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2nd edition, updated and expanded

Densborn · Finkbohner · Freudenberg
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Migrating to SAP S/4HANA®

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Dear Reader,

Any big project is best broken down into steps. Whether you're buying a house, or assembling furniture, it is important to make a plan and stick to it. These projects can be complex: building that new combination desk/bookshelf or renovating that fixer-upper in a new city. It can be easy to overlook important steps if you're not familiar with the process.

Having a guide makes these complex processes much easier. A video tutorial from the furniture manufacturer. The expert opinion of a home construction expert. There's nothing more valuable than expert advice that breaks down a project's steps, common pitfalls, and snagging points.

Take your prospective SAP S/4HANA migration project. We've assembled a team of experts with decades of SAP experience: Frank Densborn, Frank Finkbohner, Jochen Freudenberg, Martina Höft, Kim Mathäß, and Boris Rubarth. Their knowledge and guidance is collected here, in a complete resource for SAP S/4HANA migration.

What did you think about *Migrating to SAP S/4HANA*? Your comments and suggestions are the most useful tools to help us make our books the best they can be. Please feel free to contact me and share any praise or criticism you may have.

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Preface

Digitalization has arrived at enterprises. With increasing frequency, technological innovations are launched that exert drastic influence over our daily lives. The internet, with its heightened interoperability of persons, products, and services, substantially impacts your enterprise and business processes. To consider this interoperability, you must reassess traditional business models and business processes and adapt them if required. Exponential data growth requires innovative approaches to data storage and processing. In terms of system landscapes, the requirements for outsourcing business processes to the cloud keep changing. Access through mobile devices is the user interface that our customers know from their everyday lives and thus use more and more often. As the market leader for business software, we consider it our responsibility to help our customers, whatever the status of their existing system landscapes may be, and support them in addressing the challenges of this digital transformation.

With SAP S/4HANA, SAP provides a modern ERP suite that uses the in-memory technology of SAP HANA to overcome the technical limits of traditional databases. SAP S/4HANA can become the digital core of central, mission-critical business processes such as accounting, logistics, procurement, and sales and distribution along the entire supply chain. The design of SAP S/4HANA is based on the following core aspects: simplification of the application—in particular, simplification of data structures; simplification of the user experience through role-based user interfaces in SAP Fiori; embedded analytics; machine learning; and a cloud-first approach for developing new functions and business processes.

Customers can freely select the appropriate operation option for their business processes: running the business processes on premise, operating entirely in the cloud, or outsourcing only selected parts of the business processes to the cloud. SAP S/4HANA ensures flexibility. Since the introduction of SAP S/4HANA in 2015, approximately 16,000 customers have chosen this product (as of Q4/2020). The central question for our customers is no longer *if* they migrate to SAP S/4HANA but *how* to perform the migration to gain the maximum benefit from it.

This book describes the different operating models and scenarios for migration to SAP S/4HANA in detail. Readers get the opportunity to assess the corresponding scenarios and thus plan their migration to SAP S/4HANA more efficiently. In the context of the various SAP S/4HANA migration scenarios, we'll illustrate different options for defining your own pace for the

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migration and thus protecting the investments made into your existing system landscape.

Jan Gilg
President, SAP S/4HANA

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Introduction

SAP S/4HANA is SAP's next-generation application suite. SAP S/4HANA is targeted both at existing customers who use SAP ERP or the traditional SAP Business Suite and at new customers who have never used an SAP solution before.

Regardless of your situation, if you want to use SAP S/4HANA, this book is your guide to migrating to SAP S/4HANA. We'll familiarize you with all critical areas of the new SAP S/4HANA system and describe how to migrate to SAP S/4HANA, using individual migration scenarios to illustrate the process.

On-premise or in the cloud?

In this context, we won't just introduce the basic options for the tools provided by SAP; we'll also support you during the migration process by illustrating typical usage scenarios. Our goal is to provide optimal support and find the best way to make SAP S/4HANA work for you—irrespective of whether you want to use SAP S/4HANA in the cloud or on premise and irrespective of your existing ERP system. This book describes different operating models for SAP S/4HANA and explains the differences in the migration processes of the various models.

Scenarios

You'll also learn how to convert your existing SAP system to SAP S/4HANA, how to implement a new SAP S/4HANA system and transfer your data to this system, and how to transform an existing landscape into an SAP S/4HANA landscape. SAP has defined three ways to implement SAP S/4HANA:

- New implementation of SAP S/4HANA
- System conversion to SAP S/4HANA
- Selective data transfer to SAP S/4HANA

The goal of this book is to illustrate and explain the necessary processes in detail. After introducing the basic principles of SAP S/4HANA, we'll discuss all aspects of the migration scenarios and of the migration to SAP S/4HANA Cloud and on-premise SAP S/4HANA. You will be provided with step-by-step descriptions of the different migration scenarios, and their different requirements and implementations are compared using real-life examples. This book will also equip you with decision-making criteria and necessary knowledge. By the end, you'll have the know-how to decide which method is ideal for your migration to SAP S/4HANA.

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Who This Book Is For

Because this book provides a holistic overview of migrating to SAP S/4HANA, we have targeted various groups of readers. For making decisions and choosing the appropriate migration scenario, this book supports IT managers and administrators who will integrate SAP S/4HANA. However, because we also go into detail, this book also supports SAP consultants who manage SAP S/4HANA migration projects for customers or in their own organizations and project leads who want to get an overview of the individual methods and tools. All these groups can use the instructions in this book as a guide to implementing their own migration projects.

Previous knowledge

Because SAP S/4HANA is a separate business suite, you do not require any previous SAP ERP knowledge for this book. However, if you want to reproduce the migration scenarios in this book, you should have a basic understanding of SAP NetWeaver. For more information on SAP NetWeaver, SAP HANA, and data migration in SAP systems, or for a detailed business overview of SAP S/4HANA, refer to the other specialized SAP PRESS books.

Release status

This book describes all procedures and methods for on-premise SAP S/4HANA 2020 and SAP S/4HANA Cloud 2008. If you use higher versions, the screenshots shown in this book might deviate slightly from your screen views. However, we assume that the basic steps for migrating to SAP S/4HANA will stay the same in higher releases.



Terminology

The term *SAP S/4HANA migration* in this book is the generic term for the various scenarios for migration to SAP S/4HANA. Thus this term not only refers to data migration and data transfer from legacy IT systems or SAP production systems but also refers to the conversion of individual systems or the transformation of system landscapes.

Structure of This Book

This book is structured into four parts. The following sections summarize the content of these parts and the individual chapters for better orientation.

Part I: SAP S/4HANA: Basic Principles

The first part of the book contains descriptions of the most important basic concepts, which will be necessary for you to make a decision for or against a specific installation and migration scenario. This part is also relevant to IT

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managers and IT employees in organizations that have not yet decided on a concrete migration plan but want to get more information about the various options. We'll explain the various deployment options for SAP S/4HANA: in a public cloud, on premise, and as a hybrid model. Finally, you'll learn how to prepare the migration to SAP S/4HANA and explore the steps of a new implementation method for SAP S/4HANA.

Requirements and benefits

Chapter 1, SAP S/4HANA: Requirements and Benefits, provides a basic overview of SAP S/4HANA and illustrates the benefits of this new solution. In this context, we'll also cover the transformation of traditional business models—a result of the digital transformation—and we'll describe digitalization challenges that enterprises face today and will face in the future. You'll get to know SAP S/4HANA's technological and business features to address these challenges.

Differences between SAP S/4HANA and the SAP Business Suite

Chapter 2, SAP S/4HANA versus the Traditional SAP Business Suite, introduces the basic differences between SAP S/4HANA and the SAP Business Suite based on SAP ERP, and it positions the SAP S/4HANA solution in the SAP product portfolio. In this chapter, we'll also explain the reasons for these differences and discuss the relevant options for your IT department and business processes. We'll also describe the relevance of these changes for your SAP S/4HANA migration plan.

Cloud, on-premise, and hybrid

SAP S/4HANA is available in different deployment models. These options include an implementation in the private cloud or public cloud, on premise in your data center, and using a hybrid approach. **Chapter 3**, Cloud, On-Premise, and Hybrid Scenarios, conveys a fundamental understanding of these operating models and introduces the deployment options within the SAP S/4HANA product family. It describes the differences between the various models so that you can make a fact-based decision for the best deployment model. Because you need to consider adaptability to your own operational specifics when planning the migration to SAP S/4HANA, you will also learn about the available adaption and enhancement options.

Part II: Preparing for Migration to SAP S/4HANA

The second part of the book provides a step-by-step description of the different migration scenarios for SAP S/4HANA. In this part, we'll discuss the advantages and disadvantages of the various scenarios and help you with the decision-making process.

Preparing for migration

After explaining the basic principles of SAP S/4HANA, **Chapter 4**, Which Migration Options Are Available?, introduces the procedures for migrating to SAP S/4HANA and describes the concrete steps that you need to consider in the project planning process. For this purpose, we'll go into the details of the various scenarios under different conditions.

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Selecting a migration scenario

The appropriate strategy for migrating to SAP S/4HANA depends on your initial situation. This part provides you with decision-making criteria and examples for each individual migration scenario. **Chapter 5**, Selecting Your Migration Scenario, summarizes the advantages and disadvantages of the individual migration scenarios and compares them. This chapter discusses core decision criteria between choosing a new implementation or a system conversion. Landscape transformation is a special case because it can be combined with both scenarios. Ultimately, however, your choice among these scenarios will be based on business requirements.

Trial systems

Chapter 6, Trial Systems, concludes the second part of the book. It discusses the trial systems available for SAP S/4HANA. A *trial system* is comprised of a preconfigured system including customizing (such as predefined company codes and organizational structures) and sample data. The trial system helps you identify the requirements and prerequisites for your migration.

Part III: Migration through System Conversion According to the Brownfield Approach

On-premise or private cloud?

The third part of this book concentrates on the conversion of an existing SAP system, an approach that is referred to as *brownfield* and that is not available for the SAP S/4HANA Cloud product. The on-premise version of SAP S/4HANA can either be operated in your data center or be hosted in a private cloud—for example, as an infrastructure-as-a-service (IaaS) product. The system conversion as a transition scenario is one possible path for the SAP S/4HANA on-premise version, and it is detailed in this part of the book.

System conversion

Chapter 7, Preparing System Conversion, and **Chapter 8**, Executing System Conversion, introduce the first scenario for transitioning to the on-premise version of SAP S/4HANA: a system conversion. Converting an existing SAP ERP system enables you to go to SAP S/4HANA without having to install a new system. This chapter describes the general process (from the planning phase to the actual conversion), the individual steps required, and the necessary technical tools.

Part IV: New Implementation and Data Migration According to the Greenfield Approach

Greenfield approach

The last part of the book analyzes the SAP Activate implementation methodology and details the various migration tools available for the new implementation (greenfield approach) of an SAP S/4HANA system (cloud and on-premise versions). We'll introduce the SAP S/4HANA migration

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cockpit, SAP S/4HANA migration object modeler, and SAP Data Services, including SAP Best Practices Content (Rapid Data Migration solution) on the basis of real-life examples.

Implementation methodology

Introduced with SAP S/4HANA, SAP Activate is a new method for implementing SAP software and is designed to support customers migrating to SAP S/4HANA. **Chapter 9**, SAP Activate, introduces this successor to the ASAP and SAP Launch implementation models.

Installation and configuration

When migrating to the on-premise version of SAP S/4HANA, you can either install a new SAP S/4HANA system or transform an existing SAP system. **Chapter 10**, Installing and Configuring SAP S/4HANA On-Premise or in the Private Cloud, describes the necessary steps for installing backend and frontend servers and for configuring the system.

Configuration of SAP S/4HANA Cloud

A cloud solution offers new opportunities for organizing and financing IT in your enterprise. **Chapter 11**, Setup and Configuration of SAP S/4HANA Cloud, shows how you can deploy SAP S/4HANA in a public cloud. In this chapter, we'll discuss the things you should consider when implementing a cloud solution.

Planning the migration

Chapter 12, Planning Data Migration, describes how to effectively plan your data migration projects and data migration tasks. For this purpose, we'll introduce you to data migration in SAP Activate and a methodology for effectively distributing your tasks to the data migration phases.

SAP S/4HANA migration cockpit

Chapter 13, SAP S/4HANA Migration Cockpit, describes the SAP S/4HANA migration cockpit data migration tool and its various migration approaches. Among other things, we'll discuss how a migration can be performed step by step in the different approaches and which other applications support your data migration.

SAP S/4HANA migration object modeler

In **Chapter 14**, SAP S/4HANA Migration Object Modeler, we'll introduce the modeling environment of the SAP S/4HANA migration cockpit—the SAP S/4HANA migration object modeler. On the basis of real-life examples, we'll describe how you can use the SAP S/4HANA migration object modeler to adapt the content provided to customer-specific requirements and create your own migration objects.

Rapid Data Migration

In **Chapter 15**, Rapid Data Migration, we'll introduce SAP Data Services, including SAP Best Practices Content (Rapid Data Migration solution), using real-life examples. In this context, special attention is paid to data cleansing, as well as standardization and data validation.

Comparison of tools

Finally, **Chapter 16**, Comparing Data Migration and Modeling Tools, compares the various SAP data migration tools.

Information boxes

The highlighted boxes in this book contain information that is good to know and useful but outside the context. To help you immediately identify

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the type of information contained in the boxes, we have assigned symbols to each box:



- Boxes marked with this symbol contain information about *additional topics* or important content that you should note.



- This icon refers to *specifics* that you should consider. It also *warns* about frequent errors or problems that can occur.



- *Examples*, which are highlighted with this icon, refer to real-life scenarios and illustrate the functions described.



- Text passages highlighted with this icon summarize thematic relationships *at a glance*.

We hope that this book proves to be a good reference and guide for your migration to SAP S/4HANA. Christian Klein, chief executive officer (CEO) of SAP, aptly said:

> *"More than ever, the [coronavirus] pandemic has proven that digitalization is no longer an option but a must-have to withstand challenging times and to achieve desired business outcomes." (See http://s-prs.co/527900).*

We wish you an enjoyable read and hope you can use the insights gained from reading this book in real life. All the best for a successful SAP S/4HANA migration.

Frank Densborn, **Frank Finkbohner**, **Jochen Freudenberg**, **Martina Höft**, **Kim Mathäß**, **Boris Rubarth**, and our data migration experts, **Heike Jensen** and **Kirstin Siebenmorgen**

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PART I

SAP S/4HANA: Basic Principles

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Chapter 1

SAP S/4HANA: Requirements and Benefits

Increasing digitalization and interoperability in the economy doesn't just impact industrial production processes. This chapter explains how SAP S/4HANA addresses the requirements of the digital transformation.

Enterprises have always had to deal with technological changes and innovations. In the 1970s (since the so-called industrial revolution), automation became prevalent in production for the first time. Since then, computers have been introduced and electronics and information technology have been used in production, and previously manual process steps are now performed by machines.

The fourth industrial revolution—Industry 4.0

The interoperability of products, processes, and infrastructures in real time has led to another critical change in industrial production processes, introducing a fourth stage of industrial revolution. All areas of the value chain, such as supply, production, delivery, customer service, and maintenance, are linked via the internet, and information on each individual step is available in real time. The Internet of Things (IoT), as well as data and services, entails a holistic digitalization of the traditional industries, which can be summarized by the Industry 4.0 concept .

As you can see in Figure 1.1, in the past, people and enterprises had about 100 years to migrate to the next industrial level. After industrialization, mass production, and automation, Industry 4.0 now leads to global and extensive changes in production processes, business models, technologies, the world of work, and people's everyday lives.

Opportunities and risks

This paradigm shift, which is often referred to as *digital transformation*, offers opportunities and risks for new business models and existing value chains. Established enterprises can increase the efficiency of existing business models or develop new ones. Enterprises that ignore transformation risk being forced out of business by more innovative enterprises because their own business processes remained too stagnant.

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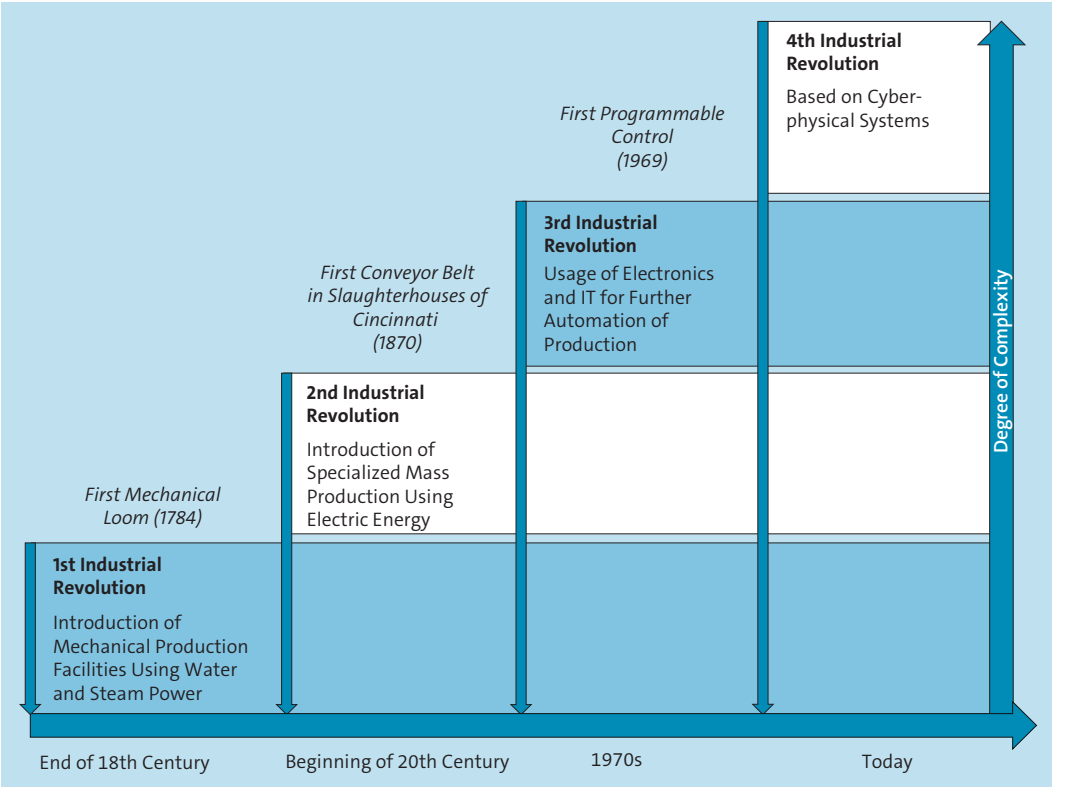


Figure 1.1 Levels of Industrial Revolution

This chapter first addresses these opportunities and risks in detail. Section 1.2 then introduces the solutions offered by SAP S/4HANA to take advantage of the digital transformation. Finally, Section 1.3 describes individual SAP S/4HANA components for marketing, procurement, logistics, finance, and human resources.

1.1 Future Business Challenges

The 2000s also introduced changes that required enterprises to adapt their business models. In comparison to the previous industrial revolutions, the radical character and speed of the latest digital transformation are specific and new. In the past, changing business models often led to large enterprises acquiring small enterprises; today, in the digital economy, dynamic enterprises acquire slow, passive enterprises. Product suppliers that had been previously unknown can become market leaders in no time at all and can thus turn established industries upside down.

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The COVID-19 pandemic constitutes another big boost for digital business models. Based on the experience gained from this crisis, enterprises will increase production automation and transform their services to digital services.

1.1.1 Digitization of Business Processes

Examples of digital transformations

Today's business processes are influenced by the increasing penetration of IT, which forces enterprises with traditional business processes to rethink those processes and adapt them to the digital transformation.

Table 1.1 lists some examples of how traditional business processes have changed over the last years.

Enterprises	Traditional Business Processes	Digital Business Processes
Airlines	Order processing via travel agencies	Online order processing
	High-quality service	No services
	Departure/arrival at central airports	Departure/arrival at provincial airports
Fashion	Outsourced production in Asia	Backsourcing of production to Southern Europe
	Design cycles of several months	Collections changing every week
	Fashion retail in specialized shops	Distribution via online channels
Heating system companies	Thermostats for heating systems in households and enterprises	Thermostats including integration into smart home technology
	High quality and holistic server portfolio	Proactive maintenance schedules
		Portfolio of additional products for smart home technology

Table 1.1 Comparison of Traditional and Digital Business Processes of Various Industries

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Enterprises	Traditional Business Processes	Digital Business Processes
Taxi companies	Assignment of taxi services via telephone	Taxi order via smartphone
	Cash payment	Automatic payment by credit card
Tool manufacturers	Tools for construction companies	Site management, including leasing tools at fixed prices per month (including repair and maintenance services)
	High-quality and holistic server portfolio	Last-mile, 24-7 service for delivery of tools to the site
	On-premise retailer	Online order processing
Guitar manufacturer	Standard production	Additional custom shop as distribution channel for customized guitars
	Outsourced production to low-cost countries	High-price segment with production in home country

Table 1.1 Comparison of Traditional and Digital Business Processes of Various Industries (Cont.)

Level of digitalization

How high the pressure is for changing traditional business processes actually depends on the segment in which the enterprise operates. The "Monitoring Report DIGITAL Economy 2016" publication of the Federal Ministry for Economic Affairs and Energy (Bundesministerium für Wirtschaft und Energie [BMWi]; see *http://www.bmwi.de/Navigation/EN*) categorizes the industries in Germany according to their level and speed of digitalization. Table 1.2 shows the categorization of industries into the following groups:

- **Enterprises with a high level of digitalization**
  Enterprises in industries with conditions strongly supporting digitalization with regard to processes, value chains, investments for digitalization, and integration of digitalization into the business strategy
- **Enterprises with an average level of digitalization**
  Enterprises in industries with conditions moderately supporting digitalization
- **Enterprises with a low level of digitalization**
  Enterprises in industries in which digital processes only play a minor role

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High Level of Digitalization	Average Level of Digitalization	Low Level of Digitalization
■ Enterprises in the information and communications technology (ICT) sector ■ Knowledge-based service providers	■ Finance and insurance sector ■ Retail ■ Energy and water supply ■ Mechanical engineering ■ Chemical and pharmaceutical industry ■ Transport and logistics ■ Automotive industry	■ Healthcare ■ Other manufacturing

Table 1.2 Evaluation of Industries Based on Level of Digitalization

Organizations that do not adapt to the changes resulting from the digital transformation will be massively impaired by their own business processes. In today's world, customers want to buy products whenever and wherever they want. Organizations using processes that do not meet this requirement will vanish from the market if they do not adapt their processes to this market condition.

Types of transformation

The increasing digital transformation comprises three types of changes for business models:

- Existing traditional business models can be complemented by the digital transformation.
- Existing traditional business models can be superseded by the digital transformation and replaced by digital business processes.
- The digital transformation can allow for business models that would not be possible without the digital transformation.

Complementing business processes

If the existing traditional business model is complemented by the digitalization, usually the enterprise can keep or even reinforce its market position. Take, for example, optimizing machine tools and production facilities. If sensor technology costs can be reduced, the enterprise can measure the maintenance requirements for a production machine and only take maintenance actions when actually required. In this case, the digital transformation supports and improves an existing traditional business model. The existing product and service portfolio is extended to ensure future business growth.

Replacing business processes

In some areas, traditional business models might be superseded by the digital transformation and replaced by digital business processes. This digitalization can radically change the rules of the market, often referred to as *disruptive transformation* or *disruptive innovation*.

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Radical change can also open traditional sales markets for new enterprises. Who would have thought that a manufacturer of Wi-Fi routers would add radiator thermostats and switchable outdoor outlets to its product portfolio? Using online services provided by the router manufacturer, customers can control the thermostats in their homes or control their garden sprinklers via the internet. Traditional providers of radiator thermostats, as well as new competitors entering the market, can respond to this digital transformation and also provide internet-based smart home products. Some providers go a step further and use the connected radiator technology to involve maintenance technicians and calculate maintenance schedules proactively.

New business processes

One example of a business model that has been made possible by the digital transformation is *crowdsourcing* or *crowdfunding*. For crowdsourcing, project tasks are distributed across internet users via internet platforms. For crowdfunding, investors are found who want to (partly) invest in a project. The interaction of these actors has been made not only possible but also economic and efficient by the internet, thus forming the basis for these business models. The digital transformation provides a wide range of options for creative business actions, and certain themes, such as focus on the customer and the quality of the infrastructure, have come to the fore. Focusing on the end consumers and their benefits is becoming a key success factor.

1.1.2 Trends of the Digital Transformation

Business and technical trends

In the context of the digital transformation, the business and technical trends illustrated in Figure 1.2 play a major role. The following sections discuss each of these trends in greater detail.

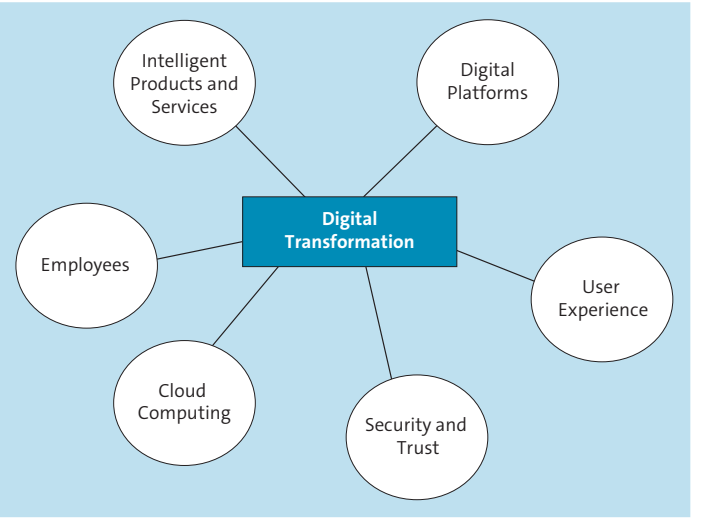


Figure 1.2 Trends of Digital Transformation

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Smart Products and Services

Internet of Things

Increasing interoperability and the development of rapid sensor technology have transformed every device and machine into an information hub. Also called the *Internet of Things* (IoT), these capabilities have changed established value chains and industrial production processes. Previous business models focused on the quality, price, and delivery times of products; in the digital world, personalized products and services with additional benefits (smart products and smart services) have become increasingly important.

Smart products and services

The following three examples illustrate how the digital transformation can change established value chains and production processes:

- **Smart maintenance**
  In smart service processes, sensor data can be used to predict the maintenance status of machines. The goal is to optimize maintenance processes by performing maintenance actions only when the status of the machine makes maintenance necessary. If this capability is supported by IT, not only will you be able to measure the current status of a machine, but you'll also be able to predict, based on historical data, when the machine is likely to break down, a capability known as *predictive analytics*.

  Smart automation is involved if a sensor on a machine or a prediction triggers a spare parts procurement in the ERP system. This enhancement of traditional business models also demonstrates how production facilities and the ERP system of the enterprise can converge. You'll benefit greatly from these smart maintenance processes because your machines will function better for longer.
- **Digital farming**
  Digital production processes have also entered traditional industries such as farming. A tractor can become a data hub, which—if equipped with the corresponding sensor—can determine how much fertilizer or seed different fields need. Harvesters can become data collectors, used by agricultural machinery manufacturers to supplement traditional business models with additional services. Conversely, mobile harvesters can also be integrated into smart maintenance processes. Agricultural machinery can be centrally monitored, and smart maintenance periods can be determined so that harvest processes run smoothly.
- **Lot size of one**
  Sales figures for electric guitar makers have declined over the past ten years. One countermeasure of major US guitar makers is to increasingly provide custom-built guitars. For selected high-price guitars, a customer can compose their own individual guitar (selection of the wood type,

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shape of the guitar neck, integrated pickups, individual artificial aging of the guitar, etc.). Providing these individual pieces requires a highly flexible structure in production processes for order processing. In the context of digitalization, this kind of production is an individual production till the lot size of one (unit of one).

An interesting dimension of unit-of-one products is that these highly emotional products involve a relationship with the product maker. The website of a major US guitar maker introduces customers to the guitar makers who design these individual products. These individual production processes have been made possible by the easy customer communication facilitated via the internet. In general, decreasing the number of units with increasingly changing orders and consequently increasing setup times for machines are digitalization trends that many organizations should take into account.

The aim of these examples is to illustrate how interoperability increases automated, software-based value chains and supplements and supports traditional business processes with corresponding services. In the future, value chain elements will be increasingly connected across the involved enterprises. The communication between the individual steps of an end-to-end business process will increasingly take place in real time. Correspondingly, the need for standards in the context of Industry 4.0 will increase, which is also demonstrated by the publication of DIN SPEC 91345, "Reference Architecture Model Industry 4.0 (RAMI4.0)," as a standard in April 2016.

Platforms

Examples of digital platforms

Compared to the new and changed value chains, digital platforms are a completely different business model. Some examples of digital platforms include the following:

- Apple's iTunes Store, on which independent providers offer apps for iPhones and iPads
- Amazon Marketplace, via which independent retailers and their products are integrated into Amazon's product portfolio
- Airbnb, a platform for leasing and letting accommodations in private homes
- Uber, an online agency service for transport services
- Industry-specific platforms such as First4Farming, a technology platform that connects participating enterprises in the farming industry

Characteristics of digital platforms

Digital platforms, the internet, and the cloud are inextricably intertwined. Search and purchasing processes are performed online; customers can

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order products using any mobile end device anytime. Digital platforms enable external providers to be a part of the value chain without having a specific technology infrastructure. The platform provider is responsible for the operation and maintenance of the infrastructure but also defines the rules and costs for using the platform.

Focus on services

Digital platforms follow a completely different approach than traditional value chains. While the focus is on the product in the traditional economic world, platforms turn their attention to infrastructure services. For example, the services provided by Airbnb and Uber (only) consist of connecting users with providers of accommodations in private homes and of private taxi services, respectively. Digital platforms provide service providers with simplified access to digital real-time markets and cloud technologies. As a result, platform providers have a strategically outstanding importance compared to the actual service providers. On the other hand, many service providers would not be able to offer their services without the platform at all, or only with much more difficulty.

Human Capital

Need for flexible employees

The migration to digital business processes requires highly qualified employees. If you want to support highly flexible and customer-specific production processes, you'll need highly flexible employees supported by critical information and data. Your employees' specific capabilities, especially their flexibility, are key factors of the digital transformation. Enterprises need to support their employees with more flexible working hours, home office options, the required infrastructure, and flextime. Due to the impacts of the COVID-19 pandemic, the digitalization of workstations is no longer just an abstract requirement. It is a real requirement for many small and medium-sized enterprises and large corporate groups, for example, if employees are quarantined or business premises are closed for some time and work remains undone because not enough staff is present on site. Therefore, the working environment will change radically due to the use of home offices and the remote services and virtual reality tools that are required for this purpose.

E-learning

The increasing requirements of flexible and complex business models also require further employee qualifications. To ensure continuous development, enterprises must integrate modern qualification approaches that are based on digital technologies. For example, specific e-learning courses (so-called massive open online courses or MOOCs) convey knowledge through videos and forums and allow trainers and students to communicate with each other and establish communities. The significance of employee qualifications must also be reflected in the context of a shortage of skilled workers, which is seen as a barrier to digitalization by many large enterprises.

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User Experience

The wide usage of smartphones, tablets, smart TVs, the internet, messenger services, and emails generally affects customer expectations for user interfaces. Today's customers, who order products and services on the internet, have the same high expectations for all the user interfaces they encounter.

Business model focusing on the user experience

The assignment of taxi services via smartphone apps has created a new business model, which replaces traditional taxi companies using radio communication to assign taxi services. In both cases, the customer orders a taxi. However, why is this (often quoted) example of the digitalization of business models successful and interesting? Because of the excellent user experience created by the taxi app on the customer's smartphone. The central feature of this experience is that an attractive order process (with an interactive map that displays taxis nearby) is linked with an attractive payment process. This process is so easy that you can simply leave the taxi after the ride and don't have to do anything because the invoice is paid via credit card details specified earlier. This example illustrates that digital business processes also differentiate themselves from each other by means of the user experience: they will only be successful if they create outstanding user experiences.

Focus on consumers

Thus, with the digital transformation, all enterprises need to focus on the consumer. The technology is not as important as the value added by the digital business process for the customer. The interface that supports the business process plays a major role for user acceptance.

Cloud Computing

Flexible IT and costs

Another digitalization trend is that IT services and business processes are outsourced to the cloud. An increasing number of cloud offerings enables you to overthink the tasks of your internal IT department. For example, specific services that cannot be efficiently provided by your own IT department can be outsourced to cloud providers. The data centers of cloud providers can usually respond more efficiently and flexibly to workload fluctuations that require computing and memory capacities to be flexible and adaptable. In addition, the costs of these flexible adaptations to fluctuations are easier to calculate. If you outsource services to external cloud providers, you don't necessarily have to support the new employee skills required by the digital transformation, which we mentioned in the discussion of "Human Capital" section earlier.

Impact on business processes

If you consider the impact of cloud computing on business processes, speed and flexibility play a major role. For example, an enterprise that outsources new business processes to the cloud, which results in shorter implementation cycles, can respond more quickly and more flexibly to

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changing market conditions. This proves to be an advantage during the COVID-19 pandemic. Using cloud computing, enterprises can quickly adapt their plans because cloud technology enables direct communication from everywhere.

Cloud computing also enables enterprises to redefine business processes. A growing number of cloud offerings allows enterprises to standardize business processes and outsource them to the cloud if they do not have to differentiate themselves from competitors in this area. Enterprises do not necessarily have to run their online shops themselves, and you can use common internet trading standards as a guide. In contrast, core business processes might emerge in which you might want to, or have to, differentiate yourself from your competitors. Perhaps you want to implement highly specialized and individual business processes that are not compatible with the standardized processes in the cloud. In this case, you'll usually want to run these business processes yourself within your enterprise.

Security and Trust

On the one hand, the increasing interoperability of value chains and the collection of large data volumes, using sensors that have become cheaper and cheaper, allow for new and supplementary business models. On the other hand, these developments also present security risks, which business organizations must address.

Security in the cloud

One of the greatest barriers to cloud solutions is *security*, which must be considered when designing the applications. While monitoring production facilities was once a rather enterprise-specific topic, in the context of smart maintenance processes, the system can be opened up to network access, which requires the corresponding security measures.

Digital business processes also place stricter requirements on security and the protection of the collected data. You must ensure that, in the relevant business processes, only authorized and authenticated partners can communicate with each other. Modern IT security and encryption systems can ensure security for this communication but must be tailored for this purpose.

Employee qualifications

For *data security*, the employee qualifications again play an important role. To innovate and ensure the competitive edge of your enterprise, your employees need to be qualified in cybersecurity. The digital skills of your employees regarding the handling and disclosure of data must be supported. What good is a modern cybersecurity concept if your employees use the same insecure password for all systems?

Higher security standards

Outsourcing business processes to the cloud can be the ideal solution for cybersecurity because reliable cloud providers usually have higher security

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standards than the IT department in many organizations can ensure. Centrally managed cloud environments can also provide the benefits of backup and recovery processes.

The users' trust

In the context of digital transformation, the success of an enterprise also depends on the users' trust. Customers will turn away from an enterprise that cannot ensure personal data is protected. But users' trust is not limited to data security; some customers might also consider ethics and values when assessing a business model. There are certainly customers who prefer a taxi app if they know that the drivers are treated more fairly and that a higher share of revenue is used for car inspections.



COVID-19 Pandemic

In many enterprises, the COVID-19 pandemic leads to further considerations regarding their digitalization. They face a challenge: To what extent is a quick digital restructuring of the enterprise possible? How, for example, can cloud computing services and software as a service (SaaS) be used for their business processes, in order to be better prepared for future events that require working from the home office?

1.2 The Pledge of SAP S/4HANA

SAP S/4HANA is a real-time ERP suite that can form the *digital core* of a business. SAP S/4HANA is completely based on SAP HANA, an in-memory platform, and provides SAP Fiori as an intuitive, role-based user interface that is structured on advanced design principles. Two deployment options are available for SAP S/4HANA: on premise and SAP S/4HANA Cloud.

Section 1.3 describes the business processes integrated into SAP S/4HANA and discusses how SAP S/4HANA can support various business departments in mastering the digital challenges we detailed in the previous section.

Support for the digital transformation

This section summarizes to what extent the basic design of SAP S/4HANA meets the requirements of the digital transformation. The aim of SAP S/4HANA is to help enterprises address the challenges resulting from the digital transformation. SAP S/4HANA enables customers to map new digital business models in addition to their traditional business models. SAP S/4HANA is SAP's answer to the increasing complexity of the digital world. SAP S/4HANA simplifies functions, data structures, user experiences, and analyses to meet the requirements for benefiting from interoperability, IoT, or big data.

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1.2.1 Simplification of the Functionality

One of the characteristics of ERP software is that its functionality grows over the years. New business trends are often integrated into the latest version of an ERP software product. Initially provided mappings of business requirements are supplemented and extended, and new applications are launched.

However, in real life, this natural and useful software growth often produces multiple functions for identical or similar requirements. In addition, technological trends and different programming languages make their way into ERP software versions.

This business and technical variety leads to complexity. For example, different technologies generate different requirements for maintenance processes. Redundantly mapped business requirements make promoting innovation difficult. If identical functions are provided in various areas, new business trends need to be integrated into all the different areas. Finally, this functional redundancy has a negative effect for all customers because the development resources of the software provider are required in various areas and are not available for other tasks, which decelerates the innovation cycle of the functions provided.

With SAP S/4HANA, SAP is committed to the *principle of one*, which means that in SAP S/4HANA, a business requirement is mapped only to one target architecture.

One mapping per requirement

An example of the principle of one in action in SAP S/4HANA is the credit management function. In SAP ERP, two credit management types have emerged over the last years: SAP Credit and Risk Portfolio Management (SD-BF-CM) and the advanced version, SAP Credit Management (FIN-FSCM-CR), which was introduced to SAP ERP at a later stage. The advanced SAP Credit Management version, which provides a wealth of functions, enables you, for example, to integrate external credit information providers. Because SAP Credit Management is SAP's preferred target architecture for credit management, only SAP Credit Management is integrated as a function into SAP S/4HANA. Future innovations will also only take this function into account.

Simplification of the system landscape

Another example of the principle of one is the simplification of existing system landscapes. In the 2000s, *best of breed* was a trend in the software development sector and would signify that the best possible solution was provided for each application area. Due to this trend, separate solutions were developed for some application areas and operated in separate systems, which then had to be integrated with the enterprise's ERP system. SAP also followed this approach by developing separate planning, sales, and

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purchasing systems. Not all of the functions that are provided in these separate solutions are also available in SAP ERP.

SAP S/4HANA provides some of these previously outsourced application areas. Thus, migrating to SAP S/4HANA also offers the ability to consolidate linked business processes into one system and thus simplify the system landscape and save IT costs.



Previously Outsourced Areas Now Available in SAP S/4HANA

An example would be production planning and detailed scheduling (PP/DS). This function enables you to generate proposals for in-house production or external procurement to cover product requirements. In the past, PP/DS has been provided within SAP Advanced Planning and Optimization (SAP APO). SAP APO is an independent solution that can be operated with SAP ERP. As of SAP S/4HANA 1610, customers can also use the integrated PP/DS function in SAP S/4HANA.

Another example in this context is the mapping of purchasing functions from SAP Supplier Relationship Management (SAP SRM) in SAP S/4HANA or in the cloud-based SAP Ariba solution. Integrated warehouse management functions in SAP S/4HANA can supersede warehouse management systems that previously ran in parallel.

With SAP S/4HANA 1709, functions from SAP Customer Relationship Management (SAP CRM) are made available in SAP S/4HANA. SAP S/4HANA for customer management is an add-on for SAP S/4HANA that you can use to manage your customer relationships and set up and run functions and processes for areas such as service order processing and customer interaction. You can find detailed information on SAP S/4HANA for customer management at *http://s-prs.co/527901*.

When migrating to SAP S/4HANA, you should evaluate the options for simplifying your system landscape. You can also optimize your landscape after migrating to SAP S/4HANA because the existing integration scenarios are usually also available with other on-premise solutions. For more information, refer to SAP Notes 2816584 and 2238445.

Merging industry-specific functions

In a third example of the principle of one, previously industry-specific functions that operated independently are now merged into SAP S/4HANA. For example, SAP S/4HANA provides functions from SAP Retail and from SAP Discrete Industries and Mill Products (DIMP). Figure 1.3 gives you an idea of how the industry solutions are mapped in SAP S/4HANA.

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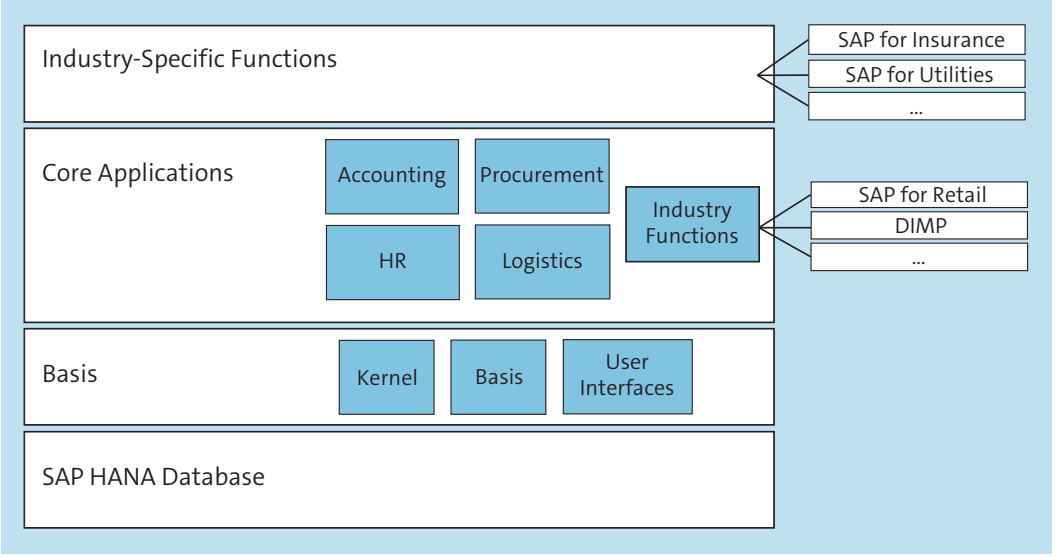


Figure 1.3 SAP S/4HANA: Shared Industry Solutions

In addition to the examples mentioned, future SAP S/4HANA releases are supposed to integrate further industry solutions that can currently only be operated separately. Up-to-date information about which industries can be operated together in SAP S/4HANA is available in the central restriction SAP Note of SAP S/4HANA. For the current release (SAP S/4HANA 1909), this is SAP Note 2799003.

Despite the benefits from simplifying the functionality and from the principle of one, however, there are also consequences that customers should be aware of when migrating to SAP S/4HANA. Customers using SAP Credit and Risk Portfolio Management (SD-BF-CM) must know that this function is not available in SAP S/4HANA and that migrating to the new SAP Credit Management (FIN-FSCM-CR) function needs to be considered.

Checking the Availability of Solutions

Before migrating to SAP S/4HANA, you should check whether the solutions you use are available in SAP S/4HANA or whether you might have to migrate to new solutions.

For more information on customizing functions in the context of migrating to SAP S/4HANA and on the relevant support provided, refer to Chapter 8.

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1.2.2 Simplification of Data Structures

In 2011, SAP introduced the new SAP HANA in-memory database, which supplements the technical framework of traditional databases. Previously, data was mainly stored on hard disks due to the limited capacity of memory; now that this limitation is no longer in play, you can use other programming methods for applications that run on in-memory databases. SAP S/4HANA leverages these new options and optimizes business applications in such a way that the potential of the SAP HANA database is fully exploited. For example, the table structure for data storage is optimized. As shown in Figure 1.4, tables in the different application areas of SAP S/4HANA were modified in such a way that aggregates in tables can be omitted.

Thanks to the increased access speed of in-memory databases, data no longer needs to be stored redundantly, which was necessary before for performance reasons. For more technical details on how the SAP HANA database allows for these optimizations of the data models, refer to Chapter 2, Section 2.3.

At this point, you might ask yourself what the benefit of a simplified (technical) data structure is for the customer. We'll use two examples to demonstrate the benefits: one example from inventory management and one example from accounting.

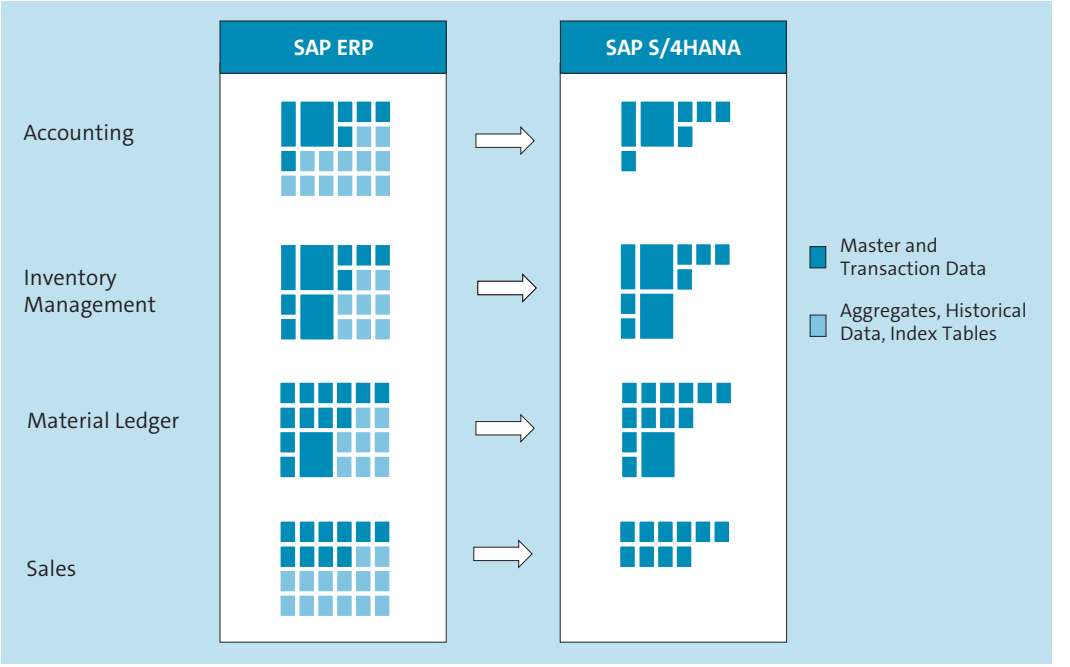


Figure 1.4 Data Structure Simplification

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Simplifications in inventory management

Determining the current material stock is rather complex, both from the business perspective and from the technical perspective. In addition to the physical inventory, you must also consider the planned goods receipts and issues at any given time. In SAP ERP's software architecture, this process was based on traditional databases. Consequently, the inventory management tables contained aggregates to optimize the performance for the determination of the current material stock. To avoid data deviations, the material stock has to be locked when new goods receipts or issues are posted. Parallel goods receipts and issues have to wait until the other process is completed. With the SAP HANA inventory management function, the SAP HANA in-memory database enables you to write goods receipts and issues of a material directly to a large material stock table without having to form aggregates (table MATDOC, Material Documents). Because goods receipts and issues now directly update stock information, the delay from locks, which were previously necessary, is minimized. As a result, a simplified data structure in inventory management also supports a higher data throughput.

Simplifications in accounting

The technical conditions of traditional databases in SAP ERP led to a software architecture that distributes the data across various tables and structures and consequently also stores data redundantly. This redundancy is a problem for the programs used to conduct financial closings because they have to consolidate this data content. This process involves reconciliation tasks that make it difficult and time-consuming to map line items.

SAP HANA enables you to centralize this previously distributed information in SAP S/4HANA in the so-called Universal Journal and thus simplify the process. SAP S/4HANA provides a central table (table ACDOCA, Universal Journal Entry Line Items) that consolidates all line-item data. As a result, external accounting and internal accounting are always reconciled, which ensures that reconciliations or real-time integrations between Financials (FI) and Controlling (CO), as well as between General Ledger Accounting (FI-GL) and Asset Accounting (FI-AA), are no longer required. Reports from all components are based on data from the same documents. This consolidation of the data in one database allows for shorter closing cycles. You can create reports and analyses anytime during the posting period.

We must mention that the benefits we described from a simplified data structure also come with effects that you should be aware of when migrating to SAP S/4HANA. Customers that convert their SAP ERP system to SAP S/4HANA have to check their existing customer-specific program code. If your custom code refers to data structures and SAP entities that change in SAP S/4HANA, you might have to carry out adaptations during the migration. So-called compatibility views were provided that maintain read access

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to obsolete SAP ERP data structures, but if data is written to data structures that are no longer available in SAP S/4HANA, you'll have to adapt the code.



Checking References to SAP ERP Data Structures

Before migrating to SAP S/4HANA, check whether your custom developments refer to SAP ERP data structures that were modified for SAP S/4HANA.

1.2.3 Simplified User Interfaces

With the new user experience (UX) from SAP Fiori, SAP meets the requirements of the digital transformation for advanced user interfaces. SAP Fiori is an intuitive user interface that has been developed according to advanced design principles. Available on all end devices (mobile devices, desktop, tablet), SAP Fiori allows for role-based user experiences that can be compared to the user experience of consumer apps. Chapter 2, Section 2.4 addresses the technical differences between SAP Fiori and SAP GUI and the operating concept behind the new interfaces.

Red Dot Award

SAP's new way of thinking about user interface design has already been recognized with awards. Who would have thought that possible when thinking of traditional SAP ERP interfaces? SAP Fiori 2.0, which is based on SAP S/4HANA, won the Red Dot Award in 2015. According to the committee, "The SAP Fiori 2.0—Next Generation Business Software concept takes the personalized, responsive, and simple user experience to the next level."

SAP Cloud for Real Estate is another example of outstanding design. This solution for professionally managing corporate real estate received the Red Dot Award in 2017. Figure 1.5 shows the user interface. You can find more information on SAP Cloud for Real Estate at *http://s-prs.co/527902*.

SAP Fiori apps reference library

You can find a list of available SAP Fiori apps in the SAP Fiori apps reference library. Choose **SAP Fiori Apps for SAP S/4HANA** under **Categories** to display the SAP Fiori apps that are available for SAP S/4HANA.

Custom SAP Fiori applications

Officially released SAP Fiori apps also enable enterprises or SAP partners to develop custom SAPUI5-based SAP Fiori apps using the SAP Web IDE.

This browser-based toolkit includes an integrated development environment. This option for developing custom user interfaces is extremely important for SAP customers. In today's SAP Business Suite, about 50% of the interfaces that are used by SAP customers are custom developments.

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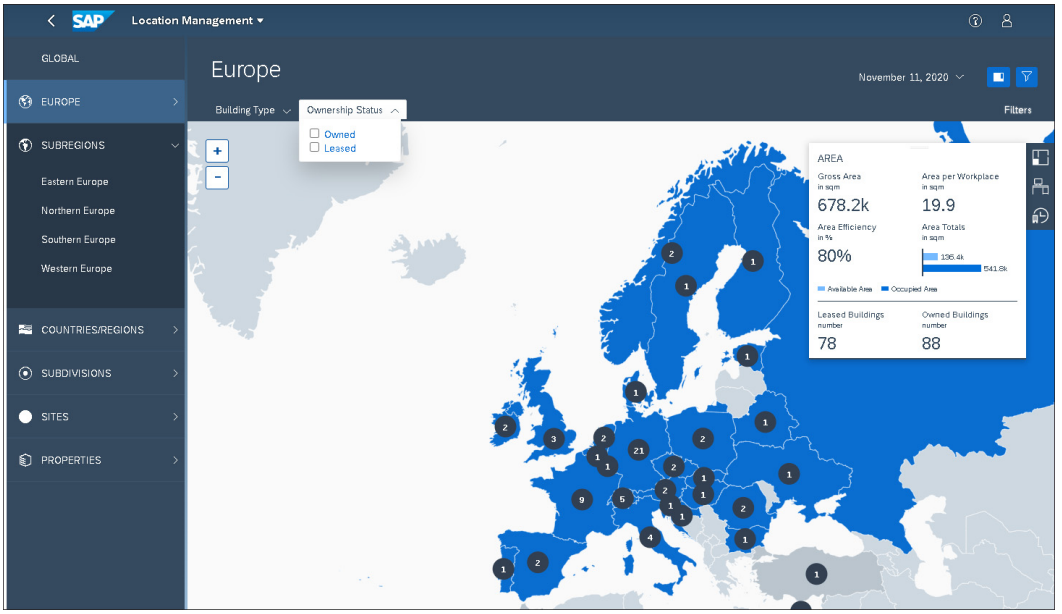


Figure 1.5 SAP Cloud for Real Estate

Additional Information

- You can find further information for redesigning the user experience using SAP Fiori at:
  https://www.sap.com/products/fiori.html
- For more information on SAP Fiori 3 go to:
  http://s-prs.co/527903
- You can access the SAP Fiori apps reference library at:
  https://fioriappslibrary.hana.ondemand.com/sap/fix/externalViewer/

1.2.4 Simplified Analyses

Relevance and user community of analytical data

In an increasingly complex world, you require increasingly more detailed information for your decision-making processes. Providing precise analytical data has always been a challenge and has become more and more important in the last two years. For example, 85% of the participants in "Analytics That Work: Deploying Self-Service and Data Visualization for Faster Decisions" (*http://s-prs.co/5279133*), a *Harvard Business Review* study, mentioned the increasing relevance of analytical data as the basis for decisions. Most participants (93%) thought that analytical data will be even

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more relevant in the next two years. The community using analytical data has also changed. Previously, strategic departments were the main users, but today, operational departments increasingly have to justify their decisions with analytical data.

Provisioning type for analytical data

Consequently, the number of users of analytical data has increased, which also affects how this data is collected and made available. Traditionally, the IT department of the enterprise was responsible for collecting the data, and the data was usually provided using custom reports. If these reports did not exist, they were requested. For custom reports, the SAP Business Suite with its ABAP-based reports was ideal.

But these reports are actually not fast, not user-friendly, and not available to all user groups. To meet increasing requirements, advanced analytical tools need to enable end users without specific IT knowledge to create new analyses. New visualizations have to be optimized, and complex data and data structures must be presented in a simple format.

Distribution of data

Another concern is how data that is supposed to be analyzed is distributed across multiple sources. Today, reports are often based on data that is distributed across ABAP reports, Excel files, or embedded Business Warehouses. Creating a report can entail a time-consuming process of generating analyses and standardizing complicated visualizations of the results.

SAP S/4HANA Embedded Analytics

The analytical functionality provided by SAP S/4HANA is referred to as *SAP S/4HANA embedded analytics*.

For more information, see Chapter 2, Section 2.6.

1.3 Business Functions in SAP S/4HANA

As a modern digital ERP suite, SAP S/4HANA forms the core of the central business processes for accounting, logistics, human resources, procurement, and marketing. Customers can use SAP S/4HANA or SAP S/4HANA Cloud. Figure 1.6 illustrates the central business processes that are briefly described in this section.

Central business processes

The SAP S/4HANA business functions that are introduced in the following sections only highlight some of the supported functions in SAP S/4HANA. These examples demonstrate how SAP S/4HANA supports customers in meeting the requirements of the digital transformation. You can find a description of all SAP S/4HANA functions in the SAP documentation on SAP S/4HANA (*http://help.sap.com/s4hana*). Remember that these functions require different SAP S/4HANA licenses.

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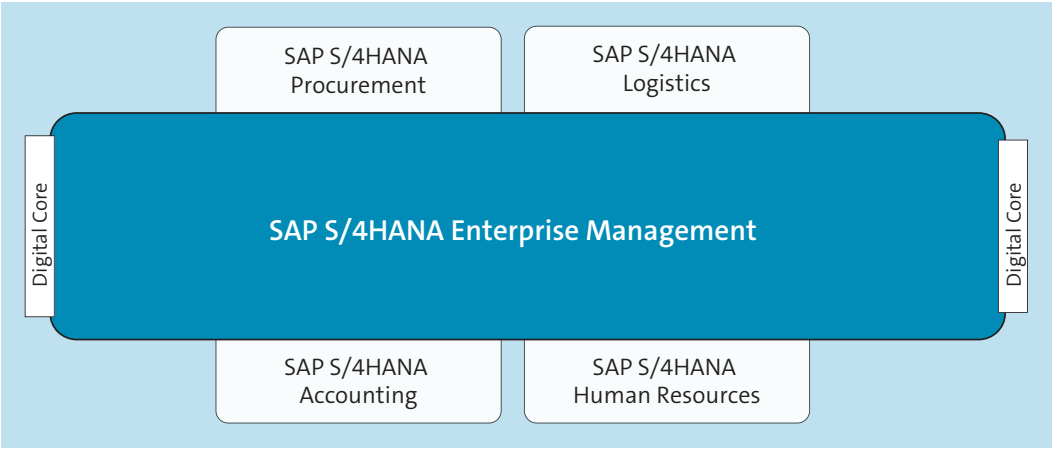


Figure 1.6 Central Business Processes in SAP S/4HANA

1.3.1 Accounting

Requirements of the digital transformation

In accounting, digitalization has rapidly increased the number and complexity of postings to systems. The transition from standardized, bulk processes to personalized products and services to made-to-order processes triggers the creation of various documents, which are then used in cost centers, asset accounting, or profit and loss (P&L) statements. The increasing number of processes that need to be performed places an extreme workload on traditional ERP systems.

Functions

In general, SAP S/4HANA can map all business processes as you would expect from an advanced accounting system. The simplified data structures in accounting, supplemented by intuitive SAP Fiori-based user interfaces, enable a completely different working experience. Figure 1.7 shows the core functions of accounting that SAP S/4HANA maps. We cannot introduce all accounting functions of SAP S/4HANA here, but we can discuss some special functions in the following sections.

Accounting and Financial Closings

Finances in general

The financial functions in SAP S/4HANA support all transactions that are relevant for accounting in the logistics and human resources components of SAP S/4HANA. In financial accounting, transactions are posted in real time via automatic account determination. As a result, all logistic quantity transactions (goods receipts, stock withdrawals, etc.) and value-based accounting updates have identical statuses.

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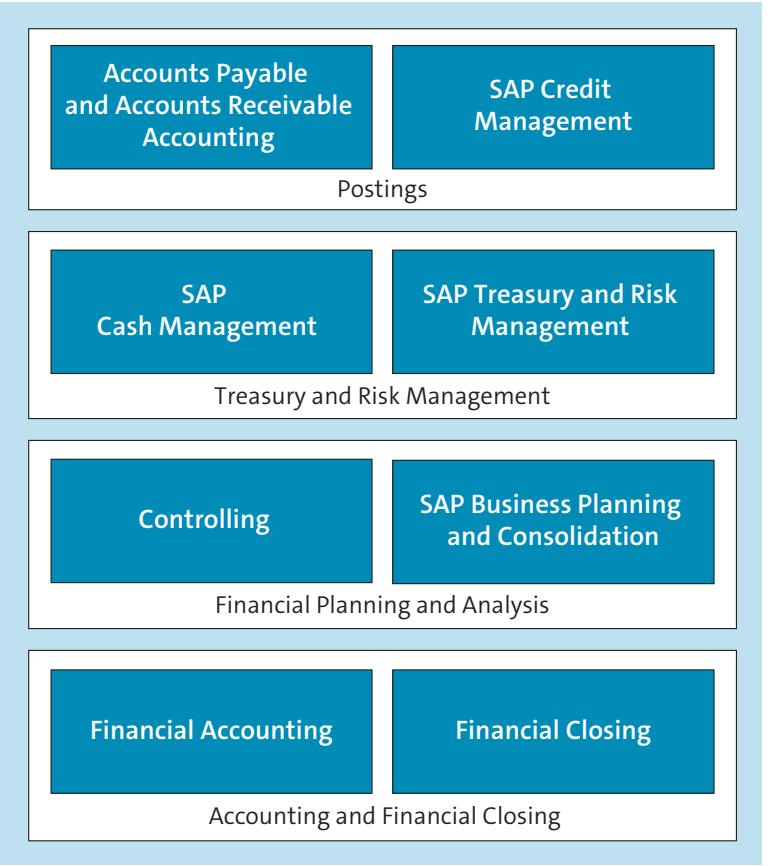


Figure 1.7 Accounting in SAP S/4HANA

Parallel accounting

In addition to the legal accounting requirements, the SAP S/4HANA accounting function also meets modern requirements such as the mapping of parallel accounting in general ledger accounting. Thus, you'll be able to close a company code according to various accounting standards. For example, a German subsidiary of a US group can prepare a period-end closing both according to the accounting standards of the US parent company (US-GAAP) and according to the German Commercial Code (Handelsgesetzbuch [HGB]).

Central finance

Central finance enables you to connect your distributed system landscape to a centralized SAP S/4HANA finance system. In this scenario, a central finance system is added to the existing system landscape, thus allowing for a general, cross-system reporting structure. With central finance, you can migrate to SAP S/4HANA without facing interruptions in the existing system landscape, which might consist of a combination of SAP systems with different releases and non-SAP systems. For more information on central finance, refer to Chapter 3, Section 3.2.1.

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Financial Planning and Analysis

The optimized data structure in SAP S/4HANA is the basis for flexible real-time analyses and evaluations to support your daily tasks. The necessary reports and analyses, as well as simulation tools, are available to meet your various requirements.

SAP Business Planning and Consolidation

SAP Business Planning and Consolidation (SAP BPC) for SAP S/4HANA is a flexible and user-friendly solution for financial planning in enterprises. With regard to content, the functions for financial planning cover planning tasks for P&L statements and liquidity planning. Business planning and consolidation for SAP S/4HANA is integrated into SAP S/4HANA. A separate installation as an add-in is not necessary.



Additional Information

- Further general information on SAP S/4HANA Finance is available at *http://s-prs.co/5279107*, *www.sap-press.com/4838*, and *www.sap-press.com/4857*.
- For more information on SAP S/4HANA central finance, refer to SAP Notes 2148893 (Central Finance: Implementation and Configuration), 2154420 (SAP LT Replication Server for SAP Central Finance), and 2184567 (Central Finance: Frequently Asked Questions [FAQ]).
- Information on setting up SAP BPC for SAP S/4HANA is available in SAP Note 1972819 (Setup SAP BPC optimized for S/4HANA Finance and Embedded BW Reporting [aka Integrated Business Planning for Finance]), as well as at *http://s-prs.co/5279108*.

Controlling

The controlling functions of SAP S/4HANA enable you to view the costs that are incurred within the organization (actual data) but also to prepare cost planning (planned data). Using the appropriate SAP Fiori apps for comparing actual data to planned data, you can determine deviations in data and then control your operational processes accordingly.

Treasury and Risk Management

SAP Treasury and Risk Management

SAP Treasury and Risk Management in SAP S/4HANA provides multiple solutions designed to analyze and optimize the business processes related to an enterprise's financial tasks. These solutions include the following:

- **Market Risk Analyzer**
  The Market Risk Analyzer (TRM-MR) component of SAP Treasury and Risk Management is designed for global risk management of insurance policies and organizations.

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- **Credit Risk Analyzer**
  This component of SAP Treasury and Risk Management enables you to measure, analyze, and control default risks.
- **Portfolio Analyzer**
  The Portfolio Analyzer (FIN-FSCM-TRM-PA) component supports calculating and monitoring the return on investment (ROI) of your financial assets.
- **Transaction Manager**
  The financial transactions that are mapped in the Transaction Manager are B2B transactions between your enterprise and banks, financial institutions, brokers, or similar institutions. Transaction Manager also is connected to SAP Cash Management in SAP S/4HANA.

SAP Cash Management

SAP Cash Management in SAP S/4HANA enables enterprises to centrally manage cash and liquidity. In addition to the main function of bank account management, it also provides cash operations and liquidity management as core functions.

Bank account management helps you meet today's requirements and increased efforts with regard to bank account management and provides approval workflows for setting up new bank accounts or changing existing ones. *Cash operations* covers all activities to do with the day-to-day management of working capital. This includes monitoring and validation of incoming bank statements, approval and monitoring of payments, triggering of bank account transfers and payments, and forecasts and analyses of incoming and outgoing payments. *Liquidity management* particularly comprises the areas of liquidity planning and analysis. For SAP Cash Management, you'll need a separate license.



Additional Information

- For additional general information on SAP Treasury and Risk Management, go to *http://s-prs.co/527904* and *http://s-prs.co/527905*.
- For additional general information on SAP Cash Management refer to the central SAP Note 2274211 (Configuration of cash management) and *http://s-prs.co/527906*.

Postings

Accounts payable/ receivable

SAP S/4HANA enables you to manage the accounting data of your vendors and customers. The corresponding accounting documents are automatically posted from the related sales and purchasing business transactions to the new, simplified accounting data structure. This provides electronic, and thus automated, support for all common methods of payment as forms.

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The solution maps all advanced collaboration scenarios as supported in the cloud-based Ariba Network solution—also used for invoice processing and accounting in SAP S/4HANA.

SAP Credit Management

In Section 1.2.1, we briefly discussed the functionality of SAP Credit Management in SAP S/4HANA. Essentially, it provides functions for credit standing checks and credit limit checks for business partners to minimize the risks of payment defaults. For existing customers, you can define rules for credit standing checks and thus automate order processes. For new customers, you can integrate external providers of credit information via a dedicated interface. SAP Credit Management supports a heterogeneous system landscape and enables you to consolidate credit-related decisions in the system landscape.

1.3.2 Logistics

Requirements of the digital transformation

As described in Section 1.1, the digital transformation places new requirements on logistics and production processes. Highly personalized products, digital supply chains, and new service-oriented business models in the spare parts and repairs processing area (so-called aftermarket business models) arise from the digital transformation. The ERP systems that are integrated in these digital business processes need to support these models.

Functions

Figure 1.8 shows the core logistics functions of SAP S/4HANA. Again, we cannot introduce all the logistics functions in SAP S/4HANA here. In general, SAP S/4HANA enables you to map all common business processes of logistics management in enterprises. The following sections discuss only some special functions in detail.

Additional Information

For additional general information on logistics functions in SAP S/4HANA, go to *www.sap-press.com/4785*.

Supply Chain Management

Inventory management

In SAP S/4HANA, the "no posting without a document" principle also applies to inventory management. To meet the increasing posting requirements of enterprises in the digital world, data storage processes for inventory management were also simplified in SAP S/4HANA, as already described in Section 1.2.2. Various SAP Fiori apps support plant controllers in analyzing stock quantities and can warn them about future material bottlenecks.

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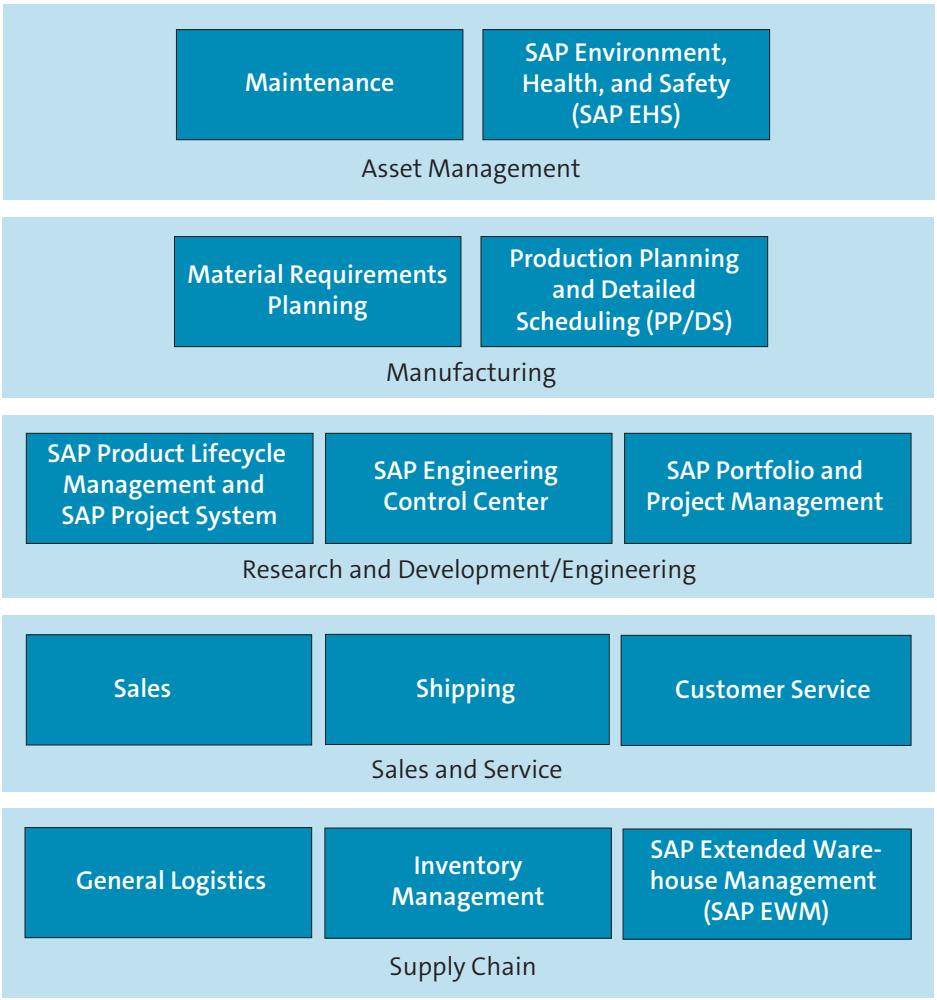


Figure 1.8 Logistics in SAP S/4HANA

SAP Fiori apps allow you to monitor items with reduced inventory turns and to track the shelf-life of products in real time, as new user interfaces enable users to work much more efficiently.

Global availability check

The global availability check (advanced available-to-promise [aATP]) in SAP S/4HANA provides advanced functions for availability checks. In addition, managing delivery quotas across multiple levels, new backorder processing methods, and interactive rescheduling methods ensure that high-priority customers are served first when a bottleneck exists.

SAP Extended Warehouse Management

SAP Extended Warehouse Management (SAP EWM) provides advanced warehouse functions, which are now also integrated in SAP S/4HANA with SAP S/4HANA 1610. Available functions include automation via storage retrieval systems, task and work optimization, and the usage of mobile end

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devices without requiring a separate system. You can also optimize your system landscape when migrating to SAP S/4HANA. However, you can also still run SAP EWM separately.



Additional Information

- For additional information on requirements planning in SAP S/4HANA, go to *http://s-prs.co/527907*.
- More information on aATP in SAP S/4HANA is available at *http://s-prs.co/527908*.
- For more information on SAP EWM, go to *https://help.sap.com/ewm*.

Sales and Service

Optimized processes

Digital business processes aim to automate the standard processing of sales and service orders as much as possible and optimize the handling of exceptional situations. Therefore, in addition to providing standard functions for order and delivery processing, SAP S/4HANA focuses on the optimization of the processes for handling exceptions.

An optimized SAP Fiori user interface can enable your sales employees to get an overview of a bottleneck, analyze the reasons for the bottleneck, and trigger solutions.

SAP S/4HANA for customer management

As mentioned in Section 1.2.1, the SAP S/4HANA for customer management add-on is available as of SAP S/4HANA release 1709. With this add-on, you can manage your customer relationships and set up and run functions and processes for areas like service order processing and customer interaction. Additional functions of customer management are scheduled for future SAP S4/HANA releases.



Additional Information

For additional detailed information on SAP S/4HANA for customer management, go to *http://s-prs.co/527909*.

Production and Material Requirements Planning

Production planning and detailed scheduling

SAP S/4HANA provides dedicated functions for production planning and detailed scheduling (PP/DS). These functions can be specifically used to plan critical products—for example, products with long replenishment lead times or products that are produced using bottleneck resources. Previously, these functions were provided in separate planning systems such as SAP Advanced Planning and Optimization (SAP APO). Migrating to SAP S/4HANA will simplify your system landscape.

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SAP Manufacturing Execution

To consider the actual production status in production planning in SAP S/4HANA, you can integrate SAP S/4HANA with SAP Manufacturing Execution or other manufacturing execution systems (MES). This integration enables production processes to be confirmed in the SAP S/4HANA system, where you can then create the required production orders, planned orders, and maintenance orders.



Additional Information

- In SAP Notes 2841107 and 2825650 describe details for usage and implementation for Production Planning and Detailed Scheduling for SAP S/4HANA 1909.
- For more information on SAP Manufacturing Execution, go to *http://s-prs.co/527910*.

Research, Development, and Engineering

The digital transformation affects the areas of research and development (R&D) and engineering in two ways: with the trend toward personalized products and with the need to carry out a large number of change projects and manage these projects efficiently.

SAP Product Lifecycle Management and SAP project system

To meet these requirements, SAP S/4HANA provides standard functions for SAP Product Lifecycle Management (SAP PLM) and SAP project system, but also additional specialized functions such as SAP Engineering Control Center and SAP Portfolio and Project Management. Let's start by introducing the two specialized solutions.

SAP Engineering Control Center

The trend toward personalized unit-of-one products increases product variety and complexity. Correspondingly, providing product information across the entire product lifecycle and supporting the decisions of all involved business departments by supplying holistic product data are required. For this purpose, SAP Engineering Control Center, an add-on for SAP S/4HANA, offers functions that support processes from development to the actual production of a product. SAP Engineering Control Center enables you to integrate data from computer-aided design (CAD) solutions into a central data source. Today, complex devices often consist of mechanical, electronic, and software components. Thanks to SAP Engineering Control Center, the corresponding authoring tools for each kind of component can be merged, allowing a holistic 360° view of the product data.

SAP Portfolio and Project Management

The digital transformation also increases the number of change projects in enterprises. Correspondingly, software requirements increase to better and more efficiently support these projects with regard to managing, controlling, and integrating internal and external employees. In addition to the

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traditional standard functions for project management, SAP S/4HANA provides SAP Portfolio and Project Management as a customized solution for project and portfolio leads and members. Instead of leading to complex data aggregations and batch processes for project monitoring and controlling tasks, SAP Portfolio and Project Management enables real-time access to the relevant data for accounting or human resources. SAP Fiori-based user interfaces allow for project monitoring and provide an overview of upcoming project milestones, project tasks, and reoccurring problems. The role-based approach of SAP Fiori apps solves the problem in which different interfaces are required by users who use project functions versus those who rarely have to perform project-related tasks.



Additional Information

- For more information on SAP Product Lifecycle Management, go to *http://s-prs.co/5279109*.
- For more information on SAP Engineering Control Center, go to *http://s-prs.co/527911*.
- For more information on SAP Portfolio and Project Management, go to *http://s-prs.co/527912*.

Asset Management and Healthcare

SAP S/4HANA Asset Management

SAP S/4HANA Asset Management enables you to analyze and evaluate asset data that is based on machine or sensor data in real time. You can thus make decisions and create forecasts in a timely manner to minimize downtime.

SAP EHS Manangement for SAP S/4HANA

The SAP EHS Management for SAP S/4HANA functions support your enterprise in managing your business processes in the environment, health, and safety sectors. These functions use real-time data to help experts perform the following tasks:

- Controlling operational risks
- Occupational safety
- Conformity with integrated solutions for managing accidents or chemical data
- Assessing operational risks
- Occupational health and monitoring of exposures
- Adherence to legal requirements
- Emissions management

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Additional Information

- For more information on asset management in SAP S/4HANA, go to *http://s-prs.co/527913*.
- For more information on SAP EHS Management, go to *http://s-prs.co/527914*.

1.3.3 Human Resources

Requirements of the digital transformation

The digital transformation doesn't only impact production processes. Advanced human resources processes face the following challenges:

- The increasing flexibility of business processes must entail more flexible working hours and working time models.
- If business models change quickly, you'll also have to quickly adapt the goals of the individual employees to correspond the new strategic goals of the business.
- In a global market for qualified employees, enterprises can no longer ignore digital media for recruitment.
- Enterprises must strive to find and engage qualified employees. Enterprises need to know which skills individual employees have and which skills are missing in the enterprise to stay ahead of competitors in the digital world.
- Furthermore, advanced compensation systems have to consider the increasing demands on employees.
- Enterprises want to create a viable and innovative environment for their employees and managers. For this purpose, the software for human resources (HR) processes should be as intuitive as possible and provide for a compelling user experience.

The trend of outsourcing business processes to the cloud is particularly reflected in human resources. Increasing cost pressures and the options provided by digital learning platforms or online ratings make enterprises outsource their business processes to the cloud, especially in the HR area.

In SAP S/4HANA, cloud-based functions in SAP SuccessFactors can map the target architecture for HR. SAP S/4HANA maps HR functions and comprehensive core functions, such as talent management, recruiting, application management, onboarding, learning management systems, performance management, and succession management in the cloud. Standardized integration scenarios and a unified user interface, which is based on SAP Fiori, ensure the technical and functional integration of HR processes.

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Figure 1.9 provides an overview of the functions provided by SAP S/4HANA and SAP SuccessFactors.

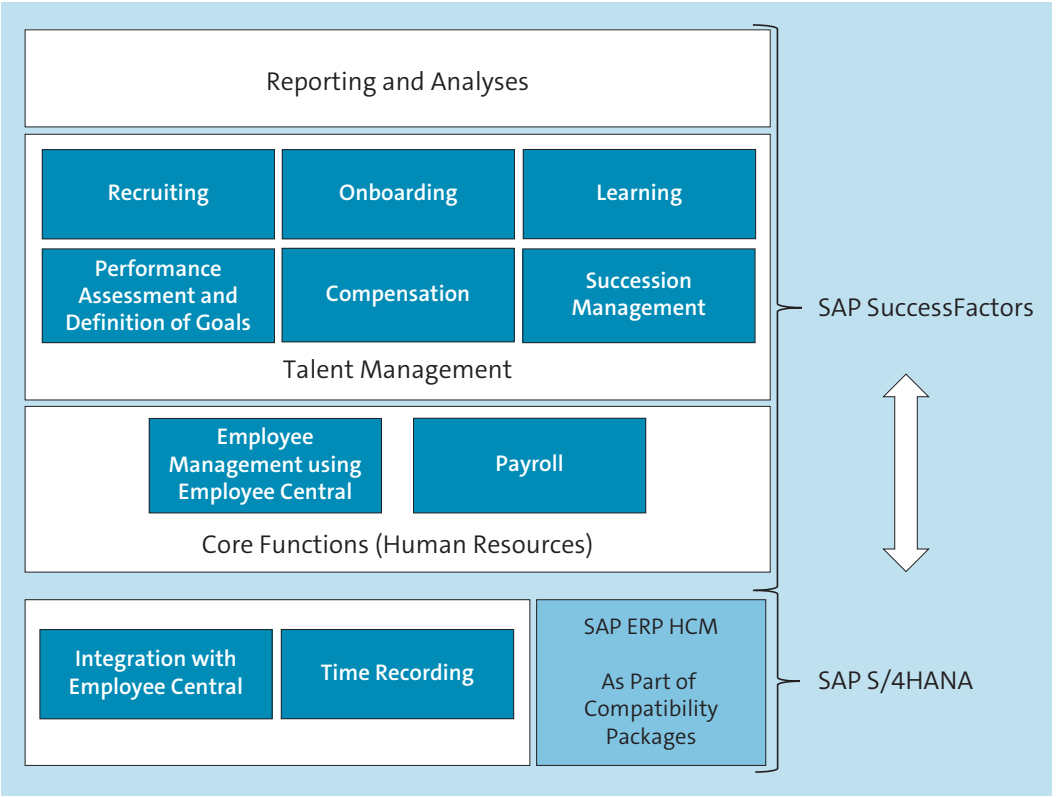


Figure 1.9 Human Resources in SAP S/4HANA

Human Resources Functions with SAP S/4HANA

Time recording

The Time Recording SAP Fiori app enables you to enter times for specific activities to settle and invoice projects. You can also record times for tasks that are not related to projects—for example, for administration tasks, trainings, or travel. Managers can approve or reject time sheets that employees have submitted for approval.

Integration with SAP SuccessFactors Employee Central

Integrated with SAP SuccessFactors Employee Central, SAP S/4HANA provides access to manage employee master data. You'll be able to use the employee data required for carrying out processes such as project planning and project time recording to create customer invoices or to invoice and reimburse travel costs. Replicating employee data from SAP SuccessFactors Employee Central to SAP S/4HANA is based on standardized service application programming interfaces (APIs).

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Traditional human capital management functions

In SAP S/4HANA, the SAP S/4HANA compatibility packages provide familiar functions that you know from SAP ERP. After migrating to SAP S/4HANA, these functions are still available but are not the target architecture from a technological perspective. For more information on SAP S/4HANA compatibility packages, refer to Chapter 3, Section 3.2.1.

For human resources in SAP S/4HANA, the following SAP ERP Human Capital Management (SAP ERP HCM) functions are available, for example:

- Core HR functions (such as personnel administration, management of external employees, and organizational management)
- Payroll
- Talent management
- Time and attendance management

In general, customers who already use SAP ERP HCM functions in their SAP ERP system (either installed together in one system or via a separate SAP ERP HCM system integrated with SAP ERP) can continue to use them after their migration to SAP S/4HANA. Please note the entries for SAP ERP HCM in the SAP S/4HANA simplification list. However, for SAP, the future of HR business processes is in the cloud. SAP SuccessFactors functions are target architecture for human resources management in the future.



Gradual Migration with Compatibility Packages

The functions delivered with the compatibility packages, and thus SAP ERP HCM, allow you to migrate to the target architecture gradually.

SAP SuccessFactors

Core Functions of SAP SuccessFactors

In principle, SAP SuccessFactors comprises the following components:

- **SAP SuccessFactors Recruiting**
  This component is used to recruit appropriate talents for the enterprise and to hire them quickly and efficiently.
- **SAP SuccessFactors Onboarding**
  Onboarding supports integrating newly hired staff quickly and efficiently. Here, among other things, the focus is on granting access to the resources and information required.
- **SAP SuccessFactors Learning**
  The aim of this module is to develop and improve the capabilities of employees and managers via additional training, as well as to reduce compliance risks.
- **SAP SuccessFactors Performance & Goals**
  Here, you can continually track and control employees' performance

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and adapt it to new strategic business goals as required. Continuous performance management allows for regular feedback for employees and for a focus on coaching.

- **SAP SuccessFactors Compensation**
  This component supports HR managers and employees in planning and distributing budgets, adapting compensation to business results, and defining a transparent wage policy. Performance-based comparisons of employees across the entire organization ensure that employees are paid fair salaries based on performance.
- **SAP SuccessFactors Succession & Development**
  These functions support HR managers in recruiting and promoting talent and in establishing successors for all important positions. HR managers will have access to an overview of the talent in the enterprise; can quickly identify vacancies and possible personnel gaps; and can provide for suitable replacements using the integrated tools, reports, and search functions, which can also accommodate external applicants.

Deployment Variants

Cloud, on-premise, or hybrid

Figure 1.10 illustrates the various options for how HR functions in SAP S/4HANA can be deployed:

- **Cloud scenario**
  The first variant is to deploy all solutions in the cloud ❶. The integration between SAP S/4HANA Cloud and SAP SuccessFactors allows you to run financial and logistics processes, together with the HR management functions, in the cloud.
- **Hybrid scenario**
  The second variant is a hybrid scenario in which you run the financial and logistics processes in SAP S/4HANA, on-premise, and integrate these processes with the functions of SAP SuccessFactors in the cloud ❷.
- **On-premise scenario**
  The third variant is a strictly on-premise scenario. After migrating to SAP S/4HANA, you can continue to use traditional human capital management functions—either by installing SAP S/4HANA together with SAP ERP HCM ❸a or, alternatively, by connecting a separate SAP ERP HCM system ❸b.

New on-premise solution for HR management for SAP S/4HANA

In early 2018, SAP announced another option for customers who want to continue to operate HR on premise. The plan is to provide a new on-premise solution for HR management by 2022. This solution is based on SAP ERP HCM and provides a comparable functional scope (except for the SAP E-Recruiting application). It is supposed to be implemented in a separate or

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embedded instance and be closely integrated with SAP S/4HANA. As noted, the plan is for the solution to be available in 2022.

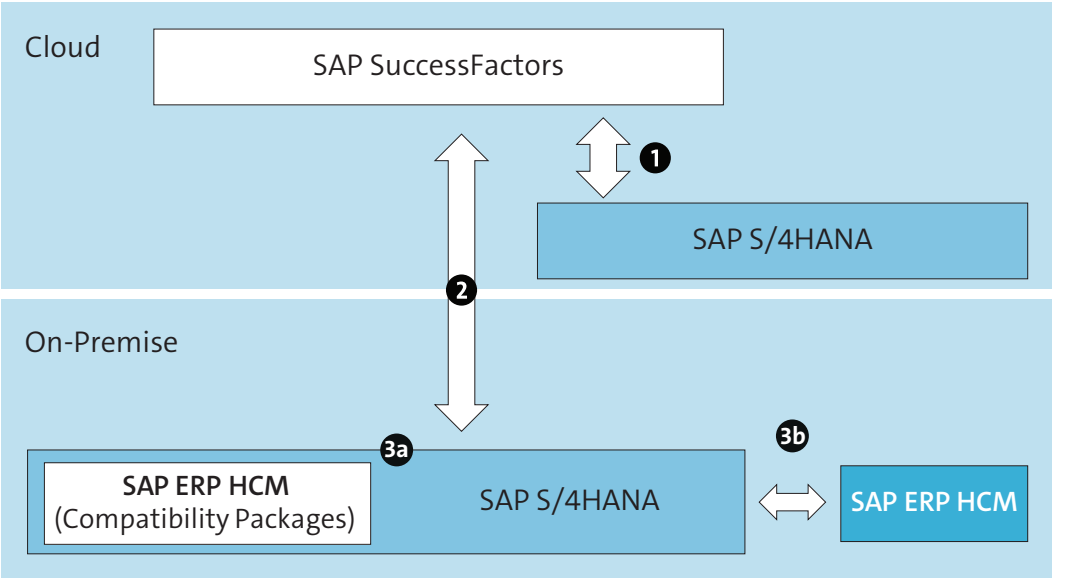


Figure 1.10 Deployment Variants for Human Resources Functions with SAP S/4HANA

Additional Information

- For additional general information on HR functions in SAP S/4HANA, go to *http://s-prs.co/5279134*.
- For more information on SAP SuccessFactors, go to *http://s-prs.co/5279110*.
- For more information on the new on-premise solution for HR management for SAP S/4HANA, go to *http://s-prs.co/5279136* and *http://s-prs.co/5279135*.

1.3.4 Procurement

Requirements of the digital transformation

As part of the digital transformation, more and more devices and machines are becoming linked information hubs. Advanced machines and devices use sensors to report their maintenance requirements to ERP systems and thus increase the need for automation in the purchasing department, where most of an enterprise's costs are incurred. Consequently, material requirement processes need to be automated.

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Digitalization will automate all processes that can be mapped by algorithms. Buyers will increasingly focus on strategic tasks and only process deviations from defined business process. To make efficient strategic decisions or exceptional decisions, buyers need to be supported by qualified data and information.

Functions

The procurement function in SAP S/4HANA maps all common purchasing processes—from strategic processes to operational processes: purchase order handling for direct and indirect materials and services, goods movements, invoices (including the transfer to accounting), and so on. SAP S/4HANA's preconfigured integration with the cloud-based Ariba Network and with SAP Fieldglass solutions optimizes electronic and interactive processes with suppliers and assists the management of external employees. Figure 1.11 shows the procurement functions of SAP S/4HANA.

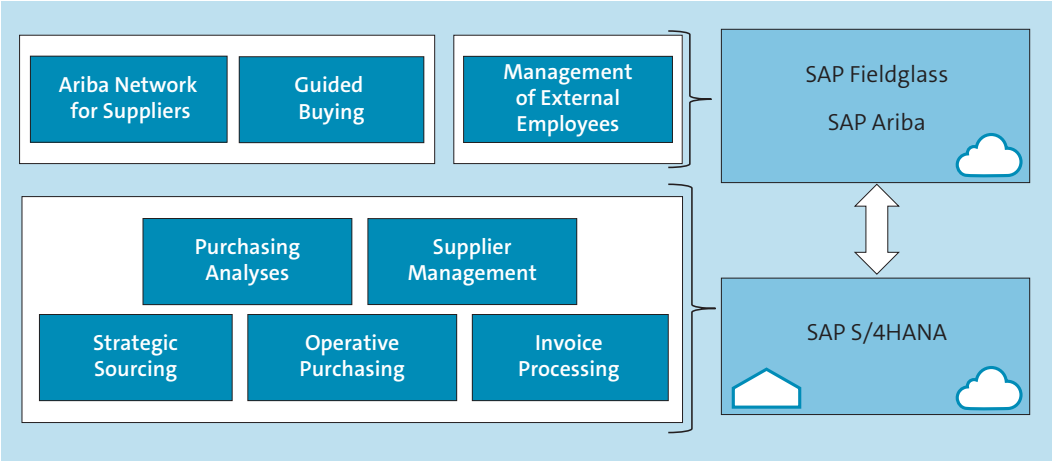


Figure 1.11 Procurement with SAP S/4HANA

Operative Purchasing

Automated functions

SAP S/4HANA eases the workload of operational buyers and significantly optimizes standard processes. The functions include the following:

- Automated purchase order creation based on order requirements
- Purchase order handling for direct and indirect materials and for service procurement, including the corresponding confirmation processes
- Catalog-based material procurement based on self-service processes
- Completely electronic communication with suppliers (optional)
- Integration with Ariba Network for optimizing the collaboration with suppliers

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Strategic Sourcing

Foundation for automation

To automate operational purchasing, you'll have to lay a foundation in strategic sourcing. SAP S/4HANA enables you, for example, to specify the sources of supply for the required products and services in corresponding purchasing contracts. This determination ensures that the right products are automatically ordered with the right price from the right supplier for material requirements planning (MRP). The monitoring of the purchasing contracts assures that the relevant release quantities and target quantities are available anytime and that actions can be taken if required.

Invoice Processing

SAP S/4HANA also enables you to map the processing of all incoming invoices. In addition to invoices for purchase orders from the SAP S/4HANA system, you'll be able to map incoming invoices created with Ariba Network or SAP Fieldglass. The goal of this function is to increasingly automate invoice verification processes for standard invoices so that buyers only have to process invoices that deviate from the usual purchase orders (e.g., with regard to items, quantities, or price).

Supplier Management

SAP S/4HANA provides various functions for classifying suppliers on the basis of attributes and master data. You can evaluate suppliers according to different factors (compliance with agreed upon prices or scorecards).

Analyses in Purchasing

Embedded analytics

With SAP S/4HANA, buyers can analyze data in real time without using separate data warehouses. Some of the available analyses, presented via SAP Fiori, include the following:

- **Supplier analyses**
  Supplier on-time delivery, price variance, and quantity variance
- **Purchasing contract analyses**
  Unused contracts and expiring agreements
- **Spend analyses**
  Purchasing spend and contract leakage

Guided Buying

Efficient workflow

Guided buying processes walk buyers through the system to help them make the right purchase decision according to business requirements in an efficient manner. Ultimately, guided buying processes save buyers from non-value-adding tasks and are based on existing SAP Ariba catalogs and enterprise-specific policies that are easy to maintain. With guided buying,

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you can also define budget policies for material groups or define the logic behind approval workflows.

Ariba Network for Suppliers

Communication with supplier systems

The Ariba Network for suppliers is a cloud-based platform that supports collaboration with your suppliers of materials or services. Figure 1.12 illustrates the electronic processes between buyer and supplier that can be integrated with Ariba Network.

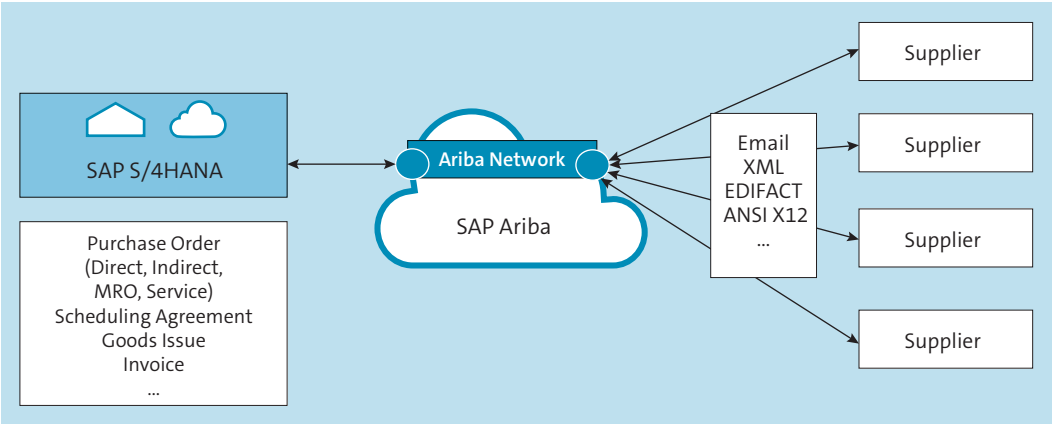


Figure 1.12 Collaboration Processes with Ariba Network

In SAP S/4HANA, the integration with Ariba Network is already preconfigured. From a technical perspective, Ariba Network is the central interface to the supplier and converts data into the data formats that the relevant supplier supports. For example, PDF forms can be filled out and exchanged via email or in specific data formats such as EDIFACT (Electronic Data Interchange for Administration) or ANSI X12 (American National Standards Institute Accredited Standards Committee X12).

Additional Information

For more information on SAP Ariba, go to *www.ariba.com*.

Management of External Employees

SAP Fieldglass

Because business processes are constantly changing, enterprises increasingly rely on external employees. By hiring external employees, temporary skills gaps can be closed, and peak loads can be balanced. The cloud-based SAP Fieldglass solution provides functions for service procurement processes and for managing these external employees. Based on preconfigured integration with SAP S/4HANA, master data, such as cost centers, internal

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orders, or organizational data, is exchanged, and invoice processing, including for the invoices of external employees, can be automated.



Additional Information

- For additional information on SAP Fieldglass, go to *https://www.fieldglass.com*.
- For more information on service procurement and contingent workforce, go to *http://s-prs.co/5279111*.

1.3.5 Connecting Business Data Using Experience Management

A rapidly changing market, constantly changing customer behavior, and continuously increasing customer expectations pose ever greater challenges to enterprises. The exchangeability of products and a high number of alternative products force enterprises to respond to customers' requirements and expectations faster and faster. To be able to meet these requirements, enterprises must create a positive customer experience in order to emotionally bind customers to their products and the enterprise. This calls for a high degree of digitalization and new business processes. Enterprises need consistent experience management (XM) to meet this challenge.

With its takeover of the US company Qualtrics in 2019, SAP was able to integrate one of the leading enterprises in the area of experience management software into its products. The experience management solution of SAP and Qualtrics records data (which will be discussed in the next section) from various data sources so that enterprises learn more about their customers, employees, brands, and products (see Figure 1.13).

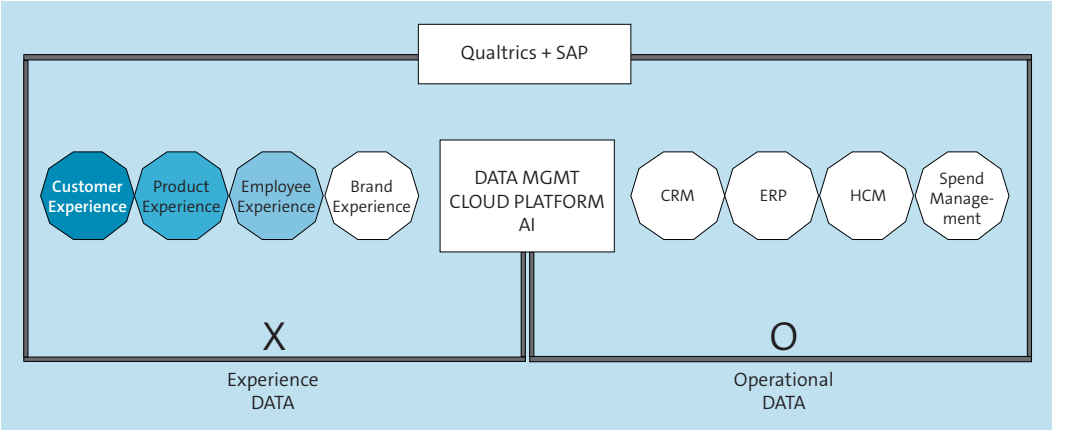


Figure 1.13 Connection of Experience and Operational Data

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Based on this data, they can gain insights into buying behavior, but also collect sentiments and experiences of employees to counteract high fluctuation or increase employees' satisfaction if required. You can also draw conclusions on the popularity and acceptance of products and brands from this data.



Additional Information

- For more information on experience management, go *http://s-prs.co/5279112*.
- For more information on Qualtrics, go to *https://www.qualtrics.com*.

Experience Data and Operative Data

Experience data and operative data

As already described, the experience management solution of SAP and Qualtrics collects experience data and combines it with operative data. Experience data basically includes all data that refers to a specific behavior of customers, such as convictions, emotions, and intentions (also referred to as *human factors*). Operative data involves operational or process data, product reviews, customer feedback, recommendation rates (net promoter scores), and brand sentiment. Based on the analysis and interpretation of merged experience and operative data, enterprises can derive measures to predict the needs and desires of their customers, employees, products, and brands. The data can be used to find out what happened (operative) and why (experience). It helps you to predict and prevent problems before they arise. It also helps you to realign enterprise processes with a focus on the customer and optimize any interaction between the customer and your enterprise throughout the sales process.

Experience Management Using Qualtrics and SAP S/4HANA Cloud

Experience management, embedded in SAP S/4HANA Cloud

Experience management was integrated with the product design of SAP S/4HANA Cloud in release 1911. SAP S/4HANA Cloud users can now continuously collect feedback on products and requirements from their customers and derive measures from it in order to meet customer requirements faster and better. To collect this feedback, SAP S/4HANA Cloud users are provided with surveys from a series of official feedback tools.

Since release 1911, SAP S/4HANA Cloud is integrated with the experience management solution of SAP and Qualtrics. This integration is used to give customers an opportunity to forward their feedback and experience to SAP. The goal is to continually optimize the SAP S/4HANA Cloud product. With this measure, SAP also becomes an experience management enterprise.

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Additional Information

For additional information on the integration of SAP S/4HANA Cloud with the experience management solution of SAP and Qualtrics, go to *http://s-prs.co/527915*.

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Chapter 2

SAP S/4HANA versus the Traditional SAP Business Suite

How are SAP S/4HANA and SAP ERP related? What is SAP's "intelligent enterprise"? Perhaps you've already asked yourself these and similar questions. In this chapter, we'll tackle these basic questions and explain the role of SAP S/4HANA in SAP's product portfolio.

SAP has offered various enterprise resource planning (ERP) products. The most important ones are SAP ERP, including the respective SAP ERP Enhancement Packages (EHPs) and SAP Business Suite on SAP HANA, with SAP S/4HANA being the current version. This chapter describes the similarities and differences between traditional products and SAP S/4HANA. We'll first discuss the key areas and goals of each product and then explain the important concepts behind the new solution: its simplification concept, its new data model, and the underlying SAP HANA database, as well as the new SAP Fiori user interface (UI). Finally, we'll address integrating SAP S/4HANA into your system landscape, reviewing changes on existing interfaces. Based on the information in this chapter, you'll be able to assess and plan your migration to SAP S/4HANA.

2.1 Comparing the Available Solutions: SAP S/4HANA and the Digital Core

For several decades, SAP has been the market leader for business software, known especially for its applications in core business areas and for its ERP products in particular. The most popular SAP ERP products are SAP R/3, SAP R/3 Enterprise, and SAP ERP (including its Enhancement Packages). How does SAP S/4HANA fit into this portfolio? To answer this question, let's look in detail at core business processes and at which conflicting requirements your business application faces.

Core business processes

Core business processes form the backbone of any enterprise. On top of the standard processes implemented by the software vendor, usually enhancements are added to meet enterprise-specific requirements, such as devel-

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oping new and advanced business processes, strengthening customer relationships, optimizing goods movements, and more.

One of the characteristics of core processes is their high level of stability at first glance. But if you take a closer look at these processes, you'll see that they now are subject to changing requirements and expectations as well. The supporting software solution must therefore be able to take new perspectives and issues into account. Otherwise, the software solution no longer supports business processes but instead hinders them.

Pressure for change

In addition to this process-related pressure for change, another pressure for change is driven by technical requirements. As with other technical products, technological innovations enable new design approaches for ERP systems. Such a technological innovation allowed SAP to develop SAP R/3, the successor to SAP R/2. This new system used the client/server architecture for the first time and thus permitted new usage patterns.

In-memory SAP HANA technology

The new SAP in-memory database, SAP HANA, was the next technological innovation. In the past, software solutions had to compensate for slow access to physical data storage media when users worked with large data volumes. Thanks to the in-memory database, this compensation is no longer necessary, opening up a new realm of possibilities for the architecture of data models and related processes.

Future challenges

As a user of an ERP solution, the question you should ask yourself is: How can I benefit from an advanced software solution? To answer this question, you should consider the dimension of time: How will the requirements for my business processes change in the future? SAP asked itself these questions and determined, from analyzing these conflicting requirements, that it could only meet future challenges if it revised the application core.

Even if the traditional ERP architecture can cover the current processes in an enterprise, in a few years this architecture will probably no longer be sufficient. Several factors contribute to this conclusion: On the one hand, there is the forecasted development of data volumes within the enterprise. On the other hand, the requirements to support users with embedded "intelligence" increase constantly. Let's first consider *data volume*. Many researchers predict considerable growth of data that is generated on a global scale. Forecasts differ slightly in their estimate of absolute figures. But they all agree that the data volume will increase exponentially. According to a study conducted by Seagate, a hard disk manufacturer, the data volume generated worldwide will increase to approximately 175 zettabytes by 2025 (see *http://s-prs.de/v745521*). This increase is driven by the data generated and used by people in their social lives (e.g., videos, tweets, conversations, streaming services used, and much more). But the growing deployment of artificial intel-

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ligence (AI), which depends on large data volumes via deep learning, also significantly contributes to this increase. These examples primarily involve unstructured data. Likewise, the volume of data generated through IoT will increase dramatically (see Figure 2.1). Enterprises will have to analyse and interpret data more than ever before.

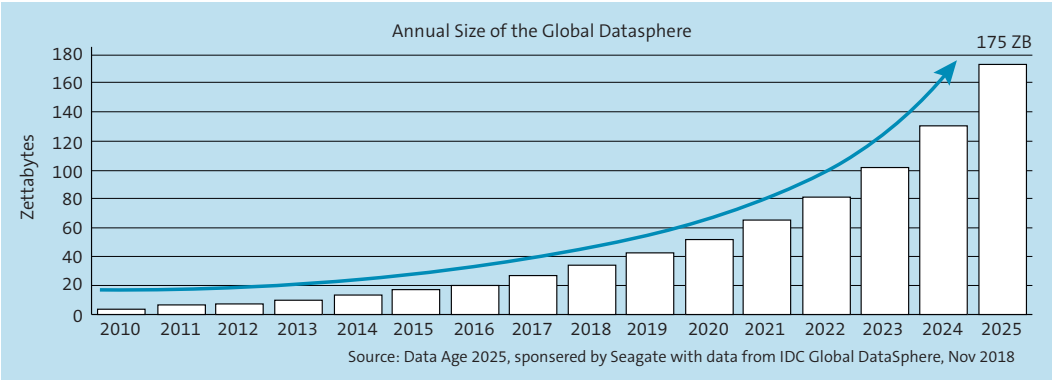


Figure 2.1 Dramatic Increase in Global Data Volume to 2025

For enterprises, the challenge now is to quickly and purposefully filter and process the information from this data volume that is relevant for their activities . This way, enterprises can make critical business decisions based on all relevant information.

Growing data volumes

Application architectures from the 1990s can no longer process these data volumes with the performance your business requires. Thus, SAP would offer suboptimal solutions if it ignored this basic architectural change.

More holistic value chains

Let's now consider the "intelligent support" of users. To survive in a global competitive environment, enterprises must operate with maximum efficiency. For this purpose, users require, for example, proposals of their ERP system to direct their attention. They also expect an option to easily analyse increasingly complex business processes. Examples include the recognition of dependencies, forecasts of expected development, and evaluations from different points of view.

SAP wants to provide solutions for an "intelligent enterprise": intelligent mechanisms that relieve the workload of the person in charge and can independently analyse large amounts of data to provide users with hints and support. An example would be sales processes that are made outside of framework contracts and thus cause unnecessary costs for the enterprise. Another approach to this intelligence would be, for example, automated classification of notifications. In addition to predefined intelligent processes, SAP also provides comprehensive libraries with integrated machine

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intelligence. Particularly in SAP HANA, these large amounts of data can be processed quickly and efficiently.

Expectations about the scope of *end-to-end processes* have risen; process chains have become increasingly longer. The extension of process chains is indicated by the fact that the direct interaction between the manufacturer and the end customer has taken on a bigger role and the fact that various distribution channels continue to merge (a famous example is omnichannel retail).

For this reason, SAP has redistributed the functions of its applications. In addition to SAP ERP for core business processes, the traditional SAP Business Suite contained further standalone solutions, such as SAP Customer Relationship Management (SAP CRM), SAP Supplier Relationship Management (SAP SRM), or SAP Supply Chain Management (SAP SCM). Because these products were positioned separately, some functions overlapped. By default, SAP S/4HANA now includes processes that were delivered by these standalone processes in the traditional SAP Business Suite.

New digital core

The new *digital core*, SAP S/4HANA, is designed to integrate and supplement default processes with core processes (see Figure 2.2). Compared to the traditional SAP Business Suite, where the integration between SAP ERP and other applications usually had to be implemented specifically, SAP S/4HANA provides the major benefit of these functions integrated fully with each other.

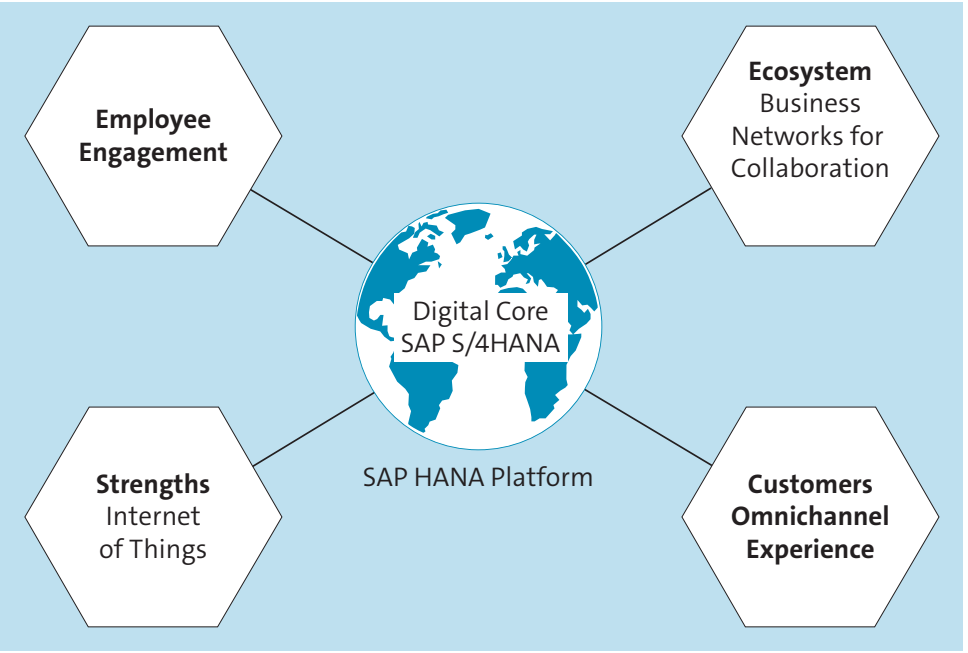


Figure 2.2 Role of the Digital Core in End-to-End Process Chains

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Gradual introduction

Many enterprises want to gear up for these challenges, and SAP S/4HANA enables you to lay a technical foundation for mastering these challenges. The solution can be rolled out gradually; that is, the individual components can be implemented when your business processes require them, thanks to the compatibility between SAP S/4HANA and SAP ERP. Chapter 4 discusses options for a gradual transition in more detail.

2.2 Simplification

Expectations of digital natives

The rise of the so-called digital natives—the generation that has grown up with advanced digital technologies—as employees fundamentally changes the requirements for IT business systems. More and more employees expect to access IT systems anytime, anywhere, and from any device. Furthermore, application interfaces should be intuitive and guide users (if possible, via artificial intelligence), thus allowing users to focus on the content-related solutions to their business issues.

New SAP Fiori UI concept

SAP S/4HANA meets these requirements with a new UI architecture and with adapted development policies for this UI, which is accessed via browser-based apps on a frontend server. The name of this new UI concept is SAP Fiori, which we'll discuss in more detail in Section 2.4.

These newly designed user interfaces are only a part of the overall simplification that SAP wants to implement with SAP S/4HANA. However, SAP S/4HANA's simplification goes deeper. Simplifications and optimizations of data models form the foundation for this new concept. On this basis, access to data is considerably enhanced in comparison to the traditional suite. For example, you'll have access to embedded data analysis functions, which are described in Section 2.6. Business applications are then built on these technical simplifications, and SAP has merged functions from various areas of the traditional SAP Business Suite into SAP S/4HANA.

As we described in Chapter 1, the utilization of "smarter" applications also results in simplification for the users whose workload is supposed to be supported and reduced.

Reducing alternative implementations

From the alternative solutions for similar business processes have emerged over time, SAP today focuses on the applications that have gained the highest customer acceptance. Some applications in the traditional SAP Business Suite were replaced or will be replaced by others.

In many cases, the migration to SAP S/4HANA is mainly technical and does not require time-consuming change projects on the customer side. However, depending on the individual structure of your system, further activi-

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ties might be required. Usually, you can flexibly schedule these activities, because—depending on the migration scenario selected—the traditional functionality will still be available for some time (see Chapter 3, Section 3.2).

SAP provides a complete list of the functional simplifications in the Simplification Item Catalog for SAP S/4HANA (*http://s-prs.co/527916*). When planning your migration to SAP S/4HANA, you should always refer to this list.

New product

The following conclusions can be drawn from the simplification: SAP S/4HANA is a new product and not a new version of SAP ERP. SAP S/4HANA also covers all core business processes but follows a new approach and is based on a different technical architecture.

Thus, SAP currently provides two lines of products for core business processes:

- The *traditional* line of products, which consists of the core SAP ERP applications and EHPs, as well as SAP CRM, SAP SCM, and SAP SRM. These will be maintained at least until 2027 and are compatible with all common databases.
- The *new* line of products. SAP S/4HANA, which has a completely revised architecture, forms the basis for future innovations. This line of products is exclusively available on the SAP HANA in-memory database. SAP emphasizes the future viability of this new product with its maintenance commitment until at least the end of 2040.



SAP S/4HANA and SAP ERP

SAP S/4HANA refers to a separate line of products that is available in parallel to the line of products of the traditional SAP Business Suite. SAP S/4HANA is an alternative implementation of the business functionality.

Changing the product family

Thus, changing to SAP S/4HANA means that you'll switch to a different product family. Chapter 3, Section 3.2, introduces the members of this new product family. While migrating to a higher version within a product family is implemented via upgrades, changing to a new product family usually requires a new implementation (see Figure 2.3).

For SAP S/4HANA, SAP also provides the option of converting an existing SAP ERP system into an SAP S/4HANA system. Chapter 4 defines in more detail the different technical options for changing to the new product family.

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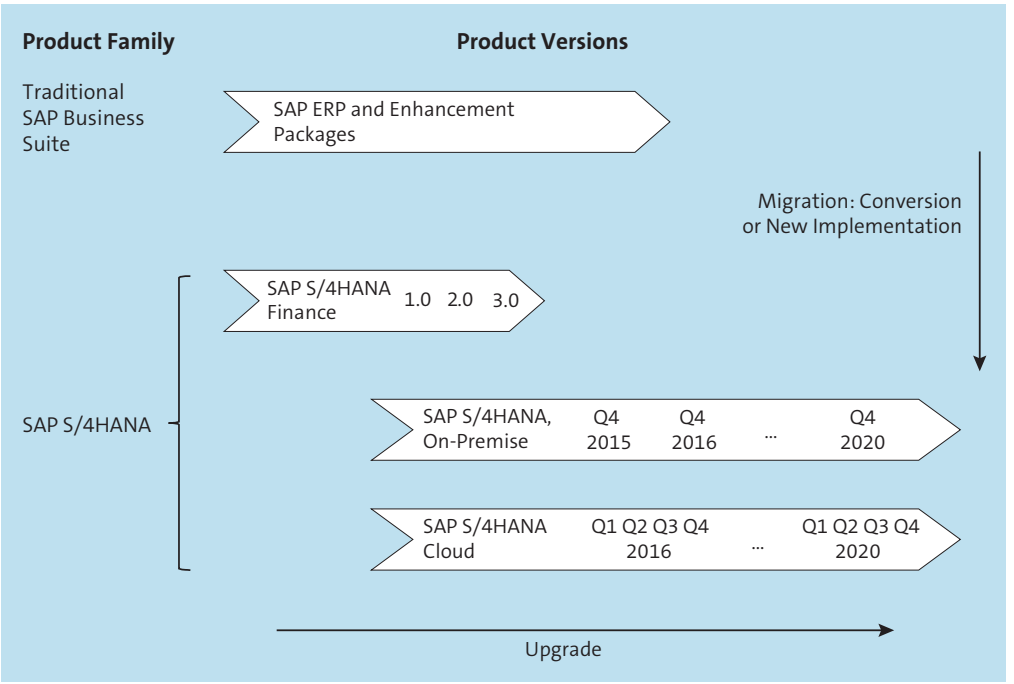


Figure 2.3 Versions of Traditional SAP Business Suite and SAP S/4HANA Product Family

2.3 The New Data Model and the SAP HANA Database

Traditional databases are based on designs that were developed decades ago. The technical conditions during this time, as well as the usage requirements, differed from today's expectations. Traditional databases have been enhanced, but their ability to adapt to new challenges is limited due to compatibility reasons.

Limitations of traditional databases

From the perspective of business application software, traditional databases lead to critical limitations and can complicate or even hinder the simplification, acceleration, and integration of business processes. The following characteristics of traditional databases can be obstructive, for example, when redesigning your business processes:

- **Online transaction processing (OLTP) versus online analytical processing (OLAP)**
  At present, users of database solutions have to decide whether they want to analyze data (OLAP) or update data (OLTP). However, in many situations, a combination of both views makes sense—for example, for forecasts and simulations or for making decisions on the basis of real-time data.

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- **Technical restrictions**
  Traditional business applications have to deal with various restrictions, which complicate things for users. Examples include locks that occur so that only one user can work on a dataset at a time, which slows down processes. Another factor is the delay resulting from internal data editing processes. Updates carried out by other users, or even by the same user, are sometimes written to the relevant system tables with considerable delay.
- **Integration**
  In traditional applications, raw data is usually first internally prepared and consolidated via aggregates. These aggregates follow the specific logic of the individual application. If other applications use this data, a delay occurs. Furthermore, you'll require semantic knowledge of the corresponding application aggregate. Consequently, the data first needs to be translated into the data model of the other application. For this purpose, interfaces must be available or must be developed.

  Integration on the basis of such an architecture thus has disadvantages with regard to costs (development and maintenance of the interfaces) and with regard to lacking real-time access.

In-memory database

Over the last few years, new database architectures have been developed, so-called in-memory databases. SAP S/4HANA is completely based on a database of this kind: SAP HANA. The following sections describe the characteristics of SAP HANA and describe why no other in-memory database is currently compatible with SAP S/4HANA.

2.3.1 SAP HANA

If you take a look at hardware development in the few last years, you'll see that two basic changes arose at the turn of the millennium: On the one hand, multicore processor architectures emerged—and, with them, the option of substantial parallelization. On the other hand, memory evolved from being relatively expensive and limited to being widely available.

Data permanently stored in the main memory

Due to the memory restrictions with regard to availability (i.e., price and addressability), the data in software architectures was mainly stored on the hard disk, and only some data was stored in the memory. Accessing in traditional databases was limited by hard disk processing speeds. In in-memory databases, the hard disk is only used to store, archive, and restore data. The data itself is permanently kept in the main memory.

Optimization for business software

In contrast to other in-memory databases, SAP HANA has further unique characteristics: SAP HANA is not only an ideal generic database but has also been optimized for business applications due to SAP's holistic experiences with these kinds of applications.

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Column-based database

A key result of SAP's experience is that the data in SAP HANA is stored in column-based tables, while the data in other databases is stored in row-based tables. Why is this relevant?

In business applications, most data are accessed per column: usually, the values of a field or a selection of fields are selected and edited (e.g., names of a set of employees or prices of a selection of goods). Rarely is an entire set of rows required (i.e., all attributes of an employee or of a good). If `SELECT` statements are executed using column indexes, much smaller volumes of data need to be processed. Moreover, the values in the columns can usually be easily compressed—in particular, under the conditions given for business applications, which consist of similar data.

Parallelization

Another benefit of the SAP HANA database is that it has been optimized in such a way that the main business data operations can be executed with high performance. For this purpose, SAP HANA uses multicore central processing units for parallelization. In addition, algorithms are optimized using assumptions about the types of updates, inserts, and deletions that are carried out frequently and should consequently be the focus for high performance. This comparison can be seen in Figure 2.4.

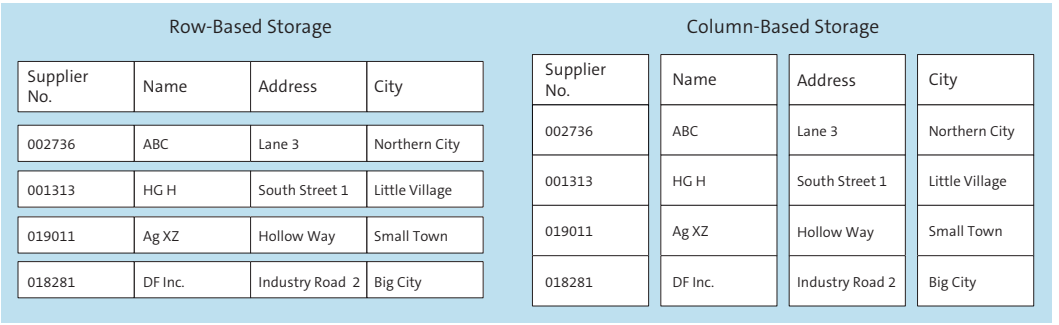


Figure 2.4 Comparison of Row-Based and Column-Based Data Storage

2.3.2 The Data Model

Optimization of the data models for the database

SAP S/4HANA is designed to fully exploit the benefits of SAP HANA described in the previous section. With this focus on SAP HANA, the following consequences arise for the data models in SAP S/4HANA:

- Aggregates are omitted.
- Existing ABAP Dictionary tables are redesigned.
- Code pushdown happens.

The following sections discuss each of these consequences in greater detail.

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Aggregates Omitted

Disadvantages of aggregates

To compensate for the poor speed of traditional databases, data was previously consolidated in *aggregate tables*. The applications then accessed these aggregate tables to read the data. However, these aggregates had the following disadvantages: due to the consolidation, entries in the aggregate tables always lagged behind entries in the original tables. This delay increases with the growth of the volume of data that needs to be processed.

Another disadvantage is that the aggregation uses assumptions of the content as a prerequisite for consolidation. As a result, processing this data from a different perspective is usually not possible without reworking the aggregation and thus can be a rather complicated task. For this purpose, you'll have to use the original data, which reduces processing speed.

Figure 2.5 shows an example of a target architecture with a simplified data model for sales documents after migrating from SAP ERP to SAP S/4HANA.

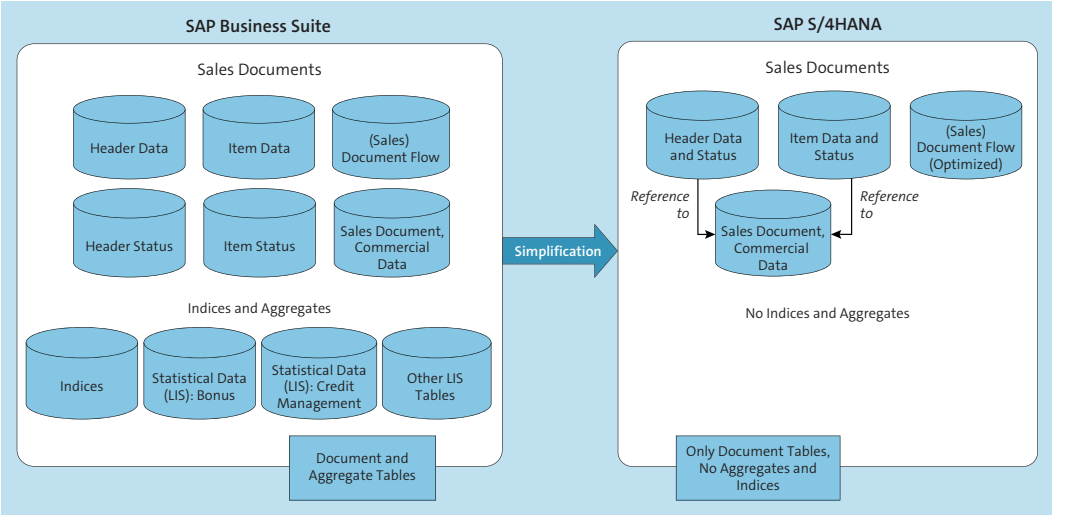


Figure 2.5 Simplification of Data Model for Sales Documents: Target Architecture

The usual aggregate tables were omitted in this case. All new SAP HANA–optimized applications directly access the original data.

Database views

Note that the aggregates continue to exist in the new data model; the database can emulate the aggregate tables in real time. For this purpose, SAP S/4HANA provides predefined *database views*. These views simulate the aggregates in real time so that existing applications that have not been optimized for SAP HANA can be deployed smoothly.

As a result, you'll still have read access within existing custom developments, such as reports, and you can usually still use these reports without needing adaptations to the new data model. Chapter 7, Section 7.2.6

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describes how you can check your existing code for compatibility with SAP S/4HANA.



Accessing the Traditional Data Model

SAP S/4HANA includes compatible database views, which allow you to access the data model of the traditional SAP Business Suite.

Existing ABAP Dictionary Tables Redesigned

Optimizing the data architecture

In addition to omitting aggregates, the example shown in Figure 2.5 also illustrates that the architecture for the storage of original data is also optimized. In this context, you must keep in mind that the data models in SAP ERP were developed over several decades. On the one hand, these data models had to be compatible with all databases; on the other hand, rigid changes would have led to problems with SAP ERP EHP upgrades, which were promised and expected to be easy to use.

With the focus on the SAP HANA database and the clear differentiation of existing products, SAP S/4HANA now also allows for redesigning the data architecture comprehensively. In this process, data storage is further optimized for SAP HANA—for example, to enhance the compression rate or optimize the general performance.

Code Pushdown

Another innovation in SAP S/4HANA is that procedures can be directly transferred to the database. In the traditional SAP Business Suite, the ABAP kernel decoupled the application from the database to ensure compatibility with any type of database. Consequently, the raw data first had to be loaded from the database and then concatenated in the application to carry out complex, data-intensive selections and calculations.

Optimizing Application Coding

In SAP S/4HANA, some data-related processes are pushed down to the database itself, which accelerates the entire process, which is known as *code pushdown*. Code pushdown can be executed either in ABAP using OpenSQL or via SAP HANA content created in SAP HANA Studio.

How does this affect existing custom code enhancements? Because existing OpenSQL data access still works, you can continue to use existing enhancements and only have to adapt them in exceptional cases. However, such code does not exploit the full potential of SAP S/4HANA. Thus, when you plan to migrate to SAP S/4HANA, you should check which custom code should be rewritten and optimized. Because you can address custom code at any time after migrating SAP S/4HANA, you'll enjoy greater flexibility in planning.

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New Data Model and Sidecar Scenarios

Note that existing sidecar scenarios must be revised with high probability due to the changes in the data models. In these scenarios, data of (several) separate systems is replicated into one central system. This replication usually writes directly to the database tables. Because the latter have changed in SAP S/4HANA, the replication rules must be adapted accordingly and new mappings must be made.

2.3.3 Handling Existing Data

Converting data for the new data models

How do these changes to the data model affect planning a migration? The good news is that you'll only have to take into account a small portion of these data model changes because SAP S/4HANA provides database views with all the necessary compatibility (see Aggregates Omitted, Section 2.3.2). However, when planning your migration project, you'll have to take into account that a selection of your existing data needs to be converted into the new data models. Depending on the technical migration scenario selected (Part II introduces the individual scenarios), different technical procedures are used to convert the data. Usually, these procedures include execution of program after import (XPRA) or execution of class after import (XCLA). The XLCA procedure was introduced with SAP S/4HANA 1709 to optimize data conversions in SAP S/4HANA and minimize downtime.

Both procedures take place after the database schema has been adapted. In special situations, certain conversions are made in individual cases in special phases of the Software Update Manager (SUM). Regardless of the scenario you choose, converting the technical data will take some time.

How much time this conversion needs mainly depends on the volume of the data to be converted. For this reason, you should check what existing data can be archived before migrating to SAP S/4HANA. In this way, you can reduce the volume of the data to be converted and thus minimize the conversion runtime. Thanks to SAP S/4HANA's built-in compatibility mode, applications contain read modules that allow you to read archived data.

2.3.4 Sizing

Sizing depends on the size of the database

If you want to implement a new SAP S/4HANA system or convert an existing SAP ERP system to SAP S/4HANA, you'll have to consider the following issues:

- **The sizing rules for SAP S/4HANA systems and for SAP ERP systems differ**
  Analyzing hardware requirements (*sizing*) for modern systems follow

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different conditions and rules than sizing systems based on traditional databases. The main reason for this difference is that SAP HANA stores data in random-access memory (RAM), which requires different sizing requirements. The new SAP HANA data architectures and embedded data compression algorithms routinely achieve data compression rates by a factor of three to five on average.

- **Random-access memory = twice the compressed data volume**
  As a rule of thumb, SAP recommends calculating twice the compressed data volume for the RAM volume. Because sizing strongly depends on your specific conditions (e.g., on the compression rate that can be achieved), SAP recommends running a sizing report in your existing SAP ERP systems. For more information on sizing, see *https://service.sap.com/sizing*.

In summary, the SAP HANA database is more closely linked to implementing application functions than other databases in previous years. This close link is the only way for applications to sufficiently benefit from the advantages of the database. This close relationship is probably also why SAP S/4HANA is currently only available for SAP HANA. The in-memory databases of third-party providers sometimes follow other approaches and require alternative implementations.

2.4 SAP Fiori User Interfaces

SAP developed its traditional SAP Business Suite applications assuming that users access the ERP system using a specifically assigned frontend computer. The component used for this frontend access is SAP GUI. In a time-consuming process, SAP GUI had to be installed on all workstations in the enterprise because the applications could only be used with the appropriate and latest version of SAP GUI on the user's desktop computer.

Role-based portals

In the 2000s, SAP wanted to provide users with role-based access to the increasingly complex business processes. For this purpose, central portals were successfully implemented, allowing users access via a browser. Connections to the SAP ERP system were established through dedicated frontend applications deployed on the central portal.

New UI concept

Despite this progress, the interfaces in the SAP ERP systems seem to be outdated—particularly if you compare them to the omnipresent interfaces of smartphones, tablet computers, and modern computers. SAP S/4HANA is based on a completely new UI concept called SAP Fiori, which combines technological changes with newly designed user concepts.

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SAP Fiori comprises three different types of apps, which differ with regard to their focus and requirements for the infrastructure:

- **Transactional apps**
  These apps enable you to perform transactional tasks such as creating leave requests for employees. Transactional apps provide focused views for users to interact with business processes and solutions.
- **Fact sheets**
  Fact sheets display context information and the most important aspects of central objects (e.g., a purchase info record fact sheet provides information about the purchase info record business object). From a fact sheet, you can drill down to detailed information about the relevant object.
- **Analytical apps**
  With analytical apps, you can monitor relevant key figures in real time and use them to make decisions.

SAP Fiori apps reference library

You can find a list of available SAP Fiori apps in the SAP Fiori apps reference library. From there, select **SAP Fiori Apps for SAP S/4HANA** to display the SAP Fiori apps that are available for SAP S/4HANA.

When migrating to SAP S/4HANA, you certainly should consider implementing SAP Fiori. To facilitate this migration, SAP has ensured the compatibility of the new product: you can still use SAP GUI to access applications. However, users can only access the traditional SAP ERP applications via SAP GUI, not the newly developed SAP S/4HANA functions, which run on SAP Fiori. However, using SAP GUI is not possible for the public cloud variant of SAP S/4HANA because SAP GUI is not suitable for cloud usage.



Flexible User Access

SAP S/4HANA on-premise also enables users to access traditional transactions via SAP GUI.

This compatibility allows for a gradual migration; Chapter 4 goes into further detail.

2.4.1 Technological Changes

One major change with SAP Fiori is that no GUI component is locally installed. A web browser is used to access the SAP S/4HANA system, eliminating the time-consuming process of setting up local SAP GUI installations.

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Cross-device access

Consequently, users can basically use any internet-enabled device to access SAP applications. They are not bound to their workstations but can use a smartphone or tablet to access the SAP system. For this purpose, the SAP S/4HANA application instances are supplemented by a central *frontend server*, as shown in Figure 2.6.

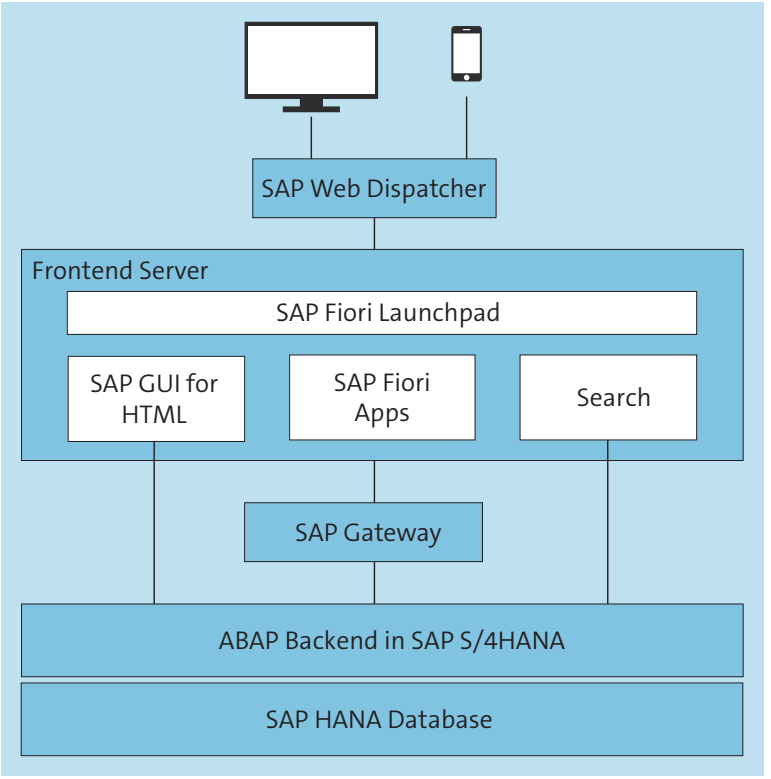


Figure 2.6 Architecture of SAP S/4HANA

SAP Web Dispatcher establishes the connection to the frontend server. On the frontend server itself, you can find the SAP Fiori launchpad and the SAP Fiori applications. These main components of the frontend server are complemented by an installed search function and by SAP GUI for HTML, which is available for compatibility reasons. You can implement SAP Gateway separately or as a part of the frontend server.

The SAP Gateway system is responsible for distributing the browser requests of the frontend server across the various application systems (backend systems) of the enterprise. You can implement SAP Gateway separately or as a part of the frontend server.

Although you can install (*embed*) the frontend server on the central instance, it can be beneficial to install the frontend server separately as a

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central frontend hub in selected cases. This way, several SAP S/4HANA systems will be addressed via the same frontend server. In that case, please refer to SAP Note 2590653. The backend and frontend server versions must be coordinated. Figure 2.7 illustrates the basic distribution of the required system instances.

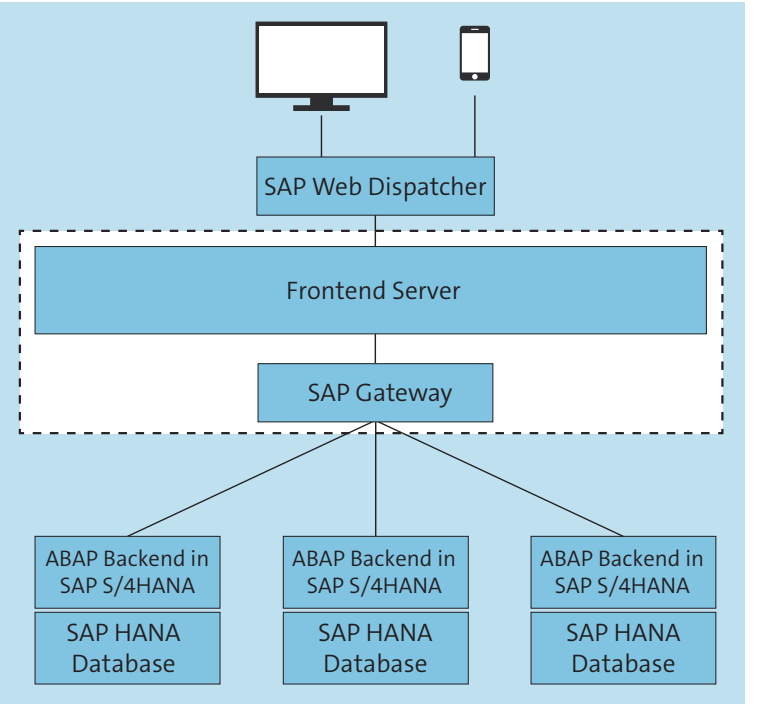


Figure 2.7 Connecting SAP Fiori Frontend Server to SAP System Landscape

2.4.2 Operating Concept

The operating concept behind SAP Fiori can be summarized in one word: *simplicity*. With SAP Fiori, SAP provides simplified access options for all users. You've already come across one element of this simplified access: access from any end device.

SAP Fiori Launchpad

In addition, the structure of applications is simplified. The SAP Fiori launchpad (see Figure 2.8) replaces the SAP Easy Access menu of the traditional SAP Business Suite. The launchpad consists of tiles used to access applications.

Live tiles with relevant KPIs

The launchpad also includes so-called live tiles, which display relevant information from underlying applications, such as aggregated key performance indicators (KPIs). As a result, users can determine directly from the SAP Fiori launchpad which applications require direct intervention.

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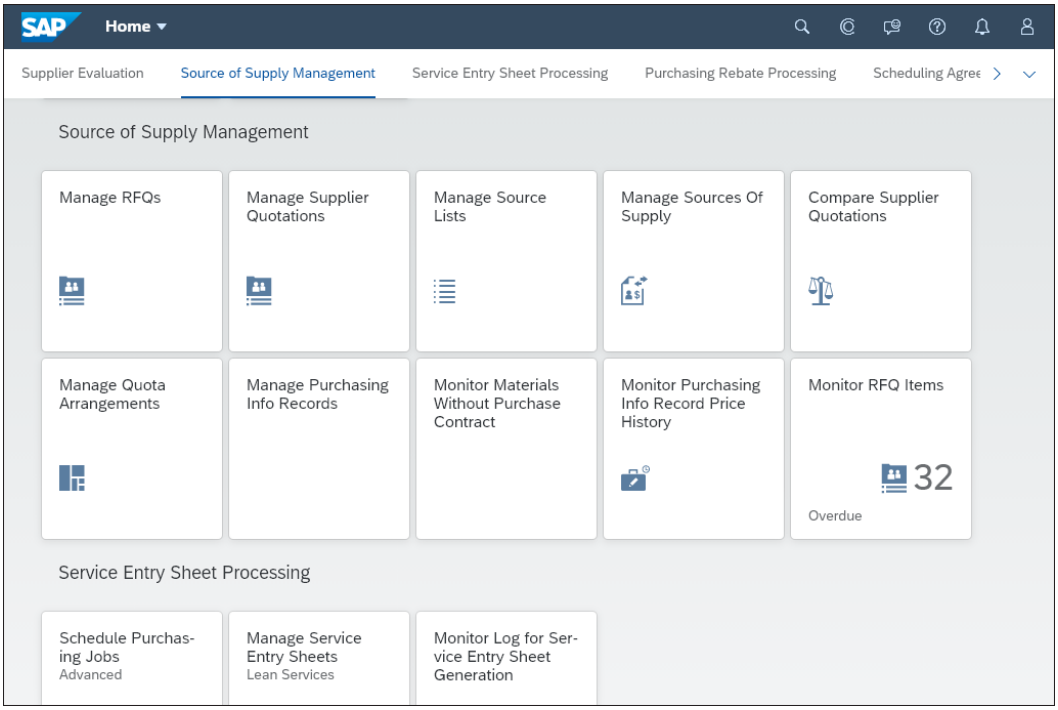


Figure 2.8 SAP Fiori Launchpad Example

Tiles are assigned to launchpad groups, which allows for a transparent tile structure and also enables users to directly access such a group of tiles via the dropdown menu in the upper-right area of the screen.

Access control via SAP Fiori user roles

The availability of the tiles in the SAP Fiori launchpad depends on the centrally assigned roles of the users. These roles are specific SAP Fiori roles, which must not be confused with authorization roles in a traditional SAP Business Suite solution. Thus, when migrating to SAP S/4HANA, you should factor in sufficient time for planning or adapting your enterprise-specific role structure. In SAP S/4HANA, applications are more focused on actual work processes and try to actively guide users through this process. You'll also have a lot of freedom to customize the predefined design. These changes are dynamic: settings such as filters affect the displayed results and available process options in real time.

Comprehensive search functions

In addition to a modern design for applications, including a completely new structure and order of screen elements, a search function has also been implemented. Users can search for keywords, such as long texts, parts of key numbers, names, and much more. The search is carried out across various business objects and even across system boundaries, and the results include matches related to the keyword. This powerful search function

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eliminates a disadvantage of the previous SAP interface, which usually only permitted users to search for individual field values via F4 help.

Help function

If users still have questions about how to use applications, a newly designed documentation system supports self-help options. The so-called X-ray documentation approach enables users to click on the areas about which they want more information. This help system then navigates the user to the relevant documentation.

Enhancements

Of course, you can also extend the SAP Fiori user interfaces. In contrast to extending SAP Business Suite, you usually don't have to write any code to extend an SAP Fiori user interface. *End user extensibility* and *key user extensibility* allow users, for example, to add custom fields, hide or display objects, modify the structure, or supplement the calculation logic. Only enhancements that cannot use these approaches require you to write new code. Chapter 3, Section 3.4 discusses extensibility in more detail.

Officially released SAP Fiori apps also enable enterprises or SAP partners to develop custom SAP Fiori applications. SAP provides the SAP Web IDE to develop such apps, which are based on SAPUI5. The browser-based toolkit is available on the SAP Business Technology Platform, as part of the SAP Extension Suite (formerly SAP Cloud Platform services for application development), and includes an integrated development environment. This option for developing custom user interfaces is extremely important for SAP customers. In today's SAP Business Suite, about 50% of the interfaces that are used by SAP customers are custom developments.

Finally, you can assign custom *theming* to your user interface to map the corporate design on the screen (consider your company's color scheme and logo).



Additional Information

- You can find further information for redesigning the user experience (UX) using SAP Fiori at *http://s-prs.co/527917*.
- For more information on SAP Fiori 3.0, visit *https://www.sap.com/products/fiori.html* or *http://s-prs.co/527918*.
- See SAP Note 2590653 (Fiori Frontend Server Deployment).
- You can find a video covering design concepts at *https://youtu.be/PLVSM6_92Fo*.
- You can access the SAP Fiori apps reference library at *https://fioriappslibrary.hana.ondemand.com/sap/fix/externalViewer*.
- For more information on SAP Web IDE, visit *http://s-prs.co/527919*.

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Accessing traditional transactions

All elements mentioned in this section are only available with the newly designed SAP S/4HANA. If you want to access traditional SAP ERP applications, you'll have to follow the usual approaches. However, if required, you can also provide the traditional transactions in the SAP Fiori launchpad. For this purpose, you can integrate the SAP Easy Access menu into the SAP Fiori launchpad.

Gradual introduction

In summary, we can make the following statements: You can convert an SAP ERP system to SAP S/4HANA without directly implementing SAP Fiori across the entire system landscape. However, in this case, you won't benefit from SAP S/4HANA's significantly simplified applications and can only use the traditional SAP Business Suite applications. Thus, your SAP S/4HANA implementation project should minimally include a gradual introduction of the SAP Fiori UI concept. Because the SAP Fiori concept is role-based, you can easily select individual business areas and employee groups for conversion. Because of the benefits provided by SAP Fiori, SAP S/4HANA Cloud does only support the SAP Fiori UI.



Gradual Introduction

The new SAP Fiori UI concept is controlled on the basis of roles and thus can be introduced gradually.

2.5 Interfaces

So far, this chapter has focused on the SAP S/4HANA innovations that affect a single system. If you migrate from an existing SAP ERP system to SAP S/4HANA, this SAP ERP system is usually integrated into a system landscape or has been enhanced with custom or third-party applications. What do you have to take into account in these cases?

Status quo

First, you should determine how the system has been integrated or enhanced:

- **Integration via SAP Process Integration or SAP Process Orchestration**
  Existing integration through the SAP Process Integration or SAP Process Orchestration middleware can be kept. SAP S/4HANA is compatible with SAP Process Integration and SAP Process Orchestration. To integrate new or significantly changed SAP S/4HANA applications, you might have to implement additional integration content.
- **Integration via authorized interfaces**
  You can continue to use authorized interfaces such as Business Application Programming Interfaces (BAPIs). In SAP S/4HANA, implementations of these interfaces are adapted to the new data model if required. This compatibility, again, refers to traditional application scenarios only.

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- **Proprietary integration**
  If you have implemented custom access options or interfaces, you'll have to analyze whether you can continue to use them in SAP S/4HANA. When implementing the new data model, SAP took into account compatibility, but some adaptation work may still be required. Chapter 4 describes how to determine this.
- **Third-party applications**
  If you use third-party applications, you should contact your software provider for more information on their compatibility with SAP S/4HANA.

Depending on the result of this analysis, you may have to include follow-up measures in the planning of your migration project. In summary, the more strictly you followed SAP's recommendations for the implementation and the more modification-free enhancements or standard interfaces you use, the less follow-up work is required.

2.6 SAP S/4HANA Embedded Analytics

The analytical functionality provided by SAP S/4HANA is referred to as *SAP S/4HANA embedded analytics*. This function enables users (not just analytical data experts but any users) to create and carry out real-time analyses based on SAP S/4HANA application data. Standard reports and analytical SAP Fiori apps are also delivered by SAP S/4HANA. The analytical data is displayed via the new SAP Fiori launchpad, which is based on SAP Fiori technology.

SAP CDS views

Technically, SAP S/4HANA embedded analytics functions are based on the core data services (CDS) views of the ABAP layer in SAP S/4HANA. These CDS views are database views organized in a *virtual data model* (VDM). On the basis of these CDS views, users can run queries on transactional data in real time. For these queries, users can use default views, enhance existing views, or create new views based on the relevant application tables.

In addition to fast customization of analytical queries, SAP S/4HANA's simplified data structures considerably enhance the creation of queries in real time. Because aggregates have been omitted and data redundancy is thus eliminated, users do not have to know the aggregation logic and can build their queries on the data of the native tables.

Analytical data in SAP Fiori

Analytical data is usually displayed via SAP Fiori interfaces. Various user interfaces and use cases are provided for different user groups (end users, key users, and developers). As shown in Figure 2.9, end users are provided with analytical applications that are adapted to the role and use case. Tools

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and functions for analytics key users are also available to enable them to create their own queries.

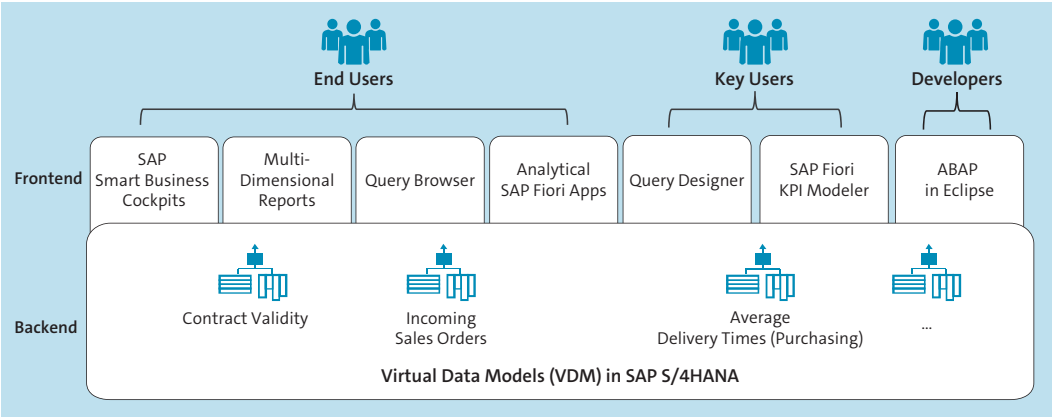


Figure 2.9 SAP S/4HANA Embedded Analytics

Different user roles

Let's look at an example of a user role, an internal sales employee, to illustrate how the integration of analytical data supports the processing of critical sales orders. The SAP Fiori app for sales order fulfillment enables employees to process exceptions for sales orders. Critical orders (e.g., orders where the promised delivery date cannot be kept) are displayed in an overview page (see Figure 2.10).

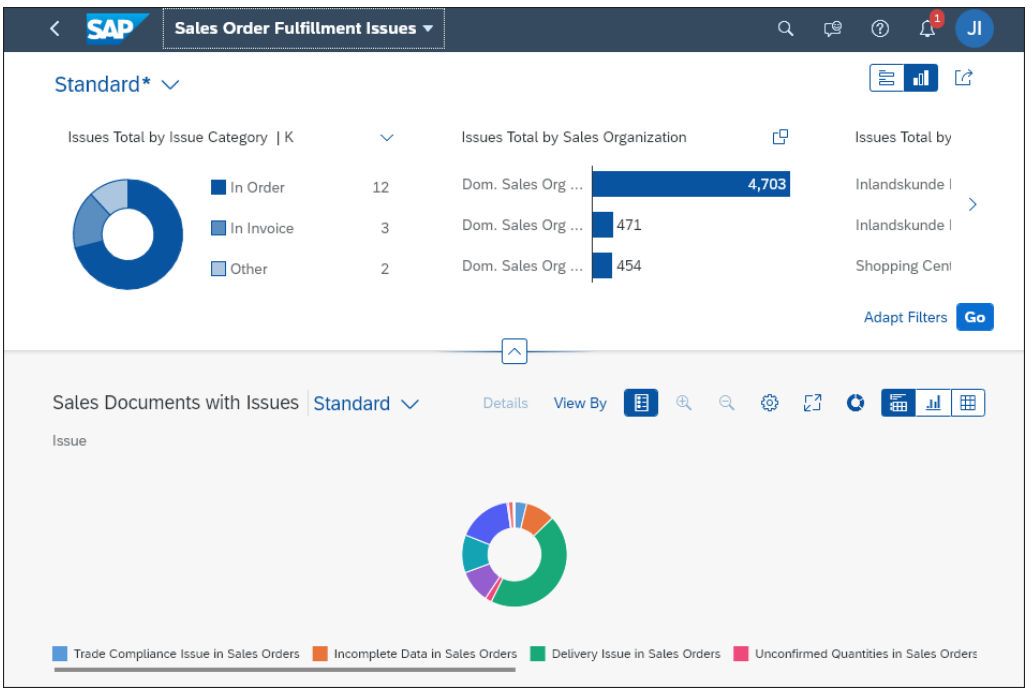


Figure 2.10 Overview Page for Critical Sales Orders

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From this page, end users can navigate to the relevant detail views and analyse the reason for the delay individually for each critical order.



Additional Information

You can find more information and examples of available applications in the SAP Fiori apps reference library at *http://s-prs.de/v631612*.

2.7 Summary

In this chapter, we have focused on the differentiation between the traditional SAP ERP product line and the new SAP S/4HANA product line. We explained the common concepts for all SAP S/4HANA products around its simplification concept, its new data model, and the underlying SAP HANA database, as well as the new SAP Fiori user interface (UI) and integration capabilities. In the next chapter, you will learn how the different SAP S/4HANA deployment options differ.

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Chapter 3

Cloud, On-Premise, and Hybrid Scenarios

You can use SAP S/4HANA in various cloud-based and on-premise editions. But what are the differences between these operating models? And what are the differences between the individual SAP S/4HANA editions?

When migrating to SAP S/4HANA, you'll have to make some basic decisions. You'll have to select the type of system landscape and decide which SAP S/4HANA functions you want and how they are supposed to be used (see Figure 3.1). First, you'll need to choose whether you want to run SAP S/4HANA *on-premise* (i.e., the software is utilized on your enterprise's hardware), in the *cloud* (i.e., the software is leased and hosted by a provider), or in a *hybrid scenario* (i.e., some parts of the business scenarios are outsourced to the cloud, other parts are kept on-premise). Furthermore, you'll have to decide whether you want to leverage the migration process to redesign your existing business processes (*greenfield approach*) or whether to generally keep these business processes with minimal alteration (*brownfield approach*).

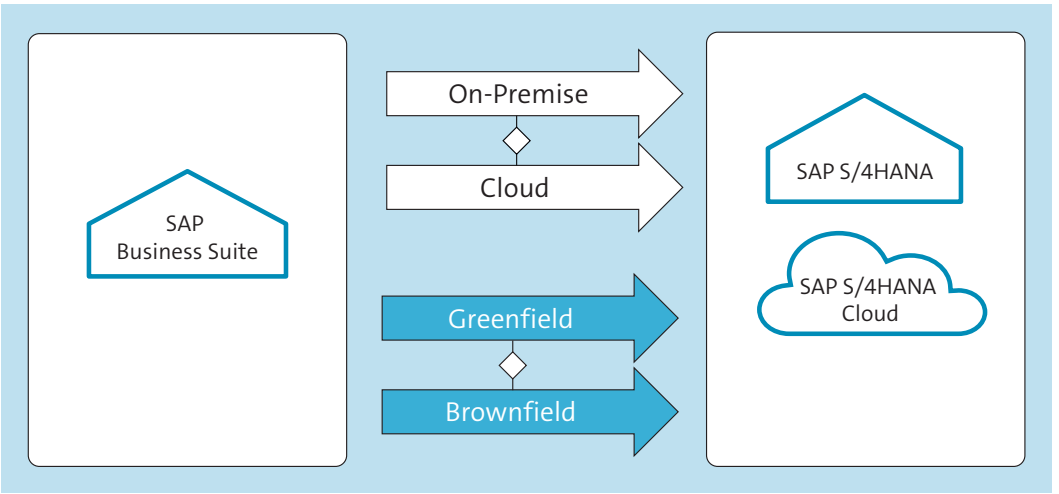


Figure 3.1 Strategic Decisions for Migrating to SAP S/4HANA

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This chapter covers the basic options for and differences between the various operating models and provides the basic information required to make the necessary decisions for your migration strategy. First, we'll provide an overview of the operating models and define fundamental concepts. Then, we'll introduce and compare the individual editions of the SAP S/4HANA product family.

Usually, an enterprise wants to customize its business processes. In addition to business configuration settings, individual enhancement options can be an essential way for an enterprise to differentiate itself from competitors. The last section of this chapter describes in detail SAP S/4HANA's enhancement concepts.

3.1 Overview of Operating Models

To enable you to choose an SAP S/4HANA operating model, this section describes the basic characteristics of the different operating models. Section 1.2 gives an overview about the SAP S/4HANA product family and Section 3.3 then compares the operating models of SAP S/4HANA.

3.1.1 On-Premise Operating Model

Full control of hardware and software

Usually, *on-premise operating model* refers to using software that a customer has purchased upfront and runs and manages the operation of this software on hardware owned by the customer. As a result, the customer is in full control of the hardware and software, of mission-critical application data, and of software maintenance schedules. Moreover, the customer achieves maximum flexibility with regards to custom enhancements and integration with other systems (in-house solutions or external systems).

But the customer is also fully responsible for the availability of the software, as well as access, security, and system stability. In addition to the costs for hardware and software, powerful and complex ERP systems incur further costs for the IT experts needed to introduce, manage, and maintain the software.

3.1.2 Cloud Operating Model

Leasing software and services

In cloud operating models, a customer does not operate or manage the software himself but rather engages a service provider for this purpose. The software and the corresponding services are leased for a defined period of time in the cloud operating model. Hardware and operating system soft-

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ware are not required on premise. The enterprise's IT staff can thus focus on other tasks.

Internet access is usually necessary to access the solution, and users can access the cloud software from anywhere and, in most cases, also via mobile end devices. One of the major benefits of the cloud operating model is the associated cost transparency. In cloud, the infrastructure is usually shared by multiple customers.

Limited scope for intervention

To ensure efficient operation, individual customers can only influence the maintenance cycles and schedules of the cloud software to a minimum extent. Additionally, the customization options in the cloud operating model are usually more limited than in the on-premise operating model. Another issue that needs to be analyzed specifically in each case is data security (*cloud security*). In general, the data security standards and processes of trustworthy cloud providers are higher or more extensive than the security infrastructure of the average enterprise.

Service and deployment models

How to evaluate the cloud operating model, however, also significantly depends on the service and deployment models used. Figure 3.2 provides an overview of these service and deployment models, which are based on the definitions from the National Institute of Standards and Technology (NIST; *https://www.nist.gov*).

Service models

For service models, the following three categories are differentiated:

- **Software as a service**
  In the case of the software-as-a-service (SaaS) model, customers use the applications of a provider, which are operated on a cloud infrastructure. Typically, customers access these applications via the internet using a web browser. In the SaaS model, the provider is responsible for managing and controlling the cloud infrastructure. Customers do not have any functions for managing or controlling the software that go beyond user-specific configuration settings.

  In addition to the SAP S/4HANA public cloud editions, the following SAP solutions fall into this category: SAP SuccessFactors, SAP Sales Cloud, SAP Ariba, SAP Concur, and SAP Fieldglass.

- **Platform as a service**
  In the platform-as-a-service (PaaS) model, application developers are provided with programming languages and tools as a service. As in the SaaS model, the provider is responsible for managing and controlling the underlying cloud infrastructure. The customers manage their own applications, which they have built on the basis of the development environment provided. One example of this model was SAP Cloud Platform.

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SAP Cloud Platform Brand Retirement and SAP Business Technology Platform

As of January 27, 2021, the SAP Cloud Platform brand has been sunset and its many services and tools now run on SAP Business Technology Platform (SAP BTP). SAP BTP is a unified platform of SAP technologies. At the time of this book's writing, it has four pillars: database and data management, analytics, application development and integration, and intelligent technologies. The application development and integration pillar includes cloud services that previously ran on SAP Cloud Platform and were known by the SAP Cloud Platform brand. The cloud-based application development services are referred to with the name SAP Extension Suite. The cloud-based integration services are referred to with the name SAP Integration Suite.

For more information about SAP BTP, check here: *https://www.sap.com/products/business-technology-platform.html*. For information about the SAP Cloud Platform brand change, see this page: *https://www.sap.com/products/cloud-platform.html*.

Throughout this book, we will use the updated terminology to refer to SAP Cloud Platform and SAP Cloud Platform services, but you should always check the service catalog on the SAP Discovery Center (*https://discovery-center.cloud.sap/viewServices?*) or reach out to SAP for an up-to-date list of services and their names. Table 3.1 highlights a few important changes that you'll see referenced in this book:

Retired Terminology	Current Terminology
SAP Cloud Platform services	SAP Business Technology Platform's cloud-based application development and integration services
SAP Cloud Platform application development services	SAP Extension Suite
SAP Cloud Platform Integration Suite	SAP Integration Suite
SAP Cloud Platform, Cloud Foundry environment	SAP BTP, Cloud Foundry environment
SAP Cloud Platform, Neo environment	SAP BTP, Neo environment
SAP Cloud Platform, ABAP environment	SAP BTP, ABAP environment
SAP Cloud Platform Identity Provider	SAP Platform Identity Provider service for SAP BTP

Table 3.1 SAP Cloud Platform Terminology Changes

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In this model, the customers have control over the schedule and maintenance of their own application, but not over the tools and services used by this application.

- **Infrastructure as a service**
  Infrastructure as a service (IaaS) refers to a service that provides users with access to computing power, data storage, and network capacity. In this model, the customers control the applications and operating systems used and usually also install them themselves. Nevertheless, the provider is again responsible for controlling and managing the cloud infrastructure. SAP HANA Enterprise Cloud (Section 3.2.3) belongs to this category.

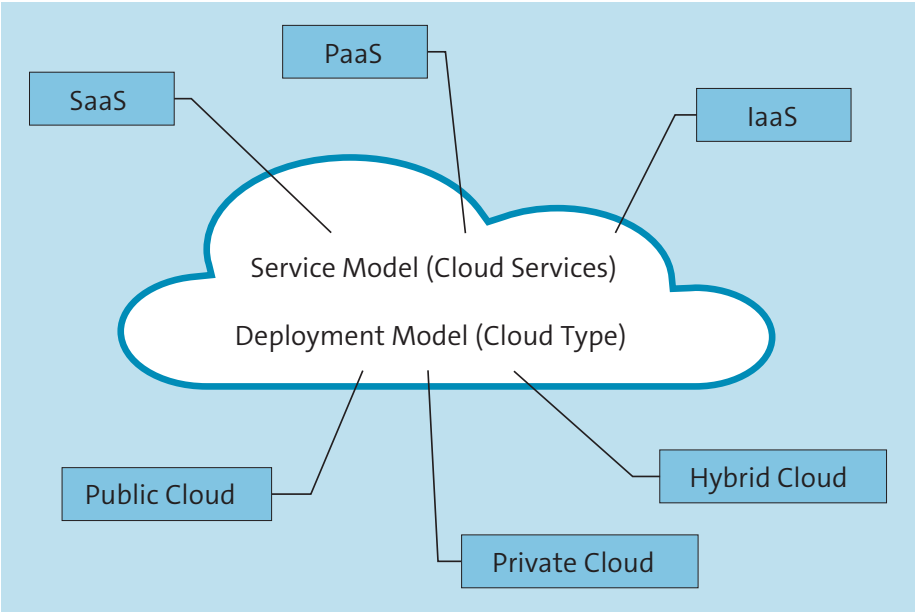


Figure 3.2 Cloud-Based Service and Operating Models

For the *cloud deployment models*, we differentiate three types: **Deployment models**

- **Public cloud**
  With public clouds, services and applications are publicly available and can generally be used by everyone. Usually, users share the resources of the cloud infrastructure, made available by a provider.
- **Private cloud**
  In a private cloud, the cloud infrastructure is deployed for specific customers or only one customer. The cloud infrastructure can be deployed internally or by an external provider. The same applies to operating a

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private cloud. The difference to the on-premise operation model is gradual and depends on the individual decision on how flexible and scalable you need the IT infrastructure to be, how business applications will be accessed via the internet, or how regularly programs should be updated automatically.

- **Hybrid cloud**
  A combination of a public cloud and private cloud is referred to as a hybrid cloud. In this case, part of the IT infrastructure is operated on premise, while other services are provided by an external public cloud provider.

3.1.3 Hybrid Operating Model

In hybrid operating models, some parts of the business scenario are operated on premise, and some parts are operated in the cloud. Hybrid operating models enable you to combine the characteristics of the on-premise operating model and the cloud operating model.

For example, core areas of your enterprise, for which you want a high degree of control and a high level of flexibility, can be operated on premise, while other enterprise areas can be operated in the cloud because common industry standards are sufficient.



Hybrid Structures in Human Resources

An example of an enterprise area in which business processes are largely outsourced to the cloud is human resources (HR). As described in Chapter 1, SAP's target architecture for HR business processes is the cloud. With the SAP SuccessFactors solution portfolio, SAP enables HR departments to outsource to the cloud functions such as workforce administration or managing job candidates and applications, employee performance, or talent.

Hybrid scenarios can also make sense based on the organizational structure of an enterprise. For example, you might want to run global business processes at your headquarters on premise, while the regional business processes at your subsidiaries can be standardized and outsourced to the cloud.

Integration requirements

With regard to technology and content, a combination of on-premise processing and cloud-based processing poses specific requirements for integrating the various solutions used, as outlined in Figure 3.3.

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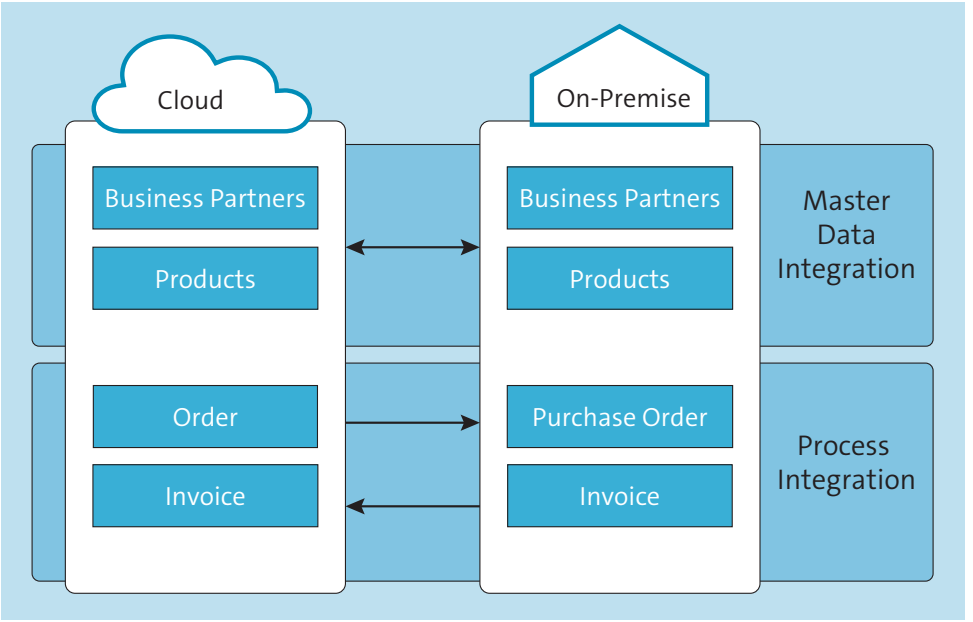


Figure 3.3 Integration in Hybrid Scenarios

Therefore, when choosing an operating model, you should consider your specific requirements for master data and process integration.

3.2 The SAP S/4HANA Product Family

Customers can choose between multiple editions of the SAP S/4HANA product family

On-premise and cloud editions

In general, we differentiate between the on-premise edition and the cloud edition. However, all members of the SAP S/4HANA product family are based on the same program code. End users will only see differences between the editions due to the different UI concepts. SAP S/4HANA Cloud only provides SAP Fiori-based UIs, while the SAP S/4HANA on-premise version allows you to continue to use the traditional interfaces based on SAP GUI for Windows.

The deployment as a so-called private-managed cloud solution is a combination of the on-premise deployment model and the cloud deployment model. Depending on the attributes, characteristics of the on-premise version can be deployed here. SAP offers a private cloud option in SAP HANA Enterprise Cloud.

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Figure 3.4 provides an overview of the entire SAP ERP product family as on-premise and cloud versions for the respective market segments.

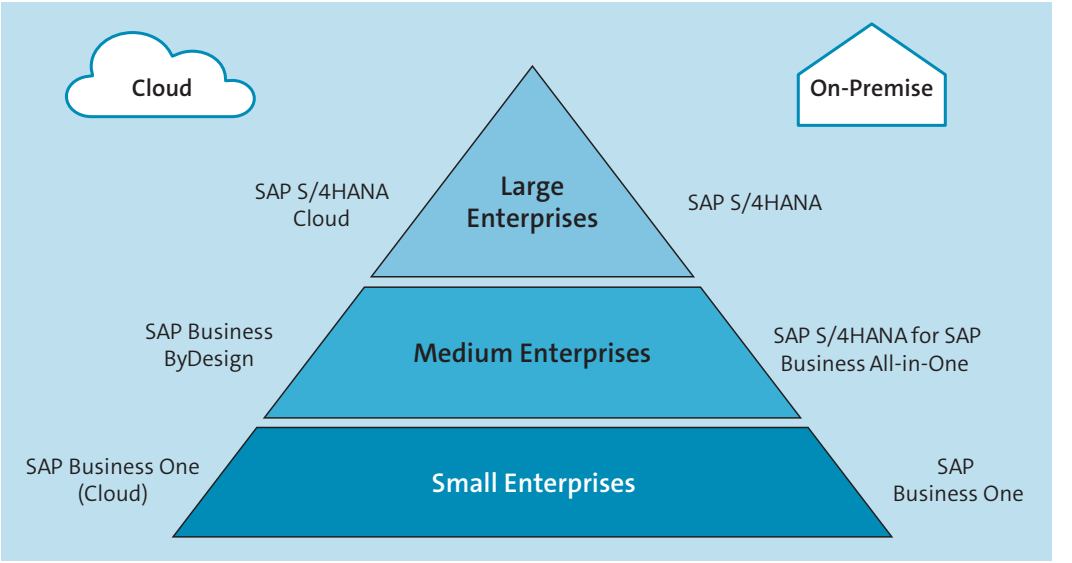


Figure 3.4 Entire SAP ERP Product Family

For better readability, we'll combine the variants of the SAP S/4HANA products in this book. In Table 3.2, you can find the assignment of the terms used in this book.

Classification	SAP Products (as of August 2020)	Terminology in this Book
On premise	SAP S/4HANA	SAP S/4HANA
Private cloud	SAP HANA Enterprise Cloud	SAP S/4HANA
	SAP S/4HANA Cloud, extended edition	
Public cloud	SAP S/4HANA Cloud, essentials edition	SAP S/4HANA Cloud, essentials edition SAP S/4HANA Cloud

Table 3.2 SAP S/4HANA Product Family

In addition to SAP S/4HANA products, small and medium-sized enterprises can also use SAP Business ByDesign and SAP Business One. SAP S/4HANA for SAP Business All-in-One is an industry-specific SAP ERP solution for medium-sized enterprises that was developed by SAP partners. The transitions between these SAP ERP suite products are smooth. In this book, we'll only detail the various editions of SAP S/4HANA.

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Additional Information on SAP ERP Products

- You can always find additional information on the individual SAP products on the SAP product page at *https://www.sap.com/products.html*.
- For more information on SAP Business ByDesign go to *http://s-prs.co/52792000*.
- For more information on SAP Business One go to *http://s-prs.co/52792001*.

3.2.1 SAP S/4HANA On-Premise Edition

In the SAP S/4HANA on-premise edition, customers operate the software in their own system landscape. They are responsible for purchasing the necessary hardware, for installing and managing the software, and for maintaining the system (for example, implementing software changes).

The digital core

In November 2015, SAP S/4HANA was published as the first version of a new, comprehensive solution for core business processes within the on-premise edition. The product name was SAP S/4HANA, On-Premise Edition 1511 (also referred to as SAP S/4HANA Enterprise Management in some documents). This on-premise edition is continuously enhanced on an annual basis. SAP refers to SAP S/4HANA as a new *digital core* for enterprise software. Figure 3.5 shows this digital core, including the relevant innovations that cover various lines of business (LOBs).

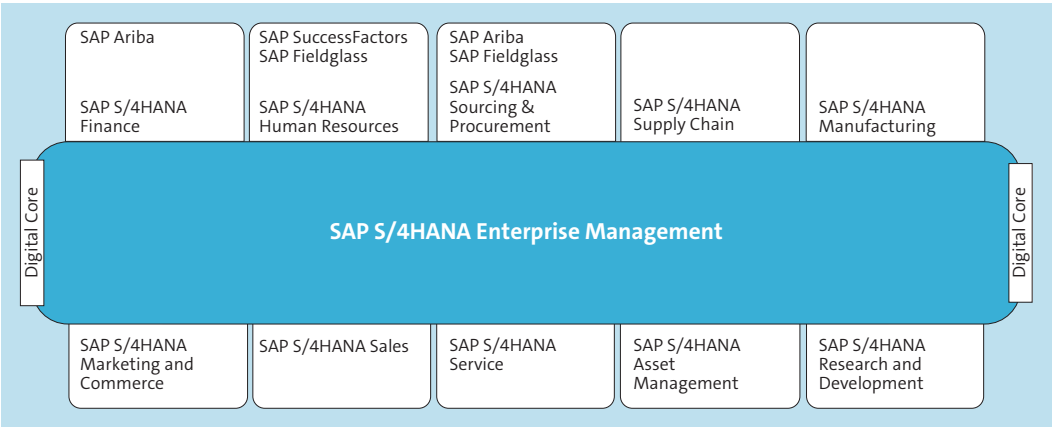


Figure 3.5 Different Business Areas in SAP S/4HANA

For more information on product innovations in the individual business areas, Section 3.3.

Compatibility packages

SAP S/4HANA is supplemented by functions from so-called compatibility packages (see Figure 3.6).

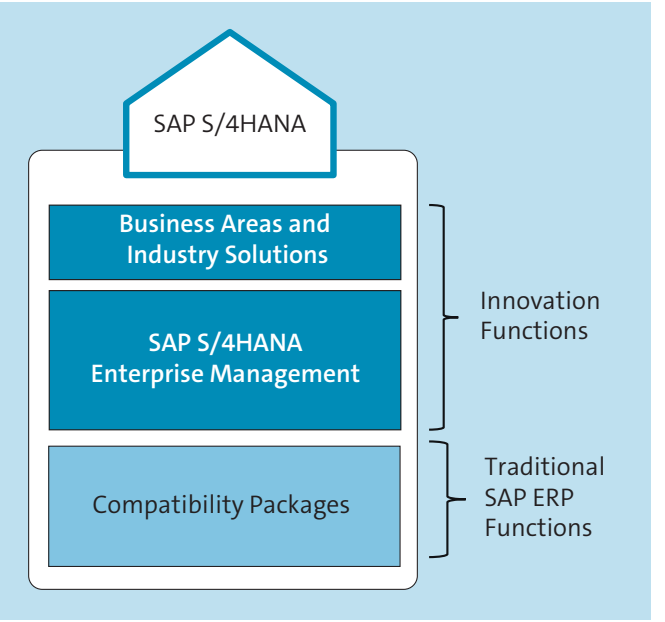


Figure 3.6 SAP S/4HANA Compatibility Packages

Compatibility packages provide functions with the traditional design you are familiar with from SAP ERP—functions, for example, for human capital management (SAP ERP HCM), for warehouse management (SAP Warehouse Management), or for transport management (LE-TRA). After migrating to SAP S/4HANA, these functions are still available in the same format (e.g., the data model is not adapted and the user interfaces remain the same). However, these functions are not the target architectures from the technological perspective. For example, the target architecture for human capital management is SAP SuccessFactors; for warehouse management, SAP Extended Warehouse Management (SAP EWM); and for transport management, SAP Transportation Management (SAP TM). Consequently, compatibility packages provide functions that give you the option of continuing to use traditional functions to simplify the migration to SAP S/4HANA. Usage of these compatibility packages is intended for a transition phase only.



Gradual Migration to the Target Architecture

Fixed-term compatibility packages enable you to choose whether you want to migrate directly to the target architecture in these subareas or whether you'd rather continue using the traditional functions.

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Fixed-term compatibility packages

The useful life of the functions covered by the compatibility packages is restricted. Up to the end of 2025, you can continue to use these functions in the traditional format. After 2025, the license for their usage in SAP S/4HANA will no longer be valid.

SAP S/4HANA for central finance

SAP S/4HANA for central finance is a deployment variant of SAP S/4HANA. In this variant, customers can connect their distributed system landscapes to a central SAP S/4HANA Finance system. Figure 3.7 demonstrates an example of a combination of SAP and non-SAP systems in which financial documents are replicated in SAP S/4HANA for central finance.

SAP Landscape Transformation Replication Server

Postings from finance and controlling are submitted from existing operational source systems to the complementary central finance system. The SAP Landscape Transformation Replication Server is responsible for replicating the actual data from the decentralized source systems to the central finance system after the data has been initially exchanged. Optionally, a central master data system (e.g., SAP Master Data Governance) can ensure the relevant financial master data is distributed.

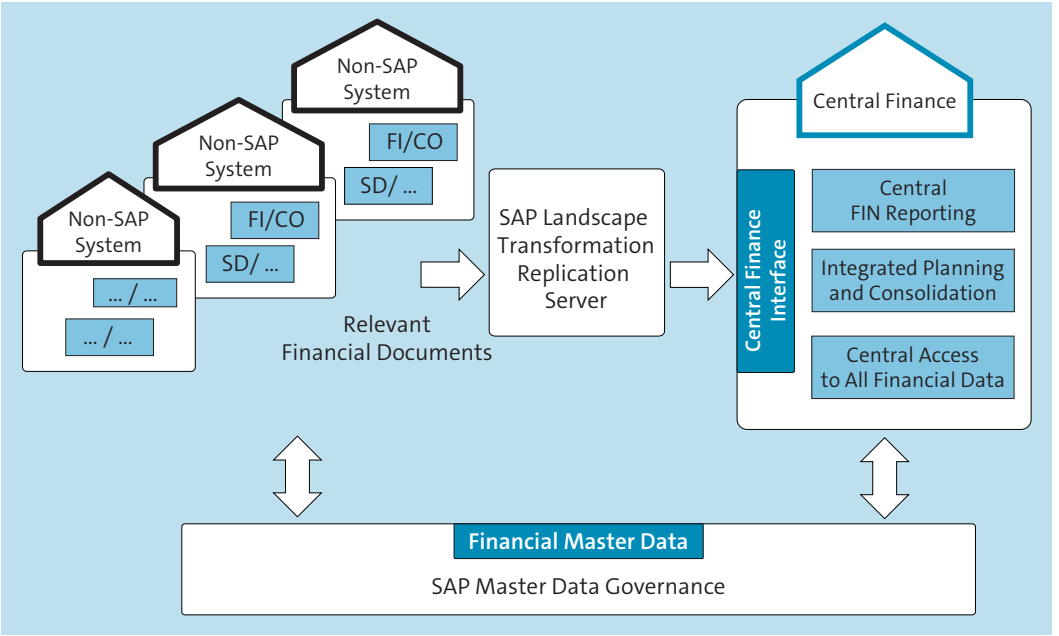


Figure 3.7 SAP S/4HANA Central Finance

More Information on SAP S/4HANA On-Premise Editions

- For further information on SAP S/4HANA Finance, see the SAP Help at *http://s-prs.co/52792002*.

- The SAP S/4HANA Compatibility Scope Matrix, attached to SAP Note 2269324, lists the functions mapped by compatibility packages.
- For more details on SAP S/4HANA Central Finance, see SAP Notes 2148893 (Central Finance: Implementation and Configuration) and 2154420 (SAP Landscape Transformation Replication Server for Central Finance).

3.2.2 SAP S/4HANA Cloud

In SAP S/4HANA Cloud, SAP operates and maintains the software. Customers access their SAP S/4HANA Cloud systems from any network with internet access by using a browser and a unique, customer-specific URL. Multiple types of end devices are supported.

Security

Sophisticated security procedures such as the Transport Layer Security (TLS) encryption procedure secure the communications between customers and the SAP S/4HANA Cloud system. In addition to this technical procedure, the following security and quality principles apply to SAP S/4HANA Cloud:

- Business data is stored in data centers according to the highest security standards.
- Customers may share physical hardware, but their data is always stored separately.
- Users requiring access to business data have to authenticate themselves, and their identity needs to be verified by user and access management.
- Customers always remain the owners of their respective customer data.

Implementation

The technical deployment of the SAP S/4HANA cloud system is followed by the adaptation to individual requirements. For this purpose, the customer implements the required business processes based on SAP S/4HANA guided configuration. Then, you can use the SAP S/4HANA migration cockpit to migrate the necessary data from your legacy system to the SAP S/4HANA Cloud system.

SAP S/4HANA Cloud is a SaaS offering. In principle, monthly subscription fees are based on the number and type of users.

Latest available version

The public cloud version is subject to a continuous innovation cycle. At the time this book was created, the innovation cycle was quarterly.



Additional Information

For additional information on SAP S/4HANA Cloud, go to *http://s-prs.co/527920*.

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3.2.3 SAP HANA Enterprise Cloud

Private cloud

Another variant is to deploy SAP S/4HANA as a *private cloud solution*—that is, as a hosted service. For this purpose, SAP provides SAP HANA Enterprise Cloud. In this deployment variant, customers can individually choose between infrastructure and application management services. Depending on the scope of the selected services, the result can vary between a private cloud IaaS offering and an on-premise like implementation.

In this context, SAP HANA Enterprise Cloud supplements the SAP S/4HANA editions and links infrastructure services and application services. Customers can either solely use the cloud infrastructure or additionally outsource the operation and maintenance of the SAP S/4HANA software. You can use all functions of SAP S/4HANA on-premise with this operating variant.

Application management services

Customers can also flexibly select the application management services provided by SAP HANA Enterprise Cloud. For example, 24/7 service desk operations, internal notification processing, transportation tasks (e.g., implementing SAP Notes), job management, authorization management, print management, or interface administration can be outsourced to service providers. SAP HANA Enterprise Cloud is not only provided by SAP but also available from selected service partners, such as IBM or Hewlett Packard Enterprise.

3.2.4 SAP S/4HANA Cloud, Extended Edition

Private cloud option

SAP S/4HANA Cloud, extended edition is a variant that meets specific enhancement and security requirements. For example, in the extended edition, customers are provided with enhancement options that go beyond the scope of the options of the public cloud edition. Customers have dedicated systems and do not share system resources. With regard to functions and supported country versions, the extended edition corresponds to the SAP S/4HANA on-premise version.

Figure 3.8 shows an overview of the various SAP S/4HANA deployment options.

In this specific context, you can imagine SAP HANA Enterprise Cloud as a bridge from on-premise to SAP S/4HANA Cloud. With regard to the name, SAP S/4HANA Cloud stands for the public cloud version, which provides a higher degree of standardized services. For this reason, maintenance cycles and other operating parameters cannot be customized—just like in SAP S/4HANA Cloud, extended edition.

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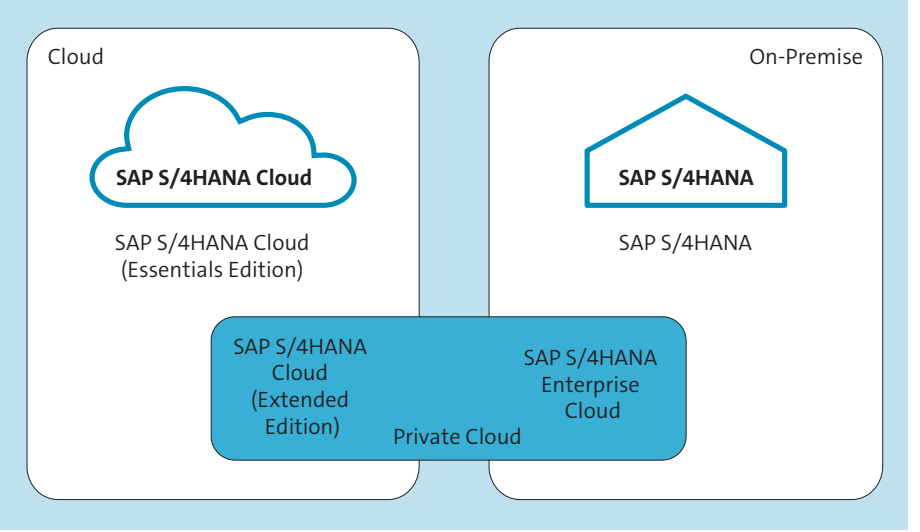


Figure 3.8 SAP S/4HANA Deployment Options



Additional Information

For more information on SAP HANA Enterprise Cloud, go to *http://s-prs.co/52792003*.

3.3 Comparing the Operating Models

This section describes the individual characteristics of the respective operating models in detail and compares how the corresponding editions of the SAP S/4HANA product family meet these criteria.

3.3.1 Hardware, Software, Operation, and Maintenance

Operation

The most obvious difference between the on-premise and cloud editions is the fact that you operate, maintain, and manage the SAP S/4HANA on-premise editions yourself, while SAP carries out these tasks in the public cloud editions. Public cloud editions are available via SaaS operating models. All SAP S/4HANA Cloud editions are operated at different data centers located in various countries and regions around the world. Table 3.3 lists the differences in detail.

Hardware in the public cloud

For each public cloud edition, the hardware can be obtained in different packages, depending on the number of users and the required size of the SAP HANA database storage. When the cloud system is handed over, the

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applications are fully installed. For the public cloud editions, SAP is responsible for operating, monitoring, and maintaining the system (implementing enhancements and upgrades).

SAP S/4HANA, On-Premise Version	SAP S/4HANA Cloud	
■ The customer owns and maintains the hardware. ■ The customer is responsible for installing, operating, maintaining, and managing the applications.	■ SAP or selected service partners provide the hardware and infrastructure. ■ Depending on the service level agreement, the customer and SAP or selected service partners install the applications. ■ Depending on the service-level agreement, the customer and SAP or selected service partners operate and maintain the applications.	SAP S/4HANA Cloud (private cloud scenarios)
	■ Hardware and infrastructure are located at SAP. ■ When the system is handed over, the applications are fully installed. ■ SAP operates, maintains, and manages the applications.	SAP S/4HANA Cloud (public cloud scenarios)

Table 3.3 Overview of Hardware, Software, Operation, and Maintenance of SAP S/4HANA Editions

Maintenance cycles in the public cloud

At the time of this writing, maintenance cycles are specified as follows:

- **Hotfix collection**
  A hotfix collection is implemented every two weeks.
- **Release upgrade**
  Upgrades to the next SAP S/4HANA Cloud release are implemented quarterly. Upgrades contain new functions and hotfix collections.
- **Emergency patch**
  Critical corrections for a specific customer system, if required, are implemented as soon as possible.

Differences in the managed private cloud

In the managed private cloud, customers can customize the scope of the required hardware and the supported services to a large extent. For the hardware, you can choose between a two-tier or three-tier landscape (public cloud editions consist of a two-tier system landscape). From the services

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available, you can choose implementation services (requirements analysis, implementation, data migration, go live) and operation services (incident, problem, and change management and application monitoring). In SAP S/4HANA in SAP HANA Enterprise Cloud, you can even control details like maintenance dates.



Additional Information

You can find further information on this topic in the SAP agreement documents at *http://s-prs.de/v631617*.

3.3.2 User Interfaces

UI technology

In all SAP S/4HANA editions, the role-based approach of SAP Fiori is the basic target UI technology. Thus, the public cloud editions are completely designed for this target architecture. In individual cases, public clouds also use other web-based SAP technologies, such as Web Dynpro, in addition to SAP Fiori. In the on-premise edition and the private cloud edition, you can also use SAP GUI for Windows in addition to the web-based UI technologies (see Table 3.4). SAP GUI-based transactions that can no longer be executed in SAP S/4HANA on-premise are included in the simplification list for SAP S/4HANA (see Chapter 7, Section 7.2.3). You should use the SAP Fiori launchpad as the central entry platform for end users in all SAP S/4HANA editions.



Gradual Migration to the SAP Fiori Target Architecture

Because traditional user interfaces are still supported, gradual migration to SAP S/4HANA is feasible.

SAP S/4HANA, On-Premise Version	SAP S/4HANA Cloud	
■ Web technologies ■ SAP GUI for Windows	■ Web ■ SAP GUI for Windows	SAP S/4HANA Cloud (private cloud)
	■ Web	SAP S/4HANA Cloud (public cloud)

Table 3.4 UI Technologies of SAP S/4HANA Editions

3.3.3 Functional Scope and Supported Country Versions

The on-premise and public cloud editions of SAP S/4HANA are based on the same program code line. Consequently, the same data models and product

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innovations are available. However, the editions vary with regard to their functional scope, the supported country versions, and the options for customizing the business processes (see Table 3.5).

SAP S/4HANA, On-Premise Version	SAP S/4HANA Cloud	
■ 64 countries with SAP standard localization ■ Process flexibility according to on-premise configuration options	■ 64 countries with SAP standard localization ■ Process flexibility according to on-premise configuration options	SAP S/4HANA Cloud (private cloud)
	■ 41 countries with SAP standard localization ■ Process flexibility according to cloud scenarios and the guided configuration approach of the public cloud	SAP S/4HANA Cloud (public cloud)

Table 3.5 Functional Scope and Supported Country Versions for SAP S/4HANA Editions

On-premise version and private cloud

The on-premise versions and the private cloud edition have the same business functions and support the same country versions. The complete functional ERP scope is supported in 64 countries with the standard SAP localization. To adapt these SAP S/4HANA editions to your specific requirements, all the traditional configuration options are still available in the Implementation Guide (IMG).

Public cloud

The functional ERP scope provided in the public cloud editions differs partially from the functional scope of the on-premise edition. For example, compatibility packages (Section 3.2.1) are not available in the public cloud edition. The supported functional scope is based on the best practices content of the public cloud edition, which has been deployed as preconfigured. SAP S/4HANA Cloud supports more than 40 countries with corresponding localizations and numerous languages. The functional scope and localizations are extended continuously.

Additional Information

- For more details on the functional scope and supported country versions, see Feature Scope Description in the SAP Help Portal (*http://help.sap.com/s4hana*) and in the globalization area (*http://s-prs.de/v631618*), as well as in SAP S/4HANA Cloud.
- The product roadmap is available at *http://s-prs.co/52792004*.

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3.3.4 Options for Enhancement

Cloud editions

Basically, you can use the key user enhancement tools and enhancement options, which are based on SAP Extension Suite (extension services that run on SAP BTP), in all editions of the SAP S/4HANA product family (see Table 3.6). In SAP S/4HANA Cloud (private option), you can carry out further adaptations through ABAP programming. With these adaptations, modification-free enhancements are possible, which can be used for Business Add-Ins (BAdIs) and user exits.

On-premise editions

Beyond that scope, in the on-premise editions it is theoretically possible to even modify SAP objects, but we don't recommend doing this considering the increasing costs for future release changes. Section 3.4 describes the SAP S/4HANA enhancement options in detail.

SAP S/4HANA, On-Premise Version	SAP S/4HANA Cloud	
■ Traditional enhancement options through ABAP programming ■ Usage of the key-user enhancement tools for SAP S/4HANA ■ Enhancements based on SAP Extension Suite	■ Selected enhancement options through ABAP programming ■ Usage of the key user enhancement tools for SAP S/4HANA ■ Enhancements based on SAP Extension Suite	SAP S/4HANA Cloud (private cloud)
	■ Usage of the key user enhancement tools for SAP S/4HANA ■ Enhancements based on SAP Extension Suite	SAP S/4HANA Cloud (public cloud)

Table 3.6 Enhancement Options for SAP S/4HANA Editions

3.3.5 Payment Model and Runtime

License or subscription

Variants of SAP S/4HANA on-premise still offer the traditional license and maintenance model, whereas the public cloud editions are provided via a cloud subscription model with flexible runtimes (see Table 3.7). The actual costs for the subscription model depend on the number of users, the application scope used, and the hardware packages selected.

SAP S/4HANA, On-Premise Version	SAP S/4HANA Cloud	
License and maintenance fee	■ Flexible model (license and maintenance fee or subscription) ■ Customers can contribute existing SAP licenses	SAP S/4HANA Cloud (private cloud)
	■ Subscription with flexible runtimes	SAP S/4HANA Cloud (public cloud)

Table 3.7 Payment Models and Runtimes of SAP S/4HANA Editions

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3.3.6 Model for Migration to SAP S/4HANA

Brownfield or greenfield approach

With SAP S/4HANA on premise, customers can choose either the brownfield approach or the greenfield approach. In other words, you can either convert an existing SAP ERP system to an SAP S/4HANA system or install a completely new SAP S/4HANA system.

Migrating to SAP S/4HANA Cloud always entails a new installation of the system. The business processes supported in SAP S/4HANA Cloud are implemented according to best practices, and the required master and document data is transferred to the cloud system (see Table 3.8).

SAP S/4HANA, On-Premise version	SAP S/4HANA Cloud	
Brownfield or greenfield approach	New installation with subsequent data migration	SAP S/4HANA Cloud (private cloud)
		SAP S/4HANA Cloud (public cloud)

Table 3.8 Migration Scenarios for SAP S/4HANA Editions

For more information on new implementations or on converting single systems, see Part II of this book.

3.4 Extensibility of SAP S/4HANA

Every enterprise is unique, not just in the specifications for its products or services, but in its employees, its goals, and thus its business process structures. In the ideal case, business software supports such uniqueness and the resulting differences because these details differentiate the enterprise from its competitors.

Previous SAP enhancement options

To date, SAP has supported differentiation to the greatest extent possible with its software: SAP provided released interfaces and disclosed the source code of the entire application. Moreover, SAP offered SAP NetWeaver Application Server ABAP (SAP NetWeaver AS ABAP), which is a development environment in the application system. SAP provided several options for integration with other applications, such as SAP Process Orchestration. With this portfolio, SAP has created an optimally customizable solution with scalable enhancement options. Third-party providers also appreciate this extensibility and can deliver supplementary functions for standard SAP solutions. When planning your migration to SAP S/4HANA, you should always pay attention to the solution's *extensibility*.

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Extensibility put to test

In SAP S/4HANA, SAP has refined this extensibility, which has been adapted according to SAP's simplification philosophy for products. Particular attention was paid to allowing customization without comprehensive programming knowledge but also provide the flexibility required for significant enhancements. In SAP S/4HANA, these concepts were improved. In this way, the disadvantages of extending the standard software to meet individual requirements are minimized. In the past, the high degree of flexibility in SAP ERP could lead to risks that had to be considered individually in each specific case: comprehensive enhancements entailed projects involving several parties within the enterprise, and sometimes implementation partners as well. Thus, it could take some time before an enhancement could actually be used. When enhancements were implemented, the next risk was in the operation of the software: During the lifecycle of the software, hotfixes and planned updates to the default software are usually installed. Testing and adjusting custom developments in this constantly updating software lifecycle can involve a great deal of effort.

New extensibility concepts

Consequently, the extensibility in SAP S/4HANA has been adapted to accelerate the implementation of enhancements and simultaneously reduce the costs of these enhancements. In particular, modifying the default SAP code can be avoided in most cases. For this purpose, SAP S/4HANA provides tool-based enhancement options in the applications themselves, as well as platform-based enhancement options outside the software product. These functions support the following characteristics:

- **Scaled extensibility**
  The default software can be customized at various levels. For example, end users can personalize their user interfaces and implement their own (restricted) enhancements. Selected experts can be authorized to implement further enhancements that affect the processes of multiple users. At the top level, you can customize the entire application in an implementation project.
- **Scaled lifecycle**
  You can loosely couple enhancements. While enhancements can exchange data with SAP S/4HANA and are merged on the user interface, they can also perform independent software maintenance cycles.
- **Openness**
  SAP S/4HANA includes a vast array of open interfaces, so partners can implement existing enhancements or offer their own enhancements.



Extensibility of SAP S/4HANA

You can customize SAP S/4HANA using various enhancement procedures.

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To implement this extensibility, SAP follows two approaches:

- Side-by-side enhancements
- In-app enhancements

Both approaches complement each other and can be combined. Figure 3.9 compares the two enhancement approaches. These approaches are described in detail in the following sections.

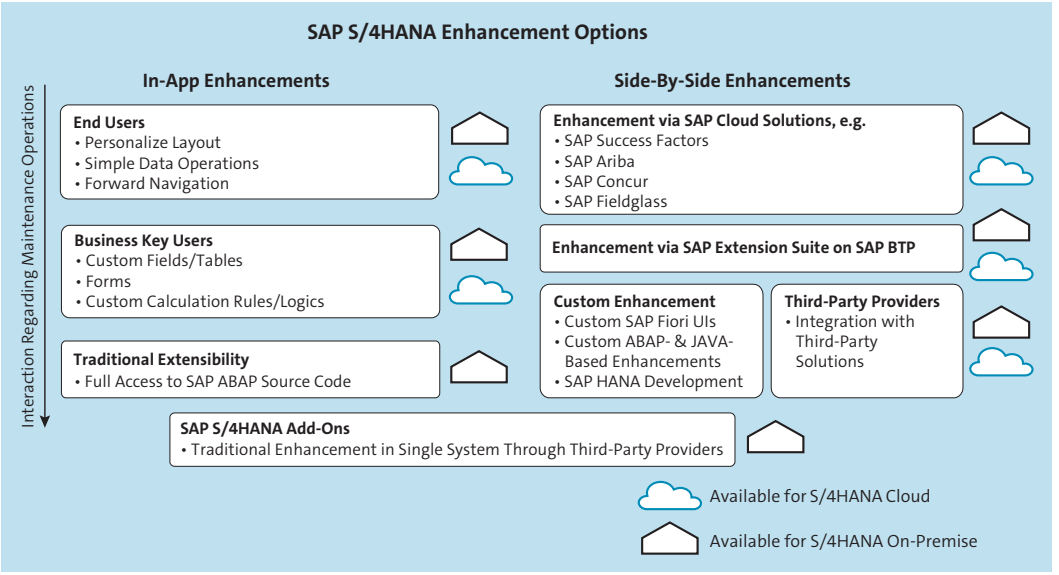


Figure 3.9 Enhancement Options in SAP S/4HANA

The in-app and side-by-side approaches involve various levels. The deeper the level, the greater the impact on the software lifecycle. Not all options are available in all deployment options (Section 3.3.4).

3.4.1 Side-By-Side Operation

SAP Extension Suite

The characteristic of side-by-side enhancements is that they use Extension Suite services that run on SAP BTP. In addition to the SAP HANA database, this solution contains comprehensive tools for developing, testing, integrating, and operating the SAP software.

Enhancements on SAP Extension Suite can be carried out using various implementation approaches, such as Java code, HTML5 commands, and SAP HANA database queries. Consequently, this enhancement approach is particularly suited to developing custom user interfaces easily and integrating additional steps into SAP standard business processes.

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ABAP in the Cloud

Since the end of 2018, SAP has also offered a cloud-based ABAP development and runtime environment: SAP BTP, ABAP environment (previously, SAP Cloud Platform, ABAP environment). By using this product for side-by-side enhancements, you can efficiently utilize existing ABAP know-how for creating future-proof enhancements—both for SAP S/4HANA Cloud and for the on-premise version.

You can find more details on this topic in Section 3.5.



Side-By-Side Operation

The enhancement options based on SAP Extension Suite are ideal for creating custom user interfaces or additional business process steps.

User Interfaces

Development environment for SAPUI5: SAP Web IDE

The SAP Fiori user interfaces are written with HTML5 and are based on central SAP libraries (SAPUI5). The software development process for HTML5 applications differs from the development in ABAP, which is the language used to implement the SAP S/4HANA application logic. Therefore, SAP S/4HANA does not contain a development environment for HTML5. Instead, SAP provides an optimized development environment for SAP Fiori user interfaces called SAP Web IDE, available via the SAP Extension Suite on SAP BTP. In addition to development tools such as an editor, this also includes tools for packaging and deploying the user interfaces developed (see *http://s-prs.co/527921*).

Business Processes

Additional Java applications

SAP S/4HANA enables you to supplement existing business processes with your own business logic and data. In most cases, you'll only need to adjust the SAP standard processes to your specific business requirements. In some cases, however, your processes deviate so much from the processes of your competitors that this deviation can no longer be mapped by in-app enhancements. SAP Extension Suite is the ideal enhancement solution here, allowing you to build complex custom applications side by side and then integrate them with SAP S/4HANA. Communication with the platform is via web services. The enhancement logic itself can be created either in Java or—since 2019—in ABAP (Section 3.5).

Integration infrastructure

SAP BTP already provides the required integration infrastructure for both cases: a central integration middleware with SAP Integration Suite and SAP

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Gateway for integration with SAP Fiori. Consequently, SAP Extension Suite is the optimal basis for enhancements—not only for SAP S/4HANA but also for other applications in the landscape.

Released interfaces

Extending SAP S/4HANA via SAP Extension Suite uses SAP's APIs, including the following:

- New SAP S/4HANA interfaces:
  - Representational State Transfer (REST) web services
  - Simple Object Access Protocol (SOAP) web services
  - Open Data Protocol (OData) web services
- Traditional SAP interfaces:
  - BAPIs
  - Intermediate Documents (IDocs)

The traditional interfaces are included for compatibility reasons and only released for the enhancement of the SAP S/4HANA on-premise version. The number of interfaces released is continuously increasing.



Using the SAP API Business Hub

In some cases, it's a challenge to find the right interfaces for a planned enhancement. In addition to finding the interface and interpreting the interface parameters, you also need to consider for which application cases the interfaces were released by SAP. For this reason, SAP provides SAP API Business Hub as a central repository for APIs. This repository doesn't cover all available SAP APIs, but instead focuses on the interfaces and Core Data Services (CDS) views that are recommended for cloud-oriented enhancements. The usage of interfaces is described and a test option is provided. You can find the SAP API Business Hub at *https://api.sap.com/*. In the **SAP S/4HANA Cloud** or **SAP S/4HANA** category, you'll find the interfaces that are relevant for the enhancement of SAP S/4HANA.

3.4.2 In-App Enhancements

In-app enhancements are striking because of their simplicity: These enhancements are implemented in the same system, connections to other systems are not necessary, and latency is reduced. Furthermore, you can use the existing application as a base and use the powerful ABAP Dictionary, which contains the CDS, to create table views, for example.

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Enhancements without developer knowledge

You don't necessarily need any development know-how for enhancements and you can leverage the following extensibility options:

- End user extensibility
- Key user extensibility

The key user extensibility in particular provides the options shown in Figure 3.10.

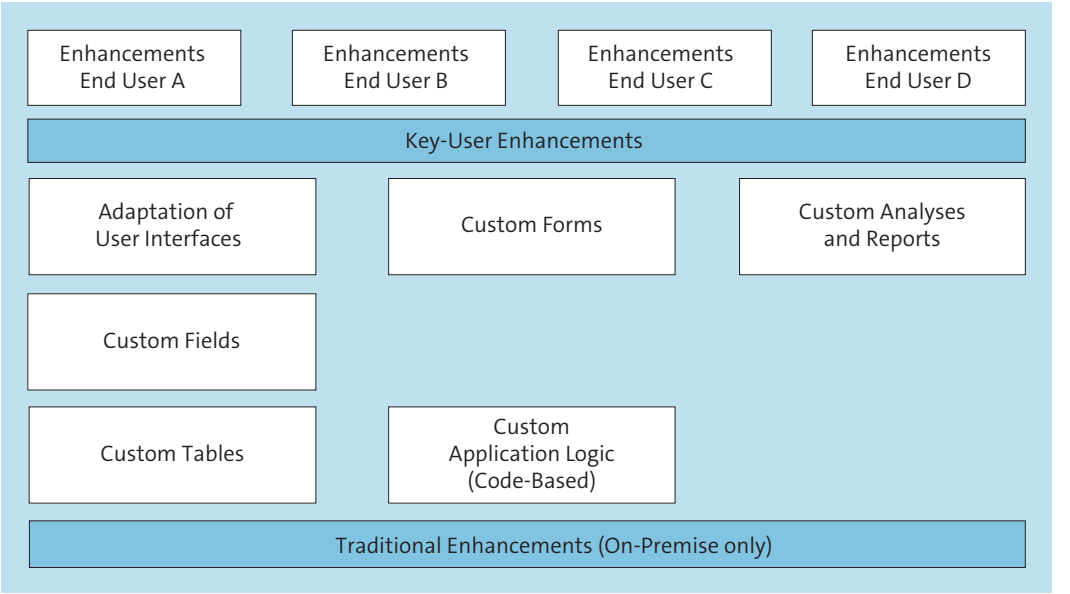


Figure 3.10 In-App Extensibility

Enhancements carried out by central key users impact all users of the system, who in turn can make specific adaptations. The traditional extensibility of the ABAP source code is only available on premise and is mainly included for compatibility reasons.

End User Enhancements

User-specific customization

End user enhancements can be implemented directly in SAP Fiori applications. These enhancements are user-specific and do not affect other users of the SAP S/4HANA system. Simple enhancements include customizing screen layouts or selection fields, simple column operations, and basic settings for object-based navigation. These enhancements can only be carried out in specifically prepared applications, and you can access enhancements via the cogwheel icon in the application (see Figure 3.11). You can even customize the cogwheel icon in most SAP Fiori screens.

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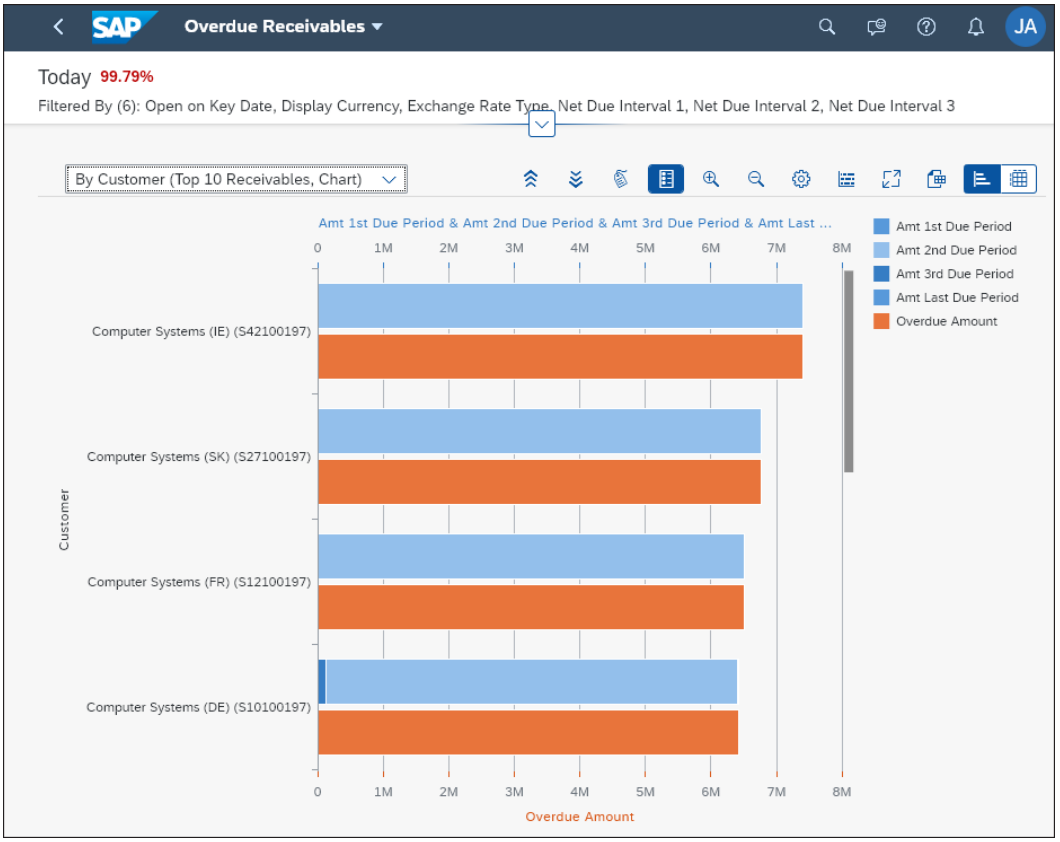


Figure 3.11 End User Enhancements for User Interfaces

Key User Enhancements

Modeling

SAP also provides enhancement options that can be implemented partially using modelling procedures, which is useful when customizing user interfaces or supplementing custom fields or tables. In a new enhancement mode, you only need basic development know-how to modify the calculation logic without directly changing the application code. One of the advantages of this method is that you don't have to adapt enhancements manually when maintaining your SAP software. As a result, operating costs are reduced compared to traditional, code-based enhancements. In contrast to end user enhancements, key user enhancements affect all system users. Remember that a specific authorization is required for these key user enhancement options. This authorization needs to be defined in the `SAP_CORE_BC_EXT` application catalog and assigned in accordance with the application role.

Advantages of Key User Enhancements

Key user enhancements use modeling rules that will not need subsequent adaptations for maintenance operations.

Enhancement options

Key user enhancement options are selected via SAP Fiori tiles, which are predefined by SAP. Among others, the following options are provided:

- **Customizing user interfaces**
  Similar to end user customization, you can change the layout of SAP Fiori applications. Examples include hiding fields, renaming identifiers, rearranging blocks, and creating selection variants. These activities do not require any development know-how. To customize a user interface, in the application that you want to change, select the user icon in the upper left of the screen first. You can then change the user interface using the **Adjust UI** icon.
- **Field extensibility**
  In the business contexts provided for that purpose, you can define additional fields for the application to use (see Figure 3.12). Select the **User-Defined Fields and Logic** tile in the **Extensibility** group on the SAP Fiori launchpad. These fields are not only displayed on the user interface but can also be stored in the SAP data model and are thus available in the database views, for searches, and for other operations.

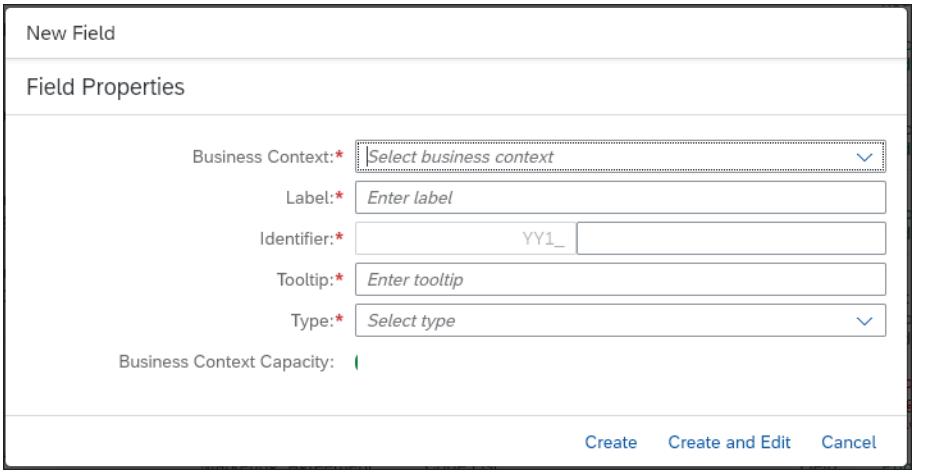


Figure 3.12 Extensibility of Fields

- **Table extensibility**
  Besides new fields, you can also define and use custom tables in SAP S/4HANA. Similar to custom fields, custom tables are created within SAP S/4HANA and integrated into user interfaces. The application then exchanges data with the table. A custom table is a special kind of user-defined business object.
- **Business objects**
  You can define specific business objects for your enhancements. Business objects are sets of tables between which you define relationships. In

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addition, you can point an interface to access this newly created business object. Doing so enables you, for example, to access these business objects when specifying calculation logic. To access business objects, select the **User-Defined Business Objects** tile in the **Extensibility** group.

- **Adjusting the calculation logic**
  You may often find it necessary to check the meaning of entered or displayed data, to specify defaults, or to trigger exception handling. Another example of a calculation logic adjustment is specific calculation procedures that are not provided in the SAP standard. In these cases, additional logic can be inserted in the relevant applications.

  The logic is defined in a code-based implementation via a web editor (see Figure 3.13).

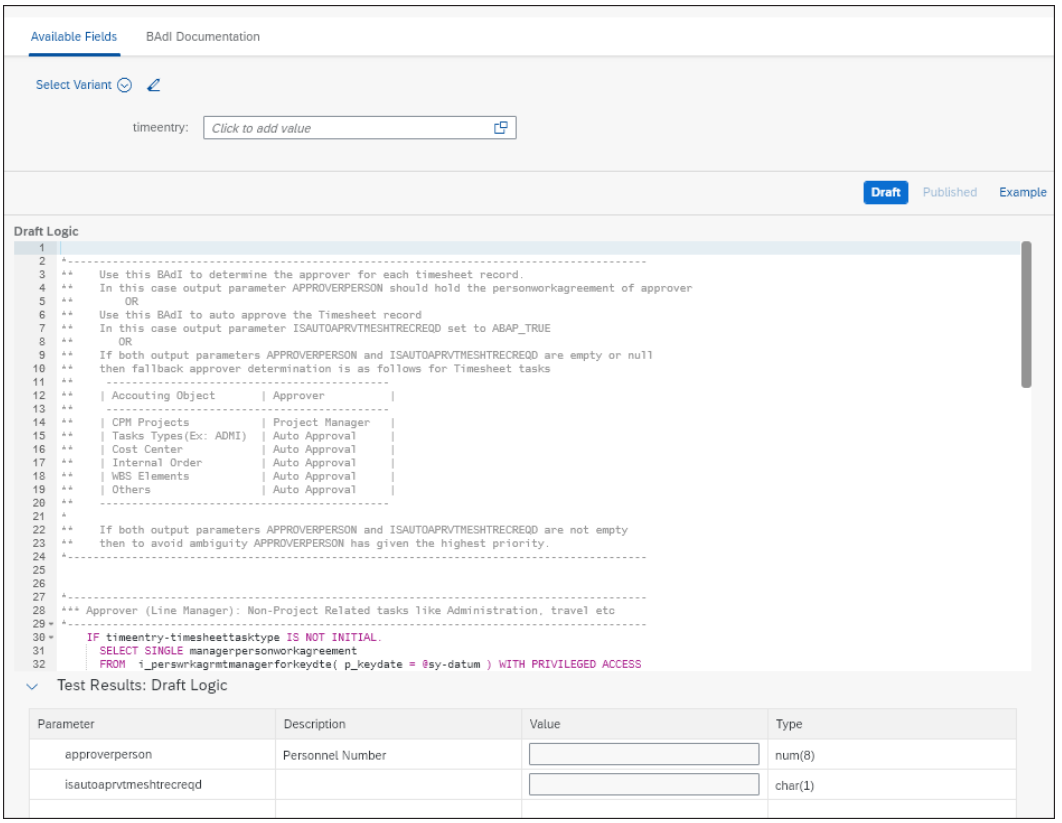


Figure 3.13 User-Defined Fields and Logic

In the editor, the syntax is simplified in comparison to traditional ABAP so that detailed ABAP know-how is not required. For this adaptation, use the User-Defined Fields and Logic tile in the Extensibility section and then the

User-Defined Logic tab. However, you will need some development know-how for this activity. Compared to traditional enhancement options, you'll be provided with numerous commands and instructions in this tile. You can also save these enhancements and export them to other systems.



Transport of Enhancements

In general, key user enhancements should be implemented and tested in a quality assurance system first. To transport verified enhancements to the production system, you can follow this export and import procedure: After developing your enhancement, select the **Export Software Collections** tile in the **Extensibility** group. Next, assign your enhancement to a software collection, which you can then export.

Now, in the target system, select the **Import Collection** tile in the **Extensibility** group, where you can import the previously exported enhancement. Note that export and import should be carried out by a software logistic administrator; as a result, this activity requires specific roles with access to the `SAP_CORE_BC_SL_EXP` (for exporting) and `SAP_CORE_BC_SL_IMP` (for importing) application catalogs.



Additional Information on Enhancement Options

Further options are available in addition to the described enhancement options. For more details, see the Extensibility section in the product documentation at *http://s-prs.co/52792005*.

Traditional Extensibility

ABAP enhancements

In the on-premise version of SAP S/4HANA, you can still enhance or even modify the ABAP source code using the tools from the traditional SAP Business Suite, such as the ABAP Workbench. While this approach offers the maximum freedom to develop your own custom enhancements, interactions regarding maintenance operations in the system will often be necessary. When implementing new SAP corrections, you'll always have to adjust your enhancements to the SAP Notes. As a result, you need to install corrections in close cooperation with your development department. When migrating to SAP S/4HANA, you should also consider how custom enhancements can be re-implemented using the new options. You don't have to do this for all existing enhancements; it's subject to individual consideration.

In addition to these more formal enhancement options, SAP S/4HANA also provides comprehensive applications for defining custom data analyses or creating custom forms.

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3.4.3 Checking Custom Enhancements when Migrating to SAP S/4HANA

Analyzing existing adaptations

When you plan to migrate to SAP S/4HANA, you should analyze existing adaptations to the current system:

- **End-user customization**
  Individual end-user adaptations are lost when you migrate to SAP S/4HANA. Users will have to then customize the new product again, as described in Section 3.4.2.
- **Generic enhancements for all users**
  Generic enhancements that are effective for all system users can be implemented when migrating to the new product. The appropriate procedure for this implementation depends on the operating model selected for SAP S/4HANA. You should generally implement these enhancements using the key user enhancement options, which will result in fewer follow-up costs and simplify the maintenance of the enhancements.

  If the source system is an SAP source system, you should run SAP's *custom code check* first. This check identifies custom code in the existing system and generates a task list. Chapter 7, Section 7.2.6 discusses this check in detail.

3.5 ABAP-Based Enhancements via SAP BTP, ABAP Environment

When planning the migration to SAP S/4HANA, users were faced with a difficult dilemma: if they wanted to reduce the interaction of their custom enhancements with SAP maintenance events, at the time, they had to use SAP Cloud Platform (now SAP Extension Suite services on SAP BTP). Therefore, the enhancement had to be implemented completely anew, for example, in Java. If they wanted to implement the applications in ABAP, usually only the SAP S/4HANA on-premise version qualified, whereby a link to SAP maintenance events still existed.

Fortunately, a new option provides additional alternatives for planning custom ABAP code. SAP has published a new product line called SAP BTP, ABAP environment.

3.5.1 SAP BTP, ABAP Environment

SAP BTP, ABAP environment (formerly known as SAP Cloud Platform, ABAP environment) is a stand-alone cloud product of SAP. It provides the latest, cloud-optimized version of ABAP design and runtime (see Figure 3.14).

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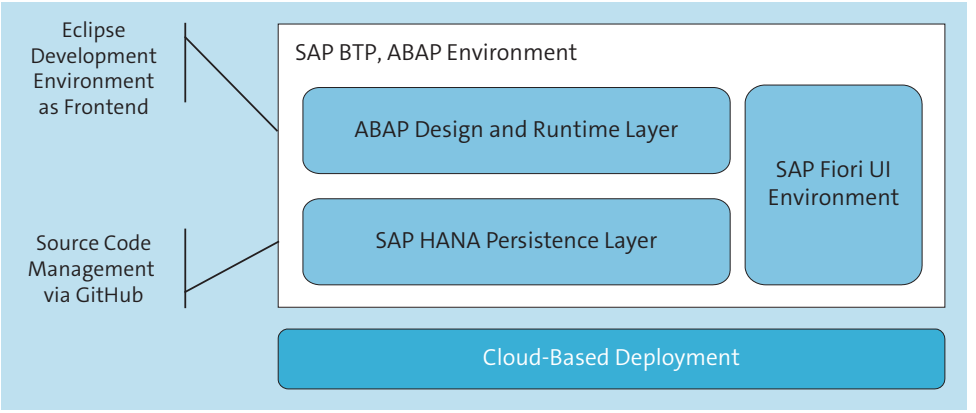


Figure 3.14 Overview of SAP BTP, ABAP Environment

It offers numerous advantages—not only with regard to the migration of existing SAP ERP systems to SAP S/4HANA:

- **Utilization of the existing ABAP knowledge base**
  The enterprise's ABAP expertise that has been established over the years can still be utilized. But other SAP Extension Suite services can also be integrated.

  The original extensibility of SAP S/4HANA Cloud can be supplemented with comprehensive side-by-side enhancements.
- **Independent innovation cycles**
  The innovation cycles for custom coding can be specified independent of the SAP application system. As a cloud product, SAP BTP, ABAP environment receives the latest functional enhancements at short intervals while still providing full compatibility with existing implementations, so the speed of innovation in custom developments can be increased considerably.
- **Custom SAP HANA database**
  SAP BTP, ABAP environment includes its own SAP HANA database. This enables you to use the advantages of the SAP HANA database without your SAP application systems having been migrated to SAP HANA yet.

Custom enhancements are future-proof. As side-by-side enhancements, they are not included in the SAP source code, but they communicate with the SAP application using stable interfaces. For these interfaces, a contract against modifications exists. Therefore, they don't need to be synchronized when the SAP application is maintained. Their enhancements are located in a separate system in the cloud and thus become independent of version changes.

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The application core of SAP systems remains mostly unchanged because you only need to implement interfaces. This is another advantage with regard to complying with security requirements.

System management by SAP

The system is managed by SAP because SAP BTP, ABAP environment is a native cloud application. This reduces the workload of the enterprise's IT department. This also results in easy scalability because you don't need to take care of hardware procurement.

Considered as a whole, the approach of implementing custom enhancements via SAP BTP, ABAP environment enables you to use the advantages of the cloud without having to complete the migration of all your application systems to the cloud.

Possible Migration Scenarios

New migration concepts

Chapter 4 discusses the basic scenarios for migrating to SAP S/4HANA Cloud. If you include SAP BTP, ABAP environment in your considerations, interesting new approaches for project planning arise. This section discusses these additional options.

The starting point for migrating to SAP S/4HANA is the general decision for this target scenario—for example, SAP S/4HANA Cloud or the SAP S/4HANA on-premise version—and the planning and realization of the technical and content-related conversion project. This conversion project can be developed in more detail using SAP S/4HANA Cloud.

Utilization of SAP HANA

If your SAP application system is not yet operating on the SAP HANA database, you might want to gain experience with SAP HANA to enable better planning of the migration effort. In this case, you have the option of migrating the existing SAP application system to SAP HANA. However, this may also entail unnecessary additional effort because the conversion to SAP HANA takes place anyway together with the planned migration to SAP S/4HANA.

SAP HANA-based cloud environment

SAP BTP, ABAP environment offers a cloud environment that is already based on SAP HANA. You can replicate selected data to your SAP BTP, ABAP environment. This enables you to immediately investigate how you must optimize your code for SAP S/4HANA and which additional options arise through SAP HANA. The side-by-side approach ensures that the application system remains completely unaffected.

Similarly, you can start to supplement your production system(s) with SAP HANA-based enhancements to bridge the systems until the full conversion to SAP S/4HANA takes place.

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Alternative Check of Custom Code

The migration to SAP S/4HANA includes the check and adaptation of custom code. As described in Section 3.4.3, custom code must be checked for compatibility with SAP S/4HANA. Adjustments may be necessary.

If you need to check and adapt your code within the scope of the SAP S/4HANA migration project, SAP BTP, ABAP environment offers two interesting approaches:

Decoupled lifecycle

- **Architectural decoupling**
  Depending on the scope of your existing enhancements, it may be advisable to decouple the architecture. If you have comprehensive custom code, you may want to decouple the software lifecycle of your code from the application system's lifecycle in the future. In this case, it's advisable to separate the code in a side-by-side approach.

  Unfortunately, SAP no longer offers any further development for SAP NetWeaver. This eliminates the option to run this decoupling through an (on-premise) SAP NetWeaver system. This gap is filled with SAP BTP, ABAP environment. You can separate your applications into this cloud-based system.
- **Time-wise decoupling**
  Thanks to the independent lifecycles of the SAP application system and your enhancement system, you can immediately start to migrate your applications. You do not need an SAP S/4HANA system for this purpose. You also do not have to synchronize in terms of time when converting the applications.

SAP offers supporting services for transferring your existing code to SAP BTP, ABAP environment, which are described in the next section.



Trial System for SAP BTP, ABAP Environment

SAP offers comprehensive options for extensions via the SAP Extension Suite on:
https://www.sap.com/products/extension-suite/capabilities.abap.html

Details on SAP BTP, ABAP Environment can be found at:
https://discovery-center.cloud.sap/serviceCatalog/abap-environment

The option to use a free trial system is particularly useful. Although this trial system does not offer the full functional scope and is shared with other users, it still enables you to get an initial practical impression of the basic offering, as described in a blog post at:
http://s-prs.de/v745537

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3.5.2 Migrating Custom ABAP Code to SAP BTP, ABAP Environment

The migration of your existing code to SAP BTP, ABAP environment comprises several steps:

1. Analyzing the existing code
2. Estimating the modification effort
3. Creating a roadmap
4. Technical migration
5. Adapting the migrated code
6. Testing
7. Converting

Fortunately, SAP offers various tools that facilitate several of these steps. This minimizes the effort of migrating the code to SAP BTP, ABAP environment. The following sections provide an insight into the processes for the individual steps.

Analyzing the Existing Code

The migration to SAP BTP, ABAP environment also involves a code scan using special checks. This process is similar to the one described in Chapters 7 and 8. In this special case, in addition to the adaptation to SAP S/4HANA described previously, you must also identify adaptations required for the adaptation to the ABAP cloud environment. For this purpose, you can use an SAP BTP, ABAP environment system as the check system. Your current application system doesn't need to be upgraded to a specific SAP version to get the latest checks. However, the checks must be made against a functional combination of code and content. We therefore recommend a check against your current source system.



Duplicate Check?

You require two checks for the migration of custom code to SAP BTP, ABAP environment (which is discussed in this chapter) within the scope of a migration to SAP S/4HANA:

1. One check is for the compatibility of the code against the new version of the SAP S/4HANA application because functions from SAP ERP releases are no longer available in the same form due to simplification.
2. The other check is for compatibility with the new ABAP language scope in SAP BTP, ABAP environment.

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Custom code check

For this purpose, you provision an appropriate cloud system at SAP using your cloud cockpit. This system establishes a remote connection to your current application system—for example, your development system. The ABAP test cockpit will be used for the actual checks. For this purpose, you run the cloud platform readiness check using the `SAP_CP_READINESS` RFC-enabled check variant. You can check systems as of SAP Basis version 7.00.

Check using your own ABAP test cockpit system

As an alternative, you can also use your own ABAP test cockpit system on premise. However, this scenario requires the availability of an ABAP test cockpit system with SAP Basis 7.52 SP 1 or higher. You also must first implement the following SAP Notes in this scenario (at the time of this book's writing, these notes still used the SAP Cloud Platform brand in their titles):

- SAP Note 2682626, Code Inspector Check for Restricted Language Scope Version 5 (ABAP for SAP Cloud Platform)
- SAP Note 2684665, Custom Code Checks for SAP Cloud Platform, ABAP Environment
- SAP Note 2830799, Custom Code Checks for SAP Cloud Platform, ABAP Environment

The technical prerequisites in the target system are identical in both cases. You will find more details in SAP Note 2364916. In both cases, you configure the target systems to be checked using Transaction SM59.

Estimating the Adaptation Effort

Once the checks are complete, you receive a list of any potential issues detected. Based on this, you can estimate the resulting efforts in detail.

Partially automated adaptations via quick fixes

Note that SAP offers so-called quick fixes for numerous adaptations. The list of available quick fixes is updated continuously. If a quick fix is available, it's highlighted in the result list, and you can select it in the context menu of the check result. Thus, these results can be repaired in a mechanized way, so to speak.

Creating a Roadmap

Similar to the project to migrate to SAP S/4HANA, we recommend considering several dimensions when planning your adaptations:

- **Effort of adaptations**
  Is it possible to do "mechanical" adaptations using quick fixes? Or are there many outdated technologies, such as Dynpro, which must be converted to SAP Fiori UIs?
- **Urgency**
  Which functions must or should be updated first?

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- **Importance for future operating processes in SAP S/4HANA**
  How important is this function for the planned business target processes?

Particularly if you use an older version of an SAP ERP system, some of your enhancements may no longer be required in the current scope because they can be covered through the new default functional scope.

When you estimate the modification effort, consider both the adaptations to the language scope of SAP BTP, ABAP environment and the adaptations to SAP S/4HANA.

Technical Migration

SAP BTP, ABAP environment supports Git, the current source code management system. The sources are no longer processed using SAP Transactions like SE80 or the like. Instead, they are processed using the ABAP Developer Toolkit for Eclipse.

Git repository

From the technical point of view, this means that sources that reside in the current ABAP systems must be transferred to Git. For this purpose, we assume that you already have a Git account. For the transfer, you can use the open-source `ZABAPGIT` program, which is available in the repository at *http://s-prs.co/527922*. This utility program is maintained by an open-source community and is not provided by SAP.

Ensure that the appropriate ABAP Git enhancement is installed on the Eclipse frontend used. This enhancement should appear in the feature list under the name **abapGit for ABAP Development Tools (ADT)**. You can also use the following URL: *http://eclipse.abapgit.org/updatesite/*.

Additional information on installing ABAP Git is available on the SAP Help Portal: *http://s-prs.de/v745539*.

Transferring the codes

The code is transferred at package level. We recommend the following procedure: Create a list of packages whose objects are to be transferred from the source system. Add these packages to your Git repository in `ZABAPGIT`. In the target system project, create the packages in the development environment using the same name. In the target system project, connect the newly created packages with your ABAP Git repository.

Separating code lines

Your objects are now available in the target system project. Note that the code lines are separated from this point on. Because objects of the source system usually cannot be run without making adaptations in the target system, the implementations of your objects differ. Corrections to the source system objects should be made manually. It is not recommended to replicate them.

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Adapting the Migrated Code

You must remedy any incompatibilities that were found in the analysis step for the code that you want to use in the planned business scenario. Many conversions can be made mechanically thanks to the support of quick fixes.

Adapting outdated UI technologies

When planning your project, you should take into account that only a subset of the adaptations can be made partially automated. In some areas, new implementations might be necessary. Outdated UI technologies, such as ALV or Web Dynpro, are no longer supported. Therefore, user interfaces must be created completely anew in the form of SAP Fiori UIs. Only this technology enables the intended user experience.

Integration via interfaces

Due to the side-by-side approach, the application system's data must be accessed via interfaces. Direct access to tables of the target system is no longer possible. We recommend migrating to remote OData accesses. Also note that in this model, the persistency of your enhancements and their data—for example, custom data elements or tables—resides in the provided SAP BTP, ABAP Environment development system and not in the tables of the application system.

SAP HANA optimization

If your enhancements make runtime-critical accesses to the database, these accesses should be optimized for SAP HANA. Although existing selects can usually be transferred, they do not provide the desired runtime benefits. In this context, also refer to the descriptions provided in Section 2.3.

Test and Conversion

These steps do not differ from the procedure of further developments or conversion of your code in on-premise systems. They are based on your processes for code modifications.

3.6 Summary

This chapter dove into the different deployment options for SAP S/4HANA and their advantages. In particular, we outlined the options you can leverage to tailor the SAP S/4HANA system to your company's needs via the various extensibility options provided. Based on this information, you may scope your migration project. In the next chapter, we'll discuss the detailed preparations with your scope in mind.

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PART II

Preparing for Migration to SAP S/4HANA

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Chapter 4
Which Migration Options Are Available?

This chapter introduces the three migration scenarios covered in this book: new implementation, system conversion, and selective data transition.

Which steps should you consider when planning your migration project to SAP S/4HANA? How does SAP support you? Can the migration be compared to an upgrade within the SAP ERP product family? This chapter answers these questions. Furthermore, we'll introduce three possible migration scenarios: new implementation, system conversion, and selective data transition. Chapter 5 discusses these scenarios in more detail and summarizes their advantages and disadvantages under different conditions.

4.1 Basic Considerations

Upgrade or product implementation?

Migrating to SAP S/4HANA offers many benefits, but to ensure a smooth migration, you must be aware of your specific reasons for migrating. Consequently, you should not plan to migrate to SAP S/4HANA as an update or upgrade of an already implemented solution. With SAP S/4HANA, you want to introduce a new digital core to your enterprise that ensures future competitiveness. This will succeed optimally if you adapt both technical aspects and content-wise design of business processes.

What needs to be taken into account?

You should answer (at least) the following questions, which will be discussed in more detail later on in this section:

- **Which target status do you want to achieve?**
  What position is SAP S/4HANA supposed to take in your system landscape? Do you want to execute a proof of concept, or do you want to use SAP S/4HANA immediately in production? Can you use the migration as an opportunity to optimize how your processes are mapped in the enterprise software?
- **Which operating model suits you?**
  Do you want to run SAP S/4HANA in your own data center or through a hosting service? Or do you want to use SAP S/4HANA via a SaaS model?

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- **What is the initial situation?**
  What is the current product version of your source system? What is the quality of the data in your source system? How strictly do you leverage SAP standard, and how many custom enhancements exist? Do you want to use a system as a template?
- **Which users exist?**
  How many users exist, and how are they distributed? Which user groups are expected to benefit from the implementation of SAP S/4HANA?
- **How is the solution to be used?**
  Which business scenarios and transactions are to be used? How are these requirements distributed across your users?
- **What is your defined time frame?**
  Within what period of time is the project supposed to be completed? Which milestones need to be reached and when?
- **Do you need support?**
  What kind of support do you need? What is your budget? Which services do you expect to purchase, and which services can be provided in house?

Preparing for the coming decades

The more aware you are of the significance of SAP's digital core, the more added value SAP S/4HANA can usually generate. The basic concept of SAP S/4HANA is its pledge to prepare enterprises for the challenges of the coming decades. Restricting yourself to a purely technical update of existing systems and landscapes would be an inadequate simplification. You should analyze whether your processes have grown, as well as whether your system landscape will be sustainable in the future or whether its structure is obsolete and should be adjusted.

Technical and process-oriented parts

Thus, when migrating to SAP S/4HANA, you'll have to consider at least two parts of the implementation: the purely technical part and the process-oriented part (see Figure 4.1):

- **Technical implementation**
  The *technical implementation* of a migration mainly includes migrating the database to SAP HANA, replacing the program code, adapting data models to the SAP S/4HANA data model, and implementing the frontend server for SAP Fiori interfaces. Your existing custom code might also have to be technically adapted.

  These activities generally do not depend on the scope of subsequent use in production and can easily be implemented using the relevant tools and can therefore be technically controlled and supported. SAP provides a comprehensive portfolio of tools for planning and carrying out this technical implementation.

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- **Process-oriented implementation**
  The *process-oriented implementation* of a migration refers to adapting how existing business processes are mapped in the system and introducing new applications. These modifications to business processes are only partially carried out in the system itself. In most cases, you can only enter indicators, such as changed configuration information. Regarding planning, however, you'll have to perform far more comprehensive change management steps. These steps include, for example, designing your newly changed business processes, configuring necessary measures, training users, assigning roles and authorizations, pilot operation, and converting the production system.

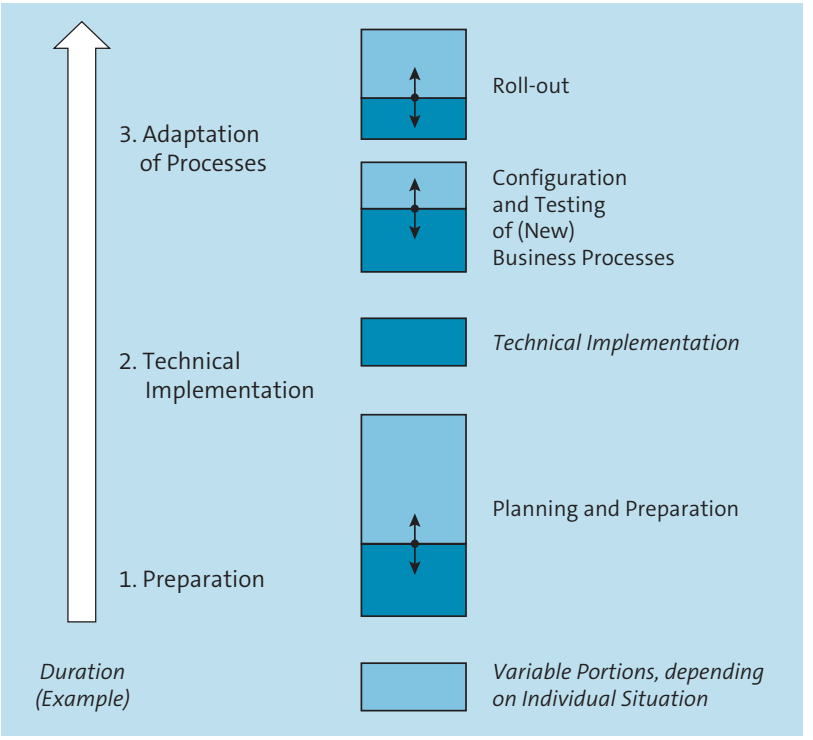


Figure 4.1 Main Parts of Migrating to SAP S/4HANA

Tasks in the individual phases

The following tasks can be assigned to these outlined phases:

1. **Preparation (preparatory steps in the source system)**
   - Analysis of the existing business process implementation
   - Comparison with the SAP S/4HANA innovations
   - Identification of the necessary integration scenarios
   - Prechecks in the source system—for example, functions used, industry-specific enhancements, custom code, third-party enhancements

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   - Implementation of necessary preparatory conversions in the source system
2. **Technical implementation**
   - Installation of SAP S/4HANA, SAP HANA database, and SAP S/4HANA applications
   - Adaptation of the technical infrastructure
   - Customizing
3. **Process adaptation**
   - Adaptation of custom programs in SAP S/4HANA
   - Development of new or enhanced business processes to leverage the innovations in SAP S/4HANA
   - Adaptation of integration scenarios
   - Customization of SAP Fiori interfaces

The time and effort required for the process-oriented implementation—depending on the initial situation and target status—can account for either a small or a large part of the overall process. Thus, we recommend dividing the migration project into the three phases we just described because the process-oriented implementation—in particular, the implementation of new business processes—does not have to be carried out in parallel to the technical migration.



Process Migration and Technical Migration as Separate Steps

In general, you can plan the introduction or migration of your business processes independently from the technical migration.

Parallel project phases

Figure 4.2 shows one possible approach for introducing SAP S/4HANA to your enterprise. In the project, you prepare and implement new functions in batches, while the users continue to use the existing functions.

A prerequisite for optimal project planning is knowing the desired target state. While this prerequisite might sound rather trivial at first, SAP S/4HANA migration projects often fail to describe the goal of the migration in detail and rely on vague statements like "implementation of SAP S/4HANA."

Analyzing the trade-off at an early stage

Migrating to SAP S/4HANA has a general trade-off that you should be aware of, in particular if your initial state includes an SAP ERP system or SAP landscape: the more properties of the source system you decide to keep unchanged (e.g., configuration, custom code, or applications), the simpler the (technical part) of the migration project. However, the benefit that you can derive from SAP S/4HANA in this case might also be reduced because

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the major benefits from SAP S/4HANA are optimized business processes, simplified user interfaces, and greater flexibility for future requirements.

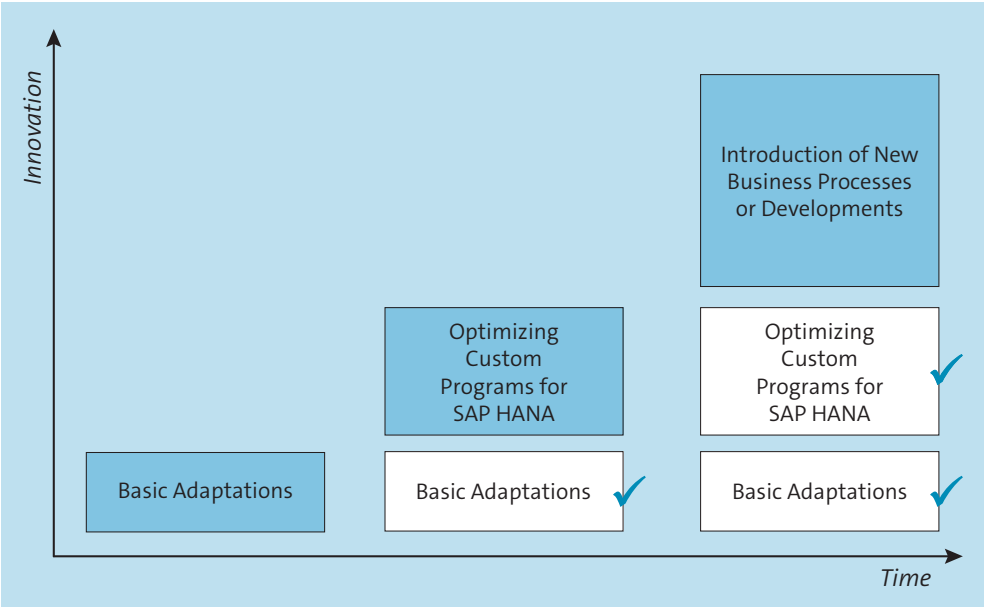


Figure 4.2 Parallel Preparation and Implementation of New Functions

Therefore, you should always analyze this trade-off. Possible analysis criteria include the following:

- **Type of usage**
  Is the target system used for production, or do you want to execute a proof of concept first? In the latter case, you should carry out a greenfield implementation with selective data transfers.
- **Total cost of ownership**
  SAP S/4HANA enables you to reduce the total cost of ownership (TCO). For example, it allows for a reduced *data footprint*; that is, the storage space for application data in the database is reduced. Another dimension is reduced requirements for your internal IT department thanks to avoiding local SAP GUI installations at employee workstations. If your explicit goal for the migration is to lower the TCO, you should also analyze where custom enhancements can be omitted or replaced by SAP S/4HANA applications. Furthermore, you should examine the extent to which multiple existing ERP systems can be merged into one SAP S/4HANA system. In addition to the reduced TCO, users benefit from access to real-time data from the systems that were previously separated.

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- **Operating model**
  Is SAP S/4HANA to be operated in the cloud or on premise? The two operating models have different characteristics that need to be analyzed. In simple terms, outsourcing the system administration to the cloud is attractive, especially for standard business processes.
- **Target landscape**
  How is the entire landscape supposed to change? Are systems to be consolidated? Are systems to be separated (e.g., financial accounting and material requirements planning)? How is the existing architecture to be adjusted? What data must be transferred from the legacy system and what can be left behind?

Remember that you usually also have to set up and configure the frontend servers for SAP Fiori, which are required for the new SAP S/4HANA functions.

SAP Activate implementation methodology

SAP recommends a methodology with six phases for project planning and implementation: discover, prepare, explore, realize, deploy, and run. This methodology is called SAP Activate, and we'll describe it in detail in Chapter 9.

When referring to migration activities in this book, we assume that you have already opted for SAP S/4HANA. We'll assume the *discovery* phase has already been successfully completed—during which enterprise priorities are identified, the target architecture is defined, the business case is optimized, and a readiness check is carried out. Our focus in this book is on the technical implementation of the migration and less on process-oriented implementation. We assume that you have selected and defined the characteristics of the business process scope in a separate business implementation project.



Preparation with Trial Access

If you have not completed the discovery phase yet, you should test an SAP S/4HANA system. For this purpose, SAP provides trial access to a cloud instance of SAP S/4HANA that is only valid for a limited time. For more information on these trial systems, see Chapter 6.

4.2 The Three Migration Scenarios

Greenfield or brownfield?

SAP has defined several technical scenarios for the introduction of SAP S/4HANA and also provides the corresponding tools. When planning the migration, you should select the scenario that meets your individual

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requirements best. The following sections introduce the individual scenarios and describe the advantages and disadvantages of each approach. The chapters in Part III and Part IV of this book then each discuss the different scenarios in detail. We will not discuss the scenario of selective data transition in detail because, in contrast to the other two scenarios, you can only perform a few steps of that scenario yourself. This will be explained in more detail at the end of this chapter in Section 4.2.3.

There are basically three scenarios for the migration to SAP S/4HANA (see Figure 4.3):

- New implementation of SAP S/4HANA
- System conversion to SAP S/4HANA
- Selective data transition to SAP S/4HANA

The selective data transition also includes the steps of the first two scenarios and complements them to further benefit from SAP S/4HANA.

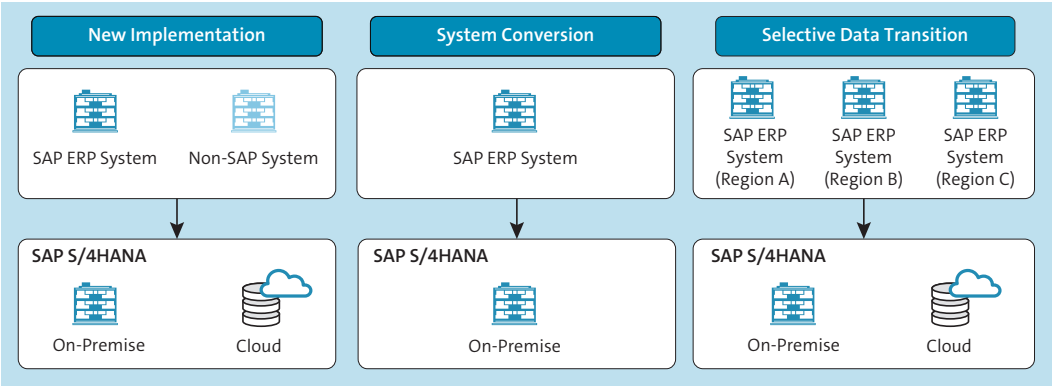


Figure 4.3 Three Scenarios for Migration to SAP S/4HANA

Except for the system conversion, all three scenarios allow you to choose whether you want to implement SAP S/4HANA via a SaaS model in the cloud or as an on-premise implementation (see Chapter 3, Section 3.1).

4.2.1 New Implementation of SAP S/4HANA

Installing a new system

From the technical perspective, this scenario is based on a completely new installation of SAP S/4HANA. In this scenario, we'll use the Software Provisioning Manager (SWPM) to download and set up an SAP S/4HANA system from the available SAP installation media, creating a new system with a new system identification (SID). In addition to this ABAP instance, a frontend server is also installed, which will be the central hub for operating the SAP Fiori user interface.

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Customizing At first, the new system is delivered with a standard configuration. The configuration still needs to be adapted to the specific business requirements of your business processes within the scope of the process-oriented implementation phase.

Data migration The new system can be fed data from a source system. When the data has been transferred, you can replace the source system with the SAP S/4HANA system (see Figure 4.4). The data is transferred using the SAP S/4HANA migration cockpit, a tool that has been developed for SAP S/4HANA. Whether the data is from an SAP system or from a non-SAP system doesn't matter.

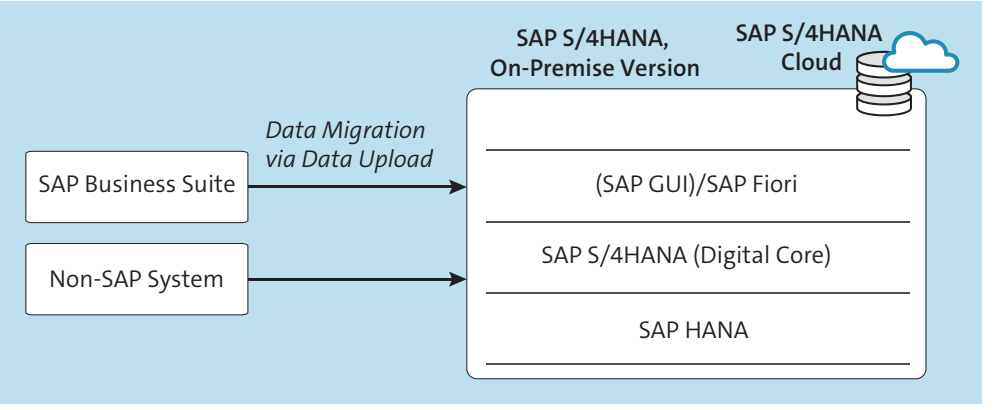


Figure 4.4 New Implementation of SAP S/4HANA

Supported migration objects SAP provides predefined models for the data transfer, so-called migration objects. They are successively enhanced by SAP. The appendix provides a list of which migration objects are supported at the time of this writing. Figure 4.5 shows a sample presentation of the migration objects in the SAP S/4HANA migration cockpit.

Default data fields, the format, and—if available—relationships or references to other business objects are defined for each of the business objects in the migration objects.

Following the simplification concept, only the most important data fields of each object are already activated in this predefined content for data migration. If needed, you can optionally display additional fields, if they're available in the SAP standard. Custom fields (in custom namespaces) can also be supplemented. You must consider the following when migrating such fields:

- In an *on-premise implementation*, you can supplement fields that exist in the standard API but aren't mapped using Transaction LTMOM (SAP

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S/4HANA Migration Object Modeler). You can add custom fields if this is supported by the function module used for data migration.

- In the *cloud solution*, migration objects are already coordinated in such a way that all fields and structures exist for the business processes that are implemented in the cloud. Fields that enhance the cloud's default scope can be subsequently mapped to customer requirements using a service, which may be necessary after an expert configuration, for example. Contact the SAP Support Center in this case.

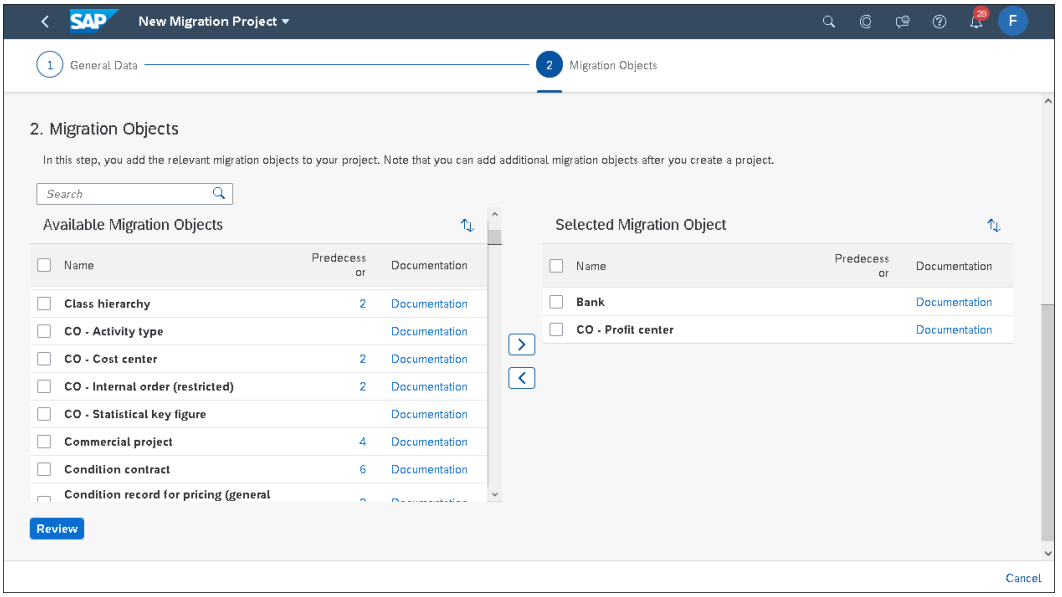


Figure 4.5 Presentation of Available Migration Objects in SAP S/4HANA Migration Cockpit of SAP S/4HANA Cloud

Overview of the migration project

The selected migration objects are transferred to the project view of the SAP S/4HANA migration cockpit. In the cockpit, at any time during the data transfer, you'll be able to see what object data still has to be loaded and for which objects the migration has been completed.

If data needs to be cleansed (e.g., if duplicates need to be identified and eliminated), you should address these issues before migrating the data. The cleansed data from the source system is stored in a file in a format defined by SAP. The relevant templates are provided by default.

Uploading to SAP S/4HANA

In the next step, this file is uploaded. Basic inconsistencies in the data that is planned to be imported to the target system or conflicts in the configuration are determined by tools and can be eliminated. Then, the data transfer from the source system is complete. Figure 4.6 illustrates these steps.

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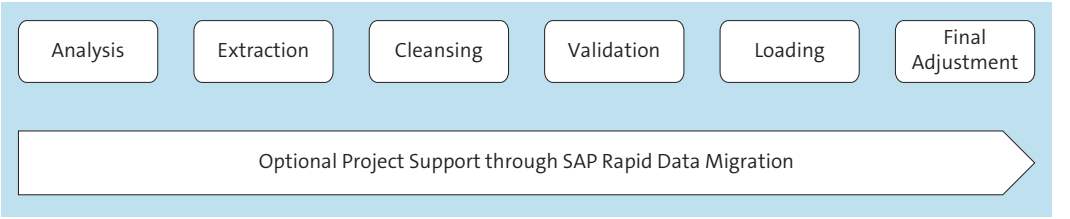


Figure 4.6 Steps for Data Transfer to SAP S/4HANA for New Implementation

The result is a system that corresponds to the SAP standard as much as possible and doesn't contain any obsolete data. This procedure focuses on master data; only a small amount of transactional data is transferred.

The SAP S/4HANA migration cockpit replaces the Legacy System Migration Workbench (LSMW), which was used in SAP R/3 and SAP ERP systems. SAP S/4HANA no longer supports this tool. LSMW still exists (in the on-premise version of SAP S/4HANA), but it rarely makes sense to use it and should be used at your own risk. For the planned new implementation project, which data you want to transfer is decisive: if data objects have requirements that are not part of the content provided, you cannot transfer them with the SAP S/4HANA migration cockpit.

SAP Data Services

For more specific data transitions, you should use SAP Data Services, a tool for extracting and loading data. SAP Data Services is included for all SAP HANA users who have an SAP HANA license. Consisting of a central SAP Data Services server and a local frontend for modeling, SAP Data Services also provides migration content that is less comprehensive than in the SAP S/4HANA migration cockpit (you can find details in the appendix). Also, using SAP Data Services requires more technical effort and key user know-how than using the SAP S/4HANA migration cockpit. Optionally, SAP offers a license extension for SAP Data Services, which supports modifying and improving data quality and data cleansing.

Recall that the migration procedure we described creates a new system with a new SID that contains (selected) data from the source system. In most cases, this new system or the new multitier system landscape (involving development, test, and production systems) needs to be integrated into the overall landscape.



Checklist for New Implementation

Let's summarize the individual steps for new implementations:

1. Determine the target status (operating model and distribution of the instances). You can carry out new implementations for on-premise implementations, for SAP HANA Enterprise Cloud, and in the SaaS cloud.

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2. Identify the desired new business functions.
3. You can find a comparison of the functions currently used in the simplification item catalog of your respective SAP S/4HANA version at *https://launchpad.support.sap.com/#sic* (you need an SAP S-user ID for this purpose). Take into account the number of users for each function.
4. For existing SAP ERP source systems, implement the simplification item check in simulation mode (see SAP Note 2502552).
5. Analyze custom enhancements using the custom code migration worklist (see *http://s-prs.co/527923*). For more information on enhancements for SAP S/4HANA, refer to Chapter 3, Section 3.4.
6. For on-premise systems only, perform sizing (*https://service.sap.com/sizing*).
7. Implement data cleansing and archiving in the source system, if possible.
8. Adjust capacity planning for the project and confirmation of the migration scenario.
9. Set up the target system.
10. Start the SAP S/4HANA migration cockpit and transfer data.
11. Check the result.
12. For on-premise systems only, set up the frontend servers for SAP Fiori.
13. Implement delta configuration.
14. Implement final tests.
15. Implement the rollout of new processes for users.

To support your migration, SAP provides the comprehensive SAP Readiness Check for SAP S/4HANA, which you can use to obtain an electronic checklist and detailed, regularly updated information on preparation (see *http://s-prs.co/527924*).

4.2.2 System Conversion to SAP S/4HANA

SAP ERP system as a base

In this scenario, we'll take an existing SAP ERP system and convert it to an SAP S/4HANA system in several steps (see Figure 4.7). The SID, the customization, and the existing data of the source system are kept in this procedure. When selecting this scenario, you should cleanse your data *before* you convert the system. Note that this scenario is *not* an upgrade because the existing system belongs to a different product family.

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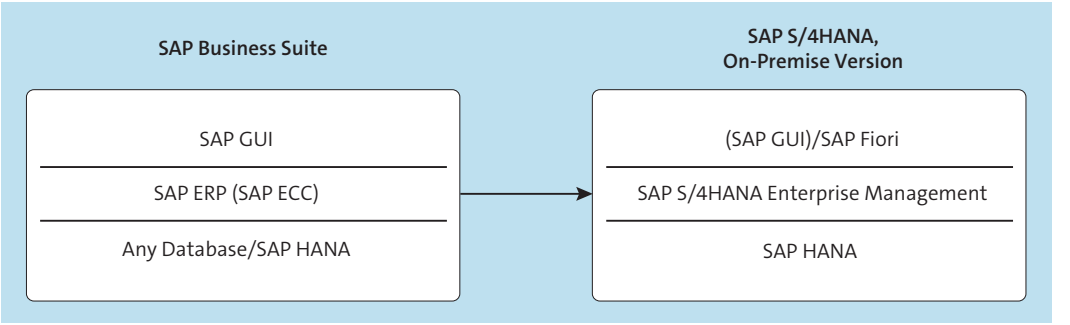


Figure 4.7 System Conversion to SAP S/4HANA



Data Footprint and Archiving

SAP S/4HANA features a considerably reduced data footprint, meaning that the data in the SAP HANA database occupies less storage space than in common SAP ERP systems on traditional databases. SAP HANA's improved compression algorithms are already considered in SAP's official sizing recommendations. However, in the case of system conversions, these sizing rules usually do not apply to the target system because the storage requirements are temporarily higher than in newly implemented systems. More memory is needed because SAP keeps your data to avoid data loss. Consequently, data is temporarily kept redundantly in the target system: in both the new data models of SAP S/4HANA and in the obsolete tables of the SAP ERP system.

Therefore, the target system needs to be sufficiently sized initially. After the conversion project is complete, you can delete redundant data manually. First, however, you should check whether the data has been successfully converted. We therefore recommend that you keep duplicate data in the system for several weeks.

To effectively size the target system (providing sufficient but not too much memory), you should analyze what data in the source system can be archived. You'll be able to access these archives from SAP S/4HANA. Another benefit is that the actual conversion runtime will also be reduced. However, you should not archive active data. Your planning should also consider that the archiving routines in the SAP S/4HANA target system still have to be adjusted to the new data models so that the target system can also archive future data. In addition, you can use the *data aging* option, which is integrated into SAP HANA. This method moves data that is not actively used from the SAP HANA memory and could be considered a kind of preparatory step for archiving. In this system, hot data is stored in the SAP HANA memory; cold and historical data is stored in the archive.

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Simplification list

Before you convert your system, you must analyze the source system in detail. The *simplification item catalog* provided by SAP contains all relevant changes that affect available SAP ERP functions: omitted functions, significantly modified applications (or application architectures), and nonstrategic functions (see Figure 4.8).

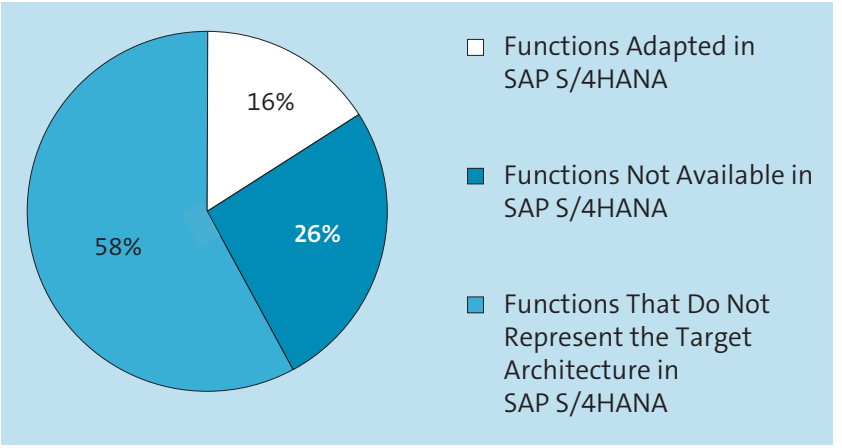


Figure 4.8 Most Functions in Simplification Item Catalog Should Only Be Used for Short Transition Time

Nonstrategic functions are functions that are available in SAP S/4HANA but that SAP no longer recommends. Because SAP doesn't plan to enhance or maintain these functions in the future, you should only use them during the transition phase. You can find details in Chapter 7.

Readiness check

For simplification reasons, SAP provides numerous automatic prechecks, also referred to as *readiness checks*. They answer the following questions about your system:

- Are the technical system requirements met?
- Are functions used that are will no longer be available in the target system in the same form?
- Is incompatible software used, such as add-ons that have not been released for SAP S/4HANA (yet)? Incompatible software must be uninstalled from the source system, or you must find a compatible version for SAP S/4HANA. Please contact the add-on's manufacturer for further information in this case.
- Are your custom enhancements compatible with SAP S/4HANA?

The results of these checks can considerably impact project scoping. We therefore recommend running these checks at the beginning of the conversion project so you can accurately estimate the overall project scope. We recommend that you initially run the simplification item checks in a

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simulation mode (see Figure 4.9). You initiate the check using Report /SDF/RC_START_CHECK from SAP Note 2399707.

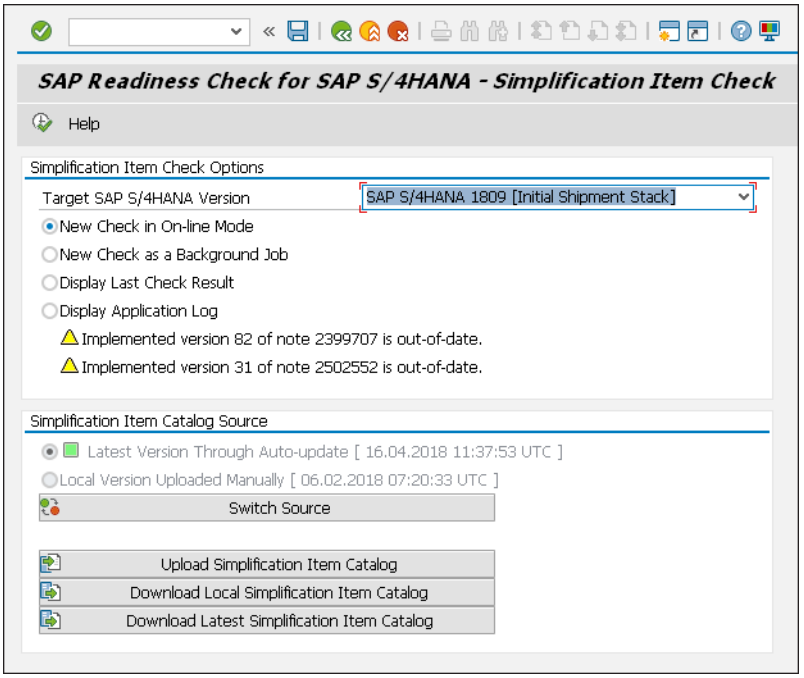


Figure 4.9 Initial Screen of Simplification Item Checks for Preparing SAP S/4HANA Conversion

Results of the checks

Make sure that you select the correct target release. The check is carried out in two steps. A *relevance check* is implemented first. This check determines which areas of the existing system are actively used. It synchronizes these areas of the system actively with the latest version of SAP's simplification item list.

The results of the relevance check are subdivided into two categories, which you can identify by the icons in the **Relevance** column shown in Figure 4.10:

- Application areas that are affected with high probability (yellow triangle)
- Application areas that are not affected (green check mark)

In the second step, you then have to run *consistency checks* for the system areas that have been actively used and for which a list entry exists. For the scenario in Figure 4.10, this means that you should run a consistency check for the entries marked with a yellow triangle.

To do so, select the **Check Consistency for All** button in the toolbar. You then obtain a presentation in list form. The system displays a description of the situation and refers to additional information for checks that resulted in errors (see Figure 4.11).

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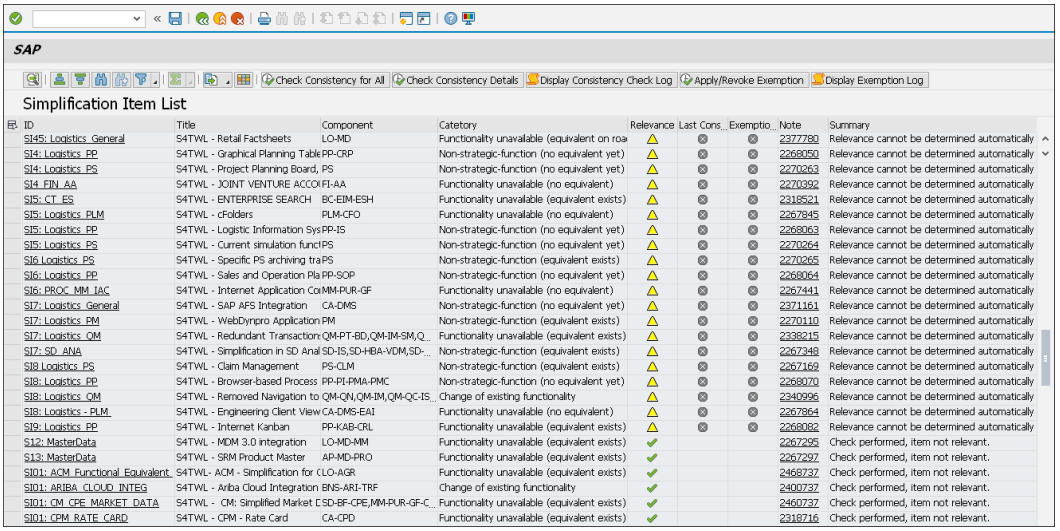


Figure 4.10 Result List of Relevance Check (Areas Marked Relevant Must Be Checked in More Detail)

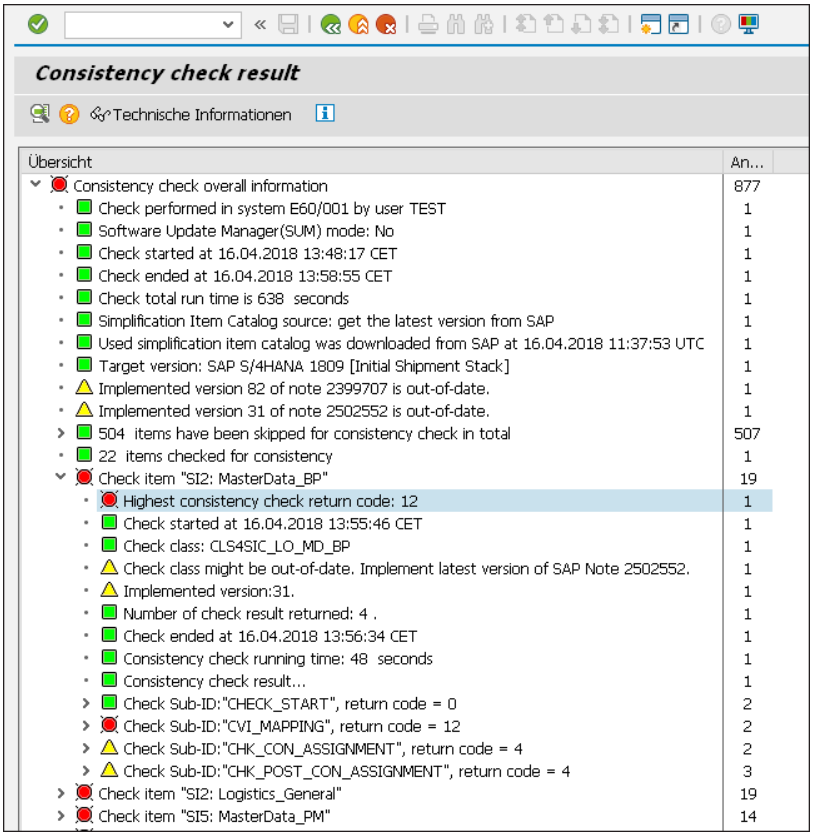


Figure 4.11 Results of Consistency Check

The results of the checks are categorized as follows:

- Positive results (green square)
- Warnings (yellow triangle)
- Errors that hinder a conversion (red circle)

Warnings do not prevent the technical implementation of the conversion from continuing. However, because these warnings might lead to data loss under certain conditions, you should also analyze warnings in detail. SAP has made these simplification item checks available via SAP Notes (see SAP Note 2502552). Prechecks are imported into the source system, where you'll run the check, meaning you can carry out checks independently of the technical conversion project. To be safe, the conversion routine requests that you run the simplification item checks to avoid converting systems that have not been checked.

Custom code checks

Custom code checks deviate from the procedure just described. To check custom code, an SAP NetWeaver system is connected to the source system, and the custom code is then analyzed in this SAP NetWeaver system. In this way, unnecessary workload is diverted away from the source system. The result of these checks is a *custom code migration worklist*, which lists adaptations recommended by SAP for your custom code.

SAP has created an SAP Readiness Check for SAP S/4HANA, which is deployed in SAP Solution Manager to provide a convenient overview of the numerous recommended prechecks. In addition to the checks mentioned previously, SAP Solution Manager helps you to evaluate further information semiautomatically—for example, sizing, add-on usage, or recommendations for using SAP Fiori apps. You can find links to this SAP Readiness Check in our checklist given ahead and in SAP Note 2290622.

Adjusting the source system

After the checks have been carried out, you should eliminate the abnormalities found in your source system. Otherwise, the conversion might not run smoothly. After implementing all corrections, you can verify the system readiness by checking the system again.

Carrying out the conversion

If the prechecks do not indicate any abnormalities, you can initiate the next conversion phase. Call the maintenance planner via the SAP Support Portal using an SAP S-user account (*http://s-prs.co/527925*). Then, enter the desired target status—the selected version of SAP S/4HANA in our case—in the maintenance planner. You then carry out the actual technical system conversion using a version of the Software Update Manager that has been optimized for SAP S/4HANA.

Standard or downtime-optimized

You can choose how the technical conversion should be carried out. SAP provides two procedures for this:

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- Using default, predefined procedures, SAP will try to balance resource consumption, downtime, and overall runtime.
- A procedure with optimized downtime converts larger data volumes into the SAP S/4HANA data format while the system is in production operation, which reduces the downtime. The price you pay is increased resource consumption and sometimes a longer runtime for the technical conversion.

You can optimize additional requirements in individual projects. If you strive for near-zero downtime, SAP recommends involving SAP consultants in the conversion project.

Conversion steps

The technical conversion usually involves the following three steps:

1. **Migrating the database to SAP HANA**
   Your source system database does *not* have to be SAP HANA. In this case, SUM enables you to also convert the database to SAP HANA, which is referred to as the Database Migration Option (DMO).
2. **Implementing new repository objects**
   The software programs are updated to the new SAP S/4HANA versions.
3. **Converting the data**
   The data of the source system is transferred to the target system using its new storage options.

After you have successfully implemented the technical conversion, you might have to perform some application-specific tasks.

Configuring the new functions

The system is ready for use again—but only with the functional scope of the legacy system. The new SAP S/4HANA functions are available in the system but usually still have to be configured. To simplify this configuration, SAP provides predefined content in SAP Best Practices.



From a Single System to a Landscape

The conversion steps we described must be performed in *all* systems of the landscape—that is, at least in the development, test, and production systems. To overcome the resulting downtime, you can generate a temporary copy of the landscape. Note that in this case, you probably won't be able to transport code or configuration changes between systems on the source product version and the new SAP S/4HANA systems. This limitation also applies to SAP corrections. These limitations arise because the code (custom code and SAP code) and configuration tables differ. We recommend adjusting the landscapes manually.

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You should also divide the project into two phases and focus on the technical conversion of the system first. You can then introduce new or changed processes on the converted system in a second step.

Prerequisites

The possible target SAP S/4HANA versions depend on the source product version. Usually, you can select between multiple target releases. When you begin a conversion, SAP HANA doesn't have to be already implemented in your source system. You also don't need to implement versions of SAP S/4HANA sequentially when transitioning to a higher version. In general, a source system running on SAP ERP 6.0 or higher is sufficient, as shown in Figure 4.12. Chapter 7 provides more details on conversion paths.



Conversion Checklist

The following list summarizes the individual steps for a system conversion:

1. Determine the target status (operating model and distribution of the instances). The system conversion can only be carried out for on-premise implementations or for SAP HANA Enterprise Cloud.
2. Identify the desired new business functions.
3. Compare the functions currently used in the simplification item catalog of your respective SAP S/4HANA version (at *https://launchpad.support.sap.com/#sic*). Take into account the number of users for each function.
4. For existing SAP ERP source systems, implement the simplification item check in simulation mode (see SAP Note 2502552).
5. Analyze custom enhancements using the custom code migration worklist *(http://s-prs.co/527926*). For more information on enhancements for SAP S/4HANA, refer to Chapter 3, Section 3.4.
6. Perform sizing (*https://service.sap.com/sizing*).
7. Implement data cleansing and archiving in the source system, if possible.
8. Adjust capacity planning for the project and confirmation of the migration scenario.
9. Plan your system conversion in the maintenance planner (*http://s-prs.co/527927*).
10. Select the standard conversion or the conversion with optimized downtime in SUM, adjusting sizing if required.
11. Execute the maintenance transaction.
12. Check the result.
13. Set up the frontend servers for SAP Fiori.

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14. Implement delta configuration.
15. Implement final tests.
16. Implement the rollout of new processes for users.

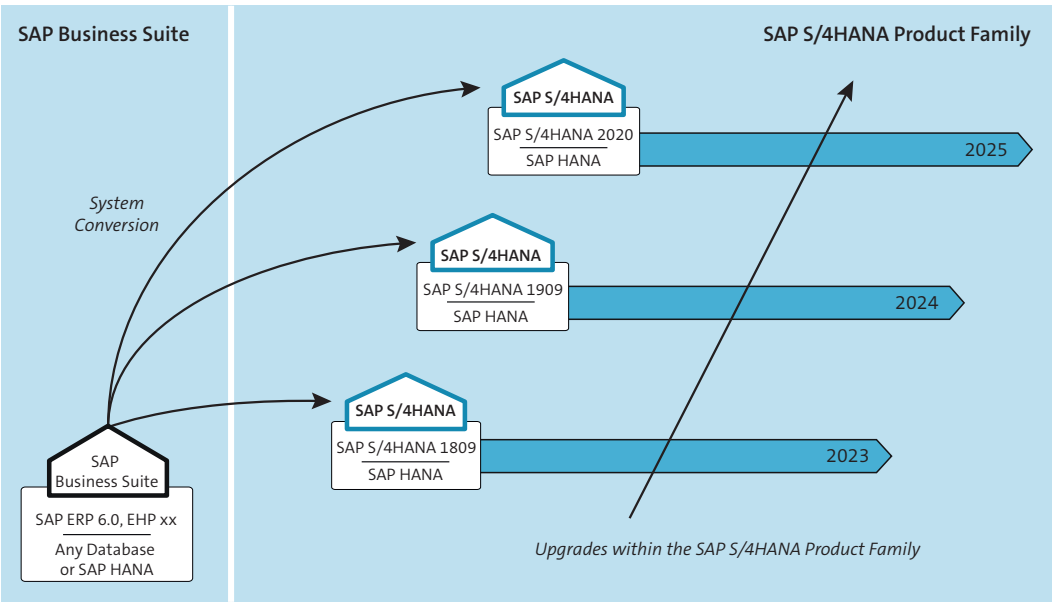


Figure 4.12 Different Conversion Paths to SAP S/4HANA

To support your conversion, SAP provides the comprehensive SAP Readiness Check, which you can use to obtain an electronic checklist and detailed, regularly updated information on preparation (see *http://s-prs.co/527928* or SAP Note 2290622).

4.2.3 Selective Data Transition to SAP S/4HANA

This section explains the third and last transition scenario, selective data transition. Older presentations of these three scenarios still use the term *landscape transformation*, which was replaced by the new term, *selective data transition*. This scenario is also the only one of the three transition scenarios with several alternative forms: you can perform a system consolidation, transfer an organizational unit, or transfer a specific application area (such as financial data).

Before we explain the options in more detail, this section first addresses why SAP customers choose one of the scenarios for selective data transition. Compared to a system conversion, whereby the entire system is converted, and a new implementation, whereby the customer begins with a

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completely new system (greenfield approach), a selective data transition falls between these two scenarios. Depending on your requirements, only certain parts of your existing SAP system are transferred to SAP S/4HANA. The duration of such a data migration depends on many factors and is specified within the scope of a planning service. The actual conversion is carried out during a period of system downtime (usually over a weekend).

As mentioned at the beginning of this chapter, selective data transition is not discussed in more detail in this book because the other scenarios can be implemented by customers and partners themselves using the tools provided by SAP. Selective data transition, however, is very complex, and the relevant expert tools are not freely available. For example, SAP supports the complex system consolidation only within the scope of SAP value assurance services packages. It is therefore useful to include experts from SAP consulting. This section discusses some details of selective data transition so that you can get an appropriate picture of the scenario.

Data in a shared database

Landscape consolidation refers to a concept in which various SAP ERP systems are integrated into a shared SAP S/4HANA system (see Figure 4.13). You might choose landscape transformation to benefit the most from SAP S/4HANA's real-time data processing: only if all data is kept in one database can the system use this data with the highest efficiency. Another benefit is that data no longer needs to be replicated. SAP S/4HANA's efficient compression algorithms and its high speed can handle the volume of data that previously would have been spread out to multiple traditional systems.

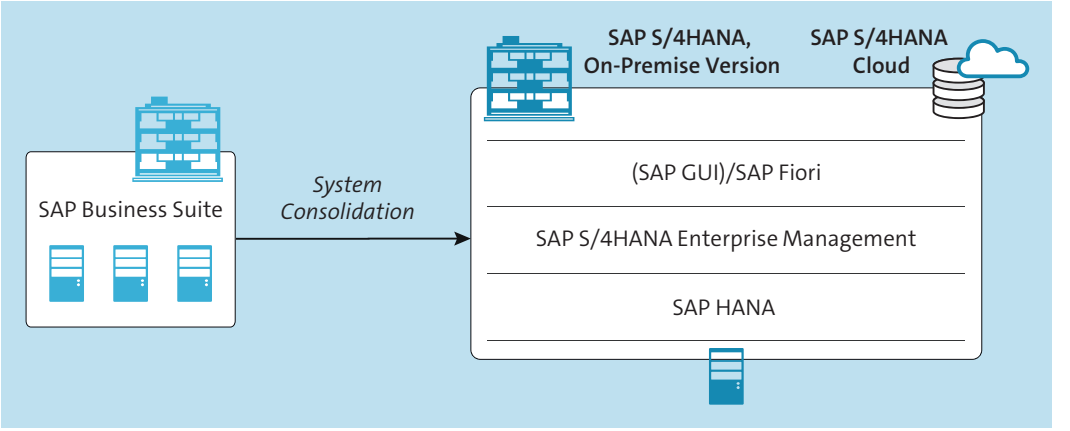


Figure 4.13 System Consolidation

Two subprojects

The landscape transformation process consists of two subprojects. In the first part, the master system is prepared. As described in the previous two sections, the master system is either a new implementation of an SAP S/4HANA system or a system conversion. The latter scenario is implemented if the

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landscape contains an SAP ERP system that can be used as the basis for the other systems. The configuration and process specifications should be optimized and up to date in this system. When planning this first step, take into account the guidance for new implementations and system conversions described in the previous two sections.

Selecting selective data transition

After you've implemented an SAP S/4HANA master system, you still need to transfer the data from your other systems in the landscape to this system. First, determine the required selective data transition method. Figure 4.14 illustrates some common methods:

- Consolidation of several complete systems
- Transfer of selected company codes
- Transfer of selected business processes

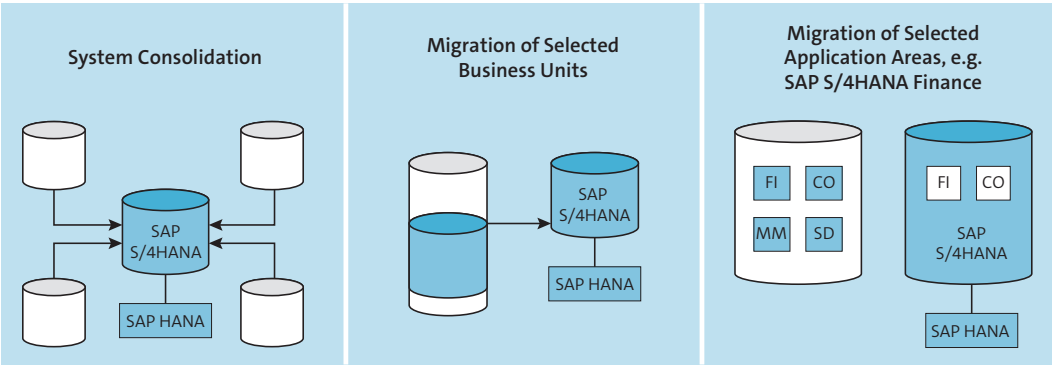


Figure 4.14 Examples for Selective Data Transition

Expert tools

Regardless of the data extraction method, the data from one or more SAP ERP systems are written to the SAP S/4HANA system. In this process, this data will need to be translated into the new SAP S/4HANA data model. From a technical perspective, SAP's expert tools are primarily used for this purpose—because changes need to be made directly in the database, for example. To ensure maximum security and data consistency, as mentioned previously, these tools are only run by SAP experts.

Non-SAP source systems

Although the previously mentioned common cases of selective data transition usually require (at least) one SAP ERP system as a source, the approaches can also be deployed for non-SAP source systems with some restrictions. In this case, however, you should consider using SAP Data Services, as described in the new implementation scenario. The decision for such usage depends on your individual situation. The individual realizations in a selective data transition are highly specialized projects. In addition to the technical support, SAP and other service providers can offer specialized consulting and implementation services for these scenarios.

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4.3 Summary

We've covered which steps you should consider when planning your migration project to SAP S/4HANA. We introduced the three possible migration scenarios: new implementation, system conversion, and selective data transition. Next, we'll these scenarios in more detail and summarize their advantages and disadvantages under different conditions.

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Chapter 5
Selecting Your Migration Scenario

To successfully migrate to SAP S/4HANA, the strategy you follow is a decisive factor. This chapter provides support for deciding among the individual SAP S/4HANA migration scenarios.

This chapter summarizes and compares the advantages and disadvantages of the individual scenarios to provide decision-making support. However, we must mention that we can't decide which scenario you should use for you. Every customer situation is specific, and numerous factors play a role when making the decision. In general, the three doors to SAP S/4HANA are always open for all customers if an SAP ERP system already exists. Therefore, careful planning and analysis of your current situation are essential.

New implementation or conversion

The most critical decision is whether to implement a new system or convert your existing system. Selective data transition is a special case because it can be combined with both scenarios. However, you should choose the most economically sensible scenario for your enterprise, and your decision should be based on technical requirements.

The first section starts with a summary of the different options provided by SAP for migrating to SAP S/4HANA. Then we'll go into more detail through examples and expectations about possible target landscapes.

5.1 Overview of Procedures and Input Helps

Initial situation

Let's start with an overall overview in Figure 5.1. An essential criterion for deciding among the scenarios is your initial situation. Does your source system run SAP ERP 6.0 (or higher), or do you have a different system?

If your SAP system is not supported or if you are using a non-SAP system, you will have to implement a new system. Depending on the volume and quality of your (master) data to be transferred, in a new implementation, you would use the SAP S/4HANA migration cockpit for standard cases or use the SAP Data Services tool for complex data transfers.

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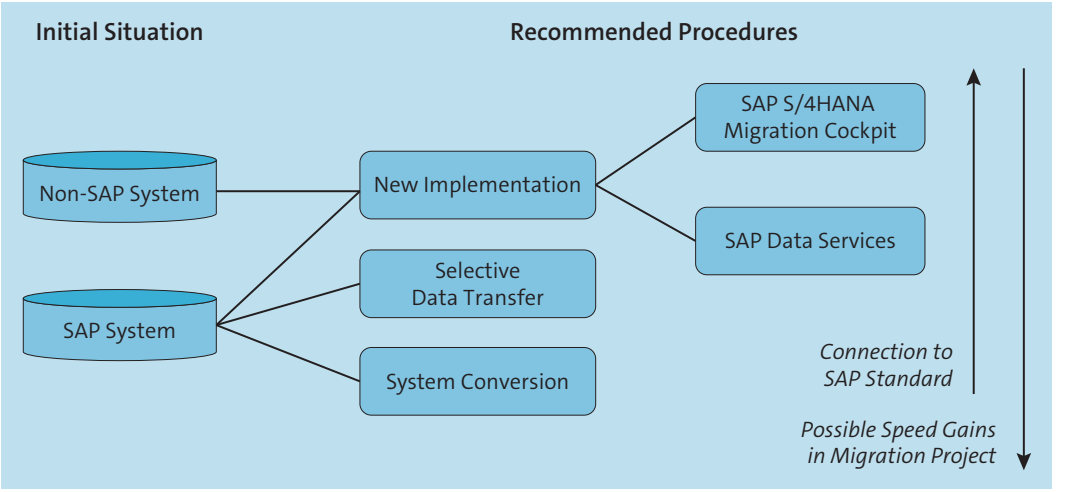


Figure 5.1 Decision Tree for Different Scenarios to Migrate to SAP S/4HANA

Preliminary analyses

Only for source systems with SAP ERP 6.0 or higher are all three migration scenarios possible. However, you should always consider the following criteria when analyzing your initial situation at an early stage:

- What are the results of the prechecks provided by SAP?
- How much would adapting your custom programs cost, according to the recommendations of the custom code analysis?
- Analyze which new SAP S/4HANA functions you want to use. In this context, which makes more sense: adapting or rethinking existing business processes? Also, consider the simplification list.
- Which parts of the existing landscape do you want to migrate to SAP S/4HANA over what period of time?

With this information, you'll perform detailed analyses. In general, we recommend the scenarios at the top in Figure 5.1 if comprehensive adaptation work is necessary. The procedures listed in the bottom area are usually considered if the source system already provides a good basis for the target situation and does not need to be changed considerably. In this case, too, you should think about the long term; for example, consider whether the current form of your existing business processes (their configurations and existing specific enhancements) must be kept.

Planning tools

You are provided with various tools for individual planning, each covering different goals: SAP Innovation and Optimization Pathfinder, often referred to as the pathfinder; SAP Transformation Navigator; and SAP Readiness Check for SAP S/4HANA. We will introduce these tools in an overview.

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5.1.1 SAP Innovation and Optimization Pathfinder

Let's start with SAP Innovation and Optimization Pathfinder because it is not specifically aimed at SAP S/4HANA as a new target environment, but always analyzes an existing SAP ERP system and its potential added value. If you want to find out whether your existing SAP ERP system really exploits the full added value that it could provide, whether it contains further optimization potential, or whether it's prepared for digital transformation, then the pathfinder provides the relevant answers. The following aspects are considered based on the current profile of an existing SAP ERP system:

- When you consider SAP innovations, such as SAP Fiori apps, enhancements of SAP Business Suite, SAP S74HANA scenarios, or enhancements via the cloud, which are the most important ones for your daily business?
- Is there any potential for improving the performance of your existing business processes? How to you perform compared to other customers in your area or industry?
- Is there any potential for IT optimizations—again, compared to other customers in your area or industry?
- Are there any indications from SAP that lead to further reduction of TCO and increases in operating profit?

Pathfinder report

The pathfinder report is available to customers and partners alike. It always considers a customer-specific system and is available free of charge.



Pathfinder—Overview and Report

- You can find a full overview of the pathfinder report's content in the video at *http://s-prs.co/527929*.
- You can request the report itself at *http://www.sap.com/Pathfinder*.

The following information is required as a prerequisite and the basis of the analysis:

1. A list of the SAP transactions from the SAP ERP production system via Workload Monitor, which is available via Transaction ST03N. It must have recorded at least one representative month.
2. Data from the enhanced SAP EarlyWatch Alert, including the company key figures.

Enhanced SAP EarlyWatch Alert

Most basis or technology experts are familiar with Workload Monitor (Transaction ST03N) and the regular SAP EarlyWatch Alert. However, it is not commonly known that company key figures are recorded from SAP EarlyWatch Alert, which can be activated optionally in SAP Solution Manager. They are consolidated under the term *enhanced* and are not activated

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by default. SAP Solution Manager 7.1 SP 12 and higher or SAP Solution Manager 7.2 are the technical requirements for this functionality.



Activating Enhanced SAP EarlyWatch Alert

To activate these relevant functions, a self-paced tutorial from SAP Enterprise Support Academy (S-User needed) is available at *http://s-prs.co/527930*.

It usually takes less than an hour to make the necessary adaptations and settings. However, it can take two to three weeks for all key figures to appear in SAP EarlyWatch Alert after the initial activation.

To get an initial idea and better understanding of which questions are answered by the pathfinder, refer to Figure 5.2, which shows a screenshot of a sample report.

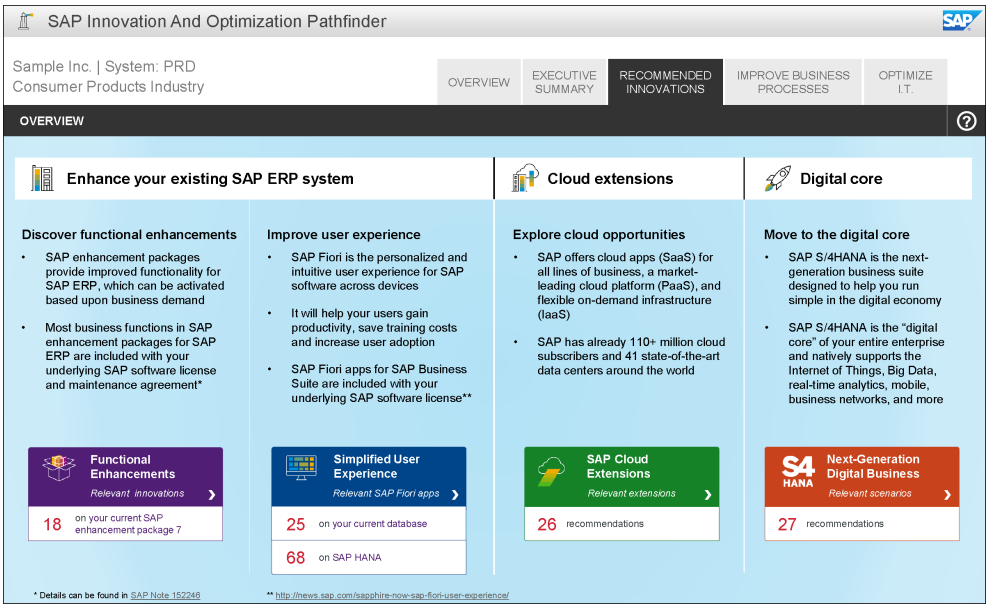


Figure 5.2 SAP Innovation and Optimization Pathfinder

5.1.2 SAP Transformation Navigator

After the usage analysis of an existing system and the identification of relevant innovations, consider the following question: What is your path to an SAP landscape that is based on SAP S/4HANA? The SAP Transformation Navigator is a free self-service option for companies and partners, which they can use to create a custom guide for an SAP S/4HANA-centered product landscape.

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The SAP Transformation Navigator considers the entire system landscape and uses a roadmap to identify the appropriate target environment for each source product selected. For this purpose, clear recommendations are made, and the following areas are addressed:

- The challenge:
  - Which products do you need?
  - What is the added value?
  - How is integration done?
  - What about licenses?
  - Which services are available?
- The strategy:
  - Your current product landscape is the starting point.
  - Ready for a change? Define your new business models.
  - Consider concrete added value for your transformation.
- The solution:
  - A free self-service option is available for all customers and partners.
  - Recommendations are the starting point for subsequent dialog.
  - A combined guide offers detailed information on products, licenses, integration, services, and business functions.

Figure 5.3 gives a first impression of the various areas of the SAP Transformation Navigator.

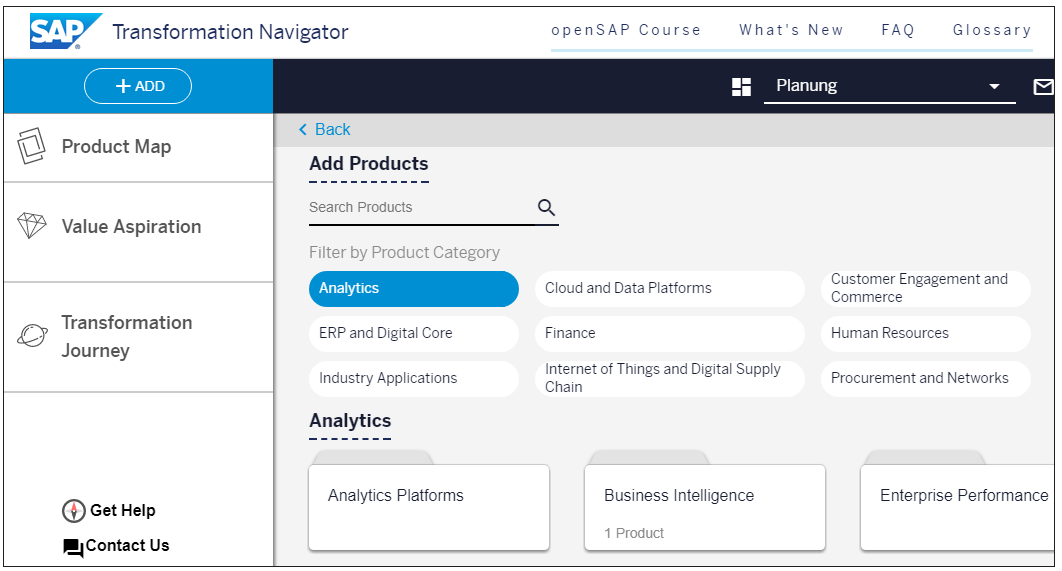


Figure 5.3 SAP Transformation Navigator

Customers can either navigate through the SAP product portfolio themselves or load data directly from their own system landscape as the starting point into the SAP Transformation Navigator. For this purpose, you use information from the maintenance planner, which is presented in detail in Chapter 7.



openSAP Courses

An openSAP course is also available for detailed impressions and additional training at *https://open.sap.com/courses/tn1*.

5.1.3 SAP Readiness Check

SAP Readiness Check is the third tool that you can use for planning. Basically, it is closely linked with the scenario of system conversion and is therefore described in great detail in Chapter 7. For general planning, the analysis of SAP Readiness Check provides a very detailed insight into how elaborate such preparations can be. This information, in turn, can impact the decision in favor of another scenario—for example, a new implementation. For this reason, the tool is also part of the general recommendation and not just an element of the description for system conversion. The check is free of charge, provided that an SAP maintenance agreement or an S-user account exists. You can find the central information page for SAP Readiness Check at *http://s-prs.co/527931*. There you can also find information on how to set up this tool.

Once the data of an existing SAP ERP system have been loaded, the system automatically creates an appropriate dashboard, as shown in Figure 5.4.

The dashboard provides an overview of all areas—for example, from **SAP S/4HANA Sizing** to an analysis of customer-specific coding to recommended SAP Fiori apps. Simplification items, which are described in more detail in Chapter 7, are an important aspect in this context. They illustrate the critical differences between your current SAP ERP system and the future SAP S/4HANA system. Each of these areas in turn provides a detailed view with considerably more information. Figure 5.5 shows the detail view of SAP HANA sizing as an example.

These tools provide you with valuable information if you require support for your planning or are unsure about the transition to SAP S/4HANA.

Valuating the scenario selected

By default, your planning should include a careful evaluation of the migration scenario you selected. You can make the right decision and find the procedure best suited to your needs only if you include all technical information from the prechecks, the custom code analysis, a consideration of the forms of new and existing processes, and other information.

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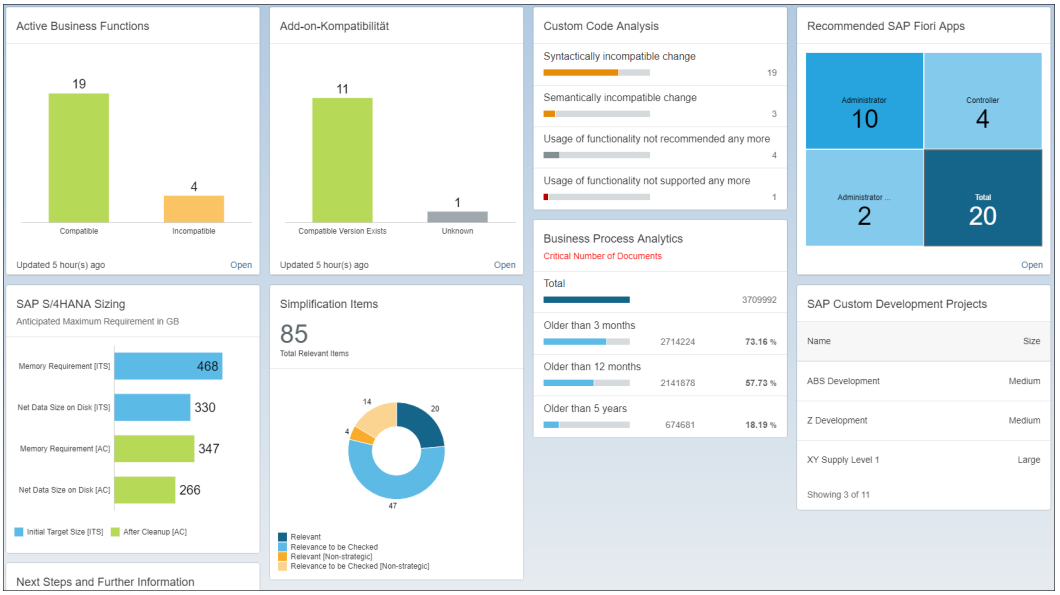


Figure 5.4 Dashboard of SAP Readiness Check

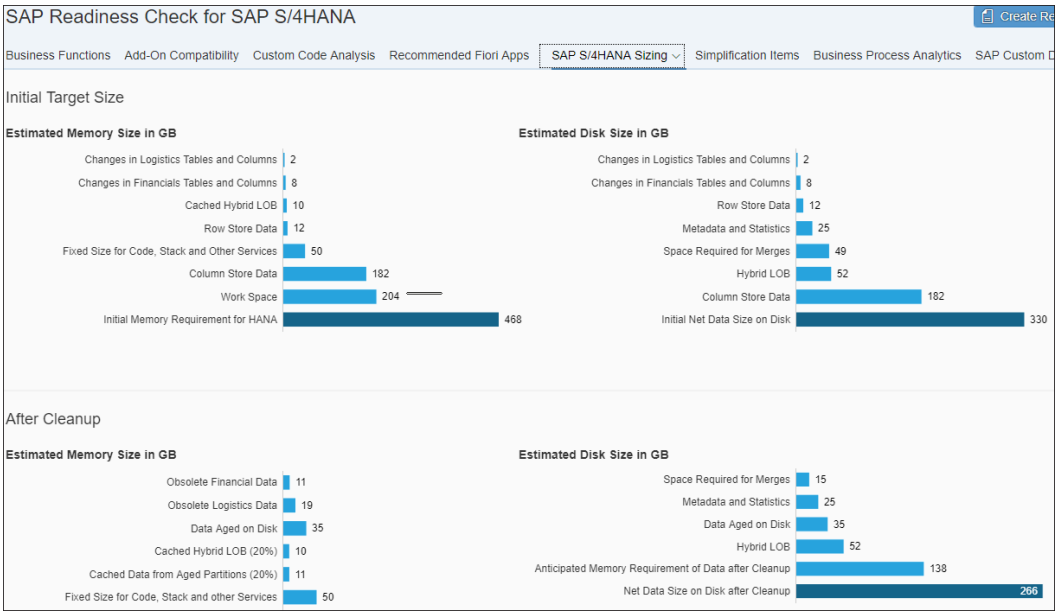


Figure 5.5 Sizing Analysis in SAP Readiness Check

SAP services

Because the final choice of migration scenario is based on numerous specific factors, SAP provides various support services. We recommend using the Innovation Strategy & Roadmap service to obtain a specific recommendation for your situation. Figure 5.6 provides a rough overview of the services in the different phases.

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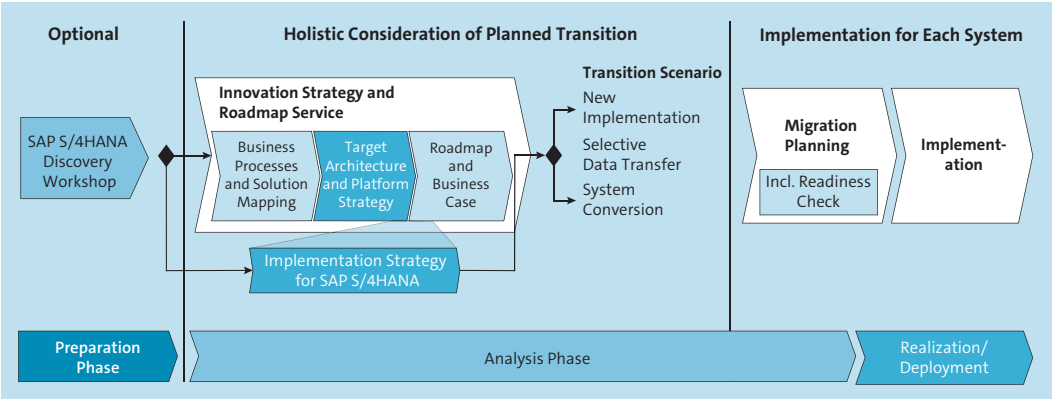


Figure 5.6 SAP Services for Migrating to SAP S/4HANA

Roadmap Viewer

The Roadmap Viewer provided by SAP is a detailed checklist for the concrete planning and implementation of your SAP S/4HANA transformation process. You can find the Roadmap Viewer at *https://go.support.sap.com/roadmapviewer*. Of course, you can also implement your planning without using the SAP services, which we'll discuss next.

5.2 Creating Your Own Roadmap

To help you create your own roadmap, in this section we'll use examples to discuss different initial situations. This section describes the details you'll have to keep in mind and provides recommendations. In this context, we'll start with determining the new target landscape first and then identifying the best way to achieve this goal. Nevertheless, we cannot cover every possible customer situation, so your specific roadmap may differ significantly from what we describe for various reasons.

Target landscape

For new customers who have not used SAP products at all, the best way to introduce SAP S/4HANA is as a new implementation. For customers using SAP ERP, the first step is to define or analyze the current target landscape. Depending on how long ago the system landscape was established and how the existing architecture meets today's business and IT requirements, this assessment involves more or less effort. Your first analysis should answer the following questions, for example:

- Which applications can be used to meet future business requirements in the best possible way?
- How many SAP S/4HANA production systems are supposed to be used (e.g., regional or global production systems)?
- Does existing architecture need to be retained for other applications, or are certain functions covered by SAP S/4HANA?

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This first planning step and the answers to these questions by themselves cannot determine whether a new implementation or a system conversion is ideal for you.

However, in a decentralized system landscape, you can now identify whether you'll require selective data transition through a system consolidation. In general, migrating to SAP S/4HANA always allows you the opportunity to rethink your landscape strategy.

Consolidation of system landscapes

Consolidating system landscapes has been an issue for SAP customers for more than ten years. Many customers have already consolidated their SAP ERP systems and harmonized their business processes. You'll have to take into account and evaluate various criteria.

The most important criteria are the business requirements for global process harmonization and for the global management of business processes. These criteria should be the driving factors of the strategy you select. You should analyze whether a global harmonization makes sense or whether adaptations at the regional level or within business areas is feasible. These decisions also have an impact on the technical side. Globally consolidated systems require a single defined system configuration, as well as efficient change and troubleshooting processes. Furthermore, a uniform release calendar with test periods and downtimes can be implemented. Another criterion is how risks regarding system performance, scalability, and operation issues are addressed. Figure 5.7 illustrates some considerations to keep in mind when developing your landscape strategy.

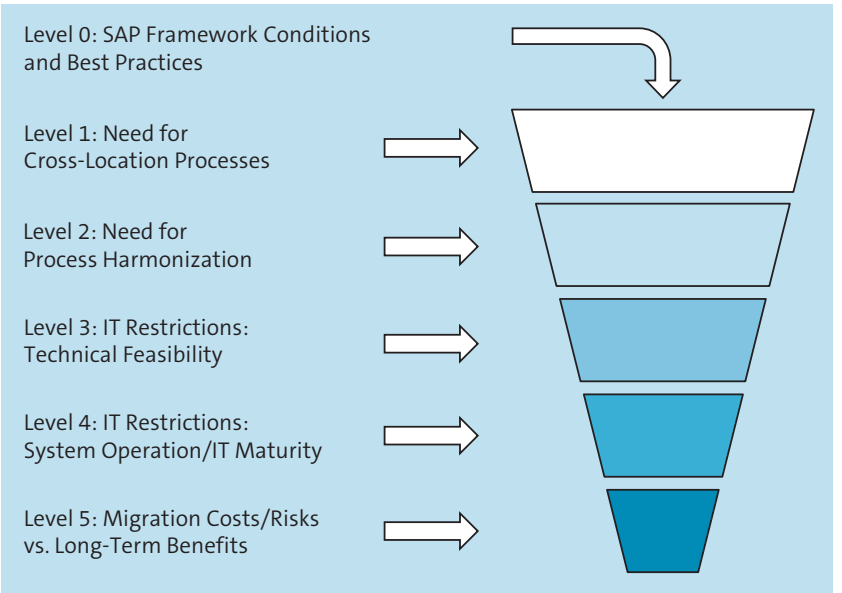


Figure 5.7 Decision Process for Landscape Strategy

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Production system strategies

Let's take a traditional SAP ERP system that covers financial and logistics functions as an example. Typically, the result of a system strategy is one of the following configurations:

- **A single global production system**
  This case is common among small regional enterprises or global enterprises that leverage globally harmonized processes and a global supply chain.
- **Global production systems per business area**
  A strategy per business area is ideal for varying or organizationally independent business areas.
- **Regional production systems using a global template and a uniform master data system**
  A configuration of a regional production system using a global template and a uniform master data system is often used in large enterprises with regional supply chains—for example, in the consumer goods industry.

Landscape strategy for SAP S/4HANA

The main difference when determining your landscape strategy for SAP S/4HANA compared to traditional SAP ERP systems is that SAP ERP can be found in the transactional system. In most enterprises, dividing the landscape into regional SAP ERP systems based on a global template would not reduce the business value more than a global SAP ERP system. SAP S/4HANA now enables you to perform comprehensive analyses and planning activities within the transactional system.

A global SAP S/4HANA system thus allows for operational reporting and financial planning at a global level in real time. In contrast, a regional SAP S/4HANA configuration would require a separate installation of SAP Business Warehouse (SAP BW). Consequently, the business value added by a global SAP S/4HANA system is higher than that of a global SAP ERP system when compared with the relevant regional architecture. Technically, system performance and scalability are no longer barriers to a global system thanks to the performance and throughput of SAP S/4HANA.

Global configurations of a landscape

SAP S/4HANA makes global configurations more attractive. Compared to the previous SAP ERP system, SAP S/4HANA does not change the production system strategy of most enterprises that already use a central landscape.

For enterprises that use a decentralized, nonconsolidated, and/or nonharmonized SAP ERP landscape, the following considerations are relevant:

- In the long run, you should benefit from the innovations found in SAP S/4HANA.
- Even in an entirely technical system conversion to SAP S/4HANA, you will have to make some application-specific adaptations to the existing solution.

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- Instead of converting all decentralized systems separately, combining the conversion with a landscape consolidation makes sense—provided that a consolidated landscape is suitable.
- Migrating to SAP S/4HANA would create more value and reduce operating costs.

Consequently, for enterprises with decentralized landscapes, migrating to SAP S/4HANA is the ideal starting point to also consolidate their systems.

Merging functions

SAP S/4HANA also enables you to use functions within the system that previously belonged to separate, additional applications. Examples include production planning and detailed workflow planning, which were previously only available in SAP Advanced Planning and Optimization (SAP APO).

Single system versus codeployment

However, we must mention that all existing deployment scenarios for SAP ERP are still feasible with SAP S/4HANA. No technical requirements for changing the landscape exist, and you should always implement potential changes with a detailed business case. To help you define a target landscape for components that can be used directly in the SAP S/4HANA system, consider the following:

- **Global views as single systems**
  If several regional SAP S/4HANA systems are part of the planned target landscape, you'll have to set up all applications that require a global view as global single systems. Examples include an SAP BW system or SAP Business Planning and Consolidation (SAP BPC). If required, you can also use SAP APO or SAP Integrated Business Planning (SAP IBP) and/or SAP Transportation Management for global transport planning, which would be the same as in an SAP ERP-based landscape.
- **Mission-critical systems as single systems**
  All mission-critical systems, such as systems that automate production processes or warehouse management processes, should be defined as single systems. A common example is SAP Extended Warehouse Management (SAP EWM). If you had SAP EWM set up as a single, SAP ERP-independent system in your existing landscape, this setup would probably still be intact after migrating to SAP S/4HANA because SAP EWM plays a critical role for the enterprise.

  A separate system offers several advantages, such as independence for software modifications and the reduced risk of collateral effects. However, if an SAP EWM system covers rather uncritical processes (more like traditional SAP Warehouse Management in SAP ERP), you should think about codeploying SAP EWM in combination with SAP S/4HANA.

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Considering value added and disadvantages

Finally, you should check the added value from the newly integrated processes that are only available when specific functions of SAP S/4HANA are codeployed. You should compare the potential benefits and disadvantages, as well as the costs, of such a migration.

Examples include the ability to use operational reporting with SAP S/4HANA embedded analytics instead of operational reporting with SAP BW or the ability to use detailed production planning integrated in the new material requirements planning (MRP) function within SAP S/4HANA instead of a separate SAP APO system.

Some potential disadvantages you'll have to consider include standardized maintenance and release cycles, common system downtimes, and possibly longer downtimes for smaller functions because the software is updated for all components in parallel.

Scenario and sequence

After defining the new target landscape, you can specify the appropriate migration scenario and the sequence of the actions required. Depending on the target situation, the following questions may arise:

- Is a system conversion the appropriate scenario for your migration to SAP S/4HANA, or should you consider a new implementation?
- What is the appropriate approach for a system conversion if multiple SAP ERP systems need to be consolidated into a few SAP S/4HANA systems?
- How can the necessary steps be sequenced appropriately, and what relationships need to be taken into account?

The following sections use examples from different customer situations to identify the possible answers to these individual questions.

5.2.1 Initial Situation: Single System

Possible scenarios

In the first scenario, your enterprise has a central single SAP ERP system. Because a system consolidation is out of scope here, you can only choose between a system conversion and a new implementation. The following options are possible:

- **Standard system conversion**
  Assumptions:
  - The existing solution mainly meets your existing business requirements.
  - Your business requirements do not need a completely new implementation.
  - A one-step procedure to SAP S/4HANA without reimplementation is preferred.

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- **New implementation according to the greenfield approach using the model company**
  Assumptions:
  - The existing solution is too complex and/or no longer meets your existing business requirements.
  - You have business requirements that need a new implementation and a return to the standard (irrespective of SAP S/4HANA).
- **New implementation reusing an existing template**
  Assumption:
  - The existing solution still meets your business requirements, but the system contains a large volume of (unused) legacy data.

System conversion

For many SAP customers, at first glance, the standard method for system conversion seems to be the ideal solution to convert an existing SAP ERP system into an SAP S/4HANA system. The major advantage of this scenario is that your existing configuration and data are kept. This kind of conversion can also be implemented in one step, depending on your initial situation.

For this recommendation, we assume that the solution used so far meets the business requirements and a completely new implementation is not necessary. You can also implement minor changes (such as returning to the standard for customer-specific adaptations in isolated areas, cleansing custom code, and implementing new functions) in system conversions.

New implementation

If the solution currently used is too complex or no longer meets existing requirements and/or if you generally want to implement a new system (irrespective of SAP S/4HANA), this is the ideal solution. If your system is 20 years old or older, starting from scratch is likely ideal because requirements have likely changed considerably over time.

In this case, migrating to SAP S/4HANA is ideal for implementing a new system. You can use SAP Best Practices and the preconfigured model company to reduce costs and the implementation project duration to minimums. For a new implementation, you'll only transfer your master data and open items from your existing SAP ERP system. Historically completed data is not copied in general. In special cases, you can set up an SAP S/4HANA system from an existing template, which means that the configuration and custom code from the existing SAP ERP system will continue to be used.

Multiple SAP ERP systems

Even if this example refers to a customer with a single system, the procedure would be the same if multiple SAP ERP systems existed—if the landscape stays the same in SAP S/4HANA and a consolidation is not required.

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One-step or multiple-step procedure

For customers who decide to convert their SAP ERP system to SAP S/4HANA, the question arises whether the system is supposed to be converted in one step or in multiple steps. In most cases, the one-step procedure for converting from SAP ERP to SAP S/4HANA is technically feasible and makes sense. Nevertheless, customers may ask themselves whether the one-step procedure is generally the simplest way or whether two or even more projects should be planned and implemented, in particular if only migrating to the SAP HANA database is planned as an intermediate step. Table 5.1 summarizes these differences.

	First Option	Second Option
	One-step conversion to SAP S/4HANA	First project: Database migration to SAP HANA Second project: System conversion to SAP S/4HANA
Time to value	Faster implementation of the SAP S/4HANA target environment (analytics, new financials solution, new MRP run, SAP Fiori, etc.)	■ Faster on the first level with SAP HANA (better performance, SAP HANA Live, etc.) ■ More time to implement the SAP S/4HANA target solution
Migration costs	In total, lower costs because you'll implement one large project with one test phase	■ Higher costs due to two separate projects with two separate test phases ■ Overlapping tasks lead to unnecessary costs
Risks and consequences of the migration	■ Higher project complexity ■ Potentially longer downtime	■ Lower project complexity ■ Two potentially long downtimes ■ Potentially higher risk due to reduced focus on individual test phases

Table 5.1 Comparing One-Step and Multiple-Step Procedures

Duration, costs, and risks

When evaluating the different options, you should always consider and compare the duration of the implementation project, its overall costs, and its risks:

- **One-step procedure**
  The one-step procedure provides the major advantage that only one project is required: it's the fastest path to SAP S/4HANA. In comparison,

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costs are also lower because the costs of test cycles or for project management are only incurred once.

- **Two-step procedure**
  For two-step procedures, two projects are necessary; the second project may be delayed due to other priorities (e.g., due to additional rollouts or functional projects). Depending on how long the first release level is kept (which would be SAP Business Suite powered by SAP HANA here), unnecessary and redundant costs may be incurred. For example, if SAP HANA Live or SAP Fiori are to be introduced after the first step, additional costs may be incurred for modifications that are necessary at a later stage because many of these functions are included in SAP S/4HANA.

On the other hand, the project complexity of a one-step procedure is higher than for two subsequent projects. Therefore, the general project risks are also higher. However, you can still minimize these risks with in-depth preliminary analyses and planning processes, as well as by scheduling sufficient resources and test cycles. Unfortunately, enterprises often underestimate the test effort required for two separate projects, which leads also to higher risks. Experience has shown that the project risks for the two approaches are nearly identical.

General considerations

In the end, your decision should be based on general considerations:

- The balance between identified business requirements with the new options available in SAP S/4HANA, taking into account the schedule for implementing these potential benefits
- System-specific migration risks and options for minimizing risk
- Other dependencies—for example, the estimated duration of the implementation project, how the project fits into the release calendar with other projects, and the availability of required resources
- The current status of the existing system, taking into account the necessary technical requirements

SAP S/4HANA Finance as an intermediate step

When making these decisions, the question often arises whether an additional intermediate step to SAP S/4HANA Finance makes sense instead of directly migrating to SAP S/4HANA.

In this case, you should consider the duration of the project, its costs, and its risks to decide whether to deploy SAP S/4HANA Finance as an intermediate step. In individual cases, business areas may expect significant benefits provided by the new financial functions in SAP S/4HANA and want to achieve this added value as fast as possible. This intermediate step is particularly relevant if the implementation to SAP S/4HANA suffers from delays due to customer-specific complexity in the logistics area or if the necessary third-party applications are not yet supported.

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5.2.2 Initial Situation: Decentralized System Landscape

Approaches to system consolidation

As we described earlier, migrating to SAP S/4HANA offers a good opportunity for decentralized system landscapes to be consolidated. Several options exist to combine an SAP S/4HANA project with a system consolidation. In general, the following approaches are useful:

- **New implementation**
  A new implementation is either based on an existing template or uses SAP Best Practices, including preconfiguration and subsequent data migration. In this approach, your data will be copied from all your existing SAP ERP systems, which usually includes master data and open items. Under certain conditions, you can also copy other historical data; however, this data duplication would increase costs and effort.
- **System conversion**
  A system conversion of your existing SAP ERP system is followed by the migration of the data from all your other existing SAP ERP systems. In most cases, you'll convert one of your more central systems, the one with the most appropriate existing configuration or system size. As with the first approach, the data migration only includes master data and open items.
- **Consolidation**
  All SAP ERP systems are consolidated into a central SAP ERP system. This consolidation can be performed by following a one-client or a multiple-client approach; afterward, the resulting SAP ERP system is converted to SAP S/4HANA.

The criteria described in the previous sections can help you find the best possible option. How well does the solution you currently use meet existing and future business requirements? Do you have a general requirement for a new implementation of the existing landscape, and does historical data have to be transferred? Answering these questions can help you make the right decision.

Sample requirements and solutions

The following examples may be used for orientation:

- **Consolidation if business requirements remain the same**
  Your current solution still meets all business requirements in all SAP ERP systems, but you want to consolidate the systems. You can use one of the systems as the starting point for SAP S/4HANA. Further adaptations (such as returning to the standard, code modifications, and activating additional SAP S/4HANA functions) are planned. You can create a solution based on a uniform template and then implement the solution in several systems. Then, you can consolidate these systems into a smaller number of regional systems or into one global system.

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- **Consolidation based on a leading configuration**
  Configuring one SAP ERP system is ideal because you can then use the system as a template for all other business areas or regions that are currently mapped in other systems or with other configurations. For example, a solution used in one of the larger regions is ideal for smaller, deviating implementations in satellite regions. In this case, the goal is to consolidate and harmonize all the systems on the basis of the configuration of the leading region.
- **General modifications required**
  An existing solution usually meets the requirements of at least one system, but general modifications are often necessary to stay competitive, regardless of whether you have migrated to SAP S/4HANA. In this case, a new implementation based on a template from at least one existing and largely appropriate system is feasible.
- **No SAP system as the basis**
  The existing solution no longer meets your business requirements, and no SAP ERP system is available to be used as a template or starting point for SAP S/4HANA. In this case, a new system must be implemented, ideally using SAP Best Practices.

Historical data

For historical data that needs to be transferred, the main issue is data volume. Normally, only master data, as well as transaction data in the form of open items, is transferred for new implementations. If historical data plays a role in your new system landscape for critical reasons, the complexity of the project may increase considerably, thus increasing effort and costs because of additional required data transformations. As a result, you should always discuss this kind of requirement thoroughly and consider alternatives, such as data archiving, first. Depending on the current situation, various options are possible (see Figure 5.8).

Decision matrix

The matrix presented in Figure 5.8 illustrates the migration scenarios preferred, depending on the answers given. Note that these recommendations are only rough proposals and do not replace general and customer-specific analyses and evaluations. You'll always have to take into account the time to implement (based on the duration of the project), as well as costs, benefits, and risks. Factors that you don't have to consider include the current status of the system, the need for historical data, the number of systems to be consolidated if required, and consequently the differences between the systems involved. The technical feasibility of the selected scenario does not have to be analyzed in detail—in particular, in the case of specific data migration requirements.

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Relevance of System Consolidation when Migrating to SAP S/4HANA

Consolidation activities are not a prerequisite for migrating to SAP S/4HANA and should not be considered necessary if you didn't identify a need for these activities before. You can generally expect that a system conversion of a single system or a new implementation of SAP S/4HANA, followed by data migration from the other SAP ERP source systems, is always easier to implement than harmonizing all systems in advance.

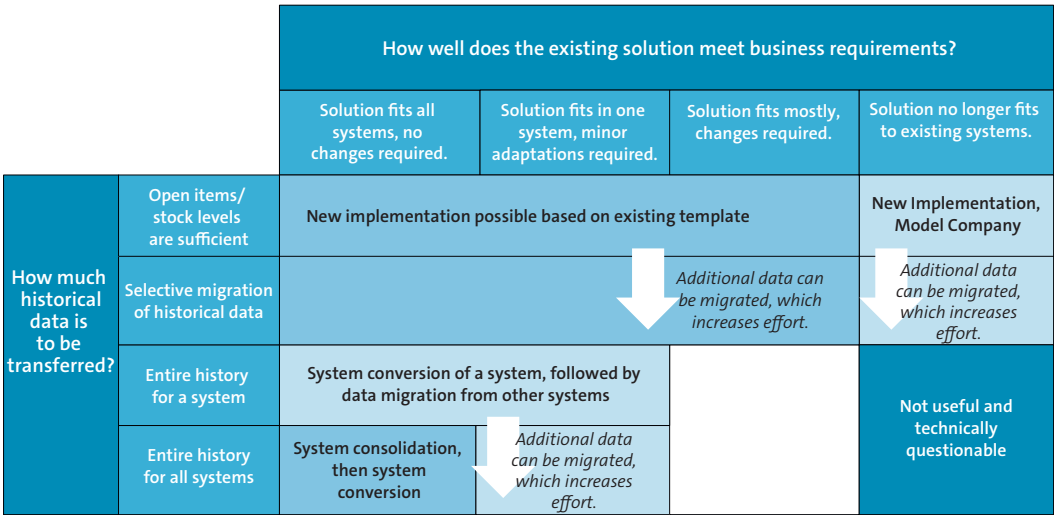


Figure 5.8 Decision Matrix for Different Requirements

Codeployment

SAP S/4HANA provides entirely new deployment options for your system landscape. Functions that previously required separate systems are now available as components of SAP S/4HANA. Customers often ask how these new functions impact migrating to SAP S/4HANA and defining a roadmap, including the relationships among the individual steps included in the migration.

We should mention that there is no technical requirement for modifying an existing landscape. You can convert existing SAP ERP systems to SAP S/4HANA and keep and continue to operate all related systems, such as SAP BW, SAP APO, or SAP Supplier Relationship Management (SAP SRM). If you need additional single systems, you can add them to the landscape, regardless of whether you've migrated to SAP S/4HANA.

In other words, these systems run on both SAP ERP and SAP S/4HANA. For example, you can start by introducing SAP EWM, regardless of other required migration steps. However, if you use one or more of SAP S/4HANA's new codeployment options and want to replace the corresponding function

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from the existing single systems, you can only start the project during or after migration of your SAP ERP system to SAP S/4HANA.

Numerous examples of these projects are available, such as implementing the advanced available-to-promise materials management function in SAP S/4HANA, which replaces the global available-to-promise (global ATP) function from SAP APO. Another example is implementing the self-service procurement function in the SAP S/4HANA procurement solution, which covers the same functionality as the corresponding function within SAP SRM.

5.2.3 Sample Roadmaps

This section provides sample roadmaps for migrating to SAP S/4HANA to better illustrate the topics discussed in previous sections. Although the situations described in this section may not exactly map to your specific situation for your system landscape, you can still obtain useful information for creating your own roadmap.

From a Single System to an SAP S/4HANA Single System

Initial solution

The first example involves a global SAP environment with regional SAP EWM systems. The existing solution consists of the following components:

- A single global SAP ERP system
- A single global SAP APO system used for the global ATP function
- A single SAP SRM system for the Self-Service Procurement function
- A single SAP BW system for operational and strategic reporting, as well as SAP BPC for financial planning and consolidation
- The recent introduction of SAP EWM with the aim of creating three regional systems in order to minimize risks

Long-term target landscape

A long-term target landscape with SAP S/4HANA looks like this:

- A single global SAP S/4HANA system will be introduced. In addition to the functions used in SAP ERP today, the plan is to map the following functions with SAP S/4HANA:
  - Real-time reporting with SAP S/4HANA embedded analytics
  - Financial planning and consolidation as a part of SAP S/4HANA
  - Advanced ATP and Self-Service Procurement
- In addition, a global SAP Integrated Business Planning (SAP IBP) system will operate in the cloud for sales and distribution, planning, and procurement.

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- A global SAP BW system will be used for strategic reporting based on historical data.
- Three regional SAP EWM systems will limit the risk of failure.

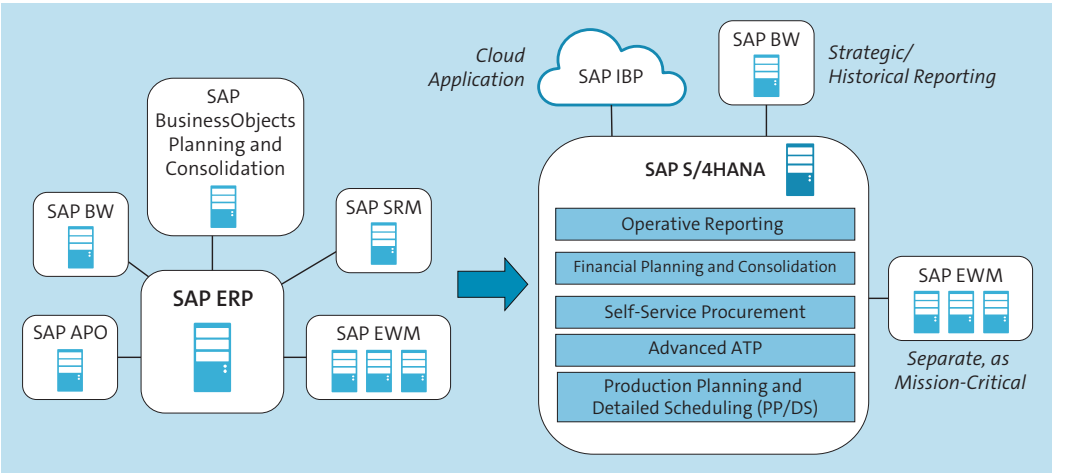


Figure 5.9 From Single SAP ERP System to Single SAP S/4HANA System

Roadmap

Figure 5.9 illustrates these changes graphically. A value-driven roadmap for migrating to this new target landscape could look as follows:

- You can proceed with the implementation of the SAP EWM systems as planned because no changes are necessary.
- First, SAP IBP in the cloud is used for new functions, such as SAP IBP for Response and Supply, which complements your existing SAP APO implementation. This cloud-based implementation is a new implementation, which you can carry out regardless of whether you're migrating to SAP S/4HANA.
- You can then add the planning function for demand (SAP IBP for Demand) to SAP IBP, which replaces the corresponding function of the SAP APO implementation. This adoption is also independent of migrating from SAP ERP to SAP S/4HANA.
- You can convert the SAP ERP system to an SAP S/4HANA system in one step because the solution currently used still meets most of your business requirements.
- When converting to SAP S/4HANA, and in subsequent projects, new functions will be added to the new system (e.g., operational reporting and advanced ATP), which replace their corresponding functions in SAP BW and SAP APO.

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- After converting to SAP S/4HANA, you should migrate your financial planning and consolidation functions from the separate SAP BPC system to the corresponding function embedded in SAP S/4HANA. The previous Self-Service Procurement function is also migrated from the separate SAP SRM system.

Figure 5.10 illustrates the entire roadmap for this example.

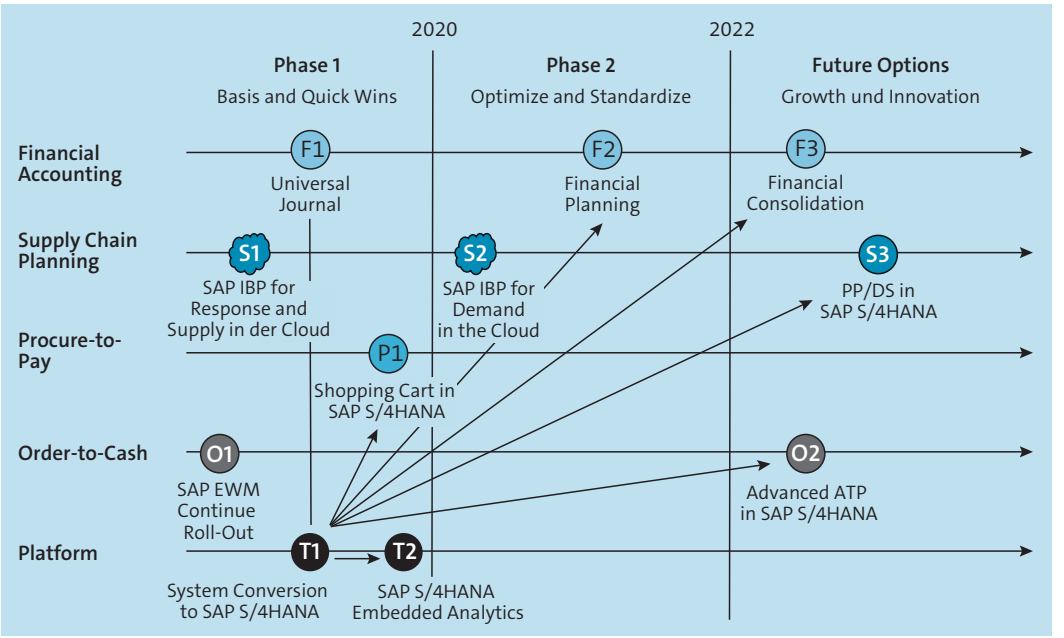


Figure 5.10 Sample Roadmap for Migrating to Single SAP S/4HANA System with Integrated Systems

From an SAP ERP Landscape Distributed across Regions to a Global SAP S/4HANA Landscape

Initial solution

In our second example, we'll start with a system landscape distributed across multiple regions that will be consolidated into a global system landscape. The initial situation of our landscape distributed across multiple regions is as follows:

- Three regional SAP ERP systems use a harmonized global template. One SAP ERP system, for the leading region, is much more comprehensive, while two smaller regional satellite systems also exist.
- Three regional SAP BW systems are used for regional operational and strategic reporting.
- A further global SAP BW system including SAP BPC is used for enterprise-wide reporting, as well as financial planning and consolidation.

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Long-term target landscape

The long-term planning for this SAP S/4HANA target landscape could look like this:

- You introduce a single, global SAP S/4HANA system because day-to-day operations have been globalized. In addition to the SAP ERP functions used so far, the following functions will be added:
  - Real-time reporting with SAP S/4HANA embedded analytics
  - Replication-free financial planning and consolidation with the SAP BPC function included in SAP S/4HANA
- A global SAP BW system is used for strategic reporting based on historical data.

Roadmap

Figure 5.11 shows the entire landscape before and after the conversion. An appropriate roadmap for this migration to the target landscape could look as follows:

- You convert the largest SAP ERP system of the leading region into an SAP S/4HANA system in one step.
- You then migrate selected data from the regional satellite systems to the new SAP S/4HANA system. This data includes relevant master data and transaction data in the form of open items.
- You add the new real-time reporting function to the new SAP S/4HANA solution. You can add these real-time reporting functions during the system conversion or add them before or after migrating the data from your other regional systems. You can then gradually add further reports to replace the reporting from your regional SAP BW systems.

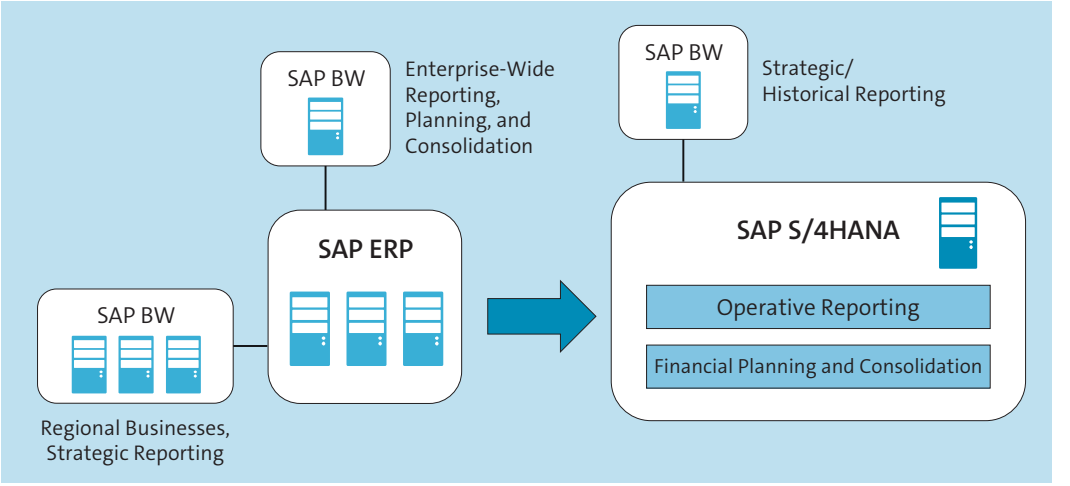


Figure 5.11 From Regional SAP ERP Landscape to Global SAP S/4HANA Landscape

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- From the separate SAP BPC system, you can migrate the financial planning and consolidation function to the corresponding function in SAP S/4HANA. However, all regions must be integrated into the new SAP S/4HANA target landscape before you can move these functions. After integrating all the regions, the financial dataset is complete, which is required for financial planning and consolidation in SAP S/4HANA.
- The global SAP BW system remains unchanged and is populated with data that is relevant for strategic reporting and historical data from regional SAP BW systems. These systems can be removed from the landscape after this process has been completed. This step is largely independent of the actual migration to SAP S/4HANA.

5.3 The Most Important Criteria for Your Decision

Based on the examples described in this chapter, let's now summarize the most important criteria for your decision-making. The four figures in this section refer to two questions. Indicators in each figure provide recommendations, irrespective of your answer to the question. Again, these recommendations are only examples and depend on your specific situation. The first recommendation (see Figure 5.12) refers to your system requirements.

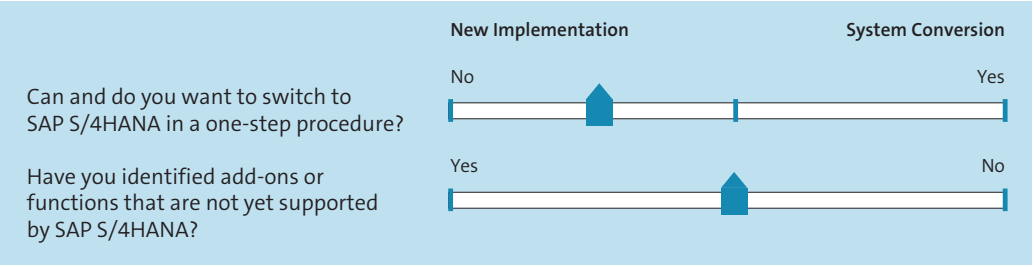


Figure 5.12 Questions and Evaluations Regarding System Requirements

If your current SAP Business Suite system is a rather old release (lower than SAP ERP 6.0), you'll have to perform multiple steps when migrating to SAP S/4HANA. First, you'll have to switch to a release that allows for a system conversion to SAP S/4HANA from a technical perspective. For old releases, a new implementation is the ideal solution, saving you the time and costs required for switching to a newer release. A new implementation would even be faster.

However, certain add-ons and business functions might not be available on the SAP S/4HANA roadmap for now, such as industry solutions. The nonavailability of these functions or add-ons that have not been released

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yet could delay the implementation of SAP S/4HANA. However, this applies to all migration scenarios, from new implementation to system conversion, so there is no dedicated recommendation for this.

The second block of questions shown in Figure 5.13 refers to business processes.

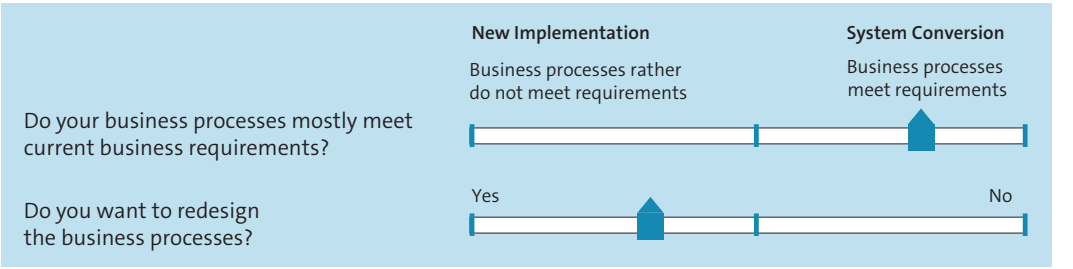


Figure 5.13 Questions and Evaluations Regarding Business Processes

If the business processes used so far and the configuration of your existing system meet current business requirements, a system conversion is probably the right solution. For system conversions, the present configuration and the existing dataset are both kept. Refer to the simplification list for information on possible changes relevant to SAP S/4HANA.



Simplification Item Catalog

As an alternative, the simplification list is now also available in online format to easily search for specific entries. This format is subdivided into the various SAP S/4HANA releases. You can access the simplification item catalog centrally using the following link (you need an S-user account): *https://launchpad.support.sap.com/#/sic/*.

If you want to adapt your processes, a new implementation is recommended. In this scenario, you can implement business processes via SAP Best Practices and thus determine the best configuration for your system. Application data is transferred to the new system in a data migration process so that the data corresponds to these new processes.

The third set of questions refer to your custom developments (as shown in Figure 5.14).

If you wanted to transfer existing code and custom developments (which makes sense if your specific requirements are not yet met by SAP S/4HANA), a system conversion would probably be the better solution. For system conversions, existing custom objects are kept and can be modified, using the custom code migration worklist, for example, to consider changes to

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data structures in SAP S/4HANA. However, this aspect is not that critical because you can also transfer custom developments into a new implementation. Although experience has shown that this rather applies to a minimum of custom developments.

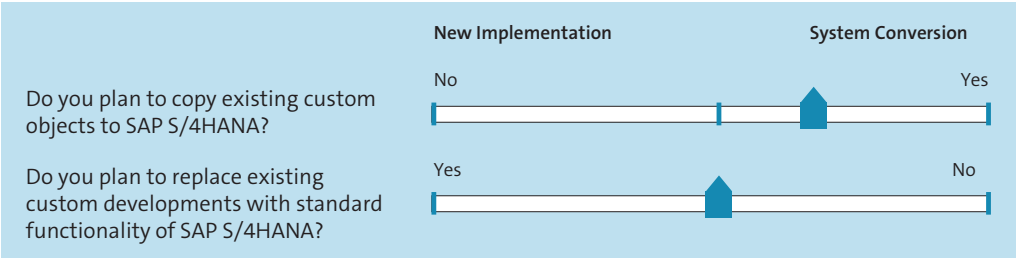


Figure 5.14 Questions and Evaluations Regarding Custom Developments

If you may want to return to the SAP standard for existing custom developments, you should probably opt for a new implementation first. However, this requirement does not depend on the migration scenario because you can also return to the SAP standard for custom developments via system conversions. You'll need to analyze the existing code in detail and schedule the steps for the relevant SAP S/4HANA functions.

The last block of questions (see Figure 5.15) refers to the *time to value*—that is, to the period of time before the relevant value has been achieved.

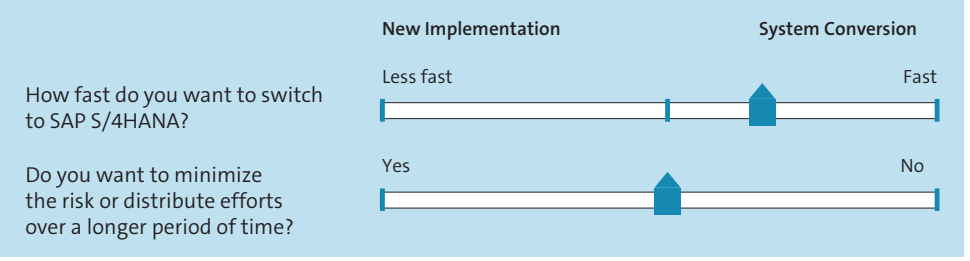


Figure 5.15 Questions and Evaluations Regarding Time to Value

How long the migration to SAP S/4HANA takes depends on your individual requirements. Depending on the size and complexity of your existing landscape, a system conversion is often the fastest method if the one-step procedure can be applied. Because your system settings would remain the same, a conversion is usually faster than a new implementation, which may involve a complete redesign of your business processes.

However, SAP Best Practices—in particular, the package for SAP S/4HANA—considerably accelerates new implementations. In particular, comprehensive, preconfigured cloud solutions can be available in a few weeks, which is

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especially interesting if you want to migrate subsidiaries to SAP S/4HANA. With a new implementation, whether the source system is an SAP ERP system or a non-SAP system doesn't matter because cloud-based systems are always implemented from scratch.

We can't make general recommendations regarding these risks, which depend on the roadmap developed rather than on the scenario selected. You can select any adaptation speed that meets your current requirements. Whether you transfer a single company code to SAP S/4HANA first or start with SAP S/4HANA Finance is up to you. The only thing that we should mention—as described in this chapter—is that SAP S/4HANA implementations in small steps usually take longer and involve more costs.

5.4 Summary

We've summarized and compared the advantages and disadvantages of the individual scenarios, and now you've got the needed decision-making support. In case you want hands-on experience, SAP provides trial access to instances of SAP S/4HANA which can help you identify the requirements and prerequisites for your migration. Next up, we'll dive into trial systems.

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Chapter 6
Trial Systems

The trial systems provided by SAP are ideally suited to quickly get started in SAP S/4HANA. These systems include predefined customizing. They are ideal for testing and determining the appropriate migration strategy.

To conclude Part II, we want to present a powerful tool for making real-life decisions: the trial systems provided by SAP, which you can quickly implement either in the cloud or in your own data center. The trial systems are preconfigured with so-called SAP Best Practices content. More information on SAP Best Practices for new implementations is available in Chapter 9, which describes SAP Activate as a framework for implementing SAP S/4HANA.

This chapter now introduces the trial system for testing and other possible applications, which go far beyond the scope of simple, free trial systems. The preconfigured system is already customized, containing predefined company codes, organizational structures, sample data, and more. The system is based on SAP Activate and SAP Best Practices and helps you identify your requirements for the migration to SAP S/4HANA and your prerequisites.

6.1 The SAP S/4HANA Trial System

Trial system

Both SAP customers and SAP partners can access the *trial system*, SAP S/4HANA's reference solution. The trial system contains SAP Best Practices, as well as corresponding sample data and scenarios.



Accessing the Trial System

You can configure the SAP S/4HANA trial system at *www.sap.com/s4hana-trial*.

SAP Cloud Appliance Library

The trial system for the on-premise version of SAP S/4HANA is provided in the SAP Cloud Appliance Library (hereafter referred to as the library) and thus in the (private) cloud. The library delivers preconfigured software systems in a cloud-based solution on demand. You can start and use these systems in your own cloud space for the library.

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IaaS

This cloud computing option allows you to lease PC infrastructure instead of purchasing your own hardware. The underlying scalable concept follows the infrastructure-as-a-service (IaaS) model. The library provides an online platform for managing your SAP systems, which can be hosted by any IaaS cloud provider (e.g., Amazon, Google, or Microsoft).

Available versions

There are two options for exploring the world of SAP S/4HANA with the SAP S/4HANA trial system:

- **SAP S/4HANA Cloud trial**
  This variant enables you to create a user with 14-day test access to a preconfigured SAP S/4HANA Cloud demo system. This public cloud variant, or SaaS model, behaves like an SAP S/4HANA Cloud system in the public cloud.

  The system is shared by all users and is ready to use. You can execute demo scenarios using wizards.

  You can use the system to become familiar with SAP S/4HANA Cloud's functions and the SAP Fiori user interface. However, you cannot change the configuration of this system and cannot run through migration scenarios because administrative functions are restricted. One advantage of this variant is that it is completely free because no hosting costs are incurred.
- **SAP S/4HANA trial**
  For this variant, you can use a 30-day test license to create a complete SAP S/4HANA on-premise system in the private cloud (which is hosted by a cloud provider). More appropriately, you *instantiate* rather than *create* the system. This system is an SAP S/4HANA appliance (hereafter referred to as an appliance)

The test license is free, but you'll have to pay hosting fees for the cloud provider you choose. Because this trial system is your system, you can view and change all functions (including customizing). You can also access the system via SAP GUI.



Setting Up Your Access to the Trial System

We recommend activating the appropriate trial system for your scenario so that you can follow the descriptions in the subsequent parts of this book more easily.

AWS, Microsoft Azure, and Google Cloud Platform

The appliance allows you to run an entire SAP S/4HANA on-premise landscape as a trial system in Amazon Web Services (AWS), Microsoft Azure, or Google Cloud Platform. You will need an account for the cloud provider. Figure 6.1 shows the appliance in the library.

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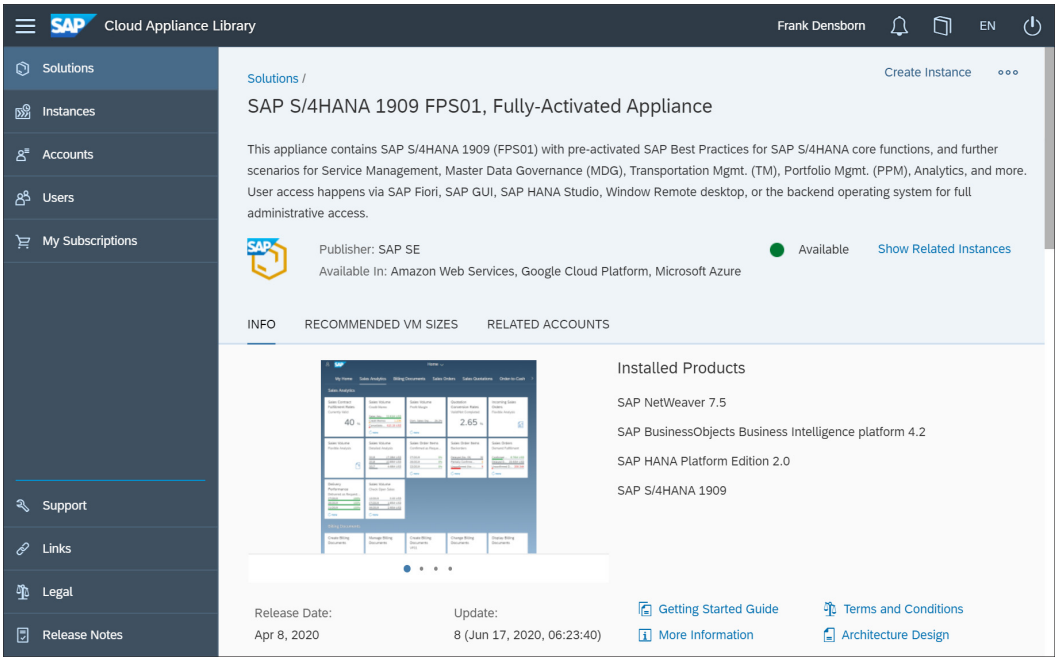


Figure 6.1 SAP S/4HANA 1909 Fully Activated Appliance in SAP Cloud Appliance Library

Benefits

The benefits of using the library landscape are its flexibility and availability: you can define various sizes for the virtual systems (i.e., different memory and disk sizes) and thus adapt the landscape to your requirements. Furthermore, you can stop, start, and use your system as required.

Actual costs involve hourly fees for activated systems only (in addition to the low basic costs for each instance). If needed, you can deactivate a system and then (re)activate it later on.

This system is deployed within a few hours with the cloud approach, but you could, if you prefer, also implement this appliance on-premise in your own data center within one or two days. In addition to a trial system, this method also allows you to deploy a sandbox system for a proof of concept, for example, or as a development system in your future SAP S/4HANA landscape. The following section discusses these options in more detail.

6.2 SAP S/4HANA Fully Activated Appliance

Appliance

A *software appliance* is a compressed system, similar to a large ZIP file, that you can easily extract to a common system. The software appliance contains all the settings and properties that were enabled when the original system was set up.

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The software appliance behaves like a system copy of an SAP S/4HANA system, including ABAP code, SAP HANA database, SAP Best Practices, and technical SAP Fiori configuration. The SAP HANA database is bundled with the SAP S/4HANA software.

In addition, the appliance contains demo scenarios and sample data. You can therefore easily use it for sandbox systems, for proofs of concept, and for the fit-to-gap or fit-to-standard analyses provided by SAP Activate (see Chapter 9). Figure 6.2 illustrates the appliance's concept.

Basis for the production system

Customers and SAP partners can use the preconfigured appliance as a starting point. You can also continue using the appliance after the 30-day trial period if you purchase licenses for SAP S/4HANA and the SAP HANA database.



SAP Cloud Appliance Library Subscription

To use the appliance in the library beyond the testing period, you need an active library subscription, which you can purchase in the SAP Store at *http://s-prs.de/v631633*. This subscription isn't required if you install the trial system on your own hardware in your own data center.

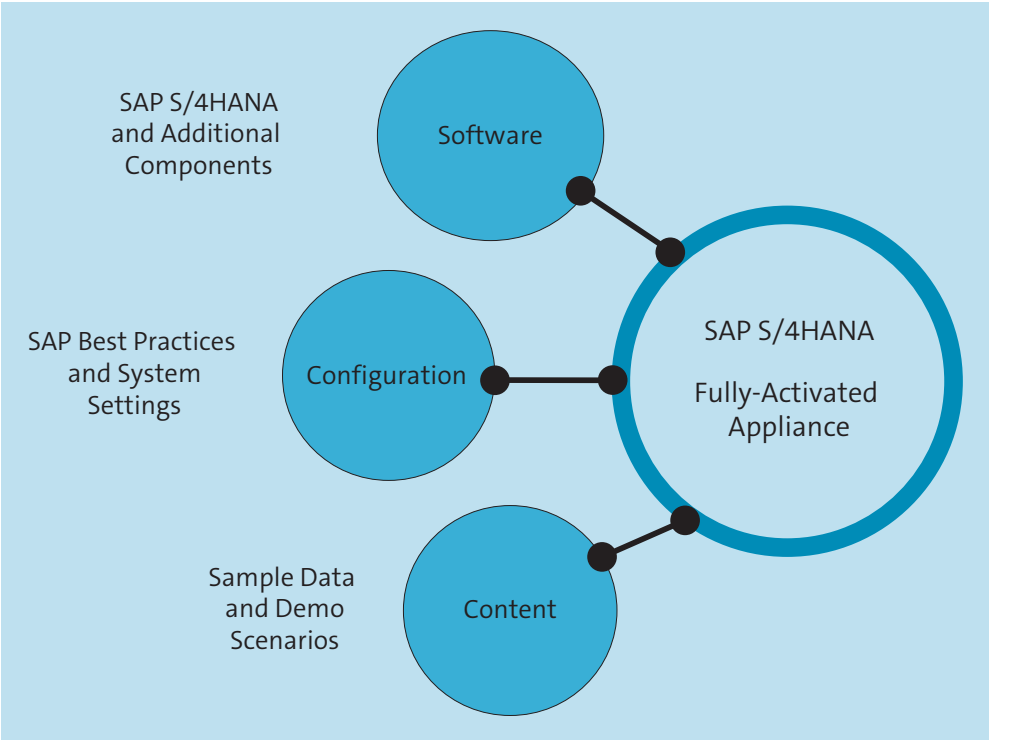


Figure 6.2 SAP S/4HANA Fully Activated Appliance Concept

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Using SAP S/4HANA fully activated appliance

There are two options for using the appliance:

- **SAP Cloud Appliance Library**
  The library allows you to use the appliance in a hosted cloud solution (IaaS). From creating your appliance instance to logging on to the system for the first time should only take one or two hours. Hosting will cost only a few dollars per hour when the system is active (during the so-called uptime or operating time). Some cloud providers give you a starting credit when creating your account, so you should check the hosting offerings of various cloud providers. This option includes a 30-day test license for the SAP S/4HANA system and library. After that period, you'll have to purchase a license for the SAP S/4HANA on-premise version and the library (via a subscription).

  The library contains a detailed description of how to set up the solution, as well as blogs and forums via which you can get support. You'll also get information on using the appliance beyond the 30-day trial period.
- **On-premise installation**
  You can also install the appliance on your own hardware easily. You'll only need hardware that is supported by the appliance and a Linux operating system. All other components are installed with the appliance. (The Linux version must meet SAP's requirements for a successful installation of a system copy.)

Thanks to the concept of the appliance, you'll be able to utilize your preconfigured system within two to three days. You can either download the installation files from the internet or order a Blu-ray disk with these files. The appliance is free, even if you order the disk. However, you'll need the corresponding SAP full or partial licenses.



Further Information on the Appliance in SAP Cloud Appliance Library and on Premise

- You can find detailed information (including a quick guide to using the library) at the following link: *https://www.sap.com/cmp/oth/crm-s4hana/s4hana-on-premise.html*.
- SAP Note 2041140 contains further information on the system requirements for the on-premise installation and the order process.

Deployment scenarios

The following deployment scenarios are available for the appliance:

- **Sandbox system**
  Sandbox systems may require more time for testing than the 30-day trial period. You might also want to keep the results of testing in the sandbox system, which makes a separate license for the product neces-

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sary. With the reference system, you can considerably reduce the initial effort required for setting up the system, and it's thus the ideal starting point for a sandbox system even if you use it beyond the 30-day trial period. You can start with the appliance and then customize the solution with your own master data, organizational structures, and so on according to SAP Best Practices. For this purpose, a hosting subscription for a cloud provider in the library is the best option because you don't have to deploy any hardware. If it's used for more than 30 days, you also need a library subscription, which was mentioned previously and is available in the SAP Store.

- **Proof of concept**
  The appliance is an ideal proof-of-concept system because it's preconfigured and can be implemented easily. Because you'll be using a specific copy of the SAP S/4HANA system, you can customize the system as required and extend the solution scope to accelerate your proof of concept.
- **Development system**
  From a technical perspective, you can also run the appliance as a development system in the production landscape later on. However, SAP doesn't recommend this system for SAP S/4HANA landscapes, for the following reasons:
  - All languages are installed and enabled in the system. (This does not apply to your production system.)
  - Depending on your licenses, additional license costs might be incurred (e.g., for SAP Integrated Business Planning for Supply Chain and SAP Master Data Governance, which are part of the appliance). This is particularly required if the development system is copied to a quality assurance system or production system later on.



Appliance as a First Step to SAP S/4HANA

You can use the trial system and the appliance to get started with SAP S/4HANA. If you then decide to migrate to SAP S/4HANA, you can transfer the settings you made in the trial system to the production landscape.

6.3 Solution Scope of SAP S/4HANA Fully Activated Appliance

Components

The appliance consists of four virtual machines bundled in one instance. The appliance comprises the following components:

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- SAP S/4HANA (ABAP backend including SAP HANA database and SAP Gateway as the frontend server for SAP Fiori)
- SAP NetWeaver Application Server Java (SAP NetWeaver AS Java), with Adobe Document Services
- SAP Best Practices (depending on the client, all SAP Best Practices that are available in SAP S/4HANA 1909 are already enabled)
- SAP Fiori (with its extensibility interfaces and additional available fields)
- Content for various scenarios in interactive demos

The following components are optional and are only available in the library (not in on-premise installations of the appliance):

- SAP BusinessObjects Business Intelligence (with predefined reports)
- Microsoft Remote Desktop (for easy access to frontend tools and SAP Fiori)
- All localizations in reference clients

Figure 6.3 provides an overview of the software components of the appliance.

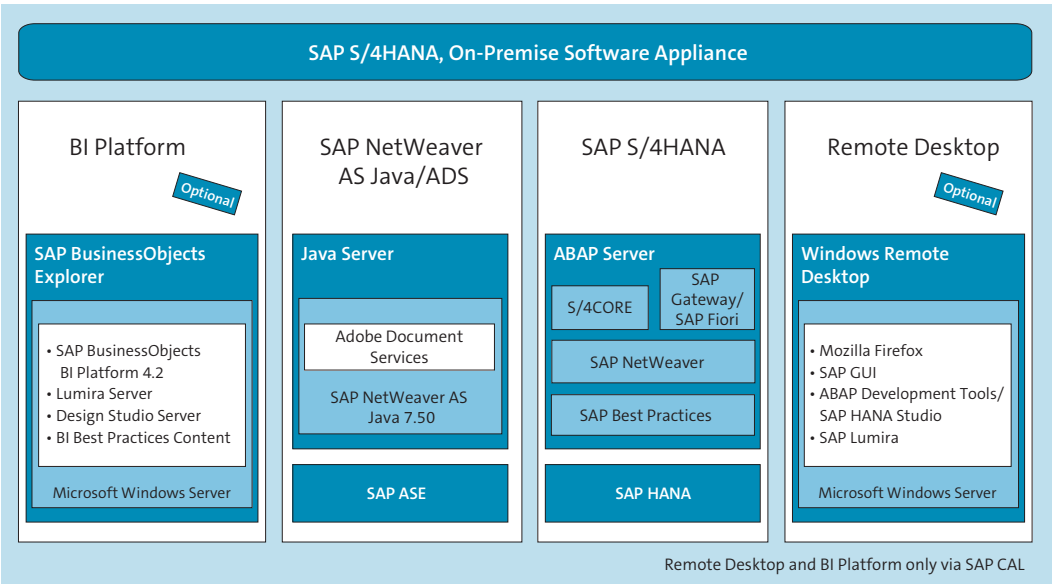


Figure 6.3 SAP S/4HANA Fully Activated Appliance Components

Preconfigured clients

The appliance contains five preconfigured clients with different flavors of SAP Best Practices content:

- **Client 000**
  The *master client* is the default client of all SAP S/4HANA systems and is delivered by the appliance without any changes. You can use client 000

as the starting point for your activities if you want to implement SAP S/4HANA without SAP Best Practices, and it serves as a reference client for comparison of the predelivered customizing with the empty product.

- **Client 100**
  Client 100 is the trial client and includes the already activated tool, SAP Best Practices for SAP S/4HANA, and sample data, processes, and scenarios for the US and Germany. Client 100 also maps complete business processes.

  This client serves as the starting point for exploring SAP S/4HANA. The system is already completely preconfigured and filled with data (master and transactional data), so you can start immediately and use a model company with company code 1710 for the US or company code 1010 for Germany.

- **Client 200**
  All technical activities for activating SAP Best Practices have been executed in this client, but SAP Best Practices has not been activated yet. Thus, you can carry out activating SAP Best Practices yourself using the scope that is relevant to you and possibly restrict it. You can also test the activation.

  Client 200 is a preactivation client that already contains the SAP Fiori launchpad configuration (and is therefore ideal for comparisons if you want to activate SAP Fiori launchpad).

- **Client 300**
  This client is the default reference client for SAP Best Practices. Client 300 is a copy of the master client with activation of default SAP Best Practices for individual countries. You can view what the system looks like after you have implemented SAP Best Practices.

  You can use client 300 as a reference because this client is not preconfigured. However, as a result, this client doesn't contain demo data. This is a so-called whitelist copy of client 000; that is, all configuration tables from client 000 are empty if they are not required for SAP Best Practices.

- **Client 400**
  Similar to client 300, client 400 is a reference system for SAP Best Practices. The difference is that all localizations are activated in the on-premise version of SAP S/4HANA and all configurations (including configurations that are not relevant to SAP Best Practices) are copied from the master client.

  You can use this client for fit-to-gap or fit-to-standard workshops because it can be used not only for comparisons with the default content

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in SAP Best Practices but also for comparisons with the complete customizing of client 000.

Fit-gap analysis

You can then run a fit-to-gap or fit-to-standard analysis in the context of the SAP S/4HANA workshop. In this way, all parties involved in the SAP S/4HANA project will receive an overview of the implementation project and develop a migration strategy at an early stage. The idea is to adjust the default model company only if you can achieve a unique selling proposition for your enterprise by doing so. In all other cases, you should adhere or revert to the default settings instead of replicating your legacy system. In general, you may have decided to deviate from the default settings in your legacy system when the necessary functions were not available in the SAP system. The goal of the fit-to-gap workshop is to understand the functions of the SAP S/4HANA system, validate the solution, and tailor it to your requirements using SAP Best Practices within the SAP S/4HANA system. Possible gaps should be determined and bridged, a completely different approach than the traditional implementation blueprint.



Reference System for Preparing the Migration with this Book

The reference system with the model company described in this chapter can be useful throughout the book when performing an SAP S/4HANA new implementation. Part IV discusses the data migration using the greenfield approach.

6.4 Summary

This chapter concludes the second part of the book. You've explored the available trial systems available for SAP S/4HANA and we encourage you to activate the corresponding trial system as a reference while moving on with either Part III (in case you're performing the brownfield approach) or Part IV of the book (for a new greenfield implementation of SAP S/4HANA). The trial system will help you to identify the requirements and prerequisites for your migration. The next part of the book will elaborate on the conversion of an existing SAP system, an approach that is referred to as brownfield and that is not available for the SAP S/4HANA Cloud product.

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PART III

Migration through System Conversion According to the Brownfield Approach

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Chapter 7
Preparing System Conversion

System conversion means converting an existing SAP ERP system to an SAP S/4HANA system. SAP offers many useful methods and functions to help you determine and implement the required adaptation tasks.

System conversion refers to a transition scenario in which you convert a single SAP ERP system to an SAP S/4HANA on-premise system. According to the vocabulary used in IT transformation projects, this scenario follows the so-called brownfield approach. In contrast to a new implementation of an SAP S/4HANA system (greenfield approach), your application data, configuration data, and custom developments are still available after the system conversion. The system conversion procedure is only available for the on-premise variant of SAP S/4HANA.

When you convert an SAP ERP system to an SAP S/4HANA system, you're transitioning to the SAP S/4HANA product family. You'll change to the SAP HANA in-memory database (if you haven't already), and the simplifications of SAP S/4HANA are implemented (see Section 1.2 in Chapter 1). This chapter introduces the procedures and tools used for checking, preparing, and adapting the SAP ERP system. Chapter 8 then describes the actual execution of the technical system conversion.



The System Conversion Concept

Because converting an existing SAP ERP system to an SAP S/4HANA system also involves a product change, this transition scenario is also referred to as a *system conversion*. We would not call it an *upgrade* because an upgrade would entail installing a new version of the same product.

7.1 Overview of the System Conversion Project

More than a technical procedure

You'll have to consider two aspects when converting your system: the technical procedure by which you will install the SAP S/4HANA software and the process of transitioning to the new product, which involves changes to the functions and processes you know from SAP ERP already.

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As shown in Figure 7.1, in addition to performing technical conversion steps, you'll also have to adapt the functional scope and data structures when converting to SAP S/4HANA.

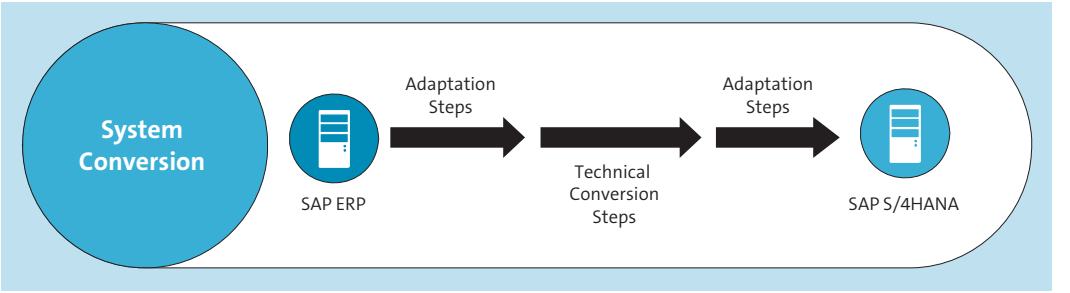


Figure 7.1 System Conversion to SAP S/4HANA: Technical Conversion and Adaptation Requirements

Example: credit management

An example of a possible adaptation requirement is the credit management function, which we introduced in Chapter 1, Section 1.2.1. According to the principle of one, SAP S/4HANA supports only one credit management solution, which might require adaptation in some cases. Customers who use Credit and Risk Management (SD-BF-CM) in SAP ERP need to change to the new credit management function, SAP Credit Management (FIN-FSCM-CR), when converting to SAP S/4HANA. However, SAP Credit Management is already available in SAP ERP, so you can change to this solution *before* you convert your system. In addition to functional adaptations due to the different solution scope of SAP S/4HANA, the simplification of the data structures can also affect your custom developments.

Determining the required adaptation work

Various methods and tools are available in the individual conversion project phases to help you determine what adaptation work you need to do to switch to SAP S/4HANA:

- **Simplification list**
  The simplification list describes the potential adaptation work for functions that is required when converting your SAP ERP system to SAP S/4HANA. For more information on the simplification list, refer to Section 7.2.3.
- **Maintenance planner**
  The maintenance planner checks the source system at the component level and provides the required software archives. The maintenance planner particularly checks whether add-ons (both SAP and partner add-ons) and business functions are supported for the SAP S/4HANA target release. You can find more information on the maintenance planner in Section 7.2.4.

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- **Simplification item checks**
  By means of simplification item (SI) checks, you check which functional adaptations that are described in the simplification list actually need to be made in you system when transitioning to SAP S/4HANA. Simplification item checks are provided as SAP Notes and are implemented and run in the SAP ERP source system (Section 7.2.5).
- **Custom code analysis**
  Within the scope of the custom code analysis, you identify the required adaptation work for custom programs when migrating to SAP S/4HANA. Adaptations of customer code are required if the code is associated with changed data structures or changed functional scope in SAP S/4HANA. For more information, refer to Section 7.2.6 and 8.2.3 in Chapter 8.

Software Update Manager

You use the Software Update Manager to install SAP S/4HANA software during the system conversion and to install subsequent updates and upgrades. SUM provides options for reducing downtime during the conversion project and is regularly updated via Software Logistics Toolsets. Section 8.1 in Chapter 8 describes how to use SUM.

SAP Readiness Check for SAP S/4HANA

The SAP Readiness Check for SAP S/4HANA is a free service (as of default support), which provides you with the most critical aspects of the SAP S/4HANA system conversion using a clear dashboard. You can run the SAP Readiness Check in your production and development systems (or in corresponding system copies).

In addition to information on relevant simplification items and adaptations of custom developments, you can also view system information that is relevant for conversion. With regard to your systems, you are provided with information on database sizing and recommendations, for example. Moreover, the dashboard presents the business functions that are active in your system in terms of their compatibility with SAP S/4HANA. Recommendations for possible SAP Fiori apps are made based on your usage data. Section 7.2.9 describes the SAP Readiness Check in more detail.

7.1.1 System Conversion Process

Project phases and tools

Figure 7.2 illustrates the basic steps you have to perform to convert your system to an SAP S/4HANA system, as well as the respective tools.

Preparation and planning phase

During the preparation and planning phase of the system conversion project, you'll have to verify the system requirements. For example, SAP doesn't provide one-step system conversions for older SAP releases (e.g., SAP R/3 4.6C). If your system is still a non-Unicode system, you must run a Unicode conversion prior to the SAP S/4HANA system conversion. You should obtain an overview of your upcoming adaptations during the

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preparation and planning phase. For this purpose, you can use the SAP Readiness Check, which comprehensibly presents the relevant results of the individual tools—for example, the simplification list, maintenance planner, simplification item checks, and checks of custom developments.

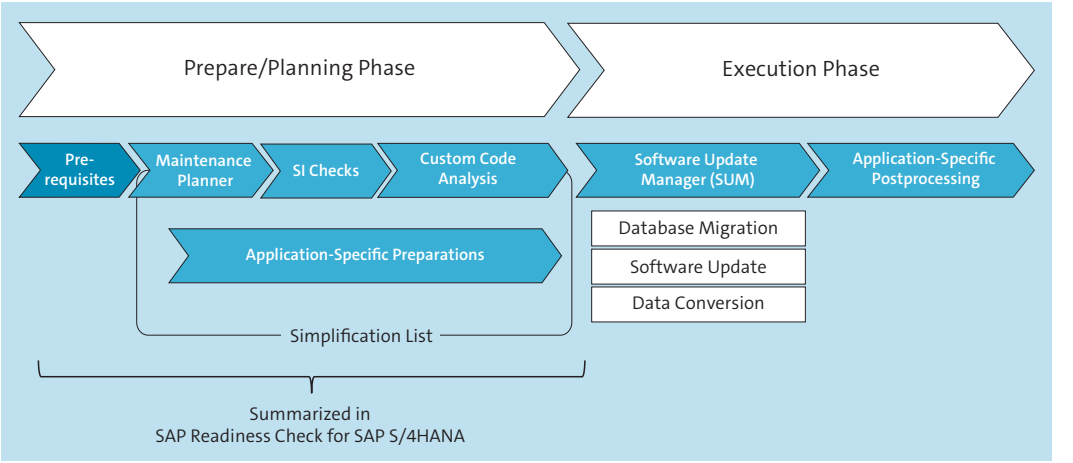


Figure 7.2 Steps and Tools for System Conversion

In this phase, for example, you'll have to determine the timeframe for implementing the new simplified processes and determine when you want to use the new SAP Fiori-based user interfaces and which SAP GUI transactions you want to continue to use after the system conversion.

Preparations in the source system

The tools and functions for the preparation and planning phase are already available in your existing SAP ERP source system. Because you can implement numerous adaptations in this system already (and some may need to be implemented before the conversion), you should perform the preparation and planning steps early in the conversion project.

Adaptation and testing phase

In the adaptation and testing phase (Section 7.1.2), you'll convert your development system (see Figure 7.3) and perform the planned adaptations. Tests (usually, several test runs are required) and end user training are preparatory steps for the go-live.

Execution phase

In the execution phase, you'll perform the technical SAP S/4HANA conversion using SUM. SUM combines three steps into one integrated process. In a one-step procedure, you'll migrate to the SAP HANA database, change the software, and convert the application data from your legacy data structure to the new data structure. When the SAP S/4HANA production system goes live, you can scale back the existing SAP Business Suite system landscape.

Figure 7.3 provides an overview of the individual tasks for the SAP S/4HANA conversion project phases.

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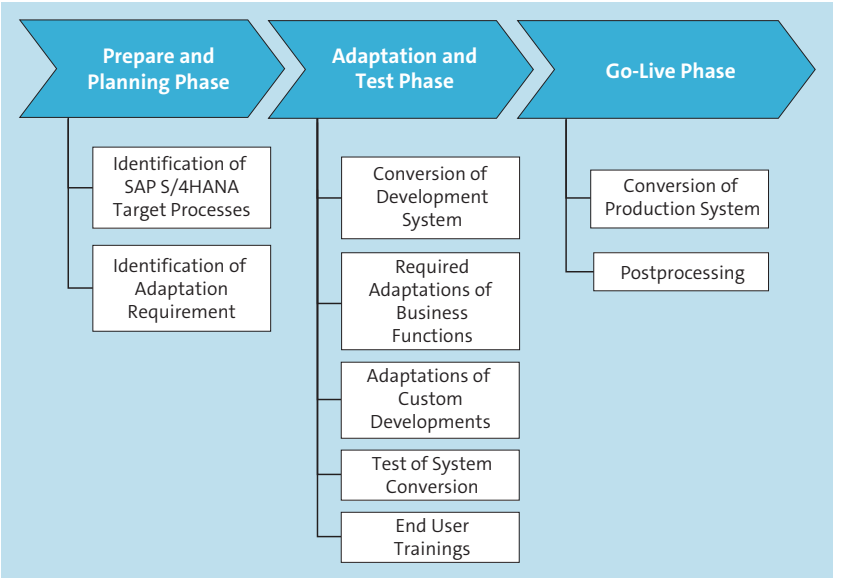


Figure 7.3 Project Phase Tasks for System Conversion

Additional Information

The Conversion Guide for SAP S/4HANA provides basic information on the SAP S/4HANA system conversion process. It is linked from the SAP Help Portal for the on-premise version of SAP S/4HANA under the Implement tab in the guides section (see *https://help.sap.com/s4hana*).

7.1.2 System Group Conversion

Multi-system landscape

The customer system landscape is a determining factor for the SAP S/4HANA system conversion. Usually, a system landscape consists of a group of several SAP ERP systems that are connected via transport routes. You therefore should never carry out the development and test tasks in the production system. To test and verify the developments, you should add a consolidation system to the system group. You'll then have a three-system landscape, which is used by the majority of SAP ERP customers.

Landscapes with Multiple Production Systems

Some customers use several production systems—for example, to map regional structures with subsidiaries in various countries. However, in this section, we'll focus on a three-system landscape with one production system.

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When converting a single-system landscape, you must consider the entire system group. You'll have to convert every system in the system group to SAP S/4HANA to continue the necessary separation of tasks by individual systems in the system group in SAP S/4HANA.

Conversion process in the system group

We can only provide general recommendations for converting system groups because customer requirements differ considerably. Figure 7.4 therefore illustrates how to convert a system group in an abstract way.

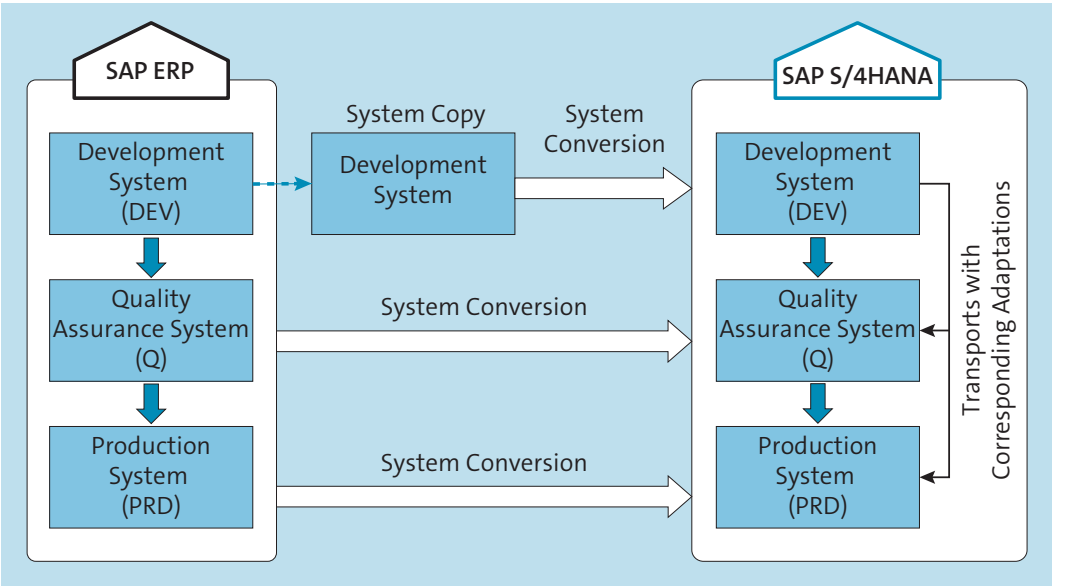


Figure 7.4 System Conversion in Three-System Landscape

Using a test system may not be necessary for updates and upgrades of traditional SAP Business Suite systems. For system conversion, however, a test run in a test system is mandatory. Subsequently, you'll convert the development and quality assurance (QA) systems to SAP S/4HANA. The SAP S/4HANA development system is usually a system copy of your existing development system in the SAP Business Suite landscape, converted to SAP S/4HANA.

Development system conversion

During the development system conversion, you'll adapt your business functionalities (e.g., the credit management function if required) and custom developments as determined in the planning phase. These adaptations are recorded by transport requests and tested in the quality assurance system.

Production system conversion

During the production system conversion, these transports are installed in the corresponding SUM phases to provide the necessary adaptations in the production system. You should carry out several test runs before you con-

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vert the production system so that you can test the entire procedure and specify measures to minimize production system downtime. Chapter 8 presents the options for reducing downtime.

Several runs

Figure 7.5 provides an overview of the various conversion runs for common system conversions:

1. **Initial test system conversion**
   The first step of a system conversion project is always to carry out tests in the sandbox system (e.g., a copy of the production—or PRD—system). You'll gain technical know-how about the conversion procedure in these tests, which you can use for subsequent conversions. End users can also make themselves familiar with SAP S/4HANA business functions in this system. In addition, you'll analyze and test your custom developments based on the new software. Only if you make all functionally necessary adaptations during the conversion of the test system can you get a comprehensive overview of the scope of tasks. You should also start to create an instruction manual for system conversion early on; in this, you'll write down the technical and functional activities of each cycle, including the time required. You will improve and refine this instruction manual after each of the following runs. Finally, you should consider keeping the converted sandbox system to run the adaptation analysis for the ABAP code using the Custom Code Migration SAP Fiori app from there (Section 7.2.6).
2. **Development system conversion**
   In the SAP S/4HANA development (DEV) system, you'll adapt your custom developments to the SAP S/4HANA solution scope and data structures. You'll also implement the mandatory adaptations in SAP S/4HANA if you haven't already implemented them in the source system. To benefit most from the SAP S/4HANA conversion, you can implement further optional adaptations. Keep any further changes to a minimum after the conversion of the development system. For this purpose, consider a system freeze, which must be coordinated and communicated at an early stage in the project.
3. **Quality assurance system conversion**
   Create an initial version of the *cutover plan*, which lists all activities for the cutover weekend from start to finish. You will then start the conversion of the quality assurance (QA) system, during which you import adaptations from the DEV system (process adjustments and adaptations of the custom developments). Subsequently, you will test the adapted business processes and new SAP Fiori user interfaces.
4. **Test run of the production system conversion**
   You'll test the production system conversion in the sandbox system

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under the same conditions that apply to your PRD system. In this context, you can prepare optimization measures for reducing downtime and can also finalize the cutover plan. There should be several test iterations.

5. **Production system conversion**
   You'll then convert the PRD system according to the specifications of your cutover plan.

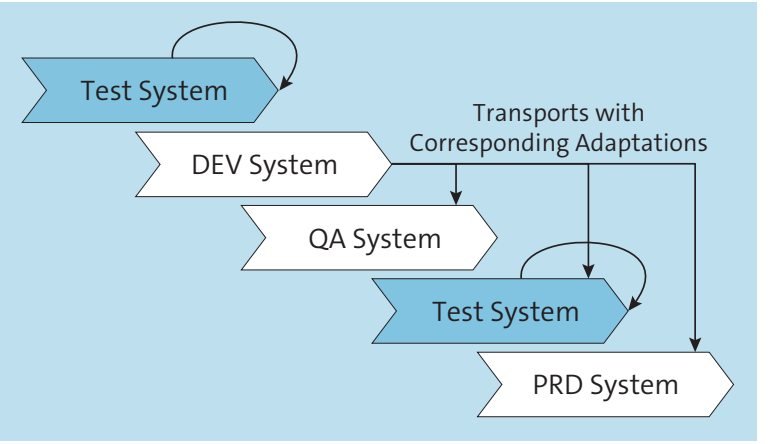


Figure 7.5 Conversion Cycles in System Group

Transition phase

Before you convert the production system to SAP S/4HANA, you'll have to keep the initial state of the SAP Business Suite system landscape—for example, to provide necessary corrections there. Consequently, you'll maintain two development systems from the start of the SAP S/4HANA conversion project (development system conversion) to the production system conversion. You can scale back the development system in the SAP Business Suite landscape when the production system conversion to SAP S/4HANA is complete. During this transition phase with two development systems, you'll have to develop a strategy addressing how changes made in the SAP ERP system group during this time will affect the SAP S/4HANA system group in the future.

Retrofit

If an ABAP development in both development systems seems to be necessary within the scope of the conversion project, you should check SAP Note 2652106 to determine whether the retrofit approach can be used.

Ultimately, the SAP S/4HANA system conversion doesn't pose new requirements for the software lifecycle management processes in a system group or to the definition of the transport routes between the systems.

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7.2 System Requirements and Checks

Now that you've obtained an overview of the system conversion, this section will discuss the systems for which a one-step procedure is possible and which adaptations may be required.

7.2.1 General Considerations

This section explains the steps that you'll have to perform in every system you are converting to SAP S/4HANA. Note that these steps are performed in different phases and probably in different systems of the system group and at different times. For example, you can adapt your custom developments in the SAP S/4HANA development system. Also in the development system, you'll collect the adaptations in transports, which are then directly installed when you convert the production system.

You can also implement many of the mandatory or optional business process modifications or adjust your custom developments immediately on the SAP ERP start release. In this case, these conversion project steps are carried out in upstream systems. You'll have to decide for your specific conversion project whether you implement these adaptations beforehand or during the system conversion in the SAP S/4HANA development system.

Architectural aspects

Several decisions for system conversion relate to the target architecture. This includes, for example, the selection of the deployment option for the SAP Fiori frontend server (see Chapter 8, Section 8.2.4). You also need to check if the operating system of the SAP ERP system's application servers is supported for the SAP S/4HANA system. You must ensure interoperability for the integration with other systems, especially hub systems such as SAP Process Integration. SAP Note 2251604 provides information on whether the product version of your hub system is sufficient. You should also decide whether your SAP S/4HANA on-premise system is to be operated in your own data center or in a private cloud. In this context, *cloud* should be understood to mean a hosted IaaS system.

DMO with system move

In SUM, the DMO with system move scenario is available for moving your system from the data center to the cloud (IaaS), provided that your SAP ERP system is not running on the SAP HANA database yet. This scenario allows you to move to another data center or to use a new host for the primary application server. This is different from the default scenario of system conversion in SUM, in which you do not switch the primary application server (the *in-place procedure*).

For switching the primary application server, particularly if you need to change the operating system, SUM offers ASCS instance move, irrespective

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of whether the SAP ERP system already runs on the SAP HANA database or not.

Relevance analysis for SAP Fiori apps

Project preparation includes the decision how many and particularly which SAP Fiori apps will be introduced with the system conversion. Relevance and Readiness Analysis in the SAP Fiori apps reference library is an analysis tool that helps you identify the SAP Fiori apps that are relevant for you. The tool analyzes which transactions you use in your source system and generates a list of recommended apps. Figure 7.6 shows a common results list of the relevance analysis.

You can use the Workload Monitor (Transaction ST03) to perform the usage analysis of the transaction data, for example. This usage data is then uploaded into the tool as a CSV file, and the tool analyzes the relevance of individual transactions and determines which SAP Fiori apps correspond to your most-used SAP GUI transactions.



Address of SAP Fiori apps reference library

You can find the SAP Fiori apps reference library at *http://s-prs.co/527939*.

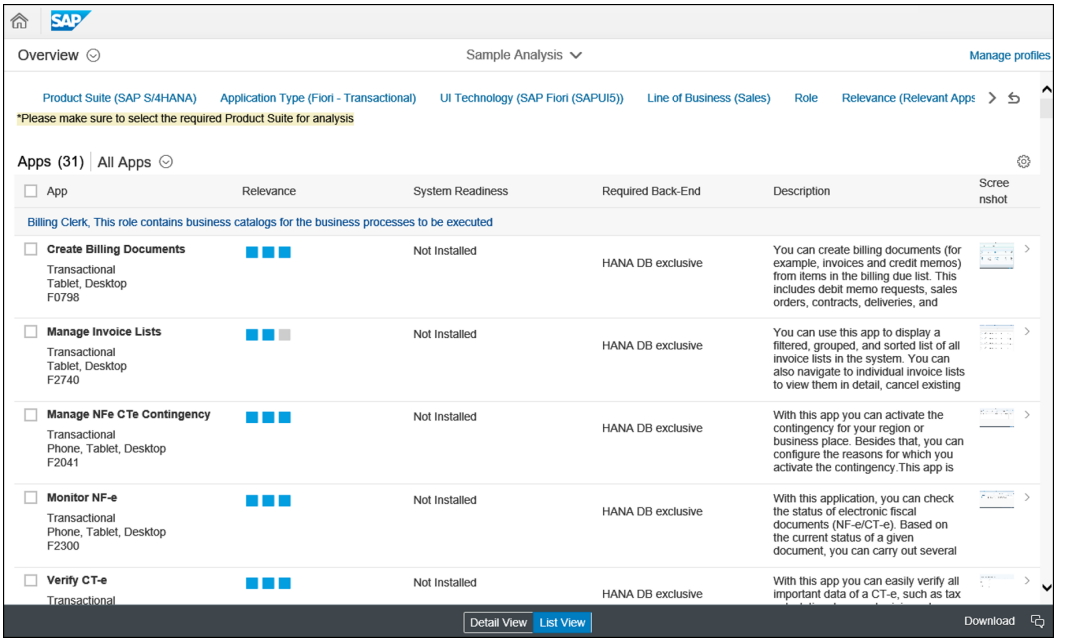


Figure 7.6 Relevance Analysis for SAP Fiori Apps

Standard tasks

In addition to the specific SAP S/4HANA conversion project steps, you'll also have to carry out standard tasks that you already know from other transformation projects—for example:

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- **End user training**
  If you modify business processes or migrate to SAP Fiori-based user interfaces, you'll have to schedule specific end-user training sessions and carry them out in a timely manner.
- **IT employee training focusing on new technologies**
  SAP S/4HANA introduces new technologies, such as CDS and the new HTML5-based SAP Fiori user interfaces. You'll have to train your experts accordingly.
- **Business process tests**
  Don't forget to include application tests.

These standard tasks of transformation projects are not described in detail in this book. Nevertheless, these tasks are also critical for the success of your SAP S/4HANA conversion project and need to be performed.



Additional Information

For more information on DMO with system move, visit the following sites:

- DMO guide at *http://support.sap.com/sltoolset*
- Blog post at *http://s-prs.co/527940*

Information on the ASCS instance move is available in a blog post at:

- *http://s-prs.co/527941*

SAP Note 2696472 provides information on supported operating systems for SAP S/4HANA.

7.2.2 System Requirements

Basically, you can convert any SAP ERP system to SAP S/4HANA. However, the effort and procedure required depend on the initial release.

One-step procedure

Migrating to SAP S/4HANA is a one-step procedure if you upgrade the software and migrate the database (if required) in the same technical step. You can convert your SAP ERP systems into an SAP S/4HANA system using the one-step procedure if the following requirements are met:

- **Start release**
  The source system's release state is SAP ERP 6.0 (without any Enhancement Package up to EHP 8). You might already be using an SAP HANA database, but you can also convert SAP ERP systems with other databases in one step.
- **Unicode**
  The source system must be a Unicode system.

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- **Pure ABAP stack**
  The SAP ERP source system must be a pure ABAP system. Converting dual-stack systems (combination of AS ABAP and AS Java in one system) is not supported. They must be split in advance using the dual-stack split option of the Software Provisioning Manager.

Systems on which older releases are installed or for which no Unicode conversion has been performed must be converted to SAP S/4HANA in multiple steps.



Unicode Conversion

In mid-2014, SAP announced that all new SAP NetWeaver releases after 7.40 and all products based on higher releases would only be compatible with Unicode. Technically, non-Unicode systems based on SAP NetWeaver releases up to 7.40 cannot be converted in one step into a product with an SAP NetWeaver release that is higher than 7.40. You'll have to perform a Unicode conversion first.

Supported conversion paths

Basically, you can convert an SAP Business Suite system as of SAP ERP 6.0 (all Enhancement Packages; the source system doesn't have run on SAP HANA as the database) to SAP S/4HANA. Ideally, the conversion target is the highest available SAP S/4HANA release. As you can see in Figure 7.7, at the time of writing, SAP S/4HANA 2020. For system conversion, SAP supports at least the two most current SAP S/4HANA versions as the target for which Feature Package Stack 02 (FPS 002) or higher is available.

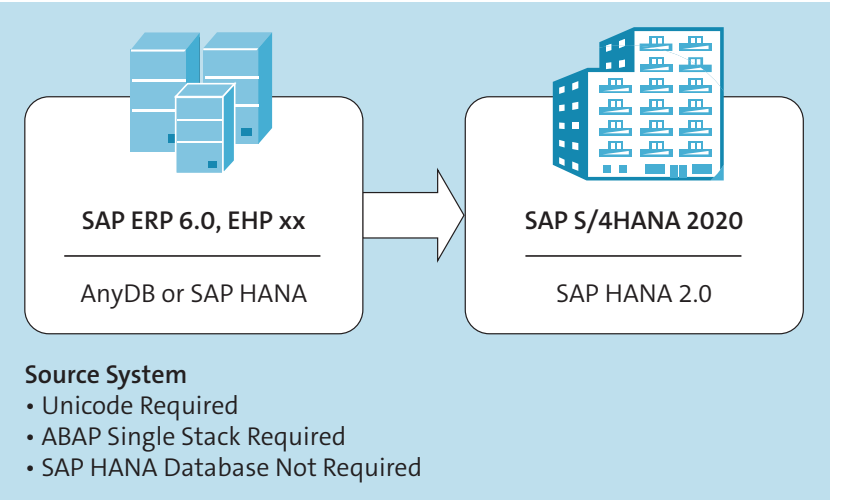


Figure 7.7 Basic Conversion Path

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Conversion Information

The SAP Release Information Notes of SAP S/4HANA provide the technical framework conditions of system conversion:

- SAP Note 2884313 for SAP S/4HANA 2020
- SAP Note 2769531 for SAP S/4HANA 1909

7.2.3 Simplification List

Simplification list items

The simplification list describes the potential adaptation work that is required to convert your SAP ERP system to SAP S/4HANA at the functional level. *Simplification list items* (or more succinctly, *simplification items*) illustrate the business adaptation requirements and effects of custom developments for each function described. For more complex modifications, the simplification items provide the relevant guides to support you.

Planning tool

The simplification list is an important tool for planning the conversion project and should be used at an early stage. You can implement many of the necessary adaptations in your existing SAP ERP source system. As a result, you'll be able to start the conversion project before actually installing any SAP S/4HANA software. Consequently, the simplification list is an important source of information to schedule necessary conversion project tasks and assign the required resources.

Provision of the simplification list

SAP provides information on the simplification list items in various ways:

- The complete list is available for download as a PDF document within the scope of the SAP help for SAP S/4HANA.
- As of SAP S/4HANA 1709, a web-based user interface enables the search and display of the current status of a simplification item directly in the *simplification item catalog*. The user interface is available at *https://launchpad.support.sap.com/#/sic*. The simplification item catalog is based on a database (the simplification database) that manages simplification items.
- The respective simplification items are available as separate SAP Notes. In addition to basic information, the SAP Notes (partially) include further information and how-to guides. They are referenced in the simplification item catalog. As an example, you can open SAP Note 2265093 (Transaction S4TWL—Business Partner Approach).

The simplification list is supplemented by program-based analysis tools to help you identify relevant adaptation tasks, such as the maintenance planner, simplification item checks, and checks within the scope of custom code analysis, which we'll describe in detail in the following sections.

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Simplification list categories

In general, the functions listed in the simplification list can be divided into three categories:

- **Functions that are modified in SAP S/4HANA**
  Simplification items in this category refer to functions that are generally available in the same form in SAP S/4HANA but have been adapted in such a way that it might affect existing processes and custom programs.



Change of the Material Number Field Length

An example of a simplification item in this category is the extension of the material number field. In an SAP S/4HANA system, the MATNR domain has a field length of 40 characters. The field length of the MATNR domain in an SAP ERP system is 18 characters. Although the function of the MATNR domain in the material master of each system remains essentially the same, this difference in field length may affect your custom code.

Usually, this change in the length of the field doesn't affect your business processes because after the system conversion, you can choose to use the longer material number field. If you want to use up to 40 characters, you'll have to take into account how this choice may affect other integrated systems. For more information on potentially necessary modifications regarding the 40-character material number, see SAP Note 2267140.

- **Functions that are no longer available in SAP S/4HANA in this form**
  Simplification items in this category refer to functions that are not available in SAP S/4HANA. In these cases, you can usually change to an alternative function already available in SAP ERP.

  An example of this category is the credit management function, as described in Section 1.2.1 in Chapter 1. For system conversions to SAP S/4HANA, you'll have to consider changing to an alternative function and then implementing this function (e.g., the advanced credit management function, SAP Credit Management). For more information on potentially necessary credit management adaptations, see SAP Note 2270544.
- **Functions that do not map to the SAP S/4HANA target architecture**
  Simplification items in this category provide information on changes that are planned for SAP S/4HANA. This category includes functions from SAP ERP that are the same in the current SAP S/4HANA version but do not map to the target architecture. Usually, alternative functions are already available.

An example in this category is the warehouse management function of SAP Warehouse Management (see Chapter 1, Section 1.3.2). You can continue to use this function after the SAP S/4HANA system conversion, but SAP Warehouse Management is not part of the target architecture. The target ware-

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house management architecture is SAP Extended Warehouse Management, as well as stock room management as of SAP S/4HANA 1909.

Distribution of the simplification item types

Distributed across the various categories, the simplification list for SAP S/4HANA 1909 contains about 675 simplification items. Figure 7.8 shows the percentage of the distribution of the simplification items in these three categories.

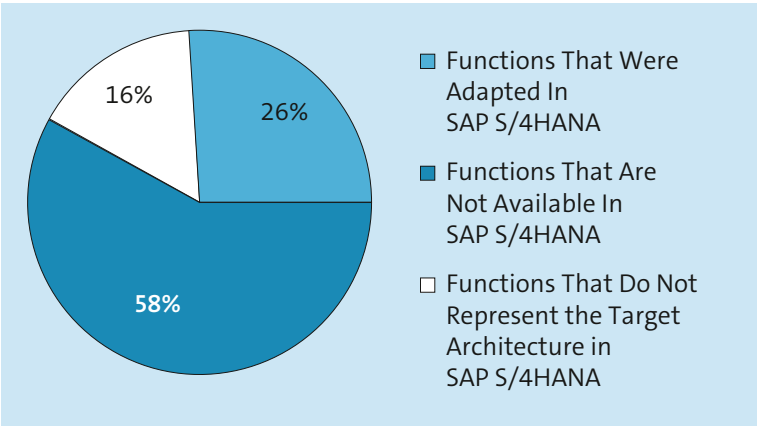


Figure 7.8 Simplification List Categories

Figure 7.9 shows how simplification items are distributed among functional areas.

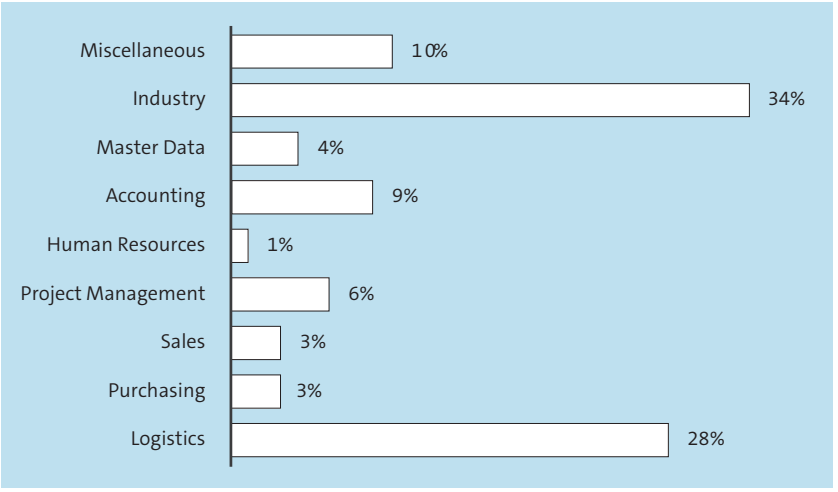


Figure 7.9 Simplification Items in Different Application Areas

Our experience from previous SAP S/4HANA conversion projects has shown that the average number of simplification items that customers may need to adapt is between 50 and 70. Simplification item checks help

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you to determine the simplification items that are relevant for your SAP ERP system. We'll discuss these checks in Section 7.2.5.

7.2.4 Maintenance Planner

Check and planning

The maintenance planner helps you plan the system conversion. It first checks at the component level whether the SAP ERP system meets the requirements. If this is the case, you are provided with all necessary software archives and a maintenance plan in the download area. You can also decide whether to install the frontend server as a separate SAP Fiori installation or in combination with the backend server.

The maintenance plan generated in the maintenance planner forms the basis for the technical system conversion in SUM. In addition, the maintenance planner checks the add-ons currently installed on your SAP ERP system and whether the enabled business functions are compatible with the SAP S/4HANA target release.

Customer landscape access

The SAP Support launchpad provides the maintenance planner as a cloud-based application. Figure 7.10 shows how the maintenance planner accesses information about the customer landscape.

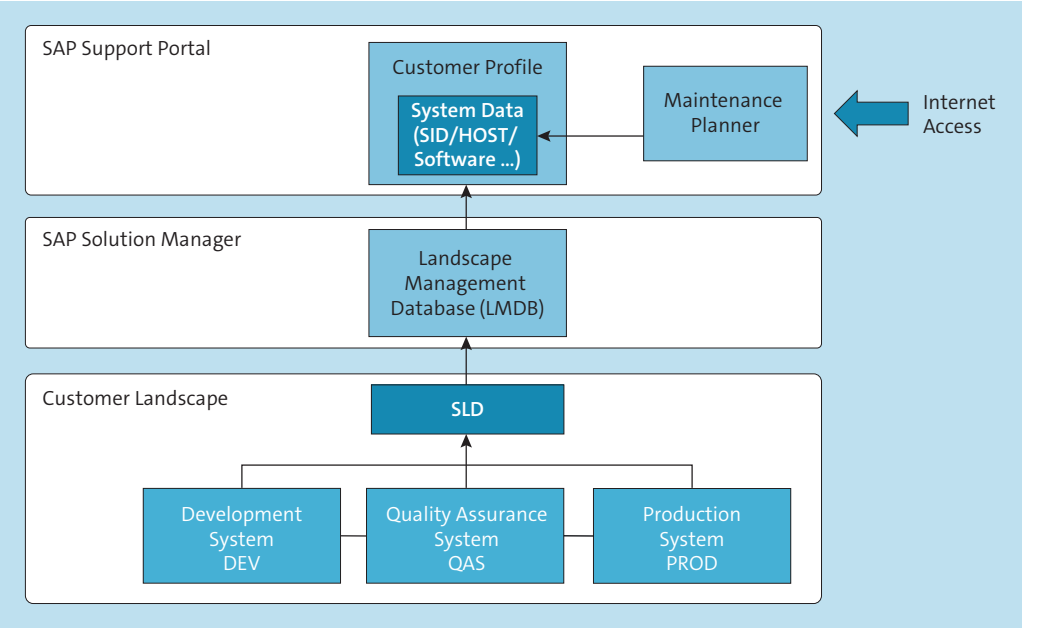


Figure 7.10 System Landscape with Maintenance Planner

The maintenance planner accesses the landscape data stored in your customer profile in the SAP Support Portal. The system landscape data in your customer profile is regularly updated via the landscape management data-

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base (LMDB) of SAP Solution Manager and the system landscape directory (SLD) of your landscape.

To access your individual customer data, you'll require an S-user for the SAP Support Portal. The SAP Solution Manager user must be assigned to the S-user.

Maintenance plan

Call the maintenance planner and select the **Plan for SAP S/4HANA** option to plan a single system conversion. Figure 7.11 shows the options of the maintenance planner's initial screen.

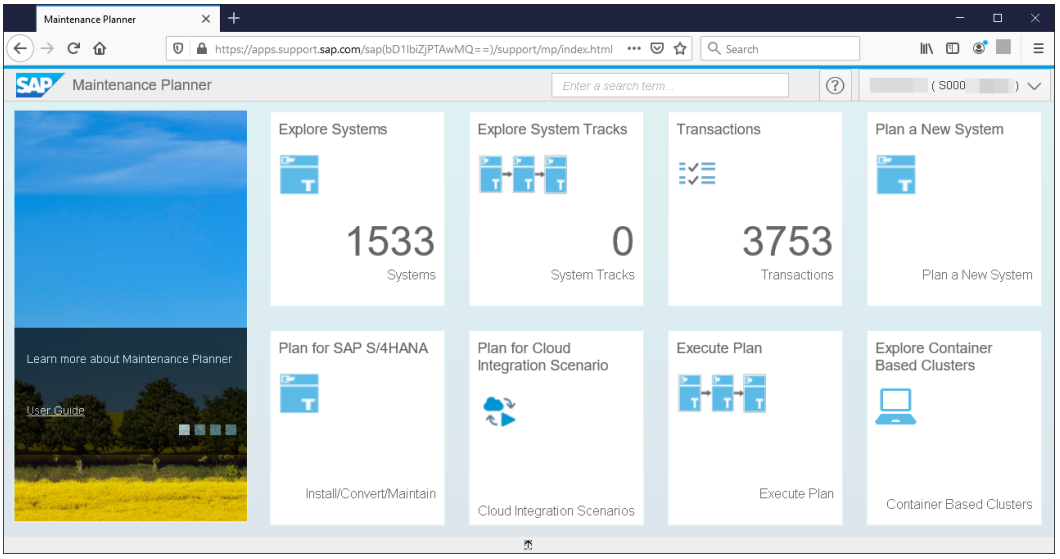


Figure 7.11 Initial Screen of Maintenance Planner (Traditional Interface)

Additional Functions in the Maintenance Planner

Since July 2020, you can use additional functions in the maintenance planner, which are described in SAP Note 2921927. To be able to use these functions requires onboarding, which is described in the same SAP Note. After onboarding, the initial screen of the maintenance planner also provides new functions, as shown in Figure 7.12. The activities for planning the system conversion are independent of the new or old initial screen.

In the guided steps, enter the SAP ERP system you want to convert, select the SAP S/4HANA target release, and specify the deployment for the frontend server for the SAP Fiori user interface. The frontend server can be operated either on a separate server (*central hub deployment*) or on the server of the SAP S/4HANA system (*embedded* or *add-on deployment*). Figure 7.13 shows the dialog for selecting the deployment option.

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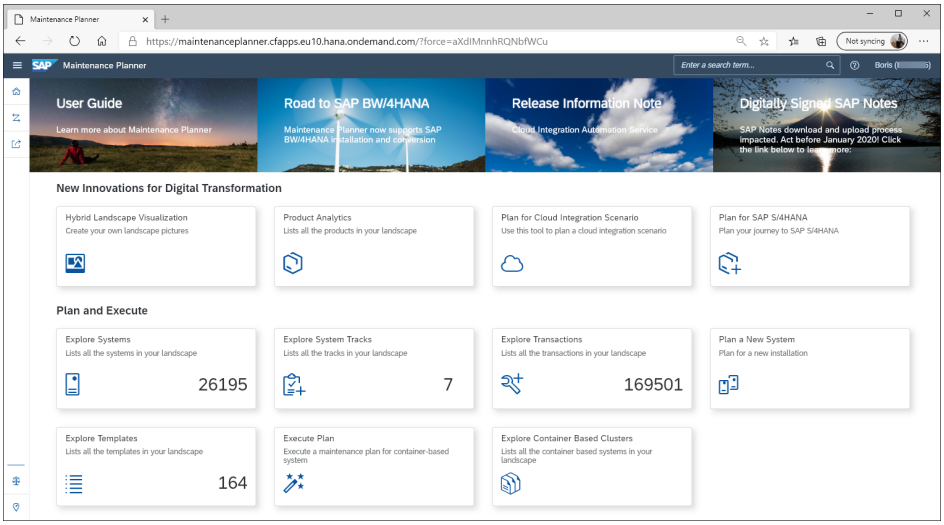


Figure 7.12 New Initial Screen of Maintenance Planner after Onboarding

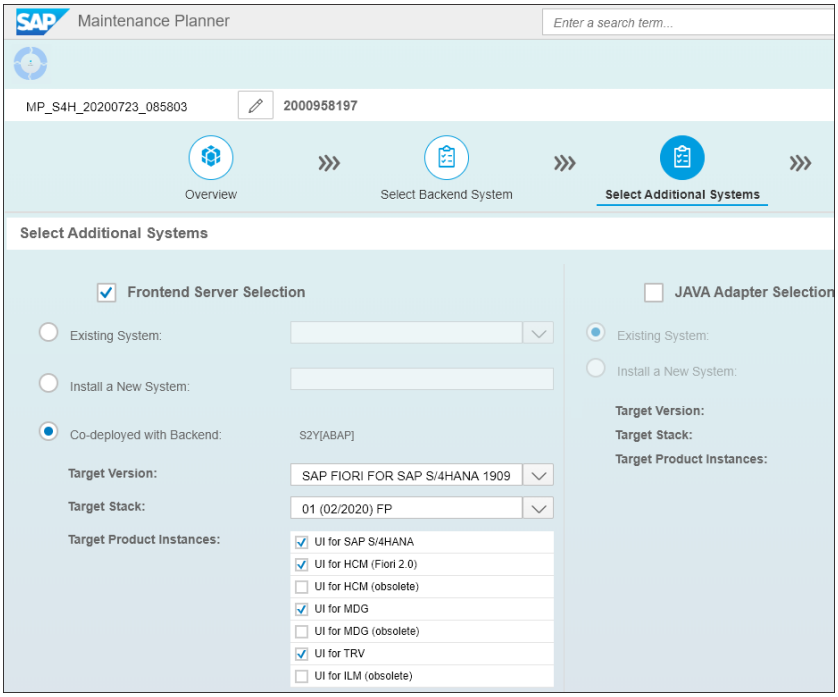


Figure 7.13 Selecting Deployment for SAP Fiori Frontend Server

If you already use a frontend server as the hub in your landscape, you can update it using the **Existing System** option. The **Install a New System** option enables you to set up a new hub frontend server. The third option, **Codeploy**, allows you to integrate the frontend server with the SAP S/4HANA backend. This approach of embedded deployments is recommended by SAP.

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Switching the Frontend Server to an Embedded System

If you've already used a hub frontend server, you can also switch to an embedded system (following SAP's recommendation). The following sources of information provide important tips:

- *http://s-prs.co/527942*
- *http://s-prs.co/527943*
- *http://s-prs.co/527944*

For SAP S/4HANA 2020, a hub frontend server must run on the basis of version 7.52. You can find more descriptions and information on the frontend server in Chapter 8, Section 8.2.4.

Check

Now, the maintenance planner will show the result of the check of the add-ons currently installed and business functions activated. If the check didn't reveal any obstacles, you can continue with the planning phase. Note that you don't need any SAP S/4HANA license for this check, which means that you can run the check at an early stage of the project. For subsequent planning, however, you need a license.

Planning

During planning, you then have to provide information on the operating system, for example. This planning in the maintenance planner results in a maintenance plan, the required software archives (for the download basket), and a so-called stack XML file, which contains information on the calculated start and target combinations. The maintenance plan is also available as a PDF document that includes a link to the SAP S/4HANA software that you want to install. You'll need the stack XML that was generated in the maintenance planner during the system conversion; it's used in SUM to ensure that only compatible maintenance operations can be executed.

Supported add-ons and business functions

Not only can you use the maintenance planner to plan your future system landscape, you also can use its guided procedure to check the add-ons currently installed on your SAP ERP system (SAP add-ons or partner add-ons) and whether the enabled business functions are compatible with the SAP S/4HANA target release. If add-ons or business functions in your SAP ERP source system are not (yet) supported by SAP S/4HANA, the maintenance planner will output an error message. However, future support for currently unsupported add-ons and business functions may be expected, so you should contact SAP or your partner provider. Note that SAP cannot make any compatibility statements for uncertified partner add-ons. Consequently, the maintenance planner outputs a warning message for this category of partner add-ons.

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Add-on uninstallation

In some cases, you can also uninstall add-ons that are installed but no longer used to proceed with the system conversion. Uninstalling is now possible for a growing number of SAP add-ons. The uninstall option is mandatory for certified add-ons of partners. Recently, there's been an option for deleting third-party add-ons if required. This option is provided in the Support Package Manager (Transaction SPAM) at patch level 75. One of the prerequisites is that the add-on is nonmodifying. The configuration tool initially allows you to check the add-on's ability to be deleted. If it can be deleted, the system creates a configuration with which you can uninstall the add-on using the SAP Add-On Installation Tool (Transaction SAINT).

If you have business functions active on your SAP ERP source system with the `ALWAYS_OFF` status in the SAP S/4HANA target release, you won't be able to convert the system to SAP S/4HANA. With the current SAP S/4HANA versions, however, you'll rarely encounter this problem.



Additional Information

- You can find additional information, links to blogs in the SAP Community Hub, and best practice guides in the SAP documentation for the maintenance planner at *http://help.sap.com/maintenanceplanner*.
- SAP Note 2214409 and the SAP Notes referenced there provide more information on supported SAP add-ons.
- SAP Note 2911053 provides information on the configuration tool for uninstalling third-party add-ons that are no longer required.

7.2.5 Simplification Item Checks

SAP S/4HANA *simplification item checks* (called *prechecks* prior to SAP S/4HANA 1709) let you evaluate the adaptation requirements for your business processes when migrating to SAP S/4HANA. The simplification item checks are SAP programs installed and executed on the SAP ERP source system release, which will output a results log. These results correspond to simplification items, which we discussed in Section 7.2.3.

Tasks of simplification item checks

Simplification item checks are responsible for two tasks: identifying the relevant simplification items for the system conversion and ensuring that tasks that need to be executed before the system conversion are actually performed.

An example of a task that needs to be executed before the system conversion is included in the simplification item for the customer/vendor integration for business partners. In SAP S/4HANA, SAP business partners must be used to benefit from IT-related advantages such as nonredundancy and data integrity. The corresponding SI check verifies whether a business partner

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exists for each customer and vendor. This SI check results in a list of customer and vendor masters that have not been implemented yet.



Business Partners

Customer-vendor integration (CVI) is a relevant work package in many projects. You can find information on this topic in:

- SAP Note 2265093 (Business Partner Approach)
- SAP Note 2713963 (FAQ: CVI)
- SAP Note 2832085, under CVI Cockpit
- The SAP S/4HANA Cookbook—Customer/Vendor Integration at *http://s-prs.co/5227945*

Time of the execution

You'll execute simplification item checks in the conversion project twice. You can (and should) first execute them in the prepare phase of the project ❶. To get more detailed results, you should ideally run the simplification item checks in the production system. Further simplification item checks are automatically executed in the execution phase ❷, called automatically by SUM when checking the prerequisites. If the mandatory activities have not been performed or if the simplification item checks have not been installed in the target system, the conversion procedures will pause, and an error log will be output.

For example, implementing the customer/vendor master records described previously for SAP business partners is a mandatory activity. Implementing this master data is a prerequisite for converting existing application data to the new data structure.

Figure 7.14 shows when the simplification item checks are executed for the system conversion.

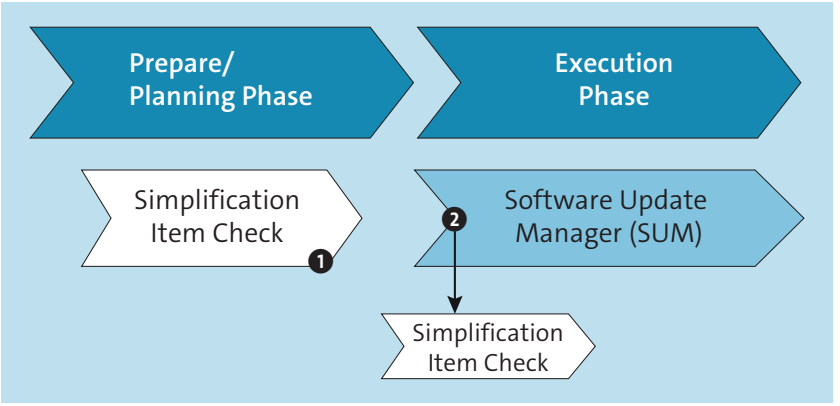


Figure 7.14 Execution of Simplification Item Checks

Executing Simplification Item Checks in the Prepare and Planning Phase

Procedure

You must install two essential SAP Notes as a prerequisite for the check. SAP Note 2502552 provides the consistency check, which is installed via transport-based correction instructions and contains the check classes of the respective simplification items. SAP Note 2399707 comprises the relevance check and particularly the check framework. This framework includes the central check report, /SDF/RC_START_CHECK. In addition, you must provide the simplification item catalog, which we discussed in Section 7.2.3.

Figure 7.15 shows the initial screen of the SI check report /SDF/RC_START_CHECK, which also lists the two SAP notes previously mentioned and the SI catalog with the currently implemented version.

Select the target version of your SAP S/4HANA system conversion and the mode. The SI check program can be executed in dialog or background mode. You can also display the results of a previous check run.

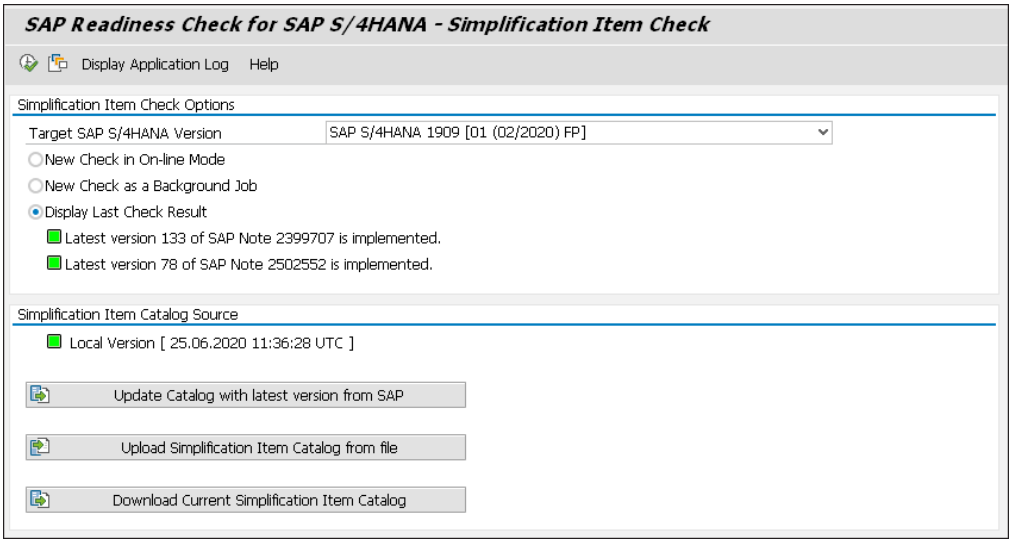


Figure 7.15 SI Check Program: Initial Screen

SAP updates the SI catalog as well as the relevant SAP Notes on a regular basis, which is why you should follow this update in the prepare phase. Later on, during conversion of the production system, you should freeze the versions in one valid status. SAP Note 2399707 lists the versions that are required as a minimum for the respective SAP S/4HANA target release. Figure 7.16 shows the result screen of an SI check run.

In this example, the result screen lists some green and four red results. The simplification items marked in red require postprocessing. In addition to the basic SAP Notes, which are also listed in the result screen of the SI check, the consistency check log includes additional detailed information on nec-

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essary postprocessing. Figure 7.17 shows the SI check log, including details on the S4TWL—General Ledger simplification item (SAP Note 2270339).

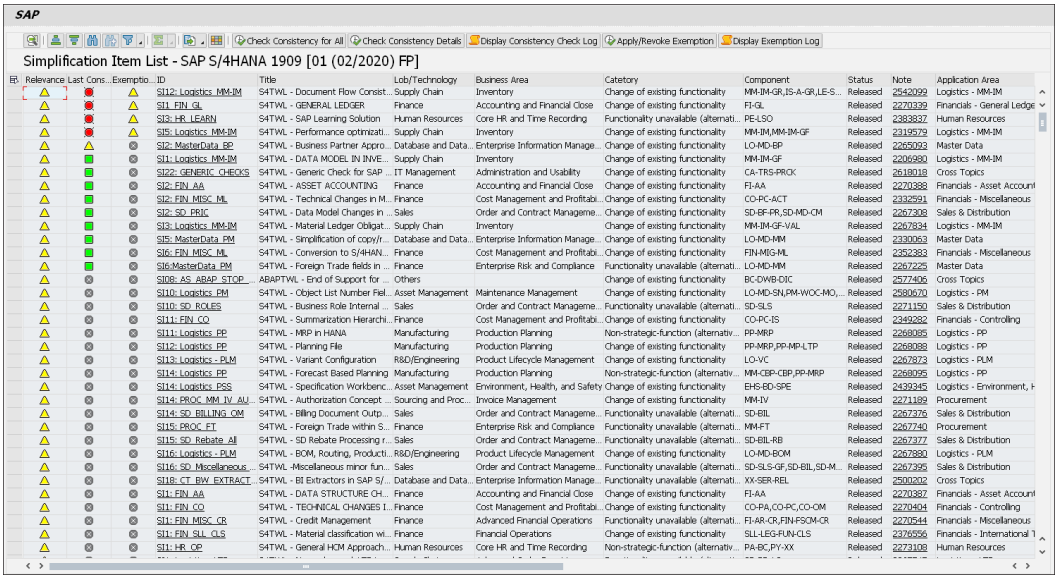


Figure 7.16 Result Screen of SI Check Program

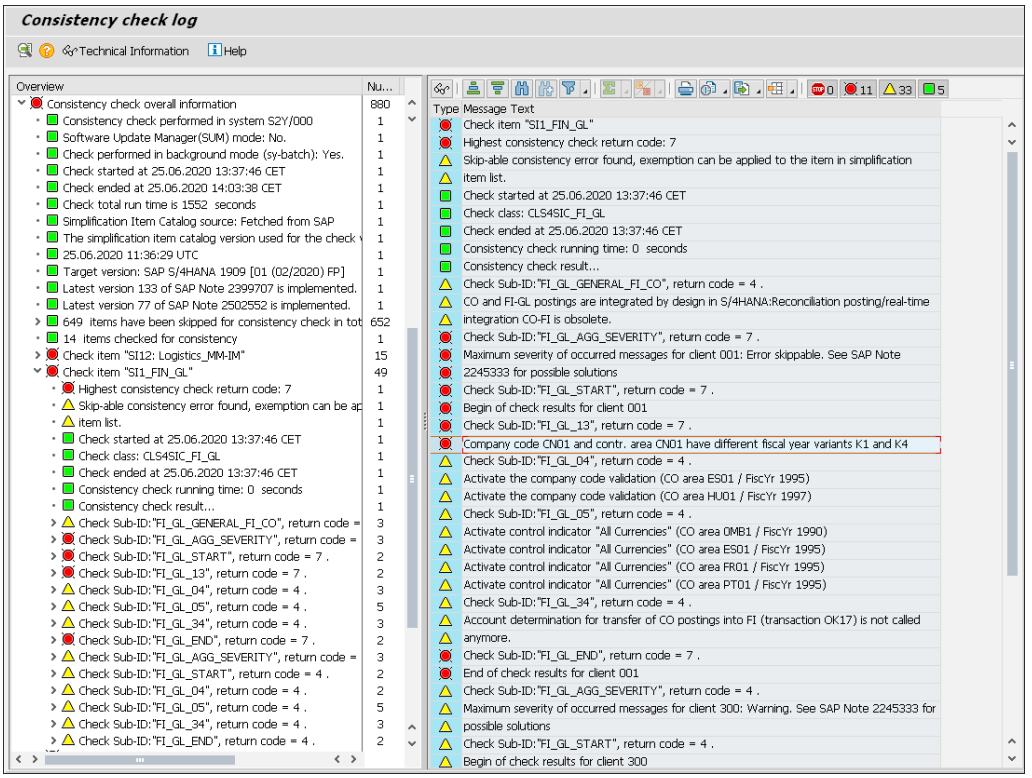


Figure 7.17 SI Check Log

In this example, the check determines that a company code and the corresponding controlling area use different fiscal year variants. You must adapt this prior to the actual system conversion. Only if the SI check program does not show any red results can you assume that the execution phase can be run without any errors.

Exemptions

There are a few checks in which you can confirm a negative check result by setting an *exemption* in such a way that the check does not block the system conversion. These are checks that indicate important changes in SAP S/4HANA but do not require immediate implementation prior to system conversion. By setting an exemption, you confirm that you will deal with this situation later on.

Executing Checks in the Software Update Manager Check Phase

As described previously, simplification item checks are also run in the technical system conversion in SUM—at the beginning and shortly before the start of the downtime. Only if the checks do not have negative results will you be able to continue the SUM run. If results are negative or if the SI check program has not been implemented in the conversion system, postprocessing work will be required. Because SUM implements the SI check in client 000, it is useful to run the SI check of the prepare phase in client 000. Only then can you ensure that both runs deliver the same results and that the data is considered in all clients during the check.



Additional Information

You can find additional information on the central check report /SDF/RC_START_CHECK in the following blog posts:

- *http://s-prs.co/527946*
- *http://s-prs.co/527947*

7.2.6 Analyzing Custom Developments

Enterprises run business processes that differ from company to company and have had to adjust their SAP ERP systems to these processes in the best possible way. In the past, enterprises frequently developed custom programs if the SAP standard couldn't map these specific requirements.

The majority of SAP ERP systems probably contain additional custom program logic. SAP ERP provides various custom enhancement options, from user and customer exits to BAdIs to modification of SAP standard objects.

Custom code migration worklist

However, these custom developments and various enhancement options affect the release compatibility and the work required when changes are re-

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leased. As with business functions, you'll also have to check whether your customer-specific ABAP developments are still compatible with SAP S/4HANA's data structure and functional scope when transitioning to SAP S/4HANA. To check this compatibility, SAP provides *custom code adaptation*, which includes tools that enable you to check and adapt your enhancements, modifications, or custom developments for compatibility before the system conversion. The tools for analyzing custom programs are partially identical to those that you may use within the scope of SAP Business Suite.

Basic usage check

However, you should also leverage the conversion to SAP S/4HANA to analyze your customer-specific ABAP developments in general. For example, modifying custom programs without checking whether they are used doesn't make sense. Even if they are used, you should check whether there are already suitable standard functions available in SAP S/4HANA—for example, in the area of embedded analytics. As a result, you should always carefully check automated inspection programs and service offers that some consulting firms provide for SAP S/4HANA conversions.

Procedure

We recommend performing steps for analyzing and adapting your customer-specific ABAP developments for the system conversion in the following order:

1. Analyzing and adapting custom developments in general:
   - Transparency for custom developments (not used/hardly used, custom development provided in the standard)
   - Optimization of custom developments (scale back, proven methods, performance optimizations)
2. Analyzing and adapting custom developments for the database migration to SAP HANA:
   - Adaptation of custom developments that use specific characteristics of the predecessor database
   - Performance optimizations on the basis of SAP HANA
3. Analyzing and adapting custom developments for the transition to SAP S/4HANA:
   - Adaptation of custom developments that are no longer mapped in the solution scope and data structure of SAP S/4HANA
   - Optional adaptation of custom developments with regard to functions that are not included in the target architecture of SAP S/4HANA
   - Analysis and implementation of possible performance optimizations

These three aspects are described in detail in the following sections.

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Analyzing and Adapting Custom Developments in General

Disadvantages of custom developments

Depending on optimization needs, SAP customers have enhanced, modified, or added custom logic to standard business processes. This individual business process optimization can lead to increased costs for operating SAP software. For example, additional effort might be required for custom developments when release upgrades are applied and support packages need to be installed. In general, system complexity increases with the number of custom developments. Considering the costs of custom developments, be sure to check them at regular intervals. As our experience from various customer projects has shown, 30% to 50% of custom programs are not used at all after a few years.

Transparency for custom developments

Consequently, you should first obtain an overview of your custom developments. You should always perform this basic task when transitioning to SAP S/4HANA. To create this overview, use the SAP custom code lifecycle management tool set to analyze and manage the lifecycle of custom developments. Usage procedure logging or ABAP Call Monitor (Transaction SCMON) allow you to gain detailed usage information on custom objects. Transaction SUSG also provides the option to aggregate usage data of Transaction SCMON so that you can monitor the usage of custom developments over as long a period as possible.

Optimization of custom developments

Based on these analyses, you can now optimize your custom developments. The decommissioning cockpit lets you identify redundant or obsolete development objects and remove them from the customer system. As an alternative, you can use the usage data of Transaction SUSG in the Custom Code Migration SAP Fiori app, presented in the following section. You should also check whether your custom developments still in use correspond to the recommended programming and performance guidelines (best practices). Furthermore, you should determine whether your customer-specific enhancements can now be mapped by SAP standard processes.

Begin in the prepare phase

Of course, you can also perform these optimization tasks prior to the actual SAP S/4HANA conversion project. When converting to SAP S/4HANA, you should also make yourself familiar with the new enhancement options in SAP S/4HANA, which were introduced in Chapter 3, Section 3.4.



Additional Information

- You can find blog posts on enhancements and exchange information in the ABAP Development area of the SAP Community at *http://s-prs.co/527932*.
- You can find information about UPL at *http://s-prs.co/527933*.

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- For SAP Best Practices for the decommissioning cockpit, go to *http://s-prs.co/527934*.
- The custom code migration guide is linked on the SAP Help Portal for the on-premise version of SAP S/4HANA at *https://help.sap.com/s4hana*.
- For a blog post offering a central entry point and a comprehensive overview of the options currently available, visit *http://s-prs.co/527935*.
- For a blog post offering tips on the options for aggregating usage data using Transaction SUSG, visit *http://s-prs.co/527936*.

Analyzing and Adapting Custom Developments for the Database Migration to SAP HANA

Adjusting native database functions

Migrating to the SAP HANA database and the related database architecture changes (i.e., from a row-based to a column-based database) can affect custom developments. Although ABAP code continues to run on SAP HANA, you'll have to adapt the custom developments that use specific characteristics of the predecessor database. Examples include the following:

- **Usage of native SQL statements**
  You'll have to replace native SQL statements.
- **Implicit sorting of results lists**
  Instead of implicit sorting of results lists, you should insert explicit `ORDER-BY` statements.
- **Direct access to pool and cluster tables**
  You'll have to modify code from pool and cluster tables because these table types no longer exist in SAP S/4HANA.

Performance optimizations

In addition, you should analyze the performance optimization options in the SAP HANA database. Examples include the following:

- **Optimization of SELECT statements**
  You should replace general `SELECT* FROM` statements with `SELECT` statements with a restriction to the mandatory fields.
- **Use the code pushdown option**
  You should analyze whether so-called code pushdown methods can be leveraged—that is, whether the data calculation logic can be moved to the SAP HANA database. Code pushdown methods use CDS technology and SQLScript.

Code Inspector

To identify conversions that are mandatory or recommended for the database migration to SAP HANA, SAP Note 1935918 provides two check variants (`FUNCTIONAL_DB` and `FUNCTIONAL_DB_ADDITION`) for the Code Inspector.

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The Code Inspector (which you can call using Transaction SCI) is a generic tool to check repository objects for various aspects of static code. The SQL Monitor (Transaction SQLM), which is available in SAP NetWeaver 7.40 (see SAP Note 1885926 for earlier releases), enables you to analyze the SQL statements in your customer systems.



Optimizing Custom Code Using SAP Standard Tools

You can analyze your custom developments and prepare for migration before you start the actual SAP S/4HANA conversion project. The corresponding tools are available in SAP NetWeaver.



Additional Information

- To adapt custom developments for the migration to SAP HANA, see SAP Note 1912445. You can access a sample scenario at the following link: *https://blogs.sap.com/2013/01/28/abap-for-sap-hana-reference-scenario/*
- For more information on code pushdown, go to *https://blogs.sap.com/2014/02/03/abap-for-hana-code-push-down/*.
- For more on optimizing ABAP applications for SAP HANA, read *ABAP Development for SAP HANA* by Gahm et al. (2nd edition, SAP PRESS, 2016, *www.sap-press.com/3973*).
- For more information on the Code Inspector, go to *http://s-prs.co/527937*.
- You can find information on how to use ABAP Call Monitor (Transaction SCMON) in the following blog post: *http://s-prs.co/527938*.

Analyzing and Adapting Custom Developments for the Migration to SAP S/4HANA

Analyzing the required adaptation work

Due to SAP S/4HANA's new data structures and functional simplifications, you might have to adapt your existing custom developments when migrating to SAP S/4HANA. Accordingly, you first need to determine the required adaptation work before you can adapt custom developments.

Analysis tool of SAP

The ABAP test cockpit has been available for analysis since 2017. As a further development, the Custom Code Migration SAP Fiori app has been added; as a third option, it can be used in SAP BTP, ABAP environment. We'll first discuss the reason for these three approaches before we'll describe the tools in detail.

Already in SAP ERP systems, the ABAP test cockpit is one of the most well-known tools of ABAP Workbench. To use it specifically for the adaptation

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analysis, however, it must be deployed in a system based on version 7.52 or higher because this release is the prerequisite for the special checks of the custom code adaptation for system conversion. Because none of the traditional systems of SAP Business Suite are based on 7.52 (SAP ERP 6.0 EHP 8, for example, runs on version 7.50), a separate, central ABAP test cockpit system is typically installed for analysis. This system only needs to be provided for several weeks, during which the custom code analysis takes place, and it does not have to meet special performance requirements. Custom developments in the SAP ERP system are accessed via remote function call (RFC).

As an alternative, you can use the Custom Code Migration SAP Fiori app, which is available in SAP S/4HANA 1809 or higher. For this purpose, you can use the first converted sandbox system—an option which is also available for the central ABAP test cockpit system. Here too, the custom developments are accessed via RFC. Compared to the central ABAP test cockpit system, the SAP Fiori app provides advanced functions like the consideration of usage statistics and scope definition, as described in this section.

To completely omit a separate system in your landscape for analysis, the Custom Code Migration SAP Fiori app is now available on SAP BTP as a third option. In this approach, the cloud connector is used for accessing custom developments. Figure 7.18 shows the three options available for analysis.

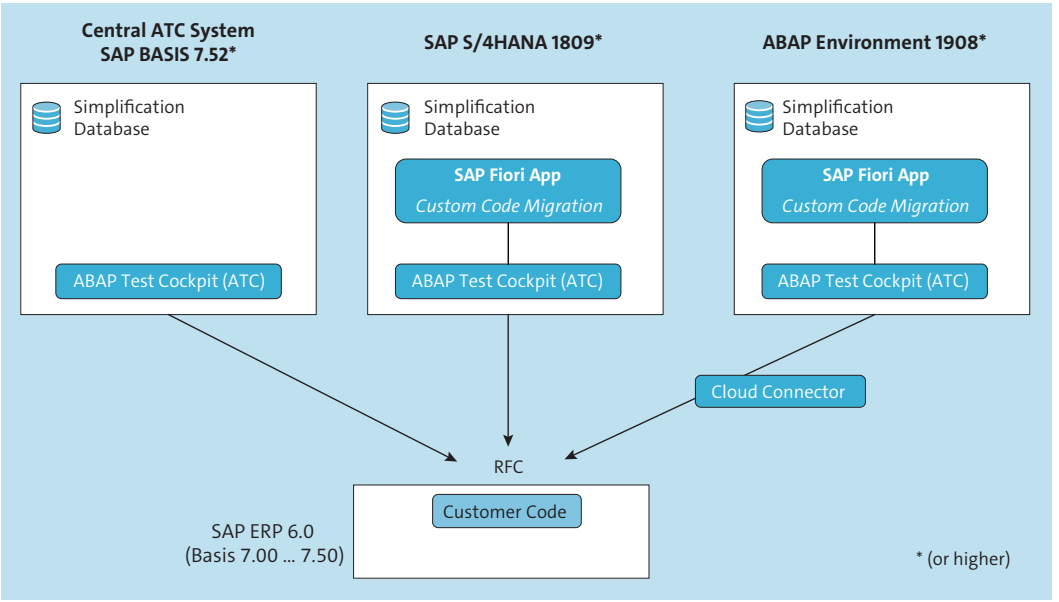


Figure 7.18 Custom Code Analysis Tools: Overview

In all three analysis approaches, you must first upload a current version of the simplification database to the analysis system as the basis for the checks. The adaptations of the SAP ABAP entities that may entail an adaptation of your custom programs are stored in this simplification database—programmatically evaluable for each simplification item (see SAP Note 2241080).

Central ABAP test cockpit system

For the central ABAP test cockpit system, you use the `S4HANA_READINESS_REMOTE` ABAP test cockpit variant to analyze your custom programs with regard to SAP S/4HANA adaptations. The results screen of an ABAP test cockpit check illustrates the potential adaptation requirements and forms the basis for your input estimates. You also can call the simplification database independent of ABAP test cockpit using Transaction SYCM. Here you can obtain an overview of the adaptations for each simplification item. An SAP Note including descriptions and adaptation recommendations is available for every simplification item of the database.

Step-by-step instructions

The following instructions will show you step by step how you can determine SAP S/4HANA's specific need for adaptations of custom developments using the ABAP test cockpit:

1. Implement the ABAP test cockpit in your system landscape:
   - Connect the relevant systems.
   - Load the current version of the simplification database content from the SAP Support Portal.
   - Update the simplification database with the current content (Transaction SYCM).
2. Start an ABAP test cockpit check:
   - Schedule an ABAP test cockpit check run (Transaction ATC). Figure 7.19 shows the necessary settings (to be called via the **Schedule Runs** option) using the `S4HANA_READINESS_REMOTE` check variant provided. Select the software packages that include your custom programs. Save your variant and schedule the run.
3. Analyze the ABAP test cockpit check results:
   - Call the results screen of the ABAP test cockpit check run using the **Manage Results** option. Figure 7.20 shows an example of seven relevant results.
   - You have different options to display the results of the ABAP test cockpit check run and to sort them by different criteria (e.g., by reference object or simplification item note).
   - From the results list, you can either go directly to the referenced simplification item SAP Note or go to the respective source code.

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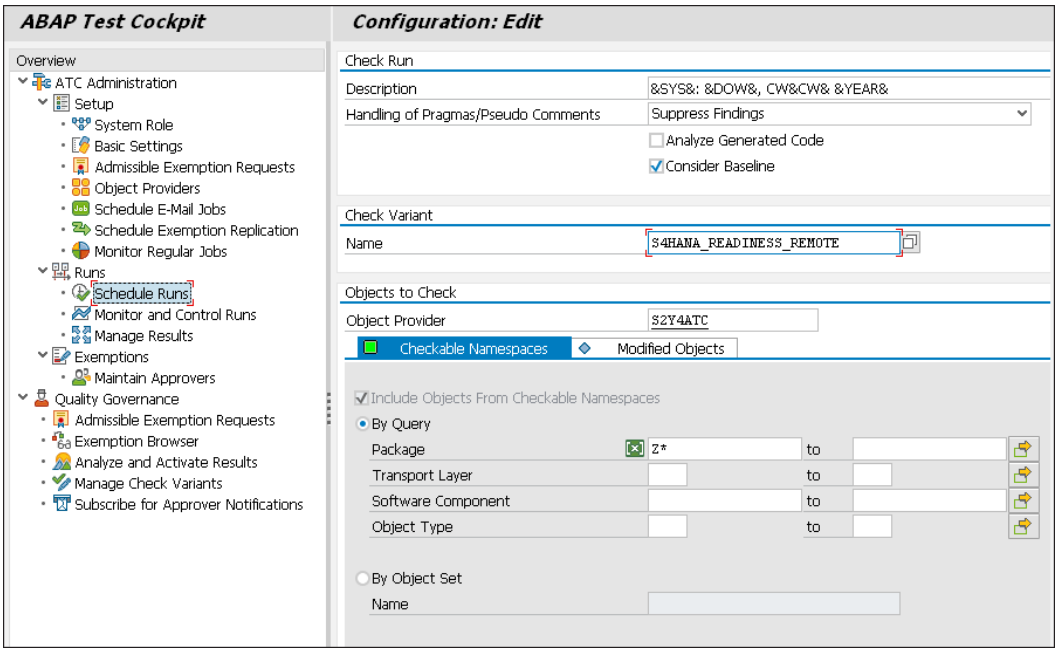


Figure 7.19 Set Up ABAP Test Cockpit Check Run

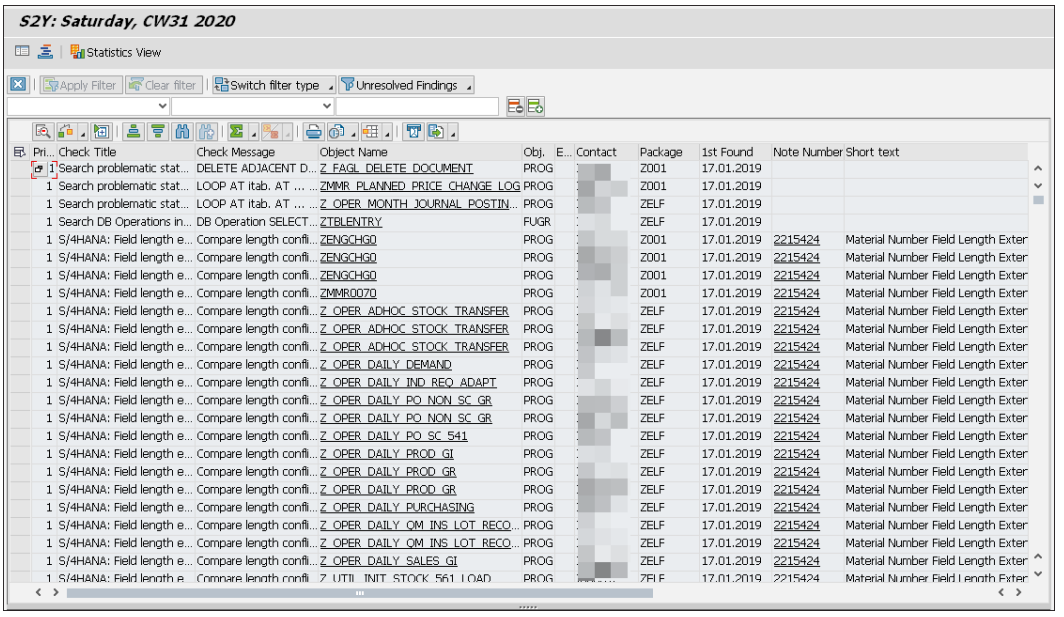


Figure 7.20 Results List of ABAP Test Cockpit Check Run

At this point, let's use SAP Note 1804812 (MB Transactions: Limited Maintenance/Decommissioning) as an example. For this simplification item, the

SAP Note describes that MB transactions for recording and displaying goods movements (Transactions MB01, MB02, MB03, MB04, MB05, MB0A, MB11, etc.) are no longer supported in SAP S/4HANA. Instead, Transaction MIGO is available for recording and displaying goods movements in SAP S/4HANA. If you use these MB transactions in your own programs, the ABAP test cockpit check run will display a corresponding result and provide a reference to SAP Note 1804812. For using Transaction MIGO in SAP Business Suite, it has already been recommended to adapt custom developments. When transitioning to SAP S/4HANA, this adaptation is now mandatory.

On-premise Custom Code Migration SAP Fiori app

The Custom Code Migration SAP Fiori app is available in SAP S/4HANA 1809 or higher. As mentioned previously, you can use a sandbox system that was already converted or install a new SAP S/4HANA system. This system is initially set up as a central ABAP test cockpit check system. Then you must configure the Custom Code Migration SAP Fiori app, which is described in the documentation.

After you've logged on to the SAP Fiori app, you create a new project to which you assign the RFC destination on your SAP ERP system. This defines the SAP ERP source system from which the where-used list of your custom developments is taken.

Integrating statistics data

You should now integrate statistics data about the usage of your custom developments. You can create this data using the ABAP Call Monitor (Transaction SCMON) and aggregate it using Transaction SUSG. As an alternative, you can collect the data in your SAP Solution Manager system (this requires SAP Solution Manager 7.2 SP 8).



Creating Usage Statistics Over a Long Period of Time

To ensure that you have a realistic image of your custom development's usage, you should collect statistics for at least one year. For example, you don't want to accidentally miss necessary reports that are run at the end of the year just because they weren't included in the statistics.

Scope definition

Based on this usage data, you can now define the *scope*—that is, identify those objects that are to be moved to the SAP S/4HANA system during system conversion. Based on the usage data, the application provides a default scope that contains the objects used and those objects for which no statistics data exists. You should adapt the scope manually by adding packages or individual objects to or removing them from the scope. You could, for example, remove custom-developed analysis reports from the scope if SAP delivers comparable analysis functions in SAP S/4HANA. Figure 7.21 shows

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that scoping is also illustrated graphically in the Custom Code Migration SAP Fiori app.

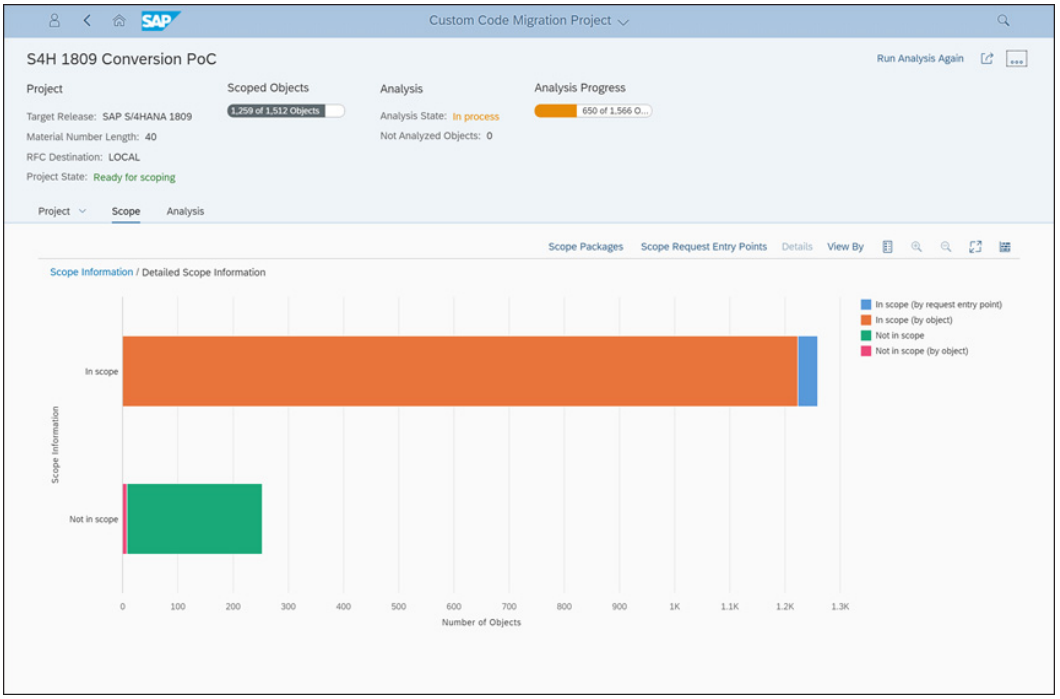


Figure 7.21 Illustration of Scoping in SAP Fiori App

Deletion transport for obsolete objects

Finally, you can use the application's scope definition as the basis to create a transport request that contains the objects to be deleted that are not within the scope. You add this request to SUM for technical conversion so that the objects can then be deleted.

After you have created the project, you initiate a custom code check in the application. In addition to the tabular presentation of the results, which are similar to the central ABAP test cockpit system's results, the application provides numerous filter options that can be illustrated in an appealing way (see Figure 7.22). You can filter by:

- Priority, to represent important results
- Scope definition
- Package name
- Simplification item areas
- Availability of quick fixes

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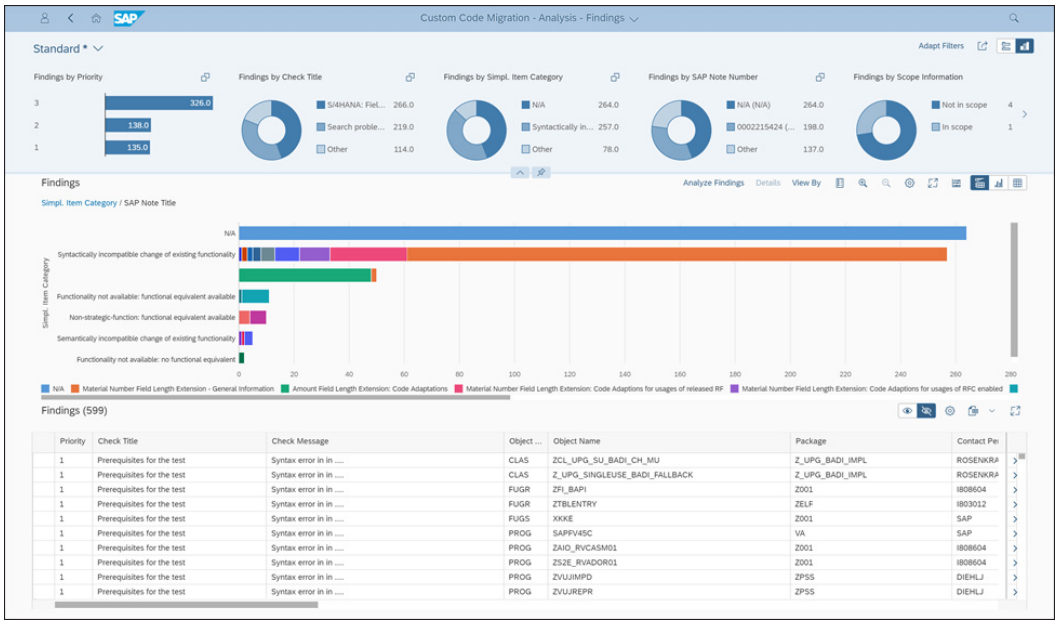


Figure 7.22 Analysis Results and Filter Options in Custom Code Migration SAP Fiori App

Custom Code Migration SAP Fiori app in SAP BTP, ABAP environment

If you use the Custom Code Migration SAP Fiori app in SAP BTP, ABAP environment instead, you don't need an installation or separate system in your landscape. Here, the SAP Fiori app is connected to your SAP ERP system using the Cloud Connector. You benefit from quarterly updates and improvements so that you always use the latest version. In a general usage scenario, the application in SAP BTP is similar to the one in an SAP S/4HANA on-premise system, which we discussed previously.

Adaptation recommendations

Irrespective of which analysis approach you have used, the system provides an SAP Note for each object of the check run's results list. This SAP Note describes the necessary adaptations in detail. The following are some adaptations that occur in many conversion projects:

- Adaptations resulting from the extension of the material number to 40 characters:
  - SAP Note 2215424 (Field Length Extension for Material Number—General Information)
  - SAP Note 2215852 (Field Length Extension for Material Number—Source Text Adjustments)
- Adaptations resulting from data model changes in sales and distribution:
  - SAP Note 2198647 (SAP S/4HANA—Changing the Data Model in Sales and Distribution)

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- Adaptations resulting from data model changes in inventory management:
  - SAP Note 2206980 (Stock Management: Changing the Data Model in SAP S/4HANA)

Total list of changed SAP objects

You can view the total list of modified SAP objects for SAP S/4HANA using Transaction SYCM. However, to do so, the ZIP file with the simplification database content must be imported. The list provides the type of modification and the corresponding adaptation SAP Note for each SAP object (Has the function or data structure changed or is the function no longer available?).

Making necessary changes

Depending on the change category, the adaptation required varies. For customer projects that include functions that will be unavailable in SAP S/4HANA, you can assume that specific custom developments will become obsolete. As a result, you'll have to check during the conversion project whether the successor function provided by SAP S/4HANA covers the business process, and you'll have to consider alternative business process extensions. If the data structure has changed (e.g., the material number has been extended to 40 characters), you'll have to adjust the custom code according to the specifications in the SAP Notes. Most adaptations can only be made after the conversion of the development system. The adaptation tools provided by SAP are therefore described in Chapter 8, Section 8.2.3 to be used after the system conversion.



Analysis of Custom Code, Based on SAP S/4HANA Adaptations

- The following blog post describes in detail how you can set up and use the ABAP test cockpit: *http://s-prs.co/527948*.
- SAP Note 2436688 contains additional information on the ABAP test cockpit within the scope of the SAP S/4HANA system conversion.
- The current content of the simplification database is available in the SAP Support Portal. SAP Note 2241080 provides information on how and where you can download the content.
- A video shows how to analyze your custom developments using the ABAP test cockpit. It is available at *http://s-prs.co/527949*. It also uses several examples to describe how you must adapt your programs.

Distribution of the Adaptation Tasks in the System Group

SAP ERP system group

Table 7.1 lists the individual adaptation tasks in the SAP ERP and SAP S/4HANA system groups. You can carry out the activities from Table 7.1 as preparatory steps in your existing SAP ERP system group.

System Role	Activity
PRD system	Activating analysis tools such as SQL Monitor (SQLM), usage procedure logging, or SCMON and Workload Monitor (Transaction ST03)
DEV system	Analyzing custom developments considering three adaptation categories: ■ General analysis ■ Analyses with regard to the SAP HANA database ■ Analyses with regard to SAP S/4HANA
	Implementing the adaptations that can be made in your existing SAP ERP system group: ■ Deleting obsolete custom developments (using the decommissioning cockpit or deletion transport from scoping, for example) ■ Developing adaptations with regard to the SAP HANA database (based on the Code Inspector checks in Transaction SCI) ■ Developing adaptations with regard to SAP S/4HANA (based on the checks in the ABAP test cockpit)

Table 7.1 Preparatory Measures in SAP ERP System Group

SAP S/4HANA system group

The activities from Table 7.2 are then carried out in the SAP S/4HANA system group.

System Role	Activity		
	Before the conversion	During the conversion	After the conversion
DEV system	(Continuation of) Analyzing custom developments considering three adaptation categories: ■ General analysis and transparency ■ Analyses with regard to the SAP HANA database ■ Analyses with regard to SAP S/4HANA	■ Adapting modified ABAP Dictionary objects (in Transaction SPDD) ■ Adapting custom developments to modified SAP S/4HANA data structures	■ Adapting modified non-ABAP Dictionary objects (in Transaction SPAU) ■ (Continuation of) Adapting custom developments to modified SAP S/4HANA data structures

Table 7.2 Activities in SAP S/4HANA System Group

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System Role	Activity		
QA system		■ Installing transport requests with adaptations in Transactions SPDD and SPAU ■ Installing transport requests with SAP HANA or SAP S/4HANA adaptations	Functional tests and performance tests
PRD system		■ Installing transport requests with adaptations in Transactions SPDD and SPAU ■ Installing transport requests with SAP HANA and SAP S/4HANA adaptations	

Table 7.2 Activities in SAP S/4HANA System Group (Cont.)

7.2.7 Database Sizing for SAP S/4HANA

When converting to SAP S/4HANA, you'll also have to migrate the SAP HANA database if you don't already operate your SAP ERP system with SAP HANA. You'll have to procure the required hardware and perform appropriate sizing for the database server before migrating to SAP S/4HANA and consider these steps in your planning.

Quick Sizer

Various options are available for sizing the SAP HANA database. One option is the Quick Sizer—a web-based tool designed for sizing new implementations of SAP HANA-based systems. For more information on the Quick Sizer, go to *http://service.sap.com/quicksizer*.

Sizing report

For system conversions, choose Report /SDF/HDB_SIZING, the ABAP sizing report, which is provided with SAP Note 1872170. This sizing report analyzes the SAP ERP source system's current memory and processing needs and outputs a report providing information on the requirements for the SAP HANA database. Besides the report, you should use the Quick Sizer for

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running additional sizing to be able to cover further requirements on innovations in the area of SAP Fiori and embedded analytics.

Sizing in SAP Readiness Check

Note that the SAP Readiness Check also provides tips for sizing. In addition, it enables you to run a simulation of database growth. Within the project, you should utilize the options to reduce the database size through data archiving, not least because you thus decrease the downtime of technical conversion.



Additional Information on Sizing

- You can find more information on sizing for SAP HANA at *https://service.sap.com/sizing*.
- In addition, read SAP Note 2303847 for more information on Report /SDF/HDB_SIZING, including guidelines and FAQs.

7.2.8 Software Update Manager with Prerequisite Check Extended

As previously described, you use SUM during the project's execution phase to perform the technical system conversion.

Overview of blocking errors

In addition, you can use SUM with prerequisite check extended (as of SUM 2.0 SP 08) as a sort of test run during the prepare phase to see which checks that are relevant for system conversion encounter errors. The advantage over the SUM's execution phase in particular is that an occurring error doesn't have to be remedied immediately before the check run can be continued. You can therefore ignore specific errors and obtain a sort of task list. The project members responsible can then work on this list in parallel before you start the actual conversion run in the execution phase. These errors should no longer occur in the conversion run.

Check run only

In this mode, you cannot perform the entire conversion run, even if no errors occur. The check run ends prior to the downtime dialog, and SUM executes a reset to the starting point. The result particularly includes the following:

- Add-ons not supported yet
- Database/operating system versions that are too low
- Inconsistencies in customer software components and ABAP repository objects (TADIR check)
- Open simplification item checks
- Open transports and inactive objects
- Open Transaction SPDD activities

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Prerequisite Check So Far

SUM has offered a prerequisite check before, which is still possible to run. This check only verifies if the database or operating system version is sufficient. It's still available because it is faster than the new check.

Selecting Prerequisite Check Extended

You select **Prerequisite Check Extended** in the second SUM dialog, after you have assigned the stack XML of the maintenance planner in the first dialog. Figure 7.23 shows that the SUM dialog provides both the previous prerequisite check and the prerequisite check extended options.

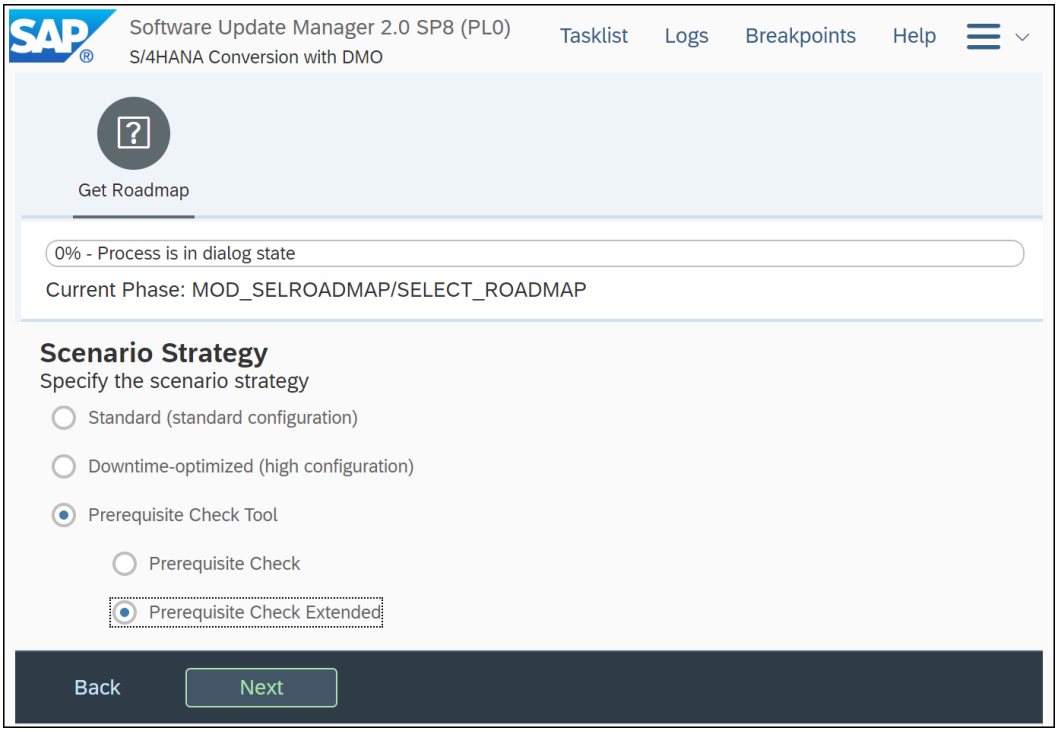


Figure 7.23 Selecting Prerequisite Check Extended in SUM User Interface

Check run possible even with blocking add-ons

In the list, we claimed that the results would also display add-ons that are not supported for the SAP S/4HANA release yet. Wouldn't the maintenance planner have to refuse to provide the stack XML file? Strictly speaking, the maintenance planner refuses this only for SAP's add-ons for which the statuses are known (and for corresponding known add-ons of partners)—and even for this category, the maintenance planner can now provide a special check stack XML file. This file enables you to run the prerequisite check extended in SUM, though it does not enable you to run the entire technical conversion.

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No simulation

Note that prerequisite check extended is not a simulation run; all steps of the uptime phases are performed in the system. However, the check doesn't generate any considerable load on the system. Neither can you ignore all potentially occurring errors.

SAP HANA database not required

If your source system is not yet running on an SAP HANA database, you need an SAP HANA target database. The option *Prerequisite Check Extended without target database* even allows you to run the check in an early stage in which the SAP HANA database is not yet provided. Meanwhile, the check is also possible for SAP S/4HANA updates. You can find additional information in the SUM conversion guide, which is listed at *http://support.sap.com/sltoolset* in the **System Maintenance** area under System Conversion to SAP S/4HANA using SUM 2.0.

7.2.9 SAP Readiness Check for SAP S/4HANA

We mentioned the SAP Readiness Check back in Section 7.1. Now that we've described the many aspects to be checked and the corresponding tools, it's time to present the SAP Readiness Check as a valuable supplement in more detail. This also gives us the opportunity to distinguish the checks from one another. Following the initial implementation, SAP Readiness Check for SAP S/4HANA 2.0 has been further developed. Another release is not planned at present, but there are regular updates and new functions. Within the scope of this book, this check is called the SAP Readiness Check.

Using SAP Readiness Check at an early stage

SAP generally recommends using the SAP Readiness Check at a very early stage, perhaps even before a decision is made with regard to the transition approach. You don't need an SAP S/4HANA license to run SAP Readiness Check, and no separate licenses are required or other costs are incurred. SAP Readiness Check gives important hints for project planning and particularly for potential preliminary projects. Such a preliminary project could involve, for example, a Unicode conversion, because you can run SAP Readiness Check even on a non-Unicode system. Later, you can run SAP Readiness Check again or update the check results to document your progress.

Setting up SAP Readiness Check

To use SAP Readiness Check, you must first prepare your SAP ERP system so that check reports can be run. You then upload the output of these reports to the actual SAP Readiness Check website to represent the results there. This procedure is described in detail in SAP Note 2913617. There, you can also find the URL for the website. This initial screen also includes a description of the approach. In your development system, you implement the SAP Notes mentioned in SAP Note 2913617, which include the check reports. Following the transport to the production system, you then run the check reports there; this is the relevant system for all customizing and data checks.

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Presentation of results

The so-called dashboard of SAP Readiness Check presents the results of the checks in tiles, which are typical for SAP Fiori. Figure 7.24 uses a sample customer to show the results screen of SAP Readiness Check. You see an overview for each area, and you can navigate to the details by selecting the header of a tile.

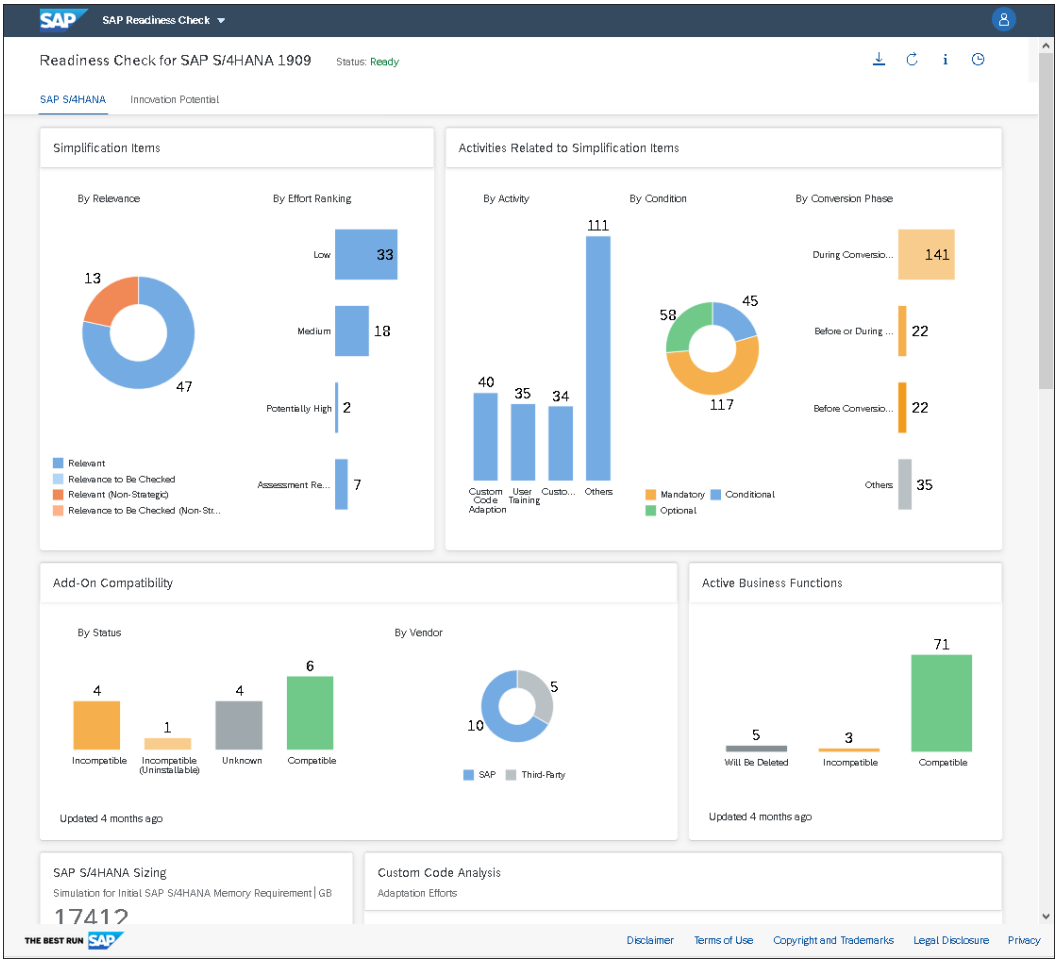


Figure 7.24 SAP Readiness Check for SAP S/4HANA

Covering other check tools

As mentioned in Section 7.1, SAP Readiness Check covers several other checks. In general, SAP tries to design the checks in SAP Readiness Check as comprehensively as possible and particularly tries to achieve the level of detail of the individual checks. When checking add-ons and business functions, SAP Readiness Check uses the check function of the maintenance planner, so the checks are identical here. This also applies to simplification item checks, for which SAP Readiness Check even offers additional filter and comment functions.

Nevertheless, the individual checks are not obsolete: without the add-on check of the maintenance planner, this tool will not provide any software archives or stack XML. Likewise, you can set exemptions only in the simplification item checks in your SAP ERP system; this isn't possible in SAP Readiness Check. You can only generate the transport request for SUM in the Custom Code Migration SAP Fiori app in order to delete unused custom developments from the system.

In addition, SAP Readiness Check offers several other checks—for example, for interfaces. It lists the appropriate SAP Fiori apps, and the list of checks is enhanced continuously.

SAP Readiness Check versus SUM prerequisite check extended

You ideally run SAP Readiness Check at a very early stage, perhaps before the project starts. But you will start SUM's prerequisite check extended only shortly before the first sandbox conversion. The checks that are run by these two tools overlap to some extent. This is particularly the case for simplification item checks. SUM prerequisite check extended can run checks directly in the system, to which SAP Readiness Check does not have access—for example, for inactive objects and inconsistencies in the customer software components and ABAP Repository objects. We recommend executing both checks at the appropriate time.



Additional Information

For more information on SAP Readiness Check for SAP S/4HANA, refer to the following links:

- *http://s-prs.co/527950*
- *http://s-prs.co/527951*
- *http://www.sap.com/readinesscheck*

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Chapter 8
Executing System Conversion

After you have carefully checked and prepared the SAP ERP source system, it's time to start the technical conversion. This chapter describes the essential aspects, provides tips for reducing the downtime, and lists subsequent activities.

After you have prepared your SAP ERP system for the technical system conversion using the tools and procedures described in Chapter 7, you can now proceed with the execution of the conversion. Besides using the Software Update Manager, this entails additional activities that partially take place during downtime and in downstream processes.

Section 8.1 initially describes how to use SUM. Section 8.2 details the activities that you need to run after SUM. Section 8.3 discusses how you can estimate the duration of the downtime and shorten it in the ideal case.

8.1 Using Software Update Manager

Basis administrators have known about SUM since 2011. SUM is designed to reduce downtime during software installation. The steps that SUM performs for SAP S/4HANA system conversions do not differ from the steps that SUM performs for SAP Business Suite upgrades. This section therefore focuses on steps that are specific to SAP S/4HANA or that are new in this context.

Three core tasks of SUM

In general, SUM carries out three core tasks of various system conversion phases:

1. **Converting the software to SAP S/4HANA**
   SUM installs the new SAP S/4HANA software on the SAP ERP source system. For example, SUM replaces the SAP_APPL software component with the S4CORE SAP S/4HANA basis component.
2. **Migration to the SAP HANA database**
   If your SAP ERP system is based on a different database, SUM migrates the database to SAP HANA using SUM's Database Migration Option.

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3. **Converting the application data to the new SAP S/4HANA data structure**
   Because some data structures in SAP S/4HANA change (e.g., data structure changes for stock management—table MATDOC), SUM converts the application data from the old data structure to the new data structure.

As you will see, SUM will not perform all necessary conversions into the new data structure; some must be performed manually after SUM. Section 8.2.1 describes this in more detail.

In-place procedure

If the source system is not yet based on the SAP HANA database, you need to change the database host during database migration within the scope of conversion. There is no host change at the application server (or instance) level. For this reason, the conversion is also referred to as an *in-place procedure*.

Figure 8.1 provides an overview of the essential SUM steps.

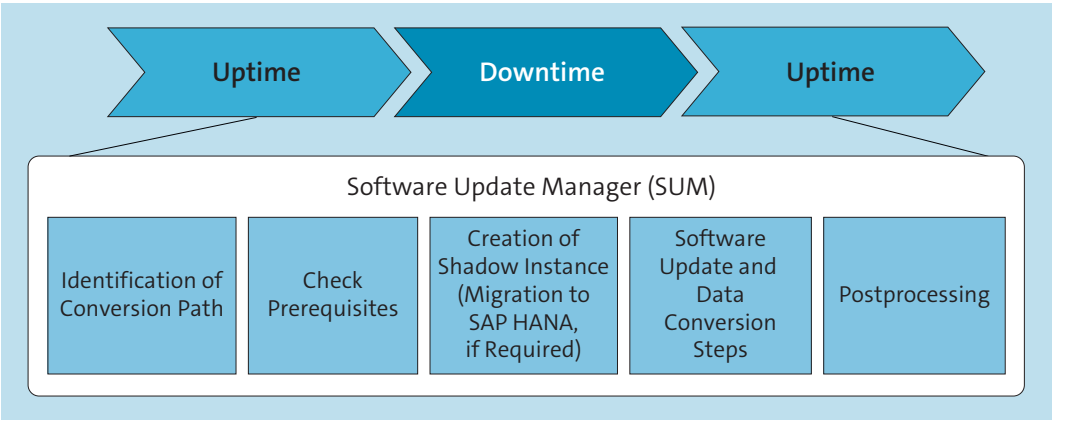


Figure 8.1 System Conversion Steps in SUM

Preparing for SUM

You must complete the following steps before you start SUM:

1. Using maintenance planner for preparing the stack XML and the required software archives
2. Solving all open simplification item checks successfully

Because you must specify the storage location of the stack XML in the first SUM dialog, you cannot start SUM for conversion without a successful planning in the maintenance planner. If simplification item checks are still open, you may start SUM, but it will stop with corresponding errors at the latest before the start of the downtime. This verifies, for example, whether the business partners have been assigned to customers and vendors. If not, the SUM procedure stops because this is a prerequisite for the next step: converting your application data from your old data structure to the new data structure in SAP S/4HANA.

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SAP Readiness Check for SAP S/4HANA Is Not a Prerequisite

Note that you do not need to run SAP Readiness Check before you start SUM, although doing so is highly recommended. SUM does not check whether the SAP Readiness Check was performed. However, it constitutes some framework for many checks that you must have already completed in detail—for example, simplification item checks.

Based on the stack XML, which contains the maintenance information, the system determines the best path to converting to SAP S/4HANA. Figure 8.2 shows the initial screen of SUM in which you enter the storage location of the stack XML. In the first execution step, SUM analyzes prerequisites for the SAP S/4HANA system conversion. In addition to technical version checks for the operating system and the database version, SUM also analyzes the business requirements.

System switch upgrade procedure

In general, the *system switch upgrade procedure* is used for the SAP S/4HANA system conversion. With this procedure, an additional instance of the target release (*shadow instance*) is generated on the application server parallel to the live system. This shadow instance works with the *shadow repository*, which contains basis tables for the new release, for example. Jointly, the shadow instance and shadow repository are referred to as the *shadow system*. The uptime activities of the shadow system reduce the downtime.

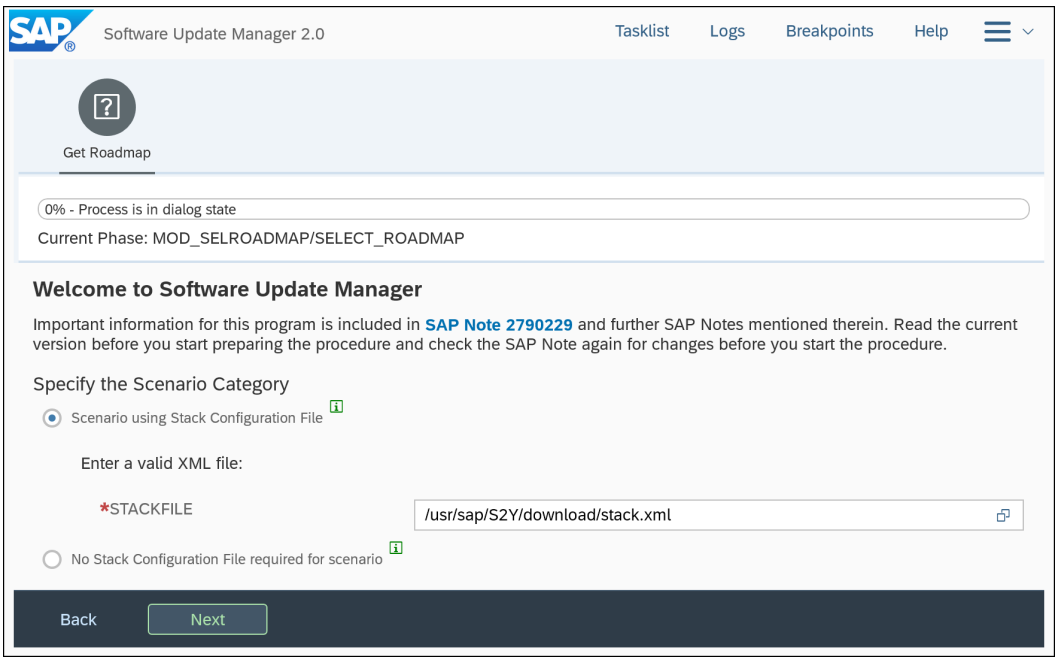


Figure 8.2 Specifying Stack XML Location

Shadow Repository in the Target Database

There is a source and a target database if the source system is not running in the SAP HANA database yet. In previous SP versions, SUM created the shadow repository in the source database. This is technically no longer possible for SAP S/4HANA target release 1909 or higher. Since SUM 2.0 SP 08, SUM therefore generally creates the shadow repository in the SAP HANA target database, now also for target release SAP S/4HANA 1809. The shadow instance runs on the application server; nothing was changed here.

If the SAP ERP source system is not yet based on the SAP HANA database, the administrator is prompted to enter corresponding target information for the new database. Figure 8.3 shows the screen for entering the database system ID and instance number.

System Conversion Uses Load Procedure

In the load procedure, the new repository is built from the content provided by SAP, and non-SAP objects are added. This requires a correct identification of non-SAP objects (i.e., customer and partner objects). SAP Note 2318321 provides a description of and more information on the preparation.

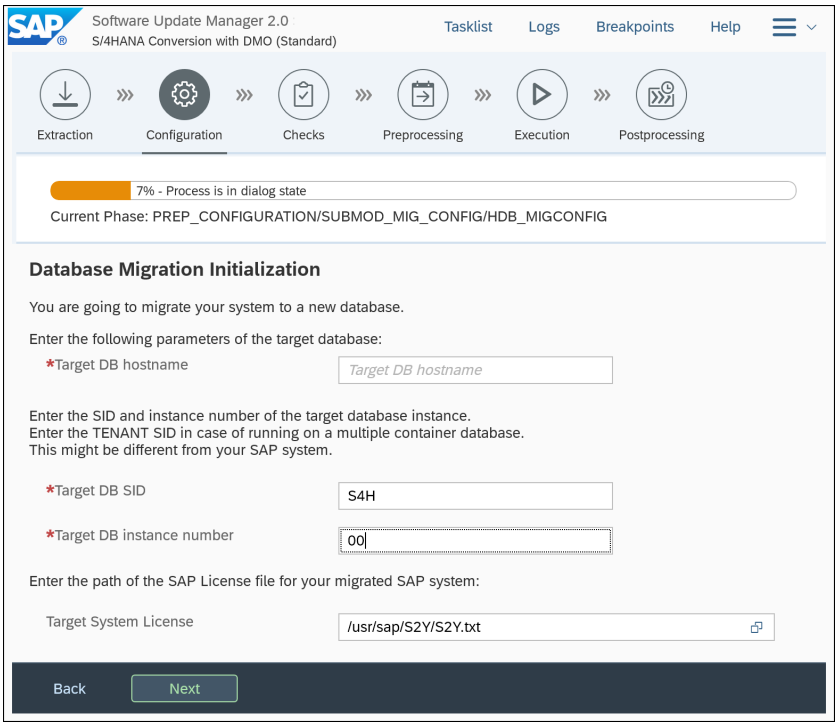


Figure 8.3 Specifying Target Database in DMO Case

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Downtime phase

When the production system is shut down, the downtime phase of the system conversion starts. In this SUM phase, some of the application data is converted from the old data structure to the new data structure, for example. This procedure is also referred to as *data conversion*. Ideally, you only see that the SUM execution process is running, as shown in Figure 8.4.

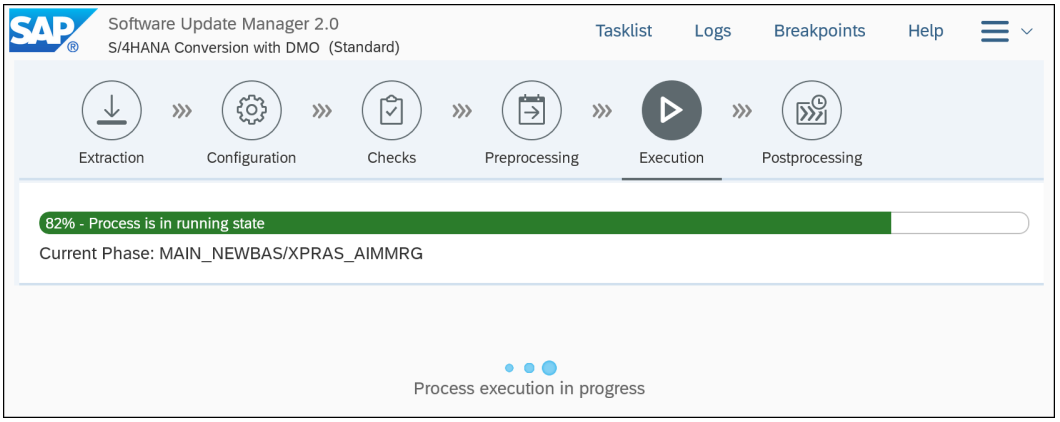


Figure 8.4 SUM Steps during Downtime

After all conversion steps have been performed successfully, the SUM execution phase is completed, and the system will display the final screen shown in Figure 8.5.

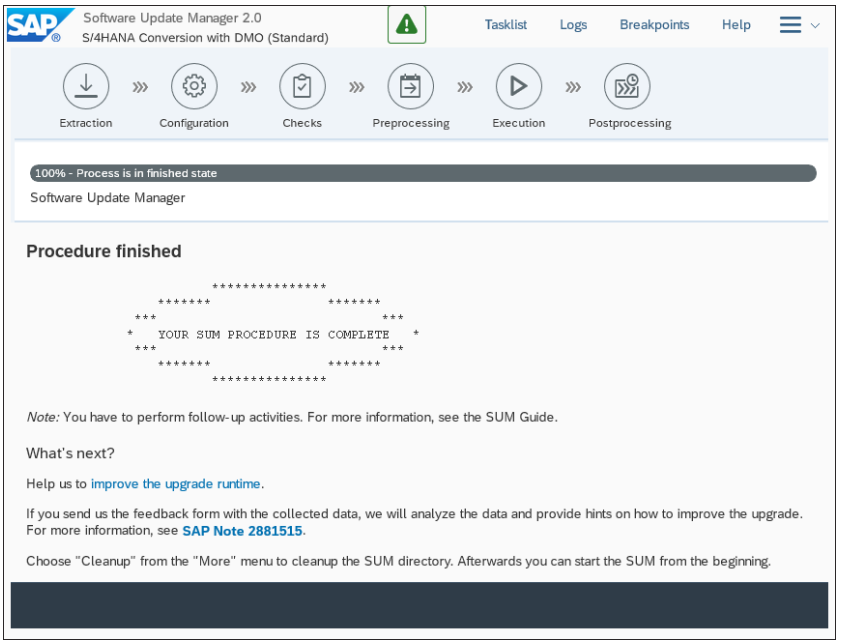


Figure 8.5 End of SUM Execution Phase

Postprocessing

The end of the execution phase sets the stage for the postprocessing phase during downtime, which is discussed in Section 8.2.

SUM analysis file

You can trace the execution of all steps in the SUM analysis file (UPGANA.XML), which provides detailed information on the system, the database size, and the runtimes of the individual SUM phases.

SUM maintenance strategy

For SUM 2.0, a new SP version is provided three times per year, as specified in its maintenance strategy. The available SP version provides corrections via patch levels (with the **In Maintenance** status). If a new SUM SP version is available, the previous SP version is no longer provided in the download area. Nevertheless, this old SP version is still maintained (with the **Patch on Request** status). As soon as the second-to-next SP version is available, the maintenance ends, and SAP can no longer provide any patches in case of a problem (the status is then **Out of Maintenance**). For critical systems, the production system in particular, you should therefore ensure in your project planning that you do not use an outdated SUM SP version during conversion. If the project takes longer than eight months, for example, you should switch to a new SP version during an early project phase. The maintenance strategy is attached to the SAP Note of the current software logistics tool set with which SUM was delivered. The central SAP Note 1563579 for the software logistics tool set always references the current SAP Note that contains this attachment.



Additional Information on Software Update Manager

- For more information on SUM, go to *http://support.sap.com/sltoolset*.
- The SAP Community Hub for SAP S/4HANA provides a SUM-specific blog at *http://s-prs.co/52792006*.

8.2 Activities after SUM

Although SUM is a core element of the technical conversion, you still must perform additional activities before users can leverage the SAP S/4HANA system. For example, SUM has not executed the data conversion for accounting. This section describes this activity and all other activities required.

8.2.1 Converting Accounting

Partial data conversion

SUM executes the data conversion to the new data model only for some parts of the application areas. You must perform the remaining data con-

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version after the SUM runtime is complete. The implementation guide (IMG, Transaction SPRO) lists and documents all necessary activities for this purpose. The official name for these activities is *conversion of accounting to SAP S/4HANA*; we'll call it *FIN conversion* in this book.

FIN conversion means downtime

After the SUM run is complete, the SAP system is in some intermediate state. The ABAP system is running, but because the necessary data conversion has not been completed yet, the system must not be used in production by the end users (downtime). FIN conversion is of special importance in this context. FIN data typically represents an essential share of the SAP ERP source system's database volume, and thus the migration of this data is also an essential factor for downtime.

You as the application expert start the IMG in this phase, for example, using Transaction SPRO. In Figure 8.6, the relevant nodes, **Preparations and Migration of Customizing** and **Data Migration**, are expanded.

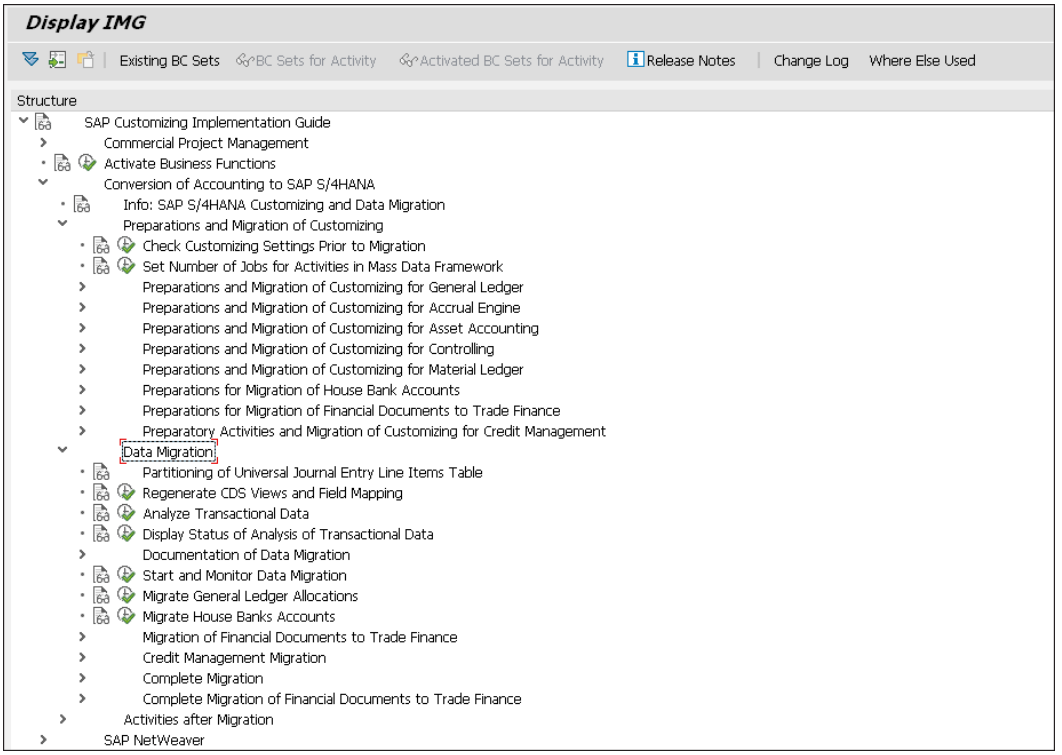


Figure 8.6 FIN Conversion as Part of IMG (SAP S/4HANA 1909)

The necessary activities, which are shown in Figure 8.6, are release-specific; in SAP S/4HANA 1909, for example, the **Conversion of House Bank Accounts** activity is automatically performed within FIN conversion.

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Guide for FIN Conversion

The attachment of SAP Note 2332030 contains a comprehensive description of the activities that are necessary in the IMG.

Storing customizing in the request

You will first create the corresponding customizing for the SAP S/4HANA system in a converted copy of the production system and store it in a transport request. You can then add this transport request to SUM in downstream systems of the landscape.

FIN conversion with potential errors

For the FIN conversion, which can only be performed after customizing, the SAP S/4HANA system performs consistency checks that are stricter than in the SAP ERP source system. So you must expect that the FIN conversion will result in errors in the first run. You must then analyze and remedy them before you can complete the migration run. Remedying inconsistencies is particularly important for the SAP ERP production system so that no errors occur during the subsequent conversion of this system; this would constitute downtime for the system.



FIN Data Check Now Also Possible in the Source System

Due to the meaning of the FIN data consistency, SAP provided the corresponding data checks for the SAP ERP source system in SAP Note 2755360. You can use them to check and cleanse your FIN data prior to the technical SUM conversion.

Starting and monitoring FIN conversion

The actual FIN conversion takes place in the **Start and Monitor Data Migration** step, which you can see in Figure 8.6 under the **Data Migration** node. You can also call this monitor using Transaction FINS_MIG_STATUS. Figure 8.7 shows a migration run with errors in the transactional data and for the migration of the house bank accounts.



The Terms Data Migration and Conversion

As you certainly have noticed, the terms *conversion* and *data migration* are used synonymously in this section. They refer to the conversion of data from the old data model of the SAP ERP system to the new data model of SAP S/4HANA. Technically, this is the transfer of table content from previous tables to new tables in which the fields' data format may also be adapted. Section 8.2.2, which discusses silent data migration, also includes this conversion.

In the other sections of the chapters that discuss system conversion, however, *migration* refers to the database migration from a non-SAP HANA database to SAP HANA.

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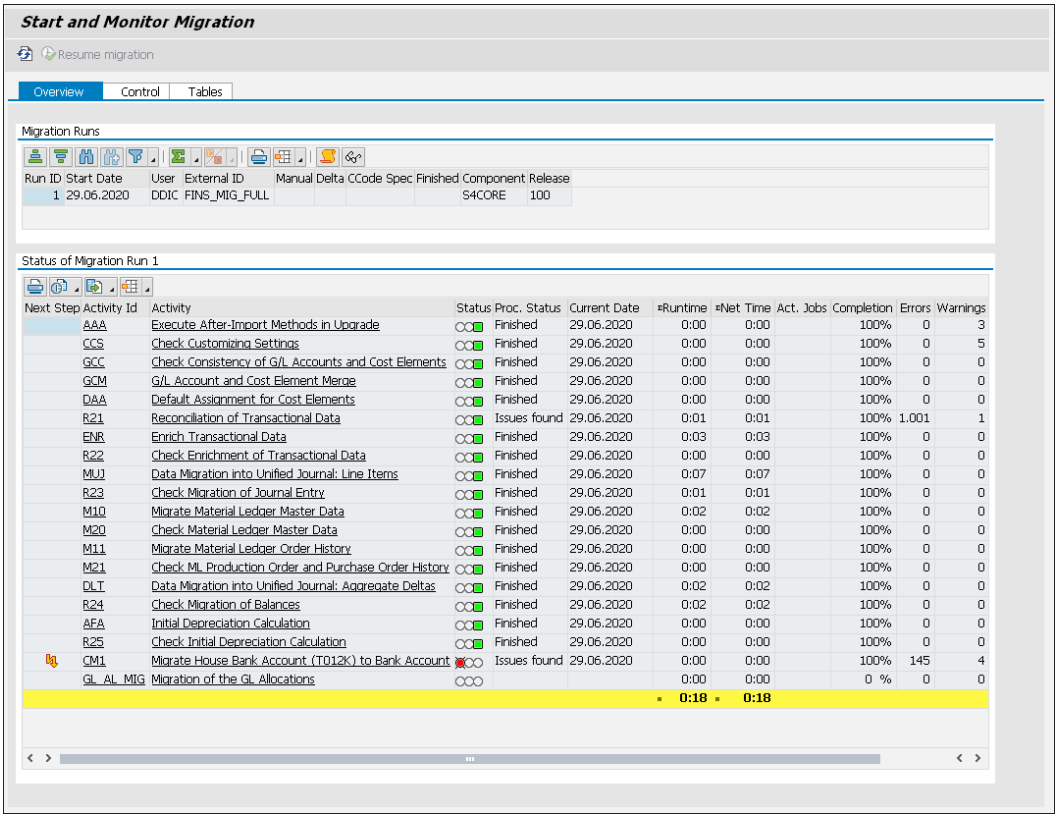


Figure 8.7 Starting and Monitoring FIN Conversion

8.2.2 Monitoring Silent Data Migration

During the upgrade of an SAP S/4HANA system to higher versions, adaptations may be required that are described as *simplification items* and that lead to a modification of the data model. To reduce the downtime caused by the associated data conversion, SAP has introduced the *silent data migration* concept.

Conversion after the downtime

Silent data migration populates the tables or table fields that are newly introduced with the target release after the downtime using appropriate background jobs. The term *silent* indicates that end users do not notice this procedure at all. SAP applications can work with the appropriate tables or table fields irrespective of whether the data conversion has already taken place or not. Only the subsequent SAP S/4HANA release requires the fields to be fully converted. Silent data migration must therefore be completed prior to the next release upgrade at the latest.

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No Silent Data Migration for a Jump Upgrade

If you skip an SAP S/4HANA release for which silent data migration was planned during an upgrade—for example, if you upgrade from SAP S/4HANA 1809 to SAP S/4HANA 2020—the appropriate migration is made during downtime. The successor release SAP S/4HANA 2020 requires that the fields introduced with 1909 have already been populated.

Creating users for background jobs

Silent data migration is performed not only for an SAP S/4HANA upgrade, but also for a system conversion to SAP S/4HANA 1909 or higher. A prerequisite for this is that appropriate users have been created for the background jobs. SUM provides this option already in the conversion run. Alternatively, you can create the users in all clients manually using Transaction SDM_USER. Monitoring the jobs for silent data migration is possible in Transaction SDM_MON.



SAP Notes on Silent Data Migration

Read SAP Notes 2664638 and 2821421 for more information on silent data migration.

8.2.3 Adapting Custom Developments

After you have determined and analyzed the adaptation requirements for your custom developments, as described in Chapter 7, you must adapt the relevant sections of your custom programs using ABAP Development Tools in Eclipse (ABAP in Eclipse). You make these adaptations in the development system following its conversion because only then will the new data model and the new objects be available.

Making adaptations in ABAP development tools

In general, you can use the ABAP Workbench for functional adaptations. However, you cannot edit CDS views and ABAP Managed Database Procedures (AMDP) there. So you should make all adaptations directly in ABAP in Eclipse. The ABAP test cockpit is also available there. As shown in Figure 8.8, you can right-click your selected program to open a context menu and run the ABAP test cockpit check (**Run As • 4 ABAP Test Cockpit With...**).

Use the provided Code Inspector check variant, `S4HANA_READINESS_REMOTE`, for this purpose. Using the example of MB transactions, which was discussed in Chapter 7, the ABAP test cockpit check prompts you to replace direct calls of the MB transactions with Transaction MIGO. For example, if you use `call transaction 'MB11'` in your code, you must replace this call with `call transaction 'MIGO'`. Once this replacement is made, another ABAP test cockpit check run will no longer have any results and you can use your custom development in SAP S/4HANA.

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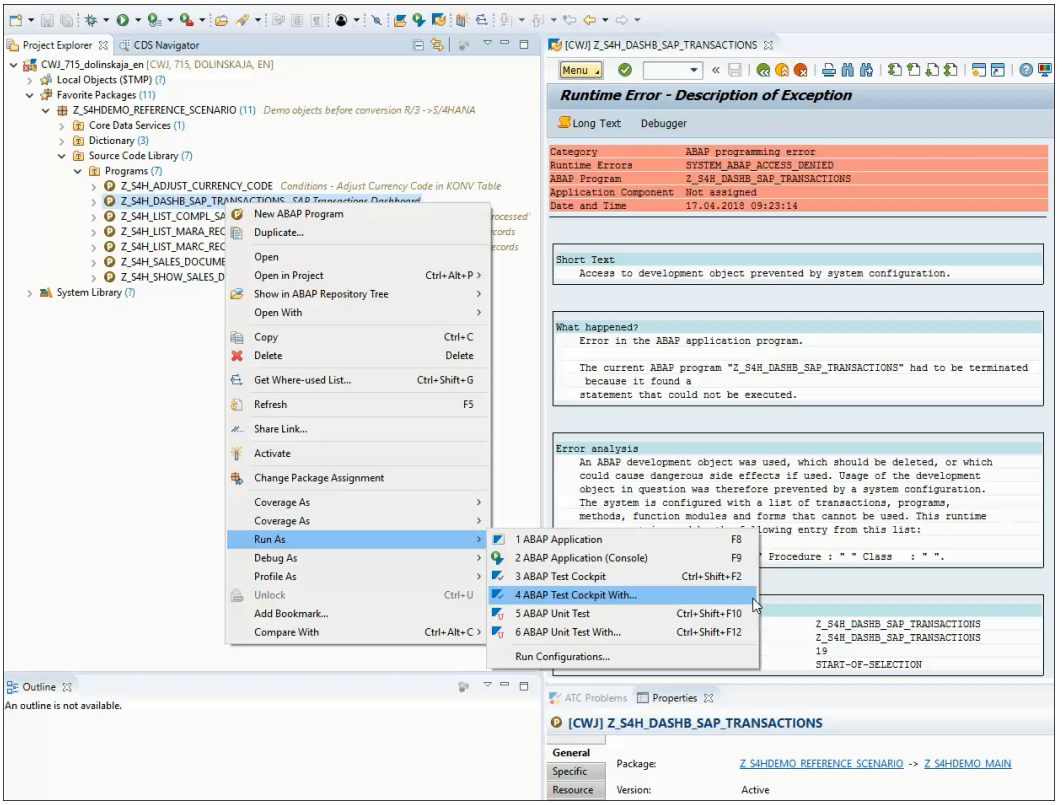


Figure 8.8 Running ABAP Test Cockpit Check in ABAP in Eclipse

Quick fixes in ABAP Development Tools

The ABAP test cockpit in ABAP in Eclipse also offers *quick fixes*—that is, quick implementations of typical adaptations, such as for the MATNR field length. A quick fix is also provided for the required ORDER-BY statement for sorting result lists during database accesses (see Figure 8.9).

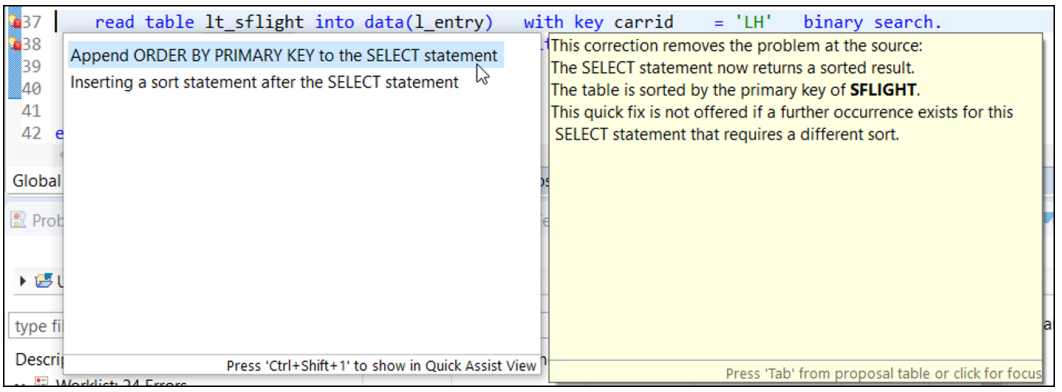


Figure 8.9 Quick Fix for ORDER-BY Statement in ABAP in Eclipse

A quick fix is also available for data model changes—for example, for tables KONV and BSEG. Moreover, quick fixes can be applied in bulk: you can apply the adaptations to all hits within a package or a software component.



Information on Adapting Custom Developments

- You can find a list of questions and answers for adapting custom developments during system conversion at *http://s-prs.co/527961*.
- The following blog post describes the options of quick fixes: *http://s-prs.co/527962*.

Performance adaptations

In addition to adapting the ABAP syntax of your programs, during the transition to SAP S/4HANA you should also leverage the options of the SAP HANA database to optimize the performance of your programs. For example, you should check if you can optimize SQL statements and which ones. By means of the ABAP SQL Monitor, you can determine how often and with which runtimes a SQL statement is executed.



Performance Optimization

Additional detailed information on performance optimization is available in the best practices document at *http://s-prs.co/527963*.

8.2.4 Setting Up the SAP Fiori Frontend Server

SAP Fiori Launchpad

SAP Fiori launchpad, which runs in web browsers (or in SAP Business Client in case of the SAP S/4HANA on-premise version) is the end user's sole central access point to the SAP S/4HANA system (see Chapter 2, Section 2.4).

Frontend server

SAP S/4HANA needs a *frontend server* for SAP Fiori user interfaces because SAP Fiori launchpad cannot communicate directly with the backend server. From the technical perspective, the frontend server is SAP Gateway. If you already use an SAP Gateway system, you can also use it as a frontend server for SAP S/4HANA.

Because SAP Fiori launchpad leverages the frontend server for communication, users log on not to the SAP S/4HANA backend but to the frontend server. You can also use SAP GUI, but then the user would have to toggle between SAP GUI and SAP Fiori with two different logon methods when accessing SAP GUI interfaces directly. SAP therefore recommends using the SAP Fiori launchpad as the entry point to SAP S/4HANA and as the new standardized SAP system user interface. Using the SAP Fiori launchpad makes switching between various programs unnecessary, unlike in the tra-

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ditional SAP Business Suite, in which content from SAP GUI sometimes opened in a web browser.

SAP Gateway version

Let's go over how to set up the frontend server. If you want to use an existing SAP Gateway system, you'll need to consider the SAP NetWeaver version and patch version required for your SAP S/4HANA version.

Components

The following frontend server components are used for the SAP S/4HANA user interface:

- The web server transfers the data to the web browser on your computer or on mobile devices using SAPUI5 technology.
- SAP Gateway uses OData services to communicate with the SAP S/4HANA backend.
- The SAP Fiori launchpad provider provides the data model and services for SAP Fiori launchpad.

For analytical SAP Fiori apps, you'll also need SAP Web Dispatcher (reverse proxy).

Deployment options

Various options are available for integrating the frontend server into your system landscape:

- A central hub deployment of the frontend server for SAP Fiori
- An add-on deployment of the frontend server for SAP Fiori (also called an embedded deployment or codeployment)

Each option has advantages and disadvantages, which we'll describe in detail next. We hope the explanations in the following sections help you to identify the best option for your landscape and your technical and business requirements.



Online Support for Using SAP Fiori in SAP S/4HANA

The following links provide the latest information on getting started with SAP Fiori in an SAP S/4HANA new implementation:

- SAP Fiori in the SAP Community:
  https://community.sap.com/topics/fiori
- SAP Fiori for SAP S/4HANA in the SAP Community Wiki:
  http://s-prs.co/527954
- Blog on SAP Fiori in the SAP Community:
  http://s-prs.co/527952
- Recommendations on SAP Fiori:
  http://s-prs.co/527953

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Central Hub Deployment

Central hub

This section describes implementing and using a custom on-premise frontend server. Although this scenario results in an additional SAP NetWeaver system in your system landscape, installing a frontend server as a central hub has the following advantages when compared to an embedded or add-on implementation in the same system:

- Software updates for SAP Fiori are decoupled from the SAP S/4HANA backend system.
- UI innovations for SAP Fiori and other UI content can be consumed faster.
- You can also leverage the SAP S/4HANA frontend server to some extent as the frontend server for other systems in the same SAP system landscape (problems arise in the case of a different release version of the other SAP system).
- Scalability is better because you can accommodate an increasing number of users independent of the backend.
- Because the display server and data retention server are separated, data security is improved.

Add-on Deployment

Add-on

Although it's technically feasible to implement the frontend server as a separate stack in a custom landscape for the reasons described in the previous section, the double-patching and standardizing of all versions (so that they can collaborate without any problems) may result in practical disadvantages in daily operation. For this reason, the SAP recommendation was adapted for production landscapes in favor of an embedded or add-on deployment in the same system in which the SAP S/4HANA backend is installed. Previously, this type was propagated for implementation in test systems (like for the SAP S/4HANA fully activated appliance that includes an embedded frontend server; see Chapter 6, Section 6.2).

Installation

As when we actually installed the SAP S/4HANA system before, you'll have to perform sizing before installing the frontend server. Then you'll perform the actual installation using the Software Provisioning Manager and implement the SAP S/4HANA add-ons for the frontend server.

Finally, you'll have to carry out manual postprocessing tasks that mainly refer to the configuration. You can access the necessary installation files using the maintenance planner.

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Additional Implementation Information

The following link points to more and up-to-date information on the implementation of the frontend server: *http://s-prs.co/527964*.

8.2.5 Migrating to SAP Fiori User Interfaces

This section explains how to switch from traditional, SAP GUI-based user interfaces to the new SAP Fiori interfaces. First, you'll have to perform basic installation steps for SAP Fiori, as described in Section 8.2.4. The relevance analysis helps you determine which SAP Fiori apps are relevant for you. This relevance analysis is based on your transaction usage statistics and was described in Chapter 7, Section 7.1. When implementing the SAP Fiori apps, you can migrate the applications gradually depending on the requirements of your users.

Planning the installation in the maintenance planner

After installing SAP Fiori components, you can configure the infrastructure, including SAP Fiori launchpad. Analogous to installing SAP S/4HANA, the installation is integrated into the Software Logistics Toolsets of the maintenance planner and SUM.

Customizing the conversion

The options provided by SAP S/4HANA's new, attractive, intuitive, and efficient user interfaces are just one dimension of an SAP S/4HANA conversion project. Another dimension is how to migrate to the new user interfaces and their new way of working.

In this section, we'll address migrating from traditional user interfaces to the new SAP Fiori-based user interfaces, which will be available after the conversion project is completed. However, you can continue to use SAP GUI transactions after converting your system to SAP S/4HANA. In general, all of your users' transactions and favorites before the upgrade will still be available in the ABAP backend after the system conversion.

Exceptions include transactions that are omitted in SAP S/4HANA for simplification reasons and for which the simplification list communicated modifications.

Note that SAP S/4HANA's new functions are usually only provided with SAP Fiori-based user interfaces. Thus, the question is not *whether* you migrate to the new user interfaces but *how* you perform the migration and which steps you carry out.

Gradual migration

Figure 8.10 illustrates a possible gradual migration from traditional SAP ERP user interfaces to a target architecture based on SAP Fiori.

Integrating various applications

Following this model, you would first introduce SAP Fiori launchpad, which will serve as the central, web-based entry point for all users that will use the

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SAP S/4HANA system. In SAP Fiori launchpad, you can consolidate applications from various user interface technologies (SAP GUI, portals) on multiple devices (desktop PCs, tablets, smartphones).

You can integrate traditional user interfaces and continue to use your functions and business processes in the same way as before the system conversion.

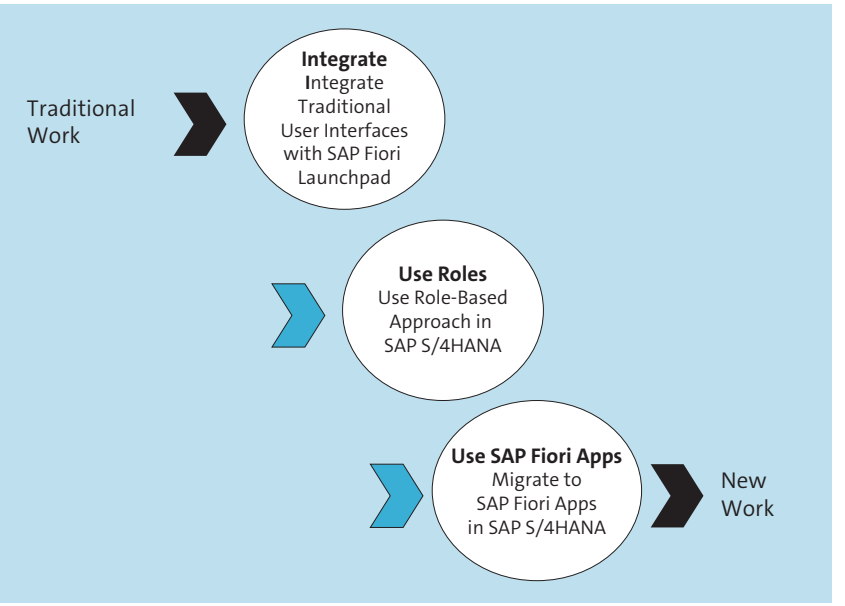


Figure 8.10 Gradual Migration to New User Interfaces

For example, you can integrate a selection of Web Dynpro-based and SAP GUI-based applications from your ABAP backend or integrate entries from the SAP Easy Access menu with SAP Fiori launchpad. The design of traditional interfaces has also been adjusted to match the design of SAPUI5-based SAP Fiori apps to support a uniform user experience.

Role-based access

Immediately after you have converted your system, you should grant end users role-based access to the SAP Fiori launchpad. In role-based access, you'll break complex applications down into useful task-based subunits. End users will only access the user interfaces they require for carrying out the steps for which they are responsible and authorized to perform.

For example, managers need different information than administrators. Managers often process approval steps on their mobile end devices, while administrators often need access to detailed interfaces to process exceptional cases. If you use predefined roles and authorizations, you can define which apps, and what data, users are authorized to access.

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The App Finder (the app store in SAP Fiori launchpad) enables users to select the apps for their roles that support their tasks in the best possible way. In this context, whether the app is an SAP Fiori, SAP GUI, or Web Dynpro ABAP application doesn't matter. You can also integrate custom SAP Fiori apps into the App Finder.

Replacing obsolete applications

In the next step, you can decide whether to use SAP Fiori apps even further and replace all of your traditional user interfaces. Many enterprises start this migration by modifying their individual process steps.

For example, you can adapt approval processes or processes for travel expenses mainly for mobile end devices, which may be used most often. Next, you can adjust core business processes that affect a limited number of users. Then you can modify business processes that affect the majority of your end users.

Ultimately, you'll have to decide yourself how and how quickly you want to migrate to the new SAP Fiori user interfaces.



Additional Information

- You can find additional information about the SAP Fiori Relevance and Readiness Analysis in the SAP Fiori apps reference library or in the user guide found at *http://s-prs.co/527965*.
- For more information on the new Quartz Light interface schema and its availability in SAP GUI for HTML, SAP GUI for Java, and SAP GUI for Windows, read SAP Note 2789396.
- Deployment recommendations for the SAP Fiori frontend server are available at *http://s-prs.co/527955*.
- For more information on the App Finder, go to *http://s-prs.co/527956*.
- The following topic page provides a central entry point for SAP Fiori in the SAP Community: *https://community.sap.com/topics/fiori*.

8.2.6 Deleting Obsolete Data

Data conversion keeps old data

A core aspect of system conversion is the transition to the new data model and the data conversion associated with it. In this data conversion, you transfer the table content of previous tables to new tables. However, old table content is not simply deleted. On the one hand, the deletion could prolong the downtime. On the other hand, the data may be required for troubleshooting. Not all old data is obsolete, but which data will still be used depends on the application.

Framework for deleting data

If you want to get rid of data that are no longer required after the conversion of your production system, you can use SAP's *obsolete data handling*

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concept. For this purpose, SAP provides the necessary framework in a report, with rules that define the content that can be deleted. This may comprise specific columns or rows or entire table content, depending on the rule defined by SAP application development. You can utilize the report, which is described in SAP Note 2661837, as of SAP S/4HANA 1809 FPS 01 and higher. You must register in order to utilize it in the initial release, SAP S/4HANA 1809. This is described in the same SAP Note.

Deleting obsolete data in the production system

With this report, you can delete data that is no longer required in the production system after system conversion without requiring any downtime. A prerequisite, however, is that you tested the data deletion rules in a copy of the production system and have the latest backup of the database available. Figure 8.11 shows the selection screen of the corresponding report.

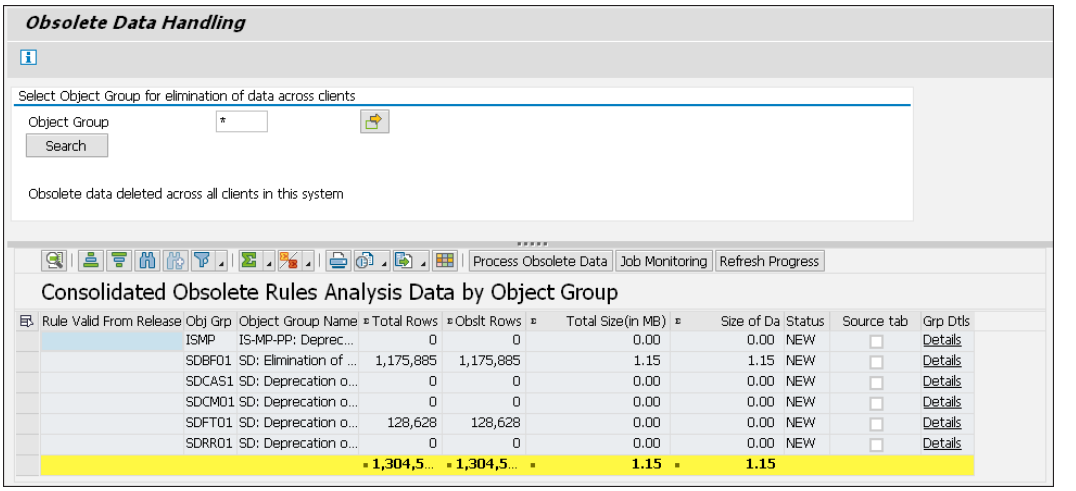


Figure 8.11 Selection Screen of Report for Deleting Obsolete Data



Additional SAP Notes about Obsolete Data Handling

In addition to SAP Note 2661837, also read SAP Note 2569435 for the MM-IM area and SAP Note 2190137 for tables in financials.

8.3 Estimating and Reducing the Downtime

For most projects, it's highly relevant how long the system's *downtime* is because the SAP ERP source system is of central importance for the business processes that are used in the enterprise and any downtime should be kept as short as possible.

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Factors influencing the downtime

The length of downtime depends on various customer-specific factors and optimization measures implemented in the conversion system. For example, the system resources used, the database size, the amount of application data to be converted, and basic factors such as the customer network play important roles in downtime. Varying importance is attached to downtime depending on the system category. For example, you could accept more downtime and might reserve less system resources for converting a test system.

Figure 8.12 shows the blocks that are decisive for technical downtime and for business downtime.

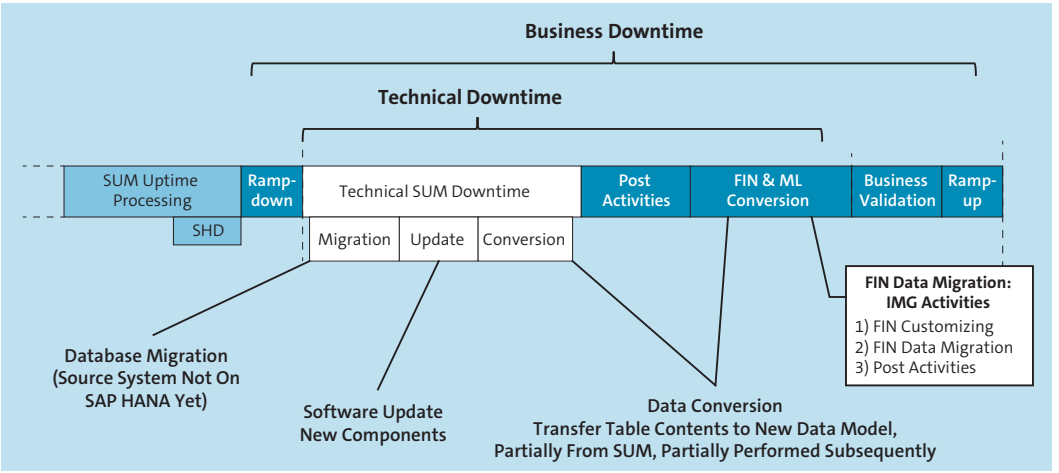


Figure 8.12 Downtime Processing Blocks

Business downtime versus technical downtime

Technical downtime consists of SUM's processing blocks (technical SUM downtime) and the IMG activities, such as the FIN conversion in particular. The *overall downtime*, usually referred to as *business downtime*, is relevant for the project. During the business downtime, users cannot use the system productively. The business downtime also includes blocks such as ramp-down and ramp-up, as well as business validation, that do not arise from the conversion tools themselves. During all discussions in the project, you should always state exactly what downtime you are talking about to avoid misunderstandings.

SUM feedback form

At the end of the SUM run, SUM provides a feedback form to give SAP feedback on your experience with the procedure and the tool (see Figure 8.5). Together with this feedback, SAP receives statistical data about the phases' runtimes. SUM collects this data in the UPGANA.XML file, which you can view under the menu path **More • SUM Utilities • SUM Analysis** during the SUM run. You should use this feedback option at least for your production

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runs because this statistics data is stored on an internal database at SAP. Future projects can benefit if a broad database of previous project experience is available. On the one hand, this data is used to develop improvements. On the other hand, it enables better predictability of runtime. In addition, SAP also considers your general feedback on the procedure.

Technical Downtime Optimization app

You can now view the statistical data of UPGANA.XML, which is transferred to SAP in the Technical Downtime Optimization app in the SAP Support launchpad. You can find the app on the launchpad's initial screen or call it via *http://s-prs.co/527957*. The app not only provides a graphical display of the various uptime and downtime blocks, but also gives tips on optimizing the downtime. You can use this app to upload statistical data for the FIN conversion that takes place after the SUM run. This data is available via Report FINS_MIG_APPLANA_XML and is provided in the APPLANA.XML file. As a result, the Technical Downtime Optimization app gives a complete overview of the blocks relevant for downtime. Figure 8.13 gives an impression of the graphical display. SAP Note 2881515 provides additional information on the Technical Downtime Optimization app. If you use the feedback form after the SUM run, the SUM dialog also lists a link to the Technical Downtime Optimization app. You can't see this link in Figure 8.5 because the feedback form hasn't been used there.

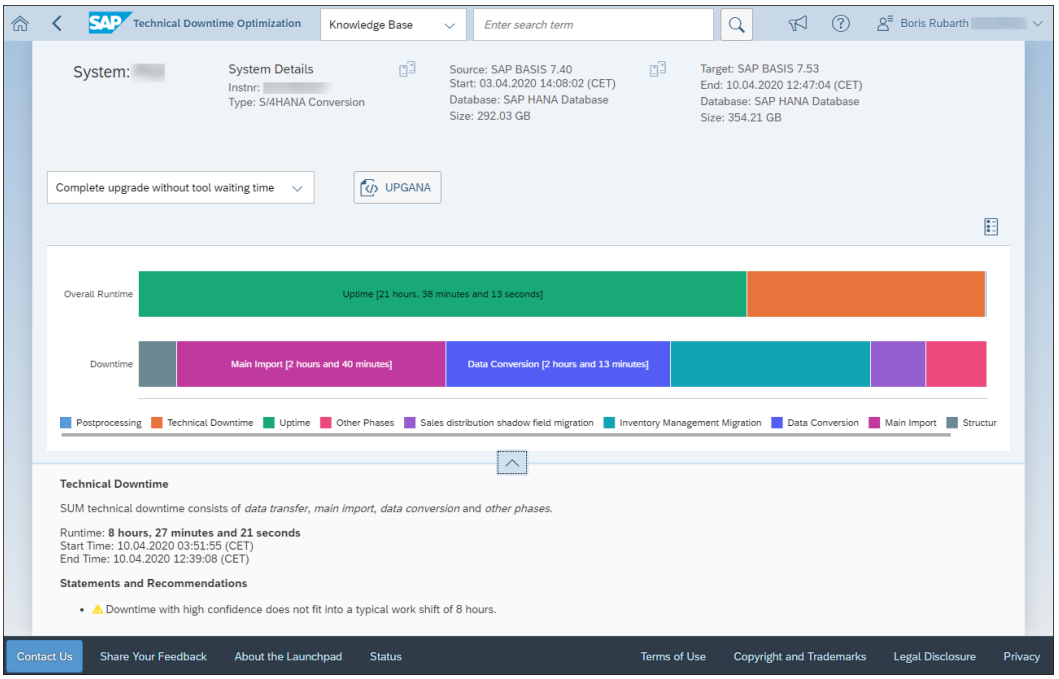


Figure 8.13 Graphical Display in Technical Downtime Optimization App

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Downtime comparisons in SAP Readiness Check

In the future, SAP plans to list the downtime of comparable systems in SAP Readiness Check when you plan your system conversion. This could give you a first impression at an early stage of the project about the experiences from other projects. A more precise estimation, however, is only possible through an optimized conversion run in a current copy of your production system. The optimizations possible are presented in the following parts of this section.

Approaches for reducing downtime

Basically, three approaches are available for SAP S/4HANA system conversion:

- Default procedure (with or without DMO)
- Downtime-optimized conversion
- Near-zero downtime technology (NZDT) as a service offer

The following sections describe all three approaches.

8.3.1 Tuning of the Standard Conversion

Archiving reduces downtime

The essential blocks of downtime comprise database migration (if required) and data conversion to the new data model of SAP S/4HANA. Both parts scale with the database size of the SAP ERP source system; they can be reduced by archiving application data prior to system conversion. After the system conversion, you configure the access to the archives previously created. As a result, the SAP S/4HANA system can still access theses archives.

Moreover, the number of processes assigned is also decisive for the migration and data conversion. For data conversion, SAP Note 2351294 provides optimization options and refers to other useful SAP Notes.

Charts control center

To optimize the migration, you should monitor system loads in test runs and optimize the number of configured `R3load` processes if required. The charts control center lets you monitor and adapt running `R3load` processes (see Figure 8.14).

During migration, SUM logs the actual migration duration for each table in so-called duration files. After a test run, you should store these files in the download directory for the next SUM run so that SUM can optimize the table splitting that is calculated automatically. This table splitting is used to reduce the migration time and is performed in the first approach based on the table size. But if the duration files provide the actual migration time for each table, you can optimize the table splitting.

Migration rate

Under normal conditions, it should be possible to obtain a migration rate of at least 300 GB/hour. Much higher rates are also possible; this value serves as a tip in case you experience lower rates, so that you then check the framework conditions more closely, for example, the network connection.

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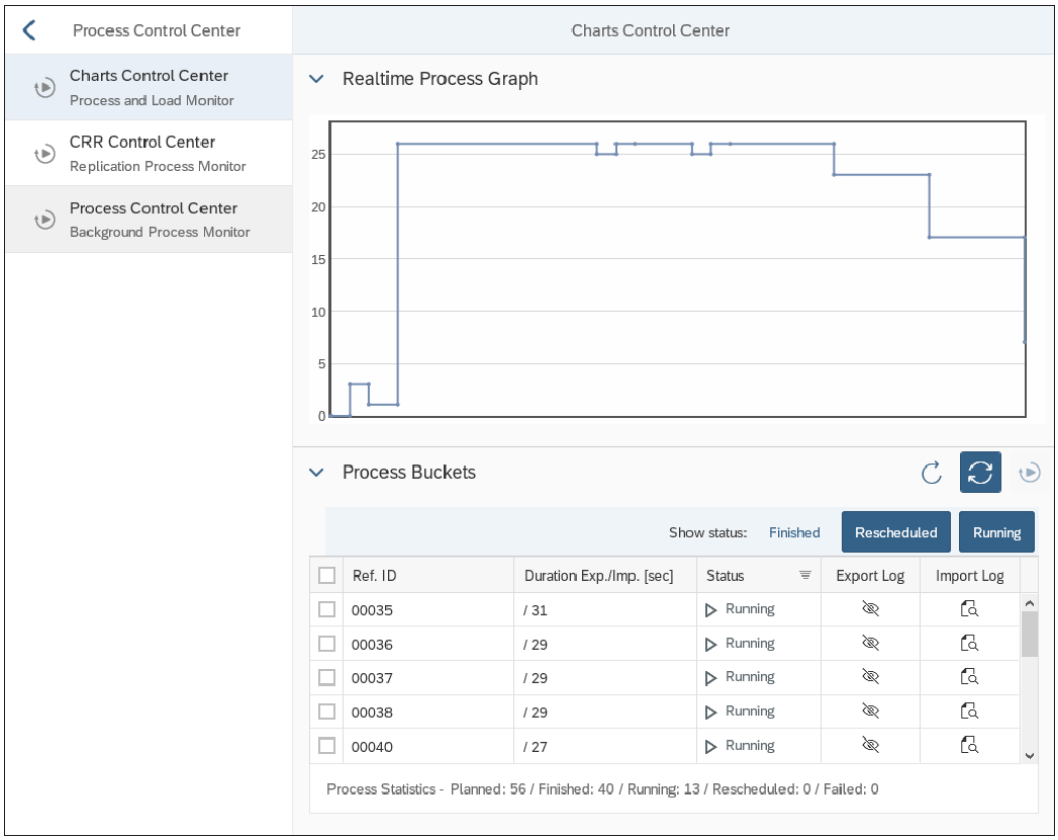


Figure 8.14 Charts Control Center



Blog on Optimizing Migration

For a blog post describing the approaches mentioned here and offering tips on optimizing the migration part, visit *https://blogs.sap.com/?p=135725*.

8.3.2 Uptime Migration (Downtime-Optimized DMO)

If the SAP ERP source system is not yet based on the SAP HANA database, you can further optimize the migration part of the downtime. Since SUM 2.0 SP 06, you can use the *uptime migration* (or *downtime-optimized DMO*) approach.

Migration of large application tables during uptime

This approach enables you to migrate selected large application tables, which have a major share of migration time, already during uptime. The changes that end users make to these tables during uptime are recorded and replicated by SUM. You can use uptime migration not only for system

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conversions but also for migrating an SAP Business Suite system to the SAP HANA database using DMO.

Uptime migration only partly useful for system conversion

For system conversion, tables affected by the new SAP S/4HANA data model must not be selected for uptime migration in this approach. For example, for uptime migration, you must not select the finance tables whose content is transferred to the new tables during finance data conversion. Consequently, this approach will provide only a little downtime reduction for most conversion projects. Only for source systems in which finance data accounts for a relatively small share of the database volume can uptime migration enable a considerable downtime reduction. Nevertheless, we want to describe this approach briefly, particularly because the procedure is also relevant for downtime-optimized conversion, which is discussed in Section 8.3.3.

Selecting uptime migration in the UI

Figure 8.15 shows the second SUM dialog for the scenario strategy that offers the uptime migration, as well as the downtime-optimized conversion approach.

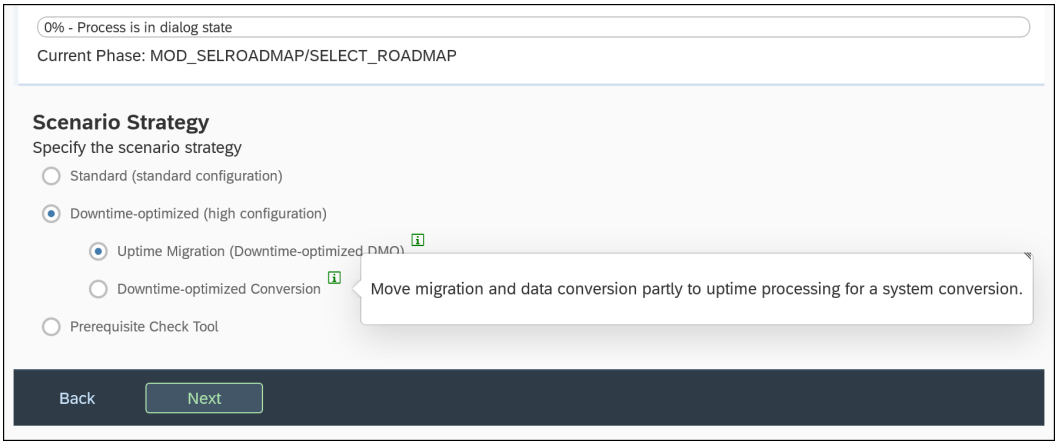


Figure 8.15 SUM Dialog for Scenario Strategy

Manual selection of the tables to be migrated

In a subsequent dialog, you specify a text file that lists the names of the tables to be migrated during uptime. SAP Note 2547309 indicates the restrictions that apply for selecting the tables. For these tables, SUM then creates database triggers that log changes to the tables. Report RSUPGBA_DODMO_SELECT, which is described in the DMO guide, supports you in selecting the tables for uptime migration.

Replication monitor in the SUM user interface

Once SUM has migrated the content of the specified tables to the target database, it can use the database triggers as the basis to replicate the changes that the end users made to the tables. You can monitor the replication rate in the SUM user interface. The downtime dialog lists the rate as well.

You should consider SAP Note 2547309 for the uptime migration. This SAP Note lists the prerequisites and restrictions—for example, supported database types for the SAP ERP system. Finally, please note once again that uptime migration can only reduce the migration share of the downtime, not the data conversion. To also move this share to uptime, the downtime-optimized conversion approach is available, which is discussed in Section 8.3.3.



nZDM for Source Systems in SAP HANA

Uptime migration is only available for source systems that are not yet based on the SAP HANA database. For systems that already run on SAP HANA, you can use the near-zero downtime maintenance (nZDM) approach instead. nZDM moves one part of the SUM activities to the uptime, but not the data conversion to the new data model of SAP S/4HANA. nZDM has been generally available in SUM for several years. SAP Note 1678565 provides additional information on this topic.

8.3.3 Downtime-Optimized Conversion

Migration and data conversion during uptime

The approach of *downtime-optimized conversion* moves the migration and the data conversion to SUM's uptime processing. Here, parts of the data conversion that are made in the standard conversion after SUM are performed by SUM directly—in particular, FIN conversion. In contrast to uptime migration, which can only be used in the case of a migration (source system to non-SAP HANA database), the downtime-optimized conversion is also available for SAP ERP systems that are already running on the SAP HANA database. In this case, the migration share in the procedure and the downtime is not applicable, of course. Figure 8.16 compares the processing blocks for standard and downtime-optimized system conversion.

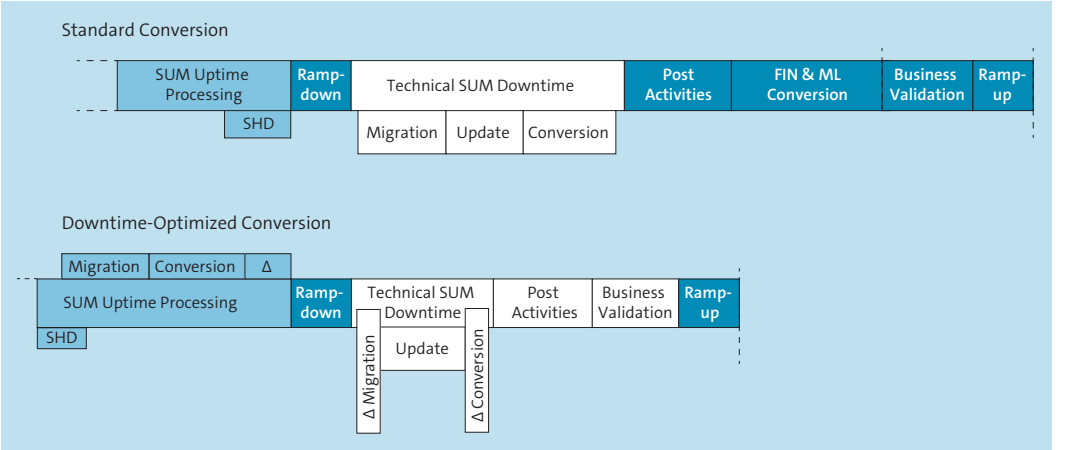


Figure 8.16 Processing Blocks of Downtime-Optimized Conversion

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As was described for uptime migration, SUM uses database triggers to record the activities of the end users. The selection of tables that are migrated and converted during uptime is stored in SUM. In addition, for specific projects, you can add large application tables for uptime migration to SUM. These manually selected tables are then migrated during uptime according to the uptime migration approach described in Section 8.3.2.

Uptime replication in parallel to user activity

During uptime, SUM performs an initial migration and data conversion of the table content concerned. The delta that is created through user activity during this time is then migrated to the SAP HANA database using replication. In parallel to this running replication during uptime, there are further user changes to the tables so that not all changes can be replicated during uptime. For this reason, SUM will migrate and convert the remaining delta at the beginning of the downtime.

FIN Customizing request required

Because SUM starts the FIN conversion already during uptime, it also requires the FIN Customizing created in the standard procedure only after the SUM run (see Figure 8.12). So prior to the actual downtime-optimized conversion run, you need to perform a standard conversion run to set up the FIN Customizing and need to store it in a customizing request. This request is then provided to SUM for the downtime-optimized conversion run. In addition, there are other aspects that increase the project effort in this approach, which are aimed at reducing the downtime for the production system's system conversion.

This approach is currently provided as a pilot procedure. A release for, for example, certified consultants, is possible in the future. The NZDT approach, which is described in Section 8.3.4, reduces the downtime even further than the approach of downtime-optimized conversion.



Information on Downtime-Optimized Conversion

You can find details on using the downtime-optimized in the SAP Community in the blog post at *http://s-prs.co/527958*.

8.3.4 Near-Zero Downtime Technology

NZDT as a service

NZDT as an SAP service can reduce downtime considerably. This technology is provided for system conversions and other scenarios, such as updates and upgrades. This service is part of minimized downtime services.

Conversion of system clones

From a technical perspective, NZDT is based on SUM, but it also uses other tools and technologies to record and replicate user changes, which is similar to the downtime-optimized conversion. NZDT creates a system clone of the production system on which you perform the system conversion, while

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the users can continue their work in the original system. As a result, the downtime blocks shown in Figure 8.12 run during uptime. Once the changes to the production system are synchronized, the changeover to the target system takes places during a short downtime. Figure 8.17 shows the process schematically.

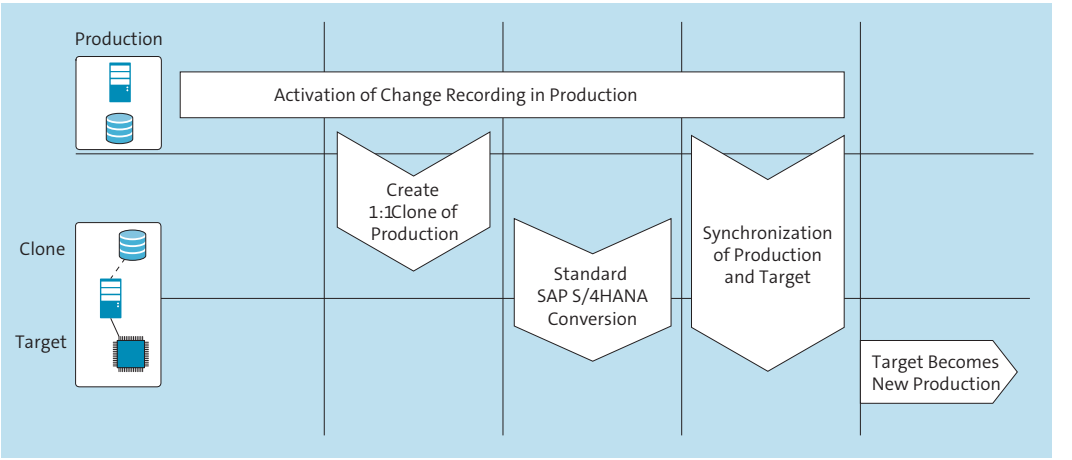


Figure 8.17 NZDT Principle Using Clone of Production System

In contrast to the downtime-optimized conversion, you also change the application server level in this procedure. Here both the hardware requirements and the project effort are higher than in a standard conversion.



Information on SUM Approaches

The page at *http://s-prs.co/527959* provides an up-to-date overview of the different approaches for reducing the downtime for the system conversion and for updates and upgrades in general. In particular, you shouldn't confuse the NZDT SAP service with the nZDM SUM procedure. The latter is a generally available approach in SUM to reduce downtime.

This somewhat more complex NZDT procedure is customer-specific and consulting-intensive and is therefore offered as a service that is subject to charge. SAP Note 693168 provides more details on the MDS approach.

8.4 Insights from Previous Customer Projects

Since the first edition of this book (early 2017), many SAP customers have implemented an SAP S/4HANA system conversion. In general, the average project durations (from project start to go-live) are between seven to ten

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months, and they are typically shorter than comparable greenfield projects. In many cases, many customers first perform the technical conversion to the SAP S/4HANA platform and then adapt the new functions and new user interfaces in a second project phase.

In general, you should start early to familiarize yourself with the tasks at hand. Many checks can be run without requiring a license for SAP S/4HANA. They can provide valuable insights prior to the actual project start.

Using SAP Readiness Check at an early stage

SAP Readiness Check is a central entry point for evaluating the situation. It particularly provides information on third-party add-ons so that you can ensure support from this side at an early stage. If only SUM points out that it will not continue without information on third-party add-ons, you risk that your project plan will be delayed. SAP Readiness Check also provides information on application adaptations that may be required—for example, the introduction of the business partner.

These two examples illustrate that the system conversion is not just a task of the IT department alone. From the very beginning, you must approach the project as a joint task of basis, development, and applications and clarify the availability of the relevant roles.

Familiarization with innovations

Familiarize yourself with the innovations of SAP S/4HANA at an early stage. The simplification item catalog is an entry point—or even better, the result of the simplification item checks for your concrete system in SAP Readiness Check. You should also clarify the degree of usage of SAP Fiori user interfaces, particularly if you haven't deployed this technology yet. Here too, a close collaboration of the basis and application departments is important. SAP now recommends embedded deployment for the SAP Fiori frontend server. The innovations of SAP S/4HANA also require that you schedule time for training users and for change management.

Evaluating custom developments at an early stage

For adapting custom developments, it is initially important to start the collection of usage statistics at an early stage. Only in the case of a long runtime will you get a realistic picture of which development objects are actually used. Here too, you must familiarize yourself with the new options of SAP S/4HANA. On the one hand, there may be application functions in the standard SAP delivery that make your custom developments obsolete. On the other hand, the concepts of CDS and embedded analytics (see Chapter 2, Section 2.6) also provide new technology approaches that could replace your previous custom developments. This typically means that a large share of custom developments can be omitted and do not have to be adapted. For objects that are to remain, you can initiate the adaptations that are required for the SAP HANA database in the SAP ERP source system.

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Considering data archiving

Timely data archiving also reduces the effort. This reduces not only the downtime for the technical conversion, but also the amount of data that may need to be corrected due to the stricter consistency checks of SAP S/4HANA.

Several test conversions

Also, schedule two to three test conversions of a sandbox system (copy of the production system). Write down the steps and insights of the individual test conversions so that your production conversions can benefit from them. Custom project planning can only happen after you have completed an initial conversion of a sandbox system.



Book on System Conversion

In summer 2020, SAP PRESS published a book on system conversion: *SAP S/4HANA System Conversion Guide*. You can find more details at *www.sap-press.com/5035*.

With this, we close the part on the transition scenario system conversion, and switch to transition scenario new implementation.

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PART IV

New Implementation and Data Migration According to the Greenfield Approach

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Chapter 9
SAP Activate

SAP Activate is the key to successfully adopting SAP S/4HANA and SAP S/4HANA Cloud. It replaces all previous implementation models and contains SAP Best Practices, tools, and methodology.

With SAP Activate, SAP has launched an implementation framework that supports enterprises to implement SAP software effectively and quickly. For this purpose, the framework combines SAP Best Practices (ready-to-use digitalized business and technology processes), tools for adaptation and extensibility, and an implementation methodology.

Successor of ASAP

The method introduced with SAP S/4HANA replaces all previous standard methods. SAP Activate is therefore the successor to the former ASAP implementation method. The ASAP-procedure model (AcceleratedSAP) was designed and used for SAP R/3 in the 1990s, to replace and standardize traditional software implementations. Then and now, the underlying concept has been using a standardized method to provide all customers with the knowledge gained from previous projects. Consequently, ASAP combined proven business best practices and project management methods. This approach, new at the time, defined a procedure that could be implemented more quickly than previous procedures. However, standardization also reduced flexibility in some cases. Over time, ASAP was further enhanced (the latest version, ASAP 8, was introduced in 2013) and could be used for new implementations, software enhancements (e.g., with new components), and upgrades. Because SAP Activate replaced ASAP, the latter is no longer further developed.

Successor of SAP Launch

The successor to ASAP is SAP Activate. Designed for both SAP S/4HANA implementations and cloud solutions, SAP Activate is the successor not only to ASAP but also to SAP Launch, which had been used for SAP Cloud solutions (e.g., SAP SuccessFactors or SAP Ariba) until now.

Key questions

The SAP Activate method answers the following questions and is thus an integral part of adopting SAP S/4HANA and SAP S/4HANA Cloud:

- How can I implement SAP S/4HANA or SAP S/4HANA Cloud successfully?
- Where can I find a task list for implementing SAP S/4HANA or SAP S/4HANA Cloud?

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- How can I implement SAP S/4HANA or SAP S/4HANA Cloud most effectively?
- How can I use SAP Best Practices for the implementation of SAP S/4HANA or SAP S/4HANA Cloud?

The following sections answer these questions by describing the concept behind and the individual phases of SAP Activate.

9.1 SAP Activate Content

In addition to SAP Best Practices and methodology, SAP Activate also offers tools for adaptation and extensibility and thus takes simplification and standardization a step further. SAP Activate provides general procedures and tools for a successful implementation of the software.

Goals of SAP Activate

The desired business value is a faster, more intuitive software implementation—whether for SAP S/4HANA or SAP S/4HANA Cloud. Innovations will be available more quickly throughout the entire product lifecycle.

In addition, it should be mentioned that SAP Activate is an integral part of SAP S/4HANA and SAP S/4HANA Cloud and therefore does not require any additional licenses.

Figure 9.1 shows an overview of the three components: SAP Best Practices, methodology, and tools for adaptation and extensibility.

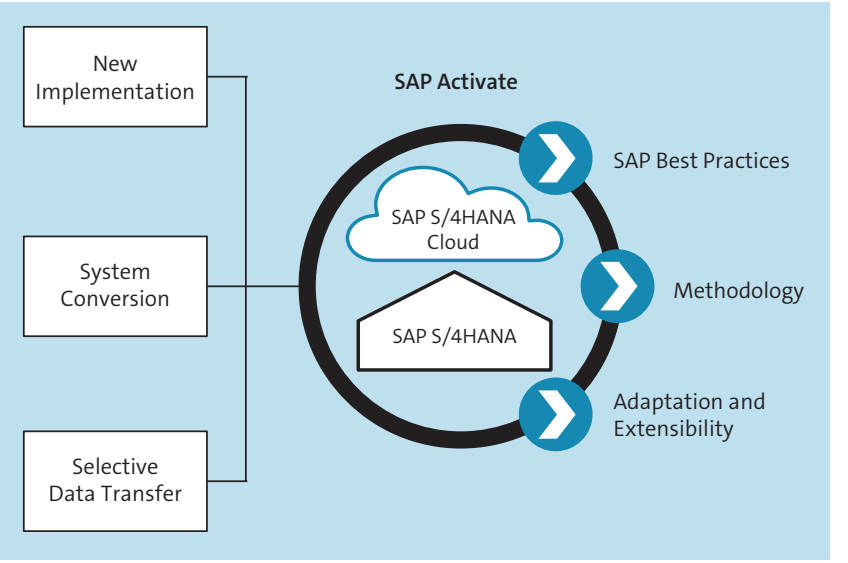


Figure 9.1 Overview of SAP Activate

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Goals of SAP Activate

In summary, the goals of SAP Activate are as follows:

- Simplifying the adoption of SAP S/4HANA and SAP S/4HANA Cloud with a combination of SAP Best Practices, methodology, and tools for adaptation and extensibility
- Delivering predefined, ready-to-use, and digitalized business and technology processes that are optimized for SAP S/4HANA and SAP S/4HANA Cloud
- Deploying SAP Best Practices for transformation, migration, integration, and configuration of SAP S/4HANA and SAP S/4HANA Cloud

SAP Activate results in a faster, less service-intensive initial implementation and eases subsequent maintenance of SAP S/4HANA and SAP S/4HANA Cloud for all SAP S/4HANA customers, irrespective of implementation method selected. The benefits are an accelerated time to value and a lower total cost of ownership.

Modules

The following sections introduce the SAP Activate modules, which are also shown in Figure 9.2: SAP Best Practices for SAP S/4HANA, tools for adaptation and extensibility, and the new methodology of SAP Activate.

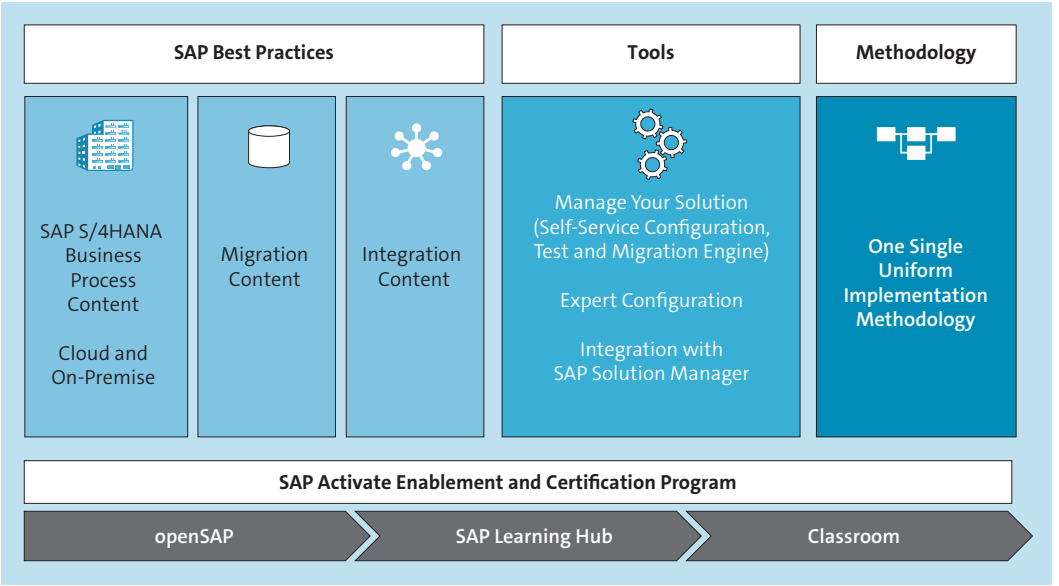


Figure 9.2 SAP Activate Modules

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9.1.1 SAP Best Practices

SAP Best Practices

SAP Best Practices contains preconfigured, ready-to-use business and technology processes. Customers and partners have free access to SAP Best Practices packages for SAP S/4HANA and SAP S/4HANA Cloud via SAP Best Practices Explorer. Figure 9.3 shows the solution packages within SAP Best Practices Explorer.

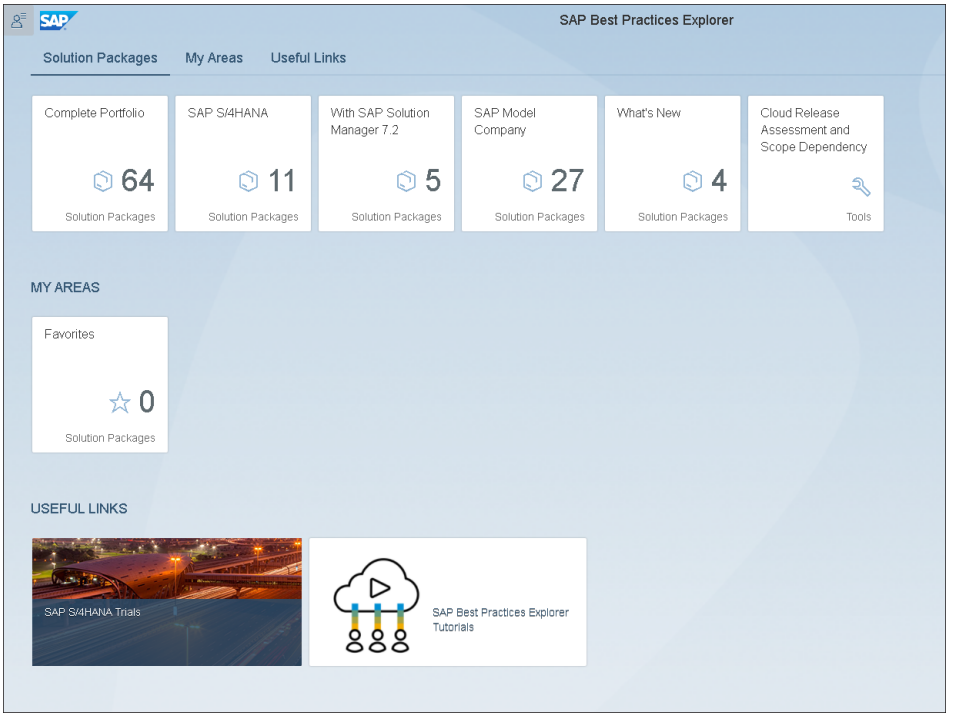


Figure 9.3 SAP Best Practices Explorer

You can gain experience with SAP Best Practices using an SAP S/4HANA test version (a so-called trial system). Within the trial system, you are provided with defined user roles and predefined business scenarios in different business areas (sales, financials, procurement, manufacturing, and project management).



Trial System

You can access the test versions provided by SAP at *http://s-prs.co/527966*. With the trial system, you can choose between your own SAP S/4HANA trial hosted by a cloud provider and an SAP S/4HANA Cloud trial that you share with other users (see Chapter 6). You don't have to pay any license fees for the trial period. Note, however, that hosting costs are incurred if you use the SAP S/4HANA trial.

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This trial access enables you to get a first impression of SAP S/4HANA's functions and the SAP Fiori user interface. The guided tours through the provided SAP Best Practices scenarios can be useful. For more information on the trial systems, see Chapter 6.

SAP Business All-in-One

SAP Best Practices was introduced in SAP Business All-in-One (BAiO, previously MySAP All-in-One) more than 10 years ago. SAP Best Practices was a preconfigured SAP solution based on a standard SAP ERP system (or on a standard SAP CRM system for SAP CRM Best Practices).

The difference between an SAP Business All-in-One system and an SAP ERP system was that SAP Business All-in-One included customizing that was specifically preconfigured for medium-sized enterprises. As a result, systems that strictly followed the SAP standard could be implemented successfully and quickly and could be operated more easily by small and medium-sized enterprises (SMEs). The individual best practices were available in packages via SAP Service Marketplace for free. All users can download these packages via their S-user accounts. Moreover, these best practices also laid the foundation for specific SAP partner industry solutions.

Rapid-deployment solutions

The next step involved the development of the concept for large enterprises in the form of rapid-deployment solutions (RDS). The difference between SAP Activate and previous best practices and rapid deployment solutions is that SAP Activate includes all best practices as part of the SAP S/4HANA product and in SAP S/4HANA Cloud.

SAP Best Practices for migration

Using SAP Best Practices for migration is discussed in Chapter 12 and covered in more detail in Chapter 13.

During an implementation of SAP S/4HANA, you can use SAP Best Practices to ensure that your implementation remains close to the SAP standard.

Instead of starting with an empty system, you can use the configuration and the customizing of a model company as an example (see Chapter 6). The entire SAP Best Practices package in SAP Activate is specifically designed and optimized for SAP S/4HANA and SAP S/4HANA Cloud and shares with the historical best practices only its name. For example, the SAP Best Practices processes in SAP S/4HANA use the SAP Fiori user interface by default whenever possible, and SAP Best Practices for building your own SAP Fiori applications are also available.

Scope item group examples for best practices

The central part of SAP Best Practices for SAP S/4HANA is the so-called scope item group (baseline), which contains ready-to-use business processes for basic SAP components (e.g., for financial accounting in FI for every enterprise. The version (localization) of this scope item group involves much more than adapting the logon language and translating the

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documentation. It also provides SAP Best Practices that include content on individual countries—for example, for financial closings according to International Financial Reporting Standards (IFRS), closings according to United States Generally Accepted Accounting Principles (US-GAAP) in the United States, or per the German Commercial Code (HGB, German-GAAP) in Germany. In the FI area, SAP Best Practices are available for the following business processes, for example:

- Accounting and financial close
- Asset accounting
- Accounts payable
- Accounts receivable
- Internal order
- Profitability and cost analysis
- Period-end closing

Flow charts

Integral parts of SAP Best Practices are test scripts (previously called business process documents) and process flows. Figure 9.4 shows the process flow for asset accounting, retirement.

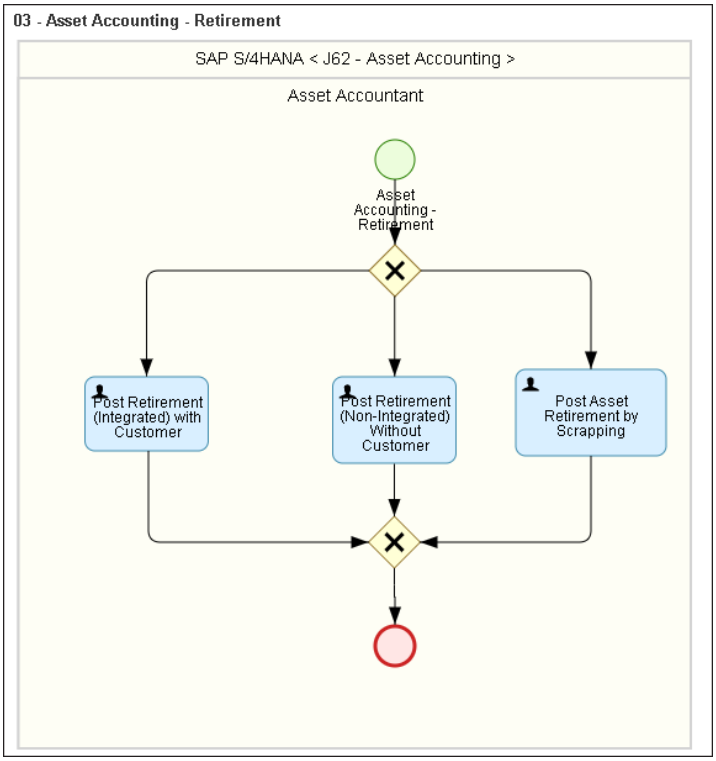


Figure 9.4 Example Process Diagram from SAP Best Practices: Procurement Process

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SAP Best Practices Explorer

You can find more information on SAP Best Practices in the SAP Best Practices Explorer at *https://rapid.sap.com/bp*. The following links provide direct access to SAP Best Practices for the individual editions:

- SAP S/4HANA: *http://s-prs.co/527969*
- SAP S/4HANA Cloud: *http://s-prs.co/527970*

In the individual package, select the appropriate version (localization) from the dropdown list. Then, you'll have access to all the SAP S/4HANA content for your solution by navigating to the relevant SAP S/4HANA subcategory, including overview documents and presentations, general documents such as documentation and SAP Notes, information on so-called scope items (Section 9.1.2 will provide more information on scope items), and a content library with the relevant content.

In addition, you'll have access to demos that demonstrate individual SAP Best Practices processes in detail and can familiarize you with the new user interfaces in SAP S/4HANA.

Although anybody can use the SAP Best Practices Explorer to obtain information on SAP Best Practices, you'll have to log on and have specific user access provided by SAP (an S-user or C-user) to download SAP Best Practices and obtain more detailed information.

9.1.2 Tools for Adaptation and Extensibility

Tools for adaptation and extensibility

The *tools for adaptation and extensibility* provided with SAP Activate support customers in all phases of the new implementation or, later, ongoing enhancements after go-live. For this purpose, SAP Activate provides tools such as configuration, embedded training material, and automated tests.

This concept considerably accelerates the adoption of SAP S/4HANA, which is critical and advantageous for SAP S/4HANA Cloud solutions in particular.

When introducing the individual components, we'll discuss tools for both SAP S/4HANA Cloud and SAP S/4HANA. We will point out when individual functions are currently only available for SAP S/4HANA Cloud (i.e., with SAP S/4HANA release 2020).

Procedure

The procedure is business process-oriented and guides the user step by step through all necessary tasks. You can set up and modify business processes and, if required, further adapt the IMG of your SAP S/4HANA system. All settings are tracked in SAP Solution Manager to create a configuration history, thus ensuring that you can always trace and undo changes. These

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change data records are also used for future configurations and delta configurations for extensions and upgrades.

Scope items

SAP Solution Manager can be used for monitoring, support, and operation and contains the configuration documentation provided by SAP, SAP Best Practices process models, and implementation guidelines. All SAP Best Practices listed in Section 9.1.1 are modeled as so-called scope items. Scope items are components of SAP Best Practices. Examples from accounting include the accounts receivable and accounts payable scope items.

Building blocks

SAP builds these scope items using *building blocks*, which are displayed in SAP Solution Builder next to the scope items. In SAP S/4HANA systems, you can create your own business processes or adjust the predelivered SAP processes, and if you use the IMG, you won't even need custom code. SAP partners can also develop custom or industry-specific best practices and implement them for you.

Manage Your Solution SAP Fiori app

First, let's look at a default case without any extensions. Figure 9.5 shows the initial screen of the Manage Your Solution SAP Fiori app, which includes the steps for configuring an SAP S/4HANA Cloud system in the realize phase (Section 9.2). The individual functions of this SAP Fiori app are described in the following sections.

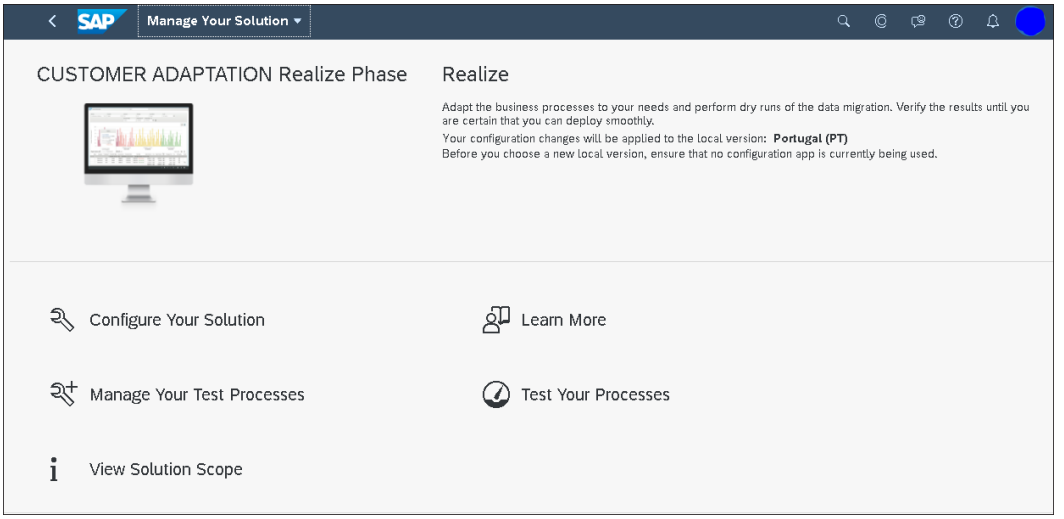


Figure 9.5 Manage Your Solution SAP Fiori app

Solution Scope (Only Available for SAP S/4HANA Cloud)

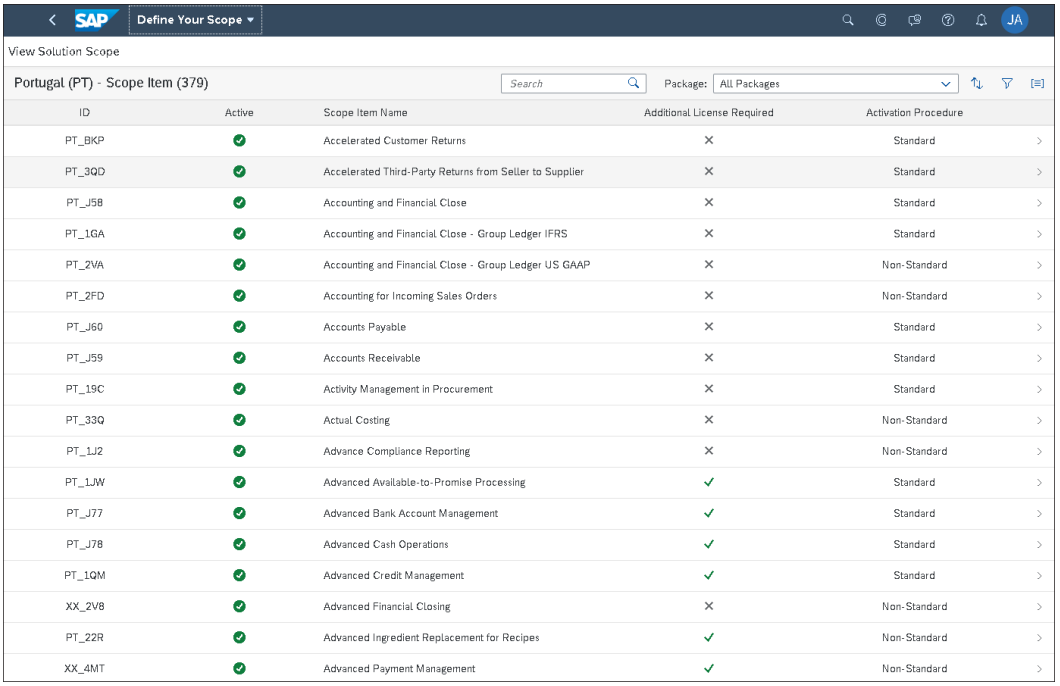
View Solution Scope function

The View Your Scope displays the business processes that have been activated in your SAP S/4HANA Cloud system. This function provides a detailed overview of the entire system quickly and easily. This feature also presents possible processes, such as additional integration scenarios or

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new processes that may suit your solution. Figure 9.6 shows an example of the scope of the SAP S/4HANA Cloud solution.

View Your Scope enables you to navigate to the documentation and view details about the individual scope items. Starting from here, you can easily make the relevant configuration settings for the selected scope. Let's take a closer look at this function.



ID	Active	Scope Item Name	Additional License Required	Activation Procedure
PT_BKP	✓	Accelerated Customer Returns	✗	Standard
PT_3QD	✓	Accelerated Third-Party Returns from Seller to Supplier	✗	Standard
PT_J5B	✓	Accounting and Financial Close	✗	Standard
PT_1GA	✓	Accounting and Financial Close - Group Ledger IFRS	✗	Standard
PT_2VA	✓	Accounting and Financial Close - Group Ledger US GAAP	✗	Non-Standard
PT_2FD	✓	Accounting for Incoming Sales Orders	✗	Non-Standard
PT_J60	✓	Accounts Payable	✗	Standard
PT_J59	✓	Accounts Receivable	✗	Standard
PT_19C	✓	Activity Management in Procurement	✗	Standard
PT_33Q	✓	Actual Costing	✗	Non-Standard
PT_1J2	✓	Advance Compliance Reporting	✗	Non-Standard
PT_1JW	✓	Advanced Available-to-Promise Processing	✓	Standard
PT_J77	✓	Advanced Bank Account Management	✓	Standard
PT_J78	✓	Advanced Cash Operations	✓	Standard
PT_1QM	✓	Advanced Credit Management	✓	Standard
XX_2V8	✓	Advanced Financial Closing	✗	Non-Standard
PT_22R	✓	Advanced Ingredient Replacement for Recipes	✓	Non-Standard
XX_4MT	✓	Advanced Payment Management	✓	Non-Standard

Figure 9.6 View Solution Scope

Self-Service Configuration (Only Available for SAP S/4HANA Cloud)

Configure Your Solution

Users can use the Configure Your Solution function to navigate to the so-called self-service configuration. Self-service configurations are designed in such a way that customers can make changes without any implementation partner. The self-service configuration only provides settings that correspond to the relevant phase (Section 9.2) and preselected scope. End users can use the application to make basic settings, such as changes to organizational structures or master data.

This self-service configuration tool is not suited to setting up or changing entire business processes; for SAP S/4HANA Cloud, you would use the SAP Service Center for this kind of expert configuration for individual available scenarios. You can run automated tests to analyze how changing the self-service configuration will affect your SAP S/4HANA Cloud system.

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Figure 9.7 shows an example of existing configurations that are available in the realize phase.

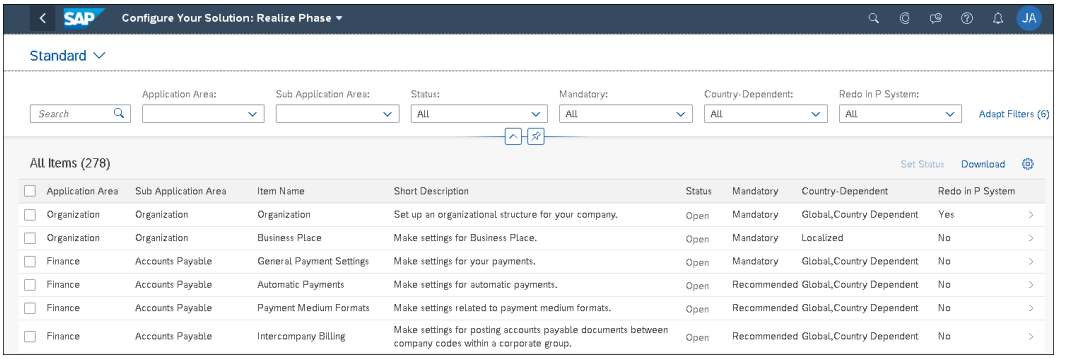


Figure 9.7 Configure Your Solution

Automated Test (Only Available in SAP S/4HANA Cloud)

Test Your Processes

With the Test Your Processes function, end users and IT experts can test configuration changes. This tool enables you to run automated tests based on test scripts provided by SAP Best Practices that you can fill with test data. The automated test documents its activities and supports creating, changing, executing, and managing test schedules (see Figure 9.8).

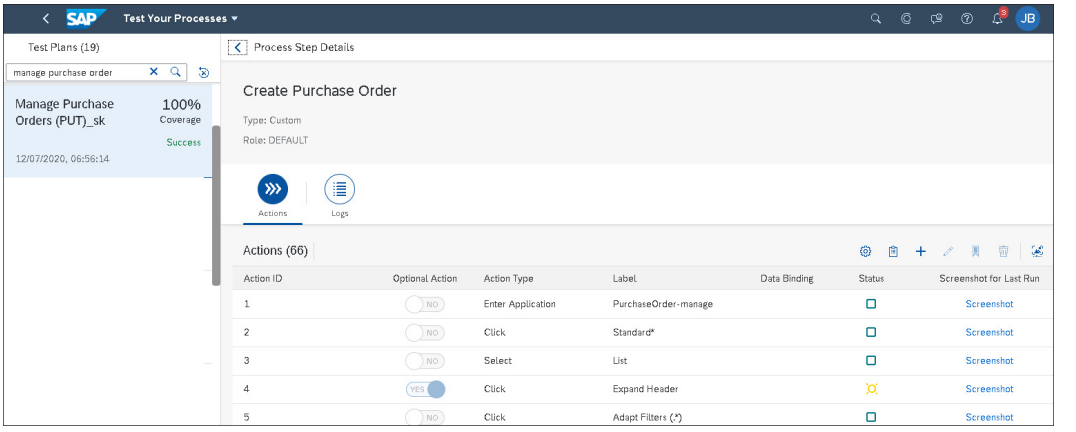


Figure 9.8 Automated Tests

Manage Your Test Processes function

You can manage your test processes via the Manage Your Test Processes function (shown in Figure 9.9).

With this function, you can select which processes are supposed to be available for tests, change old test cases, and create new test cases. You can either manually create new process steps or use system records to create new process steps.

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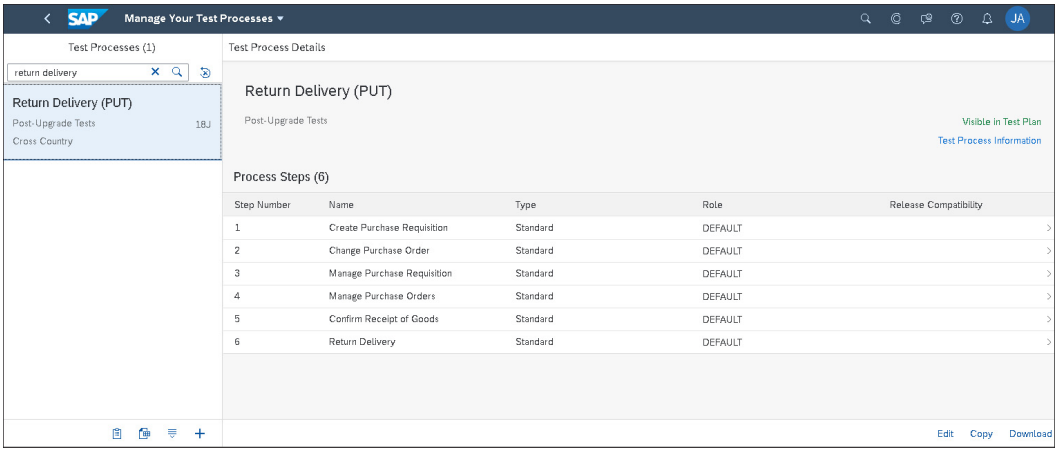


Figure 9.9 Manage Your Test Processes

SAP S/4HANA Migration Cockpit

Migrating data

The tool Migrate Your Data has been removed from the Manage Your Solution function and can be accessed via the new SAP Fiori UI application Migrate Your Data—Migration Cockpit (see Figure 9.10).

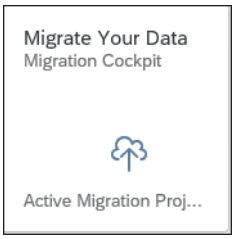


Figure 9.10 SAP S/4HANA Migration Cockpit

Chapter 13 will discuss this tool in detail.

Planning the Data Migration at an Early Stage

Experience from previous SAP S/4HANA and SAP S/4HANA Cloud migration projects has shown that you should be familiar with data migration tools, such as the SAP S/4HANA migration cockpit and migration templates, and with the subject of data migration in general at an early stage.

The earlier you can clarify critical issues (if possible, during the prepare phase), the more smoothly the data migration will run and the more likely strict deadlines will be met.

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Providing Trainings and Training Material

Access to further information

Instead of classic classroom training, SAP S/4HANA includes online learning content directly integrated into the Learn More function of the Manage Your Solution SAP Fiori app by means of the SAP Learning Hub. Depending on the user role and phase, learning content is provided dynamically.

In addition, all SAP Fiori interfaces provide a context-sensitive F1 help feature, which goes far beyond the scope of the obsolete F1 help in SAP. Figure 9.11 shows this help for various buttons and screen elements.

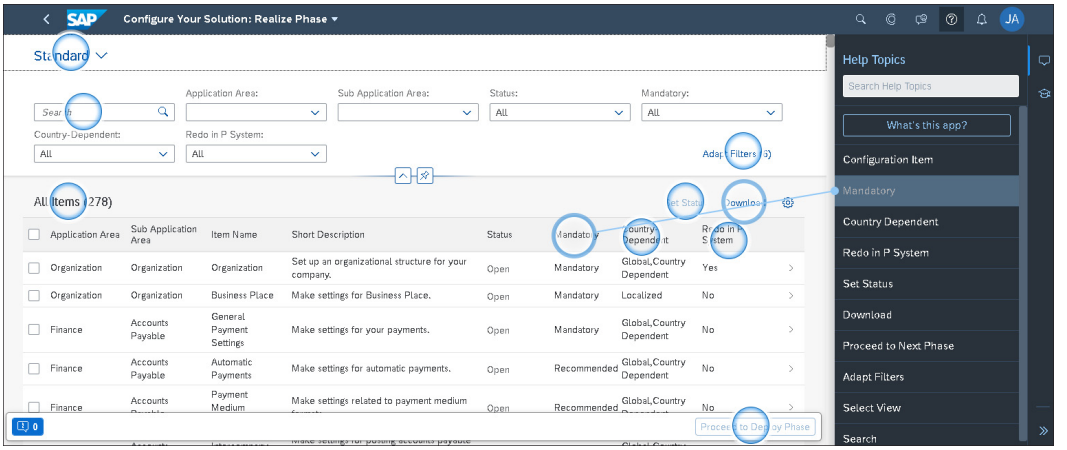


Figure 9.11 Advanced (F1) Help in SAP S/4HANA

openSAP Courses

openSAP is a learning platform developed by SAP and offered in cooperation with the Hasso Plattner Institute (HPI) in Potsdam, Germany. Based on massive open online courses (MOOCs), which differ from other e-learning models in how participants engage with each other, the online presentation approach uses concepts that have been tried and tested in traditional classroom training. These courses are held completely online and can be accessed via computers and mobile devices.

Learning units, which are divided into weekly units and can be viewed with video, form the largest portion of the learning content. Self-tests, which enable you to check your learning progress, and user forums, which allow participants to exchange information, round out the learning platform. Each course ends with a test, and if you pass the test, you'll receive a certificate. However, the most important thing is that openSAP courses are free of charge.

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Currently, the online courses are available in English only. The various units of the courses introduce SAP S/4HANA and SAP Activate via videos and demos. At present, the following courses are available:

- Find Your Path to SAP S/4HANA:
  http://s-prs.co/527971
- How to Best Leverage SAP S/4HANA Cloud for Your Company:
  http://s-prs.co/527972
- Extending SAP S/4HANA Cloud and SAP S/4HANA:
  http://s-prs.co/527973
- Migrating Your Business Data to SAP S/4HANA—New Implementation Scenario:
  https://open.sap.com/courses/s4h16

SAP Learning Hub

The Learn More function is the central entry point to the SAP S/4HANA learning content. The content also offers role-based onboarding features for new users, including interactive demos. You can use this content to access the fee-based e-learning platform, SAP Learning Hub.

9.1.3 SAP Activate Methodology

The methodology of SAP Activate is based on the SAP Best Practices tool introduced in Section 9.1.1, and you can use SAP Best Practices for both SAP S/4HANA and SAP S/4HANA Cloud implementations. In this context, we'd like to point out that SAP Activate is the first solution to establish a common methodology for implementing SAP S/4HANA Cloud, hybrid, and SAP S/4HANA systems. Moreover, SAP partners and customers can leverage the SAP Activate methodology without having to utilize SAP consulting services.

Within an SAP S/4HANA project, you can vary slightly from the standard procedure without having to give up the benefits of a standard methodology.

Which Components or Tools Are Part of the Methodology?

The SAP Activate methodology provides so-called accelerators for each phase of the implementation project (Section 9.2) and for each workspace. These accelerators include templates, questionnaires, checklists, guidelines, and tools to help you implement or upgrade SAP quickly. Templates, for example, enable you to find deltas, develop the architecture, or determine activities that are required for the go-live.

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For Which Situation Is the Methodology Best Suited?

Basically, the SAP Activate methodology promotes a holistic approach, irrespective of the deployment model (SAP S/4HANA, SAP S/4HANA Cloud, or a hybrid system). In addition, the methodology is scalable, which means that you can use SAP Activate for smaller projects or customers, as well as for large enterprises.

Who Benefits from the Methodology?

SAP Activate is a role-specific methodology. Tasks can be performed by the customer or an implementation partner. The methodology is available freely and can be applied free of charge by the customer and implementation partner. SAP consulting uses it as the standard procedure.

9.2 SAP Activate Phases

Using the scenario for a new implementation as an example, this section introduces the individual phases of the SAP Activate methodology. We'll take a closer look at the phases of a typical SAP S/4HANA project. The individual SAP Activate phases cover simple SAP S/4HANA Cloud implementations as well as complex installations of SAP S/4HANA systems. The phases are as follows:

Six phases

1. **Discover**
   In this phase, you'll familiarize yourself with the solution and define the implementation strategy and project scope. By means of the Transformation Navigator and the trial system, you can obtain information on the options and product details.
2. **Prepare**
   In this phase, you'll initiate and plan your SAP S/4HANA project, including quality gates and risk plans. You'll also plan the system landscape and SAP Best Practices for predefined business and technology processes and assign the project team.
3. **Explore**
   In workshops (fit-to-standard analysis) for each business area or process, you'll determine the necessary configurations, enhancements, and integrations. Here, a standard system with SAP Best Practices is used as the starting point. In all areas—for example, end user training—you'll create detailed plans that will be implemented in the realize phase.
4. **Realize**
   The SAP S/4HANA or SAP S/4HANA Cloud system will be configured, enhanced, and linked with other products according to the plans from the explore phase. The configuration and subsequent adaptations are

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implemented in short cycles to allow for regular validations and to obtain feedback from business departments. This phase also includes structured system tests and migration activities. At the end of this phase, all areas of the project are prepared for cutover in the deploy phase.

5. **Deploy**
   The new SAP S/4HANA or SAP S/4HANA Cloud system is about to go live, so you'll carry out some final preparations for the cutover to prepare the system and the data for production. End users are trained so that they can use the new production system. Then, the new system will go live and replace the legacy system.
6. **Run**
   The implementation project is finished with the end of the implementation phase. In the run phase, you'll gather information for enhanced usage, create new users as required, and implement updates/upgrades, as well as regression tests.

These six phases are each subdivided into various activities. The type of activity depends on the deployment model selected



Roadmap Viewer

With the Roadmap Viewer, SAP provides an externally accessible portal for SAP Activate and thus an entry point for the implementation—SAP S/4HANA or SAP S/4HANA Cloud. The following link introduces the SAP Fiori interface and displays the described phases and their individual steps: *http://s-prs.co/527974*.

The Roadmap Viewer comprises general and solution-specific roadmaps. Each of these roadmaps is subdivided into individual workstreams, whose deliverables are assigned to tasks or activities. Content and descriptions are available for these tasks. SAP Activate uses the following terminology:

- A *workstream* is used to identify and group the various work areas of a project. It is a collection of tasks to be executed that are related to each other within a project. Workstreams can be cross-phase and are independent of the start and end of a phase. A workstream can best be described as a *work package* or *task field*.
- *Deliverable* refers to a result of a task to be executed or a delivery unit. A deliverable is the result that is reached in the course of the project. Deliverables can be assigned to one or more workstreams. Several deliverables are usually assigned to a workstream.
- *Accelerators* are documents, templates, or web links that help you to perform tasks and finish them faster or with less effort.

Roadmaps are continuously updated with the product so that they always contain the latest information that you require for a successful implementation.

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SAP Solution Manager

In an SAP S/4HANA implementation, you can combine SAP Activate ideally with SAP Solution Manager because SAP Activate is fully integrated into SAP Solution Manager 7.2. SAP Activate provides SAP Best Practices directly within the SAP Solution Manager, and SAP Solution Manager is the ideal platform for carrying out fit-gap analyses to log requirements and changes.

Figure 9.12 illustrates the individual phases and necessary steps for a system conversion (top) and for a new implementation (bottom).

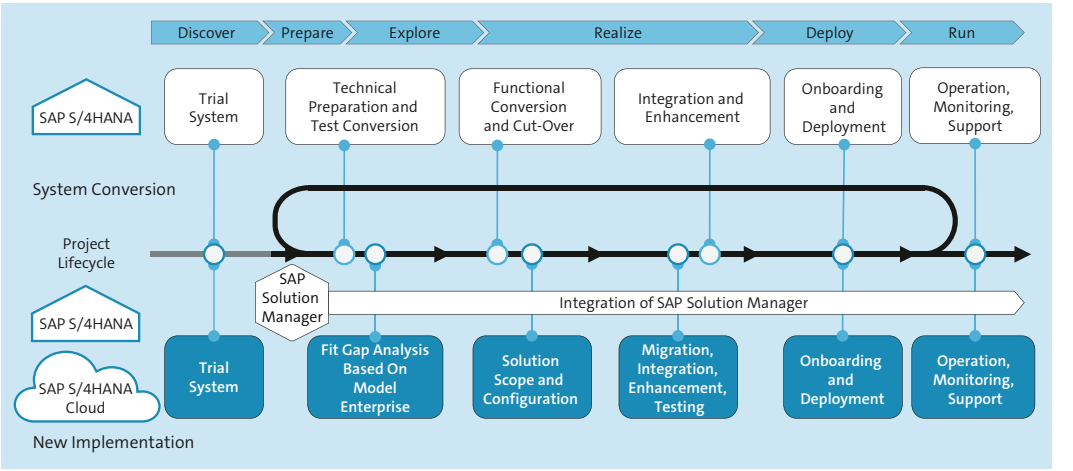


Figure 9.12 SAP Activate Phases

Sample process

The following list is an example of the steps needed for a new implementation of SAP S/4HANA:

1. **Preparing the system landscape**
   - Preparing the trial system for SAP Best Practices
   - Preparing the three-tier system landscape consisting of development, test, and production systems
   - Preparing SAP Solution Manager 7.2
2. **Carrying out a fit-gap analysis, based on SAP Best Practices reference processes, with SAP Solution Manager 7.2**
   - Evaluating the target scope using the SAP Best Practices bill of materials (BOM) during in-person workshops
   - Determining your requirements using SAP Activate tools
3. **Selecting the solution scope and activating the content in the development client**
   - Importing the reference content
   - Selecting the solution scope
   - Activating the selected solution scope using SAP Solution Builder

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4. **Configuration and transport management**
   - Delta configuration after initial activation using the Implementation Guide
   - Additional customizing in SAP client 000 (beyond SAP Best Practices)



Up-to-Date Information

To provide further and up-to-date information on the SAP Activate methodology and the individual phases, SAP has created an interactive page in the SAP Jam platform. SAP Jam allows SAP customers, SAP partners, and SAP employees to exchange information and experiences in forums and shared workspaces and to provide further information. You can access the open SAP Jam group by registering your email address at *http://s-prs.co/52791113*. (Note that the URL is case-sensitive.) You'll receive an invitation to the SAP Jam space and have access to methodology content, discussion forums, and the social collaboration space.

Like all new concepts, and due to SAP S/4HANA and SAP S/4HANA Cloud updates, SAP Activate is also subject to updates and enhancements. The following sources provide further information and are continuously updated:

- The official SAP landing page is the entry point to SAP Activate: *http://www.sap.com/activate*.
- You can find more information in the SAP Best Practices Reference Guide for SAP Activate document, which you can find at *http://s-prs.co/527967*. (Note that the URL is case-sensitive.)
- Detailed information is available in the book *SAP Activate: Project Management for SAP S/4HANA* (see *http://s-prs.co/527968*).

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Chapter 10

Installing and Configuring SAP S/4HANA On-Premise or in the Private Cloud

When migrating to the on-premise version of SAP S/4HANA, you can either install a new SAP S/4HANA system or transform an existing SAP system. This chapter describes the necessary steps for installing the backend and frontend servers and for configuring the system.

In this chapter, we'll discuss the on-premise version of SAP S/4HANA or SAP S/4HANA in a *private cloud* (in this context, *cloud* refers to a hosted IaaS system). In contrast to SAP S/4HANA Cloud (a default cloud system with quarterly updates and restricted access to the backend system), you can define the customizing and update cycles yourself with your own on-premise system. With SAP S/4HANA on-premise, the system can be implemented either in your data center or at a hosting partner. You can also have SAP implement a private cloud for you in SAP HANA Enterprise Cloud.

With SAP S/4HANA on-premise, you can better control the implementation of the system. Moreover, you can freely choose your target release, a crucial capability. This means, for example, that you can switch to SAP S/4HANA 1909 or an earlier or later version.

Prerequisites for migration scenarios

Before you start your migration to SAP S/4HANA using the greenfield approach, you must first reimplement your system (new installation). In addition, regardless of the migration scenario, the SAP S/4HANA system requires a frontend server to enable using SAP Fiori as the user interface.



SAP Fiori Frontend Server

In addition to installing the actual SAP S/4HANA system, you must also install an SAP Fiori frontend server for the SAP Fiori user interface if you want to use SAP Fiori apps. This applies to both the system conversion in the brownfield approach and the new implementation described here (greenfield approach). For more information on this frontend server and the installation steps, refer to Chapter 8, Section 8.2.4.

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Steps for a new installation

If you're not using the SAP S/4HANA Fully Activated Appliance, which we introduced in Chapter 6, you'll have to perform sizing to determine the hardware requirements, as we'll introduce later.

After determining your requirements, use the Software Provisioning Manager to set up an SAP S/4HANA system with the available SAP installation media (Section 10.1). The new system is provided with the default Customizing delivered by SAP. You then have to adapt the configuration of the new system in such a way that it meets the requirements of the business processes you want to implement (Section 10.2).

In addition to this SAP S/4HANA instance, a frontend server also has to be installed. This frontend server is the central hub for the SAP Fiori user interface (see Chapter 8, Section 8.2.4).

As an alternative to a new custom installation (which is mandatory for production systems), you can also use the SAP S/4HANA reference system (SAP S/4HANA Fully Activated Appliance), which was introduced in Chapter 6.

10.1 Installation

Sizing

If you don't want to use the appliance, you'll need to first perform the sizing for your specific case. The sizing process determines the hardware requirements of the SAP S/4HANA system and SAP HANA database, as well as the disk size, the required memory, and the anticipated network throughput.



Additional Information on Sizing

Depending on the target system release and scenario, the following links and resources provide more information on the SAP S/4HANA sizing process:

- Sizing starting point on the SAP webpage: *http://sap.com/sizing*
- Quick Sizer: *http://s-prs.co/527975*
- SAP Note 1793345 for SAP S/4HANA Finance
- SAP Note 1872170 for ABAP sizing reports

Sandbox system

This section describes how to set up an SAP S/4HANA on-premise system in your landscape. The steps remain the same for private cloud or hosting environments. For the sake of simplicity, this section explains how to install a sandbox system that contains an ABAP backend server and the SAP Fiori frontend server in the same system (a *codeployment*; see also Chapter 8, Section 8.2.4).

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Download Basket

Empty the SAP Download Manager Download Basket by deleting obsolete download requests before selecting the individual components for SAP S/4HANA. As a result, you'll be able to track the files you still need to install more effectively.

Downloading the installation files

First, you need to download the installation files using the SAP Download Manager and the Download Basket.

Downloading the installation files

To easily download the necessary files, log on to the maintenance planner, a cloud-based tool used for system conversion (see Chapter 7) and for new implementations. If your screen is different than the one shown in Figure 10.1, refer to the Additional Functions in the Maintenance Planner box in Chapter 7, Section 7.2.4, which discusses the tool's new appearance. The maintenance planner lets you plan new system installations, perform updates, and implement new or additional SAP products (e.g., the frontend server for SAP Fiori).

Maintenance planner

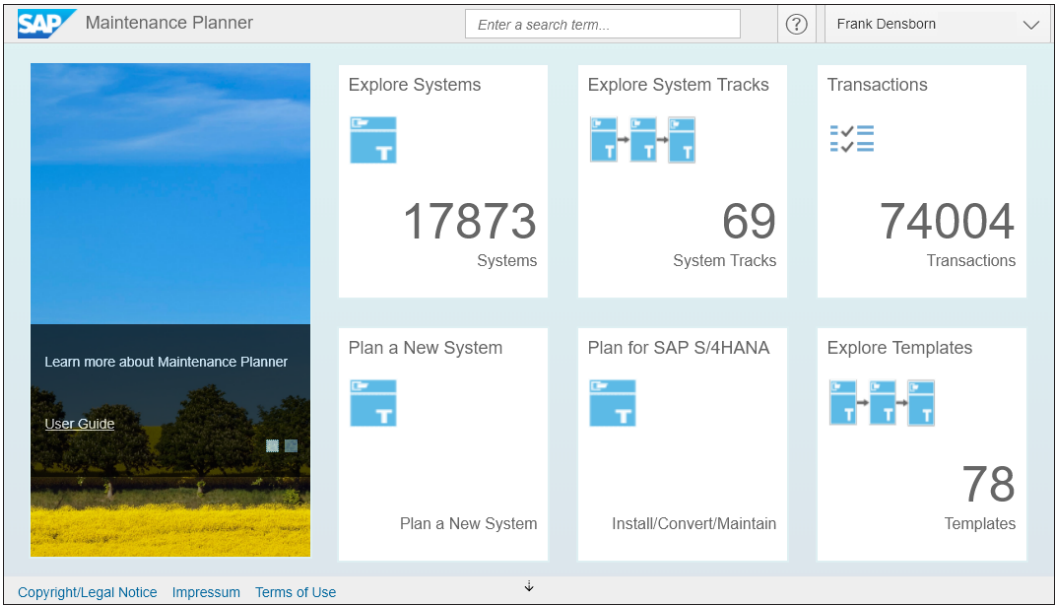


Figure 10.1 Maintenance Planner for Migrating to SAP S/4HANA

Additional Information on the Maintenance Planner

The following link provides more information on the maintenance planner: *http://help.sap.com/maintenanceplanner*.

Starting the maintenance planner

To start the maintenance planner, enter the following link into your web browser: *http://s-prs.co/527976*. An SAP Fiori-based website opens, which you can access with your S-user credentials. For SAP partners, the partner user must be linked to the specific customer to be able to view the customer's systems. Select the **Plan for SAP S/4HANA** tile. The maintenance planner helps you find and download the required installation files and provides the necessary documentation.

You use the maintenance planner not only for the installation of new systems but also for system conversions (see Figure 10.2). The tool helps you search for add-ons, business functions, and industry solutions in the existing system. The maintenance planner then helps you to determine whether a system conversion can be implemented at all.

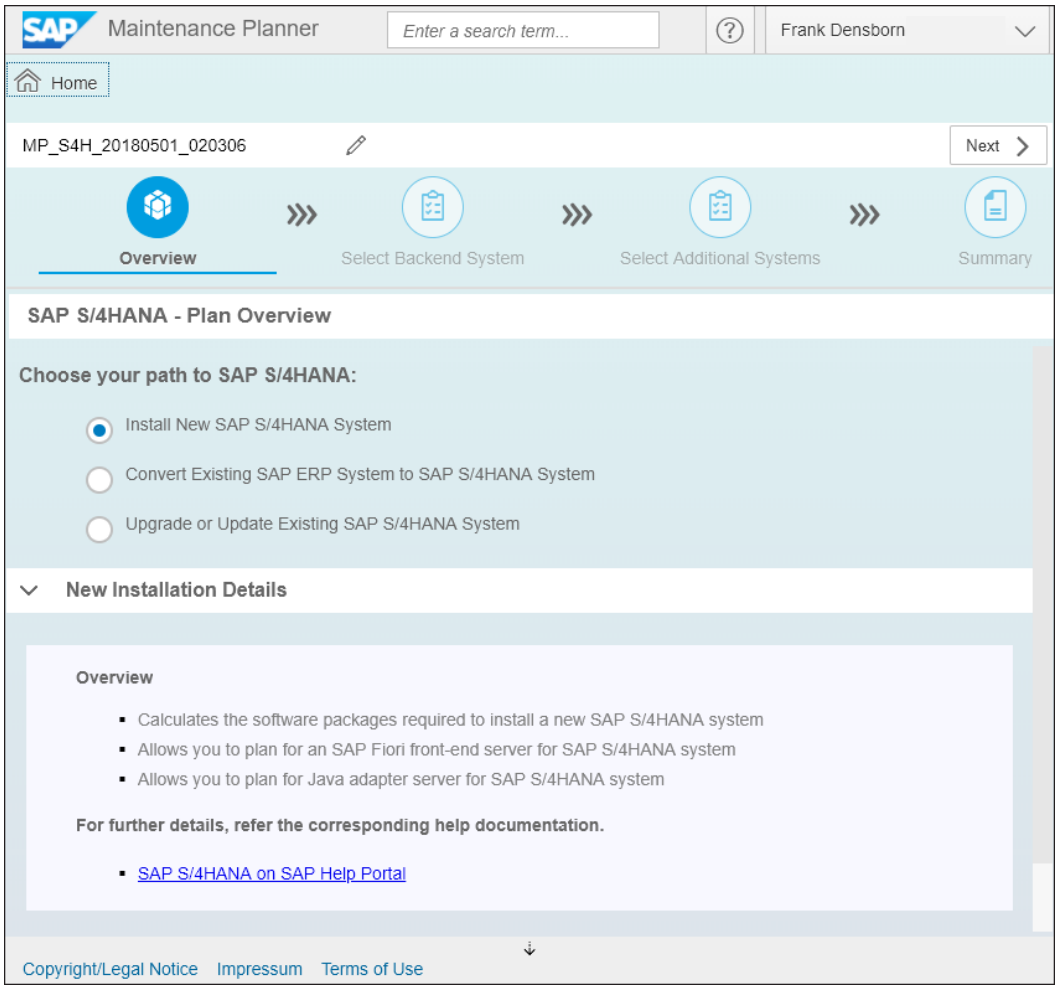


Figure 10.2 Maintenance Planner for Installing New SAP S/4HANA Systems or Converting Existing Systems

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SAP S/4HANA Installation Guide

Download the Installation Guide for your SAP S4/HANA version using the link provided in the **New Installation Details** section (see Figure 10.2, **New Installation Details** menu item). You can find it on the SAP Help Portal under the **Implement** tab (see Figure 10.3).

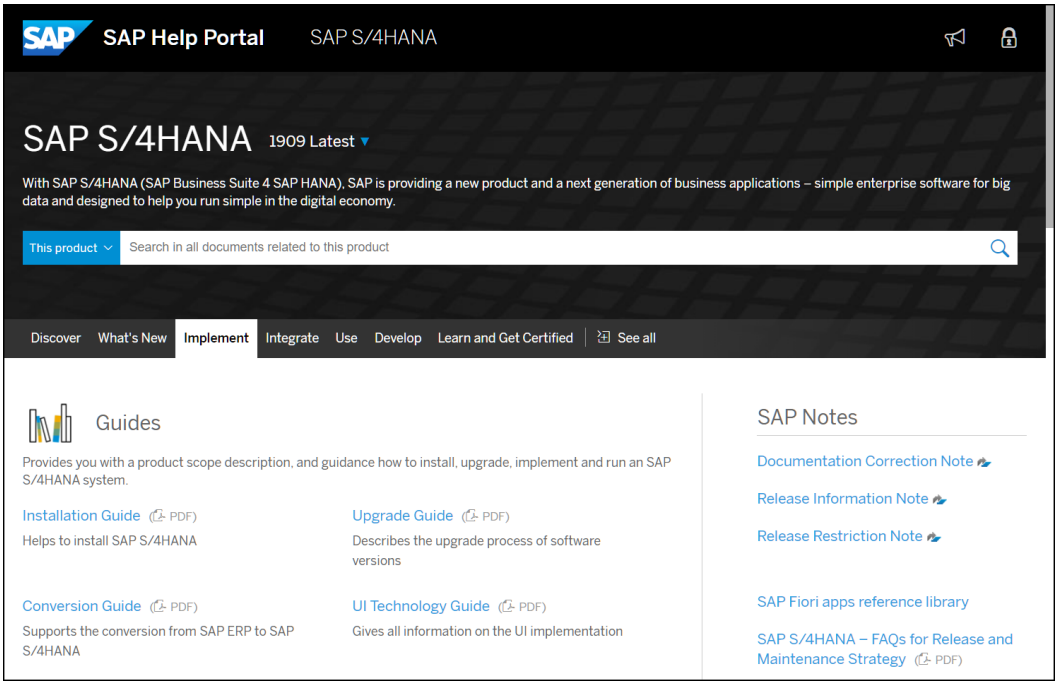


Figure 10.3 Installation Guide on SAP Help Portal

The maintenance planner guides you through the steps of the installation preparation process—in this example, for SAP S/4HANA 1909 FPS 02. After you have completed the process, you can use the **Push to Download Basket** button to move the installation files to the SAP Download Manager and directly download the files with this tool (see Figure 10.4).

Required tools

In addition, you'll need the latest Support Package Manager (Transaction SPAM) version and—if it has not been installed yet—an SAP HANA database. The latest Software Update Manager version should also be installed. Although mostly used for system conversion, you also use SUM for initial patches during the new installation.

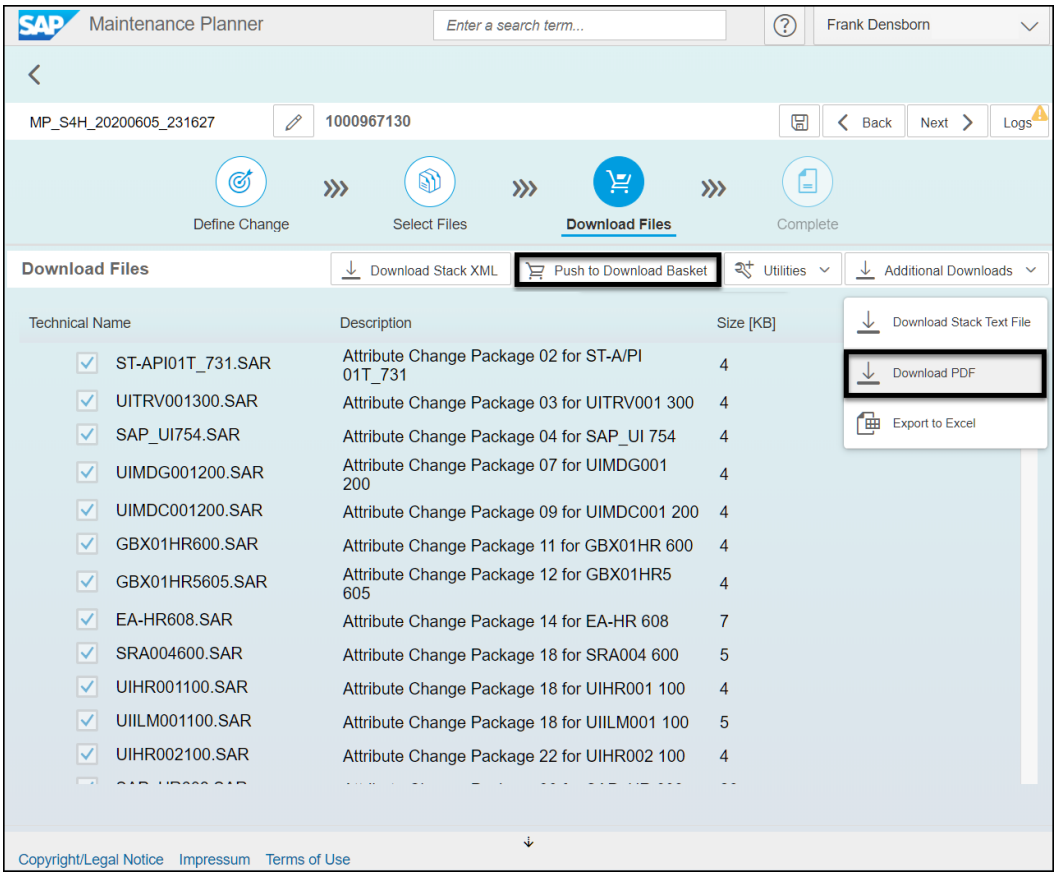


Figure 10.4 Downloading Files via Maintenance Planner

Necessary information

For the installation, you'll need the operating system version specified in the maintenance planner and the SAP HANA database version. (The specifications in the maintenance planner also contain information on the database version.) If SAP HANA is already implemented, you'll need to patch the database to the version that you need for your SAP S/4HANA version and you'll have to create a new database container. Figure 10.5 shows the download files identified and provided for your SAP S/4HANA installation in the SAP Software Download Center.

Installation using the Software Provisioning Manager

The Software Provisioning Manager then performs the actual SAP S/4HANA installation using the files you downloaded with the maintenance planner. This process follows the steps described in the installation guide and may take several hours.

SUM

After successfully installing a "naked" SAP S/4HANA system, you can use SUM to install the support packages you may need. (Ensure that you're using the latest version of SUM.)

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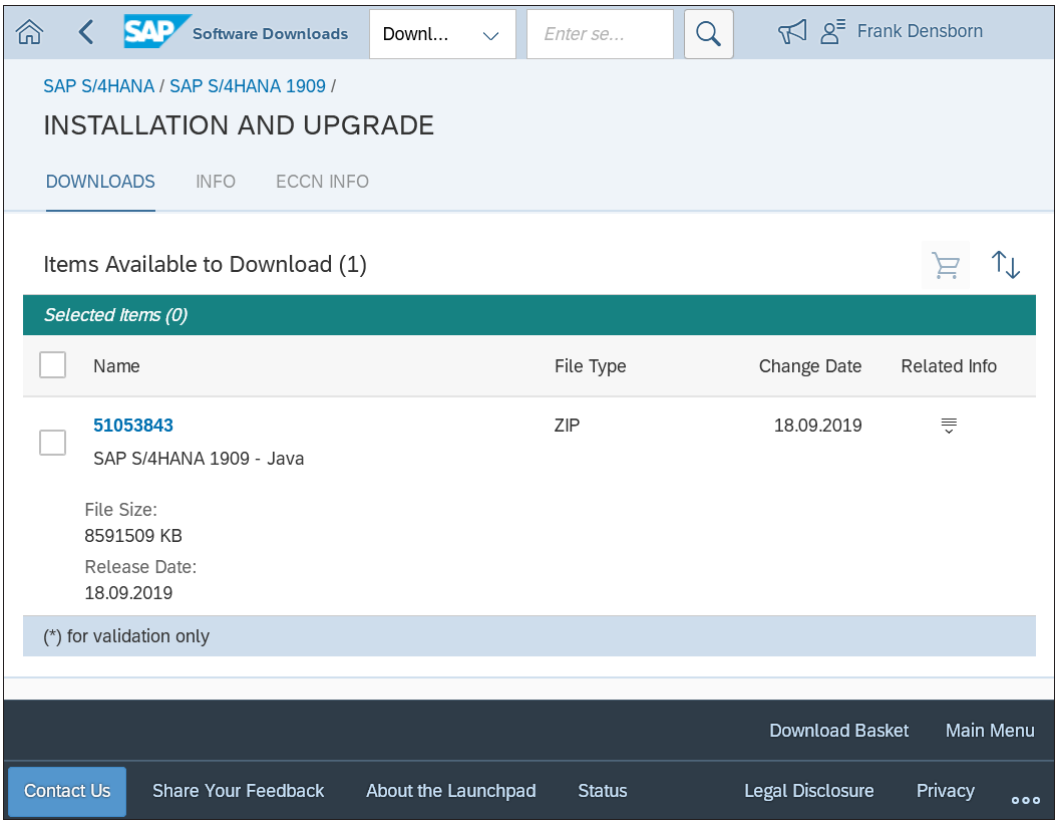


Figure 10.5 Download Files Provided for Installing SAP S/4HANA

Before starting SUM, you can archive and backup your data. The SUM process can also take several hours. You can install add-ons with the SAP Add-on Installation Tool (Transaction SAINT) together with the Support Package Manager (Transaction SPAM).

Postprocessing

Finally, you should perform some cleanup and use Transaction SPAU to make adjustments. Then, install the SAP Notes for your SAP S/4HANA version from SAP S/4HANA release notes using Transaction SNOTE and install the transports. Now, your SAP S/4HANA installation is complete.

Additional Information on the Installation

You can find more information in the SAP Community at *https://community.sap.com* and in the Roadmap Viewer at *https://go.support.sap.com/roadmapviewer*.

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10.2 System Configuration

SAP Best Practices

This section describes the system configuration procedure using SAP Best Practices, which is an appropriate approach for configuring all sandbox and proof of concept systems. For a production landscape, this option is only available if SAP Best Practices meets your customer requirements (see the section on fit-gap analysis in Chapter 9, Section 9.2).

Master client

In SAP ERP and the traditional SAP Business Suite, SAP recommends copying the major part of the content from client 000 (the *master client*) to set up a customer-specific client for the implementation project. SAP Best Practices drastically reduces the number of necessary configuration tables (more than tenfold). SAP Best Practices only includes the required system configuration settings and the necessary basic tables to set up SAP S/4HANA on-premise.

These clients in SAP Best Practices are referred to as *best practices clients* in the following sections, while the other clients with full master-client configuration are referred to as *traditional clients*. You can run best practices clients and traditional clients in the same SAP S/4HANA system (see Chapter 6, Section 6.3).

Client copy profiles

SAP S/4HANA provides two new profiles for client copies:

- `SAP_UCUS`: Customizing and user master data
- `SAP_CUST`: Customizing

With one of these profiles, you can set up a best practices client based on the master client. For this best practices copy, only the required tables of delivery classes C and G are copied to the target client; all other tables are not copied (e.g., system tables with delivery class S). A best practices client only works when copied from the master client but can facilitate future maintenance tasks if you keep standard SAP Best Practices for the remaining configuration. Future SAP S/4HANA upgrades not only affect the software but also affect SAP Best Practices content, which is also enhanced with additional functionality.

Solution Builder

To configure the installed SAP S/4HANA system and install SAP Best Practices, you'll use various tools after the master client has been initially (or partially) copied: the SAP Solution Builder for SAP Best Practices, and SAP Solution Manager 7.2. You must not confuse these tools. These tools enable you to activate SAP Best Practices according to customer-specific requirements at the scope item level for specific functions with the so-called Building Block Builder. The system configuration from SAP Best Practices is activated in the development system and then transported to the system landscape.

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SAP S/4HANA Admin Guide

The SAP Best Practices activation might take several hours and follows the steps described in the SAP S/4HANA Admin Guide. If you activate SAP Best Practices for the US, you can also integrate the content with the Vertex tax system. After successfully activating SAP Best Practices with these tools, you'll only have to perform some minor postprocessing tasks manually.



SAP S/4HANA Admin Guide

We recommend downloading a PDF version of the SAP S/4HANA Admin Guide to view it offline. The following link takes you to the Admin Guide for SAP S/4HANA 1909: *http://s-prs.co/5279114*.

The SAP S/4HANA Admin Guides for other on-premise versions are also available on the SAP Help Portal at *https://help.sap.com*.

Configuring systems in the development system

The configuration process in the development system involves the following steps:

1. Import the reference client:
   - Download the latest solution scope file and the installation files.
   - Upload the files to the SAP S/4HANA system to make the relevant settings and create the master data.
   - Import the settings to the Solution Builder using the solution scope file.
2. Use the scope items to select the solution scope you want to activate.
3. Activate the system.

Building blocks

When activating the system, you'll implement the relevant building blocks in a predefined order using the Solution Builder as an implementation wizard. Building blocks also include test data (master data) that is created with the extended Computer Aided Test Tool (eCATT) and settings that are installed via Business Configuration sets (BC sets).

Customizing transports

SAP recommends not activating content in quality assurance and production systems. Instead, you can transport the system configuration across the system landscape using the transport system. For this purpose, copy the master client using the `SAP_CUST` profile in the quality assurance system and the production system to create best practices clients. Then, the customizing settings are transported from the best practices client in the development system via customizing and workbench requests in the following order:

1. SAP Best Practices with the customizing from the initial activation
2. Additional customer-specific IMG customizing (that is, customizing implemented using the Implementation Guide)
3. Further master client settings according to SAP Note 2272406, if required

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The transport requests for SAP Best Practices (step 1) and the requests with customer-specific customizing (step 2) are therefore managed separately to allow for a successful installation of future SAP Best Practices updates. This separation ensures the future viability of your SAP S/4HANA system and simplifies maintenance.

Transport route

The transport route in the SAP S/4HANA landscape goes from the development system to the quality assurance system to the production system. As already mentioned, SAP Best Practices content is not activated within the quality assurance system or the production system. However, manual post-processing (as described in the SAP S/4HANA Admin Guide) might be necessary in the individual systems.

Alternative system configurations

You can decide whether or not to use SAP Best Practices for the system configuration. Table 10.1 compares the advantages and disadvantages of a full implementation of SAP Best Practices versus an alternative partial implementation.

System Configuration Option	Advantages	Disadvantages
Traditional client: Traditional full copy of the master client (with all configuration tables) without using the SAP Best Practices system configuration	■ Comprehensive configuration of the most functional areas. ■ The procedure is the same as for SAP ERP and the traditional SAP Business Suite.	■ Unused configuration makes future maintenance tasks more complicated. ■ No documentation. ■ No consistent and connected processes.
Alternative: Traditional full copy of the master client (with all configuration tables) and additionally enabled SAP Best Practices	■ Comprehensive configuration of the most functional areas. ■ Partially consistent and connected processes (SAP Best Practices). ■ Partial documentation (SAP Best Practices).	■ Unused configuration makes future maintenance tasks more complicated. ■ Partially redundant or inconsistent configuration, because two different configurations are used as the basis.
Best Practices client: Custom, newly created best practices client (with reduced configuration tables) and SAP Best Practices	■ Consistent and connected processes. ■ Well documented. ■ Only the necessary configuration is used, which facilitates maintenance tasks.	■ The SAP Best Practices package is not yet available for the entire solution scope of the SAP S/4HANA on-premise version.

Table 10.1 Comparing Different SAP S/4HANA System Configurations

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Free Choice of Configuration Method

You can also manually set up and configure the on-premise system without any SAP Best Practices.

Comparison to SAP S/4HANA Cloud

For the SAP S/4HANA on-premise version, the preconfigured SAP Best Practices content described in this section accelerates the implementation, but—in contrast to SAP S/4HANA Cloud—you don't necessarily have to use SAP Best Practices.

The SAP Best Practices package in SAP S/4HANA Cloud covers various processes, but SAP S/4HANA on-premise provides customers with a high degree of flexibility in configuration. Therefore, a fit-to-gap workshop (see Chapter 9, Section 9.2) is a crucial factor for successfully implementing SAP S/4HANA.

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Chapter 11

Setup and Configuration of SAP S/4HANA Cloud

A cloud solution offers new opportunities for organizing and financing IT in your enterprise. This chapter introduces SAP S/4HANA Cloud and provides information on its setup and configuration.

How can you access an SAP S/4HANA cloud instance? What do you need to consider when setting up the solution? How do you transfer existing data to SAP S/4HANA Cloud or a SaaS system?

Section 11.1 discusses these and similar questions. Section 11.2 then provides an overview of how to configure an SAP S/4HANA cloud system. Finally, Section 11.3 gives an outlook on the planned configuration of SAP S/4HANA Cloud using SAP Central Business Configuration.

11.1 Setting Up SAP S/4HANA Cloud

If you select an operating model in Cloud, you can expect to use the software in production rather quickly. To implement your cloud operating model, you should take a closer look at the characteristics of SAP S/4HANA Cloud. Chapter 3, Section 3.1.2 and Section 3.2.2 introduced the basic characteristics of SaaS solutions and their differences from on-premise operating models.

An SAP S/4HANA Cloud implementation project is subdivided into the six phases of the SAP Activate implementation method, which we presented in Chapter 9, Section 9.2. In the first phase, you'll explore the trial system. Figure 11.1 illustrates the project phases for your journey to SAP S/4HANA Cloud.



Additional Information

You can find a detailed description of the implementation phases along with additional documents in the Roadmap Viewer: *http://s-prs.co/527977*. On overview page from Roadmap Viewer choose the "Explore all Roadmaps" button. On upcoming "Explore All Roadmaps side choose on "Cloud Specific Methodology" tab the methodology "SAP Activate Methodology for SAP S/4HANA Cloud".

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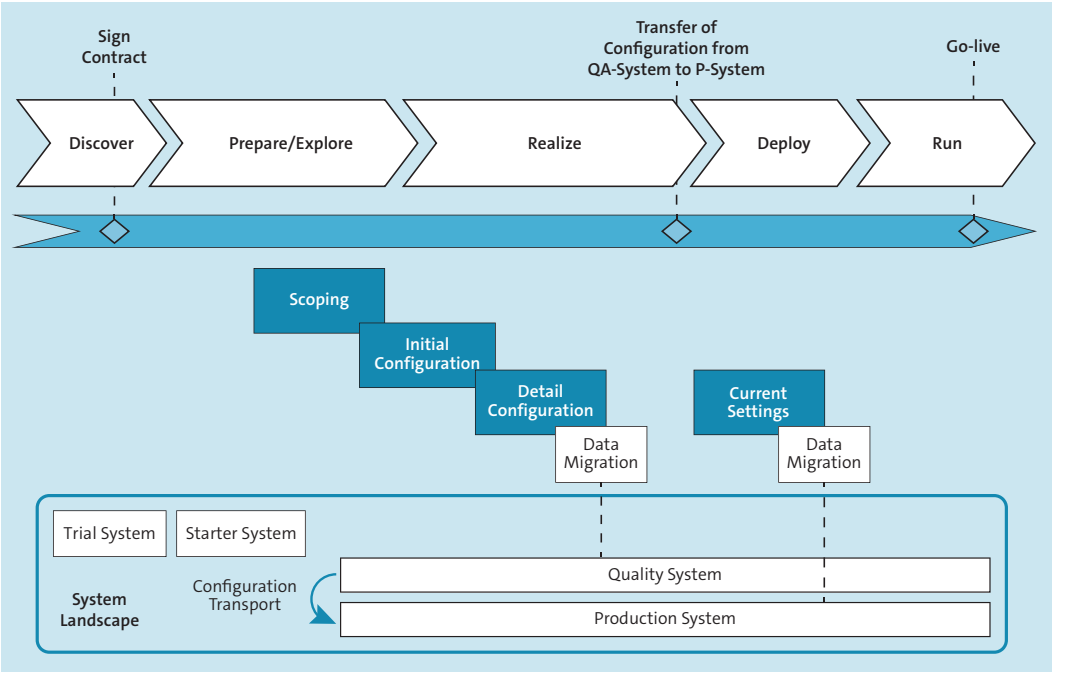


Figure 11.1 Project Phases for Journey to SAP S/4HANA Cloud

11.1.1 Discover Phase: Setting Up the SAP S/4HANA Cloud Trial System

Trial system

In the *discover phase*, you can make yourself familiar with SAP S/4HANA Cloud. For this purpose, SAP offers a trial system, which we presented in Chapter 6, Section 6.1.

You can use the specified user roles and predefined business scenarios of the trial system to get a first impression of the navigation, user interface, and appearance of SAP S/4HANA Cloud. You cannot use the trial system to set up your own SAP S/4HANA Cloud system.

A separate instance is required for your own SAP S/4HANA Cloud system. The trial system is an optional offer from SAP, and you won't have to purchase or use SAP S/4HANA Cloud when using the trial system.



Additional Information

You can access an individual SAP trial system at *http://s-prs.de/v745510*. You can use the trial system free of charge for 14 days.

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11.1.2 Prepare and Explore Phase: Setting Up the SAP S/4HANA Cloud System

Starter system

When you purchase SAP S/4HANA Cloud, SAP will provide a *starter system* set up with the solution scope that you defined. Basically, the starter system has two goals:

- It allows you to explore SAP S/4HANA Cloud in more detail than the trial system. You should not miss this opportunity to thoroughly test the business scope for your specific requirements. This is referred to as the *explore phase*.
- The starter system also allows you to define your own environment. In the starter system, you'll assign roles, configurations, users, and integration with other systems.

You'll access the system via a central URL, which you'll usually receive via email with further access information. With this URL, users can log on to the system and use the applications via a web browser.

The following sections further describe how to configure the starter system.

Assigning Users for the Administrator and Key User

Creating the administrator user

In the first step, you should receive several emails from SAP—at least two. One of the emails contains the technical user; the other email contains the corresponding password. With this information, you'll create an administrator account and define administrator access. With this administrator account, you'll later make all necessary technical settings. Of course, you'll first have to create users for the employees involved in the implementation project to define your business processes (i.e., your key users).

First ensure that the employee master data is maintained for you and your project team. Select the **Maintain Employees** tile in the **EMPLOYEE Master Data** group (see Figure 11.2).

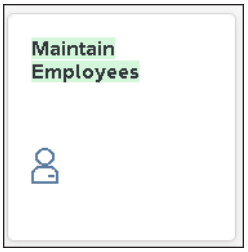


Figure 11.2 Maintaining Employee Master Data

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On the next screen, you'll maintain the required user master data, at least for the administrator(s) (see Figure 11.3).

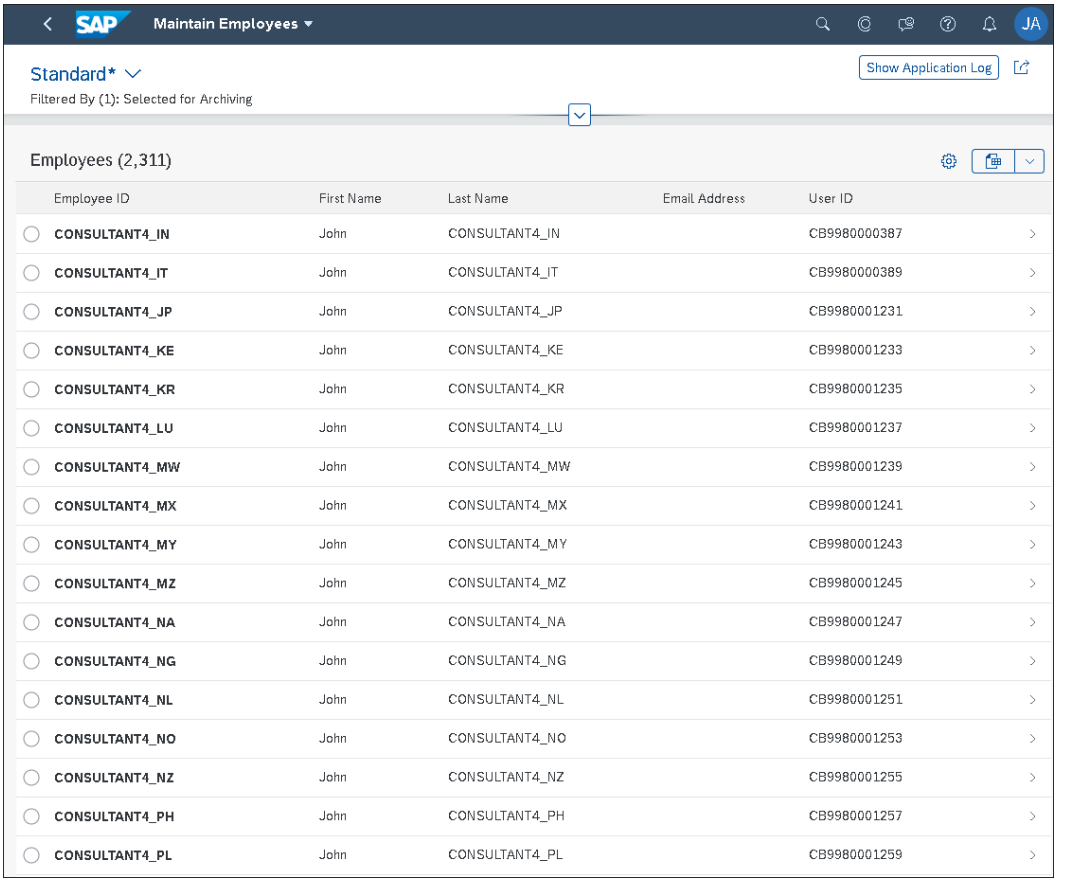


Figure 11.3 User Maintenance Entry Screen in SAP S/4HANA Cloud



Navigation in SAP Fiori Launchpad

The start screen (SAP Fiori launchpad) is divided into launchpad groups. The currently selected group is underlined in the header line. You can navigate to the other groups by scrolling or navigating through the dropdown menu at the top right.

Alternatively, you can import user data lists using the **Import Employees** tile in the **HR Master Data** group. We always recommend creating users with your personal user and reserving the technical user for initial access only.

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Assigning Roles for Administrators and Key Users

Key user role

In the next step, you must assign the administrator role to the administration user:

1. Log on to the system with the newly created user.
2. Select the **Maintain Business Users** tile in the **Identity and Access Management** group.
3. In the next dialog box, use **Add Business Roles** to assign the desired roles to the selected user, which is the `SAP_BR_ADMINISTRATOR` role in our example (see Figure 11.4). If the administrator is also expected to maintain employee data, assign the `SAP_BR_ADMINISTRATOR_HRINFO` role.

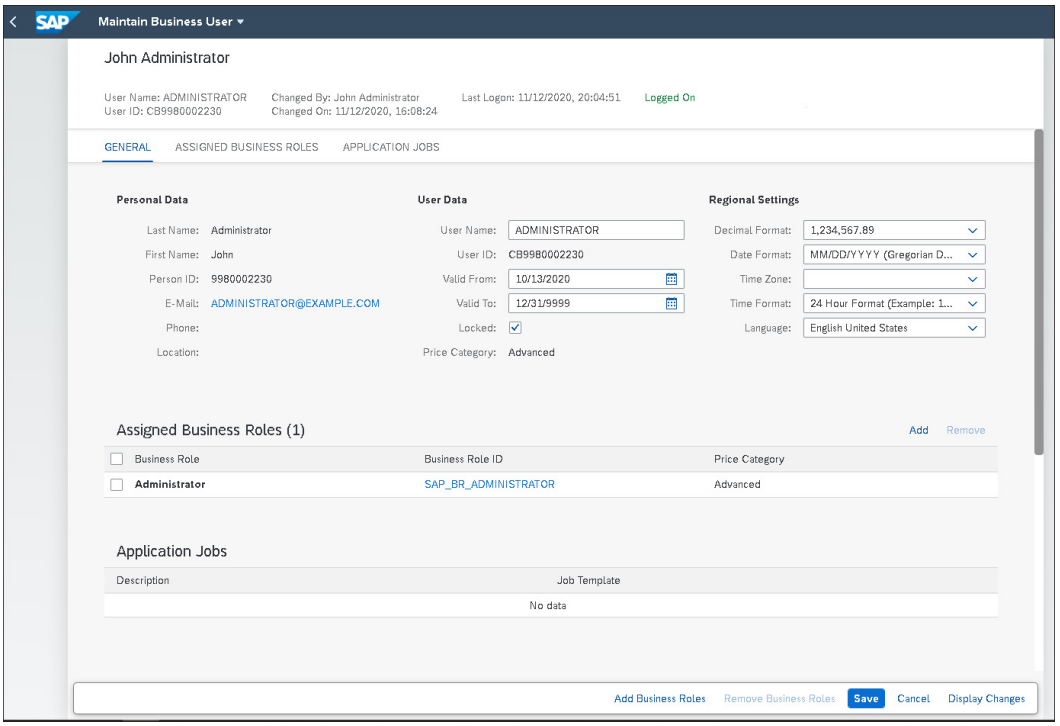


Figure 11.4 User Maintenance: Assigning Roles

Now you can use the administrator. Log on to the system as the administrator and assign roles to your key users.

Note that the starter system supports only a small number of users because it's designed to explore SAP S/4HANA Cloud in detail and to test alternative configurations. As a result, the starter system only provides a few roles. You'll usually create key users in the systems of the next project phase. Section 11.1.3 discusses this phase in more detail. Ensure that you have assigned administrator rights to at least one user.

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Importing Users to the SAP Cloud Identity Tenant

Authenticating users

Note that personal users must also be authenticated to access the cloud system via an *Identity Provider* (IDP). For SAP S/4HANA Cloud, SAP provides its own identity provider by default: *SAP Cloud Identity*. SAP Cloud Identity automatically provides a tenant for each SAP S/4HANA Cloud installation. Figure 11.5 illustrates this user identification architecture. Of course, you can also use another identity provider. However, we assume that you'll use SAP Cloud Identity for this example. You'll receive separate access data for this SAP Cloud Identity tenant.

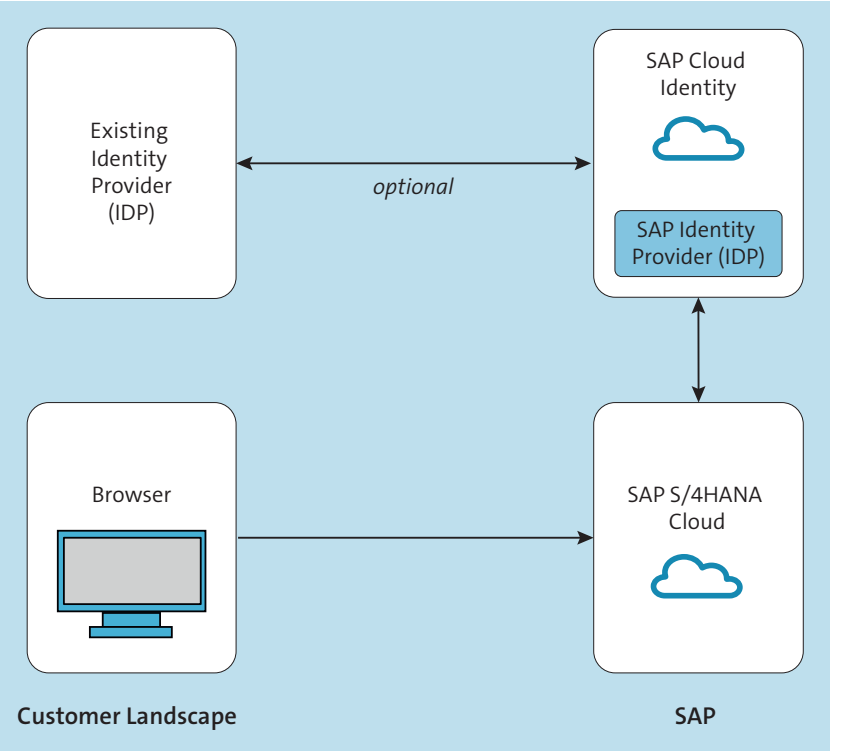


Figure 11.5 User Authentication Architecture

You'll have to create each user in these two systems. In the SAP S/4HANA Cloud system, you'll define the user master data and the various roles for business application authorizations. The SAP Platform Identity Provider service for SAP BTP (formerly known as SAP Cloud Platform identity provider) authenticates the users. You must not confuse these two systems.

To enable authentication, authorized users must be made known to the SAP Platform Identity Provider service. For data security reasons, only you are allowed to access the platform identity provider service; thus, you'll have to import your users to this service during the implementation project. You'll

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export the employee master data from SAP S/4HANA Cloud and import this data to the SAP Platform Identity Provider service. Table 11.1 provides an overview of the necessary steps in the two systems.

	Creating Employee Master Data	Exporting Data from SAP S/4HANA	Importing to SAP Platform Identity Provider Service
Action	**Maintain Employees** tile	**Maintain Business Users** tile Select the necessary users Select **Download**	**Import Users** tile Upload file Send email to users
System	SAP S/4HANA Cloud	SAP S/4HANA Cloud	SAP Platform Identity Provider service

Table 11.1 Maintaining Master Data in SAP S/4HANA Cloud System and SAP Platform Identity Provider Service

Technical and personal users

From now on, you should always use your personal user when working in the system. After creating personal users with administrator rights and making them known in SAP Cloud Identity, log off from the technical user. Then log on to the system with the administrator user to make further settings. Alternatively, you can also use a key user to carry out configurations.

User Administration Options

SAP S/4HANA provides various options for managing and authenticating users. Choosing your preferred option is an SAP S/4HANA implementation subproject. Because access to the system is a basic prerequisite for essential migration project steps, let's look at the various options next. Three user administration models exist for implementing SAP S/4HANA Cloud:

- **Embedded user administration**
  The simplest option is to use the basic user administration that is already integrated into SAP S/4HANA Cloud. In this model, SAP Cloud Identity contains a specific identity provider. This option enables you to maintain basic user master data. SAP S/4HANA does not support advanced human resources scenarios.
- **Integration of human resources with SAP SuccessFactors**
  SAP recommends using SAP SuccessFactors for all HR aspects and scenarios. You can integrate SAP SuccessFactors with SAP S/4HANA. If you create employee master data in SAP SuccessFactors, this data will be automatically replicated in SAP S/4HANA, and users will be created based on this data. Then you'll only have to assign the relevant busi-

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ness roles to these users in SAP S/4HANA. In this scenario, authentication takes place in SAP SuccessFactors.

- **Alternative IDP solution**
  Alternatively, you can integrate SAP S/4HANA with any third-party IDP solution. This option is designed for customers who already use other user administration solutions. SAP Cloud Identity then asks the alternative identity provider to authenticate the users. The embedded identity provider is not used.

In this book, we focus solely on the first model: basic embedded user administration.

Configuring Business Processes

Managing your solution as a process expert

Users configuring business processes in the system need to have the `SAP_BR_BPC_EXPERT` role (Configuration Expert—Business Process Configuration). You can configure your SAP S/4HANA Cloud system with this role using the implementation cockpit in the Manage Your Solution app. Figure 11.6 shows the initial screen of the configuration.



Figure 11.6 SAP S/4HANA: Implementation Cockpit

In principle, the initial implementation's configuration is divided into two parts. In a scoping step during the prepare phase, you define which business processes you want to use in your SAP S/4HANA Cloud system. In this phase, you also specify initial data, such as organizational data, group currency, or your individual house bank data. When you continue with the realize phase, you activate the system based on your decisions made in the prepare phase, and you can detail your business processes in a second step. Self-Service Configuration User Interfaces (SSC-UIs) are available for this purpose. This step is described in Section 11.2.

As shown in Figure 11.7, the Manage Your Solution app provides links for detailed configuration (**Configure Your Solution**), central test functions (**Test Your Processes**), and test process management (**Manage Your Test Processes**).

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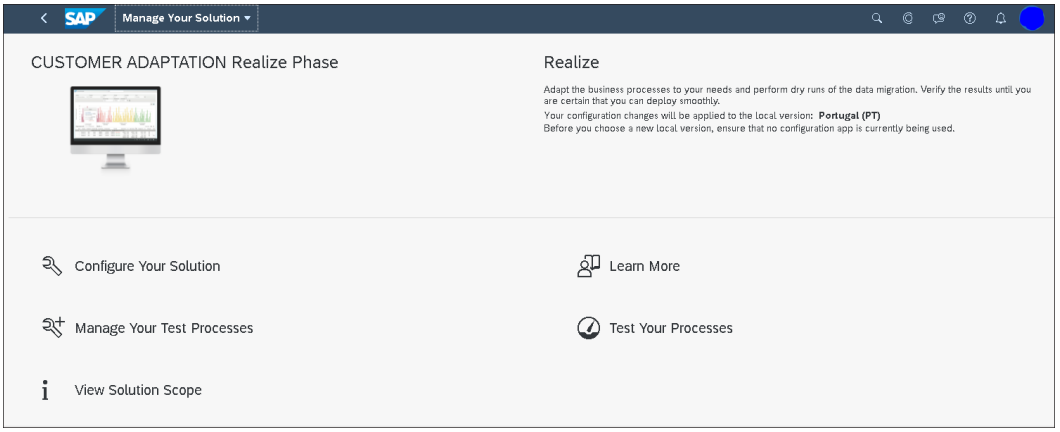


Figure 11.7 Manage Your Solution

Transition to the Realize Phase

Concluding the prepare and discover phases

With the transition to the *realize phase*, you conclude the *prepare* and *discover phases* and start to adapt the SAP S/4HANA system to your requirements.

Quality assurance and production system

Based on the selected solution scope, your corresponding quality system is available in the *realize phase*.

The system is ready for use after you have entered and activated the initial quality system settings. You must activate the quality system in the system release in which activation was made. Moreover, you must request the production system—also in the same system release.



Quality System Lock

When planning the project, take into account that the quality system is locked when the production system is generated to avoid unintentional changes.



System Types

To use SAP S/4HANA in production, SAP generally recommends multisystem landscapes. Consequently, a two-system landscape is used for SAP S/4HANA Cloud. The quality system in this two-system landscape enables you to make changes to the system without directly affecting operational production processes. You can implement and test configuration changes, new functions, or customer-specific enhancements in the Q-system. Only after successful testing they are transferred to production using the SAP transport system. The SAP transport system serves this transfer.

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11.1.3 Realize Phase: Setting Up the SAP S/4HANA Cloud Quality System

In the *realize phase* of the SAP S/4HANA Cloud implementation project, you create and test the final characteristics and settings that are supposed to form the basis for productive operation. If, for example, enhancements must be made to the solution scope (adding more business processes), you request these enhancements using a ticket in the XX-S4C-OPR-SRV component. SAP Service Center then activates the desired enhancements to the scope.

In these systems, you create users for all employees.

Steps of the realize phase

The following activities are required to prepare the system:

1. Importing or creating employee master data and setting up the authentication
2. Implementing the basic system configuration
3. Transferring data from the legacy system

To complete these preparatory steps for the system, you'll have to carry out further activities, such as setting up print control and selecting the relevant business processes. However, in this book, we won't discuss how to identify and define these processes. We assume that the necessary business processes have already been specified.

Importing Employee Master Data

Log on to the quality assurance system as an administrator. Use the **Maintain Employees** tile in the **EMPLOYEE Master Data** group to create all employees manually or forward a file with employee master data to SAP Service Center. This procedure corresponds to the procedure in the prepare phase, which we discussed in Section 11.1.2.

Creating key users

As in the starter system, you can also only create a limited number of employees in the quality system. You must ensure that the master data for the key users is maintained. *Key users* are users who configure the system in the implementation project or are responsible for enhancements, tests, and maintenance.

Assigning Key User Roles

In contrast to the procedure in the starter system, you should assign key users differentiated user roles in the quality assurance system in the following way:

1. Log on to the system with the administrator user. Select the **Maintain Business Users** tile in the **Identity and Access Management** group.

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2. In the next dialog box, assign the desired roles to the selected users. As shown in Figure 11.8, the MAINTENANCE_PLANNER user has the specific **Maintenance Planner** business role for maintenance tasks.

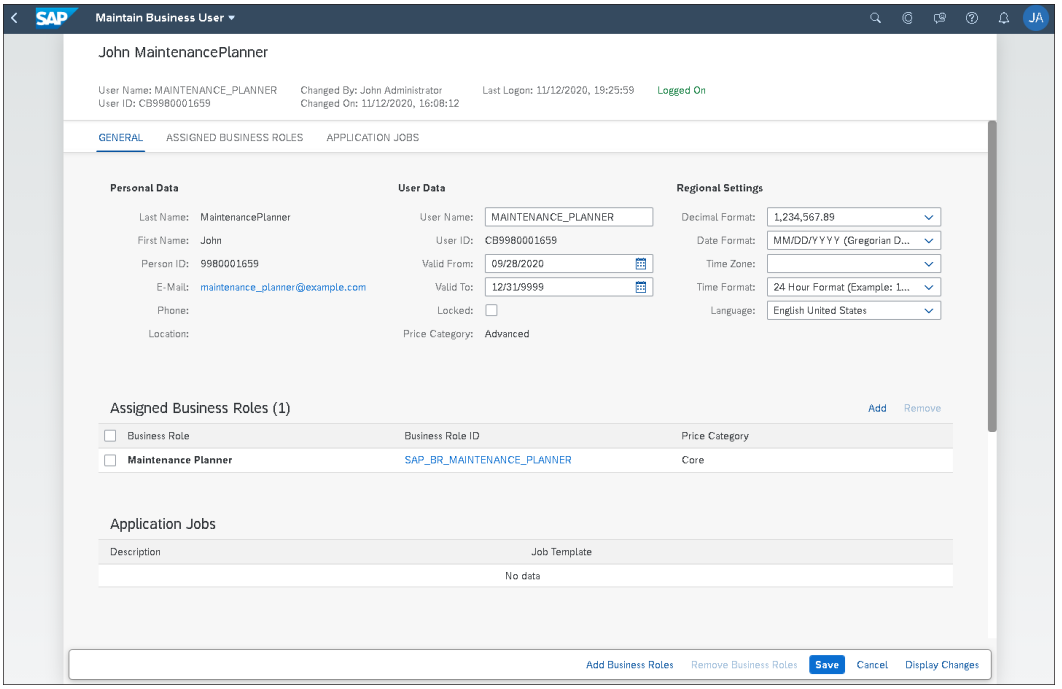


Figure 11.8 Detail Screen for Maintaining User Roles in SAP S/4HANA Cloud

Ensure that you have assigned administrator rights to at least one personal user.

Importing Users to the SAP Cloud Identity Tenant

Note that in the quality assurance system, personal users must also be authenticated to access the cloud system. Make your quality assurance system users known to SAP Cloud Identity by downloading the user list from the quality assurance system and importing it into the SAP Platform Identity Provider service. The steps correspond to the procedure in the starter system, as described in Section 11.1.2.

Basic System Configuration: Defining Business Processes

Key users are responsible for defining business processes. After logging on as a key user, select the **Manage Your Solution** tile in the **Implementation Cockpit** group on the start screen. In this application, you'll select which business processes should be available in the system. This is described in more detail in Section 11.2.

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Quality and Production System Consistency

Note that the quality system is used as the central template for generating the production system. You should therefore ensure that the business processes in the quality assurance system have been configured as required. The configuration in the production system should not differ from the configuration in the quality assurance system.

Maintenance and test

For production, the quality system also plays a central role in avoiding unpredicted effects in production—for example, from maintenance operations. You can also use the Q- system to test future adaptations of the system usage, such as the implementation of additional functions, before transferring these adaptations to production. For this purpose, read Section 11.2.

11.1.4 Deploy Phase: Setting Up the SAP S/4HANA Cloud Production Systems

Ensure that the quality system has been fully implemented and that all acceptance tests have been passed successfully. With this last step, you will change over completely to production.

Now, let's perform the basic implementation steps for the last time.

Importing Employee Master Data

Creating all production users

Log on to the production system as the administrator and create users for your employees by selecting the **Maintain Employees** tile and importing the employee master data again, as described in Section 11.1.3. Ensure that you have created all employees in the production system. You should follow a two-level approach when assigning roles and authorizations in the production system: First, you'll provide key users with access to the system. Those key users can then verify that all settings in the system are correct for the last time. Then, you'll provide all users with access to the system.

Assigning Roles for Key Users

In the **Maintain Business Users** dialog box, assign the desired roles to the users. Ensure that you have assigned differentiated roles to the users. Also ensure that you have assigned administrator rights to at least one personal user.

Importing Key Users into the SAP Cloud Identity Tenant

Import key user data into the SAP Cloud Identity tenant to grant access to the system. Key users can then migrate the data and test the system for the

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last time. Immediately contact the SAP Service Center via the SAP message component XX-S4C-SRV if you encounter inconsistencies in the production system.

Assigning Roles to Business Users

Now, use the administrator user to assign the desired roles to all system users in the Maintain Business Users app. Again, ensure that you have assigned differentiated roles to the users.

Importing Users for Business Users to the SAP Cloud Identity Tenant

If you have received positive feedback from your key users, complete the user data with all employees in the SAP Platform Identity Provider service. With this step, all your users will gain access to the system.



Steps for Implementing Any Cloud System

The following steps for the technical implementation are performed in every SAP S/4HANA Cloud instance:

- Creating employee master data
- Assigning roles
- Defining authorized users in the SAP Platform Identity Provider service
- Defining business processes
- Migrating data
- Confirming transition to the next phase

SAP provides a useful online checklist for these steps, which you can find in the Roadmap Viewer. For the technical steps described in this book, the Technical Architecture & Infrastructure section is of particular relevance (see *http://s-prs.de/v429727*).

11.2 Configuring SAP S/4HANA Cloud

Customizing

As we mentioned in previous sections, you'll have to define your implementation scope and configure your solution in detail (Customizing). This section will describe this step in more detail. In general, configuration is a separate subproject. You must differentiate between two configuration steps. During scoping, you define the basic implementation scope. During fine-tuning, you can make additional detailed settings. The settings are made and stored in the quality assurance system and then transferred to the production system.

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11.2.1 Scoping

In scoping, you define your basic implementation scope. For this purpose, on the initial screen select the **Implementation Cockpit** group, as well as the **Manage Your Solution** and **Configure Your Solution** tiles. During the prepare and discover phase, you can select so-called scope items from a list; these scope items comprise a preselection of business processes with appropriate best practices content. In the realize phase, you can supplement and enhance these selected business processes. You can also adapt the country scope by sending a ticket to the SAP Service Center. For this purpose, open a ticket in the XX-S4C-SRV component. You can view the solution scope, which forms the basis of your implementation, in the Manage Your Solution app via the **View Solution Scope** function. This function shows the list of scope items that are activated in your system. From this list, you can navigate to the respective scope item documentation.

Once the implementation scope is defined, you can continue with fine-tuning to make detailed settings within the selected business processes.

11.2.2 Fine-Tuning

During fine-tuning, you can adapt the preselected business processes in detail. You can navigate to the Self-Service Configuration User Interfaces (SSC-UIs) by selecting the **Manage Your Solution** and **Configure Your Solution** tiles.

Detailed Settings via Self-Service Configuration User Interfaces

Making detailed settings via SSC-UIs

SAP S/4HANA Cloud 2102 provides more than 2,000 Self-Service Configuration UIs for detailed settings (sorted by application area). Figure 11.9 Shows the initial screen for application areas and configuration groups.

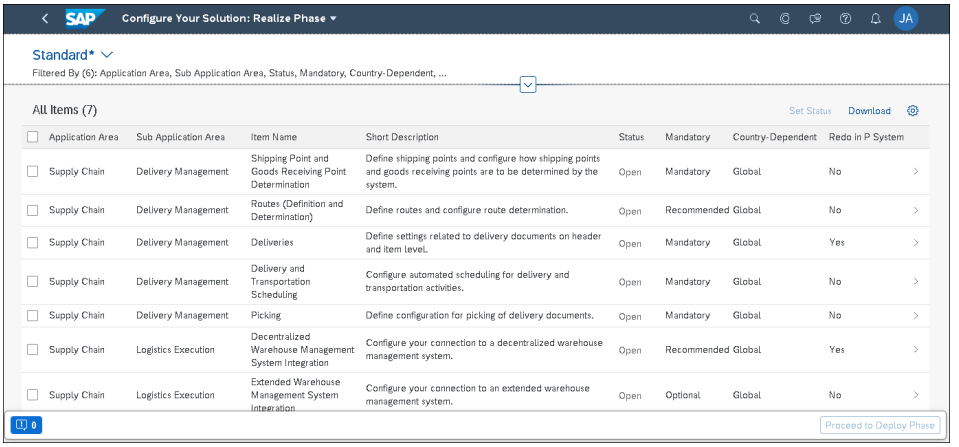


Figure 11.9 Configure Your Solution: Initial Screen

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You can filter by individual application areas or search by key words to navigate to the business groups of configuration apps. In our example, this is the **Supply Chain** application area and the **Delivery Management** subapplication area. From here, you can navigate to the detailed configuration of the various basic functions in delivery management:

- Determining the point for shipping and receiving goods
- Route (definition and determination)
- Deliveries
- Scheduling shipping and transport
- Picking

Figure 11.10 shows the SSC-UIs within the **Picking** configuration group. In the **Define Relevant Item Categories** SSC-UI, you can specify the basic relevance of individual delivery item categories for picking (see Figure 11.11).

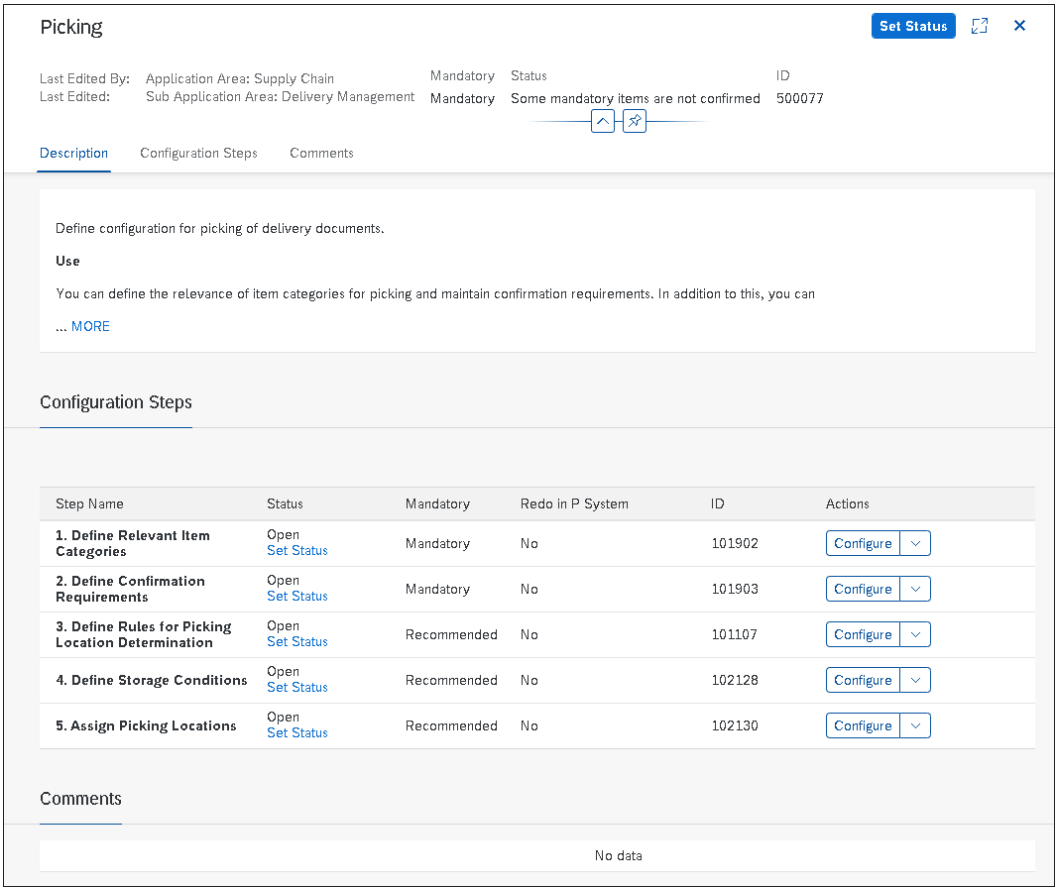


Figure 11.10 Picking Configuration Group

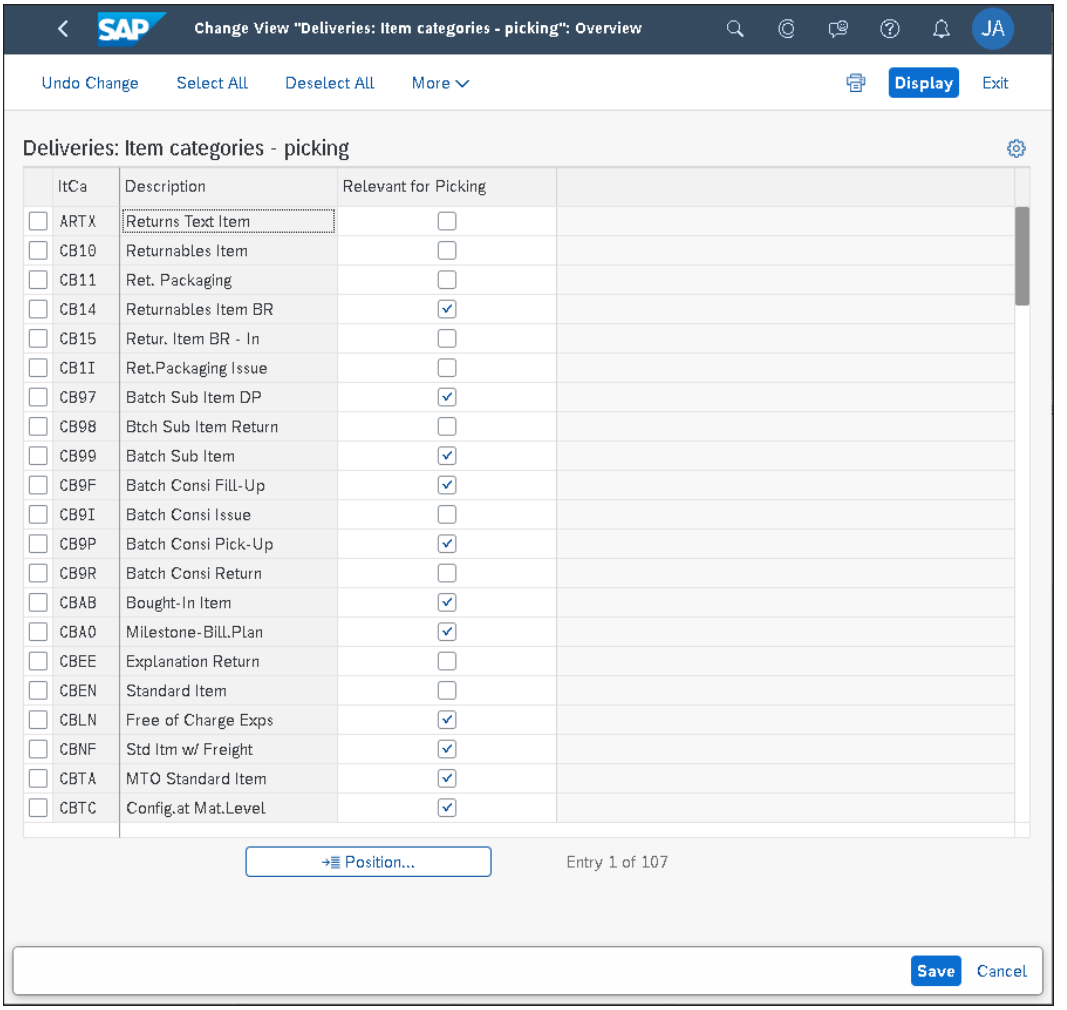


Figure 11.11 Settings for Deliveries' Picking

The settings you make in the individual SSC-UIs of the quality system are written to the central configuration transport upon saving. Once the subsequent application test is complete, you can transfer the configuration to the production system.

You can navigate to the individual SSC-UIs either by selecting the application areas or by using the keyword search. If you know exactly which settings you want to make, you can directly enter the respective unique ID of the SSC-UI. Table 11.2 lists the respective IDs for our delivery picking example.

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SSC-UI ID	SSC-UI Name	Application Area	Subapplication Area	Configuration Group
101107	Define Rules for Picking Location Determination	Supply Chain	Shipping	Picking
101902	Define Relevant Item Categories	Supply Chain	Shipping	Picking
101903	Define Confirmation Requirements	Supply Chain	Shipping	Picking
102128	Define Storage Conditions	Supply Chain	Shipping	Picking
102130	Assign Picking Locations	Supply Chain	Shipping	Picking

Table 11.2 SSC-UI IDs in Picking Area

The **Define Relevant Item Categories** SSC-UI of our example has the SSC-UI ID **101902**.

You can download a list of the SSC-UIs that are available in your system directly on the initial screen of Configure Your Solution. The list also contains the respective IDs of the SSC-UIs. The SAP Activate roadmap also includes a complete list of all SSC-UIs. This list includes a description of the SSC-UIs and their IDs.

Available Configuration Apps

Number of available configuration apps

Each SAP S/4HANA Cloud release increases the number of available Self-Service Configuration UIs. With SAP S/4HANA Cloud 2101, approximately 2,000+ of these configuration apps are available; more will follow with the release of SAP S/4HANA Cloud 2102. For configuration experts, it might not be surprising that the majority of detailed settings can be made in the area of accounting, followed by the areas of sales and purchasing.

Detailed Settings Using Expert Configuration

Detailed settings using expert configuration

If the flexibilization that you can implement yourself using the configuration apps is not sufficient, you can also request an expert configuration. To do so, you create a service request in the XX-S4C-OPR-SRV component based on corresponding templates that are available in the Roadmap Viewer (see the Detailed Configuration box ahead).

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Transferring Configuration Settings from the Quality Assurance System to the Production System

Transferring settings from the Q system to the production system

In principle, the adaptations to the predefined business processes are made and tested in the quality system and then transferred to the production system. For this purpose, you complete the mandatory configuration tasks and click **Proceed to Deploy Phase** in the overview screen (see Figure 11.12).

After the initial transfer of your configuration settings, you can still make further adaptations in the quality system and then transfer them to the production system.

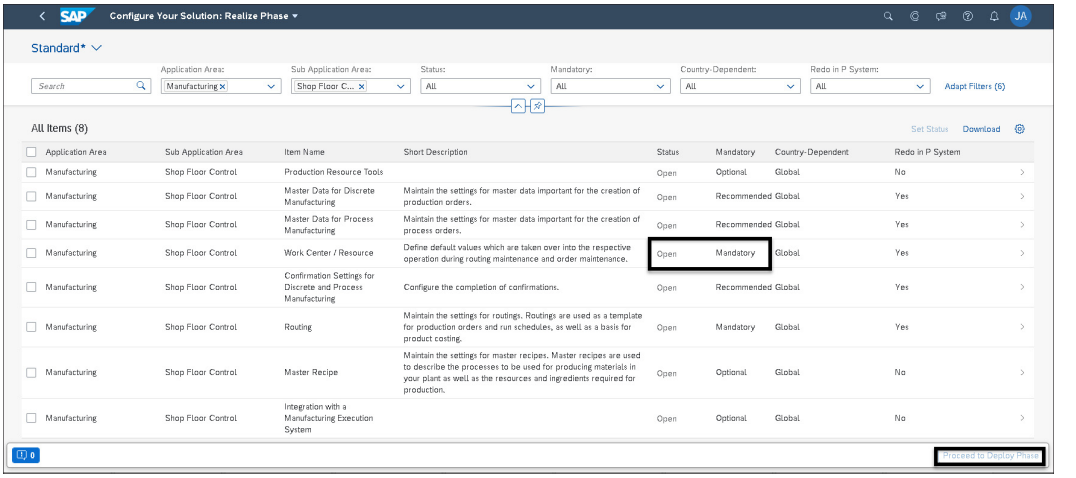


Figure 11.12 Transferring Configuration Settings from Q-System to P-System

Detailed Configuration Directly in the Production System

Current settings in the production system

There are configuration settings for which content cannot be transferred from the quality system to the production system. Integration settings, for example, are typically specific to a system. An example from this category includes settings for connecting the SAP S/4HANA Cloud system with a central finance system. Here, the settings maintained in the Q-system often differ from those in the P-system. This system-specific data is thus not transferred and doesn't need to be maintained subsequently in the production system. This category of settings is marked with **Yes** in the **Redo in P system** column.

SSC-UIs in the production system

Directly in the production system, you can only maintain the configuration settings of the **Current Settings** category. The vast majority of configuration settings must be made in the Q-system. These configuration settings are then available in the production system in display mode only. In the production system, too, you can open your Self-Service Configuration UIs by selecting the **Manage Your Solution** tile and then **Configure Your Solution**.

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Detailed Configuration

You can find more information on the detailed configuration in the Roadmap Viewer at *https://go.support.sap.com/roadmapviewer*.

Under **Solution Specific • Solution Specific/On Cloud • SAP Activate Methodology for SAP S/4HANA Cloud • Content • Phases: Realize • Solution Configuration**, you can find, among other things, tutorials that describe how to handle detailed configuration.

11.3 Setup and Configuration of SAP S/4HANA Cloud via SAP Central Business Configuration

Future application

In the future, it's planned to define scoping and configure business processes of SAP S/4HANA Cloud using the *SAP Central Business Configuration* application. As you can see in Figure 11.13, SAP S/4HANA Cloud is the first solution supported by SAP Central Business Configuration. More SAP Cloud solutions, such as SAP SuccessFactors, SAP Ariba, and SAP BTP apps, are to follow.

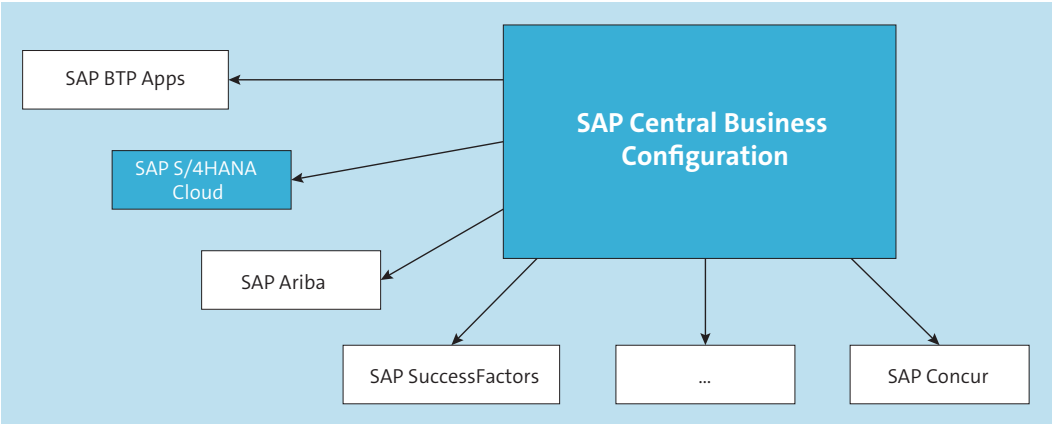


Figure 11.13 Central Implementation of SAP Cloud Solutions Using SAP Central Business Configuration

SAP Central Business Configuration becomes a central location where you configure SAP S/4HANA Cloud through *project experience* that guides you through all phases of your project based on the SAP Activate methodology.

Selecting the solution scope

The new approach is aimed at making the implementation of business processes easier and more efficient because the tool provides a central location for selecting *scoping* and configuring a business process consistently—that is, across various SAP Cloud solutions. For this purpose, SAP and its partners

provide preconfigured business processes that you can implement easily and consistently within your system landscape—not only at the beginning of an implementation project, but also during the entire lifetime of your project. Thus, the functionality of SAP Central Business Configuration aims at a seamless implementation of end-to-end business processes in *SAP's Intelligent Enterprise Suite (IES)*.

Benefits of central controlling

The benefit of controlling the configuration of all SAP Cloud solutions from a central location is that you can reduce the implementation times. This can be illustrated with a simple example of organizational structures. Organizational units, such as company codes, sales and purchasing organizations, and so on, are currently created in every SAP Cloud solution separately and must be converted if required. With SAP Central Business Configuration, there will only be one central instance for the respective organizational unit. This will lead to reduced *Total Cost of Ownership (TCO)* for both companies and SAP and will enable production starts in smaller iterative steps.



Central Goals of SAP Central Business Configuration

In summary, it can be said that SAP Central Business Configuration provides various benefits:

- Configuration is controlled via a central location.
- Implementation times are reduced.
- TCO can be reduced for customers and SAP.

The following sections detail SAP Central Business Configuration, its associated effects, and changing implementation activities.

11.3.1 System Landscape with SAP Central Business Configuration

Changing the system architecture

The system architecture changes with SAP Central Business Configuration (see Figure 11.14). On the left side, you can see the SAP S/4HANA Cloud tenant in which you operate your enterprise business. The SAP S/4HANA Cloud tenant is connected with the identity authentication service, which provides user management, single sign-on (SSO), and authentication. On the right side, you can see the SAP Central Business Configuration application. Here you will configure SAP S/4HANA Cloud in the future. SAP Central Business Configuration is connected with the identity authentication service and SAP BTP. SAP BTP is used for various services; however, it's particularly

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used for integrating SAP Central Business Configuration with other tenants or systems. The entire system architecture supports SSO, which has the advantage that you have to log on to a system only once, via SAP S/4HANA Cloud, the tenant, or SAP Central Business Configuration.

You have the option to provide a customer identity provider of your choice and connect it with the identity authentication service. Note, however, that in this case the management of the service is your responsibility. All other connections are still managed by SAP.

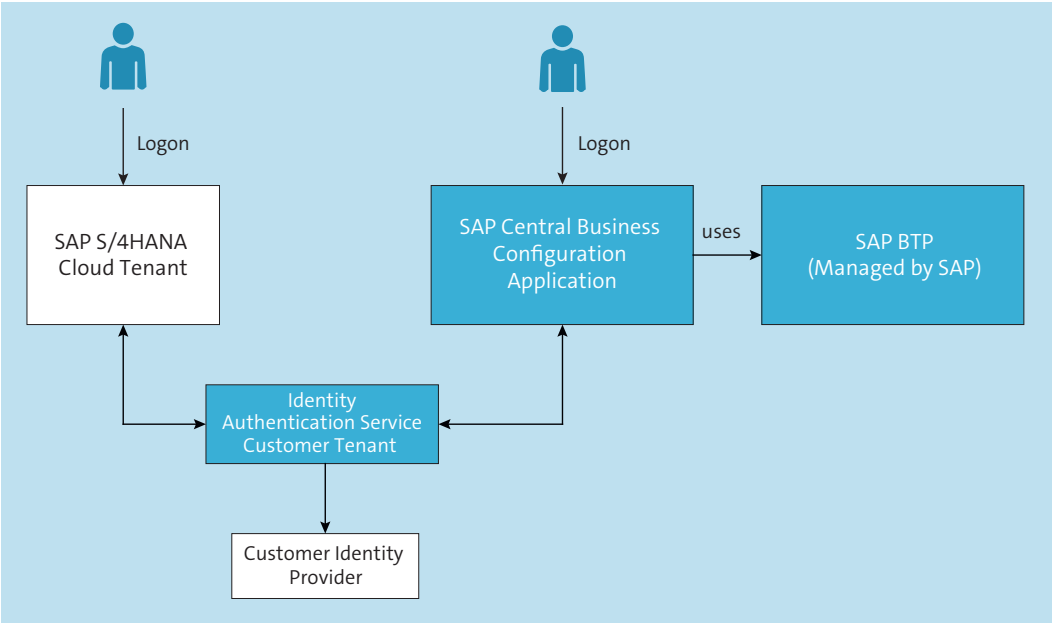


Figure 11.14 System Landscape with SAP Central Business Configuration

11.3.2 SAP Activate Methodology and SAP Central Business Configuration

Implementation using the SAP Activate methodology

SAP S/4HANA Cloud is still implemented using the SAP Activate methodology. The phases we described in detail in Chapter 9, Section 9.2 remain unchanged. Implementing SAP Central Business Configuration as a central configuration tool, however, impacts the individual phases of the SAP Activate method. Figure 11.15 illustrates the impact of SAP Central Business Configuration on the activities of the SAP Activate methodology. Let's take a detailed look at the associated changes.

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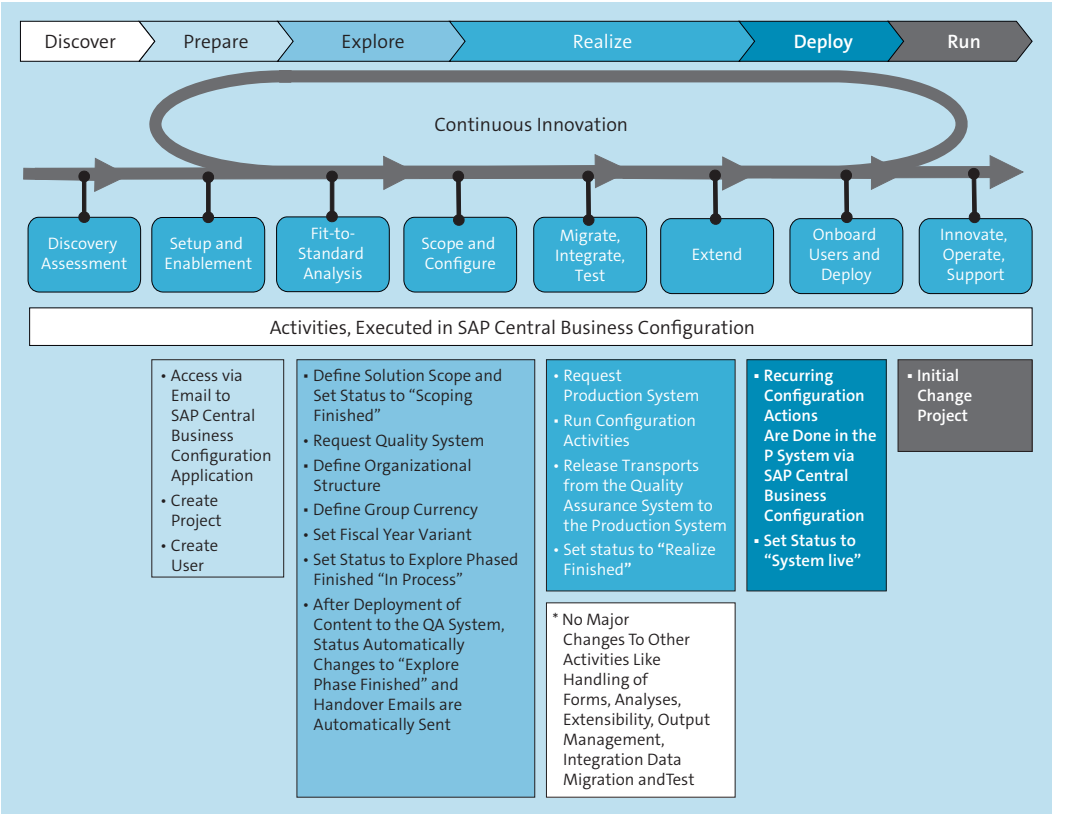


Figure 11.15 Impact on SAP Activate Activities with SAP Central Business Configuration

Discover

SAP Activate phases

The *discover phase* remains unchanged; that is, you can still use the SAP S/4HANA Cloud trial system to familiarize yourself with the SAP Fiori design and with the functions and processes in SAP S/4HANA Cloud.



Additional Information

You can access an individual SAP trial system at *http://s-prs.de/v631669*. You can use the trial system free of charge for 14 days.

Prepare

System accesses

The process of activating and providing the starter system remains unchanged initially. You can still access the starter system via a central URL, which you typically receive by e-mail along with additional access information. You also receive another URL by e-mail, which you can use to access

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the SAP Central Business Configuration application. Within the application, you must now create an implementation project and all relevant users and assign them to your project.

Explore

Defining the scoping

In the *explore phase*, you must perform various activities. First, you define your project's scoping. From the scope, you select the business processes that are relevant for your enterprise activities and that are provided by SAP and partners and transfer them to the implementation project that you created in the prepare phase. As soon as this process is complete, you set the **SCOPING FINISHED** milestone. When you set this milestone, the system prepares the SAP Central Business Configuration application based on the scoping you selected. Milestones are used to complete phases based on the SAP Activate method. We'll describe this in Section 11.3.3 in more detail. You can now request the SAP S/4HANA Cloud quality system. Moreover, you must make initial configuration settings, such as defining the organizational structure, the fiscal year variant, and the group currency. After completing these activities, you set the status to **In Process** to initiate the deployment of the selected business processes and initial configuration settings in the SAP S/4HANA Cloud quality system. As soon as this process is complete, the status is automatically set to **Explore PHASE FINISHED** and you are in the *realize phase*. The status change also triggers an automatic provision of the quality system. You receive separate e-mails to obtain access to this system. All business processes selected in the quality system are now enabled and you can start the configuration of your system.

Realize

Requirement of the production system

In the realize phase, you now start to adapt the quality system to your requirements and request the productive system.

An important change is that you use the user interface of SAP Central Business Configuration for configuring the system. It´s more a fine tuning because all pre-configuration of business processes is already available. The new configuration interface is supposed to provide a structured and user-friendly configuration of your system. We'll describe this in Section 11.3.3 in more detail. The *Manage Your Solution* app (Section 11.2.1), which contains various apps like *Configure Your Solution* and *Manage Your Test Processes*, will no longer exist in the future. The configuration settings that you made in SAP Central Business Configuration are automatically transported to the quality system. This is done via an activation engine that writes configuration settings from SAP Central Business Configuration to the customizing tables of the quality system.

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After you've completed the configuration, you set the **Realize Phase Finished** milestone. This takes you to the *deploy phase*.



Integration, Output Management, Forms

In the SAP Central Business Configuration application, you cannot make any settings for integration, output management, forms, extensibility, analysis, data migration, and testing of business processes. You must still make these settings in the SAP S/4HANA Cloud system.

The **Manage Your Test Processes**, **Test Your Processes**, and **Migrate Your Data** apps are now available via separate tiles via the SAP Fiori launchpad.

Deploy

Implement postprocessing

In the *deploy phase*, you perform recurring postprocessing for configuration activities in the production system using SAP Central Business Configuration. The **Confirm Go Live** milestone completes the deploy phase.

Run

Initiating change projects

In the run phase, you can initiate change projects to transport new configurations and enhancements from the quality system to the production system (similar to the deploy phase).



Roadmap Viewer

All phases of the SAP Activate methodology are described in detail in the Roadmap Viewer at the following link: *http://s-prs.de/v631626*.

11.3.3 Project Experience

Support for implementation

Project Experience is an app in SAP Central Business Configuration that is supposed to support carrying out your implementation project. The app guides you through the respective project phases and activities. The project phases are based on the SAP Activate methodology, which we discussed in Section 11.3.2. Each phase comprises various activities that you must process. After having completed each phase, you must set so-called milestones.

Milestones

Among other things, milestones are used to do the following:

- Trigger changes to the project phase—for example, switching from the explore phase to the realize phase
- Block project activities that aren't relevant for a specific project phase
- Trigger background processes to simplify the user experience

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To complete a project phase, you must have performed all mandatory configuration activities.

The Project Experience app also enables interactive access to various functions—for example, definition of scoping, configuration of individual activities for your business scenarios, and definition of the organizational structure (see Figure 11.16).

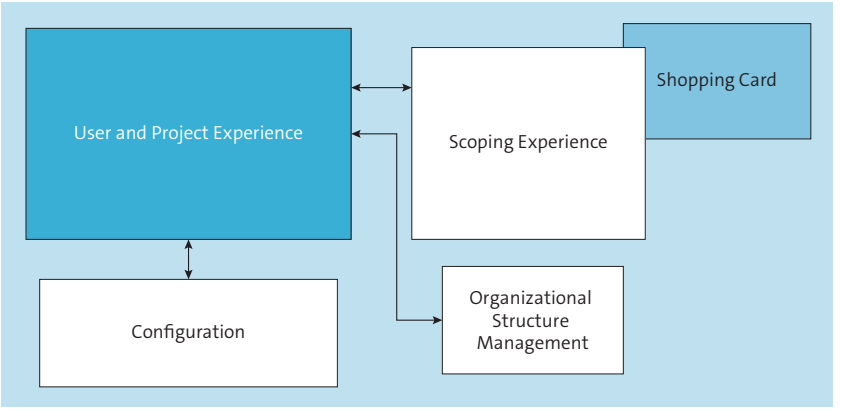


Figure 11.16 Interactive Access in Project Experience App to Various Functions

In addition, the Project Experience app provides the following functions:

Project Experience functions

- You get a graphical overview of all activities—sorted by status—that you must make for your project.
- The app contains a team member page to obtain a quick overview of all team members that are assigned to your implementation project, including their respective project roles.
- You can display a system overview of the systems used and their status (e.g., **Available**, **Unavailable**). In addition, in this view you can request system deployments and the transport release of your configuration settings from the quality assurance system to the production system.
- You are provided with a history log to track the change history for your project activities and milestones.

11.3.4 Defining the Scoping

Scoping

The definition of scoping specifies the first activity that you carry out during your implementation project. To start the definition of scoping, you must run the **Do Scoping** activity in your project. You can then select the countries for which your enterprise processes are relevant (see Figure 11.17). Here you can select one or more countries.

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Selecting a scenario bundle

After you've selected the countries, you continue with the selection of predefined scenario bundles (see Figure 11.18). A *scenario bundle* comprises various scenarios that are mandatory for your business branch—for example, professional services. Furthermore, you can select additional, non-standard scenarios. Selecting non-standard scenarios is optional. SAP Central Business Configuration ensures that no business inconsistencies arise when you select the scenarios.

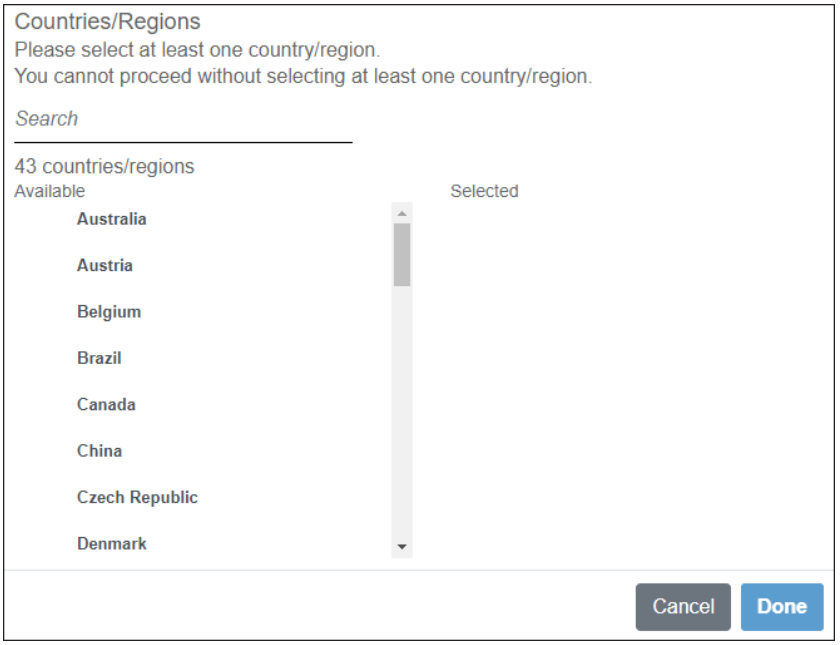


Figure 11.17 Country Selection in Scoping

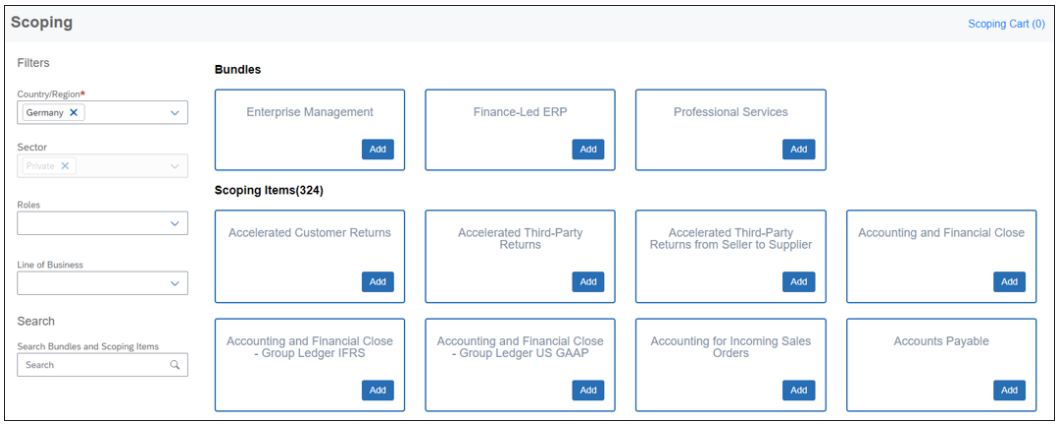


Figure 11.18 Selecting Scenario Bundles and Scope Items

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License-dependent scenarios are hidden by default and must be requested via a ticket. Also note that the current scenarios will replace scope items in the future.

Scoping card

After you have defined scoping, you can start with the configuration of your system. The scoping you selected is displayed in a so-called scoping card.



Group Ledgers: IFRS and US-GAAP

The scenarios for the group ledgers, IFRS and US-GAAP, are treated as non-standard scenarios. You can only select one of the two options and add it to your scoping. The checks that are stored in SAP Central Business Configuration ensure that all scenarios that depend on the selected ledgers are added consistently to your scoping.

11.3.5 Configuration of SAP S/4HANA Cloud via SAP Central Business Configuration

Initial configuration settings

As described in Section 11.3.4, you must carry out various configuration settings in the system depending on the project phase.

On the one hand, you must make initial configuration settings during the explore phase. These basically include the definition of the fiscal year variant, the group currency, and the organizational structure. Note that the fiscal year variant and the group currency can no longer be changed upon confirmation, apply to the entire enterprise structure, and are prerequisites for creating the organizational structure. Creating the organizational structure is available as an application that enables you to easily create and adapt your enterprise structure using a graphical display. To provide your organizational structure in the quality assurance system, you must confirm the structure. After the confirmation has been made, it's no longer possible to adapt or delete the organizational structures or their entities. Changing or deleting nonconfirmed organizational units or their entities is still possible.

Scoping- and country-dependent settings

As described in Section 11.3.4, upon completion of these activities, you must set the status to **In Process** to start the deployment of the selected business processes and the initial configuration settings in the SAP S/4HANA Cloud quality system. After you have completed these processes, you are in the deploy phase. In this phase, you carry out all scoping- and country-dependent configuration settings that are required to map your business activities. For this purpose, you are provided with so-called Fine-Tuning UIs and Self-Service Configurations that you call from SAP S/4HANA Cloud.

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openSAP Courses

Additional information on SAP Central Business Configurations is available in:

- The openSAP course at *https://open.sap.com/courses/s4h17* (this course is available in English only)
- SAP Roadmap View for SAP S/4HANA Cloud at *http://s-prs.co/5279115*

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Chapter 12
Planning Data Migration

This chapter describes the planning of data migration projects for new SAP S/4HANA implementations, as well as the tools, methods, and approaches used.

For a new implementation (greenfield implementation), the data of one or more existing systems is moved to a new system. This approach enables SAP and non-SAP users to get rid of any legacy systems (e.g., if the SAP ERP system has been used for a long time). Companies can start from scratch with a "clean" system. For those that have not used any SAP ERP system so far, this is the only and correct approach. A new implementation enables you to return to the standard. For companies that have not been SAP users so far, a new implementation is the possibility to run their business processes following a standard. The SAP Best Practices tool provided by SAP has proven very beneficial. It is delivered in SAP S/4HANA Cloud and either is already activated or can be activated by the customer. Companies with existing SAP systems with many customer modifications in particular can now return to the standard and make a fresh start, including in the areas of data volume and data quality. Each new system implementation therefore presents an opportunity to clean up and realign a custom SAP ERP system and get rid of legacy data.

Project phases and tasks

Irrespective of whether you have an on-premise or a cloud system, the individual project phases and tasks are almost identical within the implementation or data migration project. Section 12.1 provides selected roadmaps to illustrate which tasks and activities are scheduled in SAP Activate within the scope of a data migration.

Section 12.2 describes the data migration procedure in the overall implementation project and introduces the individual data migration phases.

Section 12.3 then describes the individual tasks that arise in a data migration project and how they are distributed to the respective project phases. For this purpose, the SEAMAP project planning structure for migration projects is used. Section 12.4 presents some tools that you can use for project planning and describes how to estimate the effort based on the SEAMAP project planning structure.

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Usage of SAP S/4HANA

In this chapter, we generally use the term SAP S/4HANA. It refers to both on-premise and cloud products and offerings from SAP. If a distinction between cloud and on-premise options must be made, we'll point this out explicitly.

12.1 Data Migration Using SAP Activate

SAP Activate

Chapter 9 introduced SAP Activate, the new implementation methodology for SAP S/4HANA. Data migration is an integral part of SAP Activate and is listed differently in the various roadmaps.

12.1.1 Data Migration in SAP Activate Roadmaps

Roadmap Viewer

You can find detailed information on the various roadmaps in the Roadmap Viewer. The Roadmap Viewer is available at the following link: *https://go.support.sap.com/roadmapviewer/*.

Chapter 9, Section 9.2 provides details on the Roadmap Viewer and the terms used. This section refers to the roadmaps as of January 2021 For SAP S/4HANA, the following roadmaps are available in the Roadmap Viewer:

Roadmaps

- General methodology roadmaps:
  - SAP Activate Methodology for New Cloud Implementations (Public Cloud—General)
  - SAP Activate Methodology for Business Suite and On-Premise—Agile and Waterfall (*)
- Cloud-specific methodology roadmaps:
  - SAP Activate Methodology for SAP S/4HANA Cloud (*)
  - SAP Activate Methodology for SAP S/4HANA Cloud, extended edition
- On-premise-specific methodology roadmaps:
  - SAP Activate Methodology for Transition to SAP S/4HANA

The following sections provide brief overviews of the data migration tasks and activities carried out in the respective phases of the roadmaps marked with (*). Details of the individual tasks/activities for each phase are available in the roadmaps themselves in the Roadmap Viewer.

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12.1.2 SAP Activate Methodology for Business Suite and On-Premise—Agile and Waterfall Roadmap

The general roadmap, SAP Activate Methodology for Business Suite and On-Premise—Agile and Waterfall, is intended for on-premise implementations, based on agile methods or the waterfall model. The individual deliverables for each phase are shown in Figure 12.1.

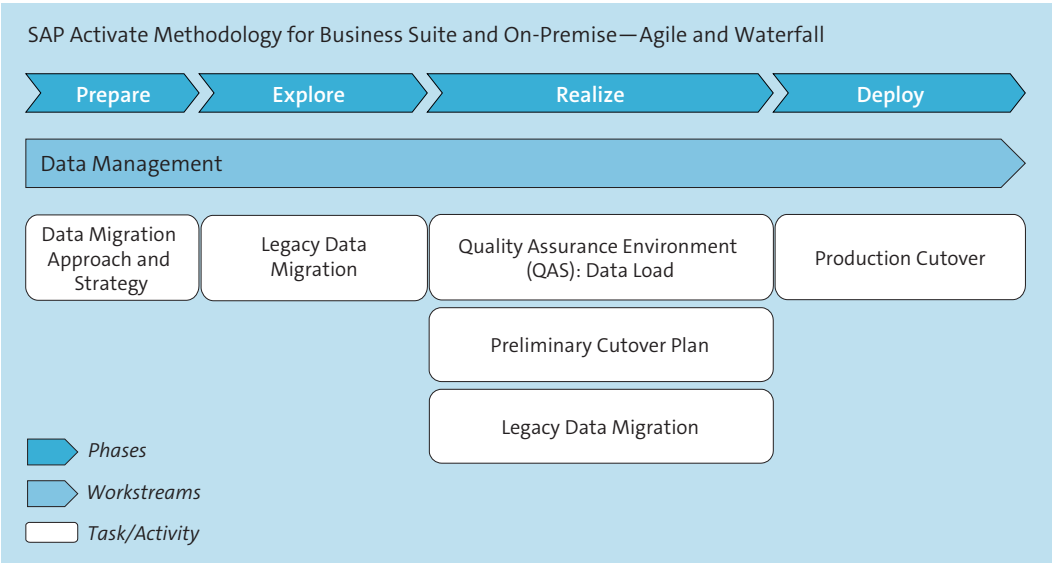


Figure 12.1 Deliverables for SAP Activate Methodology for Business Suite and On-Premise—Agile and Waterfall Roadmap

Phases and deliverables in the general on-premise roadmap

For the Data Management workstream, you can find the following deliverables with the respective tasks for each SAP Activate phase in this roadmap:

1. In the prepare phase:
   Data Migration Approach and Strategy
   - Prepare and carry out data migration workshop
   - Define data migration scope
   - Document requirements and strategy
   - Examine the organization and technical infrastructure of the customer and evaluate it with regard to upcoming data migration activities and processes to reveal and remedy shortcomings
   - Run risk analysis and develop preventive measures for mitigation
   - Complete the data migration approach and strategy document

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2. In the explore phase:
   Legacy Data Migration
   - Hold workshops for converting (mapping) data structures and values
   - Define which data is to be migrated using a migration tool or manually
   - Create a plan for ensuring, tracking, and controlling the data quality during the data migration process
3. In the realize phase:
   Quality Assurance Environment (QAS): Data Load
   - Prepare and load master data and transactional data

   Preliminary Cutover Plan
   - Develop a preliminary cutover plan and integrate all necessary data migration activities and tasks with it

   Legacy Data Migration
   - Develop a data migration architecture and data migration program for cleansing, extracting, mapping, enriching, and validating data
   - Perform and validate a manual data transfer
   - Develop a data quality plan
   - Load cleansed data to the SAP target system using the migration tools to be used and test it there
   - Measure and document load times and load quality of the individual test cycles to determine and continuously improve the efficiency of the data migration solution
   - Implement a concluding data quality test to check the quality of data
4. In the deploy phase:
   Production Cutover
   - Conclude cutover plan and run all dependent data migration activities in the correct chronological order
   - Perform final production data loading
   - Validate and sign-off the data and data quality at the end of the data migration

12.1.3 SAP Activate Methodology for SAP S/4HANA Cloud Roadmap

Deliverables

The SAP Activate Methodology for SAP S/4HANA Cloud roadmap was developed for SAP S/4HANA Cloud solutions. The SAP Activate Methodology for SAP S/4HANA Cloud, Extended Edition roadmap uses the same deliverables to a great extent and differs only marginally from the SAP Activate Methodology for SAP S/4HANA Cloud roadmap. The deliverables for the

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data migration are embedded in the Data Management workstream (see Figure 12.2).

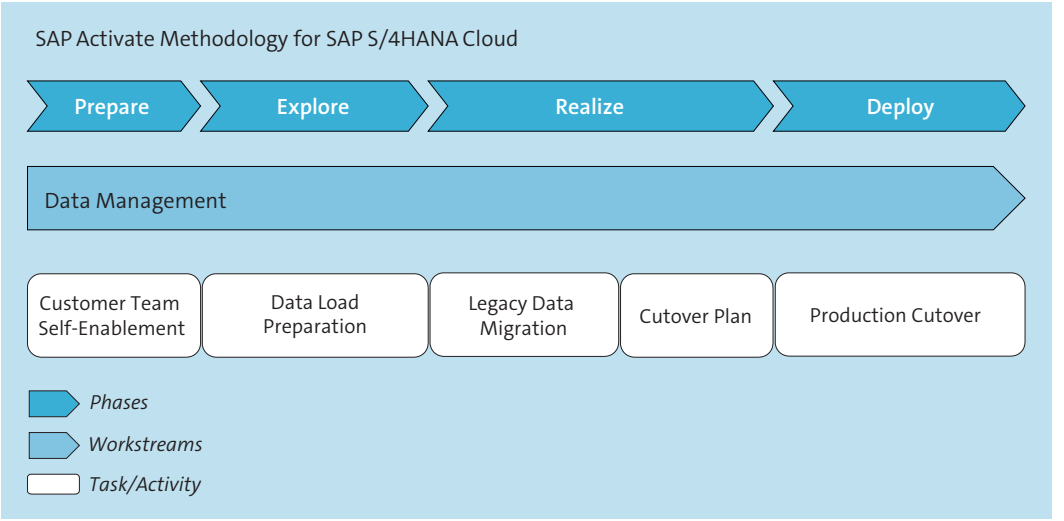


Figure 12.2 Deliverables for SAP Activate Methodology for SAP S/4HANA Cloud Roadmap

Phases and deliverables in the SAP S/4HANA Cloud roadmap

For the Data Management workstream, the deliverables and tasks distribute to the following individual SAP Activate phases:

1. In the prepare phase:
   Customer Team Self-Enablement
   - Familiarize with the SAP S/4HANA Migration Cockpit and the existing migration objects
2. In the explore phase:
   Data Load Preparation
   - Identify necessary and relevant migration objects
   - Download and check migration templates
   - Create a specification for extracting data in the source systems
   - Plan and run data cleansing activities
3. In the realize phase:
   Legacy Data Migration
   - Populate data into migration templates and load them to the staging tables either directly or using the migration cockpit
   - Validate data in the cockpit and perform subsequent value mappings
   - Remedy errors in the source data
   - Start simulation of the data migration

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- Run data migration with cleansed and validated data
- Run conclusive data quality checks, aiming to cleanse, transform, enrich, load, validate, and test source data in iterative cycles to produce acceptable data quality
- Incorporate results into the cutover plan and conclusive data validation

Cutover Plan

- Create a cutover plan and define which master data is loaded manually, via the migration cockpit, interfaces, or other applications, and define the sequence in which migration objects are loaded

4. In the deploy phase:
   Production Cutover
   - Run the tasks at hand for cutover according to schedule and verify manually created master data in the production system: cost centers, bank accounts, profit centers, and so on



Additional Courses and Workshops

- SAP training course S4C01E, SAP S/4HANA Cloud Implementation Fundamentals, or S4C00, SAP S/4HANA Cloud, essentials edition Overview, is generally recommended. For certification, you should attend SAP training course C_TS4C_2021, SAP Certified Application Associate—SAP S/4HANA Cloud, essentials edition Implementation with SAP Activate.
- Based on the trainings previously mentioned, the hands-on course HOS4C, SAP S/4HANA Cloud Implementation Workshop, informs you how to classify or use SAP Activate and data migration.
- We also recommend the SAP training course C_ACTIVATE12, SAP Certified Associate—SAP Activate Project Manager, found at *http://s-prs.co/527978*.
- These courses and workshops are also available at *https://training.sap.com*.
- If you want to learn more about SAP Activate, you should read the book *SAP Activate* by Denecken et al., which was published by SAP PRESS in spring 2020 (see *www.sap-press.com/5027*).

12.2 Data Migration Phases

Standardization of data migration

As you can tell from the previously mentioned roadmaps and possibly from your own data migration projects, the process of data migration within a project can be subdivided into specific phases with corresponding tasks. These data migration phases and the associated tasks can be generalized and

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thus be standardized. This section describes the data migration phases in more detail.

What can go wrong will go wrong

Before we discuss the individual phases of data migration, let's point out once again that data migration is a very complex matter, which many people still frequently underestimate. Data migration is not something that you can put on the project shelf and look at now and again two weeks prior to the go-live date and think that you can quickly load the data into the system.

Murphy's law

You may not think it possible, but despite numerous presentations, books, blog posts, and magazine articles on this topic from various consultants and authors around the globe, there are still consultants and customers that do not test data migration at all or only insufficiently and thus ruin the new implementation of their system. Even 70 years after the first publication of Murphy's law, his original statement still applies: "If there's more than one possible outcome of a job or task, and one of those outcomes will result in disaster or an undesirable consequence, then somebody will do it that way" (see *https://www.murphys-law.ch*).

This misjudgment and the resulting misbehavior cause unnecessary trouble and costs every time. In cloud projects, for example, a lack of understanding of what it means to use a cloud system with predefined processes and restricted flexibility is one of the most frequent reasons that specified project schedules cannot be met and are exceeded many times over. For this reason, it's even more important that you plan and carry out your implementation project using standardized implementation methods like the SAP Activate method described in Chapter 9. The sooner you deal with the necessary phases and tasks, the more often you test your data migration and the more sources of error you thus eliminate, the less will go wrong and the more successful your project and your data migration will be. Inform yourself early about the individual tasks that arise for data migration and how you can integrate them correctly into the individual project phases.

Phases of data migration are always the same

In general, the default phases of data migration in SAP S/4HANA correspond to the phases common in data migrations for SAP Business Suite systems or any other IT systems. We'll differentiate among seven phases:

1. Data analysis
2. Data cleansing
3. Mapping
4. Implementation
5. Tests:
   - Functional testing
   - Productive data load test (PLT)

6. Validation
7. Productive load and support

The previously mentioned phases of data migration can be incorporated into the phases of SAP Activate for a new implementation (greenfield) in SAP S/4HANA (see Figure 12.3).

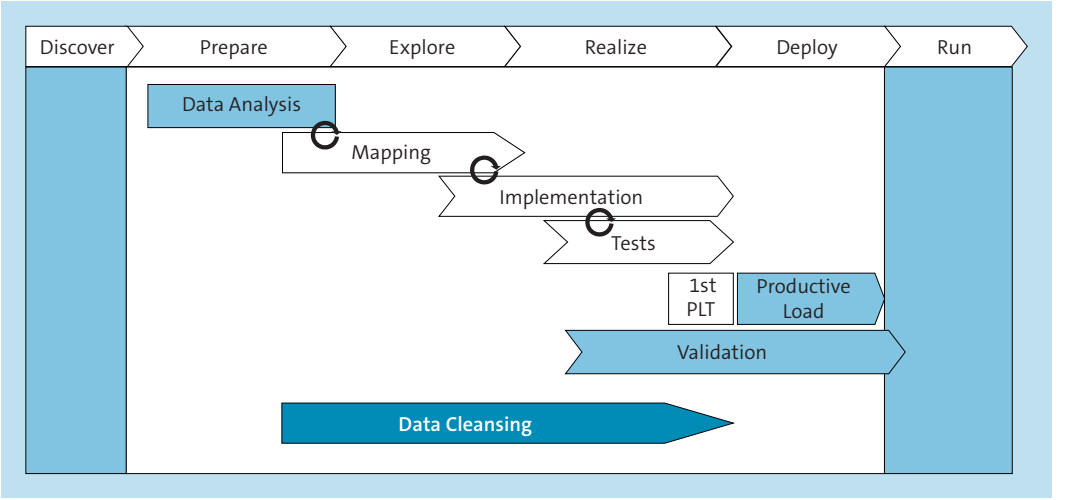


Figure 12.3 Data Migration Phases in SAP Activate

12.2.1 Data Analysis

Prepare and explore phase

In SAP Activate, the data migration starts with data migration workshops or a self-enablement during the prepare phase. We recommend that you always start data analysis as soon as possible, creating a base upon which you can build in data migration workshops. You should therefore start data analysis in the prepare phase or in the explore phase at the latest. When you analyze and then model your individual business processes, you'll specify the required business objects, the master data, and the transaction data used.



Business Object versus Migration Object

A *business object* is an individual data object that is needed to model a business process—for example, a material, customer, or purchase order.

A *migration object* is a part of the business object that is used to migrate the business object. Business objects sometimes have to be divided into smaller units for technical reasons. For example, certain parts of a business object could be installed via different APIs, or their data sources could differ. As a result, one business object may require more than one migration object.

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Master Data versus Transaction Data

Master data is data that is stable and used as the basis for business objects. Master data changes only slightly or not at all over a specific period of time. Common master data objects include, for example, customers, suppliers, materials, banks, and bills of material.

Transaction data is data that is volatile and subject to continuous change. Common transaction data objects include stock levels, account data, all types of orders, and documents.

Data migration tools and methods

Next, familiarize yourself with the data transfer methods and tools. If you use the SAP S/4HANA migration cockpit, you download, for example, migration templates for the cockpit for your respective migration objects. Read the corresponding migration documents and migration object documentation. Check if there are migration templates that are populated with sample data for your migration objects.



Data Migration Landing Page on the SAP Help Portal

With SAP S/4HANA Cloud release 1908 and SAP S/4HANA 1909, the so-called data migration landing page was published for the respective product versions and releases on the SAP Help Portal. The data migration landing page provides many useful documents, trainings and web links to posts on data migration. You can open the data migration landing page using the following links:

- SAP S/4HANA Cloud: *https://help.sap.com/S4_CE_DM*
- SAP S/4HANA: *https://help.sap.com/S4_OP_DM*

Anand Kapadia's blog at *http://s-prs.co/527979*, Help for Starting Your Data Migration Journey to SAP S/4HANA Cloud provides a very good description of the data migration landing page's content.

Analyzing and defining the origin of data

In the data analysis phase, you'll analyze the origin of your data and check whether manual or automatic data migrations are necessary. You should always use the most current data sources with the highest data quality for the data migration. Frequently, you'll have to consolidate data from different data sources into one data migration source. Many enterprises use many different data retention systems, which makes it harder to determine the leading and therefore most current data retention systems straight away.

Manual versus automatic transfer

Depending on the number and origin of data objects, it may be useful to transfer data to the new system manually if the amount of time and money

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for converting the data to a new format automatically is too high. Transferring the data manually would then make the most sense.



Many Hands Type Faster

If entering a data record in the target system takes one minute, for example, and only one person is available to manually enter 600 data records, this person requires 600 minutes or 10 hours to complete this task. Two persons handle the same workload in 5 hours and four persons in 75 minutes. If you need to decide to either implement expensive data migration and extraction logic for a couple of data records or use manual data entry, you should weigh the efforts carefully. If this data must be created several times for testing, you should consider this multiple effort in your calculation.

Determining migration objects

When determining migration objects, you should record the following information for each object:

- The SAP target system (if multiple target systems exist)
- The migration object and a description of the object
- The object type (master data, transaction data, Customizing data, other data)
- The estimated complexity of the migration object (1 = less complex; 10 = very complex)
- The object's relationships to other migration data objects
- The number of data records to be imported
- The source system(s)
- Important contact persons
- The planned data transfer method
- Related planning documents or business processes

Migration object overview

The best way to store this information is in a table—for example, in Microsoft Excel. You can then add necessary object and status information to this table.

Figure 12.4 shows a section from a sample table in Microsoft Excel.



Downloading Sample Tables

You can download the table in Figure 12.4 to use as an example for migration object documentation from *www.sap-press.com/5279*, where you'll also find other materials for this book. You can change and modify the table as required.

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									Source systems					Region 1	Region 2
No.	**Area**	**Object No.**	**Migration Object**	**Object Sub No.**	**Description**	**Comment**	MD= Master Data CU= Customizing TD= Transaction Data	**Data Migration** Y (yes) N (no) M (manual)	System 1	System 2	System 3	System 4	**Contact Person (SAP)** for Validation and Mapping	**Contact Person (Customer)** for Validation and Mapping	
1	SD	001	**Customer**	001	**Customer from Spain**	2016-09-11 Mr SAP1: Ask Ms Doe to get further information	MD	Y	X		X		Mr SAP1	Mr Murphy	Ms Killroy
2	SD	001	**Customer**	002	**Customer from Mexico**	2016-09-27 Email from Ms Killroy towards sales groups	MD	Y	X		X		Ms SAP2	Mr Doe Ms Killroy	N.N.
3	MM	002	**Supplier**	001	**European Suppliers**	2016-09-28 Herr Murphy: only eurpean suppliers are migrated	MD	Y			X		Mr SAP1	Mr Doey	N.N.
4	MM / SD	003	**Product**	001	**Raw material**	2016-09-28 Ms SAP2: and Mr Doe: only RAW materials of System 1	MD	Y	X				Ms SAP2 Mr SAP1	Mr Doe Ms Killroy	N.N.
5	MM / WM / SD / PP	003	**Product**	002	**Produced**	2016-10-08 Mr Doey: clarify MRP settings	MD	N	X	X			Mr SAP1	Mr Doe Mr Doey	N.N.

Figure 12.4 Sample Table for Documenting Migration Objects

12.2.2 Data Cleansing

Garbage in, garbage out

If you find errors during the data analysis and later on during the tests, you should eliminate these errors immediately in your source system. The better the quality of the original data, the fewer errors will arise during the data migration and the better the quality of the imported data.



Data Cleansing

In IT, the terms *data cleansing* and *data cleaning* (less frequent) are used. *To clean* means to clean something physically, while *to cleanse* means that something is (spiritually) refined, disinfected, and purified. In *data cleaning*, you only correct incorrect data, and in *data cleansing* you enrich it with missing information. In address data, for example, you can add missing house numbers, zip codes, and so on. You thus increase the data's value. Similarly, before you sell your car, you wash and vacuum it and polish its paint so that it shines nicely and the car's value increases.

Including data cleansing teams

Cleanse your data as early as possible and use existing data cleansing processes and teams, which are required and therefore already exist in many (larger) enterprises to satisfy quality audits and certifications.

The results of your first data migration tests are vitally important for future data cleansing processes in the source system. You should therefore integrate your existing data cleansing teams into the SAP S/4HANA migration team. If possible, the data cleansing process should be complete before you

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perform the initial load of the productive load test. In SAP Activate, the data cleansing phase extends from the prepare phase to the realize phase.



300,000 Data Records Become 5,000 Data Records

An SAP customer wanted to import 300,000 suppliers from an external system to a new system. A detailed data analysis showed that only about 5,000 suppliers were relevant. The other 295,000 suppliers were mainly inactive members whose records had accumulated over time. The records of some inactive suppliers, for example, included obsolete country names, such as "Yugoslavia." Ultimately, importing 5,000 suppliers was by far less time-consuming than importing 60 times that number. Finding ways to reduce the volume of the data to be migrated always makes sense. The fewer data records to migrate, the faster the processing in the relevant migration tools and the shorter the total import time.

Tools for data cleansing

Also use existing tools or evaluate appropriate data quality tools that you can use for data cleansing and increasing data quality. SAP Data Services, for example, provides some functions and extras to find and merge data duplicates or to correct and enrich address data.

12.2.3 Mapping

Paper mapping

During data analysis, you concerned yourself with data migration tools and methods. You should now know your source structures and the corresponding target structures of your data migration method (e.g., the migration template). After you have specified which data objects you want to migrate, you should immediately start to map the structures and fields of your source data to the structures and fields of the target system. You'll usually do this in parallel to determining the business processes during the explore phase of SAP Activate and use paper for this purpose (*paper mapping*). Because some of the master and transaction data is used in various business processes, the mapping of these objects should be completed when the data analysis phase is complete. This corresponds to the end of the explore phase in the SAP Activate methodology.

Predefined migration objects

SAP provides predefined data migration objects for the rapid data migration solution and the SAP S/4HANA migration cockpit. These objects are based on defined target structures that are derived from the data migration method (e.g., IDocs, function modules, BAPIs). These two tools provide predefined migration templates via SAP Best Practices. If you use the SAP S/4HANA migration cockpit, you'll only have to enter your data into the existing migration template and convert your source system values in the SAP S/4HANA migration cockpit accordingly.

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Frequently, initial tests of original data result in analysis and configuration errors that will require adjusting the target configuration and thus also the corresponding mapping and conversion rules. The mapping can consequently often not be completed until the last third of the implementation phase (the realize phase in SAP Activate) has been reached. This is one of the reasons you should start with data migration as a separate subproject as soon as possible to increase subsequent data quality through early tests.

Analysis and configuration errors



Alternative Units of Measure Suddenly Emerging

In the fit-gap workshop, alternative units of measure were not considered necessary. During the initial load tests using original data of the source system, an analysis of the source data showed that some international subsidiaries maintained product masters with different units of measures than in the leading system.

The data of the leading system is usually loaded first, which consequently determines the base unit of measure of the product. Stock levels are posted in the base unit of measure in SAP systems, which is why configuration had to be adapted. Concretely, alternative units of measure had to be implemented for product masters for which different units of measure existed in the source systems. Otherwise, 400 m of fabric in one subsidiary, for example, could be posted as 400 bolts of fabric (the basic unit of measure in the leading system). Because one bolt contained 100 m of fabric, this would have resulted in unwanted and incorrect increases in stock levels.

As many real-life examples show, some mapping problems occur during tests in subsequent phases despite intensive analyses and preparation. This emphasizes why tests of any data migration are mandatory prior to productive loading of data.

12.2.4 Implementation

During the implementation phase of data migration, which runs in parallel to the realize phase in SAP Activate, you create both the extraction programs of the source system and the transfer routings in the target system. In an SAP S/4HANA system, you should use the data transfer tools and solutions recommended by SAP. You do not have any alternatives in systems that are based on SAP S/4HANA Cloud.

SAP Best Practices

Predefined migration objects are delivered as so-called migration content for the rapid data migration solution, which we will present in Chapter 15, and the SAP S/4HANA migration cockpit (see Chapter 13). A list of the migration objects that are currently delivered is available on the data migration

Delivered standard migration content

landing page on the SAP Help Portal and in the appendix. This content is based on SAP Best Practices. Here, you'll usually have to enter the source data into the provided migration templates and maintain the source/target value conversions.

Legacy System Migration Workbench

If you use the Legacy System Migration Workbench, the implementation effort for creating the transfer programs is higher because you must build the full mapping yourself. For example, you must define the source structures and fields and map them to the target structures of their transfer methods. You must define and create rules and assign them to fields. This effort is eliminated if you use the data migration solutions that are intended for SAP S/4HANA. The implementation effort using these tools is clearer and more predictable than in a completely new implementation of the transfer procedures using LSMW or custom programs.

Using released interfaces

By using SAP Best Practices in SAP S/4HANA Cloud-based systems by default, the scope of the migration objects and useable fields is clearly defined in these systems. All migration objects required, including the useable structures and fields, are usually delivered for these systems. In SAP S/4HANA systems not offered with SAP Best Practices, it may happen that you'll have to implement or adapt transfer routines in the target system, including mapping and conversion rules, as well as implement and adapt extraction routines in the source system. In general, you must ensure for each SAP system and in particular for SAP S/4HANA that the interfaces and technologies (BAPIs, IDocs, batch input, etc.) that you want to use for this purpose are released for use by customers (e.g., that they are whitelisted).



Adapting and Newly Creating Migration Objects

For SAP S/4HANA systems that are based on the on-premise version of SAP S/4HANA, you can adapt existing migration objects or create new ones depending on the data migration tool. Using the SAP S/4HANA migration object modeler, which we will describe in Chapter 14, you can adapt the mapping rules of the delivered objects to your requirements and create new migration objects as of release 1709. In the rapid data migration solution based on SAP Data Services (see Chapter 15), SAP Data Services provides numerous options for adapting the predefined rules.

12.2.5 Testing

Intensive testing prevents additional costs

The test phase of the data migration spans the entire deploy phase of SAP Activate. Running tests is the crucial criterion for the success of any implementation. Unfortunately, experience has shown that tests are planned and run poorly, insufficiently, or not at all in the worst case. In most cases,

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too little attention is paid to tests and postprocessing tasks. This results in problems that involve unplanned additional work and costs. In some cases, this can even result in a delayed go-live—for example, if you start testing too late. If you then encounter problems, the time to go-live is usually too short. You can save these unplanned additional costs by using an appropriate test concept and providing sufficient test planning.



Direct Loading into the Production System without Any Tests

As mentioned initially, far too many data migrations take place according the motto "everything will be okay." Unfortunately, this is not often the case. Far too many users load data into a production system that they didn't test or visually check in a QA system. They simply load three data records for testing purposes and then load all other data records directly into the production system without rhyme or reason—which goes wrong in almost 100% of all cases. This is witnessed by the example of a company used exactly this procedure to load approximately 3,000 incorrect bank data records into the production system. The integrity of the migration template was destroyed due to careless copy-and-paste actions from another file to the migration template. This resulted in displacements during file upload, and the SWIFT code was migrated to the address field. This is a careless mistake that would have been discovered prior to the production system load if the data had been tested and checked carefully—which would have saved a lot of trouble. Other companies have loaded financial documents into the production system without testing them beforehand. Because there is no option to delete this data, they then had to reset the production system to the last backup prior to loading the data. This is nerve-racking and ultimately involves a lot of time and money.

More tests = more errors found = lower risk

The more data sources and conversion rules you have, and thus the more complex the data migration is, the more rigorously you'll have to test your migration beforehand. The more tests you can conduct with original data, the more problems and errors you can eliminate in advance and the higher the final data quality of the imported data. It's like the current coronavirus pandemic: the more people get tested, the more infected people are detected and are sent to self-isolation, which results in fewer new infections.

Backups and snapshots

It also makes sense to create data backups or snapshots of your database at defined times. If you create a database snapshot (data snapshot; formerly called a storage snapshot), for example, after successful loading of the master data, you can reset your system to this starting point at any time after testing the transaction data and load the transaction data again. You thus save the time of loading the master data again.

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More Information on SAP HANA Backup Types

You can find more information on SAP HANA backup types and data snapshots on the SAP Help Portal at **SAP HANA Administration Guide for SAP HANA Platform • Availability and Scalability • SAP HANA Database Backup and Recovery • SAP HANA Backup Types** (see *http://s-prs.co/527980*).

The **Data Snapshots** subitem also provides a comparison of backups and data snapshots.

The quality of the imported data is essential for your business processes and can considerably impact costs during live operations. You should schedule at least one PLT in the QA system as a dress rehearsal.

Example 1: Loading Incorrect, Untested Data

Copy values only

The SAP S/4HANA migration cockpit uses XML files as migration templates for loading data. Many users, however, don't read the introductions and help texts of these XML files. Copying content using the **Values Only** copy option does not cause any problems. But if you copy formatting, formulas, and, in particular, data types, you change the integrity of the XML file. Although the file is optically faultless in Microsoft Excel, the text editor directly reveals displacements and data type changes. Even in Microsoft Excel, you can quickly detect erroneous files. A different font is one hint of errors when inserting data: while the XML migration template uses the Arial font, erroneous data records are usually formatted in Microsoft's default font, Calibri. Text fields are left-aligned and number fields are right-aligned. You can detect an incorrect value in a text field if it's displayed in a cell with number formatting and if it's right-aligned instead of left-aligned. You should recheck your data after uploading the file to the SAP S/4HANA migration cockpit to detect formatting or displacement errors (see Chapter 13, Section 13.2.9).

Example 2: Problems After Self Configuration in the Cloud

Maintain units of measures subsequently

In SAP S/4HANA Cloud, you can made a self-service configuration. For example, you can maintain missing units of measure. Such configuration changes often impact data migration. For new units of measure, for example, you also have to maintain the respective ISO unit of measure. The predefined migration objects require an ISO unit of measure for processing data.

Considering different units of measure

The reason for this is simple. An SAP system comprises different, partially language-dependent units of measure that are assigned to an internal unit of measure. Most applications use language-dependent commercial units.

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Applications from the technical area also use technical units of measure. Others, in turn, use internal units of measure. An internal unit of measure is stored in the database, and the other units of measure are displayed. SAP specifies ISO units of measure as the default for external interfaces—for example, IDocs. The APIs used for data migration typically utilize the ISO unit of measure or the internal unit of measure for loading data. A few use commercial units. To avoid errors when mapping these four different values and to simplify the entire process, only one mapping is provided instead of four different unit of measure mappings. To follow SAP specifications, the ISO unit of measure is used as the target unit of measure. This means that the user has to convert all units of measure that occur in the source files to the ISO unit of measure in the conversion step. If you do not assign a primary ISO unit of measure when you create new units of measure, you cannot convert the data. Of course, it's beneficial to detect and remedy such problems at an early stage and not during productive loading of data. You can find more information on units of measure and ISO code usage in the SAP S/4HANA migration cockpit in knowledge base article 2907822 (see *http://s-prs.co/527982*).

Test early, test often

Our conclusions are these: Never load unchecked and untested data into a production system. Start the tests as early as possible. Test the entire data migration at least once beforehand. Even if the testing takes longer, it often takes even longer to clean the data in the production system because the system may have to be reset in case of emergency. As a Chinese proverb says: "I hear and I forget. I see and I remember. I do and I understand" (Confucius).

12.2.6 Data Validation

The data validation phase runs in parallel to the realize and deploy SAP Activate phases. With regard to the data migration phases, it takes place during the tests and the productive load. Two approaches are available for validating your data during a data migration:

- **Data validation before the data transfer**
  In this case, the source data is checked for syntax and semantics. Conversions that are made subsequently will be ignored.
- **Data validation after the data transfer**
  In this case, you check if all data records reached the system, all values were converted correctly, the appropriate fields and structures were populated correctly, and if the business processes can be executed without any errors based on the data loaded.

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You can also combine the two approaches to be on the safe side. The important thing is that you check whether the data is correct with regard to its syntax and semantics.



What Is Correctness of Syntax and Semantics?

The *syntax* of a data value is correct if the data type and the length of the target field are observed and they lie within the value range of an underlying value table. Usually, the relevant migration APIs verify the correctness of the syntax.

The *semantics* of a data value is correct if the data value makes sense in combination with other field values of a data record. The value of the data is correct.

Checking the correctness through APIs

The SAP S/4HANA migration cockpit uses mainly released BAPIs, but also internal function modules as migration APIs. The rapid data migration solution uses IDoc interfaces. Nearly all APIs used will check the correctness of your data's syntax and semantics. However, in some APIs these checks are only roughly implemented. For this reason, you should check data values before transferring the data to avoid loading defective data.

Checking against the domain's value table

The values of fields to which a conversion rule is assigned are usually checked in the SAP S/4HANA migration cockpit against the underlying value tables of the domain of the target field (if a value table is assigned to the domain). If you create custom migration objects and transformation rules, you should make sure to turn on this check. You recognize fields with an underlying conversion rule by the fact that they are usually defined with a length of 80.



Semantic Errors

An administrator for a customer from Northern Ireland maintained `NI` as the country key in the source system. For all other customers, the administrator used the common ISO country keys, as used in SAP S/4HANA. `NI` is the valid SAP country key for Nicaragua. Because nobody noticed this during the subsequent value mapping, all values were converted on a 1:1 basis. As a result, the customers from Northern Ireland were indicated as customers from Nicaragua after the conversion. In terms of syntax, the value was correct. Also in terms of semantics, the value was correct when considered on its own; in the context of the entire data record, however, it was wrong.

Always validate your data!

Don't assume the correctness of your source data and always validate your data. Depending on your specific situation, you'll validate your data before

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or after the data migration. The more complex is it to cleanse imported data or restore systems from a backup to a defined state and the less the data migration APIs provide for comprehensive simulations, the more important it is to validate the data *before* you migrate the data. In general, however, you should always validate your data in the target system after data migration. Only then can you check the data's semantics in the context of business processes.

Create validation rules!

Numerous data validation tools, such as SAP Query and SAP Data Services, are available. The rapid data migration solution contains predefined validation rules, which you can use to validate your data before and after the import. However, you should always define validation rules on the basis of expected conversion rules.

12.2.7 Productive Load and Support

In SAP, the productive load usually takes place during the deploy phase. It is the last and most critical phase of a data migration. The productive load process shows whether you have done everything correctly in previous phases and in the test and validation phases. The higher the data quality and the more tests you run in advance, the more relaxed you will be during the go-live.

No data migration without a dress rehearsal

Like a dress rehearsal is important for a theater performance, a dress rehearsal is important for data migration and the entire cutover. Only through a dress rehearsal can you learn whether your cutover plan is feasible and all necessary steps were taken into account. Carry out the data migration and the schedule as similarly as possible to the real process. Often small details, such as enabled source system backups or unscheduled maintenance work, can jeopardize data migrations.

Typical mistakes

Take into account considerations that you may not have anticipated before. Here are some typical real-life examples of problems that were discovered in various dress rehearsals:

- **Night work, weekend work, or extra hours**
  Additional hours often need to be approved in many European countries, and other countries worldwide, by notifying the relevant workers' council, union, or supervisory authority. These processes require lead times and cannot be rushed. Otherwise, for example, you may find that none of your 50 warehouse employees might be available for the final physical inventory on the go-live weekend.
- **Time zones, public holidays, and calendar weeks**
  Different time zones are often incorrectly considered or not considered at all. For example, if you scheduled a data transfer for 9 a.m. (CET), you

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should ensure that a contact person is available in the data center in San Francisco to provide you with the source data—because in San Francisco, it's midnight at that same time. Also consider different handling of daylight saving time in various countries. Another curiosity is the different calculation of the beginning of the first calendar week of a year. In Europe, the calculation according to ISO 8601 is common, but other countries prefer the American calculation. As a result, the calendar weeks within one year may vary from country to country. Confirming deadlines based on calendar weeks can be very dangerous if you need to adhere to your schedule.

- **Downtime for IT**
  Schedule downtime to avoid having numerous trucks standing at your loading ramp to be loaded/unloaded because they have to wait due to currently unavailable IT in your enterprise.
- **Automatic system processes**
  Interfaces to and from existing source systems or workflows in the target system should be disabled during the data migration. This helps you avoid falsified data, a system breakdown due to bulk generation of workflows, or flooding of inboxes with workflow entries. Another problem that is frequently underestimated involves unplanned automatic backups. A suddenly starting backup in the source system during the extraction of data or in the target system during the loading of data can delay your schedule by more than 12 hours if you notice only the next morning that the overnight data extraction or data transfer was too slow or was canceled, which means that you have to start all over again.

These are only a few real-life examples that you should consider in order to avoid the mistakes other people have made.

12.3 Project Planning Using SEAMAP

Standardizing the data migration process

As you have learned in the previous sections on SAP Activate, the data transfers of a new implementation always follow the same pattern: You must transfer data from source systems to target systems—that is, from A to B. In this process, you go through specific phases in which virtually always the same deliverables arise. Although deliverables have different names depending on the roadmap, they always comprise the same activities. For this reason, you can derive a general data migration process across all roadmaps and distribute the tasks/work packages to the data migration phases.

SEAMAP

In 2016, the book *Data Migration with SAP* by Frank Densborn, Frank Finkbohner, Johann Gradl, Michael Roth, and Michael Willinger (3rd edition,

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SAP PRESS 2016; see *www.sap-press.com/4019*) presented a structure for how to effectively distribute standardized work packages of data migration to the phases of your data migration project. In this section, we'll present this slightly adapted methodology for SAP S/4HANA and SAP S/4HANA Cloud. The structure is called SEAMAP—the *structure for effectively splitting migration projects into work packages*.

12.3.1 Overview of General Work Packages for SAP S/4HANA Systems

In general, you can split a migration project into 19 work packages that depend on each other in terms of time and content or that are based on one another. In addition, there is one independent work package. As a result, the methodology for on-premise systems like SAP ERP or SAP S/4HANA is also referred to as SEAMAP 19/1. Figure 12.5 provides an overview of the work packages that can generally arise in an SAP S/4HANA system. The following sections describe the individual data migration phases and the work packages contained therein in more detail.

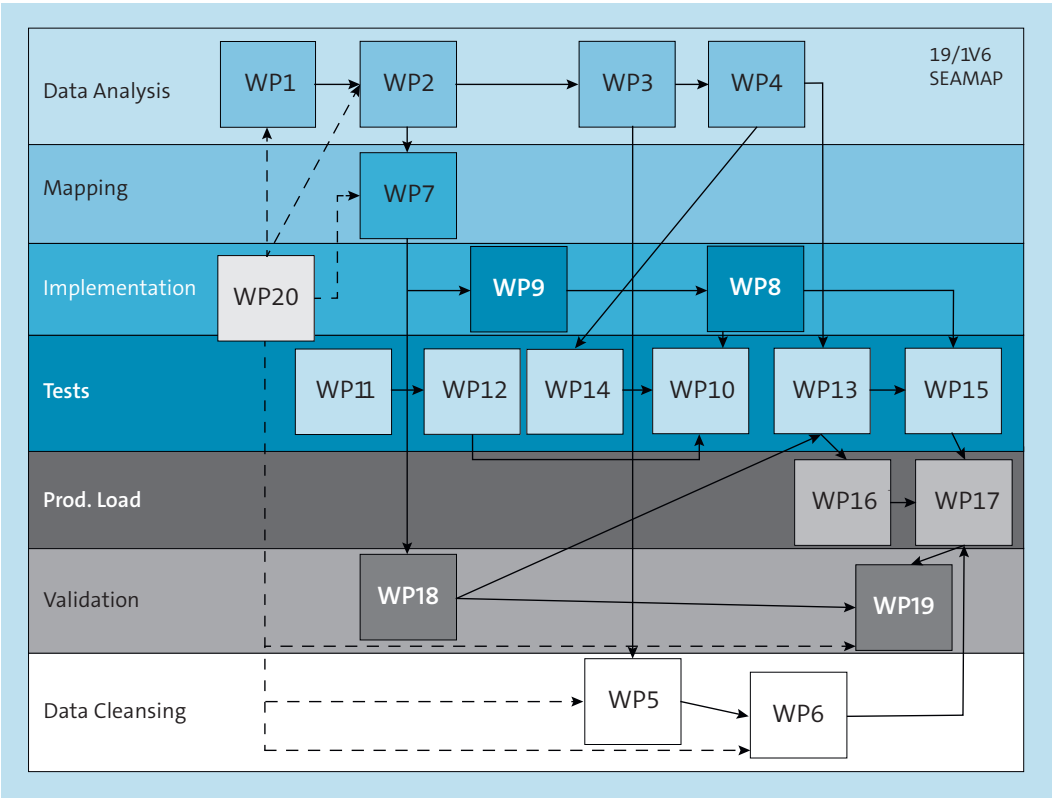


Figure 12.5 General Work Packages for SAP S/4HANA Migration Projects

Data Analysis

The data analysis phase includes the following work packages:

- **WP1: Determine data migration objects**
  You determine the migration objects that are intended for automatic or manual data migration.
- **WP2: Identify source systems**
  It is very important to identify the leading systems from which data is to be extracted for data migration. Particularly in a heterogeneous system landscape with distributed data, it's mandatory to know the leading system for specific data. Large enterprises have a vast pool of dozens or even hundreds of systems and databases that has grown over decades in some cases. It's quite complex to find the right source systems, databases, or files in such a pool. This may take months in very large system landscapes that are distributed across many subsidiaries and countries. In this case, you'll be unable to see the forest for the trees.
- **WP3: Historical data**
  Here, you create a concept of how to handle historical data (financial data, sales data). This is important because in a new implementation completed documents from the source system cannot be transferred using the common tools. In many countries, it may be prohibited by law or accounting to transfer already posted and thus completed financial documents into a new system. Apart from that, there are often no APIs and thus no migration objects or interfaces from SAP for transferring completed documents or historical data. For transferring historical balances, the FI—Historical balance migration object is now available for SAP S/4HANA Cloud and SAP S/4HANA as of release 1909. You should have an early concept of whether you require historical data and how you can solve this problem. Sometimes, it's necessary to keep a predecessor system running for some time before you switch it off. If you require, for example, only cumulated values of your historical data, you should also consider using a data warehouse, such as SAP BW/4HANA, as a data sink for this cumulated data.
- **WP4: Define load sequence**
  Here, you define the sequence in which to extract and load data.

Data Cleansing

The data cleansing phase includes two work packages:

- **WP5: Analyze data cleansing requirement**
  Specify the quality of your data and use this value to derive the cleansing activities.

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- **WP6: Perform data cleansing**
  Perform data cleansing in the source systems. This is usually a permanent process that lasts until the final data migration.

Mapping

The mapping phase includes only one work package:

- **WP7: Define mapping and conversion rules**
  Perform the so-called paper mapping. You should create a Microsoft Excel spreadsheet for each migration object in which you map the target structures and target fields on one side and the source (database, fields, etc.) that must be mapped to the target field on the other side. Also specify the conversion rules for how you want to convert source values into target values; for example, purchasing group A from the source system becomes 001 in the target system.

Implementation

Two packages can be assigned to the implementation phase:

- **WP8: Create/adapt data transfer procedures**
  If you don't use any predefined migration solution, you must create the respective data transfer procedures or adapt existing ones. If you use tools without predefined templates—for example, LSMW—you must create everything yourself, from defining the source data structure to field mapping to defining conversion routines. This may require a lot of time and incur high costs, which is often underestimated.
- **WP9: Create/adapt data extraction procedures**
  Depending on the tools and systems, you create the data extraction procedures and programs for the data to be migrated. In doing so, you can, for example, convert individual data values to the target format during the extraction.

Test

Depending on the system, the test phase comprises five (partially optional) work packages. In an on-premise system, you often need to include all of these packages due to the higher flexibility of the system landscape:

- **WP11: Plan test landscape**
  In general, you should always plan in which systems you perform tests and how you want to implement, for example, data integrity and multiple testing within the system landscape. In the cloud, this is difficult to achieve due to the two-system landscape defined at the time of this writing.

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- **WP12: Set up test landscape**
  Here, you set up the test landscape or delegate this task to a provider. You must include the lead and execution times in your planning.
- **WP14: Define and create methods for the test data transfer**
  You need test data to be able to run proper tests. This test data must first be generated, unless you migrate it to the system using the migration tools or transfer the data from the production system to a quality assurance or test system in anonymized form—for example, using P2Q services/tools—or in its original form. A test system is required for a phase-based migration (phased rollout).
- **WP10: Provide and load test data**
  This item depends on the transfer method defined in WP14.
- **WP13: Create test plan for data migration**
  The individual work steps and timeframes of all previously mentioned work packages must be neatly planned and integrated with the timeframe of the entire project. For this purpose, you usually create a test plan for data migration. This plan is then used as the basis for data migration tasks of the cutover plan.
- **WP15: Test entire data migration completely**
  As already mentioned, one aspect that is often underestimated is a thorough test of the entire data migration in all of your necessary workflows, from extracting data to loading and validating data—prior to cutover. If you only test individual data records, you will miss errors in the extraction programs or in value mappings. In cutover, these errors will lead to severe problems, delays in schedule, and high costs.

Productive Load

The productive load phase includes two work packages:

- **WP16: Create cutover migration plan**
  The cutover migration plan is usually a partial aspect of the cutover plan for the entire project and contains details of all necessary steps that are required for the entire data migration.
- **WP17: Load data productively**
  Once all other work packages have been executed successfully, this work package, which loads data into the production system, should run as smoothly as possible.

Validation

The validation phase includes two work packages:

- **WP18: Create check rules**
  Here you define your rules for how data is to be checked prior to and/or

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after data migration. The check rules are based on the mapping and conversion rules of WP7, among other things. The check rules are then used as individual steps in the test or cutover plan.

- **WP19: Validate data**
  Based on the previously mentioned check rules, you validate the migrated data.

Selecting Tools

Selecting tools for migration is an independent work package:

- **WP20: Select tools**
  In an on-premise system, companies usually have backend access, a more flexible system landscape, and several external access options. For this reason, a wider choice of tools is available for the various tasks:
  - Using extract, transform, and load (ETL) tools
  - Using ETL tools such as SAP Data Services and the rapid data migration solution enables you to extract data from SAP and non-SAP systems, create mapping and conversion rules or change existing ones, load data, and then validate it. Chapter 15 describes rapid data migration.
  - You can also use the data transfer directly from SAP systems (direct transfer) migration approach to extract data directly from the SAP systems and load it into the SAP S/4HANA system.
  - In addition, you can also use the SAP S/4HANA migration object modeler to build your own data migration objects for the SAP S/4HANA migration cockpit.
  - There are many more ETL or other special data management tools from SAP and other external providers that you can use.

  You have a versatile choice of tools for different tasks.

  In SAP S/4HANA Cloud-based systems, the external access options and thus the tools available are very limited. Because there is no backend access, all backend-driven tools, such as LSMW and at the time of this writing, the SAP S/4HANA migration object modeler is not available.

12.3.2 Work Packages for SAP S/4HANA Cloud-based Systems

Limited flexibility is an advantage

Fewer work packages are available in a cloud system based on SAP S/4HANA Cloud and in which you have limited flexibility and no backend access. Limited flexibility does not have to be a disadvantage if this entails a faster and more cost-efficient implementation. Because SAP S/4HANA Cloud uses SAP Best Practices, for example, for business processes, the number of structures and fields to be migrated is predefined to a large extent. This means that there is no need to adapt an existing migration object of the SAP S/4HANA

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migration cockpit. The migration tools are also predefined to a large extent. Tools other than the ones provided by SAP usually cannot be used. Because of the predefined system landscape, you usually do not have to plan or set up a test landscape. As a result, only 16 out of the 20 work packages described are relevant here. Figure 12.6 shows an overview of these work packages.

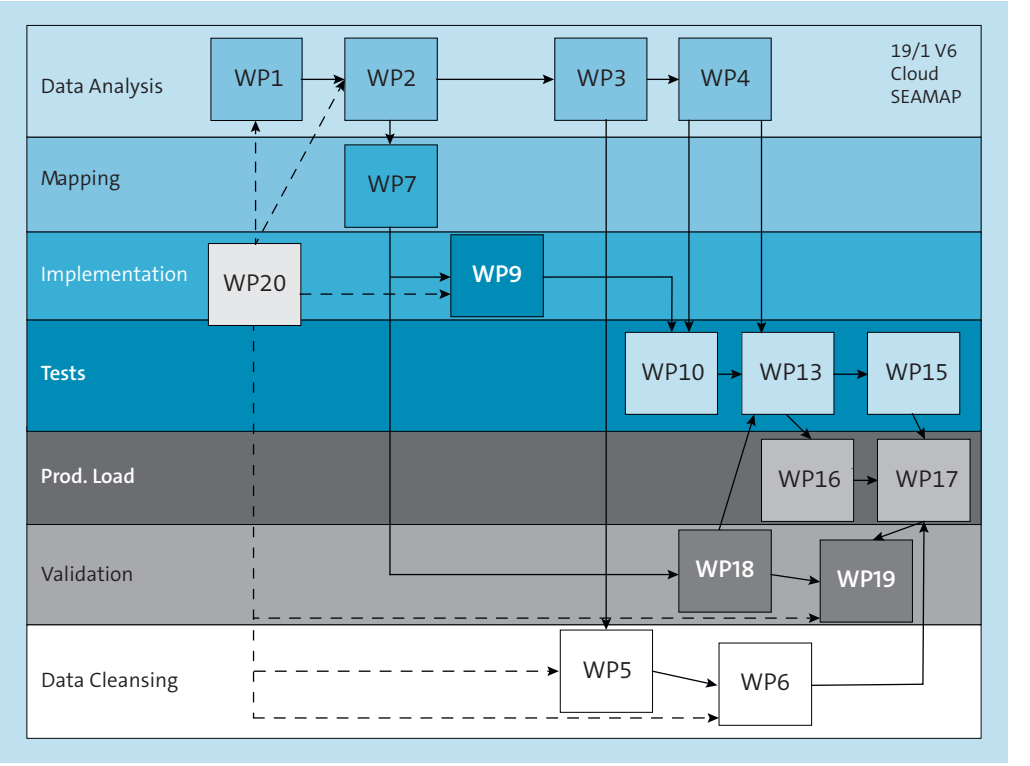


Figure 12.6 Typical Work Packages for Cloud Migration Projects

12.4 Tools for Data Migration Planning

Planning using Microsoft Excel

You can use various tools for planning the data migration. This section describes how you can estimate the effort, which you must include for data migration, using Microsoft Excel and the SEAMAP structure that was described in Section 12.3.

12.4.1 Estimating the Effort Using Microsoft Excel

The spreadsheet in Microsoft Excel is subdivided into an information area and an effort area. Moreover, there is a row for general efforts and rows for efforts per migration object.

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Info Area

The info area consists of the following sections:

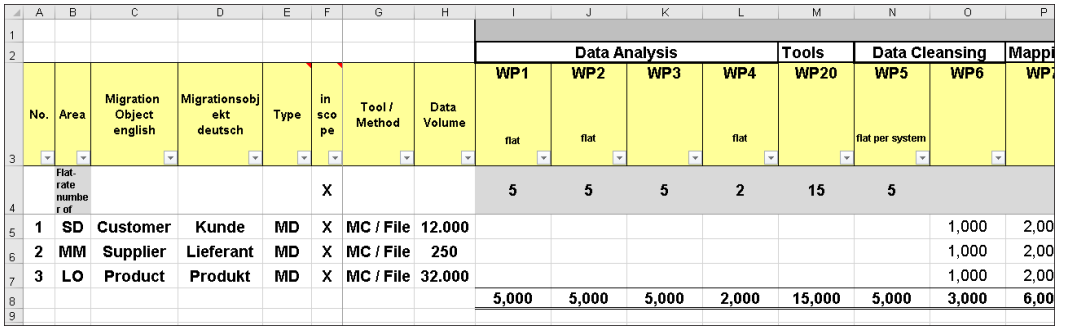
- Number (**No.**) for numbering migration objects consecutively
- **Area** to sort objects by area—for example, FIN, LOG, and so on.
- Columns 3 and 4 lists migration objects (**MObj**), in English and your own language, in the example, German. Two languages often prove very useful because most references on migration objects are in English and it's easier to find the corresponding object if you also know the English name.
- Another optional column, **Type**, helps you differentiate between master data and transaction data.
- In the next column, **In Scope**, you define whether the migration object is relevant or not. In a list of more than 150 migration objects, only some are relevant for your project. In a phased rollout, it may also be possible that migration objects are not relevant for all phases and are then identified differently in various lists.
- In the **Tool/Method** column, you define the transfer method. Do you want to migrate the data manually, or do you use a specific tool? If so, which one?
- Optionally, you can also list the number of data records to be migrated in the **Data Volume** column. This is often useful for estimating the load times for testing and productive loading.

Table 12.1 shows the structure of the info area. An example is illustrated in Figure 12.7.

No.	Area	MObj	MObj	Type	In Scope	Tool/ Method	Data Volume
	General				X		
1	SD	Customer	Customer	MD	X	MC/File	12,000
2	MM	Supplier	Supplier	MD	X	MC/File	250
3	LO	Product	Product	MD	X	MC/File	32,000

Table 12.1 Columns of Information Area A of Efforts Table

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								Data Analysis				Tools	Data Cleansing		Mappi	
No.	Area	Migration Object english	Migrationsobjekt deutsch	Type	in scope	Tool / Method	Data Volume	WP1 flat	WP2 flat	WP3	WP4 flat	WP20	WP5 flat per system	WP6	WP7	
	Flat-rate number of				X			5	5	5	2	15	5			
1	SD	Customer	Kunde	MD	X	MC / File	12.000							1,000	2,00	
2	MM	Supplier	Lieferant	MD	X	MC / File	250							1,000	2,00	
3	LO	Product	Produkt	MD	X	MC / File	32.000							1,000	2,00	
								5,000	5,000	5,000	2,000	15,000	5,000	3,000	6,00	

Figure 12.7 Information Area and General Efforts in Microsoft Excel

Efforts Area

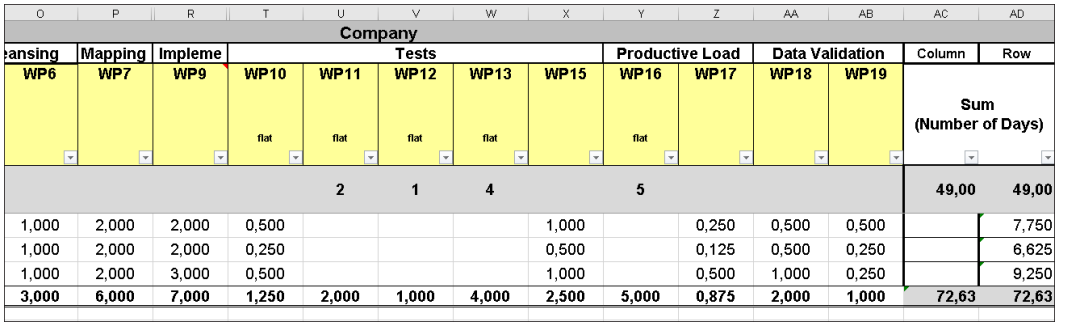
In the efforts area, you enter the respective figures for the effort estimation. It consists of the following column areas:

- The individual phases and work packages from Section 12.3
- A column for the totals

Table 12.2 and Figure 12.8 show an example for the efforts area with general and object-related efforts for the data analysis and data validation phases.

Data Analysis				...	Data Validation		
WP1	WP2	WP3	WP4	...	WP18	WP19	Total
5	5	5	2	...			53
				...	0.5	0.5	7.75
				...	0.5	0.5	6.625
				...	1	0.25	9.25

Table 12.2 Columns of Efforts Area B of Efforts Table



			Company										
ansing	Mapping	Impleme	Tests					Productive Load		Data Validation		Column	Row
WP6	WP7	WP9	WP10 flat	WP11 flat	WP12 flat	WP13 flat	WP15	WP16 flat	WP17	WP18	WP19	Sum (Number of Days)	
				2	1	4		5				49,00	49,00
1,000	2,000	2,000	0,500				1,000		0,250	0,500	0,500		7,750
1,000	2,000	2,000	0,250				0,500		0,125	0,500	0,250		6,625
1,000	2,000	3,000	0,500				1,000		0,500	1,000	0,250		9,250
3,000	6,000	7,000	1,250	2,000	1,000	4,000	2,500	5,000	0,875	2,000	1,000	72,63	72,63

Figure 12.8 Efforts Area in Microsoft Excel

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General Efforts

Estimated effort

In the cells of the row for general efforts, you enter the estimated effort in person days that arises independent of a migration object. In the SEAMAP structure, the efforts can be specified in general for the following work packages:

- **WP1: Determine data migration objects**
  Here you can estimate 2 to 10 person days depending on the number of processes to be implemented and source systems.
- **WP2: Identify source systems**
  The more complex and heterogenous your system and data retention landscape is, the longer it takes to find the appropriate source systems. Also consider inofficial sources of your clerks here. In many areas, they have extra data on customers in additional, unofficial Microsoft Excel files, card boxes, or databases that are often more up to date than the official databases. Here, too, you should plan 2 to 10 person days.
- **WP3: Historical data**
  You shouldn't underestimate the effort for this work package. You should calculate 10 person days here.
- **WP4: Define load sequence**
  It's usually not a big effort to define the load sequence. Loading the data also requires data extraction and data provision. If the systems are distributed across continents, it's important to know the load sequence so that the data is provided at the right time. Allow for 1 to 2 person days here.
- **WP5: Analyze data cleansing requirement**
  More cleansing requirements often arise after the initial tests. To analyze the data cleansing requirement, you should calculate 5 days for each system.
- **WP11: Plan test landscape**
  In a cloud environment, the test landscape is often predefined and consists of a quality assurance system. The effort is low, and usually only involves preceding source systems. In an SAP S/4HANA-based on-premise or hosted system, you can allow for 2 days.
- **WP12: Set up test landscape**
  This case is similar to the one for planning the test landscape. However, the effort must be calculated for each test performed. After all, resetting or implementing a system anew may involve several days. Schedule 1 to 2 person days for each test.
- **WP13: Create test plan for data migration**
  Test data is usually transferred using the same tools and programs that

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are used for productive data transfer. You usually adapt the test plan after each test. Therefore, enter 2 to 5 person days for the entire effort.

- **WP16: Create cutover migration plan**
  Basically, the cutover migration plan is part of the entire cutover plan. It results from the test plan for data transfer (WP13) and the effort times that were estimated for the individual work packages, data provision, loading of data, and data validation. Creating the cutover migration plan usually takes 3 to 5 person days. In complex projects, it may take up to 10 days.
- **WP20: Select tools**
  Don't underestimate the effort of selecting the tools. In a cloud environment, the transfer tools are usually predefined. The tools and methods for data analysis, data cleansing, and data extraction of your source systems can be versatile, and your selection depends on the offerings and possibly on existing licenses. In the public sector, software procurements often have to be made through public tenders. Here, the effort can be several weeks, which must be considered for each customer specifically.

Normally, you must allow for 30 to 60 person days just for general efforts. Table 12.3 shows a sample calculation for general efforts.

WP1	WP2	WP3	WP4	WP20	WP5	WP11	WP12	WP13	WP16	Total
5	5	5	2	15	5	2	1	4	5	49

Table 12.3 Example of General Efforts for Individual Work Packages

Object-Related Efforts

Effort for each migration object

All other work packages have efforts that arise for each migration object. Table 12.4 shows a sample list of efforts for work packages for each migration object in an SAP S/4HANA Cloud-based system.

Object	WP6	WP7	WP9	WP10	WP15	WP17	WP18	WP19	Total
Customer	1	2	2	0.5	1	0.25	0.5	0.5	7.75
Supplier	1	2	2	0.25	0.5	0.125	0.5	0.25	6.625
Product	1	2	3	0.5	1	0.5	1	0.25	9.25
Total	3	6	7	1.25	2.5	0.875	2	1	23.625

Table 12.4 Example of Object-Related Efforts in Person Days

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You can find the current list of available migration objects sorted by SAP product and release at the following addresses:

- SAP S/4HANA Cloud: *https://help.sap.com/S4_CE_MO*
- SAP S/4HANA: *https://help.sap.com/S4_OP_MO*

Figure 12.9 shows the available migration objects for SAP S/4HANA Cloud 2011, for example.

Select your release (**2011**) ❶ and then your language (**English**) ❷. The list displayed is initially restricted to 25 entries. By selecting **All** ❸, you can display all migration objects. You can select this list, copy it to the clipboard, and insert it into your Microsoft Excel spreadsheet. As a result, you always have the most up-to-date list in your Microsoft Excel spreadsheet. A **CSV** button ❹ is also available. With this button, you can download the list as a CSV file.

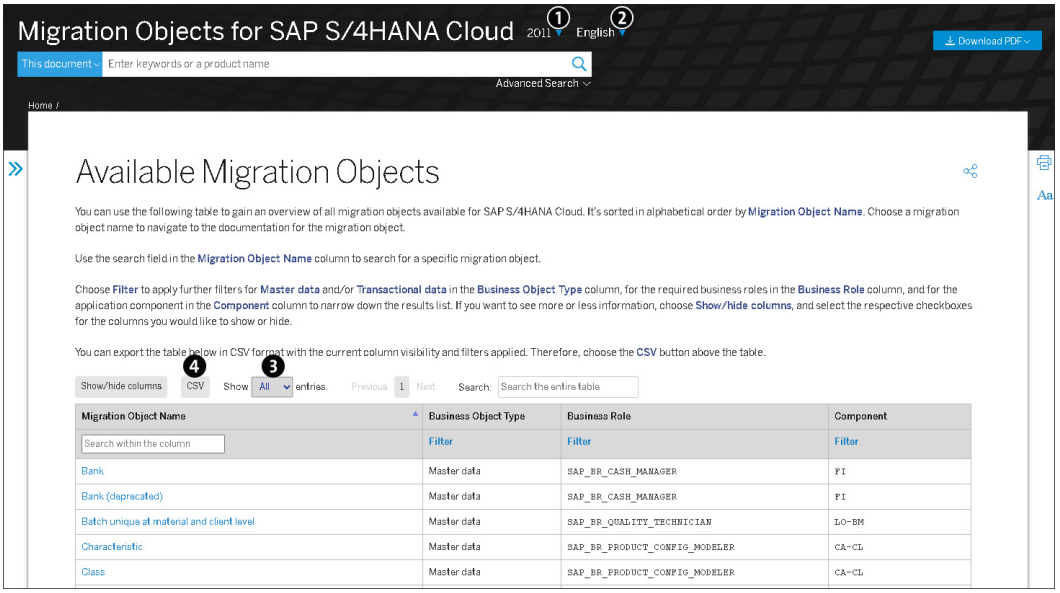


Figure 12.9 SAP Help Portal: Available Migration Objects for SAP S/4HANA Cloud 2005

Downloading a Microsoft Excel File

You can find the Microsoft Excel files that are described in this chapter in the materials available for this book at *www.sap-press.com/5279*.

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Chapter 13
SAP S/4HANA Migration Cockpit

This tool for migrating data is one of the most important tools of a new implementation in SAP S/4HANA and SAP S/4HANA Cloud. This chapter presents the SAP S/4HANA migration cockpit.

Which different migration approaches does the SAP S/4HANA migration cockpit support? How does the migration cockpit work? Where can you obtain further information on data migration and on supported migration objects? This chapter provides answers to these and several other questions. Section 13.1 describes the various data migration approaches of the migration cockpit and illustrates the underlying concepts. Section 13.2 shows how to migrate data using files with the aid of the data transfer using staging tables data migration approach. Section 13.3 discusses the transfer of data using staging tables directly. Section 13.4 describes how to migrate data using the data transfer directly from SAP systems (direct transfer) approach. Following these sections, Section 13.5 discusses individual aspects that you should consider with regard to performance. At the end of this chapter, in Section 13.6, you'll learn about the tools that support your data migration.



SAP S/4HANA versus SAP S/4HANA Cloud

SAP S/4HANA Cloud refers to SAP S/4HANA public cloud products that are technically based on the SAPSCORE SAP S/4HANA Cloud product version. SAP S/4HANA refers to SAP S/4HANA products (on-premise or private cloud) that are technically based on the on-premise S4CORE version.

13.1 Data Migration Using the SAP S/4HANA Migration Cockpit

SAP ERP tools with restricted use only

Migrating to SAP S/4HANA Cloud differs from migrating to the SAP S/4HANA on-premise version because the known migration tools, such as Legacy System Migration Workbench or SAP Data Services (rapid data migration), can't be used at all or only to a limited extent. Pure backend tools like LSMW can't be called due to missing backend access. For external tools, such as

SAP Data Services, the number of cloud-enabled interfaces that can be called from external sources to migrate data is limited. The migration cockpit (and its two migration approaches) is therefore the first and the only one available, particularly in the cloud.



Familiarize Yourself with the Data Transfer Processes

Before you start the data migration, you should familiarize yourself with the phases and activities of a data migration project in general. Unfortunately, we frequently observe that customers and consultants underestimate the complexity of a data transfer. Particularly with regard to the cloud, it is a popular misconception that everything works at the touch of a button. We therefore recommend that you first read Chapter 12, internalize the tips provided there, and incorporate them in your project planning.

13.1.1 Overview of the Migration Approaches of the SAP S/4HANA Migration Cockpit

From a pure file approach to a file/staging approach

The migration cockpit for *data transfer using files* (*file*) has been delivered since SAP S/4HANA Cloud 1511 (SAPSCORE). Technically, this is a transaction that was built on a Web Dynpro basis. Since SAP S/4HANA 1610, the cockpit has also been provided for the on-premise version of SAP S/4HANA (S4CORE). *Data transfer using staging tables* (*staging*) has been supported since on-premise release 1709 FPS 02 or SAP S/4HANA Cloud 1905. Because both approaches use the same migration cockpit, they are also referred to as *data transfer using files and staging tables* (*file/staging*).

One migration cockpit for all approaches

With SAP S/4HANA 1909, the new migration approach of *data transfer directly from SAP systems* (*direct transfer*) was added for the SAP S/4HANA on-premise versions. The migration cockpit for this approach is an SAP Fiori app and it's launched via the SAP Fiori launchpad. With SAP S/4HANA Cloud 2008 and SAP S/4HANA 2020, the migration cockpit of the file/staging approach and the direct transfer approach was combined into one SAP Fiori app.

Files as containers for populating staging tables

At the same time, the technical data retention of the *file* and *staging* approaches was combined in *staging tables* approach. Previously, the data retention of the data to be processed was physically separated between files (staging area) and staging tables; now it is stored uniformly in those of staging tables. Thus, a file is only a container for uploading the data to be processed to the staging tables. Previously, a separate migration project was required to either upload data from files or staging tables. They can now be combined in one migration project. In theory, there is no limit for the data

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volume to be loaded. The maximum file size of a migration template is limited for technical reasons. But the data to be loaded is located in the same staging tables after upload and no longer in cluster tables per file.

Comparing the migration approaches

Table 13.1 compares the two migration approaches of the migration cockpit for the SAP S/4HANA Cloud 2011 and SAP S/4HANA 2020 releases, unless another release is indicated.

Data Transfer	Using Staging Tables	Directly from SAP Systems
Availability	SAP S/4HANA Cloud (staging via SAP BTP and DBaaS as of 1905); SAP S/4HANA (staging as of 1709 FPS 02)	As of SAP S/4HANA 1909
User interface	Web Dynpro (until Cloud 2005 and on-premise 1909); SAP Fiori app (as of 2008/2020)	SAP Fiori app
Supported migration methods	Compatible function modules	
	RAP BO (CDS behavior definition)	
Source systems	Every SAP and non-SAP source system	ABAP-based SAP source systems (SAP ERP as of 6.0, SAP AFS 6.0, SAP EWM as of 5.1, SAP CRM 7.0)
Data provision	Staging tables, populated via Microsoft Excel 2003 XML templates or ETL tools	Data is selected and extracted directly in the SAP system
Data cleansing	In the source system or in the XML template	In the source system
Data protection	The files used must be retained securely	Access to the source system must be limited

Table 13.1 Comparison of Migration Cockpit's Migration Approaches

13.1.2 Available Migration Objects

With every release, the number of supported migration objects and their functions grows. However, these changes always depend on the function of the released data migration interfaces. Moreover, the number of available migration objects differ depending on the migration approach and the target product.

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Direct transfer approach

The *direct transfer* approach is distinguished by scenarios, and separate migration objects are delivered for every scenario. In other words, the number of available migration objects varies depending on the source system.

Staging approach

In the *staging* approach, the number of available migration objects depends on the target product and the release. Based on SAP Best Practices for SAP S/4HANA Cloud, the migration objects are newly created or adapted for every new release (currently every quarter). For SAP S/4HANA and systems and products that are based on it, adaptations are provided only once per year for the main release of a new product version of SAP S/4HANA. For technical reasons, migration objects of a new release cannot be provided for lower product release versions (*downports*). Moreover, a migration object is only provided for SAP S/4HANA if SAP Best Practices is available for a migration object, and the functionality is available not only for the cloud version, but also for the on-premise version. This explains the varying number of migration objects for cloud and on-premise. Table 13.2 shows the number of available migration objects for each product version at the time of this writing.

Staging	Direct transfer
SAP S/4HANA Cloud 2102: 154 SAP S/4HANA 2020: 119	SAP S/4HANA 1909 FPS 01/FPS 02: ■ SAP ERP: 113/127 ■ SAP AFS: 73/75 ■ SAP EWM: 5 ■ SAP CRM: 1 SAP S/4HANA 2020 FPS 0: ■ SAP ERP: 142 ■ SAP AFS: 72 ■ SAP EWM: 15 ■ SAP CRM: 1

Table 13.2 Number of Available Migration Objects for Each Migration Approach

Current object list on the SAP Help Portal

The migration objects that are available for a release can be found on the SAP Help Portal. The following are quick-access URLs for the individual products:

- For SAP S/4HANA Cloud: *https://help.sap.com/S4_CE_MO*
- For SAP S/4HANA: *https://help.sap.com/S4_OP_MO*

The appendix also provides a list of the migration objects that were available at the time of writing.

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Migration Objects of the Staging Approach with the Restricted or Deprecated Addition

The names of migration objects of the staging approach can have additions. For migration objects that have such additions, you should read the migration object documentation carefully. There, consider the notes on the two additions previously used:

- **Restricted**
  If a migration object doesn't cover all fields and structures or functions of all relevant business processes, the restricted addition is used.
- **Deprecated**
  If an existing migration object is newly built, the migration object used so far is indicated with the deprecated addition. New migration objects are usually created if more recent or better data migration APIs are available for these migration objects or if other technical restrictions require this. Deprecated objects are then delivered for another two releases in SAP S/4HANA Cloud. They are usually removed in the third release after the new migration object was published. In SAP S/4HANA, they are removed with the next product version; in some cases, they're removed with the same product version as the new object. This applies, for example, to the migration object for general ledger accounts in SAP S/4HANA 2020. You can find an overview of the migration objects with the deprecated addition on the SAP Help Portal at *http://s-prs.co/527983*.

Changes on the SAP Help Portal

You can find a detailed overview of the changes to a migration object and the staging approach on the following SAP Help Portal pages:

- For SAP S/4HANA Cloud: *http://s-prs.co/527984*
- For SAP S/4HANA: *http://s-prs.co/527985*

13.1.3 Differences Between the Old and the New Migration Cockpits

The old migration cockpit was developed over the years, but the new SAP Fiori-based cockpit was redesigned from scratch. As a result, some weaknesses of the old Web Dynpro approach could be eliminated. The following lists some innovations and benefits of the new SAP Fiori app:

- **Better integration with the SAP Fiori launchpad**
  In the new app, there are no more timeouts, which occasionally occurred in longer data migrations in SAP S/4HANA Cloud.
- **Full integration of Product Assistance**
  Like for all SAP Fiori apps, it is now possible to directly access Product Assistance.

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- **Direct access to the migration object documentation**
  By switching from internal migration object documentation to the SAP Help Portal, the documentation as of SAP S/4HANA Cloud 1905 and SAP S/4HANA 1909 could only be accessed indirectly via the migration cockpit. Now the documentation is available directly from the migration cockpit.
- **Predecessor migration objects**
  In the previous migration cockpit, only one predecessor object was displayed at a time. Now all predecessor objects are displayed, which may have to be loaded in advance.
- **Client dependency**
  In contrast to the previous cockpit, migration objects are now client-dependent. This provides benefits, for example, for SAP S/4HANA on-premise customers who work with several clients.
- **Staging and file in one migration object**
  By changing the data retention for files, you can now simultaneously use staging tables and files in one migration project. Previously, you had to create two separate projects.
- **Instance-based status tracking and messages**
  You can display the accumulated messages and the current status for each instance (data record of a header structure).
- **Progress monitoring during the migration's simulation**
  Previously, users were only provided with a progress bar. Now they can monitor the jobs via integrated monitoring. This is a very big advantage, particularly in cloud systems.

Migration projects are not exchangeable

The migration objects delivered are identical for the two cockpits. Due to varying data retention, however, the migration projects cannot be exchanged between the two migration cockpits. This means that projects that you created in the old migration cockpit cannot be opened with the new migration cockpit and vice versa. You should either switch to the new migration cockpit completely or complete your existing migration projects in the old migration cockpit.

The old migration cockpit will be switched to read-only mode as of SAP S/4HANA Cloud 2105 or SAP S/4HANA 2021. You can still call the app/transaction, but you can no longer run any data migrations.

You now have a general overview of the differences between the various approaches in the migration cockpit. Next, you'll learn how to migrate data using the SAP Fiori-based migration cockpit as of SAP S/4HANA Cloud 2011 and SAP S/4HANA 2020.

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13.1.4 Additional Useful Sources of Information

Landing pages of data migration

In general, it's useful to deal with the options available and the sources of information prior to the data migration. Besides this book, the landing pages for data migration for SAP S/4HANA Cloud and SAP S/4HANA provide the best entry point. You can find them on the SAP Help Portal at the following web links:

- SAP S/4HANA Cloud: *https://help.sap.com/S4_CE_DM*
- SAP S/4HANA: *https://help.sap.com/S4_OP_DM*

SAP Community

SAP S/4HANA Cloud and on-premise customers should also check out the migration cockpit page of the SAP Community at *http://s-prs.co/527986*. There you can find a wide variety of information on all aspects of data migration in SAP S/4HANA.

13.2 Transfer Option 1: Transferring Data from a File

Migration project

From the technical perspective, the migration objects of the data transfer using staging tables migration approach are migration objects of a migration project in the Migration Workbench, which you can use via the migration cockpit. The Migration Workbench is not released for direct use by customers. The migration project delivered, and its migration objects and rules are templates only. They are copied to a customer-specific project (Z project) when you create a customer project in the migration cockpit. This copy is then used in the migration cockpit to generate a function group that is deployed in the migration cockpit. This section describes the data transfer using files. Later, Section 13.3 will discuss the transfer of data by populating staging tables.

13.2.1 Assigning Roles for the Migration

Technical roles

To be able to use the migration cockpit via the SAP Fiori launchpad, the user who performs the migration (migration user) must be assigned with a role that was created from the delivered technical template role, `SAP_BR_CONFIG_EXPERT_DATA_MIG` (Configuration Expert—Data Migration). For SAP S/4HANA, it's also useful to assign the user a role that was created from the backend template role, `SAP_CA_DMC_MC_USER` (SAP S/4HANA Migration—Data Transfer).

Application roles

In addition, you'll require further authorizations and roles to import or validate the individual migration objects. These authorizations vary depending on the migration API executed. You usually create these roles with the corresponding authorizations within an authorization concept. In SAP S/4HANA Cloud, you are provided with predefined template roles for

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specific business cases. In this case, you use the template role that is intended for creating the business object in order to create your own application roles for migrating business object data. You incorporate these roles in your authorization concept. You can find the respective application role template for each migration object for SAP S/4HANA Cloud in the documentation of the migration object or in the SAP Help Portal page at *https://help.sap.com/S4_CE_MO*. The list of available migration objects also shows the required template roles for each one. As an administrator user, you'll assign to the relevant migration user the business roles for which you require a specific migration object.

13.2.2 Initial Screen of the Migration Cockpit

Calling the SAP S/4HANA migration cockpit

In the SAP Fiori launchpad, select the **Migrate Your Data—Migration Cockpit** tile (see Figure 13.1). This takes you to the migration cockpit. If you selected **Migrate Your Data—Migration Cockpit (old)**, you would call the old migration cockpit.

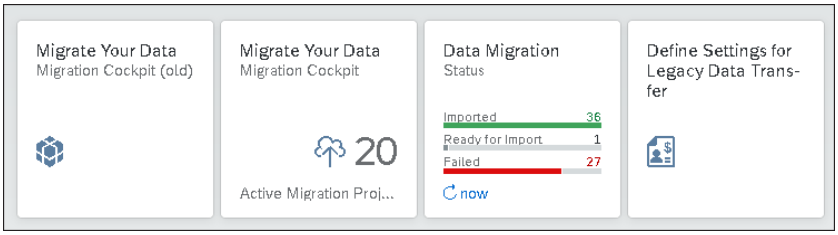


Figure 13.1 Tiles in Data Migration Group in SAP S/4HANA Cloud 21002

List of migration projects

Figure 13.2 shows the initial screen of the migration cockpit after the initial call without any migration projects created. Starting from this overview, you can proceed with your project as follows: **Create** ❶, **Edit** ❷, **Delete** ❸, and **Finish** ❹. You can also open **Monitoring** ❺. You can also sort ↕ or group [≡] the list.

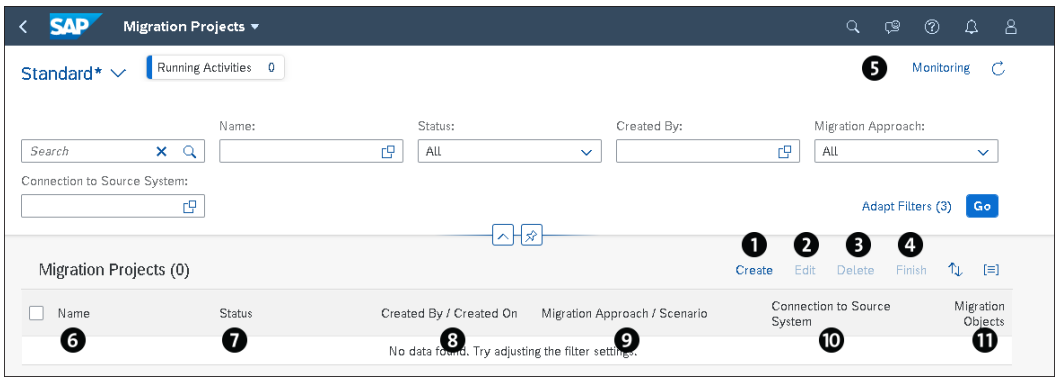


Figure 13.2 Empty Initial Screen of SAP S/4HANA Migration Cockpit

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Migration Cockpit Help (Product Assistance)

The easiest way to open the help for the migration cockpit is to click the button (**Open Help**). The help (product assistance) is displayed on the right-hand side, as shown in Figure 13.3.

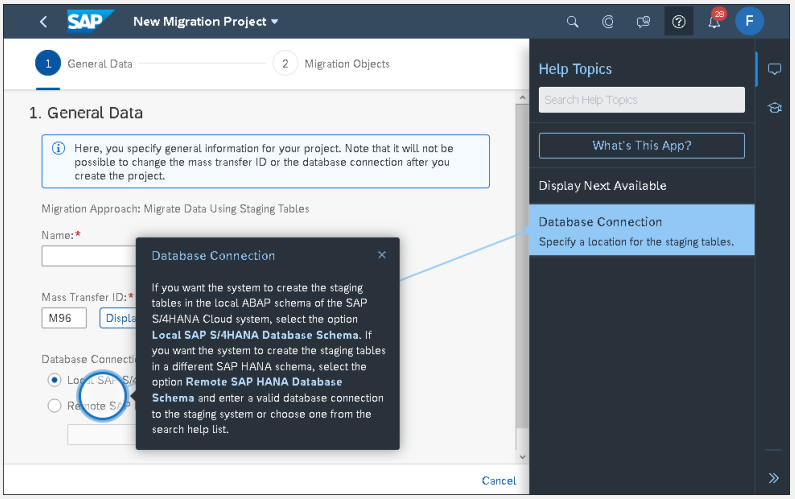


Figure 13.3 Help for SAP S/4HANA Migration Cockpit

The migration project list contains the following information: **Name** of the migration project ❻, **Status** of the migration project ❼, **Created By/Created On** ❽, **Migration Approach/Scenario** ❾, **Connection to Source System** ❿, and number of **Migration Objects** in the migration project ⓫.

13.2.3 Data Migration Process

Six process steps

The data migration process of the migration cockpit consists of six consecutive steps. Nearly each of these steps has an action assigned in the migration cockpit. This action is listed in parentheses in the following list:

1. **Selecting migration objects**
   The migration cockpit automatically generates the staging tables for every migration object selected.
2. **Load data to the staging tables (upload file)**
   You populate the staging tables either using the available migration templates or a tool of your choice. Also Section 13.3.3 in this context.
3. **Prepare staging tables (prepare)**
   The system prepares the staging tables so that data can be loaded (Section 13.2.10).

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4. **Process mapping tasks (mapping task)**
   The mapping tasks assigned to a migration object must be processed so that the source data can be converted (mapped) correctly to the respective target value (Section 13.2.12).
5. **Simulate data migration (simulate)**
   The data migration API assigned to the migration object is populated with the converted data of the staging table and called in test mode to check if problems arise (Section 13.2.14).
6. **Migrate data (migrate)**
   The converted data from the staging tables is posted to the SAP S/4HANA target system (Section 13.2.15).

Before you select a migration object, you must first create a migration project or edit an existing migration project.

13.2.4 Creating a Migration Project

Creating staging projects

In an SAP S/4HANA Cloud system, you click the **Create** button to start the process for creating a migration project for the migrate data using staging tables migration approach. In a system based on the SAP S/4HANA on-premise version, you first select the migration approach for which you want to create the migration project (from the **Create** selection). Figure 13.4 displays the corresponding selection box. You can choose between the following two approaches:

- **Migrate Data Directly from SAP System**
- **Migrate Data Using Staging Tables**

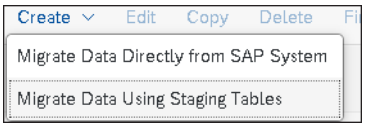


Figure 13.4 Selection Box for Create Option in On-Premise Systems

Step 1: Enter General Data

The **New Migration Project** dialog is displayed. We discuss the migrate data using staging tables approach here. The direct transfer approach is described in Section 13.4.

General data for the migration project

In the **General Data** section, enter a name for the migration project in the **Name** field.

The system automatically determines the **Mass Transfer ID**. If you click the **Display Next Available** button, the system generates a new ID if the automatically generated ID does not meet your requirements.

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Mass Transfer ID

The *mass transfer ID* is a technical key used for the technical name of the newly created migration project (Migration Workbench project and Migration Workbench subproject) and is unique. The technical name is suffixed with the mass transfer ID and is thus `ZSIN_MIG_<mass transfer ID>`. In SAP S/4HANA Cloud, you only need this information if a service employee must solve an issue via the backend system. It's also required if you want to export a migration project in order to import it into another system.

For example, if the mass transfer ID is `005`, the migration project is created with the technical name `ZSIN_MIG_005`.

Selecting the database schema

In the **Database Connection** area, you enter the location of the database schema in which the staging tables are to be created. This can be the local SAP S/4HANA database schema of the SAP HANA database of your SAP S/4HANA system or a so-called remote database schema in an external SAP HANA database. You can choose between the two entries:

- **Local SAP S/4HANA Database Schema**
- **Remote SAP HANA Database Schema**

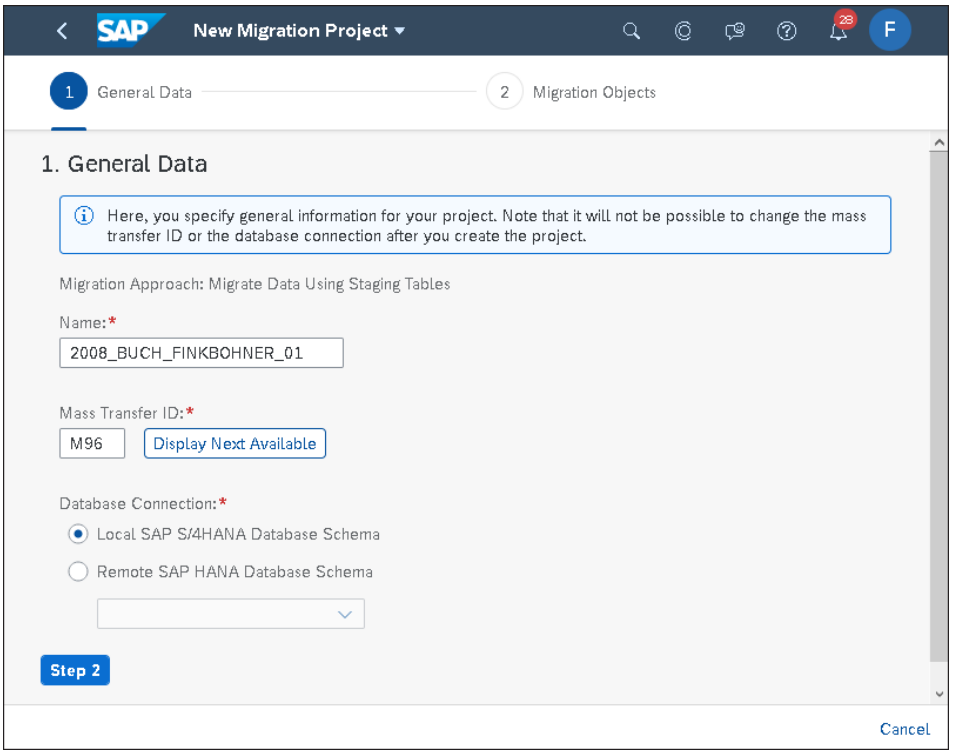


Figure 13.5 Create Migration Project, Step 1: Enter General Data

Selecting the local schema for files

If you want to transfer data from files only, you usually select the local database schema here. If you want to use the remote SAP S/4HANA database schema, you must select the corresponding schema in the selection box. Section 13.3 provides more information on this topic. Figure 13.5 shows dialog step 1 for general data with populated fields.

Step 2: Assign Migration Objects

Selecting available migration objects

After you have specified the general data of your project, click **Step 2**. You can select the objects that you want to use in your project in the **Migration Objects** area, in the list under **Available Migration Objects**. For this purpose, select the migration objects from the list and click [>] to insert them in the **Selected Migration Object** list. You can remove the objects again by using the [<] button. The column with the predecessor objects (**Predecessor**) displays the number of predecessor objects of the migration object. If you click this number, the system displays the predecessor objects in a list. If required, you can add these objects to your list. You also can call the **Documentation** of each object. In Figure 13.6, we selected two objects from the list of available migration objects for our project.

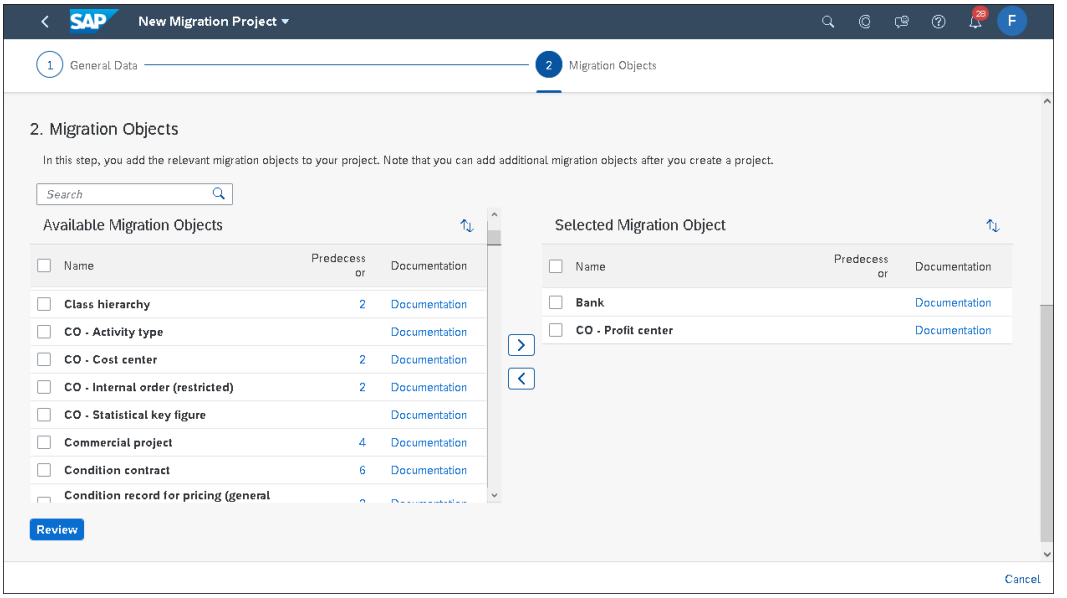


Figure 13.6 Create Migration Project, Step 2: Assign Migration Objects

Assigning objects using the Review button

By clicking the **Review** button, you assign objects to the migration project. The next screen provides a summary of all project data (see Figure 13.7). If you notice that you missed something or that you made a mistake, you can use the **Edit** button to return to previous dialogs and correct your entries.

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You create your project with the **Create Project** button. As a result, the migration objects are copied from the SAP standard delivery project to your project. This can take several minutes depending on the number and size of the selected migration objects.

Removing objects only via the SAP S/4HANA migration object modeler

A subsequent removal of a migration object from a migration project is only possible using the SAP S/4HANA migration object modeler, which we describe in Chapter 14.

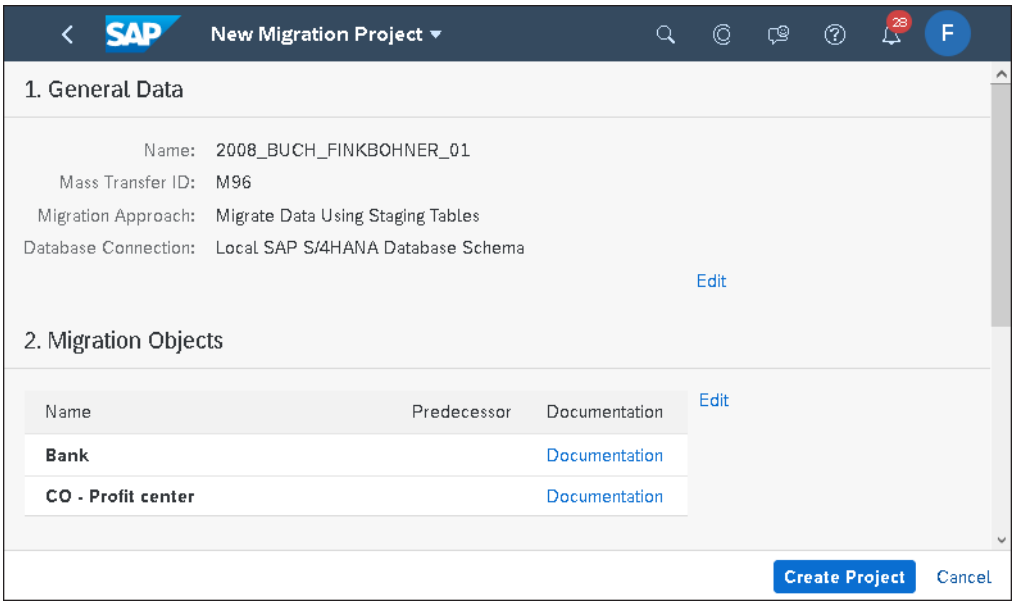


Figure 13.7 Create Migration Project, Step 3: Create Project

Your migration project appears in the list of migration projects as shown in Figure 13.8.

Nonmodifiable Systems

There are some restrictions in systems that are marked as nonmodifiable, usually production systems:

- **Create projects**
  You can create projects via the import function only.
- **Add migration objects**
  You cannot add migration objects.
- **Delete projects**
  You can only delete projects if you marked them as **Finished** and if any specified data retention time is reached.

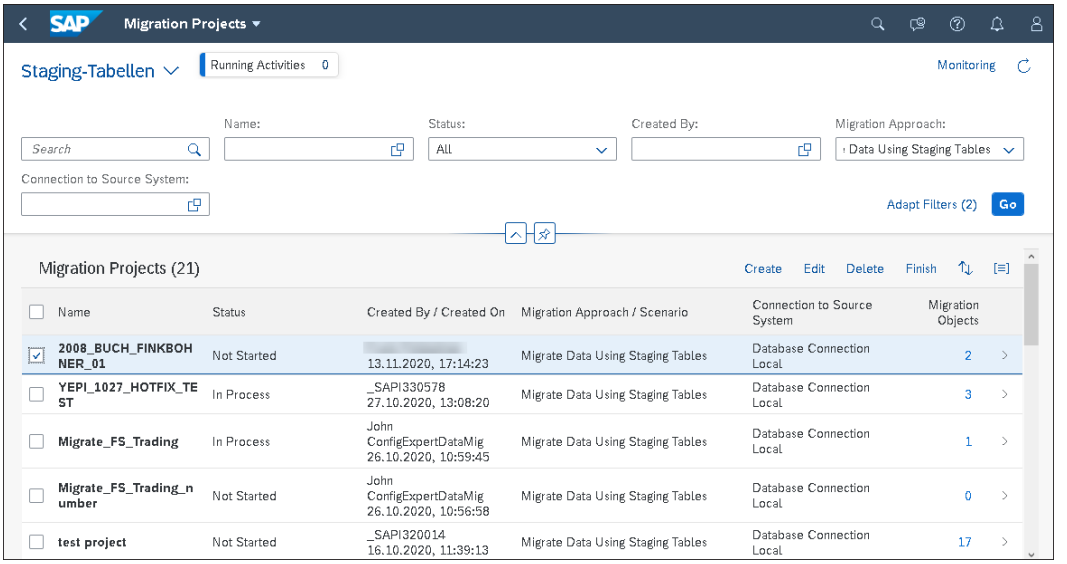


Figure 13.8 Migration Project Created

13.2.5 Editing a Migration Project

Subsequent changes to project data

If you want to change the name of the project or other migration objects subsequently, you can do so using the **Edit** dialog. For this purpose, select the project to be edited and then choose **Edit**. Then, the system displays the edit dialog of Figure 13.9. Here, you can adapt the name and the default view under **General Data**.



Adapting the Default View

Migration objects may be delivered with different views in SAP S/4HANA and SAP S/4HANA Cloud. A view defines whether a structure or field is shown, hidden, or mandatory. You can choose between **Standard Scope** and **Adjusted Scope**. In SAP S/4HANA Cloud, the **Standard Scope** view is selected initially; in SAP S/4HANA, the default view is **Adjusted Scope**. In a project, a view can only be changed for migration objects that do not contain any data yet. Migration objects that include data keep the original view. You can use the SAP S/4HANA migration object modeler to create your own views, which you can then select at migration object level.

Assigning additional migration objects

In the **Migration Objects** area, you can see all available migration objects and you can add objects that have the **Not Used in Project** status by selecting the **Use in Project** checkbox. The status of this object changes to **Add**. Additional information on each migration object is available under **Predecessor Objects** and **Documentation**. You can filter the list using the filter

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option (**All**) above the **Name** column. The following filter options are available:

- **All**
- **Not used in project**
- **To be added**
- **Used in project**

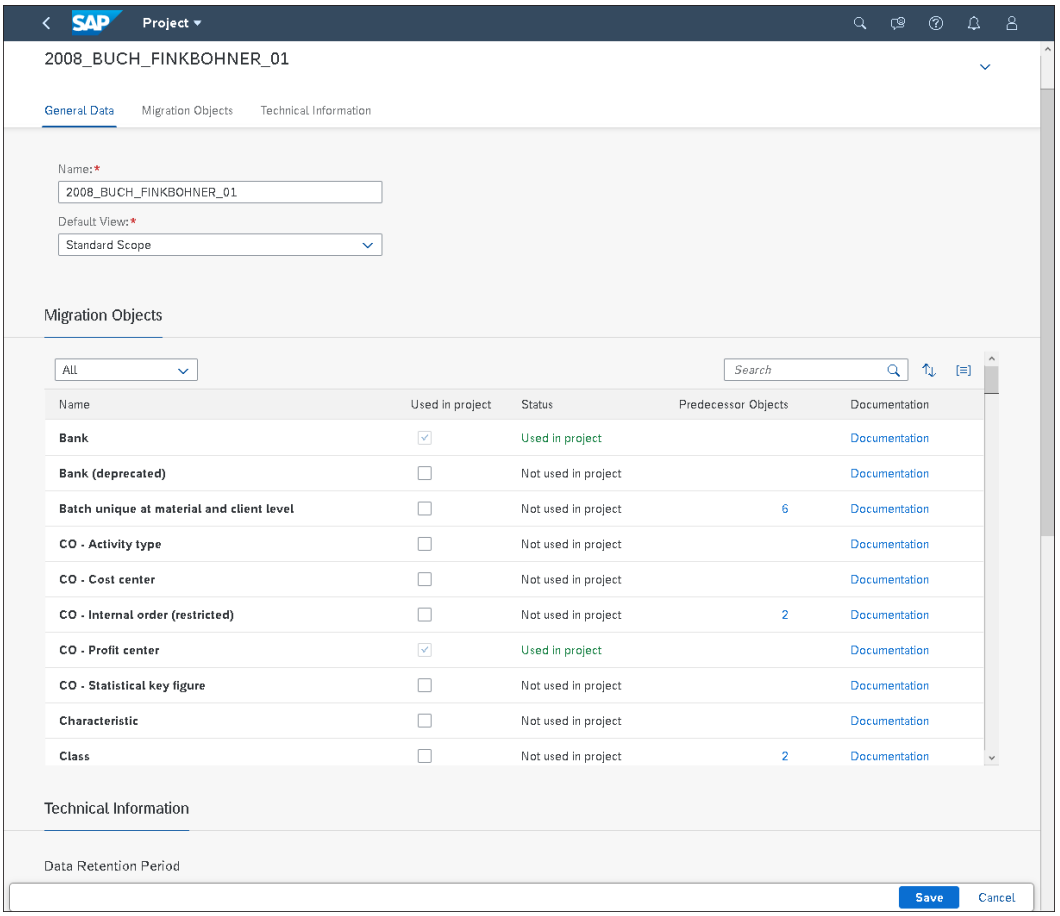


Figure 13.9 Edit Migration Project

Retention time of data

In the **Technical Information** area, you can find the settings for the **Data Retention Period**. You cannot edit this period until you have set the project's status to **Finished**. For more information, Section 13.2.19.

You save the project data by clicking the **Save** button at the bottom right of the window.

Work with One Project Only

Cross-object translation objects (value mappings) are assigned to every migration object. For example, if you migrate objects using internal number assignments, the new internal keys of the SAP S/4HANA system are mapped to the key of the source system in such a translation object. In other words, a follow-up object that also uses this translation object automatically knows the new number of the previous key and can use it (e.g., Fixed asset – Master data and Fixed asset - Postings). However, this only works within a migration project. If you migrate asset objects, for example, with multiple projects, this can lead to inconsistencies. The migrated assets' ID mappings to the new internal keys are missing if they were not migrated within the project. For this reason, we recommend only working with one migration project so that you always have access to the existing ID mappings of the migrated keys.

13.2.6 Filter the Migration Project Screen

To make the project overview more visible in case you have too many projects, you can filter this list. Using the **Expand Header** button, you can show the header with the search and filter bar. With **Collapse Header**, you hide the header section, and using **Pin Header**, you pin the header. The **Search** bar can be used to search your projects faster. Figure 13.10 shows an example.

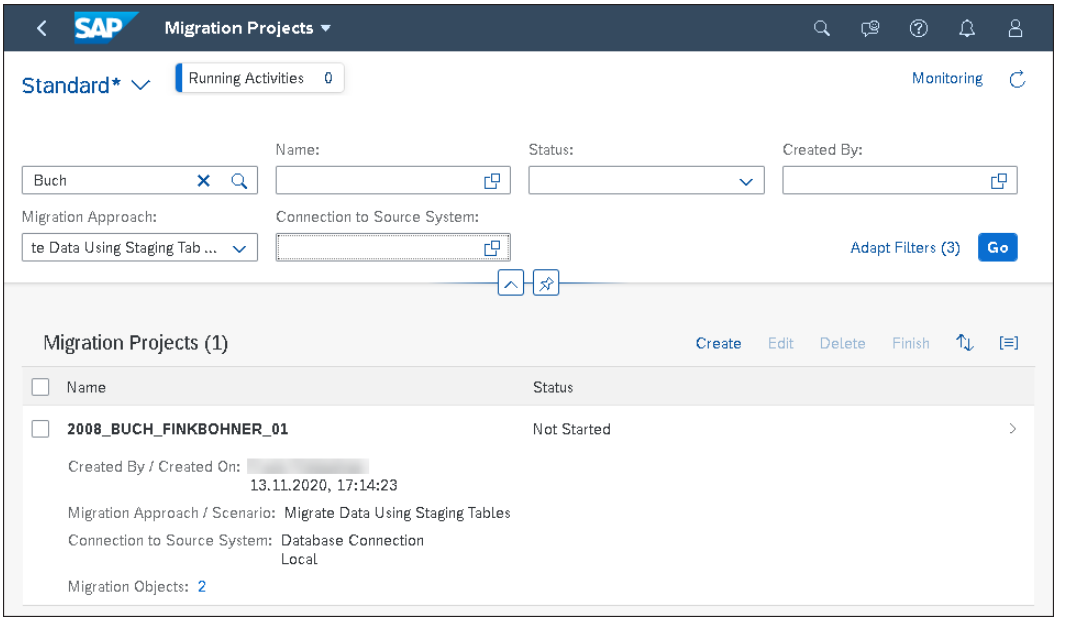


Figure 13.10 Filter List Using Search

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You can filter your project list using **Adapt Filters**. The number near **Adapt Filters** shows the number of the current active filter criteria. If you choose **Adapt Filters** a dialog window appears (see Figure 13.11). Here you can choose your filter criteria by choosing the **Name**, **Status**, **Connection to Source System**, **Created By**, and **Migration Approach** filter attributes. With **OK**, you activate the filter.

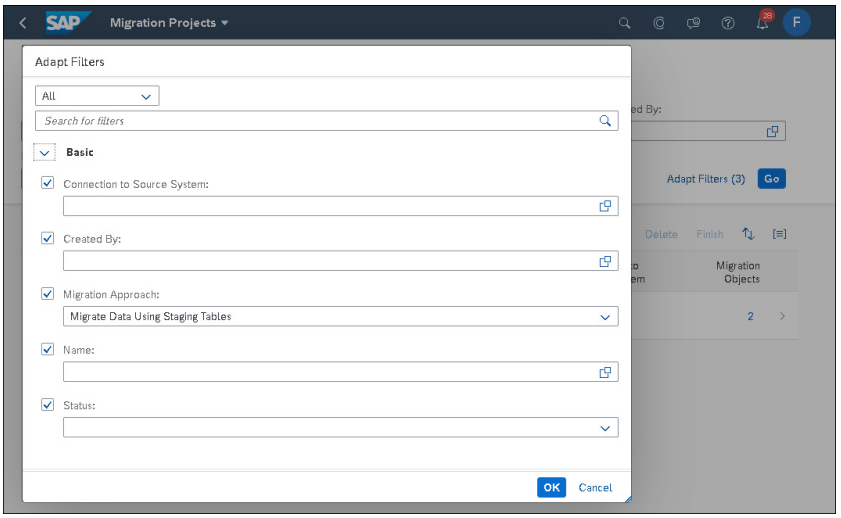


Figure 13.11 Adapt Filter

To store the filter permanently, choose **Select View** to open the **My Views** menu that is visible in Figure 13.12. Here you choose **Save As** to open the dialog to store your view permanently.

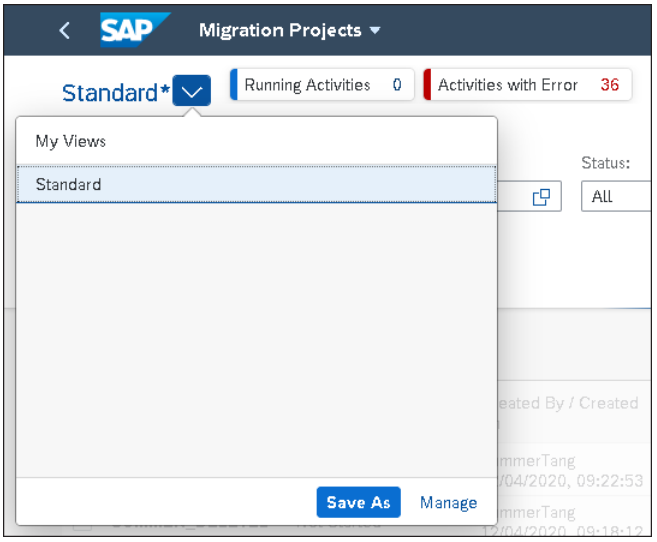


Figure 13.12 Store View via My Views Menu

Figure 13.13 shows the **Save View** dialog windows that open. Here you enter a name for your view into the **View** field. You can also choose additional options here:

- **Set as Default**
  The view is always used when opening the migration cockpit.
- **Public**
  The view can also be used by other users. You may use a **Transport** or store it as **Local Object**.
- **Apply automatically**
  The view applies immediately. You don't have to choose the **Go** button in the filter bar to apply the view.

You can also later adapt those options via **Manage** in **My Views**.

After you store the view with **Save**, the new view is visible and can then be chosen via **My Views**.

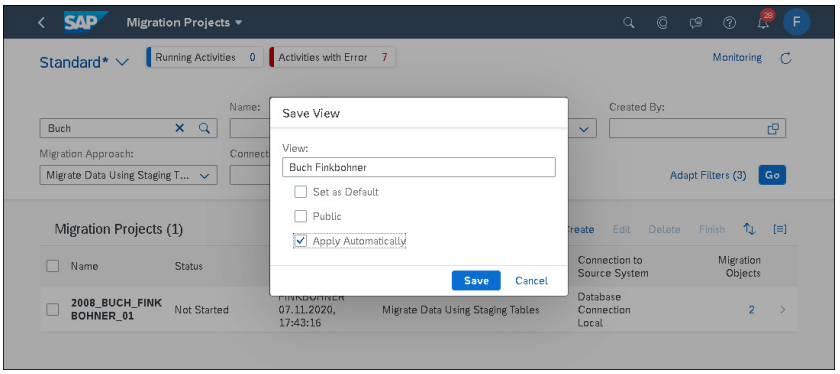


Figure 13.13 Save View with Filter Criteria

Figure 13.14 shows this new view with the filtered project list.

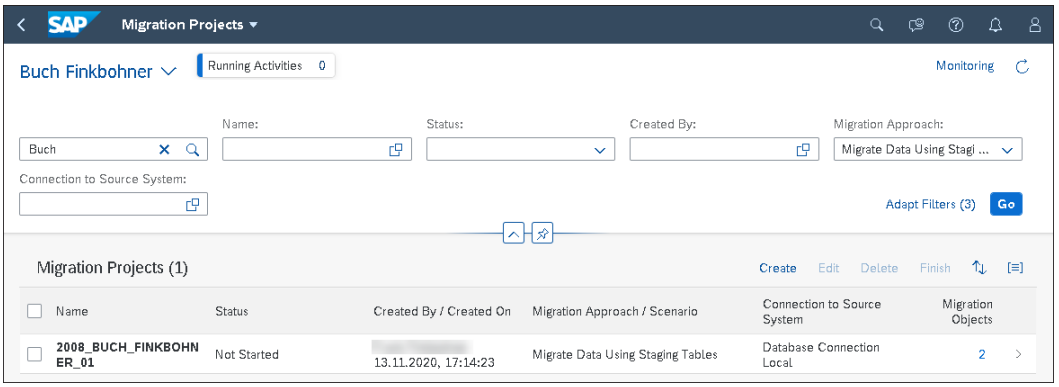


Figure 13.14 Filtered Project List via Own View

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SAP Fiori Variant Management

For more details about SAP Fiori variant management, visit *https://experience.sap.com/fiori-design-web/variant-management/*.

13.2.7 Calling the Migration Project

Overview of migration objects

Now, select the migration project and start it by clicking the button (**Next**) on the right. The system displays an overview of the migration objects of the selected migration project (see Figure 13.15).

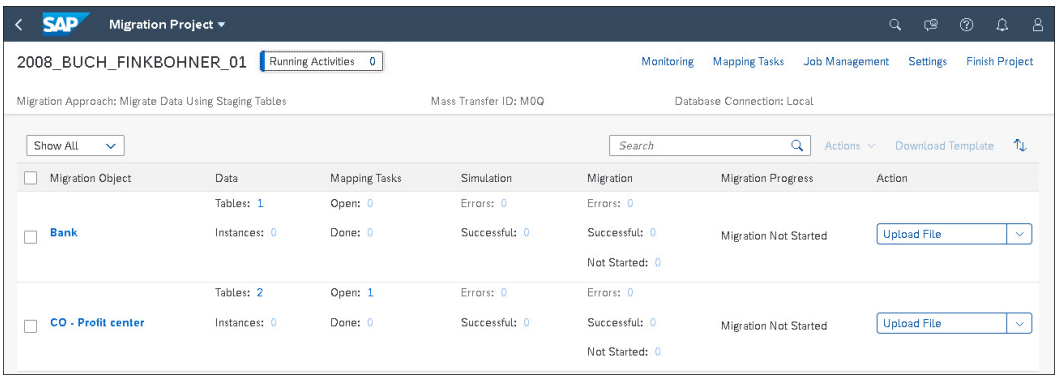


Figure 13.15 Overview of Migration Objects

Header area

The header area of the project overview provides various information and functions (from left to right):

- Name of the migration project.
- The button for displaying running activities. For example, if you add a migration object, you must copy it to the project. You can monitor this process via this dynamic button.
- **Monitoring** for running and finished activities (Section 13.2.11).
- **Mapping Tasks** for maintenance of fixed values, control parameters, and value mappings (translation objects) that are cross-object (Section 13.2.12).
- **Job Management** for maintenance of the maximum number of background jobs that can be used in the migration project (Section 13.2.13).
- **Settings** for overview of the migration objects, the history of activities, and technical information for support.
- **Finish Project**, with which you can finish the migration project (Section 13.2.19).

Object list

The respective columns of the object list comprise the following information for each migration object:

- **Migration Object**
  Name of the migration object and number of predecessor objects, if any.
- **Data**
  The number of staging tables of the object and the instances uploaded. An instance is a unique data record of the header structure. For complex migration objects—for example, Customer—an instance corresponds to exactly one customer master record.
- **Mapping Tasks**
  Number of open and completed value mappings.
- **Simulation**
  Number of erroneous and successful data records of the last simulation run.
- **Migration**
  Number of nonstarted, erroneous, or successfully migrated data records.
- **Migration Progress**
  Here, the numbers of the **Migration** column are displayed in percent using a progress bar. If a migration has not been started yet, **Migration Not Started** is displayed.
- **Action**
  Here you can select the action to be executed. In contrast to the previous migration cockpit with its strict approach (guided procedure), you can flexibly select your actions in the new migration cockpit. The migration cockpit suggests the next suitable action respectively (but you can also select another action).

Filtering the object list

The list of the migration objects can be filtered using the **Show All** selection field on the left. Possible values include **Show All**, **Errors**, **Not Started**, and **Success**. Moreover, you can use the **Search** field to search for migration objects.

Detail Screen of Migration Object

Information in the upper half

The migration object name is available as a hyperlink. If you click on the name, the system displays a detailed information screen for the migration object. In the upper half of the screen, the following information is displayed:

- **Documentation**
  The **Documentation** function comprises the link to access the documentation on the SAP Help Portal.

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- **Views**
  The **Views** function provides the current view of the migration object. The **Edit** option lets you adapt the view depending on the system and the availability of alternative views as long as the migration object does not contain any data yet (Section 13.2.5).
- **Table Structure**
  This function displays the structures' hierarchy. This is important to understand the relationships of the individual structures and their key interrelationships.

Functions in the detail screen

You can call the following functions:

- **Mapping Tasks**
  You use this function to maintain fixed values, control parameters, and value mappings of the migration object.
- **Instances**
  This function shows all uploaded data records of the header structure and their migration statuses. For more information, refer to Section 13.2.16.
- **Check for Updates**
  This function checks if updates are available for the migration object. An update is available in the various product versions in the following circumstances:
  - In SAP S/4HANA Cloud after a release upgrade or possibly after implementing a hotfix
  - In SAP S/4HANA after an upgrade to a new product version or after implementing an SAP Note Transport-Based Correction Instruction (TCI)

  Section 13.2.20 provides more details on this.
- **Update**
  If an update is available and has not been executed automatically, you can bring it up to date with this function.
- **Check for Custom Fields**
  You can define custom fields for a business object using the in-app extensibility of SAP S/4HANA. If a migration object is based on an API which was registered for this in-app extensibility, you can automatically add such fields to the migration object template. An overview of all migration objects that use an API which is registered for the migration of in-app extensibility is available on the SAP Help Portal at *http://s-prs.co/527987*. This check is usually run automatically when opening an object, but it can also be triggered using this function.

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Figure 13.16 shows the upper half of the detail screen.

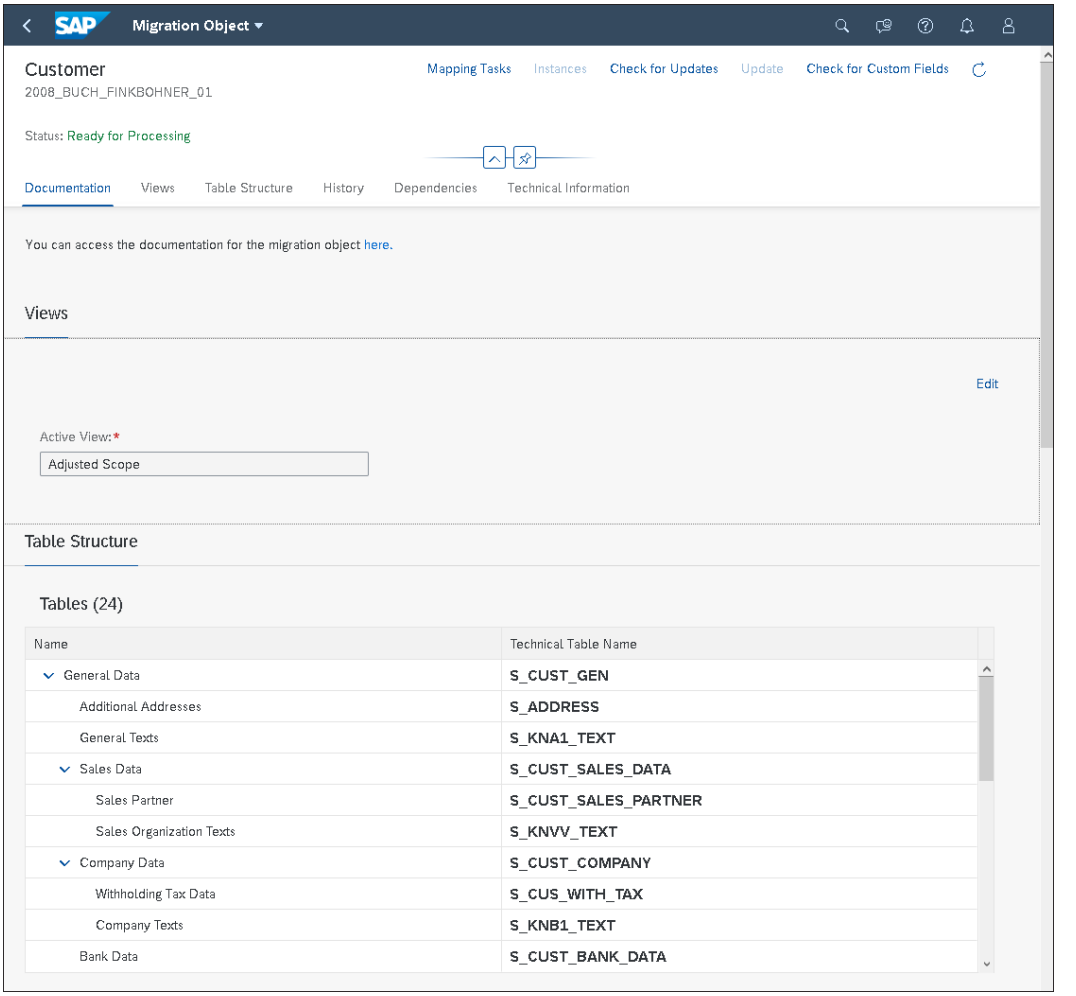


Figure 13.16 Migration Object Detail Screen (Upper Half)

Information in the lower half

The lower half provides the following information:

- **History**
  The history lists all completed actions of the objects including the data about the user who started this action. If you select **Show Messages**, you can view the messages of an action. In addition to the **Message Title**, the overview also contains the **Message Class** and **Message Number** information that is important for support. By clicking the **Message Title**, the system displays a detail screen and any existing **Long Description** for the message including detail information on the message (Section 13.2.18).

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- **Dependencies**
  This section displays migration objects that can be predecessor objects for the current migration object. The display includes the **Status** (of the migration) and **Type** (of the object)—for example, **Predecessor**, **Migration Object** (name of the migration object), and **Technical Name**. An important fact is that not every object listed here must be migrated in advance. This often depends on the constellation of the data to be migrated. The **Bank** migration object is a predecessor of the **Customer** object. In the US, however, in contrast to Europe, it is not a predecessor because in the US invoices are still paid by checks and thus no bank data for a customer is available.
- **Technical Information**
  This section lists the **Object ID**, **Technical Name** of the object, and the **Template ID**. These three pieces of information are important for support.

Figure 13.17 shows the lower half of the detail screen.

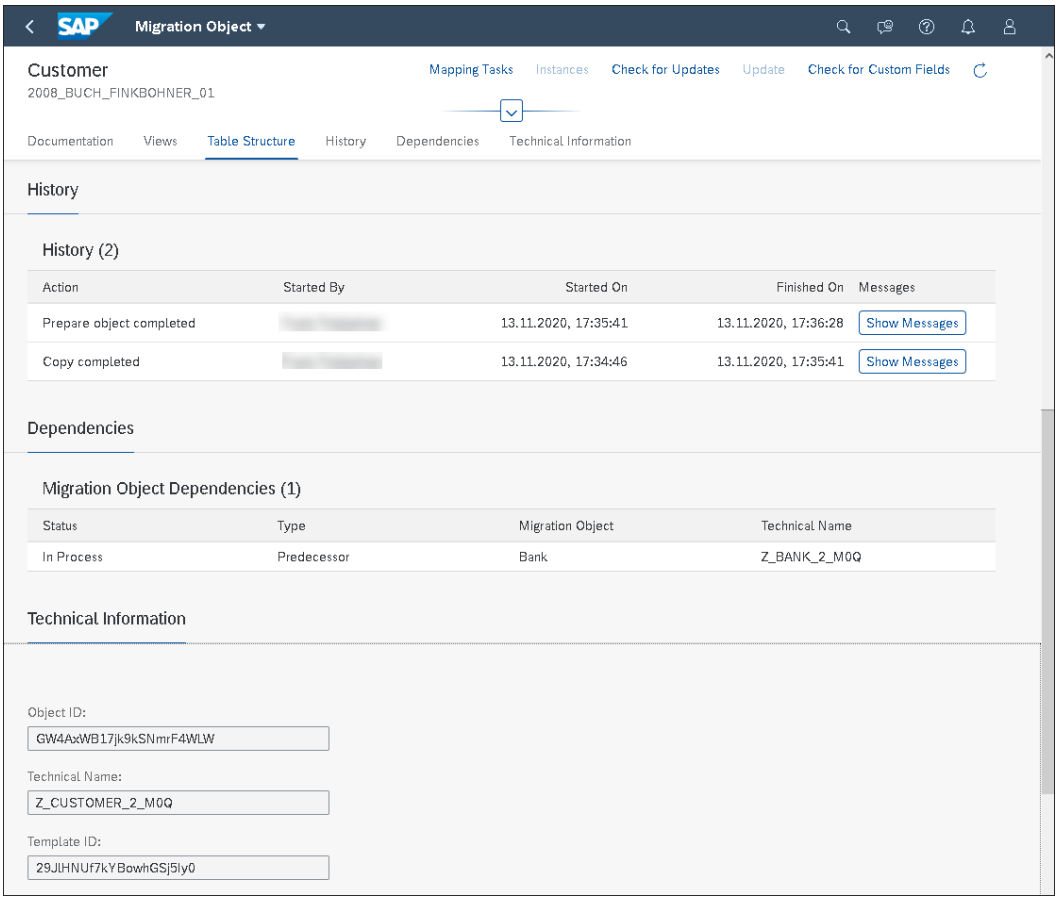


Figure 13.17 Migration Object Detail Screen (Lower Half)



Overview of Dependencies within the Migration Objects

Users frequently ask for an overview screen that illustrates the interdependencies of the migration objects and thus the sequence of objects that must be loaded first. Currently, such a screen is not available because every project is different and nobody uses all of the more than 150 migration objects. With the new version of the migration cockpit, it is now very easy to derive such an overview of dependencies in the detail screens of the migration objects.

Dependencies of migration objects

Basically, you should follow these principles when loading migration objects:

1. Always load master data before transaction data.
2. Start with the financial objects: Bank, CO—Cost Center, CO—Profit Center, Exchange Rate.
3. Then load the main master data, for example:
   - Characteristic and Class
   - Customer and Supplier (consider any interdependencies here)
   - Product
   - Fixed Assets
4. Subsequently, you can load all other objects, taking into account their dependencies.
5. Finally, you load transaction data, stock levels, and balances.
6. You can load migration objects you don't require for go-live later on.

Do not load untested data

It's critical that you run the load process several times in the QA system to discover and solve problems and dependencies in time and prior to productive loading. Loading of samples is usually not sufficient to prevent problems in productive loading. Do not load any data to the production system that you didn't load without any errors in the QA system.

Migration Object Documentation

The migration object documentation has been available on the SAP Help Portal since SAP S/4HANA Cloud 1905 and SAP S/4HANA 1909. For example, you can now view the documentation without logging on to the system and download it as a PDF file.

Migration object documentation

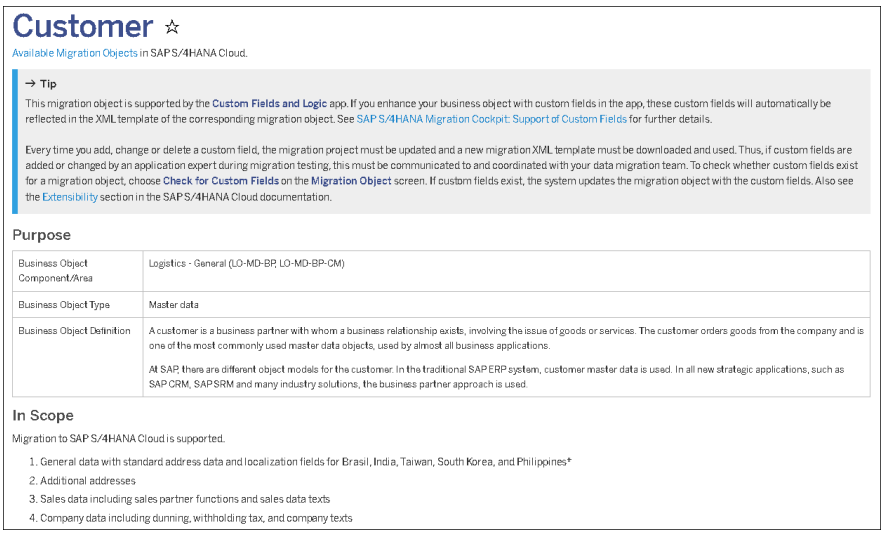
The documentation contains the following information:

- The **Business Object Component** or SAP area of the migration object.
- The **Business Object Type**, which indicates whether the object is a master data or transaction data object.

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- The **Business Object Definition** for a brief description of the object.
- The **In Scope** information specifies which functions or structures are supported by the migration object. The functions and structures are predefined by the API that is used for data migration.
- **Out of Scope** defines which restrictions must be considered for migration.
- The **Supported Features** area lists the supported transfer structures.
- **Prerequisites** lists all predecessors of the migration object that need to be migrated or created manually in advance, as well as further settings that you have to make before the actual migration process.
- **Mapping Instructions** provides additional information for mapping your source data and populating the migration file or staging tables. This section maps the **Mapping Structure Hierarchy** of the individual structures (spreadsheets/tables) of the migration object.
- The **Tasks** section contains detailed instructions that you should follow. Here you can usually find a link to the test script to obtain further information.
- **Post-processing** lists follow-up activities that you might have to perform after the migration or indicates which app and user role (for migration to the cloud) or transaction (for migration into an on-premise system) you can use to validate the migrated data. Usually, you'll also need the cloud business role to load the data, which should be assigned to the user performing the data migration.
- **Further Information** provides important information, for example, knowledge base articles, sample files, or SAP Notes.

Figure 13.18 shows example documentation for a migration object.



Customer ☆

Available Migration Objects in SAP S/4HANA Cloud.

→ Tip

This migration object is supported by the **Custom Fields and Logic** app. If you enhance your business object with custom fields in the app, these custom fields will automatically be reflected in the XML template of the corresponding migration object. See SAP S/4HANA Migration Cockpit: Support of Custom Fields for further details.

Every time you add, change or delete a custom field, the migration project must be updated and a new migration XML template must be downloaded and used. Thus, if custom fields are added or changed by an application expert during migration testing, this must be communicated to and coordinated with your data migration team. To check whether custom fields exist for a migration object, choose **Check for Custom Fields** on the **Migration Object** screen. If custom fields exist, the system updates the migration object with the custom fields. Also see the Extensibility section in the SAP S/4HANA Cloud documentation.

Purpose

Business Object Component/Area	Logistics - General (LO-MD-BP, LO-MD-BP-CM)
Business Object Type	Master data
Business Object Definition	A customer is a business partner with whom a business relationship exists, involving the issue of goods or services. The customer orders goods from the company and is one of the most commonly used master data objects, used by almost all business applications. At SAP, there are different object models for the customer. In the traditional SAP ERP system, customer master data is used. In all new strategic applications, such as SAP CRM, SAP SRM and many industry solutions, the business partner approach is used.

In Scope

Migration to SAP S/4HANA Cloud is supported.

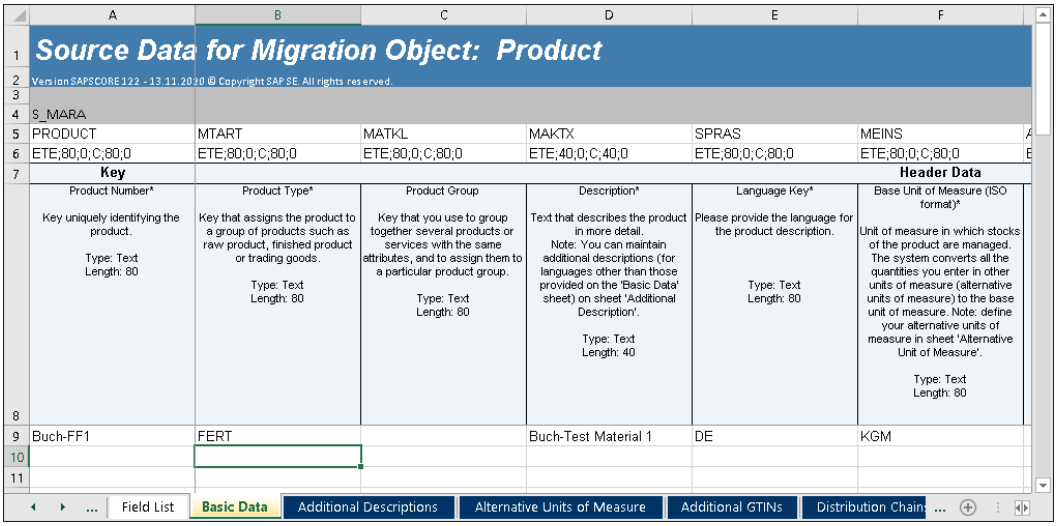
1. General data with standard address data and localization fields for Brasil, India, Taiwan, South Korea, and Philippines*
2. Additional addresses
3. Sales data including sales partner functions and sales data texts
4. Company data including dunning, withholding tax, and company texts

Figure 13.18 Migration Object Documentation (Customer Object)

13.2.8 Downloading Migration Templates

Excel file in XML format

You download migration template files to your local computer in the migration project overview using the **Download Template** option. The migration template is in the Microsoft Excel XML Spreadsheet 2003 file format. You can open and populate it using Microsoft Excel as of version 2003 or can use any other spreadsheet program that can process this format—for example, Calc. Figure 13.19 shows an example of such a migration template.



	A	B	C	D	E	F
1	Source Data for Migration Object: Product					
2	Version SAPSCORE 122 - 13.11.2020 © Copyright SAP SE. All rights reserved.					
3						
4	S_MARA					
5	PRODUCT	MTART	MATKL	MAKTX	SPRAS	MEINS
6	ETE;80;0;C;80;0	ETE;80;0;C;80;0	ETE;80;0;C;80;0	ETE;40;0;C;40;0	ETE;80;0;C;80;0	ETE;80;0;C;80;0
7	Key					Header Data
8	Product Number* Key uniquely identifying the product. Type: Text Length: 80	Product Type* Key that assigns the product to a group of products such as raw product, finished product or trading goods. Type: Text Length: 80	Product Group Key that you use to group together several products or services with the same attributes, and to assign them to a particular product group. Type: Text Length: 80	Description* Text that describes the product in more detail. Note: You can maintain additional descriptions (for languages other than those provided on the 'Basic Data' sheet) on sheet 'Additional Description'. Type: Text Length: 40	Language Key* Please provide the language for the product description. Type: Text Length: 80	Base Unit of Measure (ISO format)* Unit of measure in which stocks of the product are managed. The system converts all the quantities you enter in other units of measure (alternative units of measure) to the base unit of measure. Note: define your alternative units of measure in sheet 'Alternative Unit of Measure'. Type: Text Length: 80
9	Buch-FF1	FERT		Buch-Test Material 1	DE	KGM
10						
11						

Field List | Basic Data | Additional Descriptions | Alternative Units of Measure | Additional GTINs | Distribution Chain

Figure 13.19 Migration Template for Product Migration Object

Downloading one or more templates

Downloading Migration Template Files as ZIP Files

You select one or more migration objects and then select **Download Template**. The templates of the selected migration objects are downloaded in a ZIP file. You must unpack the migration template files to your local computer. Since SAP S/4HANA Cloud 2102, it downloads the corresponding template directly as an XML file if you select only one migration object.

Structure of the Migration Template

Spreadsheets of the migration template

The migration template usually includes several spreadsheets:

- **Introduction**

  The Introduction spreadsheet describes the migration template. You must read this introduction because it contains very important information. The urgent advice to use the **Values without Formatting** option for copy and paste is particularly important. This information simplifies your work with the migration template and usually prevents incorrect populating of the template.

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- **Field List**
  Details on the individual spreadsheets and the fields used is available in the Field List spreadsheet. The **Importance** column indicates the mandatory fields of the respective spreadsheets. Spreadsheets (structures) that must be populated are highlighted in orange. Columns 9 and 10 or columns I and J (depending on the settings of your spreadsheet program) are hidden initially. These columns contain the names of the technical structures and fields. These can be useful if you migrate from SAP ERP to SAP S/4HANA because the technical names of some objects are based on the SAP ERP tables and field names. The technical names are also useful for the release comparison of migration templates using the Release Comparison of Migration Object Templates SAP Help Portal page (Section 13.1.2).
- **Spreadsheets for the transfer structure**
  The other spreadsheets contain the individual transfer structures of the migration object. Titles of mandatory spreadsheets that must be populated are highlighted in orange. Initially, rows 4 through 6 are hidden and contain technical information on the object. If you expand row 8 (with the field descriptions), you can view advanced field information, also referred to as *tooltips*. This field information may be important for mapping your source data. Mandatory fields and key fields are marked with an asterisk (*) at the end of the field name. You can find the hierarchy of the structures and their dependencies in the detail screen of the migration object and in the migration object documentation. Figure 13.16 shows an example for the Customer migration object.

Field List for Migration Object: Product

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Sheet Name	Group Name	Field Description	Importance	Type	Length	Decimal	SAP Structure	SAP Field
Basic Data (mandatory)								
	Key	Product Number	mandatory for sheet	Text	80		S_MARA	PRODUCT
	Header Data	Product Type	mandatory for sheet	Text	80		S_MARA	MTART
		Product Group		Text	80		S_MARA	MATKL
		Description	mandatory for sheet	Text	40		S_MARA	MAKTX
		Language Key	mandatory for sheet	Text	80		S_MARA	SPRAS
		Base Unit of Measure (ISO format)	mandatory for sheet	Text	80		S_MARA	MEINS
		Change Number		Text	80		S_MARA	AENNR
		Revision Level		Text	80		S_MARA	REVLV
		GTIN		Text	18		S_MARA	EAN11
		GTIN Category		Text	80		S_MARA	NUMTP
	Basic Data	Division		Text	80		S_MARA	SPART
		Old Product Number		Text	40		S_MARA	BISMT
		Batch Management Required Ind.		Text	1		S_MARA	XCHPF
	Content / Design	Industry Standard Description		Text	18		S_MARA	NORMT
		Size/Dimensions		Text	32		S_MARA	GROES
		Laboratory / Design Office		Text	80		S_MARA	LABOR
	Groupings	External Product Group		Text	80		S_MARA	EXTWG
		General Item Category Group		Text	80		S_MARA	MTPOS_MARA

Introduction | Field List | Basic Data | Additional Descriptions | Alternative Units of Measure | Additional GTINs | Distributio ...

Figure 13.20 Migration Template with Field List for Product Migration Object

Structure of the file name

The file name of the migration object consists of the language ID and the language-dependent name of the migration object. Figure 13.20 shows the EN_Product.xml template file for the Product migration object.



Only Use Downloaded Templates as Changes to the XML File Structure Result in Errors

For compatibility reasons, only use a template that you have downloaded from the latest release. You may not be able to upload templates from other releases. The migration cockpit checks if the internal data structure of the XML file to be uploaded corresponds the data structure of the current release. If there are deviations in the structure—for example, another field sequence or new fields or structures—the file is usually not accepted. Because many migration objects in new versions are adapted to business process changes, this mechanism ensures data integrity.

Because the templates are XML files with a specific format and an internal structure, you should also consider the following:

- You can only use the format of the XML file you downloaded. Other Excel file formats do not work.
- You must not add, change, or delete any spreadsheets or columns; this would destroy the structure of the XML file and result in errors.
- Custom XML templates often cause data-loading errors.
- If you copy data to fields in the XML file using the cache or clipboard, for example, this data should only be copied as values without formatting or text. If you are unsure about the formatting, first copy the data to a text editor (e.g., Notepad) and then copy from the text editor to the XML file.

If you adhere to these rules, you shouldn't have any problems with the file.

Key fields

The key fields in the individual spreadsheets define the relationship between the header structures and substructures of an object. As a result, a key record must exist in the spreadsheet of the superior structure for each substructure record. Otherwise, the migration cockpit displays an error message and the record is not imported.



Mandatory Structures and Mandatory Fields

The migration template contains so-called mandatory structures. These structures (spreadsheets) must contain records and must not be empty. All other structures are optional and do not have to be populated. For example, in the Purchase Order object, the header structure and the item structure are mandatory. In the Customer object, only the top-level structure

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(General Data) is mandatory. Mandatory structures are marked with Mandatory in the Field List spreadsheet—for example, General Data (Mandatory).

However, you do not have to fill mandatory fields and key fields in optional spreadsheets if you don't want to use these structures. For example, if you don't want to migrate optional long texts in an object, you don't have to make any entries in this spreadsheet. Leave this spreadsheet blank.

Most Common Errors

Common handling errors

The following are the most common errors in the context of migration templates:

- **Copying data from other files**
  This includes Excel files, including the formatting and particularly the data type. A date field that is copied from another file may still look like a date, but in the underlying XML structure it has, for example, the `STRING` data type instead of the `DATE` data type. As a result, the migration cockpit interprets and uploads the values incorrectly. In the best case, the value is no longer recognized as a date; in the worst case, incorrect data may be migrated. The latter can incur follow-up costs if this is detected too late. Copy only values without formatting.
- **Inconsistent data structures**
  This involves the entry of data records at a structure level below the header level whose key does not exist at header level or in one of the parent structures. These data records are not transferred due to missing key relationships.
- **Inserting formulas in cells**
- **Deleting, moving, or adding spreadsheets**
- **Deleting, moving, or adding fields**

Always read the documentation

To avoid such errors, always read the Introduction spreadsheet in the migration template and the respective migration object documentation. Important notes are also available in the product assistance for the migration cockpit on the SAP Help Portal. The info box in Section 13.2.2 describes how to access the product assistance.



Important Knowledge Base Articles and SAP Notes

There are several important SAP Help Portal pages, SAP Notes, and SAP knowledge base articles (KBAs) that can help you to populate migration

templates better. You should read them and download and also read their attachments:

1. Data Migration Template Samples for SAP S/4HANA Cloud. This Help Portal page provides migration templates with sample population for selected objects and a description of the sample data: *http://s-prs.co/527988*.
2. 2683477—SAP S/4HANA Cloud Data Migration Content: Why Fields on Apps Are Not Available in the Content? This knowledge base article describes the phenomenon that you view fields in the maintenance app that do not exist in the migration template: *http://s-prs.co/527989*.
3. 2907822—SAP S/4HANA Migration Cockpit—Unit of Measure Handling. This knowledge base article discusses the correct handling of units of measure and why they must be converted to ISO code units of measure as the target value: *http://s-prs.co/527990*.

13.2.9 Loading a File to Staging Tables

Migration Object Tables split screen

Once you have populated the migration file, import this file to the migration cockpit by choosing **Upload File**. This opens the **Migration Object Tables** view which is split into two overviews, **Tables** and **Files**.

Files Overview

Uploading the file

In the files overview, select **Upload** to upload your migration template file. The name of the file is unique. You cannot upload several files with the same file names. Subsequently, the file is validated. Once the validation is complete, the name of the file is displayed in the list, and you can view the validation status. You can monitor both activities via **Running Activities** or **Monitoring**. If the file does not contain any errors, the status is **Data Successfully Transferred to Staging Tables**. You can click the **Show Messages** next to the status display to show messages on validation.

Instances = number of data records of the header structure

The header area indicates the number of **Instances** that you have uploaded. An instance is a unique data record of the header structure, for example, a unique product number. In IT terms, this is an entity. If an instance has already been loaded to the staging tables, you can no longer load it via another file.

Information on the source file

The list of the source files indicates the **Status** of the file, its **File Name**, **File Size**, the name of the user who uploaded the file (**Uploaded By**), and the date when the upload took place (**Uploaded On**).

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You can filter the list of files by choosing one of the following filters:

- **Upload**: File currently being uploaded.
- **Validation**: Files currently being validated.
- **Transfer to Staging Table**: The transfer to the staging tables is currently taking place but is not complete yet.
- **Finished**: Files transferred to the staging tables.

Executable actions

You can use the following **Actions** for the files:

- **Validate data**
- **Transfer Data to Staging Tables**
- **Delete Files**: If you delete a file, the data is not deleted from the staging tables. You can also remove a file using the ⊗ button (**Delete**).
- **Download Files**: With this option, you can download the files as XML files.

Figure 13.21 shows an example of a successful upload of a file.

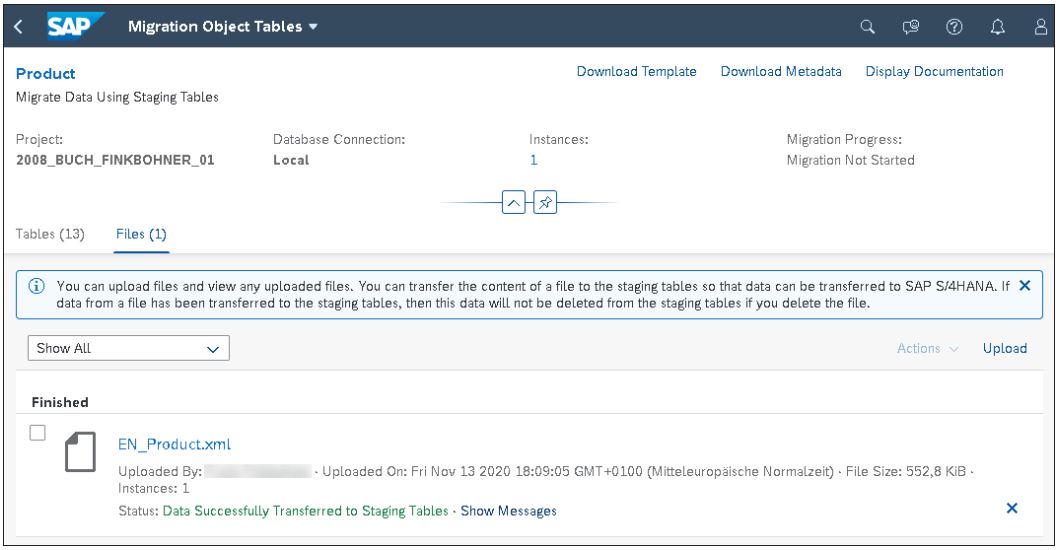


Figure 13.21 Migration Object Tables View, Files Overview, with Uploaded File

Upper Physical Limit of Files

The maximum size of a file that can be uploaded via an HTTP request to SAP S/4HANA is technically restricted to 100 MB. We can't specify an exact number of data records because the file size depends on the migration object and the data that is maintained in the file. In general, you should divide large files into several small files for uploading. Make sure that the struc-

tural integrity of the files is retained (records with dependent key relationships need to be in the same file). The upper limit of the file size is defined by the migration tool and the specified upper limit for uploading a file using an HTTP request. In contrast to SAP S/4HANA Cloud, you can adapt the maximum file size to be uploaded for the on-premise version of SAP S/4HANA. The maximum file size that can be uploaded using an HTTP request is controlled via the `icm/HTTP/max_request_size_KB` system parameter. The default value is 102,400 KB (100 MB). Your system administrator can adapt this value. Note, however, that the higher the value, the higher the probability that you'll receive a timeout error when uploading the file.

Using ZIP files

Like in SAP S/4HANA Cloud, SAP S/4HANA also provides an option to upload several files using a ZIP file. Here, the total of packed file sizes of all migration files that are contained in the ZIP file must not exceed 160 MB.

Checking the data after upload

Inconsistent data structures are not stored at all by storing files in staging tables. The entire internal XML structure is corrupted if you copy data with the wrong function and thus cause changes of the data types and a manual manipulation of the XML file. You should therefore always check the data in the migration cockpit after upload. Here, you should pay attention to the following points:

- **Displacements**
  Are all values available in the correct fields?
- **Data types**
  Are date fields populated correctly? Is the date information still valid?
- **Leading zeros**
  Do leading zeros still exist?
- **Numerical values**
  Are numerical values (numbers and their decimal places) correct?
- **Data records not transferred due to missing key relationships**
  Have all data records from the file been uploaded?

Displaying the files' content

For this purpose, click on the file name in the **Migration Object Tables** view. The content view of the file is displayed (**Migration Object File Content**). The file's detailed information is displayed in the header area (which can be hidden). This is followed by the line of hyperlinks of the respective structures/spreadsheets. The content area shows the data records for each spreadsheet/structure. Here you can search for data records, **Sort** the data records or filter them using the **Settings**. Figure 13.22 shows the content area, using a product file as an example.

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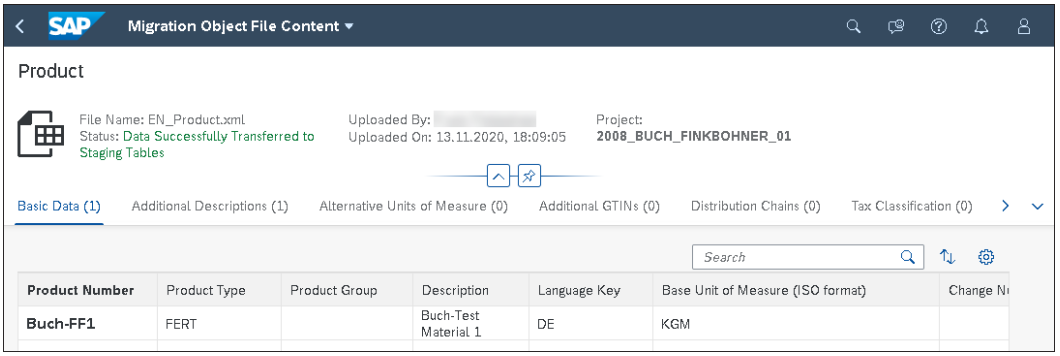


Figure 13.22 Content of Loaded Migration Object Files for Product Object

Table Overview

Downloading metadata to tables

The table overview provides an overview of the staging tables. In general, you can **Download Metadata** and call the migration object documentation using the **Display Documentation** option. The metadata file is a text file that you can also display as a CSV file (separated by semicolons) in Microsoft Excel. It basically contains the data that you know from the field list of the migration template file; but it also includes the name of the staging table and tool tips on the fields. Every structure is assigned to a separate staging table. You can execute the following actions on these tables:

- **Reset Table Settings**
  Under certain circumstances, it may happen that you must unlock staging tables. This may occur, for example, if a job was canceled manually. With this option, you reset the locks so that you can work with the data again. The number of erroneous and simulated instances is thus set to 0. The number of migrated data records is not adapted.
- **Delete All Records**
  With this option, you can delete all data records irrespective of their status. You should use this option with care because it can result in errors and inconsistencies.
- **Adjust Structure**
  This option enables you to update the structure of the selected table. In this case, the table status is **Adjustment Required**. This may be necessary, for example, for tables in a remote SAP HANA database schema or after deletion of a staging table on the database. No data is lost for existing tables.
- **Sort**
  Sorts the list.

Persönliches Exemplar für Ernst Schulten

Information of a table

A row of the table list contains the following information:

- **Name** of the structure
- **Technical Name** of the structure
- **Technical ID**, the name of the staging table in which the data is stored
- **Rows in Staging Table**, the number of data records of the respective staging table
- **Table Status**, which includes the values **OK** and **Adjustment Required**. With this status, it indicates whether adjustments to the table structures must be made using the **Adjust Structure** option.

Figure 13.23 shows an example of a table overview.

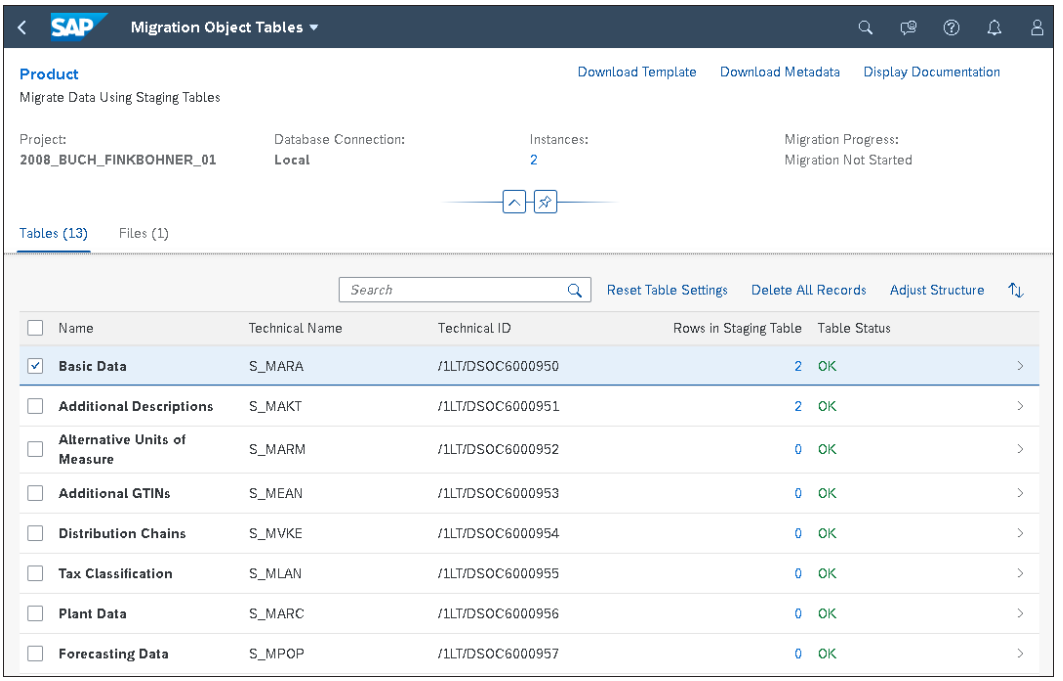


Figure 13.23 Migration Object Tables View: Overview of Tables

Displaying the Table Contents

If you click the number in the **Rows in Staging Table** column, you navigate to the overview screen, **Migration Object Table Content**. Figure 13.24 shows that all data records of the selected structure's staging table are displayed.

Displaying the table structure

In the table overview, select the name of the structure or the ⟩ button to navigate to the **Migration Object Tables, Structure** view. This view is split into two parts, as it is common in SAP Fiori. On the left side, you can view the list of structures, and on the right side you can view the metadata of the

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structure. The overview contains the following information in the header area:

- **Technical Name** of the structure
- **Technical ID** of the staging table's name
- **Table Status**

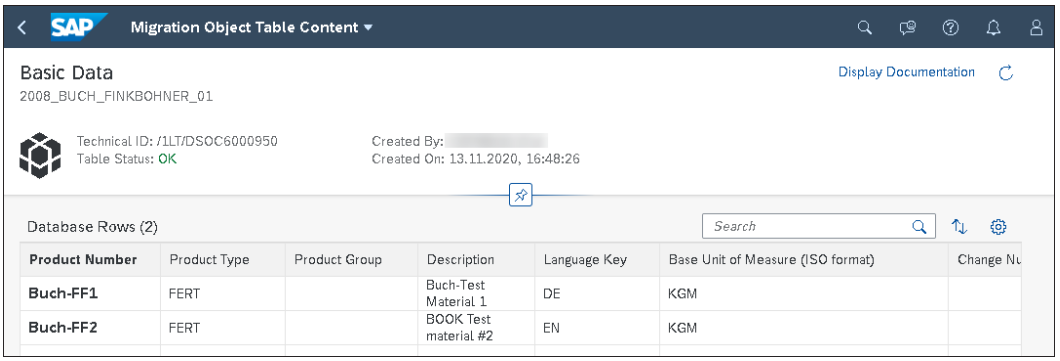


Figure 13.24 Migration Object Table Content View: Content of Structure

The list provides information on the structure which you know from the field list of the migration template file:

- **Name** of the field and tool tip about the field
- **Technical Name** of the field
- **Key Field** (Is it a key field?)
- **Mandatory**, for fields that must have values when you populate the tables with data
- **Data Type** of the SAP HANA database
- **Length**, the maximum length of the field
- **Decimals**, the number of decimal places for numerical fields
- Fields are classified in groups to ensure a better overview. In the maintenance app, related fields are usually grouped in so-called areas. The **Group** names are based on these area names.
- You can technically define a field of a database as a **Not Null** field, which means that this field must have a value. Key fields, mandatory fields, numerical fields, and date fields are usually defined as not null fields. These fields cannot be left empty. When populating them, you must transfer a defined initial value if you do not want to provide any value.

Figure 13.25 shows an example of a **Migration Object Tables, Structure** view.

Persönliches Exemplar für Ernst Schulten

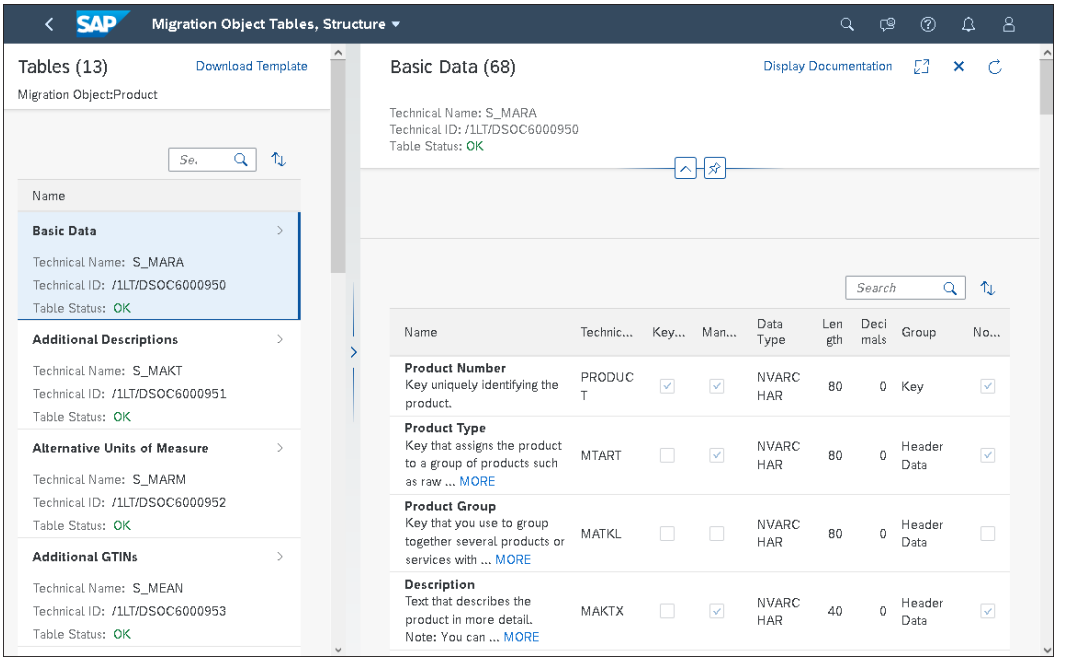


Figure 13.25 Migration Object Tables, Structure View: Metadata of Structure

13.2.10 Prepare

Preparing staging tables

After you have uploaded the data, you run the **Prepare** action on the migration object overview. The corresponding background job is scheduled and displayed under **Running Activities** (see Figure 13.26).

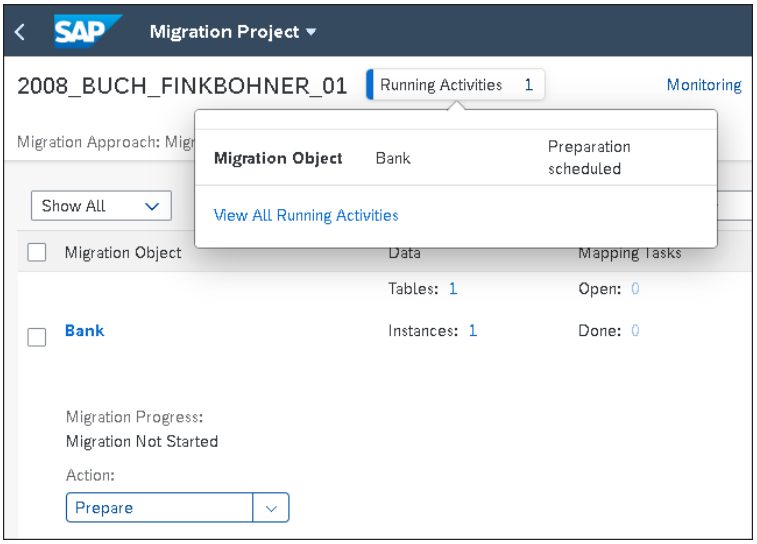


Figure 13.26 Preparation Scheduled

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The **Prepare** action is comparable to the validation step, which you probably know from the old migration cockpit. Here, the staging tables are prepared in such a way that they can be used for data transfer. This action also reads the source data from the staging tables and writes it to the defined value mappings.

13.2.11 Monitoring

Running activities

If you select **View All Running Activities** or the **Monitoring** function, the system takes you to the overview of all activities that have been triggered so far. If an activity encountered an error, another button, **Activities with Error**, is displayed on the right side of **Running Activities**.

Details of the activity

As you can see in Figure 13.27, the monitoring shows the name of the **Activity**, the **Object Type** of the activity (**Migration Object**), and the status of the activity in **Additional Information**. You can also see who started the activity, when it was started and finished, and its runtime.

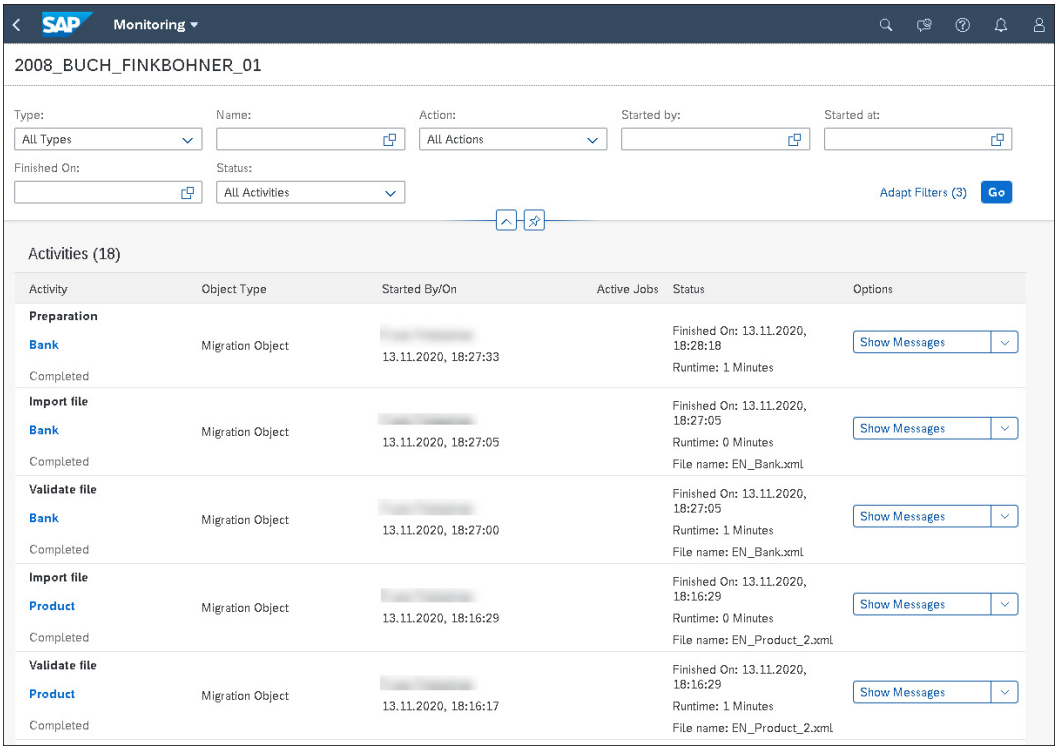


Figure 13.27 Monitoring Activities

Full job control through integrated monitoring

Integrated job monitoring of the migration cockpit is particularly useful for SAP S/4HANA Cloud customers because in contrast to SAP S/4HANA, they do not have direct access to SAP S/4HANA job monitoring. SAP S/4HANA

customers spare the additional usage of the standard job monitor (Transaction SM37) in the backend. Because the job and the user interface are separated in the SAP Fiori cockpit, the inconvenience of waiting for jobs to be completed is a thing of the past. In the SAP Fiori cockpit, you can now complete other tasks in parallel and still have full control over the job status.

Message overview

The **Show Messages** button enables you to view all messages for a specific activity. Figure 13.28 shows an example of the overview of migration messages.

Downloading messages

If you click the button, you can download the migration messages to a Microsoft Excel file.

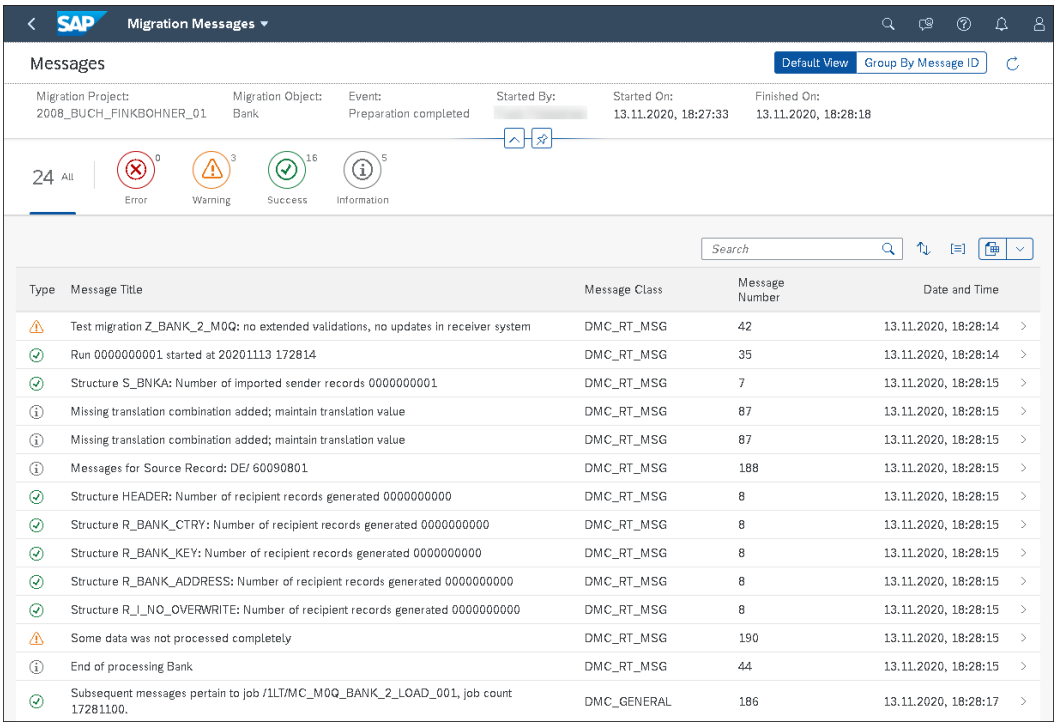


Figure 13.28 Migration Messages View: Prepare

13.2.12 Maintenance of Mapping Values

Editing mapping tasks

After you have uploaded and validated the data, the next step is to process the mapping tasks. You can edit either all mapping tasks of the project or the mapping tasks of a migration object. For the first option, you select the **Mapping Tasks** function in the upper area of the **Migration Project** view. For mapping tasks per object, you select the **Mapping Tasks** action directly for the migration object in the **Migration Project** view of the respective object. In both cases, the system opens the overview of mapping tasks that are either pending across objects for the project or must be processed for the

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selected object. In Figure 13.29, the header area indicates the number of mapping tasks that are in **To Be Confirmed** or **Confirmed** status. The list of mapping tasks shows the name of the **Mapping Task**, the **Status**, the **Type** of the mapping task, and the number of **Values** that must be confirmed in this mapping task.

Types of mapping tasks

A distinction is made between the following types:

- **Control Parameter**
  Control parameters control the behavior of the data migration. Here you specify, for example, if you require an internal or external number assignment for an object.
- **Fixed Value**
  Here you define fixed values. A typical fixed value is the one of the controlling area, which is usually specified as A000 in SAP S/4HANA Cloud.
- **Value Mapping**
  Here you map fixed values of the source to the target values of the SAP S/4HANA system.

Grouping mapping tasks

Apart from that, you can group the list of mapping tasks by a criterion, such as the type, using the (**Sort**) or (**Group**) button.

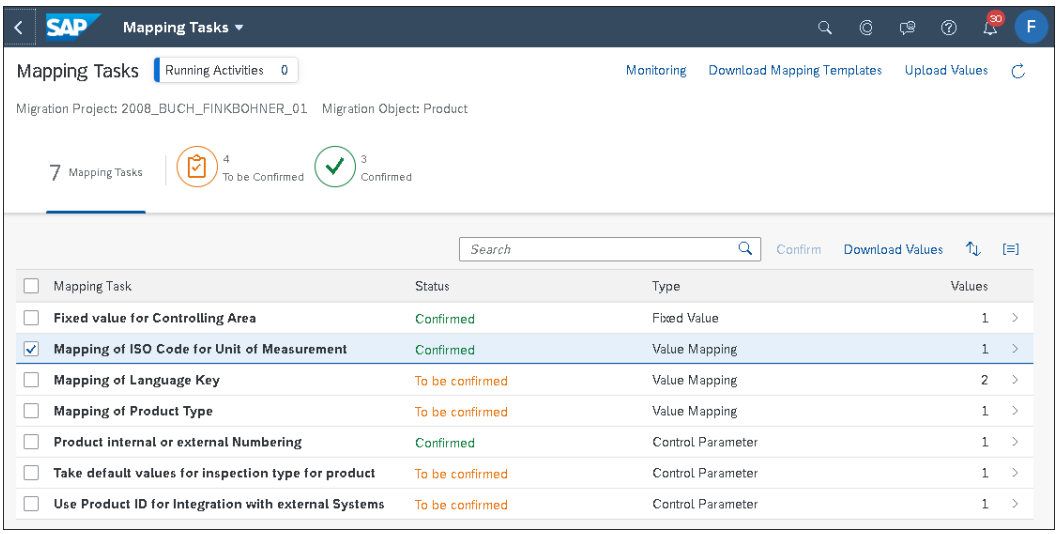


Figure 13.29 Mapping Tasks for Product Object

Bulk confirmation of mapping values

If you've maintained the correct target data already in your source data, you can simply select all mapping tasks to be confirmed and confirm them in bulk using the **Confirm** function. In this context, you must know that a source value is transferred as a possible target value to the mapping task if the source value's length doesn't exceed the target value. If the source value is too long, however, the target value is left empty. The **Confirm** function

checks in the selected mapping task if a value was entered. It also checks whether this target value is correct if a value table is assigned to this mapping task. Here you should note that such a value table is assigned to most (but not all) mapping tasks. In any case, you should check your values before you simply confirm them in bulk because even a correct target value can be assigned to an incorrect source value. The migration cockpit therefore displays a warning.

Checking the data after bulk confirmation

During confirmation, a small information window is displayed on the screen. When this message disappears, the bulk confirmation is complete. As mentioned previously, you should definitely check the values after confirmation. Mapping tasks that could not be confirmed are still in the **To Be Confirmed** status.

Exporting and importing mapping values

Next to monitoring, you can download the mapping templates using the **Download Mapping Templates** option. In the selection window, you select the corresponding mapping tasks and download them to a packed ZIP file using the **Download** option (see Figure 13.30).

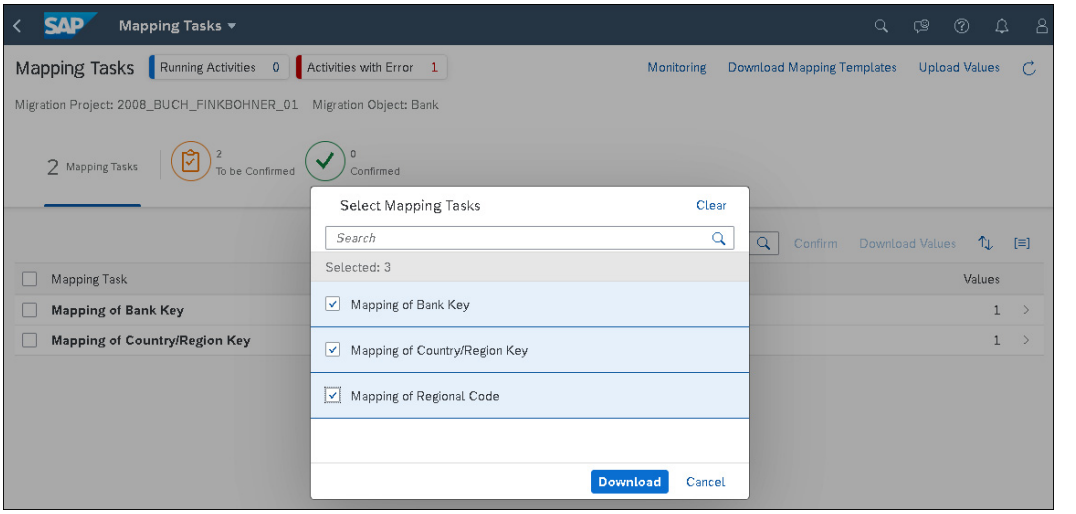


Figure 13.30 Download Mapping Templates

Editing the mapping templates file

The mapping template is an XML file that can be edited with Microsoft Excel or another spreadsheet program. It comprises the **Signature** tab that provides the technical description of the import and export parameters. You maintain the corresponding mapping target values on the **Data** tab in the export parameter column (`EV_`) for each import parameter (`IV_`). Mapping templates are useful if you define value mappings—for example, purchasing group mappings—for different user departments. You can then assign to them a template for the common mapping. Figure 13.31 shows an example of such a mapping templates file for value mappings.

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Figure 13.31 Maintaining Data in Downloaded XML File

Downloading or uploading values for each mapping task

You can also download individual mapping tasks including their values to a file using **Download Values**. A warning message is displayed that you should consider: "Note that the files may contain target values that were created automatically. This can occur if internal numbering is in use for the associated migration objects. Ensure that you adjust the target values (or remove these instances completely) before uploading the file to another system."

You then navigate to monitoring.

Download file

Here, the **Download mapping values** activity is displayed. You can select from two options:

1. **Show Messages**
   This option displays the message overview screen, which was mentioned previously, with the respective messages for the activity.
2. **Download File**
   The values are downloaded as a ZIP file.

In addition, you can use **Upload Values** to reimport value mappings of XML files you have downloaded. Figure 13.32 shows the monitoring with the two selection options for the **Download Mapping Values** activity.

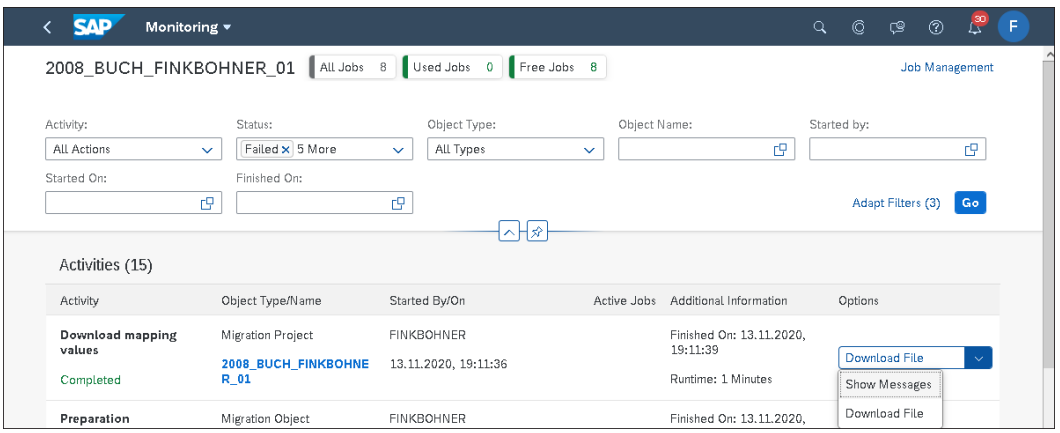


Figure 13.32 Monitoring View: Download Mapping Values

13.2.13 Job Management

Parallelizing the transfer

In SAP S/4HANA Cloud 1805, a new functionality was introduced to process the transfer of multiple files in parallel. This has considerably increased the performance of the data transfer. Previously, you also had the option to start multiple migration files at the same time, but they were processed only sequentially. Because the new migration cockpit is built on the principle of staging tables, parallelization no longer occurs through the number of files but using another mechanism. For this purpose, in job management you increase or decrease the numbers for **Maximum Number of Jobs for Project** and **Jobs Used for Migration Objects**. In the **Job Management** view, you click the **Edit** button and adapt the desired number of jobs for the project and migration object using the plus and minus buttons (see Figure 13.33). You then save your selection using the **Save** button.

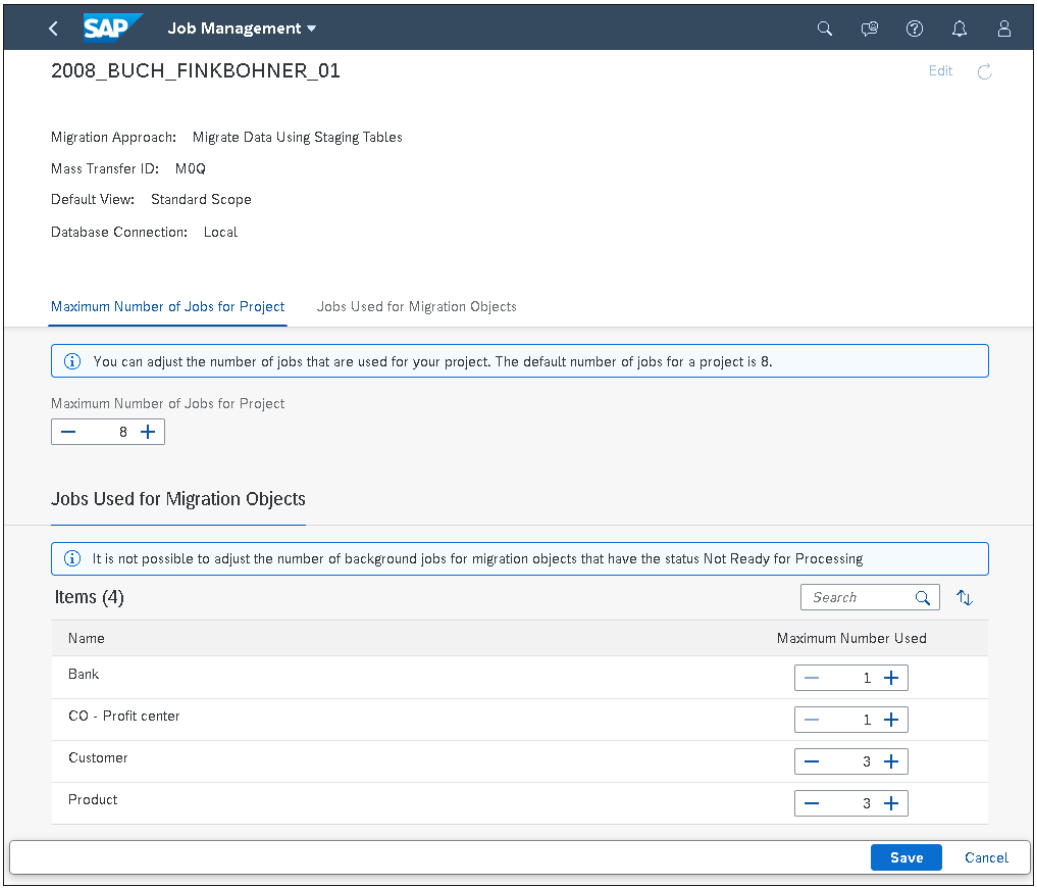


Figure 13.33 Job Management

Maximum number of jobs is limited

The number for **Maximum Number of Jobs for Project** depends on the number of jobs available in the system.

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Maximum Number of Background Processes in SAP S/4HANA Cloud

In SAP S/4HANA Cloud, essentials edition, the maximum number of background processes is limited. At the time of this writing in August 2020, the limit was eight background processes for the QA system and 16 background processes for the PROD system. Contact your system administrator to obtain more information on the number of available background processes for your SAP S/4HANA on-premise system. It's not useful to specify more jobs than are available. You should also note that some background jobs are usually already occupied with standard jobs. Using multiple parallel migration projects may have been useful in SAP S/4HANA systems prior to version 1809. Since version 1809, however, it's rather counterproductive and provides no performance gain but rather causes problems due to overflowing job queues.

13.2.14 Simulating the Migration

Starting the simulation

After you have confirmed all mapping tasks and distributed the jobs in job management, the next step is to simulate the data migration. For this purpose, in the **Migration Project** view you select the **Simulate** action of the respective migration object. A background job is scheduled whose status you can check under **Running Activities** or **Monitoring**. If simulation fails, you can see this directly using the **Activities with Error** button. Figure 13.34 shows an example with errors during simulation. The migration object is marked with a red bar on the left side to emphasize the error status.

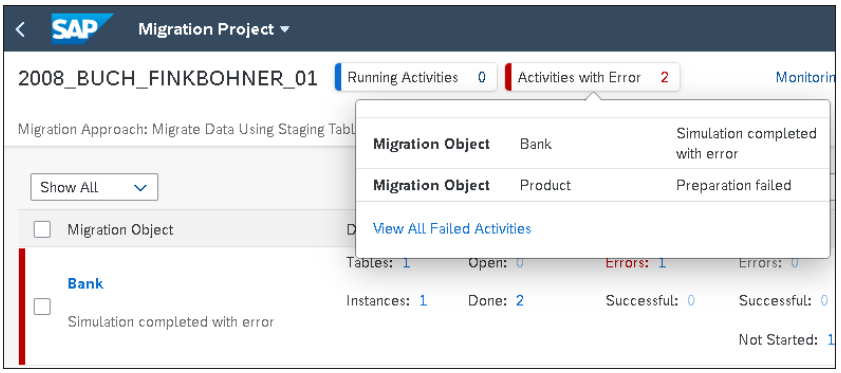
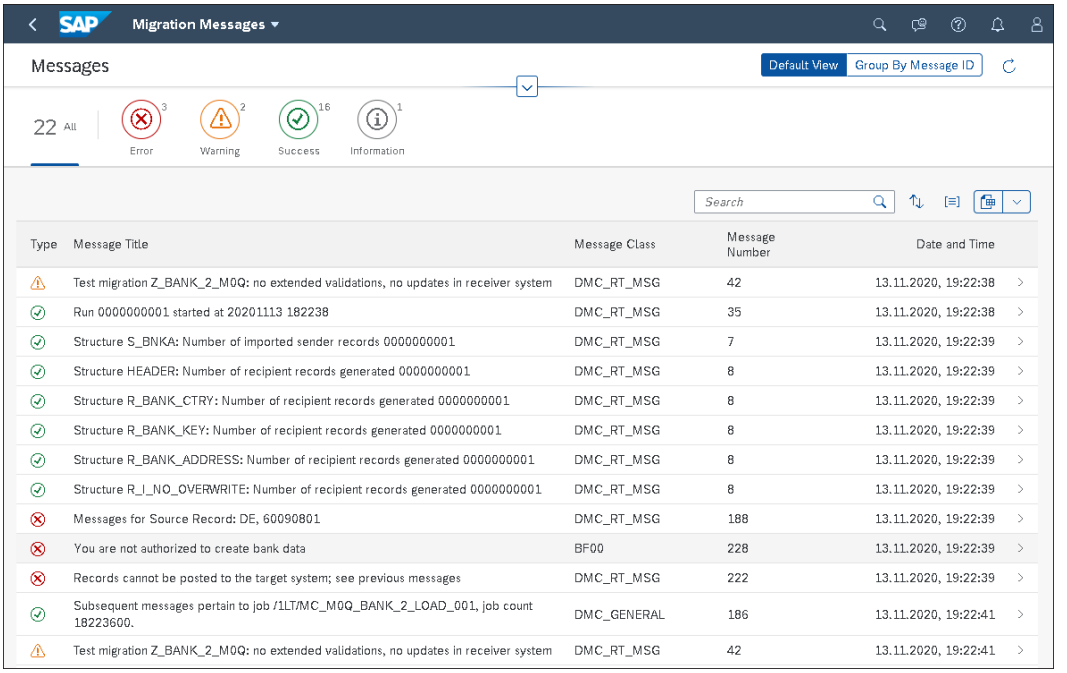


Figure 13.34 Activities with Error Button after Simulation

Checking errors in monitoring

You can display the errors using the **View All Failed Activities** option or via monitoring. For this purpose, in the **Monitoring** view, select the **Show Messages** option for the **Simulate Data** activity. The example in Figure 13.35 shows an error indicating that you are not authorized to create bank data.



Type	Message Title	Message Class	Message Number	Date and Time
⚠	Test migration Z_BANK_2_M0Q: no extended validations, no updates in receiver system	DMC_RT_MSG	42	13.11.2020, 19:22:38
✓	Run 0000000001 started at 20201113 182238	DMC_RT_MSG	35	13.11.2020, 19:22:38
✓	Structure S_BNKA: Number of imported sender records 0000000001	DMC_RT_MSG	7	13.11.2020, 19:22:39
✓	Structure HEADER: Number of recipient records generated 0000000001	DMC_RT_MSG	8	13.11.2020, 19:22:39
✓	Structure R_BANK_CTRY: Number of recipient records generated 0000000001	DMC_RT_MSG	8	13.11.2020, 19:22:39
✓	Structure R_BANK_KEY: Number of recipient records generated 0000000001	DMC_RT_MSG	8	13.11.2020, 19:22:39
✓	Structure R_BANK_ADDRESS: Number of recipient records generated 0000000001	DMC_RT_MSG	8	13.11.2020, 19:22:39
✓	Structure R_I_NO_OVERWRITE: Number of recipient records generated 0000000001	DMC_RT_MSG	8	13.11.2020, 19:22:39
⊗	Messages for Source Record: DE, 60090801	DMC_RT_MSG	188	13.11.2020, 19:22:39
⊗	You are not authorized to create bank data	BF00	228	13.11.2020, 19:22:39
⊗	Records cannot be posted to the target system; see previous messages	DMC_RT_MSG	222	13.11.2020, 19:22:39
✓	Subsequent messages pertain to job /1LT/MC_M0Q_BANK_2_LOAD_001, job count 18223600.	DMC_GENERAL	186	13.11.2020, 19:22:41
⚠	Test migration Z_BANK_2_M0Q: no extended validations, no updates in receiver system	DMC_RT_MSG	42	13.11.2020, 19:22:41

Figure 13.35 Migration Messages for Simulation with Errors

Long descriptions support troubleshooting

If you click a message, you navigate to the **Migration Message** detail view. The detail view shows the **Long Description** for a message which provides further information on the message and on troubleshooting in case of errors. Under **Technical Information**, you can find the **Message Class** and **Message Number**, which are important for the support team and for finding problem solutions on the internet. In our example, you are informed that a specific authorization is missing (see Figure 13.36).



Message Classes Tell You a Lot about the Origin of the Error Message

The message class enables you to find out, for example, if the error was output by the migration cockpit, the migration content, or the API. Message classes of the migration cockpit usually start with `DMC_`. A common message class of the migration content is `CNV_DMC_SIN`. All other message classes are usually used by APIs for data migration. You can thus better classify the problem and assign it to the relevant support component.

Migration after successful simulation

Once the problem is solved, you restart the simulation. After successful simulation, the migration object is in **Simulation Completed** status, and the button of the action is set to **Migrate** (see Figure 13.37).

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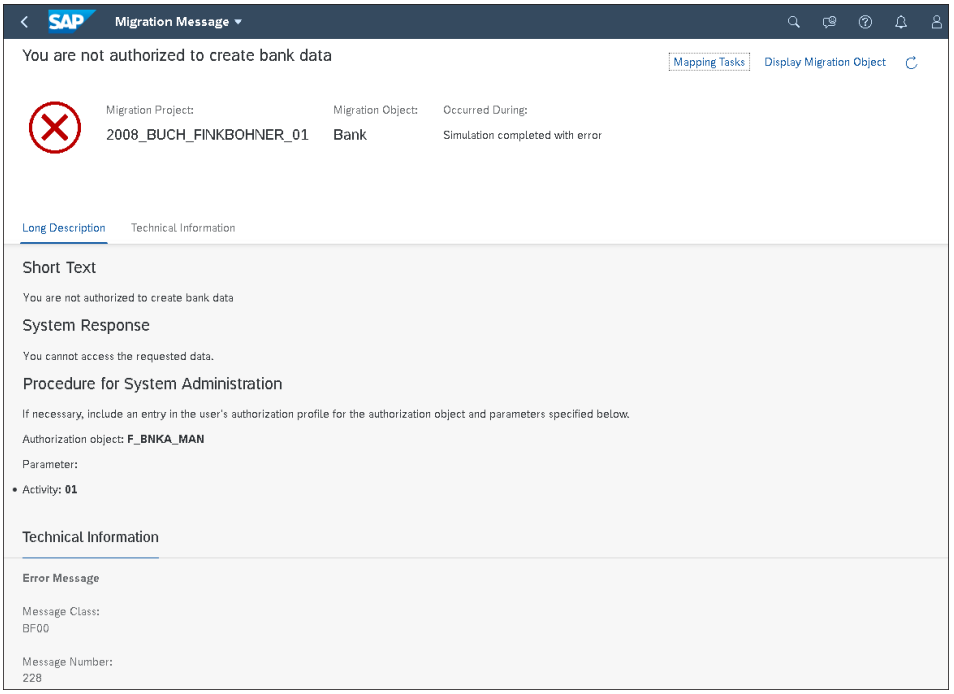


Figure 13.36 Details of Message: Long Descriptions

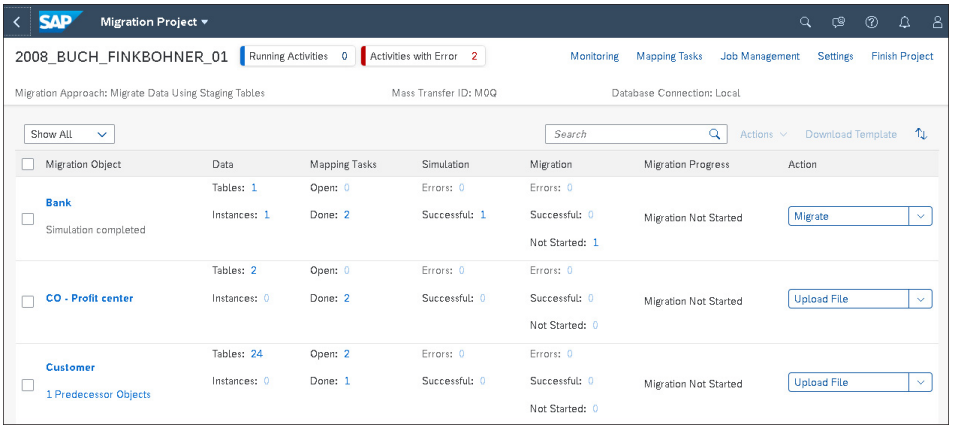


Figure 13.37 Successful Simulation of Migration Object

13.2.15 Migrating Data

Start of migration

You can now migrate your data. To do so, you run the **Migrate** action for the migration object. A window with a warning message is displayed. If you want to start the migration, confirm with **OK**. The migration object's status is then set to **Started**. In monitoring, you can monitor the activity's progress. If the data migration is successful, the status is set to **Completed** (see Figure 13.38).

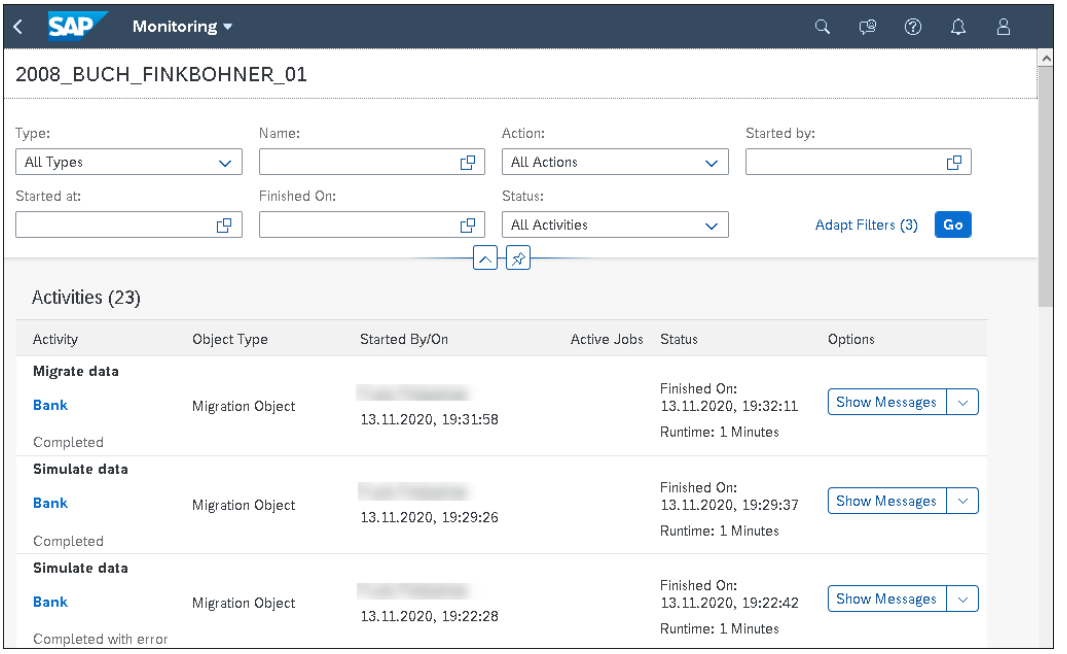


Figure 13.38 Successful Migration of Migration Object

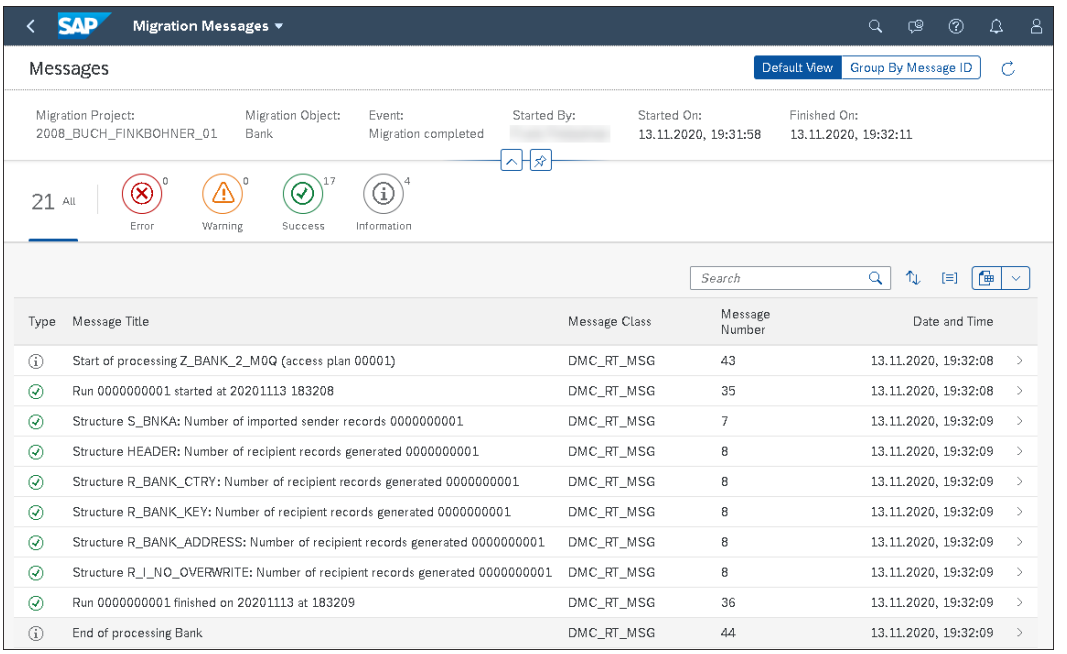


Figure 13.39 Migration Messages of Successful Data Migration

Checking the messages after the migration

After each data migration, you should view the messages of the migration run in the **Migration Messages** view using the **Show Messages** option. Figure 13.39 shows the messages of our example.

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13.2.16 Displaying Migration Object Instances

After you have uploaded the data, you can see that the **Instances** function can now be selected in the migration object's detail screen. This function takes you to the **Migration Object Instances** view. Alternatively, you can also navigate there using the object list of the migration project overview (see Figure 13.40). In this case, you select either the number of **Instances** in the **Data** area, which are provided as a hyperlink, or one of the numbers in the **Simulation** or **Migration** area.

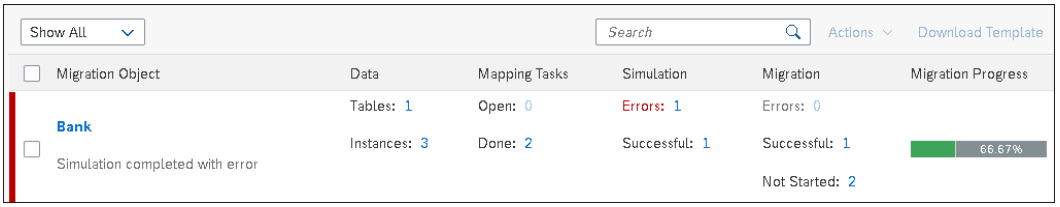


Figure 13.40 Migration Project Overview and Instances

Filtering the view of instances by status

Depending on how you called the list, the **Migration Object Instances** view displays either all instances or only those instances that correspond to the status selected (see Figure 13.41). The list shows the values of the key fields and the first fields of the instance. You can display additional fields and their values in a separate window if you select the record. You can also see the **Source** of the instance (e.g., the file name), the last **Action** of the instance (e.g., **None**, **Simulated**, **Migrated**), and the **Status** of the instance (e.g., **Initial**, **Success**, **Error**).

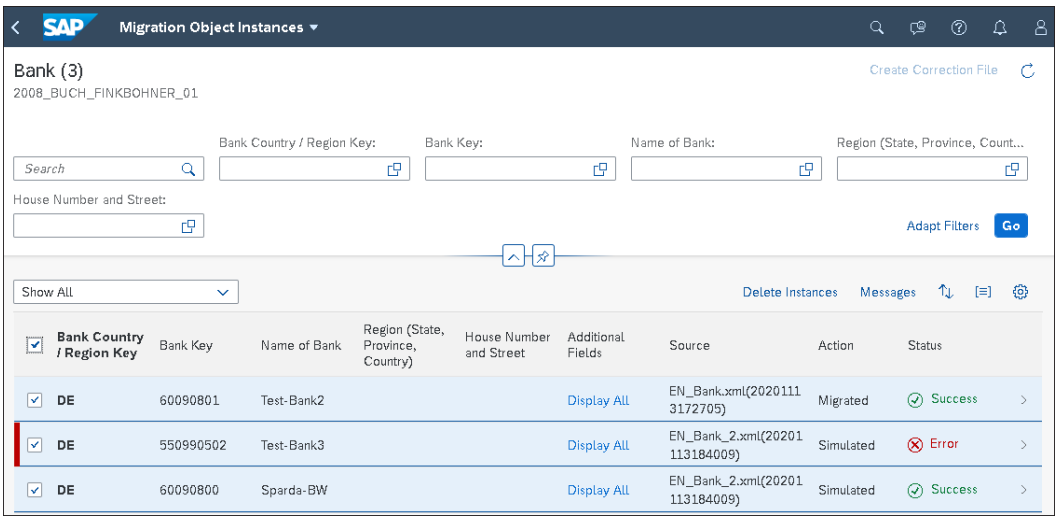


Figure 13.41 Displaying Migration Object Instances

Viewing an individual instance

When you click a data record, the **Migration Object Instance** view is displayed (see Figure 13.42). The overview is divided into two areas. On the left side, you are provided with information on the instance selected and you can choose the table (structure) to be displayed. The values of the selected staging table are then shown on the right side.

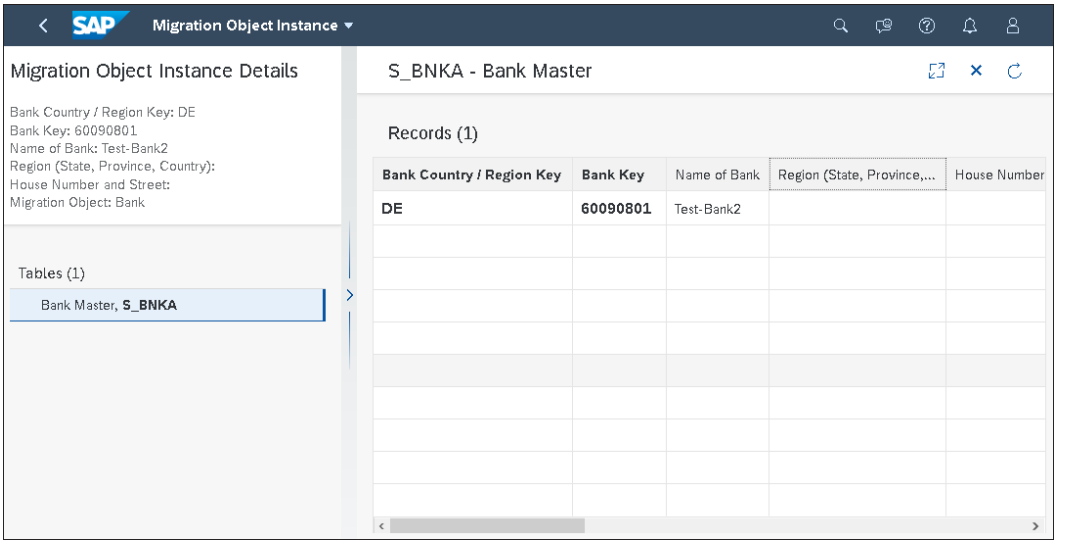


Figure 13.42 Migration Object Instance View: Bank Details

Figure 13.43 shows an example of a more complex migration object (Product), with several tables that can be selected.

Functions for migration object instances

In the **Migration Object Instances** view, you can perform the following functions on the selected instances:

- **Delete Instances**
  All instances selected are deleted.
- **Messages**
  The messages for each instance selected are displayed.



Impact of Value Mapping on the Display of Instances

The **Migration Object Instance** view shows the values of the data records as you loaded them to the staging tables. When you start the **Simulation** action, the data of the fields to which a mapping task is assigned are converted to the confirmed target value. In other words, after the simulation is complete, the system displays the converted data, which is then used for migration.

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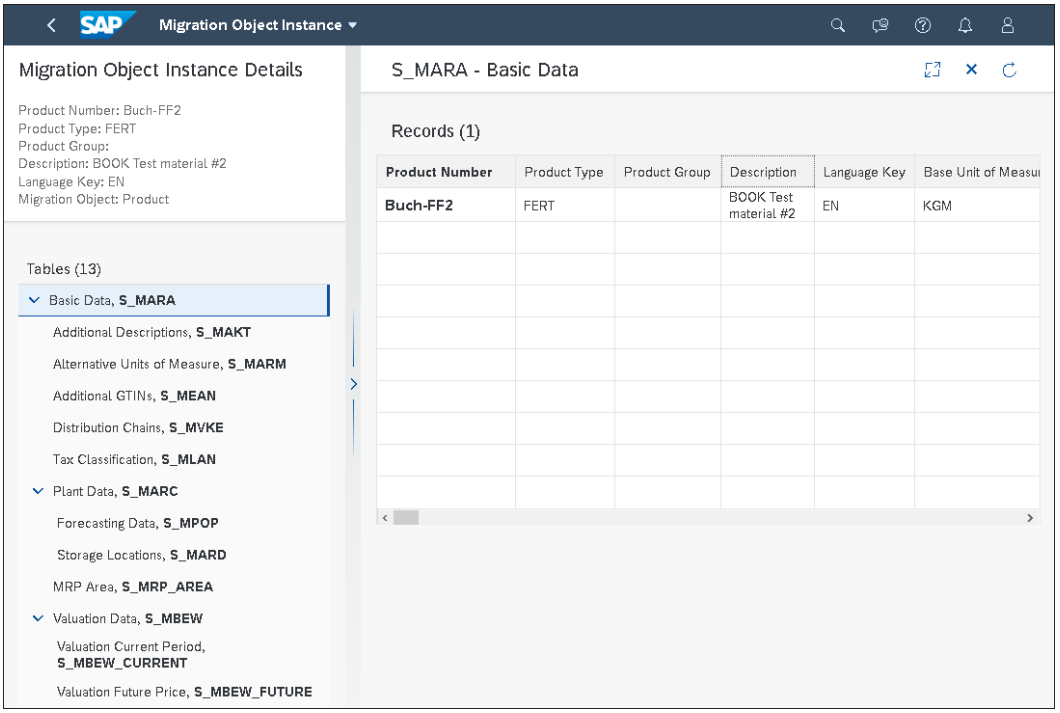


Figure 13.43 Migration Object Instance View: Details: Product

Irrespective of the instances selected, you can also choose **Create Correction File** here. Section 13.2.17 provides more information on the process of creating a correction file.

Deleting Instances

Migrated instances cannot be deleted

The **Delete Instances** function deletes the selected instances from the database. You can only delete instances that haven't been migrated successfully. After you have selected the function, a text window is displayed informing you about this. You can either run the function by selecting **Delete** or finish it by selecting **Cancel**.

Displaying Messages per Instance

The **Messages** function displays all messages of the selected instances, as shown in the example in Figure 13.44.

You select the instance on the left side. The messages for this instance are displayed on the right side.

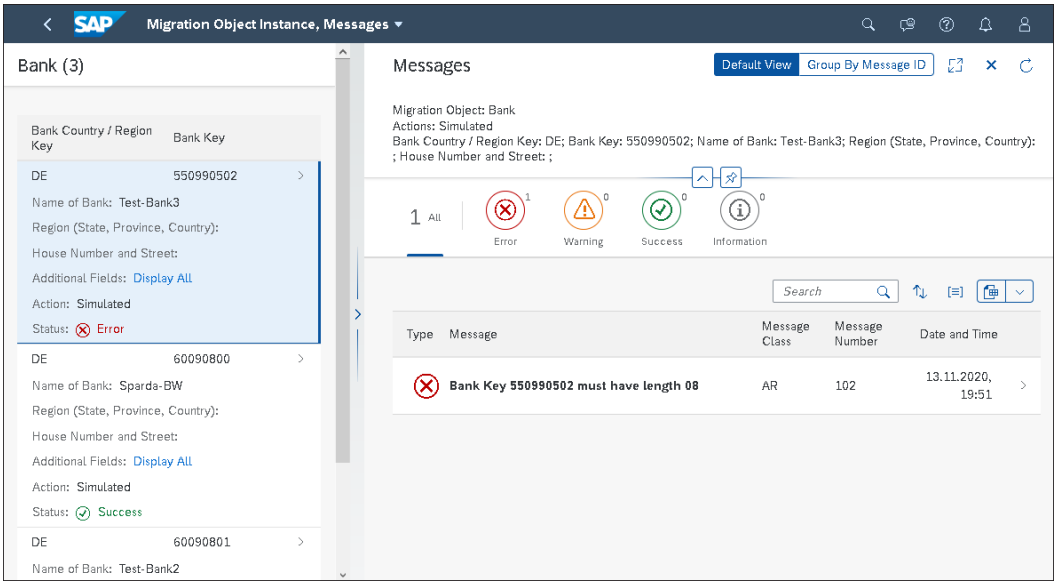


Figure 13.44 Migration Object Instance, Messages View

13.2.17 Creating a Correction File

Migration completed with errors

If errors occurred despite previous simulation, the migration object is displayed with the **Migration Completed with Error** status, and the object is marked with a red bar on the left side. You can now create a file that contains the erroneous data records using the **Create Correction File** action. For this purpose, you select the source(s) in the maintenance window that appears. You start the generation of the file with the **Create Correction File** button (see Figure 13.45).

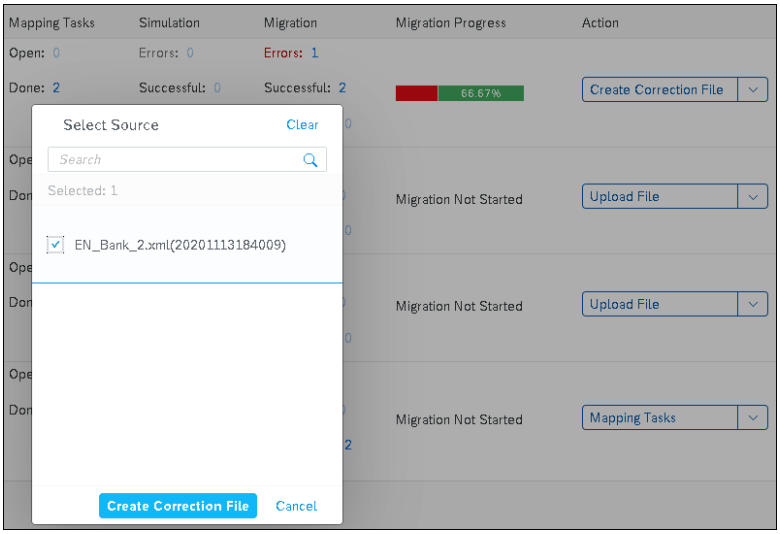


Figure 13.45 Selecting Source for Correction File

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Downloading the file

Then switch to monitoring, where you select the **Generate Correction File** activity. In the **Options** field, you can choose between **Show Messages** and **Download File** (see Figure 13.46).

Files are packed

When you download the file, the system generates a packed file in ZIP format that contains the correction file. The name of the file is composed according to the following schema: `CORR_<source>(<date and time)>.xml`. A sample name would be CORR_DE_Bank2(20200705111743).xml.

You can now edit, upload, prepare, simulate, and finally migrate this file again. Before you upload the corrected records from a revised correction file, you must have deleted the associated erroneous instances.

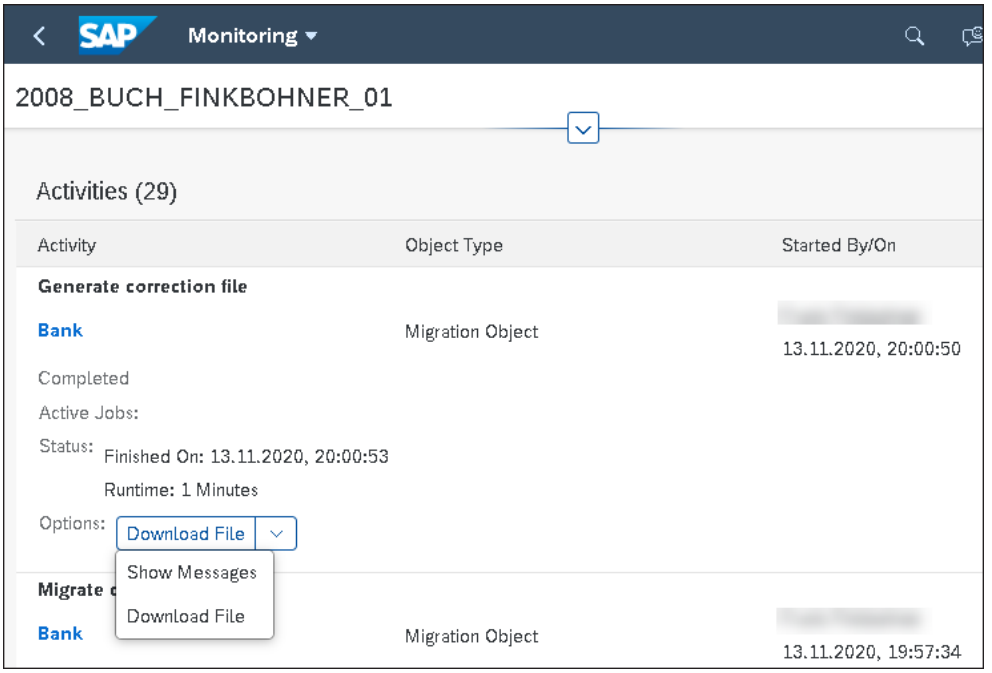


Figure 13.46 Monitoring: Download Correction File

13.2.18 Downloading Messages

Downloading messages via the history

If you want to download messages—for example, errors of a migration object's specific action—again later on, proceed as follows. First, open the **History** of the migration object's actions in the **Migration Object** view (see Figure 13.47).

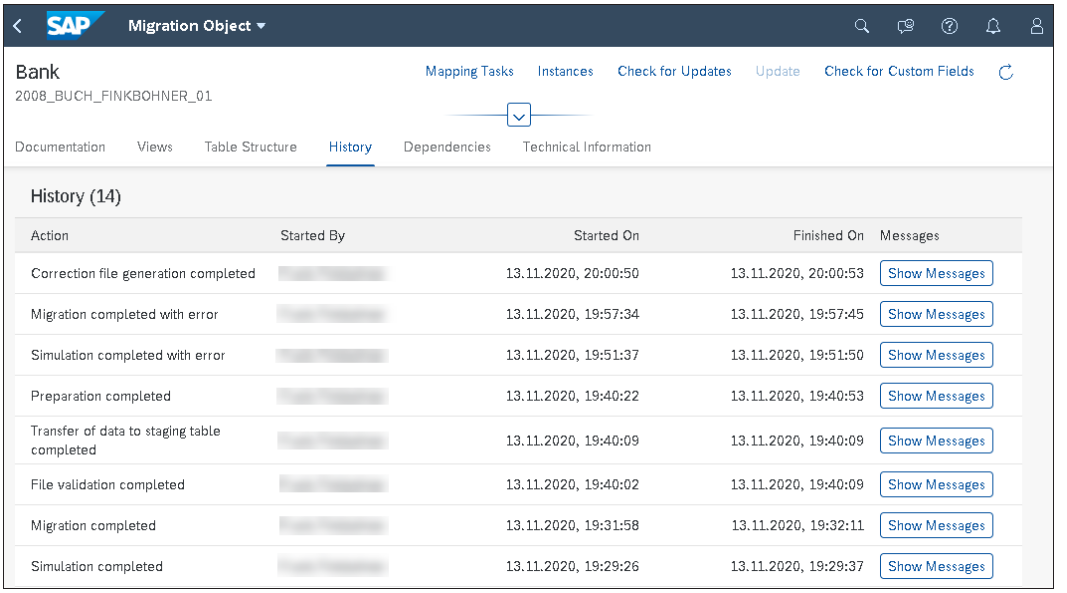


Figure 13.47 History of Migration Object

Grouping provides information on systematic problems

Then select the relevant action, **Show Messages**. The known overview of the migration messages is displayed. For a better overview, you can display the errors only and group the messages using the **Group by Message ID** option. As a result, you receive a summary of the individual error groups. Systematic errors, such as a missing configuration, can be detected quickly here. In the example in Figure 13.48, the corresponding button was used to first select the errors only and then the grouping.

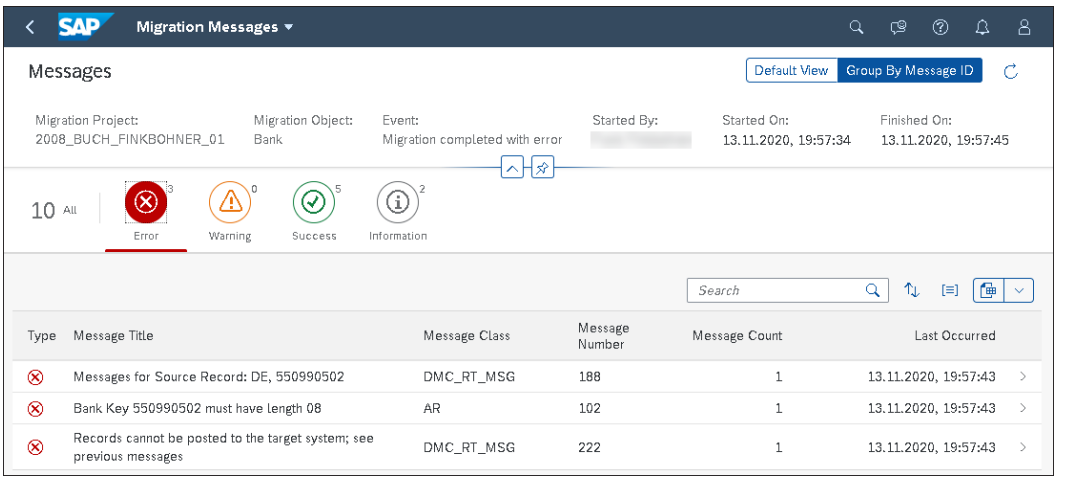


Figure 13.48 Migration Messages View: Grouped by Errors

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If you select the number below **Message Count**, the **Migration Messages** view displays the messages and their details (see Figure 13.49). **Exporting messages**

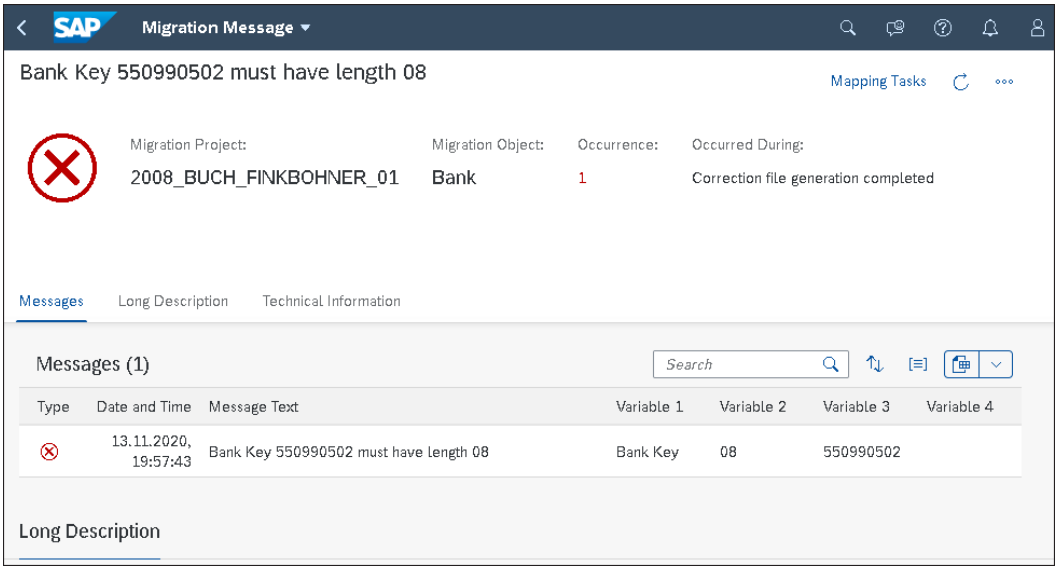


Figure 13.49 Exporting Messages

If you click the button, you can download the selected messages to a Microsoft Excel file (Messages.xlsx). You can then forward this file, for example, to your key users or user departments for troubleshooting.

13.2.19 Finishing the Project

In the top-right area of the **Migration Project** view, you can find the **Finish Project** function. With this function, you set the migration project's status to **Finished**. Subsequently, you can no longer use this project. This is useful, for example, to warrant the saved state for an audit and to prevent that additional data is migrated with this project. **Finishing the migration project**

In the dialog window, you can use the **Data Retention Period** switch to define the period for which data must be retained if you wish to do so or if this is stipulated in your enterprise or project policy (see Figure 13.50). Project data is then automatically deleted after the retention period has expired. The data migrated is not deleted in this process. You thus release this data's storage space that is no longer needed. If you set the switch to **ON**, the date is set to the current date. You maintain either the **End Date** or the **Data Retention Period (in Days)** until automatic deletion. If you select the **Finish Project** button, you permanently set the migration project to the **Finished** status. If no data retention period is activated, the data is not deleted. **Defining the retention period**

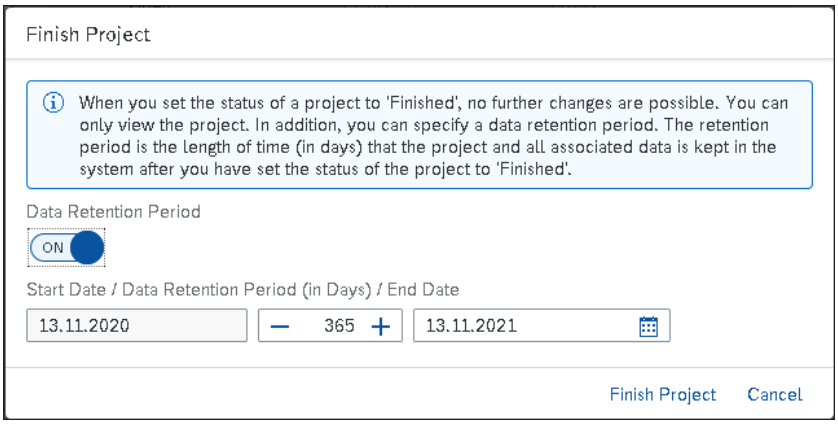


Figure 13.50 Finish Project

Data Retention Period to Fulfill the GDPR

The data retention period is also required to meet the General Data Protection Regulation (GDPR) of the European Union, articles 5 and 17.

Activating the data retention period subsequently

You can also maintain the data retention period subsequently in the project details after you have set the project's status to **Finished** (Section 13.2.5). You have to enable the maintenance of the period using the corresponding **Data Retention Period** button in the **Technical Information** area of the project.

Figure 13.51 shows the technical information of the migration project for activating and maintaining the period.

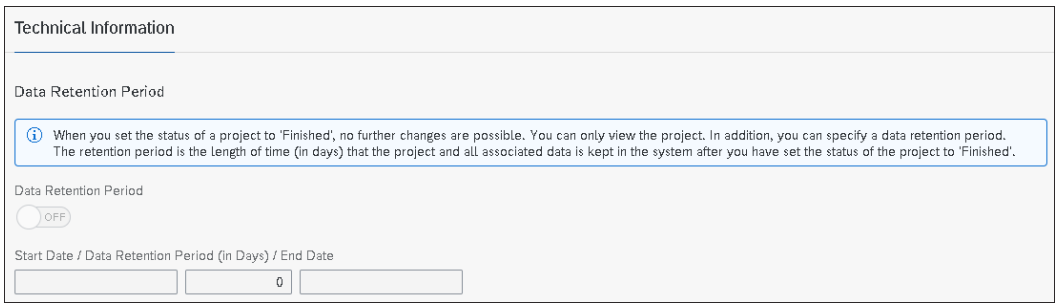


Figure 13.51 Editing Migration Project (Technical Information)

13.2.20 Checking for Updates and Updating the Object

Update of migration objects

When you select the **Check for Updates** button in the **Migration Project** view, all existing migration objects are checked for available updates. Also, you can choose the **Update** function in the **Migration Object** view as soon as

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an update is available for the migration object. You can then directly select **Update** to schedule an update for the migration object. After the check is completed, all migration objects for which an update is available are marked with **Update Required** in the **Migration Project** view. If you select **Update Required**, a selection dialog appears from where you can start the update of the migration object by clicking **Update** (see Figure 13.52).

Update of multiple objects via selection dialog

As an alternative, you can also select the **Display Objects** function in the **Updates Available for n Migration Objects** to display the selection dialog (see Figure 13.53). Here, you can either select each migration object individually or directly click **Select All**.

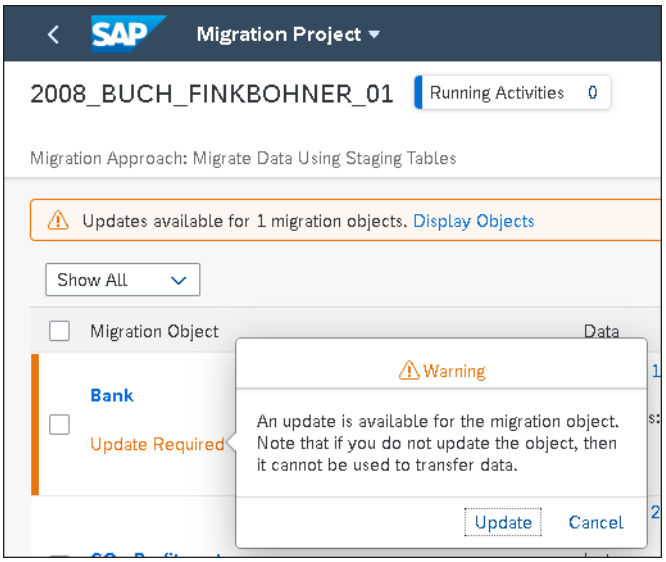


Figure 13.52 Update Required Warning

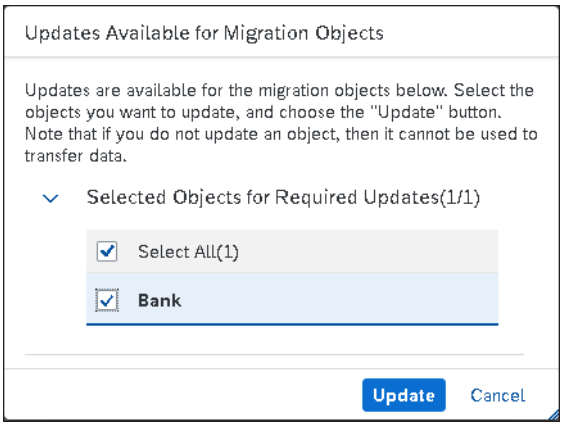


Figure 13.53 Selection Dialog of All Updates for Migration Objects

Update the migration object

The status of the migration object changes from **Update Required** to **Update in Process**. In **Monitoring**, you can find the **Update Migration Object** activity for each migration object for which an update has been started. After the update is completed, you can select **Show Messages** in the **Migration Messages** view to view all messages for the update (see Figure 13.54).

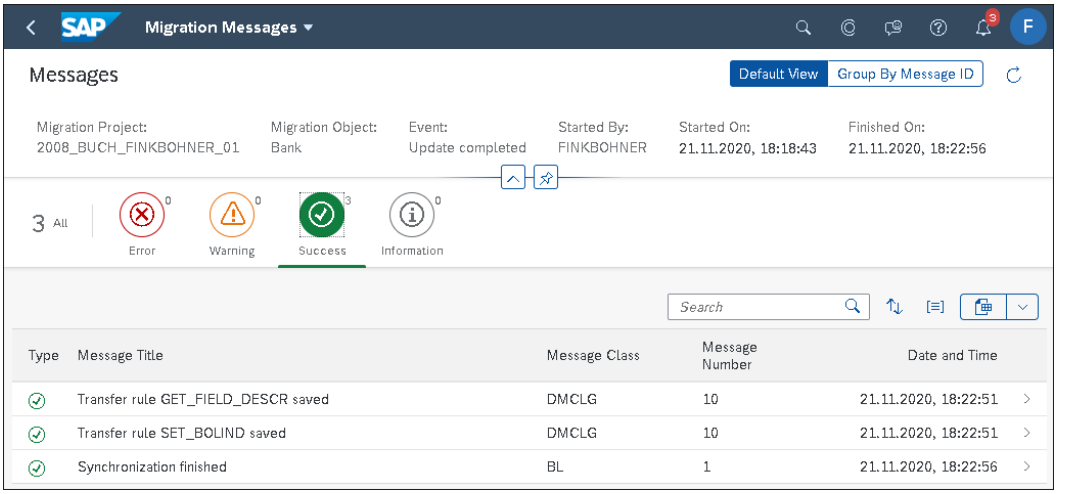


Figure 13.54 Messages for Migration Object Update

Note Analyzer

SAP S/4HANA Cloud has the advantage that your system and thus the migration cockpit and the migration objects are automatically updated at regular intervals with every new release (currently four times a year). In SAP S/4HANA, you generally have to import error corrections and service packages yourself. It therefore makes sense to run the so-called Note Analyzer for the migration cockpit in SAP S/4HANA from time to time. This report checks if your migration cockpit is up to date. You can update your migration cockpit quickly using this report. The required information on this report is available in SAP Note 2596411 and in the composite SAP Note 2780378.

Updates for migration objects via TCIs

For migration objects of the staging approach, error corrections are currently delivered for SAP S/4HANA via TCIs. You will find information on this in the composite SAP Note 2537549. These TCIs are implemented separately and not via the Note Assistant. You should therefore read knowledge base articles 2543372 and 2903843.

13.3 Transfer Option 2: Migrate Data Using Staging Tables

Since SAP S/4HANA 1709 FPS 02, the on-premise solution offers the transfer data from staging tables transfer option. This option enables you to load

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data directly to so-called staging tables. Like the migration template files, these tables are then used for data transfer. With the new data retention of the new migration cockpit for SAP S/4HANA Cloud 2008 and SAP S/4HANA 2020, the data retention is completely switched to storage in staging tables.

One staging table per data structure

One spreadsheet of a migration template file corresponds to one staging table. This means that the data of every structure of a migration object is stored in separate staging tables. When you populate these staging tables directly, in contrast to the migration template files, you spare splitting the data into several files and uploading these files to the migration cockpit. In case of very large data volumes, you can save a lot of time and you can accelerate the data migration process as a whole.

13.3.1 Technical Implementation in SAP S/4HANA Cloud

Staging area versus staging tables

In the old Web Dynpro-based migration cockpit, the data of the file transfer option was stored in the staging area in cluster tables that were located directly in the SAP S/4HANA database. In contrast to the data of the staging tables transfer option, the tables of the staging area could not be written to or read from outside the migration cockpit.

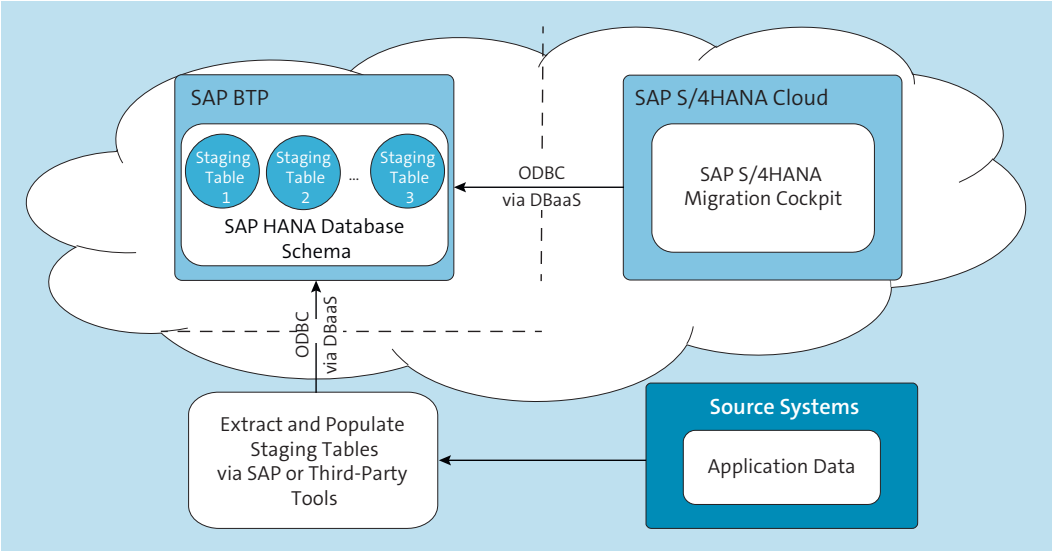


Figure 13.55 Remote Staging Tables in Cloud

Staging tables only via Database as a Service

In the new SAP Fiori cockpit, the staging tables of the local SAP S/4HANA database schema in SAP S/4HANA Cloud—in contrast to SAP S/4HANA—can only be written using the migration template file as a container. The staging tables of the remote SAP HANA database schema, however, must be created in SAP BTP. There they can be read and written from the outside.

Persönliches Exemplar für Ernst Schulten

The connection is established via the SAP_COM_0259 communication scenario. You can extract table content from an SAP ERP system, for example, and write it directly to the staging tables in SAP BTP using additional tools. The SAP_COM_0259 communication scenario establishes the database connection using a database as a service (DBaaS) in SAP BTP. Figure 13.55 shows a schematic overview of the interaction between the individual systems and the access to the remote SAP HANA database schema.

Relevant Documents for Migration Using Staging Tables (2Q2)

Read the test script and setup instructions

There are two important documents for the data migration to SAP S/4HANA Cloud using staging tables, which you should read:

- The setup instructions for setting up the SAP_COM_259 communication scenario
- The "Data Migration to SAP S/4HANA from Staging (2Q2)" test script

The documents for staging are marked with the abbreviation 2Q2. Perform the following steps via the SAP Best Practices Explorer:

1. Go to *http://s-prs.co/527991*.
2. In the **Version** field, select the **SAP S/4HANA Cloud** value.
3. In the **Language** field, select the value for your required language—for example, **English**.
4. Under **Details**, select the respective document, **Test script** or **Set-up instructions**.

Required Role for Accessing the Staging Database

Technical role for accessing SAP Cloud Platform

In addition to the previously mentioned role for the migration cockpit, `SAP_BR_CONFIG_EXPERT_DATA_MIG` (Configuration Expert—Data Migration), you need the `SAP_BR_CONF_EXPERT_BUS_NET_INT` (Configuration Expert—Business Network Integration) role. This role is necessary to establish a connection from the migration cockpit to the staging tables in SAP Cloud Platform.

13.3.2 Technical Implementation in SAP S/4HANA

Local or remote database schema

In SAP S/4HANA Cloud, the SAP HANA database for the staging tables must be set up as a DBaaS in SAP BTP. The SAP HANA database for the on-premise version, however, can be set up anywhere. Here you can either use the local SAP S/4HANA database schema of your SAP S/4HANA system or a remote SAP HANA database schema on a separate SAP HANA box (see Figure 13.56).

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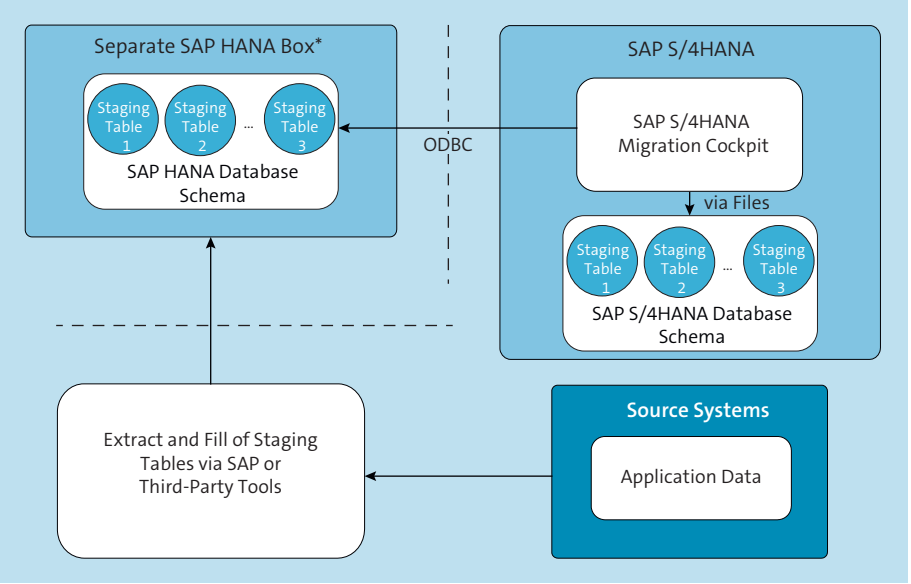


Figure 13.56 Staging Tables in SAP S/4HANA

Local schema and data privacy

Because the data in a local SAP S/4HANA database schema can be visible, you should restrict the access to this table using the `S_TABU_DIS` authorization object for data security and data privacy reasons.

Whitelisting database connection

The database connection to a remote SAP HANA database schema must have been set up in advance. To be able to use this connection, you require so-called whitelisting. In the SAP S/4HANA system, this is done by maintaining the data connection in table `DMC_C_WL_DBCO_OP` via Transaction SM30 (see Figure 13.57).

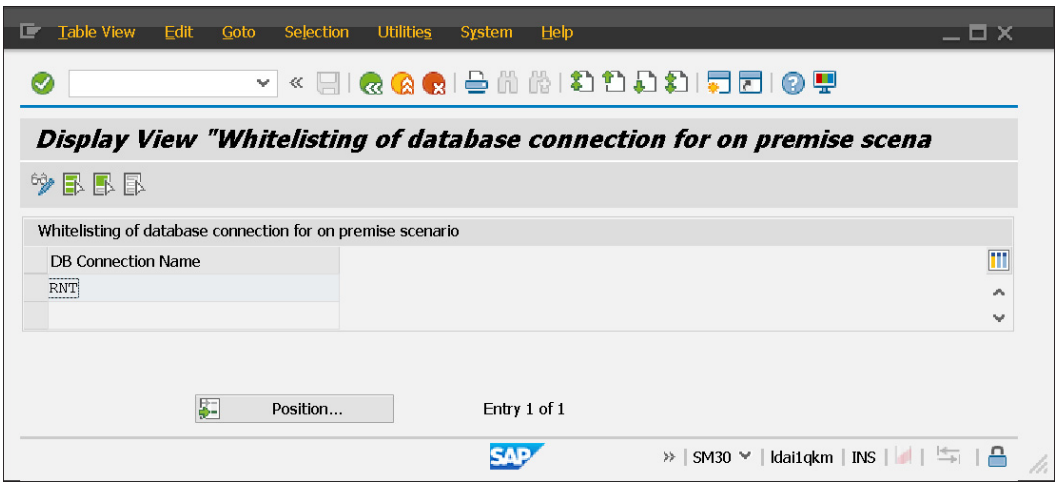


Figure 13.57 Whitelisting of Database Connection for Remote Schema

13.3.3 Staging Tables in the SAP S/4HANA Migration Cockpit

This section briefly describes the differences of populating staging tables using the migration cockpit and using files.

Creating a Project

Selecting the database schema

After you have clicked the **Create** button in the **Migration Projects** view—the initial screen of the migration cockpit—the system displays the maintenance screen for **General Data**. Under **Database Connection**, you can select between two options for the database schema that is to be used for staging tables. In the example of Figure 13.58, the **Remote SAP HANA Database Schema** is selected.

Figure 13.59 shows an example of how migration projects with different migration approaches are displayed in the **Migration Projects** view.

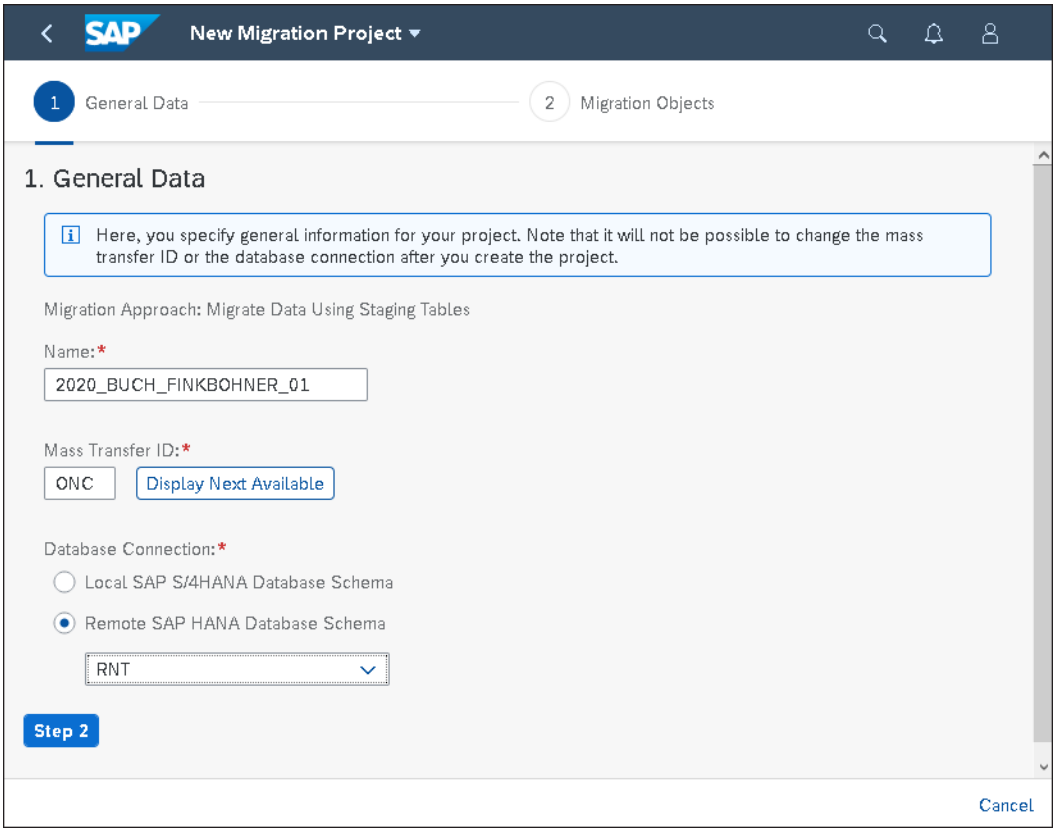


Figure 13.58 Selecting Remote SAP HANA Database Schema Option

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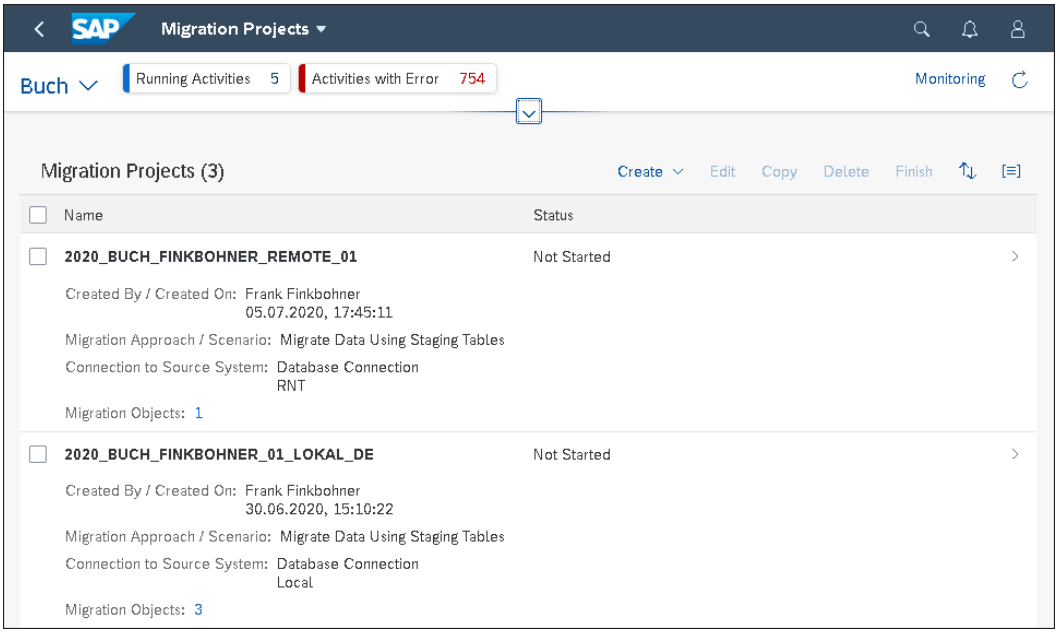


Figure 13.59 Projects with Various Database Connections

Populating Staging Tables Directly

Tools for populating

You directly populate the staging tables using external tools, such as SAP Data Services, SAP Smart Data Integration (formerly SAP Cloud Platform Smart Data Integration), SAP HANA Studio, or other tools with which you can access the staging tables of the local or remote database schema. An important source of information for how to populate this data is available in SAP knowledge base article 2733253. The article answers frequent questions on the staging table topic and also lists four blogs that describe how to populate the staging tables using the SAP Data Services, SAP HANA Smart Data Integration, and SAP HANA Studio tools.

Restrictions and Important Information on Populating the Tables

If you populate the staging tables directly in the SAP HANA database, you must write correct data to the fields. In some migration objects, fields of the NUMC data type are defined. In the SAP HANA database, these fields are defined as NVARCHAR with an initial value of zeros, which means that these fields may only contain numerals and must be filled with leading zeros. If the leading zeros are missing, this usually results in errors in the data migration API.

Also note that if a field in the SAP HANA database definition has an initial value (default), this field must be populated with its default value. This

involves eight zeros for date fields, for example. Also check the individual field definitions in the SAP HANA database table definition before you write data to the table.

After the staging tables have been populated, the process continues like after uploading the file in Section 13.2.9. The only difference is that the data is now uploaded directly to the staging tables and not from a file.

13.4 Transfer Option 3: Direct Transfer of Data from an SAP System

As of SAP S/4HANA version 1909, a third transfer option is available in the migration cockpit: direct transfer of data from an SAP system. This third option is currently (as of August 2020) only possible for a migration with SAP S/4HANA as the target. There are discussions on implementing this option for SAP S/4HANA Cloud as the target.

Systems are connected via RFC

Direct transfer means that the data is selected from the SAP source system using an RFC connection and stored in the migration cockpit, which is physically located in the SAP S/4HANA target system. For further processing, the **Mapping**, **Simulation**, and **Migration** functions are available, just like for the other two approaches. Creating or posting data in the SAP S/4HANA target system is done via SAP standard APIs.

Selection is predefined

The new approach has one decisive benefit: the selection from the source system is already predefined based on organizational units and migration objects. It can be adapted to customer requirements in the SAP S/4HANA migration object modeler. You can find more details in Chapter 14, Section 14.3.

13.4.1 Differentiation and Areas of Use

The migration cockpit has been developed for the initial data transfer to an SAP S/4HANA system. It is intended to be used in a new implementation of SAP S/4HANA. The approach of direct transfer is *not* suited to keeping data synchronized between systems, mapping a permanent data exchange between systems, or building an integration scenario. For these requirements, you are provided with other SAP products, such as SAP Master Data Governance, SAP Product Lifecycle Management (SAP PLM), SAP Landscape Transformation Replication Server, SAP Data Intelligence, and SAP's central finance concept.

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SAP S/4HANA systems or clients or SAP S/4HANA Cloud instances are currently *not* supported as a source for direct transfer to SAP S/4HANA.

Non-Unicode source systems

The migration cockpit can also process data from a non-Unicode system. In the direct transfer approach, the two systems are connected via RFC. When importing data from the source system to the migration cockpit, the data is automatically adapted to the SAP S/4HANA data model.

13.4.2 Technical Requirements and System Preparations

This section describes the technical conditions for using the direct transfer and the necessary preparations on the system side.

Technical Requirements

The following technical requirements apply depending on the source system:

- SAP ERP to SAP S/4HANA: lowest supported SAP ERP release is SAP ERP 6.0 (SAP NetWeaver 7.0).
- SAP EWM to decentralized SAP EWM, based on SAP S/4HANA: lowest SAP EWM release is SAP EWM 5.1 (SAP NetWeaver 7.0).
- SAP Apparel and Footwear (SAP AFS) to SAP S/4HANA: the only release supported is SAP AFS 6.0.
- SAP CRM to SAP S/4HANA Service: the only supported release is SAP CRM 7.0 (Scenario available as of 1909 FPS 1).

System Preparations

The following preparations must be made before you can start using the migration cockpit approach for direct data transfer:

- The SAP S/4HANA installation guide describes the steps with regard to the migration cockpit. You can find it here:
  - 1909: *http://s-prs.co/527992*
  - 2020: *http://s-prs.co/527993*
- For SAP S/4HANA 2020, implement the DMIS 2011 add-on, SP 19 or higher, in the source system. For SAP S/4HANA 1909, you need DMIS 2011 SP 18 or higher in the source system. The add-on is included in the SAP S/4HANA license.
- Define an RFC connection from the source system to the SAP S/4HANA target system.
- Set up SAP Fiori in the target system.

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- Implement *all* SAP Notes for the migration cockpit that apply to your release. Central SAP Notes:
  - Composite SAP Note 2780378—Composite SAP Note for SAP S/4HANA Migration Cockpit (all releases; see *http://s-prs.co/527994*)
  - Composite SAP Note 2747566—SAP S/4HANA Migration Cockpit: Composite SAP Note for Transfer Data Directly from SAP System (see *http://s-prs.co/527995*)
- Set up the necessary authorizations; Section 13.4.4.
- Create the customizing for the applications affected in the target system. The relevant customizing must already be available in the target system before you can start with the first migration tests. For example, you need organizational units like company codes, plants, and sales areas. You also need a document type for the migration, offset accounts for the migration, open posting periods, material types, and so on.

13.4.3 Migration Objects for SAP ERP Systems and Other SAP Source Systems

Selection options

In addition to the technical platform, the default delivery for this approach also includes predefined selection options. Depending on the source system, referred to as a *scenario* in the system, you first choose the organizational unit from which the selection is to be made. Within the chosen organizational unit, you select migration objects for which you select the relevant data records from the source system.

Table 13.3 provides an overview of the scenarios, including their predefined selection options.

Source System	Predefined Selection Criterion	Number of Delivered Migration Objects
SAP ERP	Company code	142
SAP EWM	Warehouse number	15
SAP CRM	Sales organization	1
SAP AFS	Company code	72

Table 13.3 Scenarios and Migration Objects Delivered in SAP S/4HANA 2020 FPS0

Detailed documentation for all delivered migration objects is available at *http://help.sap.com/S4_OP_MO*. Migration objects for additional SAP source systems are planned for follow-up releases.

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Documentation for All Migration Objects and All Versions

The complete list of migration objects for all migration approaches is available on the SAP Help Portal at *http://s-prs.co/527996*. There you can filter by release and migration approach. Each migration object is described in detail. You also learn about the scope, availability, useful transactions, and so on.



Information on Planning

You can find current information with regard to planning in the SAP S/4HANA Migration Cockpit roadmap. It is included in the standard presentation of the migration cockpit: *http://s-prs.co/527997*.

13.4.4 Assigning Roles for the Migration

Technical roles

For the direct transfer approach, the migration user requires specific roles in both the source system and in the SAP S/4HANA target system (see Table 13.4).

Tool	Role in the source system	Role in the SAP S/4HANA system	Role in the SAP Fiori frontend system
SAP S/4HANA migration cockpit	SAP_DMIS_OBT_REMOTE	SAP_DMIS_OBT_MASTER	SAP_BR_CONFIG_EXPERT_DATA_MIG
Migration object modeler	–	SAP_CA_DMC_MC_DEVELOPER	–
RFC user	SAP_DMIS_OBT_REMOTE (communication type)	–	–

Table 13.4 Technical Roles for Direct Transfer

Application roles

In addition, you'll require further authorizations and roles to select the data of the individual migration objects from the source system. In the SAP S/4HANA target system, you need the application roles to display or validate the migrated data in the application. These authorizations vary depending on the migration API executed. If authorizations are missing, you can use Transaction SU53, the authorization check. It lists technical information if

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authorization checks have failed. You usually create the roles with the corresponding authorizations within an authorization concept.

13.4.5 Running a Project with Direct Data Transfer

Section 13.2 guided you through a complete project using the migration cockpit. This section now discusses in detail the functions and screens that are different in the direct transfer of data from an SAP system scenario.

Starting the App

You start the migration cockpit for this approach using the **Migrate Your Data—Migration Cockpit** tile. You find the app in the **Data Migration** application group (see Figure 13.1).

Creating a Project

First, create a project. If possible, create only *one* project for all objects that you want to migrate for your organizational unit(s)—for example, one project for all migration objects that you want to migrate for company code 0001.



Mappings Are Not Cross-Project!

Mappings are cross-migration objects as long as they are assigned to a project. Mappings are not cross-project; that is, if you create more than one project, such as for a company code, mappings must be downloaded from one project and uploaded to the other project.

Select the **Migrate Data Directly from SAP system** option. A wizard guides you through the necessary steps. You must populate the following fields in step 1, **General Data**:

- **Name**
- **Scenario**—for example, SAP ERP to SAP S/4HANA. The scenario defines which organizational unit is provided for selection later on (for example, the company code) and which migration objects are available. Organizational units and objects are delivered by SAP and can be adapted to the modeling environment (Transaction LTMOM) if required. The adaptation of delivered objects and the creation of custom migration objects are especially relevant for many customers. You can find more information in Chapter 14, Section 14.3.
- **Connection to Source System**. You can select this connection here as soon as the system administrator creates the RFC connection between

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the source system and the SAP S/4HANA target system. Only one RFC can be assigned for one project. If you want to migrate data from several source systems to the SAP S/4HANA target system, you must create one project for each source system. The mappings (see the Mapping Values section in Section 13.4.5) must be kept in sync between the projects to ensure consistent migration.

- **Development Package**. You assign a development package when you create the project to be able to transport the project later on. Note that you can no longer change the scenario or development package after the project has been created.

  The transport comprises all project parts except for the mapping values. Mapping values are not transported. You can download and upload mapping values for individual, multiple, or all mapping tasks in the migration cockpit (**Mapping Tasks** screen) or in Transaction LTMOM. If you do not want to transport the project, you do not specify a transportable development package—for example, `$TMP`. The transport itself is started in the transport system.



No Transport Connection in SAP S/4HANA 1909

The transport connection is not available yet in SAP S/4HANA 1909. This means that in this release, you must create projects manually in the production system. In SAP S/4HANA 1909, you can download and upload mapping values for individual, multiple, or all mapping tasks in Transaction LTMOM only.

Data selection

When you click on **Step 2**, you navigate to the **Data Selection** area. Here you can choose one or more organizational units from which selection is made. The example in Figure 13.60 shows a company code selection.

Comprehensive documentation

When you click the **Step 3** button, you navigate to the **Migration Objects** area. Here, migration objects are displayed which SAP provides for the scenario selected. Clicking **Documentation** takes you to the object documentation on the SAP Help Portal. The description contains an object description, the exact object scope, the API used for creating or posting in the SAP S/4HANA system, transactions for checking migrated data, and so on. If you click the number in the **Predecessor** column, you obtain a list of all predecessor objects for the present object. Select the migration objects you want to use in your project and move them to the **Selected Migration Object** area by using the arrow button [>] (see Figure 13.61).

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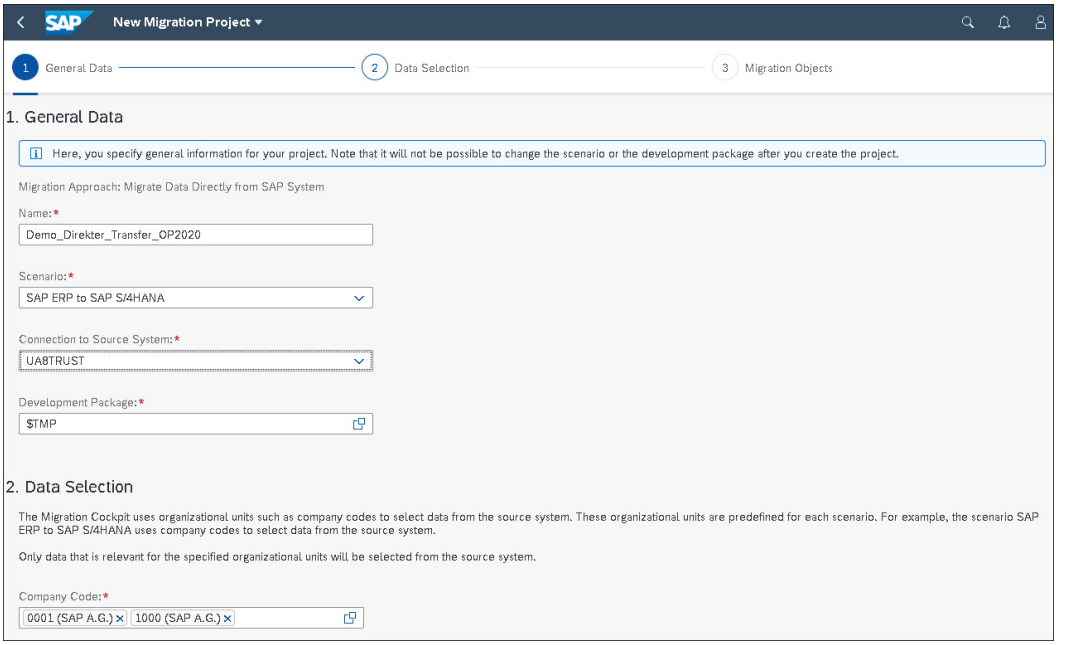


Figure 13.60 Creating Projects: Defining General Data and Data Selection

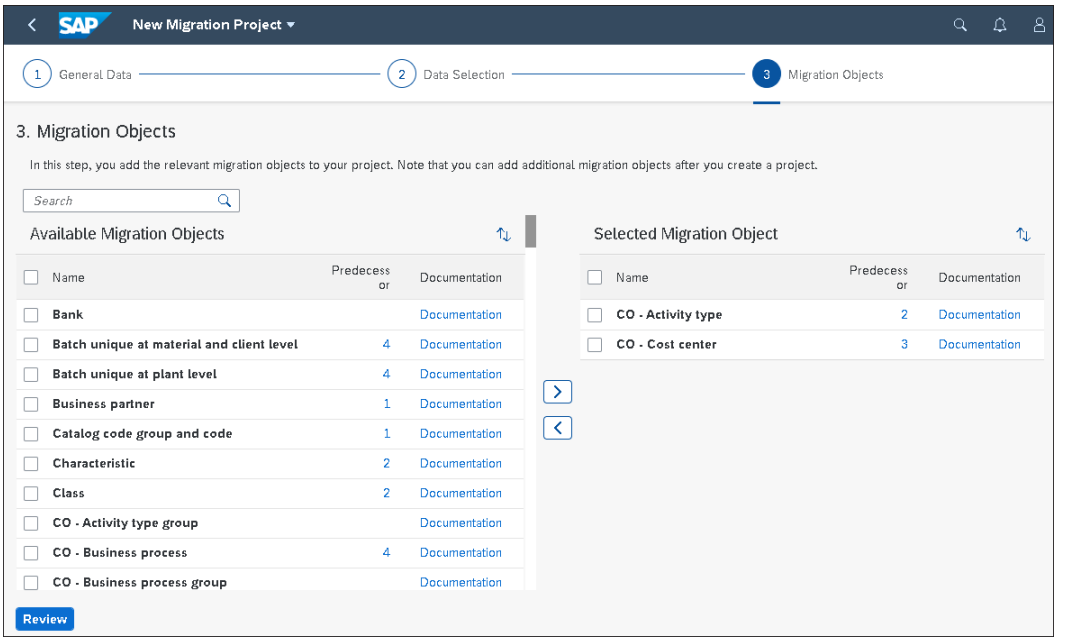


Figure 13.61 Creating Projects: Available and Selected Migration Objects

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Removing a migration object from the project

You can add further objects to the selection at any time. Deleting migration objects from a project is currently only possible in Transaction LTMOM, provided that no data has been migrated to the target system for this object. You also must delete the already existing (selected) instances for this migration object from the migration cockpit by calling Report CNV_PE_MC_DEL_ITEMS in the SAP S/4HANA backend. Alternatively, you can use a workaround and rename the unwanted migration object in Transaction LTMOM—for example, as `OBSOLETE_Cost_Center`.

Checking the predecessor objects

In the **Review** step, the system asks whether you want to add the predecessor objects to the project. A pop-up window displays the migration objects which are logical predecessors for the objects you selected, for example, the **CO—Secondary Cost Element** migration object for the **CO—Activity Type** object. It is not mandatory to add these migration objects because they may have reached the target system by other means or are not required in the individual case. No predecessors are added in the example shown here. You can now save the project with **Create Project**.

What needs to be done in case of error?

If there is any issue when creating the project, you will see this on the **Migration Project** screen. During the creation process of a project, migration objects are copied from a migration template into the project. This will take some time. While these objects are not available for further processing, these objects will be shown as **Not Ready for Processing** (see Figure 13.62). If the copy function cancels, you will see a message on the **Migration Project** screen with a link to restart it. If there are other technical problems, you will see a **Activities with Error** button in the header section. You can analyze the problems via this button (see Figure 13.62)

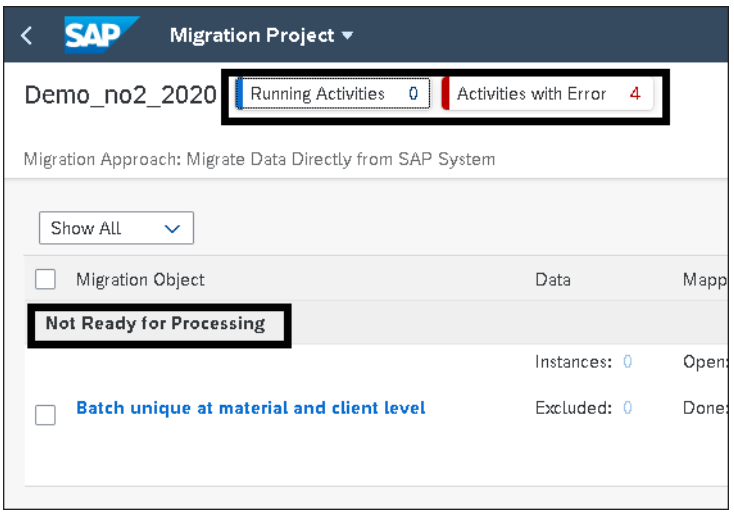


Figure 13.62 Troubleshooting in Create Project Step

Additional settings for the project

If you click **Settings** at the top right of the **Migration Project** screen, you navigate to a screen with additional functions of the project, for example, **Data Retention Period**, **History**, and so on.

Job Management

The top right area also includes an option to navigate to the **Job Management**. Section 13.2.7 provides details on the project settings and job management.

Detail Screen of Migration Object

The detail screen of the migration object is a central page. When you click on the name of the object, for example, **CO—Activity Type**, you navigate to this page. Here you can find basic information on the object and information on the history (see Figure 13.63).

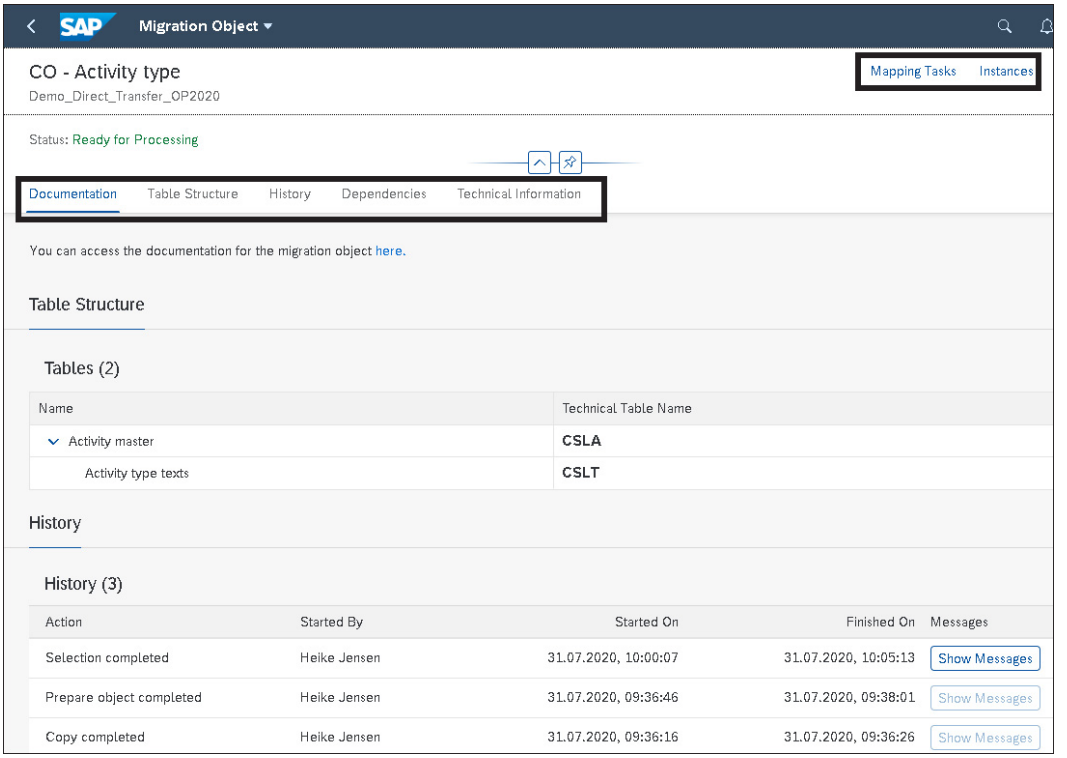


Figure 13.63 Migration Object View: Detail Screen

Compare this screen with the detail screen of Figure 13.16 and the descriptions of Section 13.2.17. You will see that the information provided for a migration object is very similar. In the top-right area of the approach shown here, you can find the link to the **Mapping Tasks** and to the individual **Instances** for this object. The current release does *not* provide any function for checking for migration object updates. If you want to use a content

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update for an object that was implemented via a TCI SAP Note, for example, you must then add the migration object to your project again. To do so, call Transaction LTMOM and select **Project • Create Migration Object • From Template • Migrate Data Directly from SAP System**.

The **Migration Object** view currently does not provide any option for checking for custom fields in the SAP S/4HANA target system (see Figure 13.63). Because the approach of direct transfer reads data from the SAP source system, we consider the check for field enhancements based on the source system. Chapter 14, Section 14.3.7 provides more details on this topic.

User Guidance in the SAP S/4HANA Migration Cockpit

The migration cockpit guides you through the migration process by suggesting the next step in the **Action** column. But it also offers full flexibility at the same time. For each object, you can select any step from the dropdown menu or execute an action from the header for all selected objects of the project (see Figure 13.64).

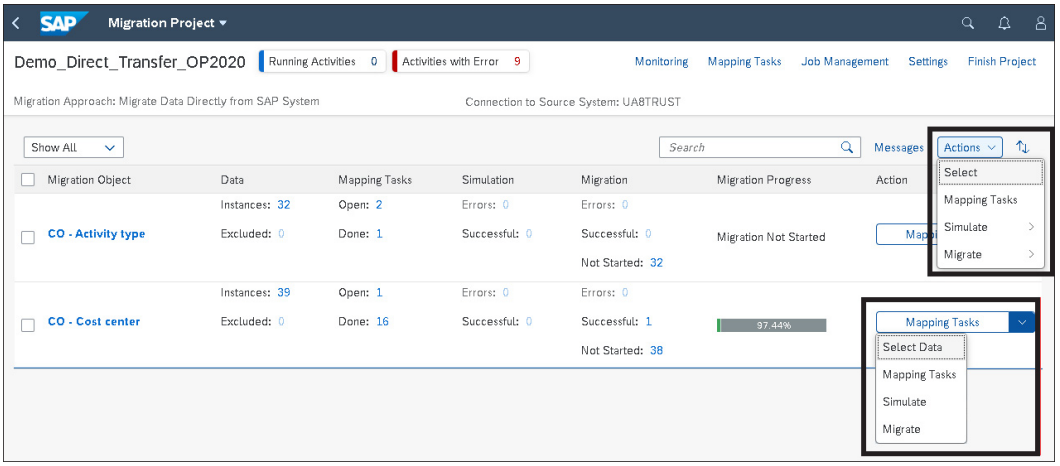


Figure 13.64 Migration Cockpit: Migration Project Screen

Selecting Data from the SAP Source System

After you have defined the project scope, you import the data from the source system.

> **Modeling Environment Provides More Options!**
>
> This section describes the selection options within the framework predefined by SAP. In Transaction LTMOM, you have more options to control the selection from the source system. There you can define additional selection criteria for individual or all migration objects within a project. You can find more details on this in Chapter 14, Section 14.3.6.

Integrated organization derivation

Based on the entered organizational units and selected migration objects, the migration cockpit specifies all relevant data records in the source. An implicit organization derivation ensures that all related data records are found.

Instances

The data model of the migration object defines which fields are imported from which tables and are assembled to one instance. The instances form the basis for subsequent posting or creation of data in the SAP S/4HANA system. The instances contain all necessary fields to correctly provide the respective BAPI of the application.

Example of organization derivation

For example, say that in your project, you defined the company code 0001 and selected the **CO—Activity Type** migration object for migration. Activity types are not assigned to a company code, but to a controlling area (see the data model of the migration object and table CSLA). The implicit organization derivation states that table TKA02 is read in the source to find the controlling area that is assigned to the selected company code (e.g., 001A). From tables CSLA and CSLT, the migration cockpit reads the fields that are required according to the definition of the migration object. It generates an instance respectively for all activity types from the controlling area 001A.

Setting up parallelization for selection

Before you start the selection, you first select the number of background jobs per project and migration object under **Job Management** (parallelization). You can start the selection for individual, multiple, or all migration objects within a project (see Figure 13.64).

In the **Migration Project** screen, the number of selected instances is updated automatically until the selection is complete. The number is shown in the **Data** column (see Figure 13.65).

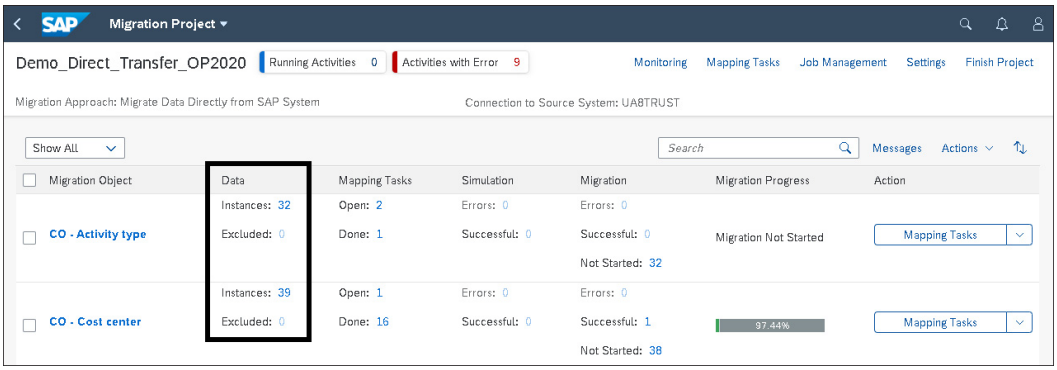


Figure 13.65 Project View after Selection Has Been Made

In the **Monitoring** view, you can view the processing progress and the messages for all activities of the project. (Also refer to the descriptions in Section 13.2.11.)

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Selection repeatable?

In principle, you can run the selection repeatedly or multiple times. Note, however, that in this case the entire data volume must be reread in the source for the migration object of concern, which requires additional time. If you rerun the **Select Data** action, the dialog shown in Figure 13.66 appears.

If you expect changed data records in the source, you should select the **New Selection** button. If you know that there are no changed records, but only newly added data records in the source for this migration object, you select **Add Additional Instances**.

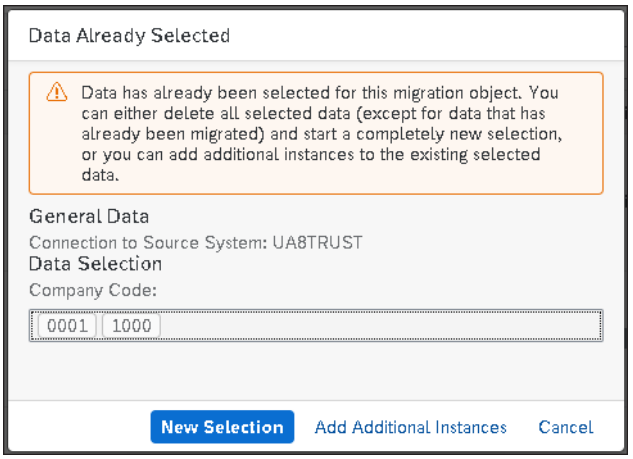


Figure 13.66 Options for New Selection

If you only want to stop processing a limited number of instances, you may exclude individual instances (in the **Migration Object Instances** view) as an alternative.

Manual Step Required for Data Record Updates in the Source in SAP S/4HANA 1909

In the SAP S/4HANA 1909 release, you can repeat the selection. If the migration cockpit finds new records in the source, they are added. But if you want to repeat the selection because data records have changed in the source—that is, the contents of the key fields are still the same—you must explicitly delete the previous selection in advance. For this purpose, log on to the SAP S/4HANA backend (SAP GUI) and start report CNV_PE_MC_DEL_ITEMS. With this report, you can delete instances based on various selection criteria.

Checking the Data Selected

You are on the **Migration Project** screen. If you click the number of instances selected, the system takes you to the **Migration Object Instances** view (see Figure 13.67). Alternatively, you can navigate to the instance view from the **Migration Object** detail view. From the instances view, you can define which columns are supposed to be displayed (cogwheel icon). You can search, sort, filter, and group in the list. You can display the entire data record for each instance (by clicking the arrow in the row). This data record consists of fields that have been selected from the source for the migration object according to the data model. The data record usually contains fields from multiple source tables.

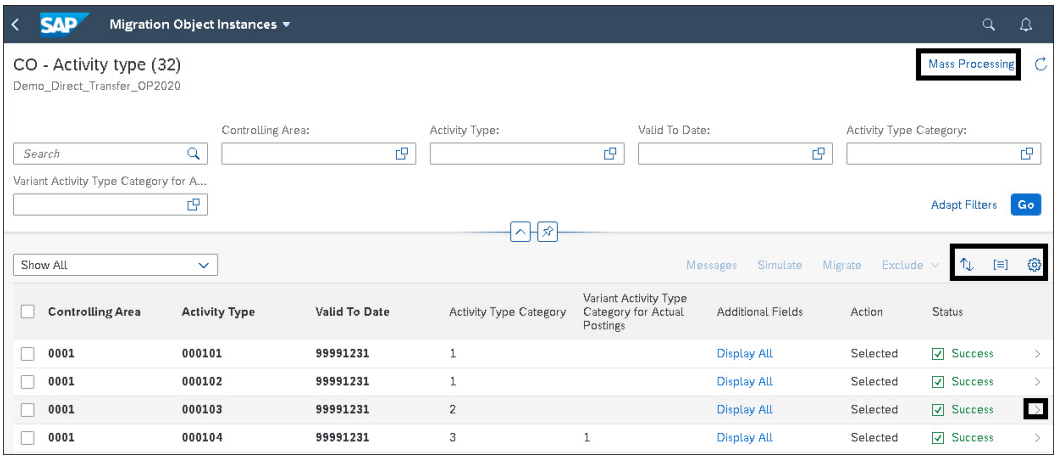


Figure 13.67 Migration Object Instances View

Executing actions for individual records

In the **Migration Object Instances** view, you can perform actions for the individual instances. Select the individual instances in the list and choose the action to be performed using the **Simulate**, **Migrate**, and **Exclude/Undo Exclude** buttons. As an alternative, you can use the **Mass Processing** function (top right) to filter records from the existing list by specific criteria and run the actions for this subset. This enables you to work specifically with certain records from the entire set of instances read, for example, with particularly critical records or records that represent specific business processes.



No Cleansing Functionality

The direct transfer approach does not provide any cleansing functionality, such as duplicate check, golden record, and so on.

If data cleansing is necessary, it must take place in the source system. Alternatively, you can set the selection in such a way that the unwanted

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records are not read (Transaction LTMOM). In the migration cockpit, you can exclude records that have already been read from further processing either individually in the **Migration Object Instance** view or using the **Mass Processing** function.

Mapping Values

Mappings are created automatically

When data is selected, the direct transfer approach generates mapping suggestions. In each migration object, which field mappings are necessary or possible is defined. During selection, a 1:1 suggestion is automatically generated for each value of such a field.

If fixed values, such as the posting date or an offset account for migration, are required for the migration object, a mapping task is automatically generated.

For the cost center migration object, for example, a total of 17 mapping tasks for the following and 13 other fields are displayed:

- **Controlling Area**
- **Company Code**
- **Cost Center**
- **Cost Center Group**

In Figure 13.68, you can confirm several or all mapping tasks at once.

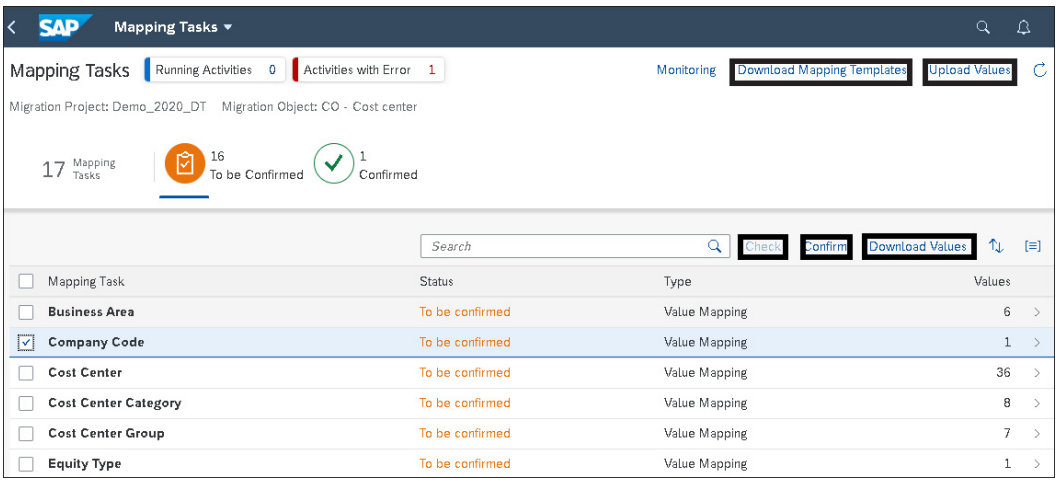


Figure 13.68 Mapping Tasks for CO—Cost Center Migration Object: Overview of Mapping Tasks

Download/upload

The overview of mapping tasks provides links to the download/upload options. This allows you to edit mappings outside the migration cockpit and to exchange and synchronize them between various projects.

Keeping mappings in sync between projects

You can download templates under **Download Mapping Templates**. They comprise three sheets: Documentation, Signature, and Data Sheet (without Values). By means of the **Download Values** function, you download mapping tasks including the mapping values, that is, the documentation, the signature, and the populated data sheet. With **Upload Values**, you upload the processed files to the system. Here you have the option to confirm the values directly with the upload or to not confirm them. You also decide if already existing mapping values are replaced or if values are only changed and new values are to be added.

You can open the detail screen of every mapping task by double-clicking the respective row. In the detail screen, you maintain the individual values of the mapping. The input help for the mapping target field can propose values that possibly already exist in the SAP S/4HANA system.

Both in the **Mapping Task** detail screen and in the screen of all mapping tasks shown in Figure 13.68, you can use the **Check** button to check the mapping target values. Depending on the mapping task, this may involve a pure check of the format or the existence of the value. In other cases, for example, the posting date, additional logical checks are done, for example, if the posting period is open on this date for the company code concerned. In the direct transfer approach, the checks are not automatically made upon confirmation of the values due to performance reasons. It must be triggered explicitly using the **Check** button if required. The check function is implemented for selected mapping tasks only in version 2020 FPS0.



There is No Check for Mapping Target Values in the Mapping Tasks Step in SAP S/4HANA 1909

In SAP S/4HANA 1909, there is no option for checking the mapping target values during the mapping maintenance. This means it's only determined if a mapping target value is correct in terms of form and content during simulation.

Mapping examples

The mapping tasks cannot be used to merge master data in the target (see the examples in Figure 13.69). For the **CO—Activity Type** migration object, you can specify the same target cost element for several instances in the **Cost Element** mapping task. For the **CO—Activity Type** object, the cost element is a field that is only assigned in the master record. The **Cost Element** field is not a key field of the activity type.

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In the second example, the value for the target cost center is specified as **A1** for both records for the **CO—Cost Center** migration object in the **Cost Center** mapping task. The migration cockpit creates the first record in the target system. For the second record, the BAPI determines that this cost center already exists in the target and issues an error message.

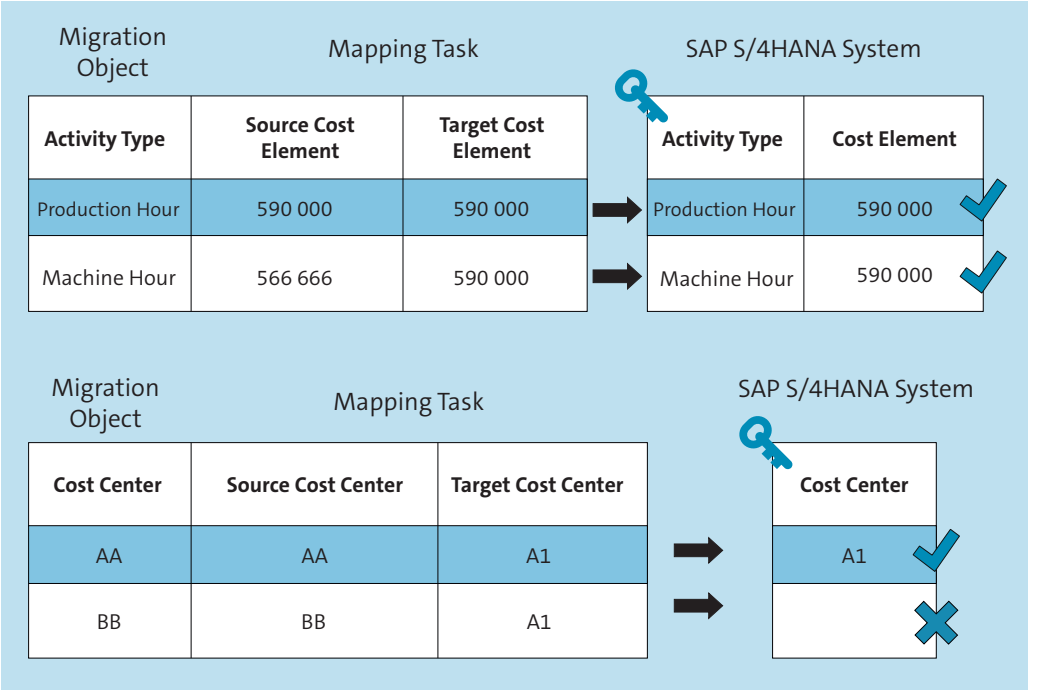


Figure 13.69 Migration Object Instances Cannot Be Merged in Target

No Central Storage or Integration with Other Tools at the Moment

In the current release (SAP S/4HANA 2020), there is no central storage for mappings or an integration with other tools—for example, SAP Master Date Governance (as of August 2020). Keep the mappings synchronized using the download/upload function. In the SAP Note search, you can check if any enhancements are developed at a later point in time.

Simulating the Migration

The next step is to simulate the migration. This means that the migration cockpit applies the mapping rules to the instances and transfers the transformed instances to the API of the migration object. The API simulates the instances. For each instance, the system passes through all checks that are contained in the API.

Persönliches Exemplar für Ernst Schulten

Setting the parallelization

Before you start the simulation, you must set the number of jobs per project and per migration object in the **Job Management** view.

Records to be processed, flexible selection

In the **Migration Project** view, you can start the simulation for several migration objects in parallel. Select them and click **Actions** in the upper area of the screen. Choose whether you want to simulate **All Instances** or **All Instances with Errors** for these instances.

To simulate a single migration object, choose the **Simulate** option in the **Action** column. Here you can decide if you want to start any 10%, any 500 instances, all instances for this object, or a user-specific selection (navigate to the **Mass Processing** function). Alternatively, you can first navigate to the **Migration Object Instances** view and then select and simulate individual instances from the list.

Analyzing and Cleansing Errors

Two views of messages

You will receive various error messages after the simulation. There are two different views of the messages. You can go to the specific run for the migration object via **Monitoring** and then click the **Display Messages** button. This takes you to the **Migration Messages** view. Once you have clicked on **Error**, you receive an overview of the error messages (see Figure 13.70).

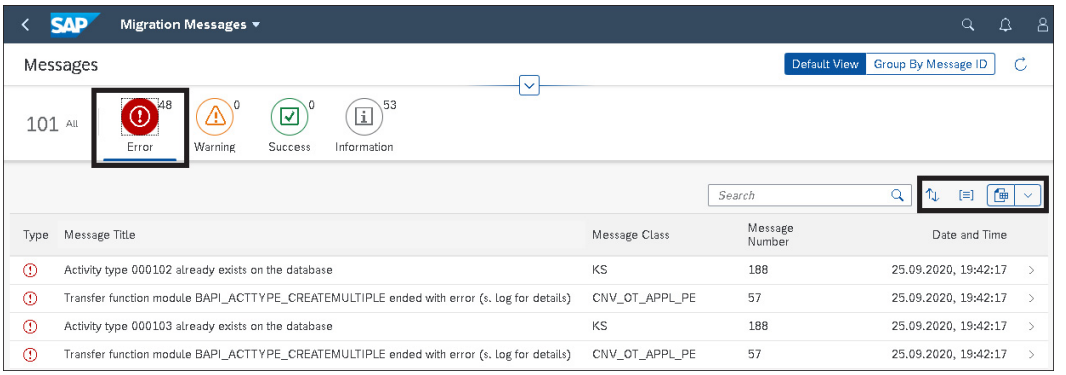


Figure 13.70 Messages of Simulation Run

You get another view by clicking one of the numbers of the project view to navigate to the **Migration Object Instances** view. All instances for this object are displayed if you click the number after **Instances**. If you click the number in the **Simulate** column (after **Error**), the system displays the migration object instance list with the instances that were simulated with errors. You can change this view as required. In the instance list, you now select the instances for which you want to analyze messages and click **Messages**. This opens a view that displays the messages per instance (see Figure 13.71). You can sort, filter, download, and the like in both views.

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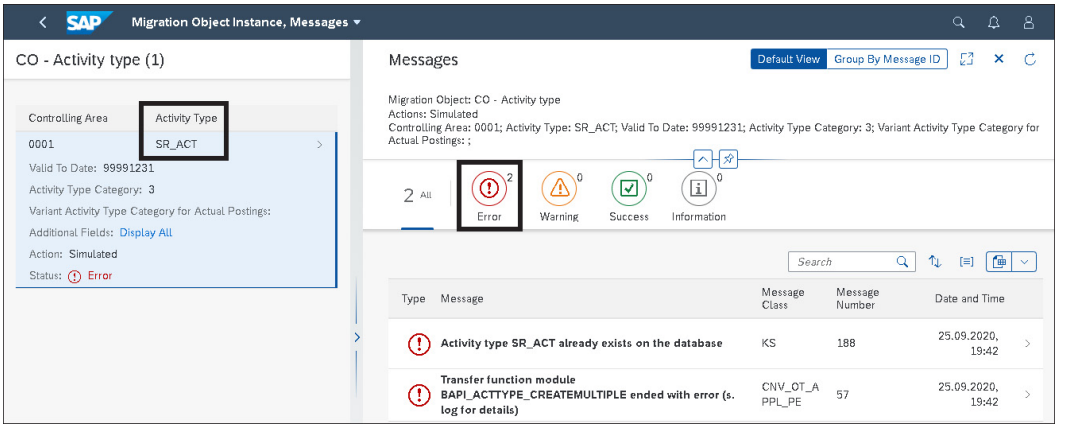


Figure 13.71 Messages per Instance

You navigate to the detail screen of the messages for further error analysis. The message ID—for example, KS 188—provides initial information about the application component concerned. You can use this abbreviation for your internet research or for searching SAP Notes to obtain valuable tips for troubleshooting. A considerably more flexible navigation within error messages is planned as of version 2020 FPS 01.

Solution options

Basically, the following solution options are available for messages that originate from an SAP application:

- Change the data in the source and repeat selection
- Create or adapt customizing in the target system
- Create or adapt required master data in the target system
- Change mapping to an existing or suitable target value
- Exclude instance from further processing

Additional Tools for Error Analysis

In Transaction LTMOM (call in the backend), you can debug instances during simulation. Also refer to Chapter 14, Section 14.3.8 in this context.

If you want to delete all instances or specific instances for a migration object from the migration cockpit, use Report CNV_PE_MC_DEL_ITEMS in the backend.

Migrating

The migration cockpit provides the same functions for migration that are available for simulation. In addition, you can migrate only successfully

simulated instances. From the technical perspective, the only difference is that the data is now created or posted in the SAP S/4HANA system.

Checking the Data Migrated

You check the data in the SAP S/4HANA target system by using the corresponding application or transaction or checking the table content using Transaction SE16. The migration object description provides information on how you can verify the result of the migration.

13.5 Performance Considerations

Parameters for the system performance

There are parameters that generally impact the duration of the migration and the system performance as such and thus apply to the migration cockpit as a whole. We present these parameters in this section.

13.5.1 Transfer Process

Accelerating the data transfer

The transfer process includes not only technical measures but also organizational measures with which you can considerably improve the performance of your data transfer. Here are the most common and most promising measures:

- **Check data in the source system**
  You should ask yourself which data must be transferred, which data is obsolete or set up incorrectly, and which accounts were incorrectly marked as OI relevant, for example.
- **Complete open transactions in the source system**
  You can check open transactions, such as open items in FI, open orders, and the like, in the source system and complete them there if possible. Frequently, you can considerably reduce the number of records to be transferred.
- **Consider the phases approach**
  Consider if you can migrate specific objects such as master data during regular operation.
- **Reduce number of active processes**
  No other processes should be active in the system during migration.

13.5.2 Transfer Method and Infrastructure

Checking the infrastructure

The infrastructure of your system and network landscape and the way you transfer data are factors that shouldn't be underestimated when it comes to

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the performance of your entire data transfer. Here are some measures to increase the performance:

- **Migration method**
  The method of data transfer has a considerable impact on the performance. For example, a *batch input* is considerably slower than a function module that was optimized for data migration. If you can choose between several transfer methods, you should always select the method with the best performance. The API of the migration object has the biggest impact on the performance of data migration.
- **Parallelization of data transfer**
  The option of calling a migration method in parallel is an important performance factor. In this context, the type and number of processes to be used in parallel constitute the bottleneck. In an on-premise system, the customer can usually decide himself how many additional application servers and thus processes he can provide for data migration. In a cloud or hosted system, the number of application server instances is predefined. Another factor is the type of usable processes. A system usually has five times more dialog processes than background processes (jobs). The number of available background processes is also reduced by the default applications that are running in the background. You should switch off any default background processes that are not required during this time if possible.

  The parallelization (number of jobs) is set per project and per migration object. It is applied to all three activities: selection, simulation, and migration. It *cannot* be set separately per activity.
- **High-performance network infrastructure**
  A high-performance network reduces response times. The performance of the network connection, for example, is decisive for populating staging tables or uploading files to the target system. But it can also be critical for the usability of a tool. The faster the network, the lower the response times.

13.5.3 System Parameters and Configuration

Optimizing the settings

The following system parameters and settings impact the performance and should therefore be checked and adapted if required:

- **System parameters**
  The number of available batch and dialog processes, the available storage space (RAM), and the number of available CPUs should be checked during the data migration's tests and optimized for live data migration.

Persönliches Exemplar für Ernst Schulten

In general, it can be said that an increase in RAM usually results in better performance than an increase in the number of CPUs.

- **Number of jobs**
  During the test runs, you should specify the optimum number of jobs that are required for data migration per object.
- **Configuration**
  The application-specific customizing can also influence the performance of the target API. You should therefore stop any jobs, workflows, or data replications that aren't required.

13.5.4 Direct Transfer: Specific Considerations

The following specific considerations must be taken into account for the direct transfer approach:

- **RFC usage**
  The bandwidth of data connection between the source and target system should not be too low, particularly for data extraction.
- **Data selection**
  The performance of the selection from the SAP system is object-specific. Migration objects that only select from few source tables are faster than migration objects that have a nested data model. The latter must read and select in many different source tables. Moreover, there are objects such as assets that must derive additional data during selection. Migration objects differ when it comes to their performance!



Search for Current Notes

Always search for current notes on the performance topic. Besides corrections, there can also be knowledge base articles or current consulting notes on this topic. Use the keywords "SAP S/4HANA Migration Cockpit" and "performance" for your searches.

13.6 Supporting Applications

Various applications are available in SAP S/4HANA and SAP S/4HANA Cloud that support a data migration. By means of these applications, you maintain, for example, the migration key date for financial objects or check the status of a data migration. We describe these applications in this section.

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13.6.1 Setting the Migration Key Date for Financial Objects

Defining a uniform migration key date

If you transfer balances and open postings from a source system to your SAP S/4HANA system, it's important to define a uniform migration key date. For this purpose, you usually enter a posting date. Since SAP S/4HANA Cloud 1902 and SAP S/4HANA 1909, the migration key date—that is, the posting date—for data transfer of financial objects must be defined centrally for each company code using the Define Settings for Legacy Data Transfer financial accounting app. It's no longer possible to maintain the posting date using the previous fixed value or the migration template. This also applies to asset accounting. Here you use the Make Company Code Settings—Asset Accounting app. Next we'll describe how to set the migration key date using these two apps.

General Ledger Accounting

Maintaining the migration key date per company code

In general ledger accounting, prior to data transfer you must maintain for the company codes the migration key dates on which you complete all preparatory activities prior to the actual data transfer. The migration key date is usually at the end of a period. This can be a month, a quarter, or a year. The migration key date is used as the posting date on which the data is actually transferred from the source system to your SAP S/4HANA system. This concerns the following migration objects:

- `SIF_OPEN_ITEM_AP`, FI - Accounts payable open item
- `SIF_OPEN_ITEM_AR`, FI - Accounts receivable open item
- `SIF_GL_BALANCE`, FI - G/L account balance and open/line item
- `SIF_INVENTORY_2`, Material inventory balance
- `SIF_HIST_BALANCE`, FI - Historical balance

If you haven't maintained the posting date via the app, you'll receive the following error messages during data transfer:

- `CNV_DMS_SIN 441`: Make setting for migration key date for company code
- `FINS_MIG_HIST_BAL 023`: Migration key date is unknown for Company Code

Maintaining the key date via Customizing

You maintain the migration key date in the SAP S/4HANA-based system via Transaction FINS_MIG_CTRL_1 (Make Legacy Data Transfer Settings) or in Customizing (IMG) via **Financial Accounting • Financial Accounting Global Settings • Tools • Legacy Data Transfer • Define Settings for Legacy Data Transfer**. In SAP S/4HANA Cloud-based systems, this transaction is available as the Define Settings for Legacy Data Transfer app. Because the handling of the transaction and the app is identical, we'll describe how to use the app. Figure 13.72 shows the tile for this app.

Persönliches Exemplar für Ernst Schulten

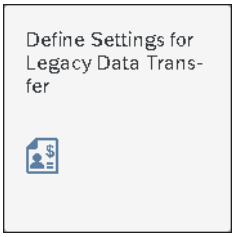


Figure 13.72 App for Maintaining Migration Key Date

Key date per company code

In the maintenance dialog, you can define a **Migration Key Date** ❷ for each **Company Code** ❶ (see Figure 13.73). In addition, you specify the **Legacy Data Transfer Status** ❸ for the respective company code. The statuses have the following meaning:

- **In Preparation**
  A specific migration key date has not been set yet. No transaction data can be migrated in this status.
- **Ongoing**
  You set this status if you want to migrate data and the key date is specified.
- **Completed**
  With this status, you complete the data migration. Another migration of transaction data for company codes with this status is no longer possible.

You save the settings using **Save** ❹.

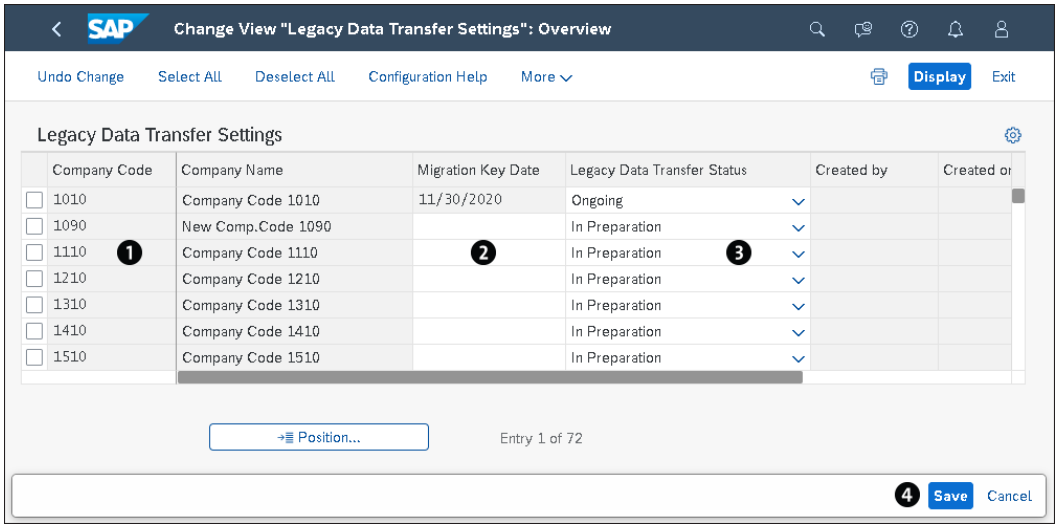


Figure 13.73 Maintaining Migration Key Date and Status

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Additional Information

Knowledge base article 2754615 provides additional information on how to maintain the posting date: *http://s-prs.co/527998*.

Asset Accounting

Defining the transfer date

In asset accounting, it's common practice that you must make various settings prior to data transfer. One necessary setting is to maintain the migration key date, referred to as the *transfer date* in asset accounting.

In product assistance, the transfer date is defined as "the calendar date on which the assets are transferred to the SAP System. The transfer date of the asset accounting must be either the G/L transfer date or later."

Migration objects with transfer date

This is required for the following migration objects prior to data migration:

- `SIF_FIXED_ASSET`
  Fixed asset (including balances and transactions). The migration object for old asset accounting only exists in SAP S/4HANA. Since SAP S/4HANA Cloud 2005, it is no longer available in the cloud because only the new asset accounting has been delivered since release 1911.
- `SIF_FIXED_ASST_M`
  Fixed asset—Master data.
- `SIF_FIXED_ASST_P`
  Fixed asset—Postings.

The two migration objects for master data and postings have been available since release 1911 in SAP S/4HANA Cloud and are used for the data transfer to the new asset accounting.

Maintaining the transfer date in Customizing

In SAP S/4HANA, you maintain the transfer date in Customizing (IMG) via the path **Financial Accounting • Asset Accounting • Asset Data Transfer • Parameters for Data Transfer • Define Transfer Date and Additional Parameters** (Transaction FAA_CMP_LDT). In SAP S/4HANA Cloud, you use the Make Company Code Settings—Asset Accounting app in the Current Settings group (see Figure 13.74).

For this purpose, in the cloud you require the same authorizations as for the asset transfer which are available in the SAP template role `SAP_BR_AA_ACCOUNTANT`. The app and transaction are handled identically. We therefore only describe where to maintain the posting date in the app.

Persönliches Exemplar für Ernst Schulten

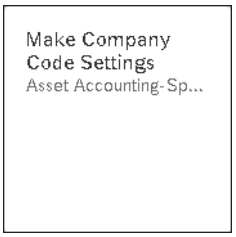


Figure 13.74 App for Maintaining Transfer Date in Asset Accounting

Maintaining the transfer date per company code

After you have called the app, you select the appropriate **Company Code** ❶ for which you want to set the posting date (see Figure 13.75). Then go to the **Legacy Data Transfer** tab ❷. Here, you create a legacy data transfer segment using the button (**Create Legacy Transfer Segment**) ❸. The legacy data transfer segment receives a sequence number. You maintain the following entries:

- **Transfer Date**
- **Document type**
  You post all posting documents of the data transfer with this document type.
- **Legacy Data Transfer Status**

Status of the transfer date

The statuses have the following meaning:

- **In Preparation**
  The initial status for which you cannot make any data transfer. The Customizing settings do not have to be complete here. For example, the document type does not have to be maintained yet.
- **Ongoing**
  You set this status if you want to migrate data and the key date is specified. Afterwards, postings are only possible via data transfer.
- **Ongoing (Other Postings Allowed)**
  You set this status if want to transfer additional data to a live company code. You can make postings via migration or manual postings.
- **Completed**
  After a successful and correct data migration, you set this status using the button (**Complete Legacy Transfer Segm**). As a result, you cannot migrate any further master and transaction data for assets for this legacy data transfer segment of the company code.

You save the settings using **Save** ❹. Figure 13.75 shows the overview of the posting date maintenance.

Maintaining additional company codes

If you want to make additional data transfers with another transfer date at a later point in time, you create another segment for this company code.

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Additional Information on Legacy Data Transfer

Additional information on the settings made in addition to the posting date for asset accounting and further important notes on data transfer in asset accounting are available in the Customizing documentation or product assistance on the SAP Help Portal under the following path: **Finance • Accounting and Financial Close • Asset Accounting • Legacy Data Transfer**.

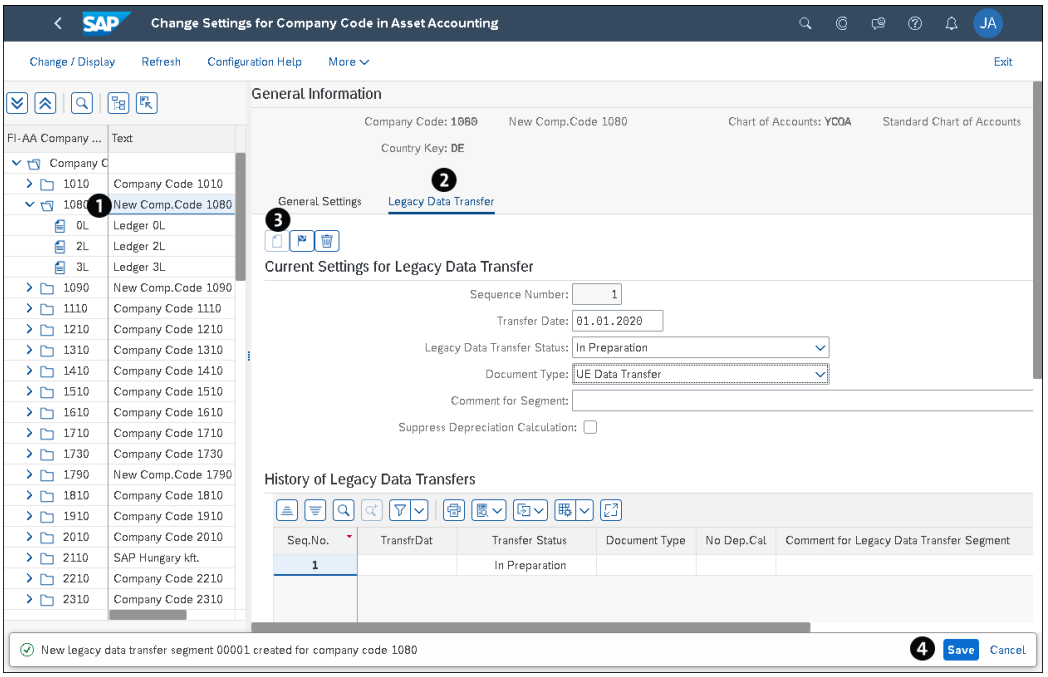


Figure 13.75 Maintaining Posting Date in Asset Accounting

13.6.2 Checking the Status of Data Migration (Cloud)

Evaluation of data migration runs

Since Release 1805, SAP S/4HANA Cloud includes the Data Migration—Status SAP Fiori app within the Data Migration application group. By means of this app, you can view, evaluate, and download the messages of individual data migration runs that occurred in SAP S/4HANA Cloud for each migration object. The Data Migration—Status app shows the evaluation of data migration runs which were loaded via the migration projects using the data transfer using staging tables migration approach. Figure 13.76 shows that the tile of the Data Migration—Status app provides three pieces of information:

- Number of data records that were **Imported** successfully
- Number of data records that are **Ready for Import**
- Number of data records whose migration **Failed**

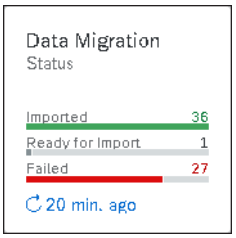


Figure 13.76 Tile for Data Migration—Status App

Initial Screen (Migration Object Overview)

Initial screen of the Data Migration—Status app

The initial screen of the app indicates the following information for each migration object started:

- How many data records were **Imported**.
- The number of data records that are **Ready for Import**.
- The number of data records that **Failed**.
- The **Total Records** of the migration object.
- The **Progress** of the data migration. Here, the percentages of imported (green), available (gray), and failed (red) data records are displayed from left to right.
- **Extended Statistics** provides the number of data records per structure across all migrated migration objects (see Section "Extended Statistics").



Alias Name Instead of Object Name in Logon Language

If you logged on with a language other than the one in which you created the migration project, the system displays the technical alias names as object names.

Restricting the display

When you call the app for the first time, the display is empty and only shows a brief start text. You then set a filter and select **Go** to view a list of all objects for which you have at least started the data migration. If you work with several migration projects and objects, it may be useful to filter the list so that you can find the desired migration object faster. For this purpose, you search for or filter by the migration project or migration object to be displayed in the upper part of the screen. Either enter a free search term in the **Search** field or filter the display of objects using other fields. The **Migration Period**, **Object Name**, **Record Status**, and **Migration Project** fields are visible by default. By means of **Adapt Filters**, you can select additional fields. With **Go**, you activate the filters. Figure 13.77 shows the initial screen of the Data Migration Status app.

Exporting to spreadsheet

The export button (**Export to Spreadsheet**) lets you export the overview list to edit it in Microsoft Excel or e-mail it, for example.

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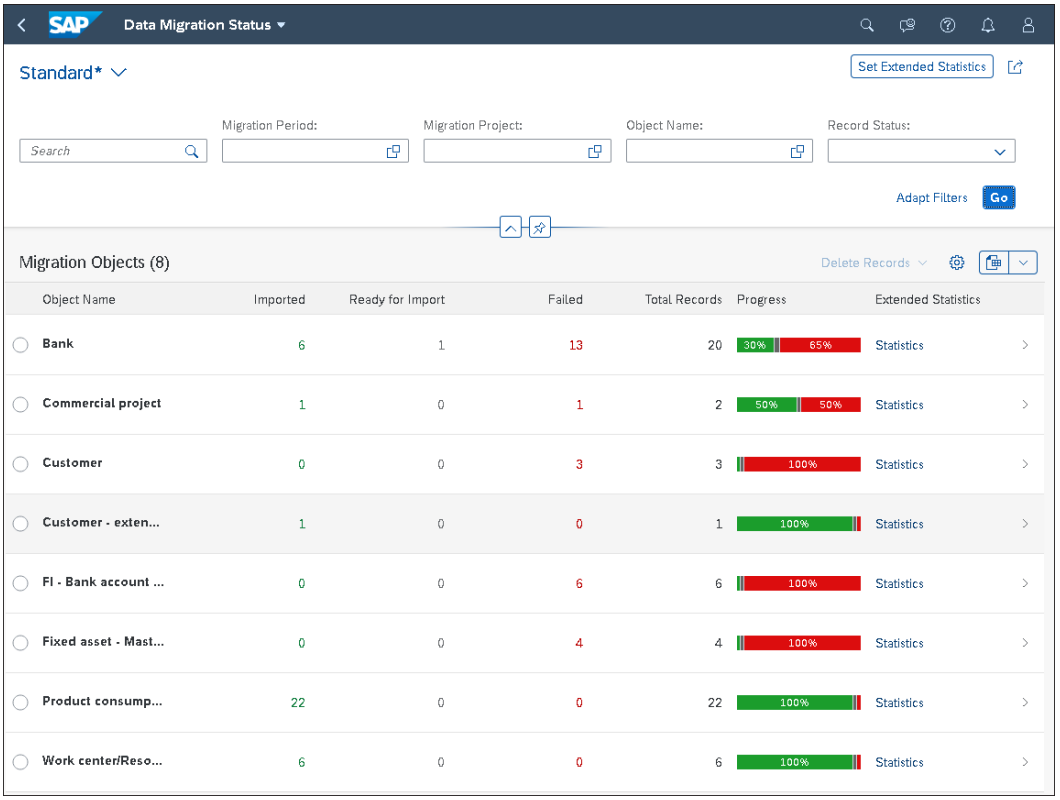


Figure 13.77 Initial Screen of Data Migration Status App

You can adapt the display using the **Settings** button. You can hide or display fields and select further display options.

Migration Object Overview (Data Records)

Full-screen mode in the overview

You open the migration object overview of the migration object by selecting the name of the migration object on the initial screen or by clicking the button of the object row on the right. On the right-hand side, a table first displays all **Records** for a migration object. The object overview is available on the left. With the button (**Full Screen**), you hide the left area to view the data record overview in full-screen mode.

You cancel the full-screen mode with the button (**Exit Full Screen**). The data records are sorted by source ID, and the table displays the following information by default:

- **Source ID**, the data record's key in the migration file/staging table. In case of multiple keys, the individual key parts are listed separated by /.
- The **Status** of the data records shows whether it was imported, is ready for import, or encountered errors.

Persönliches Exemplar für Ernst Schulten

- **Description** shows descriptive text for the data record if such text is available in the source data.
- For imported data records, the first target key is listed in the SAP S/4HANA system. Here, the field name of the first target key is displayed as a column name.
- **Audit Status** shows the status of the audit for the corresponding data record. This aspect is described in more detail in the Performing an Audit section.

Additional columns, like **User Name**, **File Name**, **Migration Project**, and **Staging Table**, can be added using the button (**Settings**).

Restricting the Status for a Better Overview

To find a data record faster, you can restrict the display of the selection list by means of the **Status** in the data record overview (**Records**) and select further filter criteria using the **Settings**. You can hide and display the upper information area using (**Collapse Header**) or (**Pin Header**) as is common in SAP Fiori. Figure 13.78 shows an example of the data record overview in full-screen mode with an expanded status box.

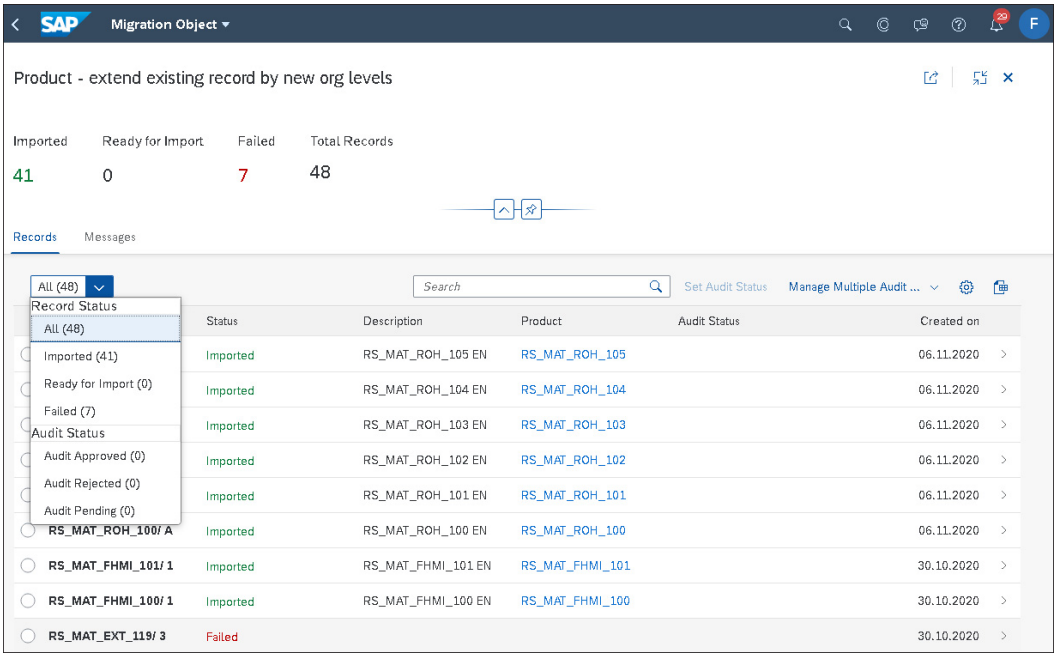


Figure 13.78 Data Record Overview of Data Migration Status App

Directly navigating to the maintenance app of the data record

If you are authorized to maintain and migrate data records of this object, the key of the imported data records is displayed as a hyperlink. You can then select the key of an imported data record. Another small window

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appears from where you can navigate directly to the predefined app of the migration object. Figure 13.79 shows the window for navigating to the product migration object. You can directly go to **Manage Product Master Data** via the link to view or further process the migrated migration object.

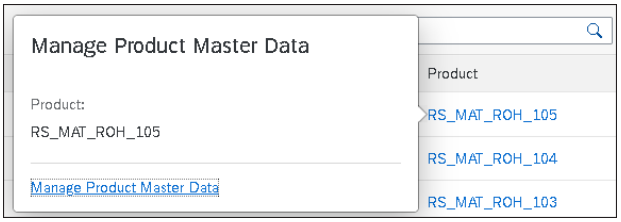


Figure 13.79 Window for Navigating to Maintenance or Display App

Objects without direct navigation

For a few migration objects, like VC—Dependency Net, direct navigation to an SAP Fiori app is not yet possible due to technical restrictions. A current list of objects for which navigation to an app is not possible is available in the knowledge base article 2681413 at *http://s-prs.co/527999*.

How Are the Links Created in the Window?

Each migration object is assigned to a semantic object in the SAP Fiori Apps Reference Library (see Figure 13.80). You can access the SAP Fiori Apps Reference Library at *https://fioriappslibrary.hana.ondemand.com*.

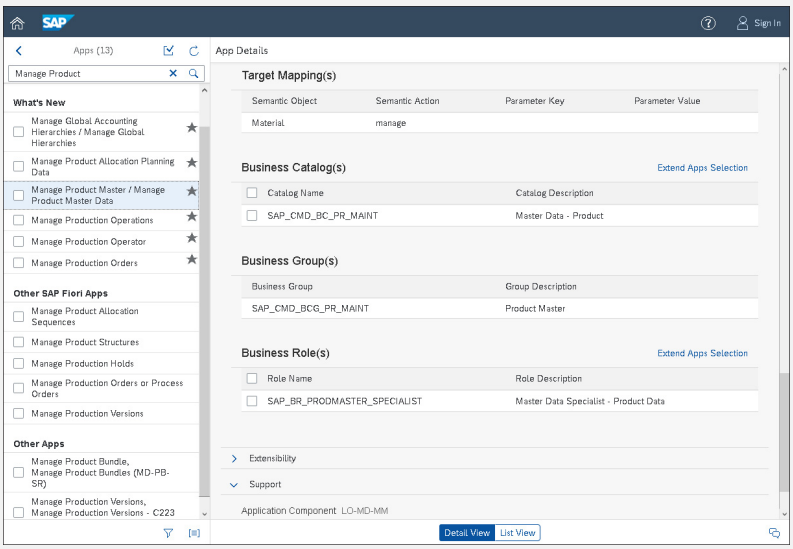


Figure 13.80 Detail View of App in SAP Fiori Apps Reference Library

If you enter "product" in the **Search** field under **All Apps**, the system displays all related apps and their roles that include this search term. If you know the app ID, you can also enter it directly.

The detail list (**App Details**) of an app provides a lot useful information. Under **Implementation Information** in the **Configuration** category, you find the respective semantic objects (**Semantic Object**) that are assigned to the app under **Target Mapping(s)**. One of these apps is now assigned to the migration object in the Data Migration Status app. Figure 13.80 shows an example of the Manage Product Master Data app (app ID F1602).

Detail Screen for the Data Record (Record)

Three areas of the detail screen

When you use ⟩ to select a data record, the details of the data record are displayed in the **Record** view. Depending on whether you enabled full-screen mode or not, the details of a data record are either displayed in full screen or in another new area on the right side. This detail view (**Record**) is divided into three areas: **General Information**, **Messages**, and **Statistics**. The following information is displayed in these areas:

- **Status**
  The status of the data records is displayed in the upper information area.
- **General Information**
  - SAP S/4HANA target key fields of the data records loaded and their values
  - Migration project (**Project**) to which the data record belongs
  - Name of the **Staging Table** in which the data record is located
  - Name of the user who migrated the data record (**Created By**)
  - Date on which the data record was migrated (**Created On**)
- **Messages**
  - List of messages generated (**Items**) and their details, such as **Message Type** and text of the **Message**
  - You can display additional fields, such as **Message ID** and **Message Number**, using the ⚙ button (**Settings**). This technical message information is useful if you search for help for this message in the SAP Support Portal, for example.
  - Many messages have a long text that contains additional information on the message. Simply click on the message's hyperlink. This opens a window that displays the appropriate long text (if available).

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- **Statistics**
  The statistics area shows a list of **Structures** that were migrated with this data record. The list contains the name of the individual structure (**Structure Name**) and the **Number of Records** for each structure.

Figure 13.81 shows the data record overview in which the detail area of a data record of the Product migration object is collapsed.

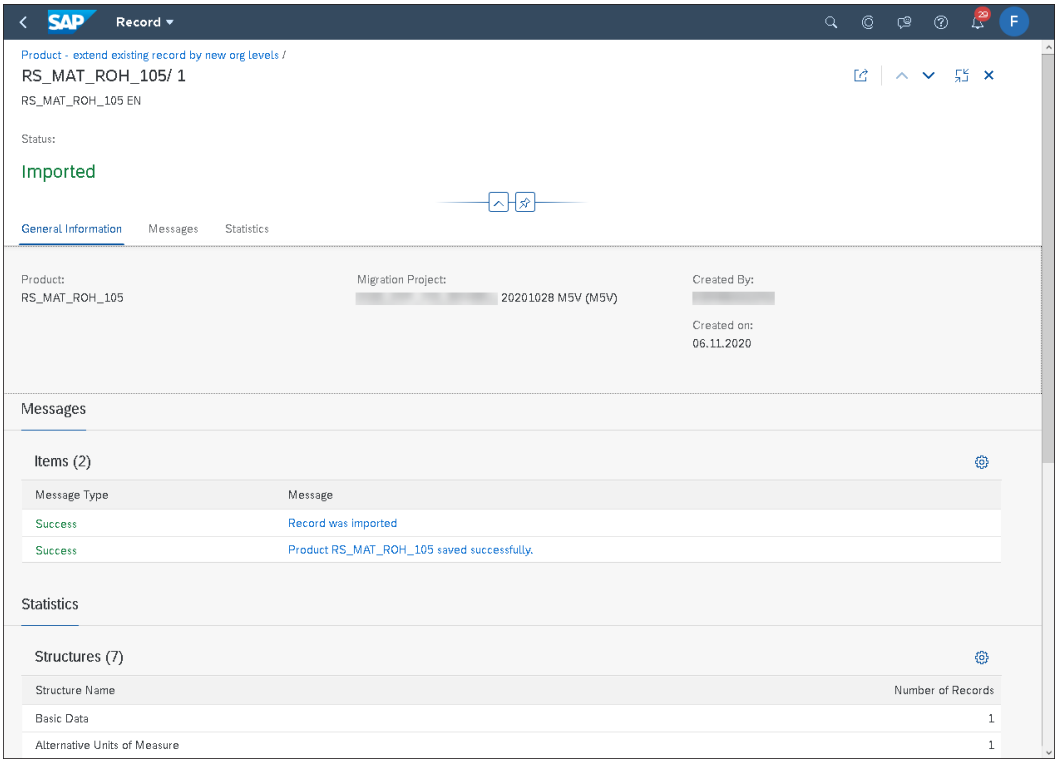


Figure 13.81 Record Detail View with General Data in Data Record

Migration Object Overview (Messages)

View of messages

Via the **Messages** option, you can go to the view of messages that are displayed grouped by message text. Here you can filter the display by the **Message Type**:

- **All** displays all messages.
- **Error** displays messages of the **Error** type only.
- **Warning** displays warnings only.

To quickly find a message, you can restrict the list using additional filters (⚙ button, **Settings**). Figure 13.82 shows an example of such a message overview.

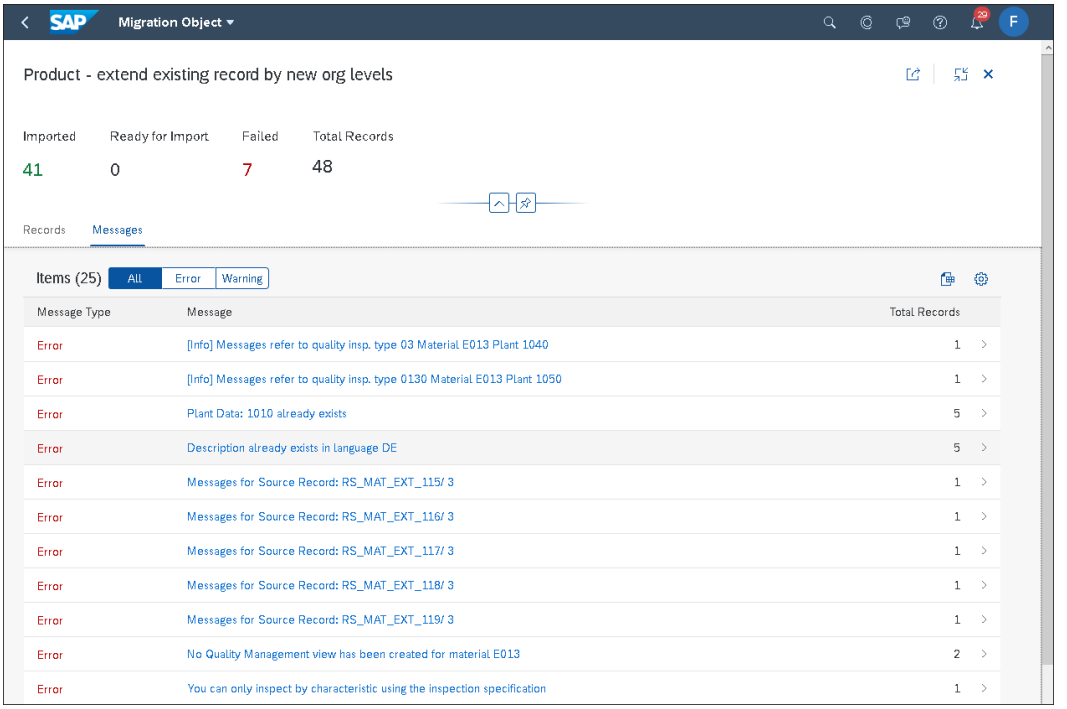


Figure 13.82 Messages for Migration Object

Detail Screen of the Message

Information on the message

If you select a message, the system displays the data records for this message either in full screen or in another area on the right side, depending on whether the full-screen mode is enabled. In addition to the **Total Records** and the **Message Type**, the system also displays technical information, such as **Message ID** and **Message Number**. The lower area lists all **Records** for this message.

The list shows the **Source ID**, the **Description**, and the migration project (**Project**) of the data record. You can use the ⚙ button (**Settings**) to adapt the view and to display, for example, additional fields like **File Name** or **Staging Table**. Figure 13.83 shows all messages for an object with the detail screen **Messages** opened, which displays all related data records for this message.

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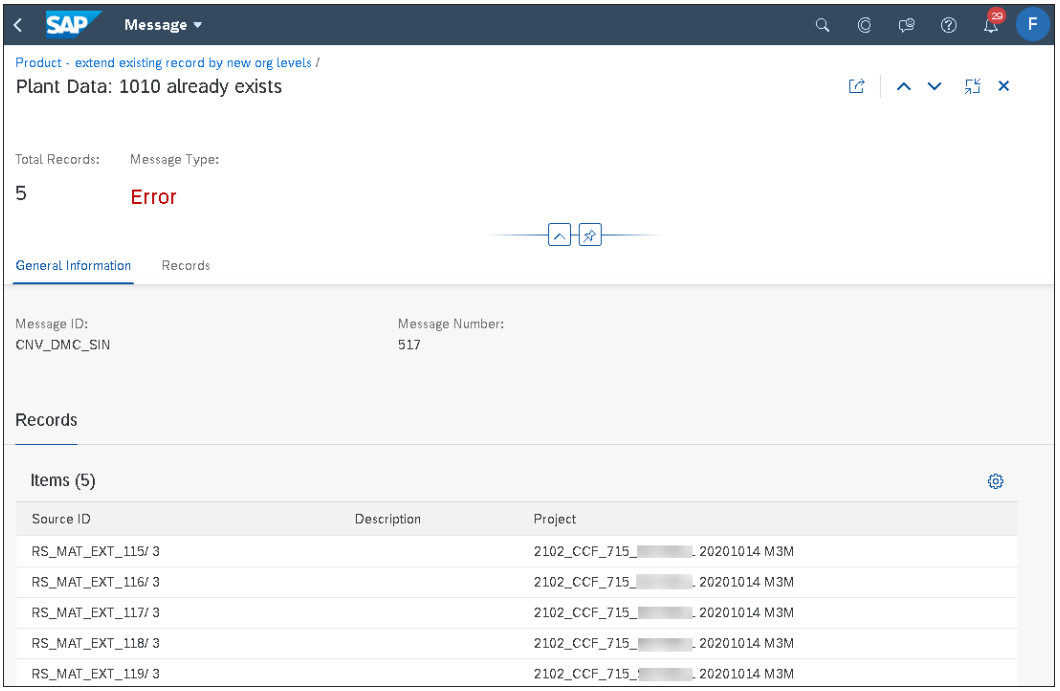


Figure 13.83 Messages per Object and Data Record Details

Performing an Audit

Validating data records via audits

It generally makes sense to validate the migrated data. The Data Migration Status app includes an audit functionality to support validation. With this functionality it's possible to select data records in the **Imported** status for an audit. The selected records are then validated and the result is set as an audit status in the Data Migration Status app. This provides you with a quick overview of the data quality of your data migration.

Selecting data records for the audit

There are two options for selecting data records for an audit or setting the audit status:

- In the **Migration Object** view, you can set the corresponding status for a data record using the **Set Audit Status** option.
- You use the **Manage Multiple Audit Status** function and execute the **Mass Assign Records for Audit** action.

The audit status can have three different states:

- **Pending (gray)**
  The data record still needs to be validated.
- **Approved (green)**
  The data record was validated and is okay.
- **Rejected (red)**
  The data record was validated and has errors.

Figure 13.84 shows the input dialog that you call via **Set Audit Status** to set the audit status for an individual record.

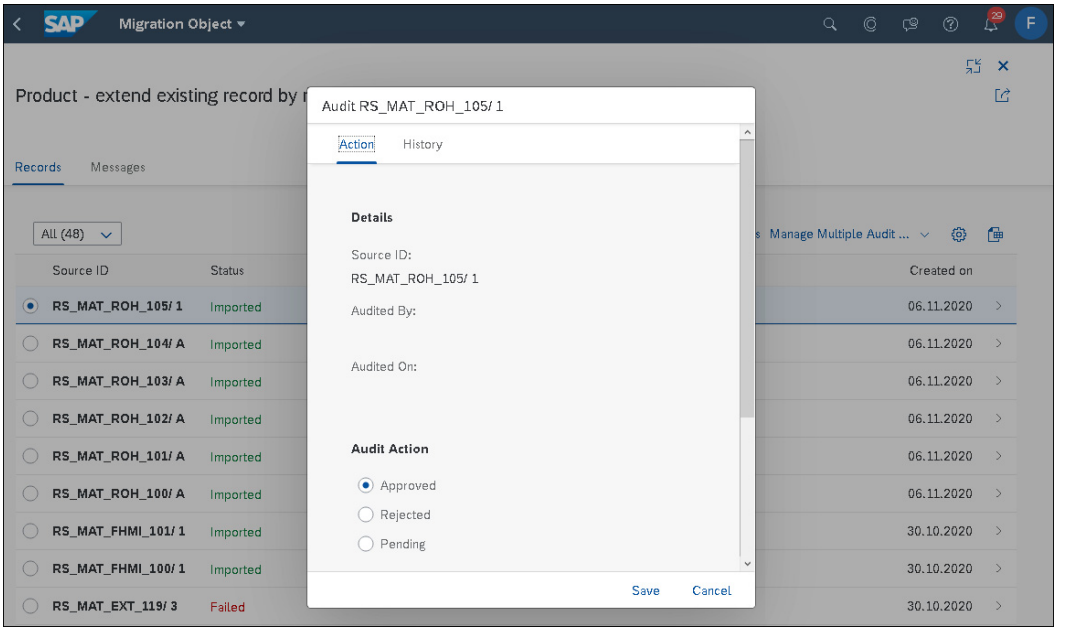


Figure 13.84 Setting Audit Status for Individual Record

Determining the data records to be audited

In case of a mass assignment of data records for auditing using the **Manage Multiple Audit Status** option, the system displays the input dialog **Assign Randomly for Auditing** (see Figure 13.85). Here you enter the quantity of data records to be selected (**Select a Quantity**) and the appropriate unit. For example, you can select either 75 data records or 75% of all data records for auditing using the **Audit Object** option.

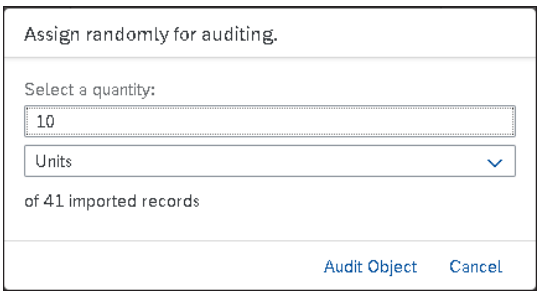


Figure 13.85 Maintenance Dialog for Mass Assignment of Data Records for Auditing

Correcting the quantity of data records

If you determined too many errors and want to cancel the audit in advance or if you accidentally selected the wrong data records or the wrong quantity

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of data records, it may be useful to remove any data records that have not been audited yet from the auditing quantity. For this purpose, the **Manage Multiple Audit Status • Remove All Pending from Audit** function is available. A window opens where you confirm this action. If you select **Remove**, the audit status is removed for all pending data records.

Extended Statistics

Calling the extended statistics

As we mentioned at the beginning of Section 13.6.2, the *extended statistics* presents the number of data records per structure across all migrated migration objects. The initial screen of the Data Migration Status app—that is, the **Migration Object** overview—provides the **Extended Statistics** column. For migration objects for which extended statistics are enabled, this column displays a hyperlink labeled **Statistics** if any statistics data was saved. If you click this hyperlink, a pop-up window opens and displays information on the saved statistics (see Figure 13.86). The window contains the number of data records per structure and a selection of categories (fields) for which statistics were saved.

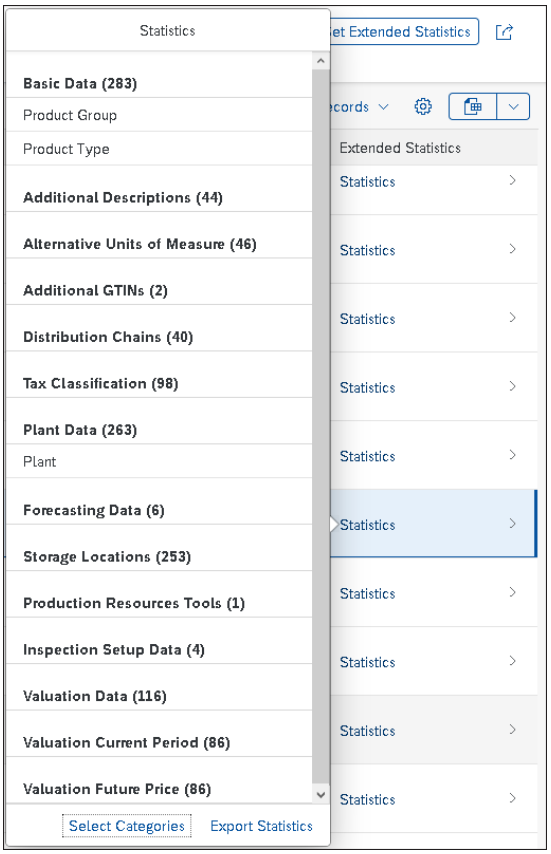


Figure 13.86 Pop-up Window with Extended Statistics of Migration Object

Data records per value mapping of a category

If you select, for example, the **Plant** category, the system displays a view of all value mappings for the selected category. In our example, this view includes the various source values of the target value assigned and the number of related data records (see Figure 13.87).

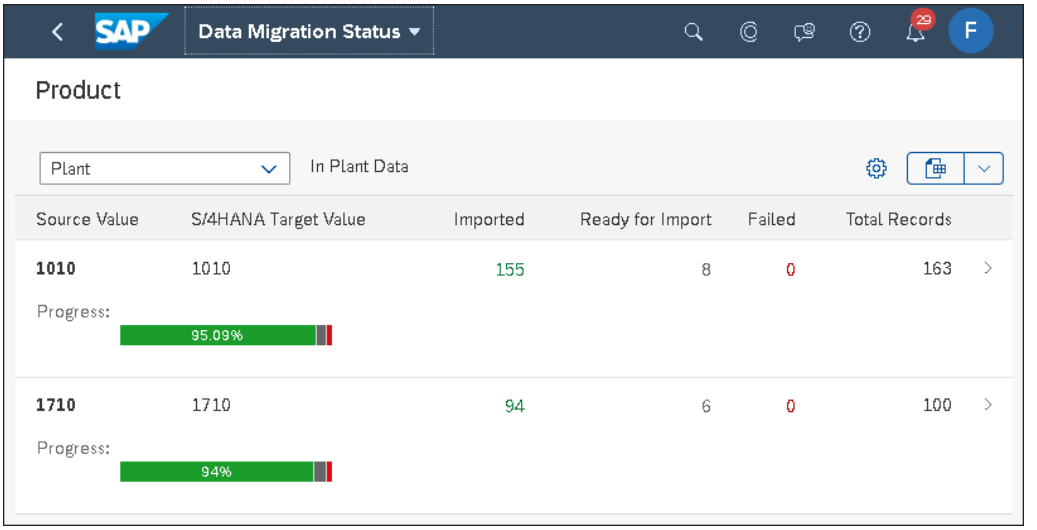


Figure 13.87 List of All Value Mappings for Statistics Category

If you select one of the records, the corresponding migration object overview of the data record is opened on the right (**Data Migration Status** screen). The overview contains all data records that are assigned to this category value. In our example, you see all data records whose source record had a value of 0002 for **Plant**, which was converted to 1710 (see Figure 13.88).

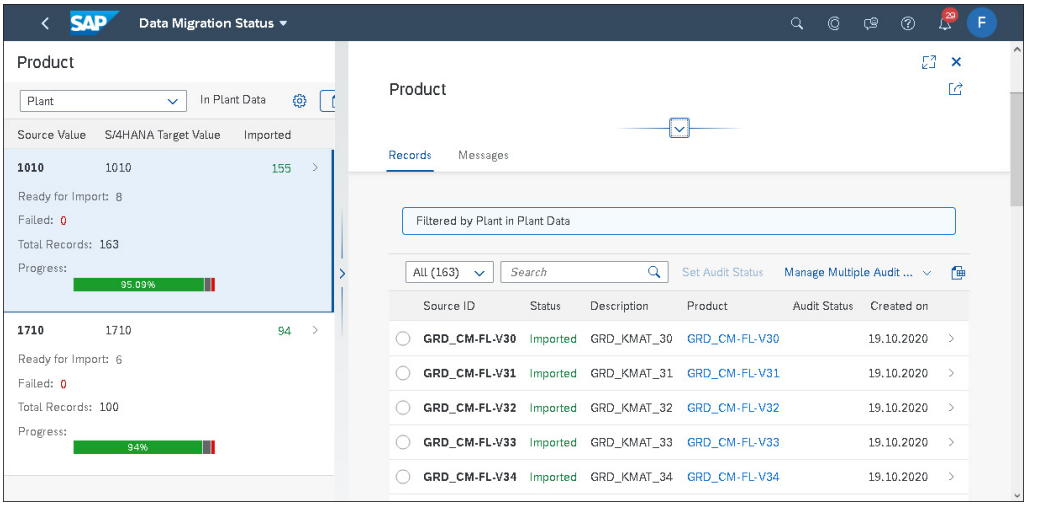


Figure 13.88 List of All Data Records for Selected Category Value

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Maintenance of the categories per migration object

In the pop-up window for the statistics, you can select the categories per structure that are supposed to be displayed in the statistics. In our example, you can see the maintenance dialog for this selection (see Figure 13.89).

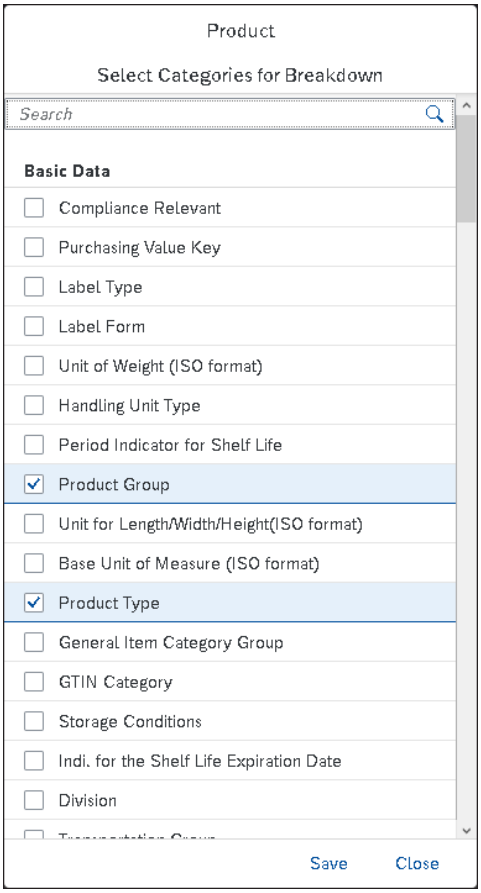


Figure 13.89 Selecting Categories to Be Displayed for Migration Object

Configuring the extended statistics

You can configure the extended statistics for migration objects in the initial screen of the Data Migration Status app using the **Set Extended Statistics** option. In the maintenance dialog, you can activate or deactivate the logging of statistics data for each migration object. The logging of statistics inevitably results in many data records being written. It may be necessary—for example, for storage or performance reasons—to switch off the logging of individual objects. It therefore makes sense to generally activate the statistics only for migration objects for which you require extended statistics prior to the first data migration in a system. If you set **Log Extended Statistics** to **Off** for a migration object, new statistics data is no longer logged and all statistics data already logged will be deleted completely. Figure 13.90 shows the maintenance dialog for setting extended statistics.

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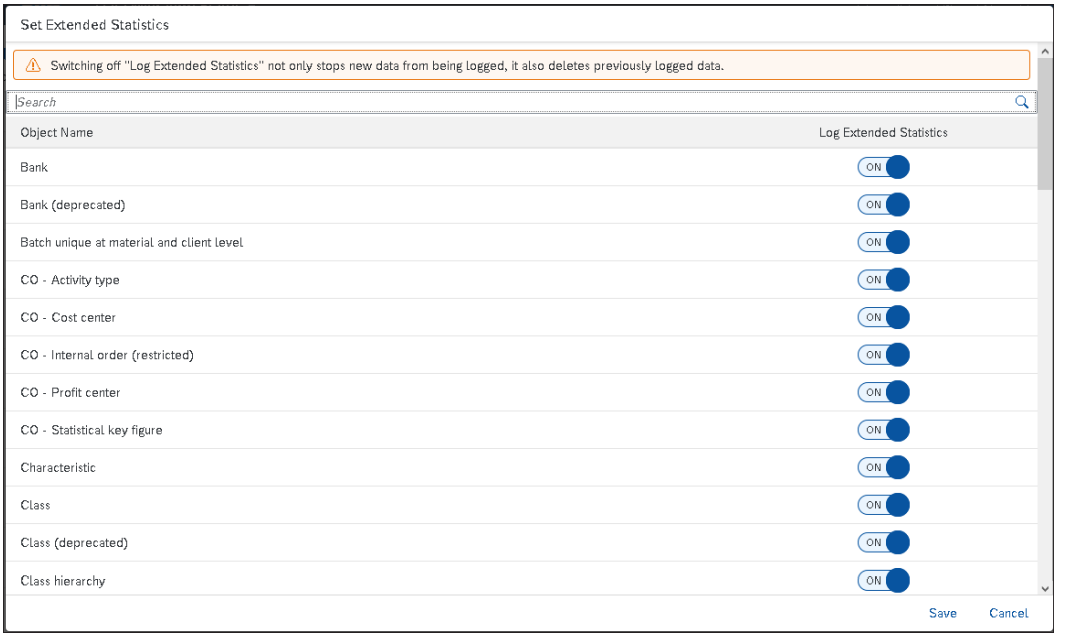


Figure 13.90 Set Extended Statistics

Messages

Message on situation handling

Since SAP S/4HANA Cloud 1905, you have the option to get notified about the end of a data migration run using the situation handling functionality. For this purpose, situation handling provides a situation type, `CA_DATA_MIGRATION_STEP_COMPLETED` (Data Migration Is Completed). To display the messages in the Data Migration Status app, you activate this situation type in the Manage Situation Types app, available in the Situation Handling tile group (see Figure 13.91). This tile group is automatically assigned to you with the assignment of a business role based on the `SAP_BR_CONFIG_EXPERT_DATA_MIG` templates business role that is required for the migration cockpit. More information is available in the Manage Situation Types app in the product assistance.



Figure 13.91 Apps of Situation Handling Tile Group

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General Functions of the "Data Migration Status" App

Exporting the overview list

The export function (**Export to Spreadsheet**) lets you export the displayed lists, like the data record or messages overview, to a Microsoft Excel file (XLSX data type).

Sharing views

You can use the button (**Share**) of the respective view to **Send E-Mail**, **Share on SAP Jam**, or **Save as Tile**.

Additional Blogs for the Data Migration Status App

Two interesting blogs are available in the SAP Community for the Data Migration Status app:

- Data Migration—Status Monitoring, by Sandeep Kumar: *http://s-prs.co/5279100*
- Extended Statistics in Data Migration Status App, by Vishnu Tanguturu: *http://s-prs.co/5279101*

13.7 Summary

With this chapter we showed you the SAP S/4HANA migration cockpit, its different approaches and complementing applications that are crucial for your data migration to SAP S/4HANA. You should now be able to migrate data into SAP S/4HANA. With the next, we'll show you how to model your own data migration objects and enhance existing once with the SAP S/4HANA migration object modeler.

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Chapter 14

SAP S/4HANA Migration Object Modeler

This chapter describes the modeling environment for the SAP S/4HANA migration cockpit for adapting and newly creating migration objects depending on the migration approach used.

Chapter 13 introduced the various migration approaches of the SAP S/4HANA migration cockpit for new implementations of SAP S/4HANA. This chapter now describes the options available for adapting the delivered content of the migration cockpit to your customer-specific requirements. For this purpose, you use the modeling environment of the migration cockpit.

A powerful modeling environment

The *SAP S/4HANA migration object modeler* is the modeling environment of the migration cockpit. It's currently only available in the on-premise version of SAP/4HANA, and you can call it using Transaction LTMOM.



Required User Role

To use Transaction LTMOM, the user must be assigned the following role: `SAP_CA_DMC_MC_DEVELOPER`.

The migration object modeler has become a powerful modeling environment in the SAP S/4HANA version 2020. New functions have been added with each release since its introduction as of SAP S/4HANA 1610. The current functionality is now comparable to the Legacy System Migration Workbench and even more comprehensive in some areas (field and structure mapping, cross-object usage of transfer rules, and, thus, value mapping). With regard to the flexibility of the supported migration interfaces, the migration object modeler as a migration interface only supports function modules and CDS behavior definitions. A behavior definition is an ABAP Repository object that corresponds to a business object in the context of the ABAP RESTful application programming model. For more information on the ABAP RESTful application programming model, go to *http://s-prs.co/5279102*.

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Legacy System Migration Workbench in SAP S/4HANA

The migration cockpit is the tool of choice for migrating business data to SAP S/4HANA and SAP S/4HANA Cloud. The LSMW is located in the simplification list. Additional information is available in SAP Note 2287723 and in Chapter 16, Section 16.1.

Can be used for all migration approaches

The migration object modeler can be used for all migration approaches of the migration cockpit. Before we discuss the functionality of the migration object modeler in the respective migration approaches, Section 14.1 provides a brief overview of its structure. Section 14.2 takes a look at the functionality of the migration object modeler if you perform the data migration in the migration cockpit using files or staging tables. Section 14.3 describes the functionality of the migration object modeler with regard to data migration directly from an SAP system. Which functions are available respectively depends on the various approaches, which are discussed in more detail in each respective chapter.

14.1 General Structure of the SAP S/4HANA Migration Object Modeler

Entry Point of the SAP S/4HANA migration object modeler

As you can see in Figure 14.1, the migration object modeler displays the object browser by default if you open it using Transaction LTMOM. You then select if you want to view a migration project with all related migration objects or an individual migration object directly.

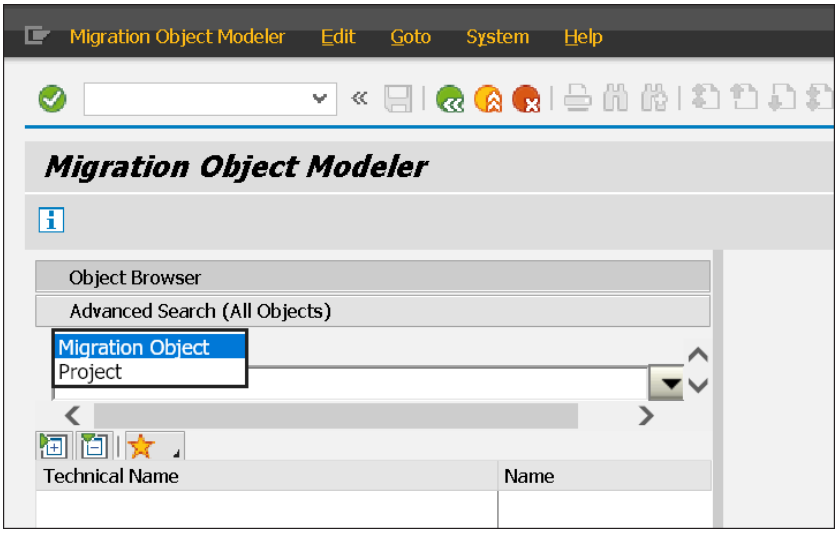


Figure 14.1 Selection in Object Browser of SAP S/4HANA Migration Object Modeler

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SAP GUI Settings

The SAP GUI screenshots in this chapter show the Corbu theme. **Belize Theme** was *not* selected in the SAP GUI settings under **Options for SAP GUI—SAP Logon • Visual Design • Theme Settings/Select Theme**. If you have other SAP settings, the screenshots may vary from your screens.

If you display an individual migration object, you can see a selection area, including a navigation tree on the left side and a workspace on the right side (see Figure 14.2).

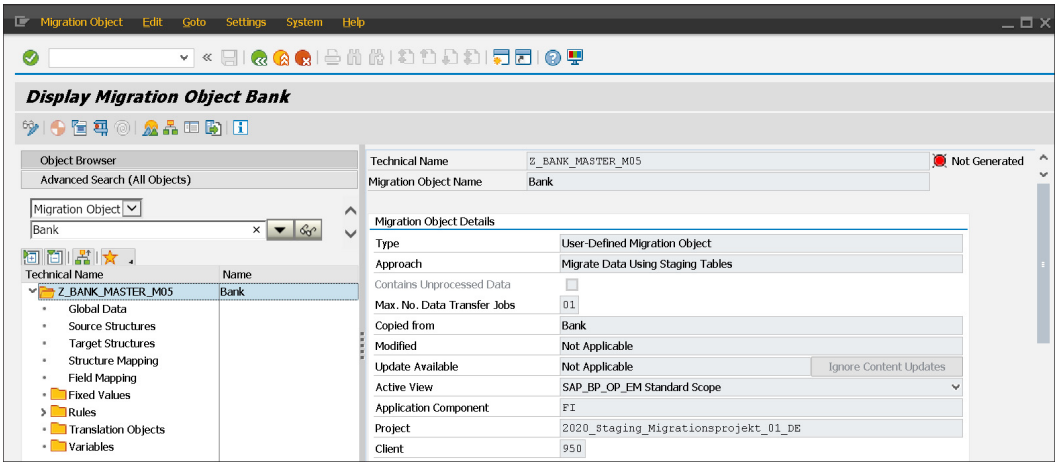


Figure 14.2 Structure of SAP S/4HANA Migration Object Modeler

You can use the button (**Fullscreen On/Off**) to hide/display the selection area and thus display the workspace in full screen.

Documentation

When you click the button, you call the documentation of the migration object modeler. Its initial screen is illustrated in Figure 14.3.

You can select the documentation of the various migration approaches depending on the approach you are currently working with. If you have already selected a project or migration object in the object browser, the system displays the documentation of the corresponding migration approach directly.

Favorites list

You can add projects and migration objects to your favorites list by selecting the relevant project or migration object. You add the project or object to your favorites list by clicking the button and selecting **Add**. Figure 14.4 shows the selection options for the favorites function. You can also edit the favorites list or specifically select an object or project.

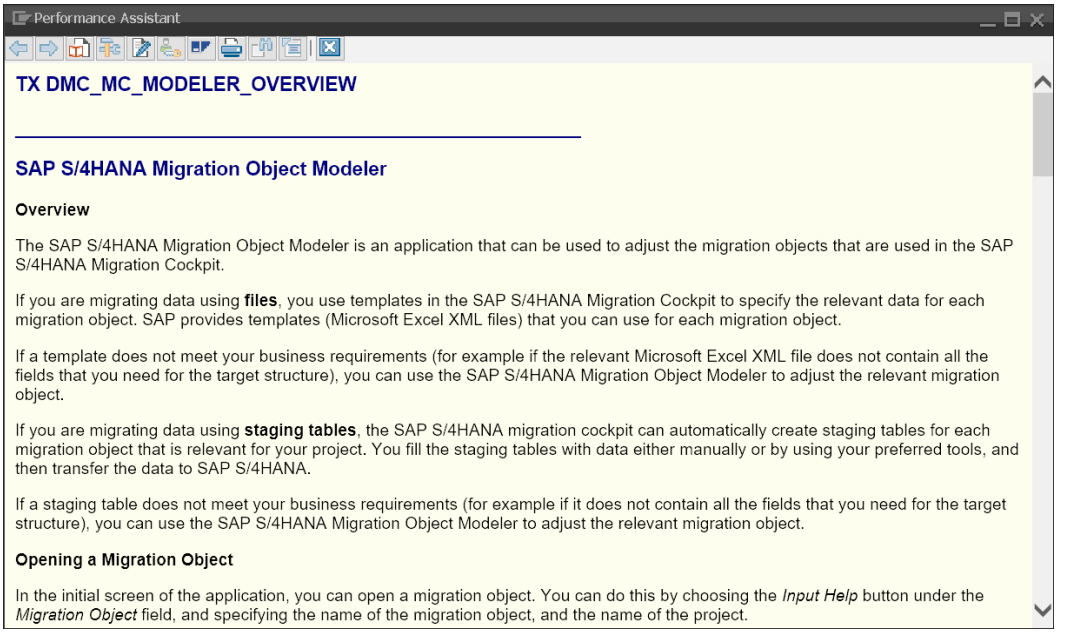


Figure 14.3 Initial Screen of Documentation for SAP S/4HANA Migration Object Modeler

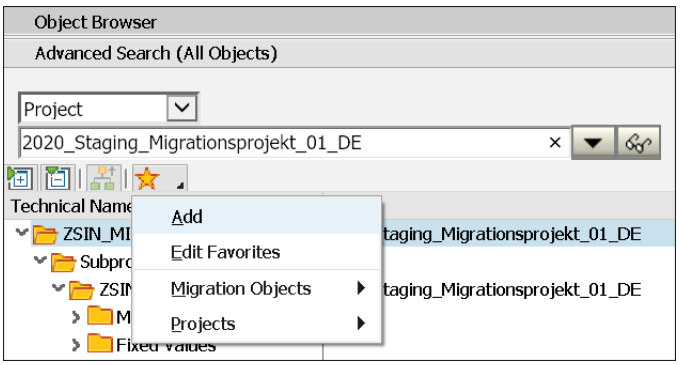


Figure 14.4 Selection Options for Favorites List

14.1.1 Selecting an Existing Migration Object

Selecting a migration object

If you want to select an existing migration object, choose the ▼ button ❶ on the right side of the empty input field for the migration object (see Figure 14.5).

The search **Find Migration Object** appears. Here, you first select the relevant migration approach in the **Approach** field; in our example, we select **Migrate Data Using Staging Tables** ❷. In the **Project** field, enter the search

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term for the project that includes the migration object. Confirm with ✓ (**Next**). Then double-click the desired migration object ❸ or confirm with ✓ again (**Next**). Alternatively, you can also display the entire project and select the corresponding migration object from this list.

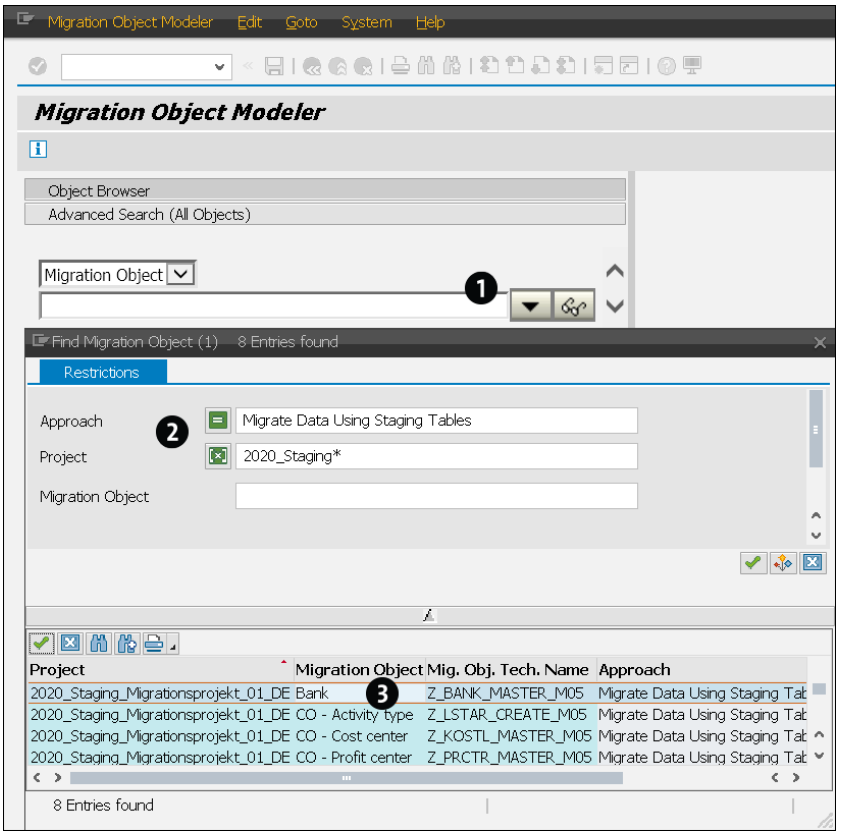


Figure 14.5 Selecting Object in SAP S/4HANA Migration Object Modeler

The full range of the migration object modeler functions for this migration object is now available.

14.1.2 Advanced Search (All Objects)

Advanced search help

The second view of the migration object modeler is **Advanced Search (All Objects)**. By means of the selection button in the left selection area, shown in Figure 14.6, you can toggle between the object browser and the advanced search.

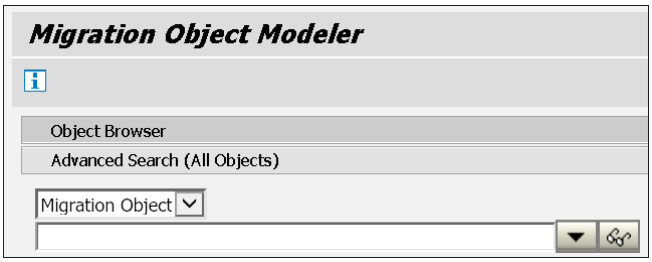


Figure 14.6 Selection Button for SAP S/4HANA Migration Object Modeler (Transaction LTMOM)

In the advanced search, you can search by **Projects** and **Migration Objects**. Select the required search mask and restrict your search using the search fields of the search mask. Figure 14.7 shows an example of a search for all migration objects for the migrate data using staging tables migration approach, which are created in projects that include "*Demo*" in their names.

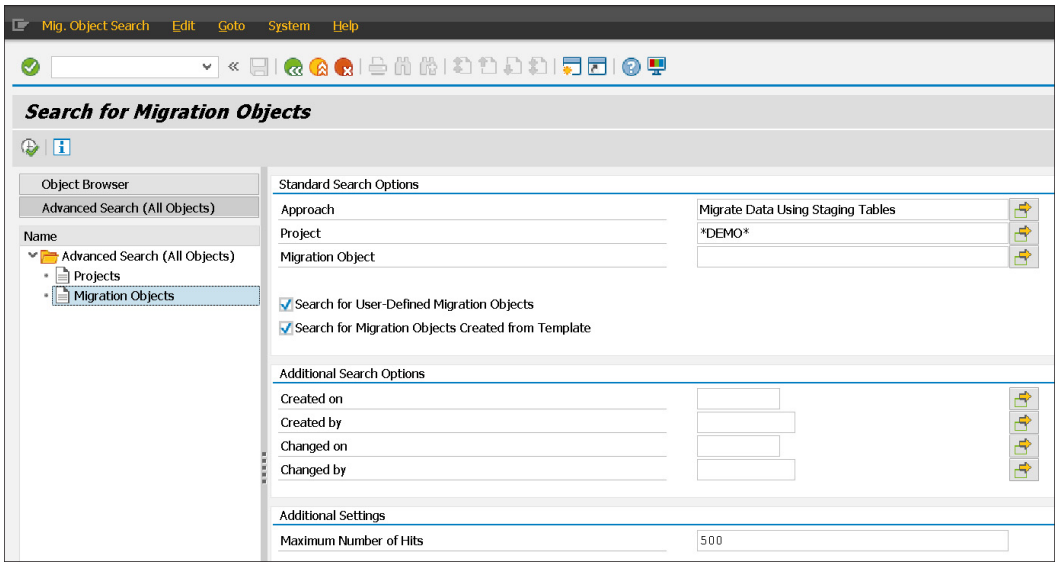


Figure 14.7 Selection Mask of Advanced Search

The search also includes all self-created migration objects (**Search for User-Defined Migration Objects**) and migration objects that were created using a migration template (**Search for Migration Objects Created from Template**).

14.2 Modeling for Data Migration using Staging Tables

Chapter 13, Section 13.2 and Section 13.3 introduced you to the migration approaches for migrating data using files or staging tables. This section now describes how you can use the migration object modeler for this approach.

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The description of the full functionality of the migration object modeler would go beyond the scope of this chapter. For this reason, we focus on the presentation of common application cases:

- **Adjust delivered migration objects (see Section 14.2.4)**
  In the SAP S/4HANA on-premise version, you can customize business processes according to your specific requirements better than in SAP S/4HANA Cloud. If the predefined migration objects of the migration cockpit do not meet your expert requirements, you can adapt them using the migration object modeler. The maximum functionality of a migration object, however, is specified by the migration API. Functions that do not support the migration API used cannot be added, of course.
- **Create new migration objects (see Section 14.2.5)**
  If the migration API used is missing a functionality or if you are missing a migration object completely, you can create a new custom migration object. For this purpose, you use function modules either that you have written yourself or that were released by SAP or CDS behavior definitions. These modules must be compatible with the migration object modeler so that they can be used.
- **Create own rules and translation objects (see Section 14.2.6)**
  You can create your own rules and translation objects if the delivered rules do not fully cover your application case or if you require user-defined rules.



Restrictions for Modified Migration Objects

Before you adapt a delivered migration object, you must note the following: in case of errors in adapted or self-developed migration objects, SAP only provides support for content-related problems that are based on the original template. SAP Note 2481235 provides more detailed information.

14.2.1 The Migration APIs Used

Standard APIs (BAPIs or function modules), released by SAP for SAP S/4HANA, are used to transfer data via the migration cockpit.

Function module documentation

Some of these APIs, and BAPIs in particular, include so-called function module documentation. You can call this documentation using the Function Builder (Transaction SE37). The documentation often provides useful information on import structures and their fields.

Standard interfaces

In addition to using standard APIs, the system also supports the use of CDS behavior definitions since SAP S/4HANA release 1909. Examples of migration objects that utilize these new usages include the migration objects ECM Change Master and QM—Quality Info Record in SAP S/4HANA Cloud.

Persönliches Exemplar für Ernst Schulten

14.2.2 Displaying a Migration Object

After you have selected a project or migration object, you can view and edit the migration objectin the object browser.



Client Dependency

Migration projects created in SAP S/4HANA 2020 or higher and for the data migration approach data migration using staging tables can only be displayed and changed in the migration object modeler in the respective client. This is not the case for older versions of the migration cockpit (Transaction LTMC).

Figure 14.8 shows the object browser for a selected migration object in display mode.

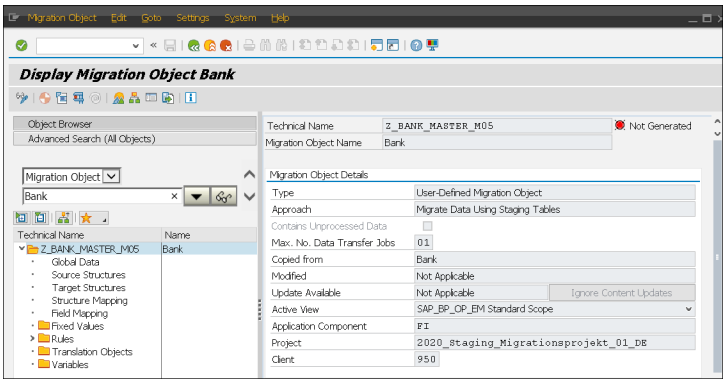


Figure 14.8 Object Browser with Migration Object Selected

The button lets you toggle between display and change mode. The **Migration Object** menu entry also provides more functions, which you can partially call via the application bar. Those are described ahead.

The navigation tree

First, let's take a look at the navigation tree on the left side. The navigation tree has a root node that represents either a migration object or a migration project. For example, if you select a migration object in the tree, you can use the button to navigate one level up to the migration project. The navigation tree has the following structure:

- The top node is the migration project. Directly below that, you can see the **Subprojects**. A 1:1 relationship exists between the project and the subproject; that is, exactly one subproject is assigned to one project.
- Below the subproject, you can find the **Migration Objects** and transfer rules of the migration subproject.

  Transfer rules can be created at subproject or migration object level, and they are then available at the underlying levels. The rules of the migra-

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tion objects delivered by SAP have mainly been created at the subproject level and are therefore available for all underlying migration objects. Rules that are delivered at the project level are displayed for information purposes as **Read-Only**. These rules cannot be changed.

- A migration object has the following navigation nodes:
  - **Global Data**: Here you define global data types and variables.
  - **Source Structures**: Here you define the source structures.
  - **Target Structures**: Here you can find the target structures of your migration API and define important settings.
  - **Structure Mapping**: Here you link the source structures with the target structures.
  - **Field Mapping**: Here you assign the source fields to the target fields and link them with a transfer rule if required. You can also assign event-based rules to the respective processing times.
  - Below that, the system displays the rules of this level.

Figure 14.9 shows the parts of the navigation tree for our sample projects.

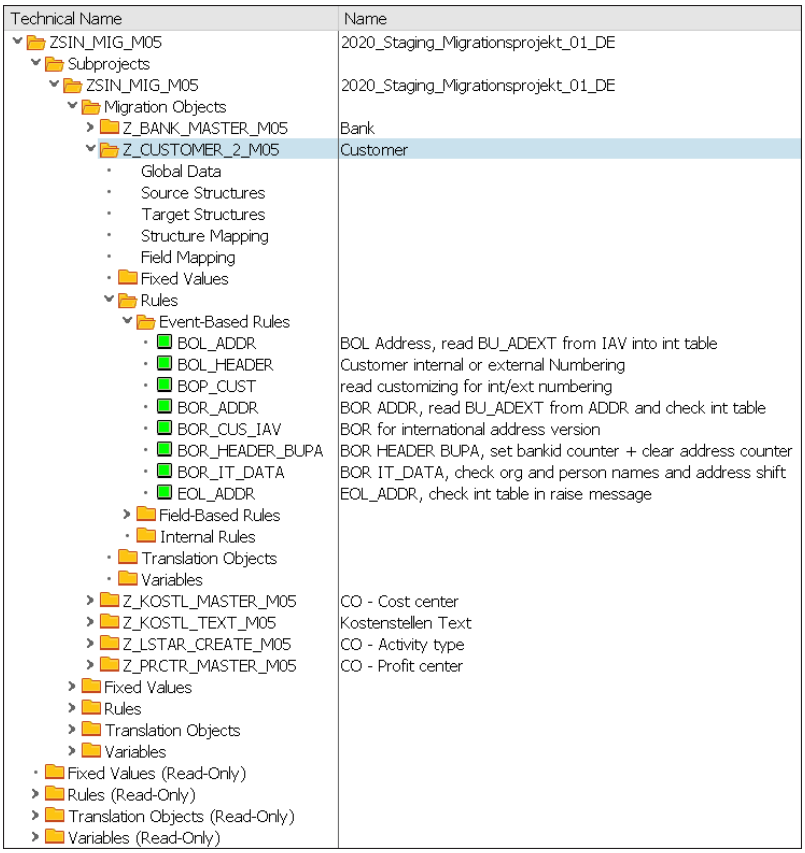


Figure 14.9 Navigation Tree in Object Browser

Rules

Types of rules

The object browser distinguishes among four main types of transfer rules:

- **Fixed values**
  A fixed value is a constant value, like a fixed controlling area, to which you can assign multiple fields or rules. Changes to the fixed value automatically apply to all assignments. To assign a fixed value to a target field, you first create a rule, assign the fixed value to this rule, and then assign this rule to the target field. You cannot assign a fixed value directly to a target field.
- **Event-based rules**
  Event-based rules comprise ABAP coding that is executed at predefined events, for example, start of loop, end of record, after loop, etc. By means of event-based rules, you can execute user-defined ABAP coding at specific events.
- **Field-based rules**
  Field-based rules can be based on translation objects, fixed values, or free ABAP coding and assigned to fields of a target structure. They can thus determine the target value either via translation objects or fixed values as well as via complex algorithms.
- **Internal rules**
  In contrast to event-based or field-based rules, internal rules are not assigned to events or fields but are called by these rules. They are something like locally defined, reusable subroutines.
- **Translation objects**
  Translation objects define how values from a specific field in the source system must be translated to the target values in the target system during data migration. Translation objects cannot be assigned directly to a target field. You must first assign the translation object to a field-based rule and then assign the rule to the corresponding target field.
- **Variables**
  Here you can define global variables that you populate, for example, in an event rule at the beginning and then read or change in other rules.

For more details on rules, refer to the documentation listed in Section 14.1 and in Section 14.2.6.

Generating and Displaying the Runtime Object

By means of the  technical function (**Generate Runtime Object**) in the application bar, you can newly generate the local function group used by the migration cockpit. This newly generated function group is required after the source structures or fields have been mapped because the fields will not be processed otherwise. When you generate the runtime object, the system automatically synchronizes the structures of the migration object.

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Display Generated Function Group

You can use (**Display Generated Function Group**) to view the entire function group in the application bar. The ABAP Editor then displays the function group (see Figure 14.10).

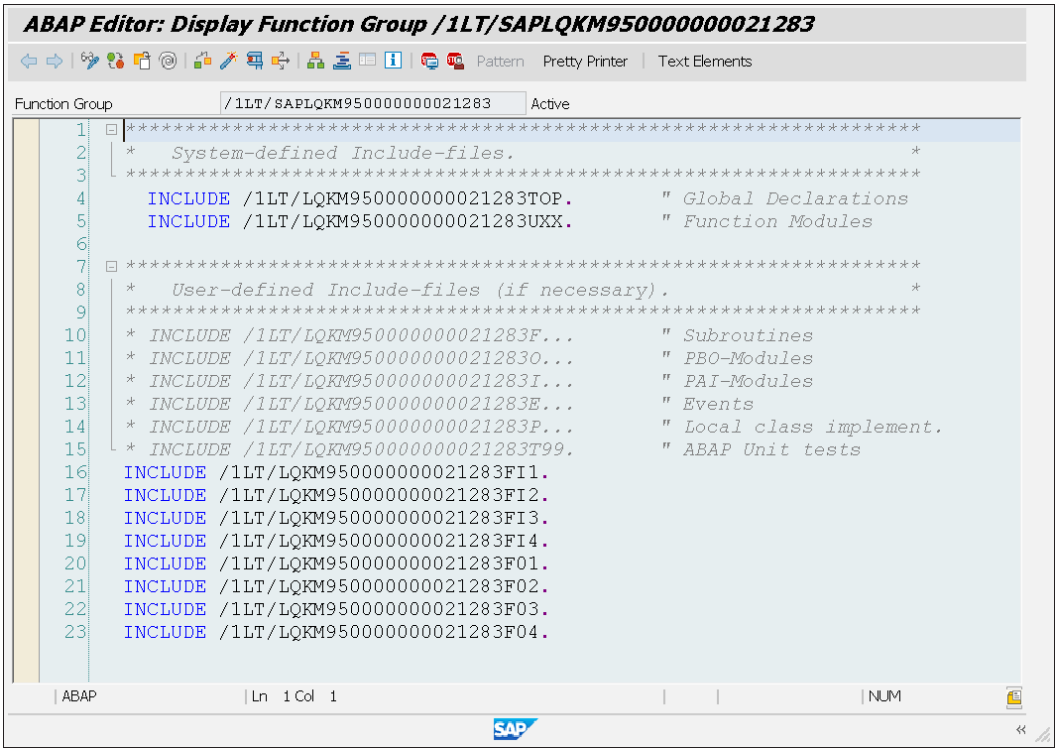


Figure 14.10 Display Generated Function Group

Updating the Migration Object

Update of a migration object

After you have adapted a delivered migration object, it may happen that the system displays a message like that shown in Figure 14.11 when you open this object in the migration cockpit.

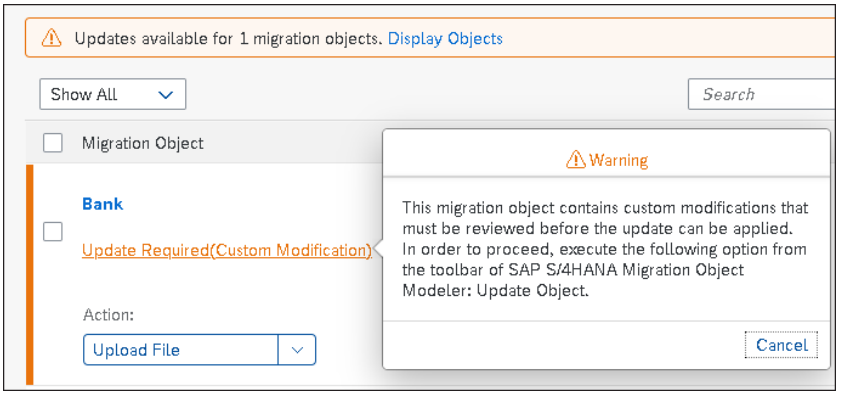


Figure 14.11 Warning Message in SAP S/4HANA Migration Cockpit

In this case, you must open the object in the migration object modeler. In the migration object's header data, the **Modified** and **Update Available** fields both have the value **Yes** (see Figure 14.12).



Figure 14.12 Update Available

A confirmation window is displayed if you now use the button to run the update in change mode.

If you confirm this message, all customer-specific modifications to this object are deleted and the object is set to the current state delivered by SAP.



Ignoring Updates for This Object

You can ignore the update for a migration object. As a result, no update takes place even if SAP modifies an object. To activate the update for the migration object again, you must delete the existing object and then create it anew from a template.

14.2.3 Creating a Migration Object

You have various options to create a migration object in your project. When you call the migration object modeler, the **Migration Object Modeler** menu entry provides the following editing functions (see Figure 14.13):

- **Create Migration Object** either **From Template** or **User-Defined**
- **Copy Migration Object**

For both options, you can select the migration approach for which you want to execute this action: either **Migrate Data Using Files/Staging Tables** or **Migrate Data Directly from SAP System**.

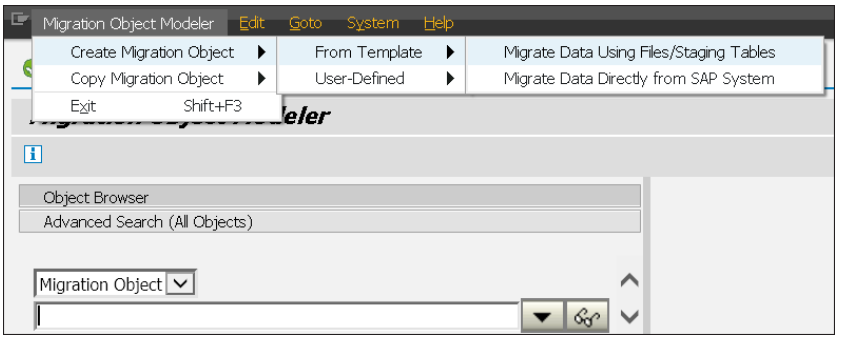


Figure 14.13 Migration Object Modeler Menu Entry

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You can also call these functions if you have already selected a project or migration object. In this case, the topmost menu entry changes to **Project** or **Migration Object**, and you can no longer choose between the various migration approaches because a migration approach always applies to the entire project.

The following sections describe the three different options for creating a migration object.

Creating a Migration Object from a Delivered Template

Creating a migration object from a template

If you want to add a migration object to an existing migration project that was previously created via the migration cockpit, you can copy one of the objects delivered by SAP to this project as a template. The so-called copy wizard is displayed after you select the menu path **Migration Object Modeler • Create Migration Object • From Template • Migrate Data Using Files/Staging Tables**. Enter the project name in the first screen. The project must have been created in the migration cockpit. In our example, this is the `2020_Staging_Migrationsprojekt_01_DE` project. To add a template object, you either enter the technical project name or the description, or call the search help. Next, you select the migration object to be copied—in our example, the **Cost Center** object (see Figure 14.14).

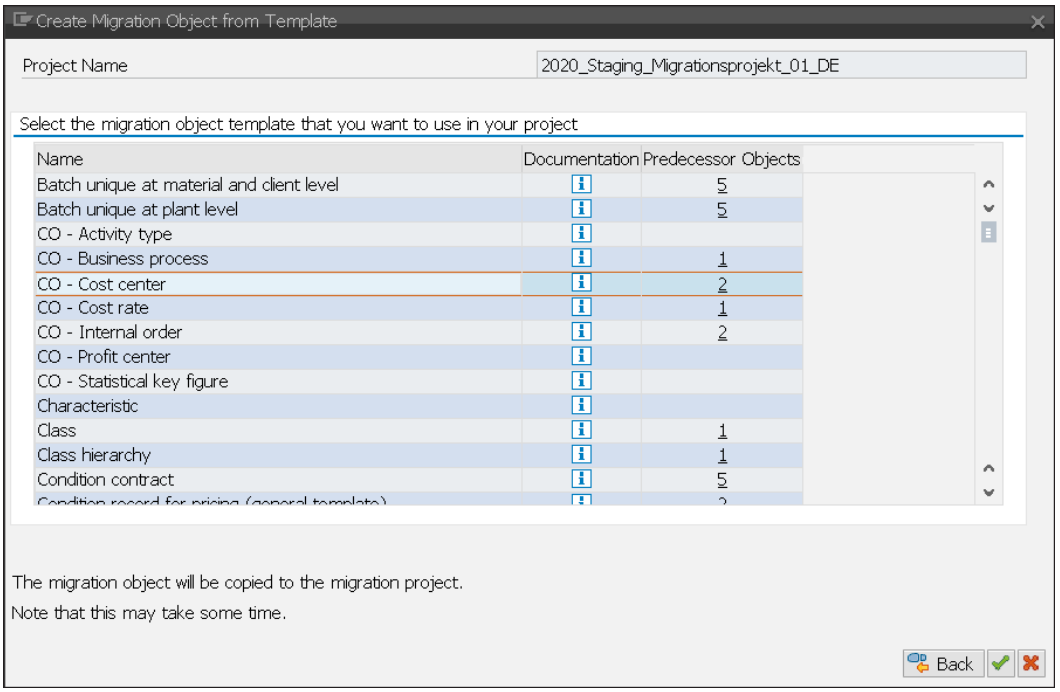


Figure 14.14 Selecting Migration Object from Template

Confirm your selection with the button (**Next**). The new migration object is displayed in the migration object modeler (see Figure 14.15).

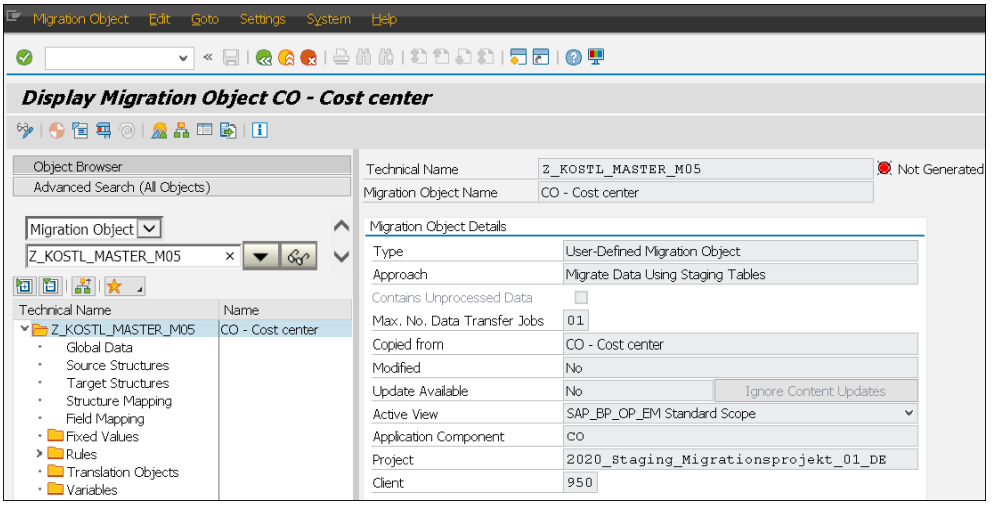


Figure 14.15 Migration Object Copied from Template

If you select the object in the navigation tree, you can navigate one level up with the button so that you can view the project level.

The functionality described corresponds to the selection of a migration object in the migration cockpit. The reference to the template object persists, and you cannot make any changes to the fields delivered by SAP (e.g., to change the field length). If SAP updates the delivered migration objects, you are prompted to update the migration object (Section 14.2.2).

Copying a Migration Object

Copying a migration object from another project

You also can copy a migration object from one migration project to another. To do so, first select the template project in the **Project Name** field of the **Select an Object to Copy From** area and then select the object to be copied in the **Migration Object ID** field (see Figure 14.16).

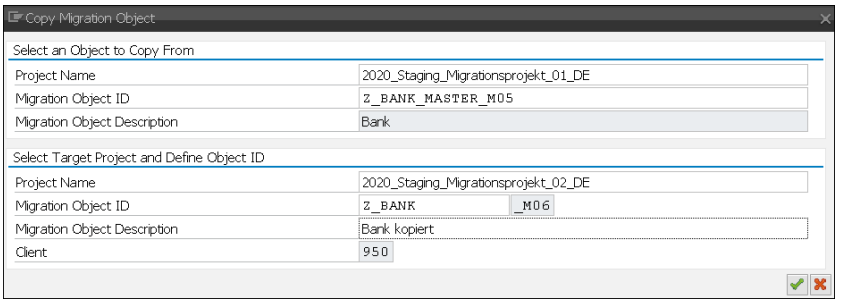


Figure 14.16 Copying Migration Object

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Subsequently, you choose the target project in the **Project Name** field in the **Select Target Project and Define Object ID** area and define the **Migration Object ID** and the **Migration Object Description**. A migration object ID always starts with `Z_`, followed by an object name that can be selected freely. The three-digit unique mass transfer ID is taken from the project to which the object is copied.

By clicking (**Next**), the object is copied and then displayed in the migration object modeler (see Figure 14.17). As you can see, the mass transfer ID `_M06` was attached to the name.

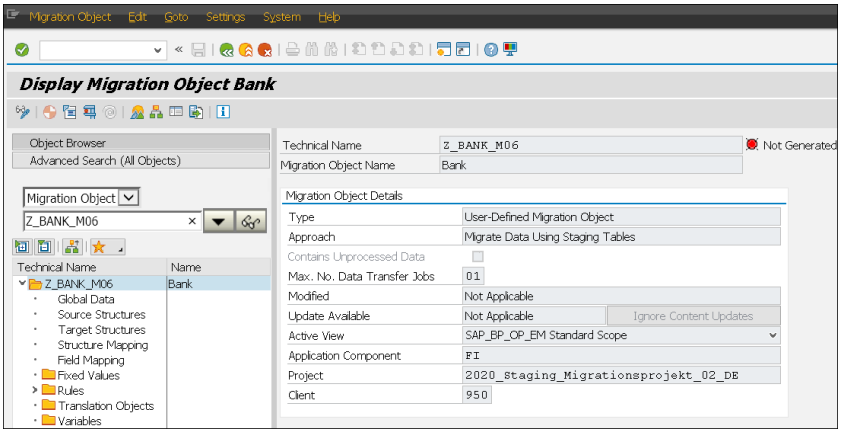


Figure 14.17 Copied Migration Object

In contrast to creating a migration object from a template, copying a migration object doesn't have any reference to the template object. The migration object is considered as a separate customer-specific migration object. You can adapt all fields (e.g., change the field length). All fields of the source structure are marked as **User-Defined Field**. There is no update if the SAP system changes the migration object through an upgrade or correction.

You can copy migration objects both from projects that were created in another client and from older projects that were created in Web Dynpro using Transaction LTMC.

Also Copy Includes when Copying Migration Objects

If you want to decouple the copied migration object completely from updates and corrections, you should also copy the existing and assigned includes in the **Target Structures** area to your customer namespace and reassign them.

Before we describe how to create a custom migration object (Section 14.2.5), you must first learn how to extend an existing migration object.

Persönliches Exemplar für Ernst Schulten

14.2.4 Extending Existing Migration Objects

Extending a migration object

In this section, we extend an existing migration object by a field. For this purpose, first select the object as described in Section 14.1.1. In the object browser, you can then perform the following activities via the navigation tree.

Editing Global Data

Global data

Every migration object has a **Global Data** area where you can store global data definitions. The global data of a delivered migration object contains the header documentation of the migration object with the following important information:

- Migration object name of the template object
- Creation date and release of the first delivery
- Migration API used (function module) with any existing wrapper function module
- Rough change history

Figure 14.18 shows the global data of the **Bank** migration object.

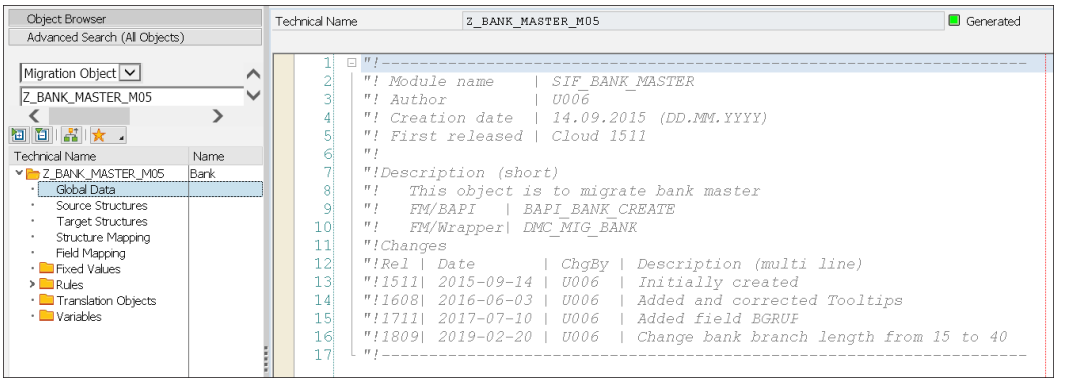


Figure 14.18 Global Data Area of Migration Object

Editing Source Structures

Adding fields to the migration template

The migration API for transferring a migration object usually contains more structures and fields than SAP Best Practices covers. You can edit this source structure via the **Source Structures** navigation node. You can then add, for example, missing fields of the migration template of an object. First, switch to the change mode by clicking the **Display<->Change** button in the application bar. Then select the **Source Structures** navigation node. The view in Figure 14.19 opens, shown in full-screen mode here.

You can edit the fields of a structure by double-clicking the structure in the source structure tree. By navigating to **Settings • Technical Names On/Off**, you can show or hide the technical names of the fields in the structure tree.

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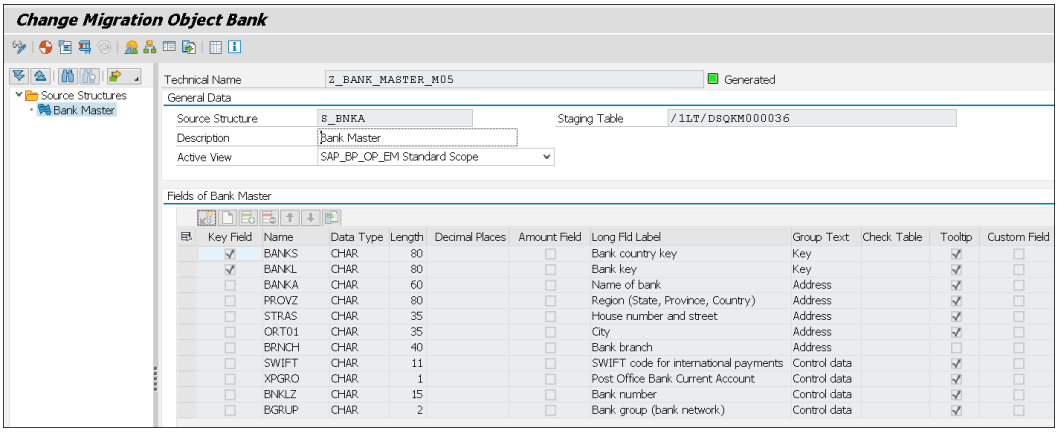


Figure 14.19 Edit Source Structures

Above the field list, in the right-hand pane of the object modeler, you can find several functions:

- (**Add Field**) at the end of the list
- (**Insert Field**) above the marked field
- (**Deleted Field(s)**)
- / (**Move Up/Move Down**)
- (**Upload Structure Field List**): to extend the structure with fields using a CSV file or completely overwrite the structure

Add Field

You now add a new field, PSTKO, to the source structure of the bank data in this example. To do so, click the button (**Add Field**) and enter the desired values for the field name, data type, field length, and so on in the new row (see Figure 14.20).

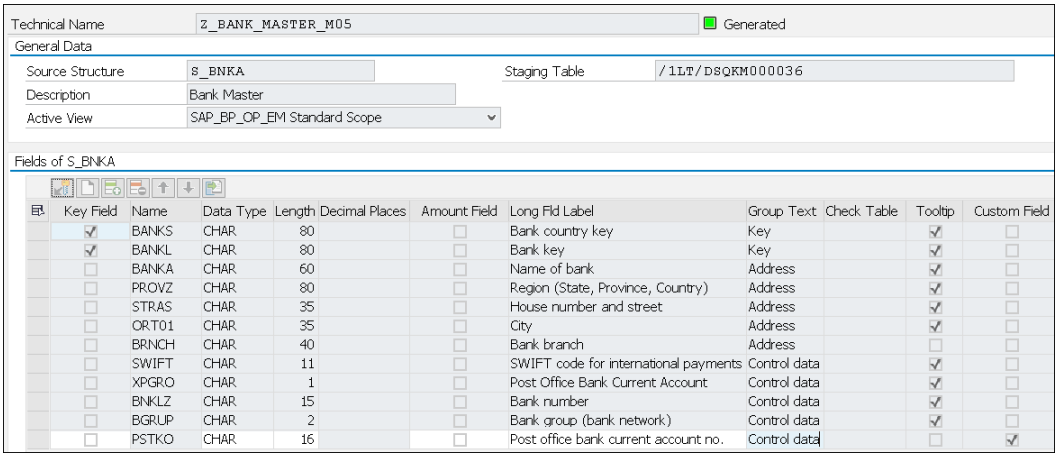


Figure 14.20 Adding Field to Source Structure

The field is automatically marked as **Custom Field** in the last column. Now, click (**Save**) to save your changes. Your source structure now includes the new field.

Modifying the migration template view

You can then modify the migration template view. First, select the **Change View** function in the context menu of the source structure. The example shown in Figure 14.21 shows the source structure view **Bank Master** (S_BNKA) of the migration object for the bank master.

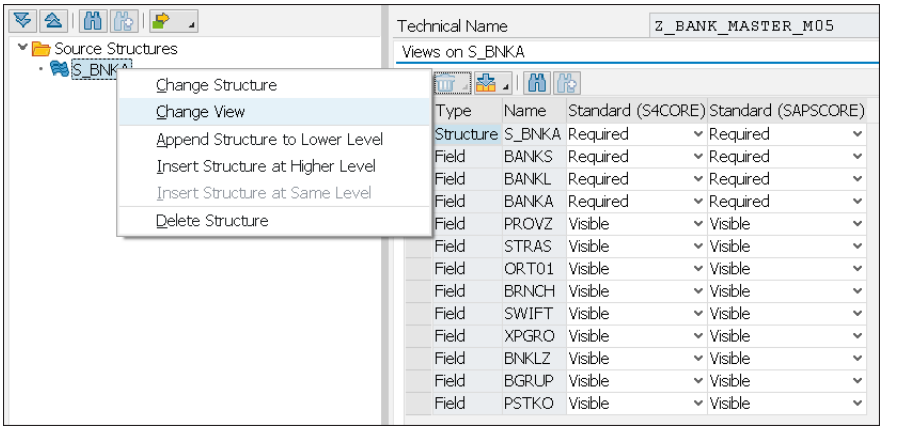


Figure 14.21 Modifying Migration Template View

You can adapt the visibility of structures and fields in the migration templates (Microsoft Excel templates or staging tables) using the following values:

- **Not Visible**
  The field or structure will not be visible in the migration template. However, hidden structures and fields may cause the data import to be terminated with an error.
- **Visible**
  The field or structure is visible in the migration template and can be populated.
- **Required**
  The structure or field is mandatory and needs to be populated.

If you want to change the delivered view settings, the best approach is to create your own customer view. Click the button (**Custom**; see Figure 14.22). The system inserts a new custom view.

You can now specify if, for example, specific fields are not supposed to be visible in the migration template because you do not want to migrate these fields. Then click the button (**Save**) in the system function bar to save your changes.

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Custom View

After you have created a custom view, you must change the **Active View** in the migration object from **Standard Scope** to **Customer-Specific Scope** in the migration cockpit or in the migration object modeler so that the fields and structures can be displayed as they are set in the custom view.

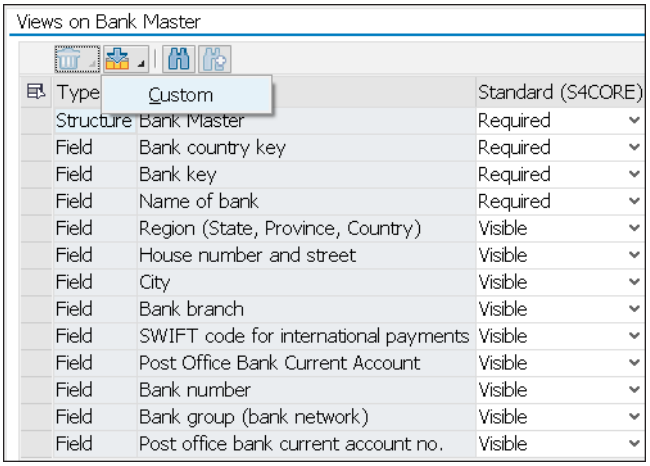


Figure 14.22 Selecting View to Be Changed

Downloading the template file and metadata

In addition to the functions described for the source structure, you can also download a template file for your migration object using the button (**Download Template File**) in the application bar. If you want to download metadata for the staging tables, you can do so using the button (**Download Staging Table Fields**). This button is only available if you are in the source structure node.

Foreign Key Relationship

The structures in a migration object are interconnected through foreign key relationships. If you add a new substructure, you must establish a foreign key relationship to a structure at a higher level using the button (**Foreign Key Relationships**).

Editing Target Structures

Field and structure of the function module

The **Target Structures** structure node displays all fields and structures of the function module used to transfer the data of the migration object. In the workspace on the right, which is shown in Figure 14.23, you find the name of the function module that is used for data transfer. In the example

given, this is the DMC_MIG_BANK function module, which is a wrapper function module that wraps and calls the BAPI_BANK_CREATE function module. In addition, you can see the settings of the function modules.

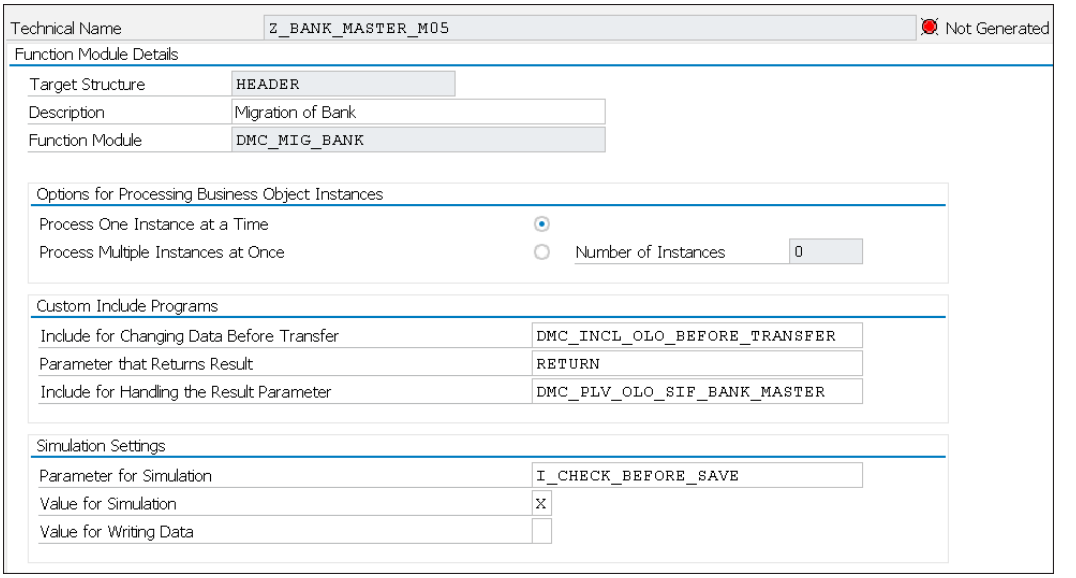


Figure 14.23 Header Structure: Settings of Function Module

The following settings are important for processing:

- **Parameter That Returns Result**
  This field includes the parameter of the function module that returns the messages.
- **Parameter for Simulation**
  This function module parameter controls the simulation of the data transfer.
- **Value for Simulation**
  This field comprises the value of the parameter that runs the simulation.
- **Value for Writing Data**
  For some function modules, the simulation of data is triggered via the commit control. The value X in the transfer parameter would mean that the data is written. Accordingly, **Value for Simulation** would be an empty value and **Value for Writing Data** would be X in this case.

You usually should not make any changes in case of object extensions.

In addition, in the **Target Structures** area, you can have the system display the fields of the target structure by double-clicking on the desired structure or field (see Figure 14.24). Alternatively, you can use the **Display Structure** entry in the context menu.

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Displaying/Hiding Structures

If required, you can hide target structures that are based on a function module so that they are not shown in the hierarchy. To do so, in the workspace of the target structure, select the button (**Show/Hide Target Structures**) in change mode.

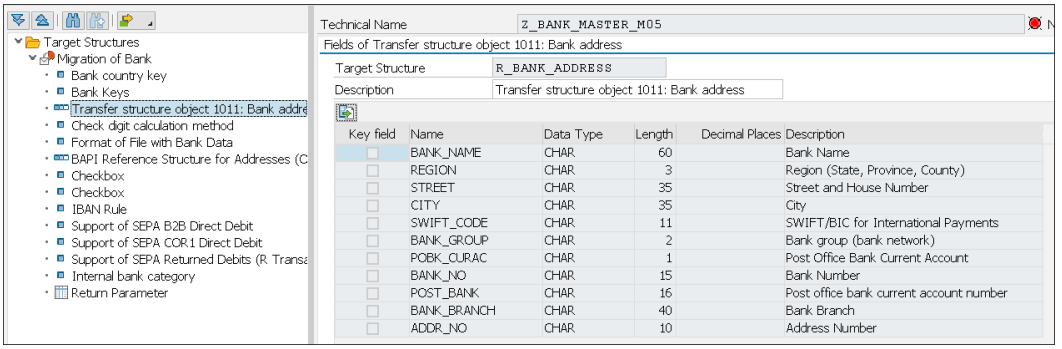


Figure 14.24 Display Target Structure

Display Structure Mapping

Mapping source structures to target structures

In the **Structure Mapping** area, you can see how the source structures that are linked to a migration object are assigned to the target structures in the SAP S/4HANA system. You can view the assigned source structures in the right area next to the target structures. After the name of the target structure, separated by <<, the system displays all source structures assigned to this structure. Figure 14.25 shows an example of a Bank migration object (**Bank Master**).

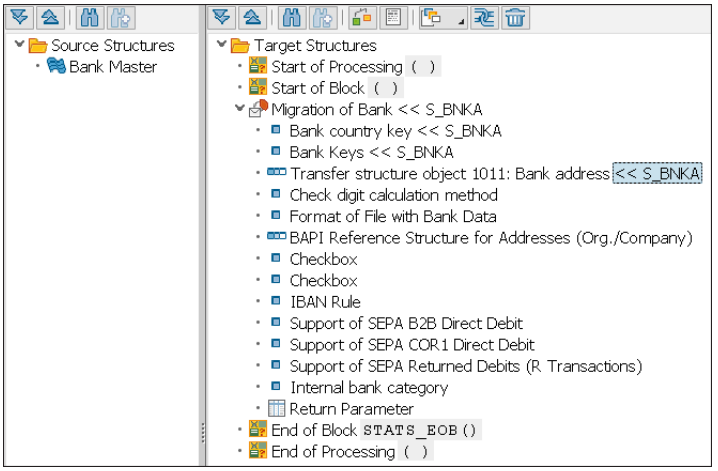


Figure 14.25 Display Structure Mapping

You assign a source structure to a target structure by selecting the source structure in the workspace on the left and dragging-and-dropping it to the required target structure. You can select the following additional functions in the structure mapping:

- (**Expand ALL**) or (**Collapse ALL**)
- (**Find**)
- (**Check Structure Mappings**)
- (**View Structure Mapping Preview**)
  With this function, the system displays the ABAP source text that will be generated because of the structure mapping that you made. This enables experts to detect errors in the structure mapping at an early stage.
- (**Rule Option**)
  You can assign event rules to the processing times **Start of Processing()**, **Start of Block()**, **End of Block()**, and **End of Processing()**. These rules include ABAP code which is processed at the times when these source code positions are passed during data transfer.
- (**Edit Structure Mapping**)
  If you want to edit a structure assignment in the target structure, select this assignment and click this button.
- (**Delete Structure Mapping**)
  If you want to delete a structure assignment, select the assignment and choose the **Delete** button.



Switching the Position of Structures

If you prefer to display the source structures on the right side of the workspace and the target structure in the middle or on the left side of the workspace, you can switch the position's structure via **Settings • Switch Position of Structures**. This setting is stored in the user parameters and retained when the transaction is called again.

Editing the Field Mapping

Assigning user-defined fields

In **Field Mapping**, you can drag and drop so-called user-defined fields, which you assigned to the source structure previously, as described in Section 14.2.4, to an unassigned field in the target structure on the right. (The unassigned field is marked by a red circle with a white cross .)

In our example, select the **Post Office Bank Current Account No.** in the source structure and drag-and-drop it to the **Post Office Bank Current Account Number** field (see Figure 14.26).

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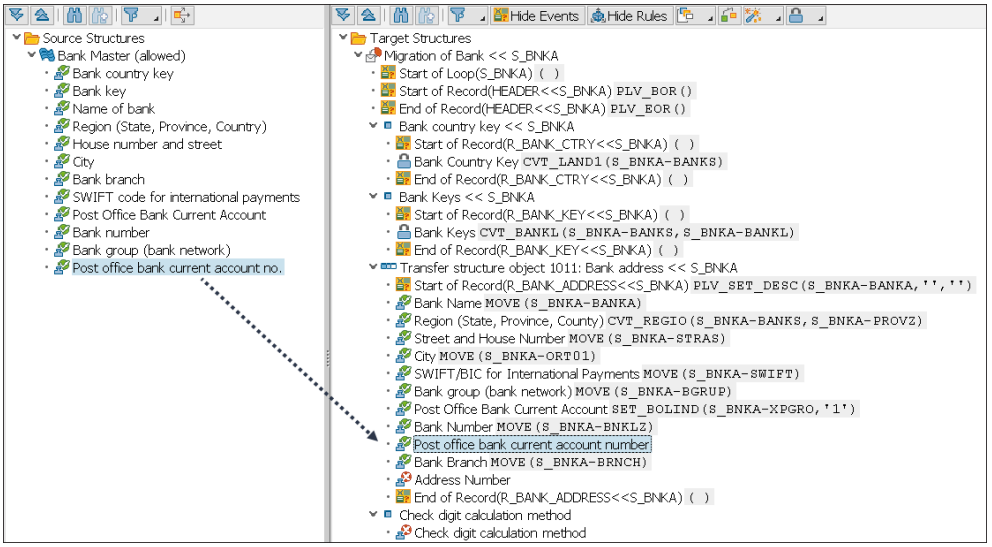


Figure 14.26 Edit Field Mapping

Type conflict

If the field definitions of the user-defined field and target structure fields are different, a dialog window appears to inform you about this conflict. The system asks you if you really want to make this field assignment. A MOVE rule that specifies a 1:1 mapping is defined for the assignment. In case of a MOVE rule, the values to be migrated to this new field must be written in the migration template file in the appropriate target format. Alternatively, you can also define rules to convert the values. Section 14.2.6 describes how to create user-defined rules. The result of a MOVE assignment is shown in Figure 14.27.

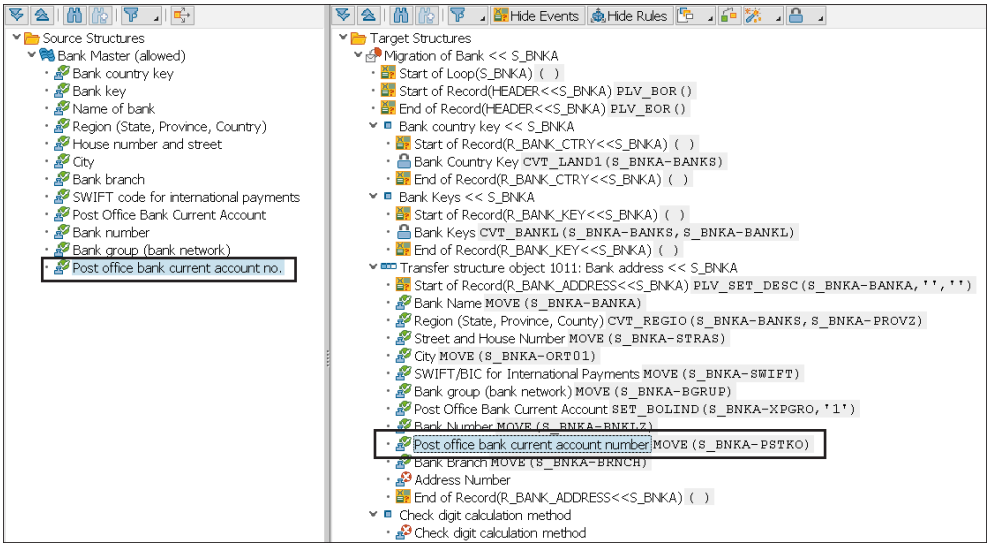


Figure 14.27 Modeler: User-Defined Field Assigned

Analogous to the structure mapping, the field mapping provides additional functions that you can select:

- (**Expand All**) or (**Collapse All**)
- (**Find**)
- (**Filter**) **Display of fields in target structure** according to the following criteria:
  - **Show all Fields** (default)
  - **Show Fields with Mapping**
  - **Show Fields without Mapping**
  - **Show Fields with Incomplete Mapping**
  - **Show Fields with Conflicts**
  - **Show Fields without Default Mapping**
- (**Filter**) **Display of fields in source structure** according to the following criteria:
  - **Show all Fields** (default)
  - **Show Mapped Fields**
  - **Show Unmapped Fields**
- Hide Events (**Display/Hide Events**)
  Displays/hides the processing times, **Start Loop()**, **Start Record()**, **End of Record()**, **After Loop()**
- Hide Rules (**Display/Hide Rules**)
  displays/hides the rules assigned
- (**Rule Options**) Assign or Remove Rule
  With these options, assign rules to fields and processing times and edit their assignment
- (**Consistency Check**)
  To check the consistency of the field mapping
- (**Mass Rule Proposals**)
  To have the system propose rules directly; described in Section 14.2.5

Figure 14.28 shows the **Assign Rule** input field for the **Post Office Bank Current Account Number** field of our example. You can use the value help of the **Name** field to select existing rules or create a new rule with the button and change the rule with the button.

Save, Generate, Get Started

Save your changes by clicking the **Save** button in the system function bar. Then click the button (**Generate Runtime Object**) in the application bar to newly generate the runtime object (function group). Now open the object in the migration cockpit, download the new migration template file, and migrate your bank data, including the new field.

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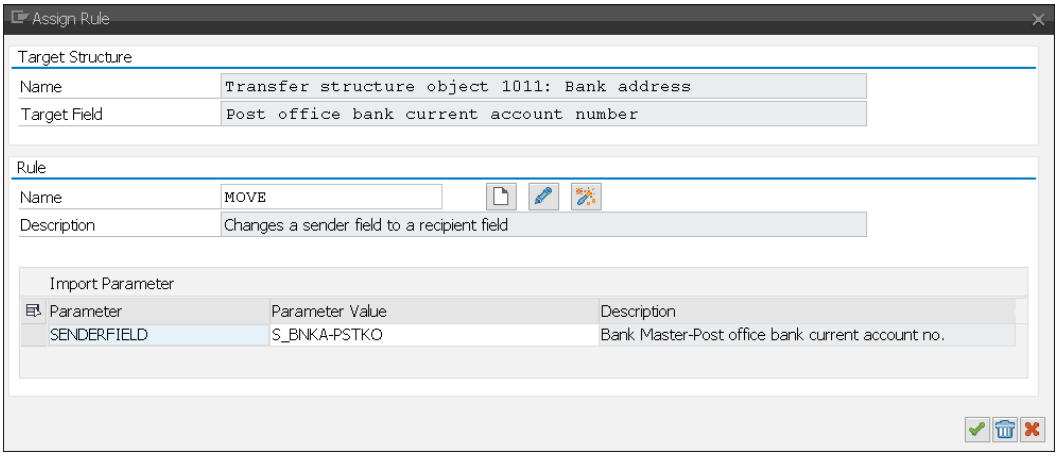


Figure 14.28 Assign Rule

Custom Fields

If you defined custom fields using the field extension described in Chapter 3, Section 3.4, custom fields are supported by the migration cockpit and automatically added to the source structure. As a result, these fields in the migration template can be provided with values. Details on which migration objects support this functionality and additional information is available at the following link: *http://s-prs.co/5279103*.

In the following section, you'll create a custom migration object.

14.2.5 Creating user-defined Migration Objects

Language-dependent descriptions for cost centers

The migration object modeler also enables you to create user-defined migration objects. We selected a common application case as an example. With the delivered migration object for cost centers, you can only create the name and the description of a cost center in one language because the function module used, `BAPI_COSTCENTER_CREATEMULTIPLE`, supports only one language. In our example, we'll create a new migration object on the basis of the `BAPI_COSTCENTER_CHANGEMULTIPLE` change module to add the name and description to the existing cost center in additional languages.

Requirements on Migration APIs

To be able to use a function module as a migration API, it must be compatible with the requirements of the migration cockpit. The requirements for a migration API are as follows:

- The function module must not throw an explicit COMMIT; the COMMIT must only be thrown by the migration cockpit.
- The function module must not trigger an implicit COMMIT (pop-up window, messages, etc.).
- All messages (error, warning, cancelation, information, success) must be returned in a return structure of the BAPIRET2 type.
- The function module must not throw any exceptions because this can lead to uncontrolled states and locking of the data record.
- In case of internal number assignments, the new keys must be returned.
- The function module should have a parameter for simulation.

Wrapper function module

BAPI function modules SAP releases for use by customers usually meet these criteria. If your function module does not meet these criteria or if it involves a method of an ABAP OO class, you can also build a so-called wrapper function module. In this case, you call the migration API to be used using this wrapper function module. The wrapper function module encapsulates the call of the desired migration API and should also meet the criteria mentioned previously. You can then integrate the return of messages in the correct format and the return of exceptions as messages into the wrapper function module. Sometimes, you can include a simulation parameter subsequently. As a result, a rollback is integrated after the call of the migration API if the parameter is set.



Requirements for a Migration API

SAP Note 2590165 provides a guide that describes the requirements for a migration API.

Creating a user-defined Migration Object

In our example, we take the migration project 2020_Staging_Migrationsprojekt_01_DE that we used in Section 14.2.3 and add a new migration object. The benefit is that the translation rules of the default migration object for cost centers can be taken over because we copied this migration object from the delivered template to our project.

Creating a new migration object in an existing project

In the project menu, select **Project • Create Migration Object • User-Defined • Migrate Data Using Files/Staging Tables**. A guided input dialog is opened. In the first input window, you assign the **Migration Object ID**. Enter your own text for your object after the preset Z_. In our case, the name of the migration object is "Z_KOSTL_TEXT." The mass transfer ID of the migration project is also preset so that the full **Migration Object ID** is Z_KOSTL_TEXT_MO5. Enter a meaningful description like "Cost Center Text" in the **Description**

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field. In the **Define Target Structure Using** field, select **Function Module**. You can find the migration object with this description in the migration cockpit. Figure 14.29 shows the first input window.

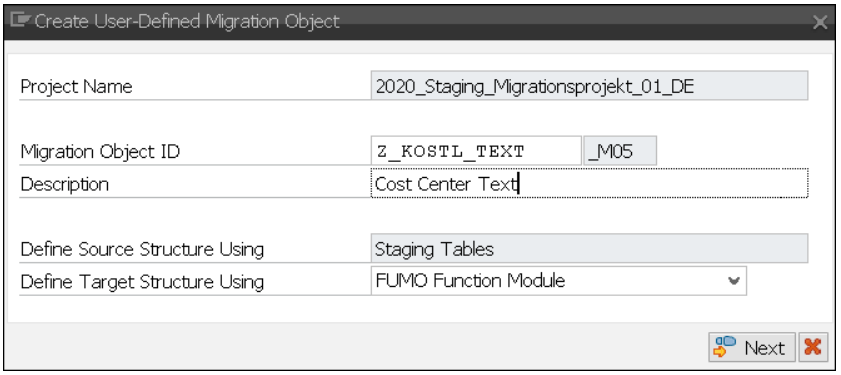


Figure 14.29 First Input Dialog Window for Creating User-Defined Object

Click the **Next** button to call the second input window. Here, under **Define Target Structure**, enter the value "BAPI_COSTCENTER_CHANGEMULTIPLE" in the **Name of Function Module** field. In the **Custom Include Programs** area in the **Parameter That Returns Result** field, enter the function module parameter that returns the messages—in our case, "RETURN." In the **Simulation Settings** area, enter "TESTRUN" in the **Parameter for Simulation** field and "X" in the **Value for Simulation** field. Figure 14.30 shows an overview of your input.

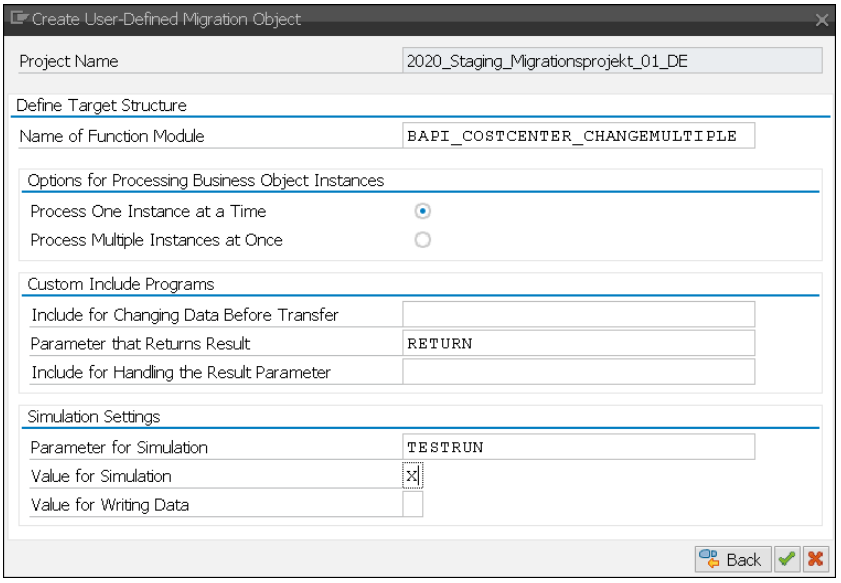


Figure 14.30 Second Input Dialog Window for Creating User-Defined Object

Persönliches Exemplar für Ernst Schulten

Then click the **Next** button; the new migration object is displayed in the migration object modeler.

Inserting the Source Structure

Creating a custom source structure

Next you create a source structure. Ensure that you're in the change mode. Double-click the **Source Structures** node in the navigation tree on the left. The editing area for the source structures opens on the right-hand side. For better processing, you should switch on the full-screen mode using the button. Here, select **Append Structure to Lower Level** from the context menu to insert a source structure (see Figure 14.31).

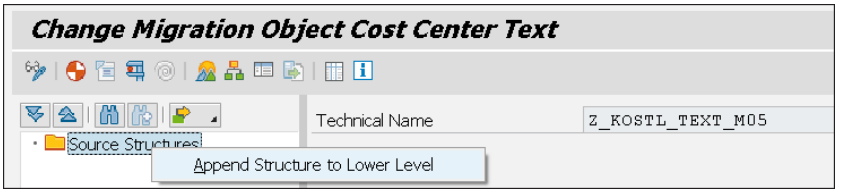


Figure 14.31 Inserting Source Structure

An input window is opened in which you enter the technical name of the structure in the **Name** field ("S_CSKT") and "Cost Center Texts" in the **Description** field. Confirm the subsequent query with **Yes**. You can then view an empty table in the workspace on the right, where you can insert the fields of Table 14.1 using the **Add Field** button.

Key Field	Name	Data Type	Length	Long Field Label	Group Text
X	KOKRS	CHAR	10	**Controlling Area**	Key
X	KOSTL	CHAR	80	**Cost Center**	Key
X	VALID_FROM	DATS	8	**Valid From**	Key
X	VALID_TO	DATS	8	**Valid To**	Key
X	LANGU	CHAR	10	**Text Language**	Key
	NAME	CHAR	20	**Name**	Text
	DESCRIPT	CHAR	40	**Description**	Text

Table 14.1 Fields of New Source Structure

Your source structure should now look like that in Figure 14.32. Save the new source structure with the **Save** button.

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Maximum Key Length

The total of all field lengths of the key at the top source structure node must not exceed 200 characters, so you should select key fields that are not too long. Otherwise, upon saving the source structure you'll receive an error message that the maximum key field length was exceeded.

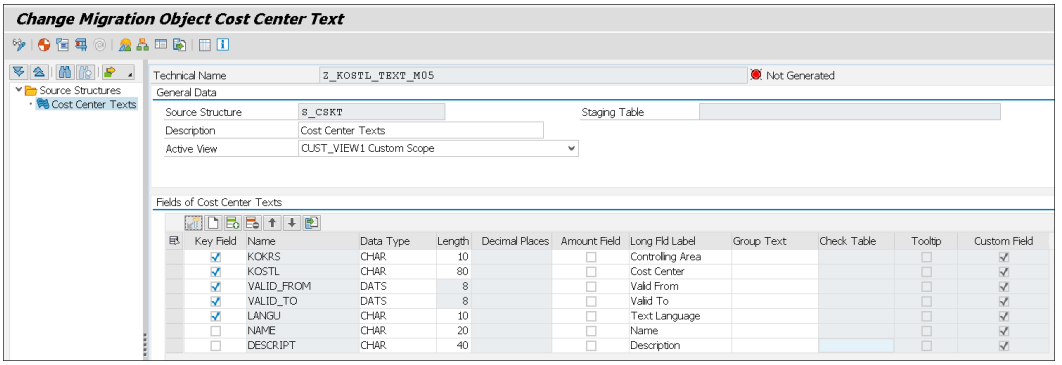


Figure 14.32 Source Structure with Fields

Adapting the View

Adapting the Custom View

In the last step, you should adapt the view using **Change View** or via the **Change View** context menu. The **Custom View** is automatically assigned to the new migration objects, and all key fields are marked as **Required** as shown in Figure 14.33.

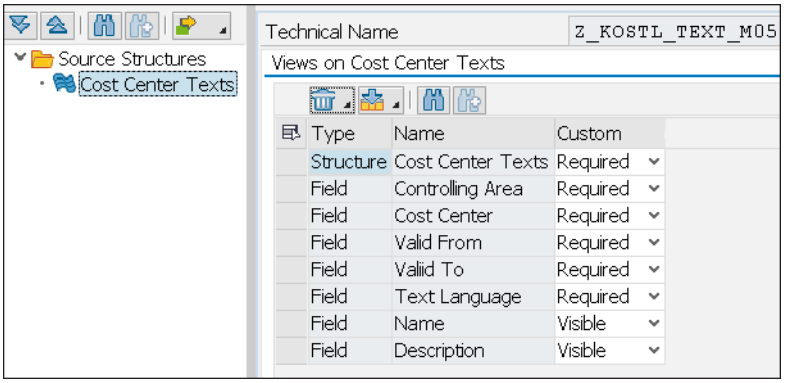


Figure 14.33 Source Structure: Maintenance View

Ensure that the **Custom View** option is selected in the **Active View** field (see Figure 14.32). You then save your selection again using the **Save** button.

Mapping the Source Structure to the Target Structure

Switch display to technical names

Because we already defined the target structure in the input dialog, we now directly switch to the structure mapping. Here, you should select **Settings • Technical Names On/Off** to switch the display of the technical names. This simplifies the assignment of structures because the structure descriptions can sometimes be confusing.

As shown in Figure 14.34, successively drag-and-drop the S_CSKT source structure to the following target structures:

- HEADER (header data)
- R_CONTROLLINGAREA (controlling area)
- R_LANGUAGE (language of texts)
- R_COSTCENTERLIST (cost center data)

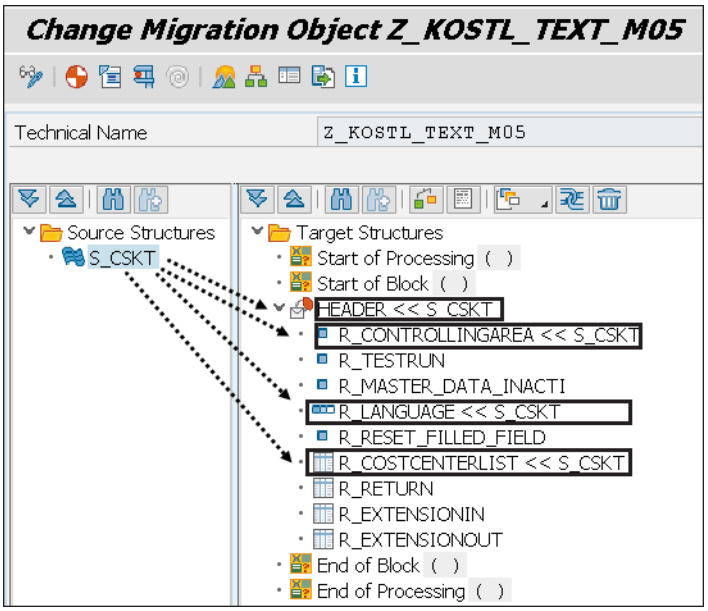


Figure 14.34 Mapping Source Structure to Target Structures

Here it's important that you do not forget the HEADER structure and observe the correct sequence. Only if you map these target structures, will the data records be processed subsequently. If you double-click the structure assignments—for example, for the HEADER structure—the **Edit Structure Mapping** window opens (see Figure 14.35), where you can edit the structure mapping in detail. The button provides detailed information on the individual access types, mapping types, and data path types.

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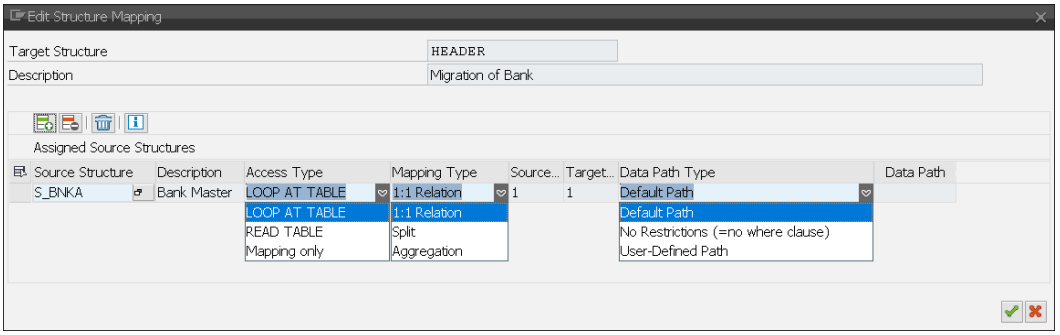


Figure 14.35 Edit Structure Mapping

Save the structure mapping using the **Save** button. You can then select (**View Structure Mapping Preview**) to display the preview of the ABAP source code generated according to your assignments. Figure 14.36 shows this preview.

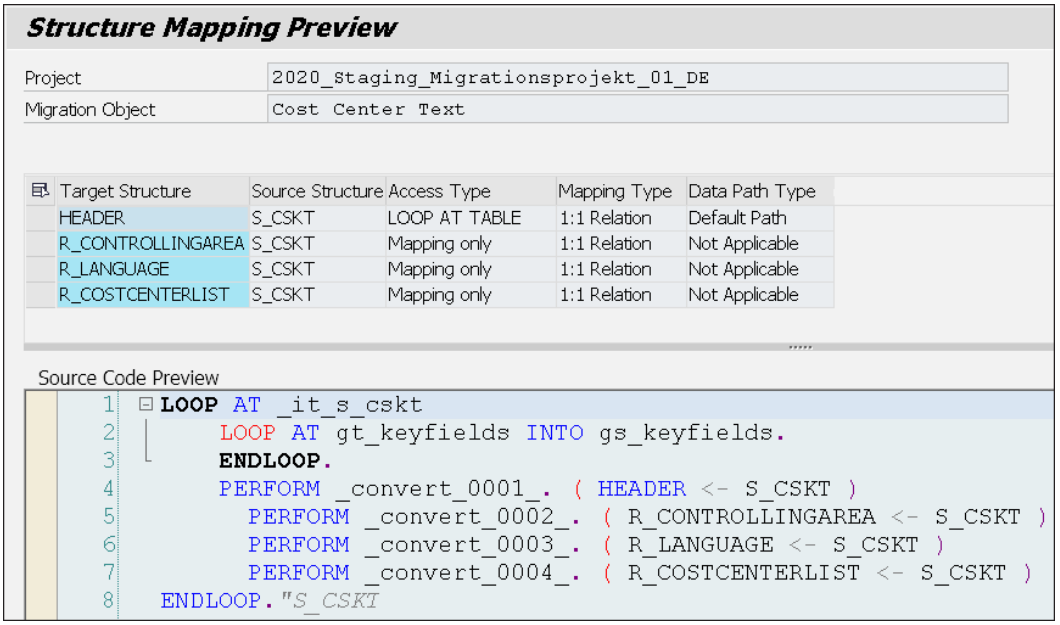


Figure 14.36 Structure Mapping Preview

Mapping Source Fields to Target Fields

Field mapping

In the next step, you map the source fields to the target fields. To do so, double-click **Field Mapping** in the navigation tree. The split dialog window for field mapping opens in the workspace on the right. Here too, you should select the button to switch to full-screen mode. You can view the source

structures and fields on the left-hand side and all target structures, fields, and the respective processing times on the right-hand side. You can drag-and-drop source structure fields to target structure fields here. If the system detects different field lengths of the source field and the target field, it displays a dialog window (see Figure 14.37). You can select **Yes** or **No** to decide whether you want to perform this mapping or not.

Longer source fields do not constitute a problem if you connect them with a field-based rule which then carries out the translation.

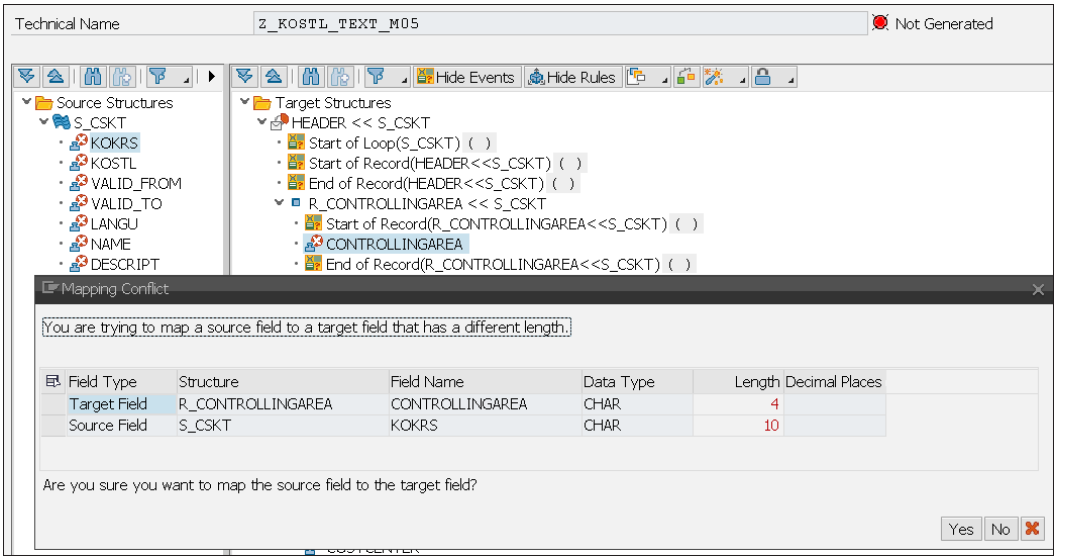


Figure 14.37 Different Field Lengths of Source and Target Fields

Drag-and-drop generates a MOVE rule

If you map a source field to a target field using drag-and-drop, a `MOVE` rule is automatically defined. So the source value is copied as the target value on a 1:1 basis. This is useful for dates, amounts, quantities, and general descriptions (e.g., text fields) for which you do not require any translation and which usually are to be copied without any deviations.

For fields that must be translated, you should select the target field and then assign a rule using the context menu or the button. We'll describe the manual procedure first. In the following section, you learn how to use the rule proposal. In our application case, which is shown in Figure 14.38, you use the existing transfer rule `CVT_KOKRS` to assign the source field `S_CSKT-KOKRS` (**Controlling Area**) to the target field `R_CONTROLLINGAREA-CONTROLLINGAREA` (**Controlling Area**) as follows: Select the target field `CONTROLLINGAREA` (**Controlling Area**) ❶ in the target structure `R_CONTROLLINGAREA`, and click the **Assign Rule** button . An **Assign Rule** input window is opened,

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where you select the value help in the **Name** field ❷. Alternatively, you can also create a new rule using the button or change an existing rule using the button. The system displays a window with all transfer rules that are available in the project. Now select the CVT_KOKRS rule ❸ and confirm with (**Next**). The CVT_KOKRS rule is then displayed in the **Name** field, and the IV_KOKRS import parameter is shown for the rule. Now you must assign the S_CSKT-KOKRS parameter value ❹ for the source field. Finally, you confirm your selection by choosing the button (**Next**). The rule is now assigned. Save your mapping using the button.

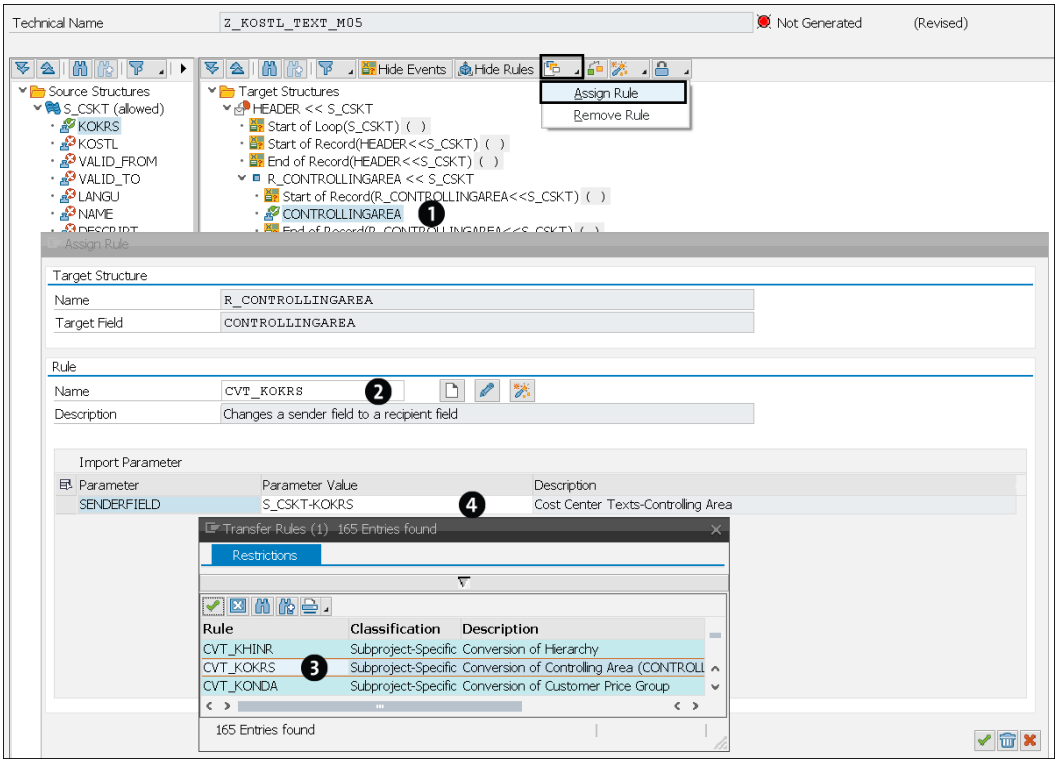


Figure 14.38 Assigning Rules

For some field mappings, as in the case of the cost center, you must assign more than one field. Because the cost center depends on the controlling area, you must assign the source fields, KOKRS (**Controlling Area**) and KOSTL (**Cost Center**), to the target field COSTCENTER (**Cost Center**). The result of assigning the rule CVT_KOSTL to the target field COSTCENTER using the two import parameters S_CSKT-KOKRS and S_CSKT-KOSTL is shown in Figure 14.39.

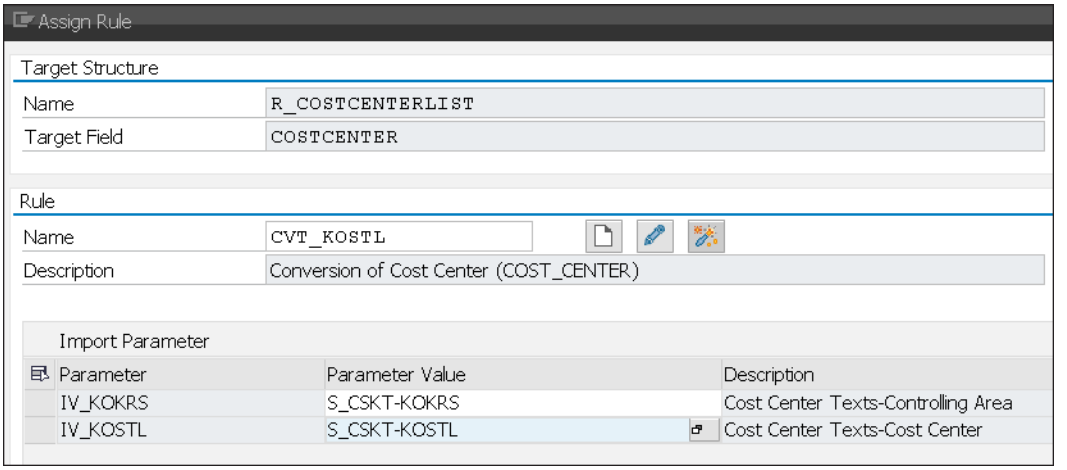


Figure 14.39 Rule with Two Import Parameters

Now map all other fields and add rules as required. In our application case, we use the field mappings defined in Table 14.2.

Source field (technical)	Target structure (technical)	Target field (technical)	Rule (technical)
KOKRS	R_CONTROLLING-AREA	CONTROLLINGAREA	CVT_KOKRS
LANGU	R_LANGUAGE	LANGU	CVT_SPRAS
■ KOKRS ■ KOSTL	R_COSTCENTERLIST	COSTCENTER	CVT_KOSTL
VALID_FROM	R_COSTCENTERLIST	VALID_FROM	MOVE
VALID_TO	R_COSTCENTERLIST	VALID_TO	MOVE
NAME	R_COSTCENTERLIST	NAME	MOVE
DESCRIPT	R_COSTCENTERLIST	DESCRIPT	MOVE

Table 14.2 Field Mapping Table

You display the final field mapping with the activated filter using the button (**Show Fields with Mapping**; see Figure 14.40). The second last step is to save the mapping using the button (**Save**).

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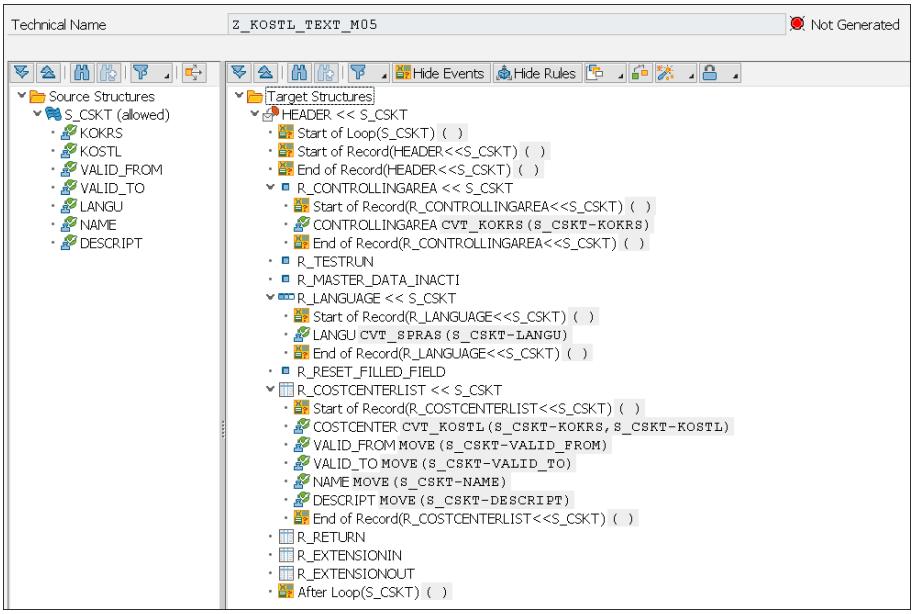


Figure 14.40 Assigned Fields and Rules

Automatic Rule Proposals

Generating automatic rule proposals

Since SAP S/4HANA 1809, you can have the system generate an automatic rule proposal as an alternative to assigning the fields manually using rules. Select **Rule Proposals** or (**Rule Proposals—Only MOVE Rules**) to open an overview of rule proposals (see Figure 14.41).

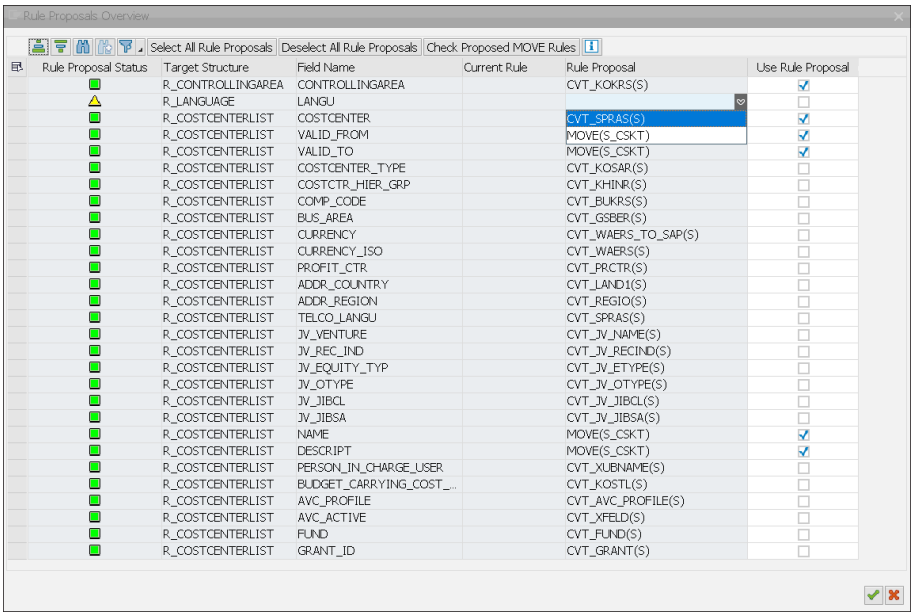


Figure 14.41 Rule Proposals Overview Screen

In this overview, select the button to call the documentation for the rule proposal screen. The system checks for every field in the target structure whether field-based rules exist that are based on the same data element or the same domain as the field in the target structure. You can then select for which target field you want to accept the proposal. If there are several rule proposals, this is indicated with a yellow triangle. You can then select which rules you want to use. For field-based rules, the system additionally indicates where the rule was created:

- **(S), subproject-specific**
  The rule was created at the subproject level and can be used for all migration objects in this project.
- **(M), migration object-specific**
  The rule was created at migration object level and can only be used by this migration object.

You can now select the relevant rule proposals in the column on the right-hand side (**Use Rule Proposal**).



Rules with Import Parameters

If a rule proposal has import parameters and no values were specified for the import parameters, the system displays a question mark after the rule under target structures. You must then specify the import parameters for the rule in the **Rule Assignment** dialog window.

After you have selected the automatic rule proposals and maintained the relevant import parameters, you should see the same assignments as in Figure 14.40.

Generating a Function Group

In the last step prior to the actual data transfer, you now generate the migration object using the button (**Generate Runtime Object**). If you have not made any mistakes, the subsequent window of Figure 14.42 should be displayed below the workspace on the right.

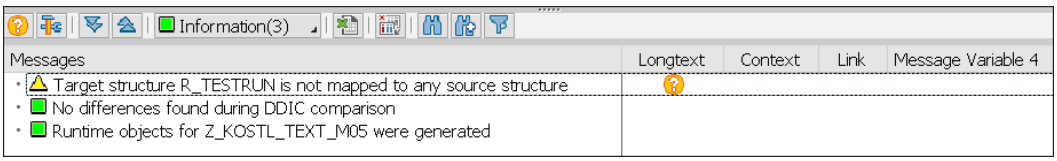


Figure 14.42 Successful Runtime Generation

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Display generated function group

You can now display the runtime object using the button (**Display Generated Function Group**). The function modules of the migration processing are available in the second row, `INCLUDE`, which ends with `UXX`. In our example, it is `/1LT/LQKM950000000021657UXX` (see Figure 14.43).

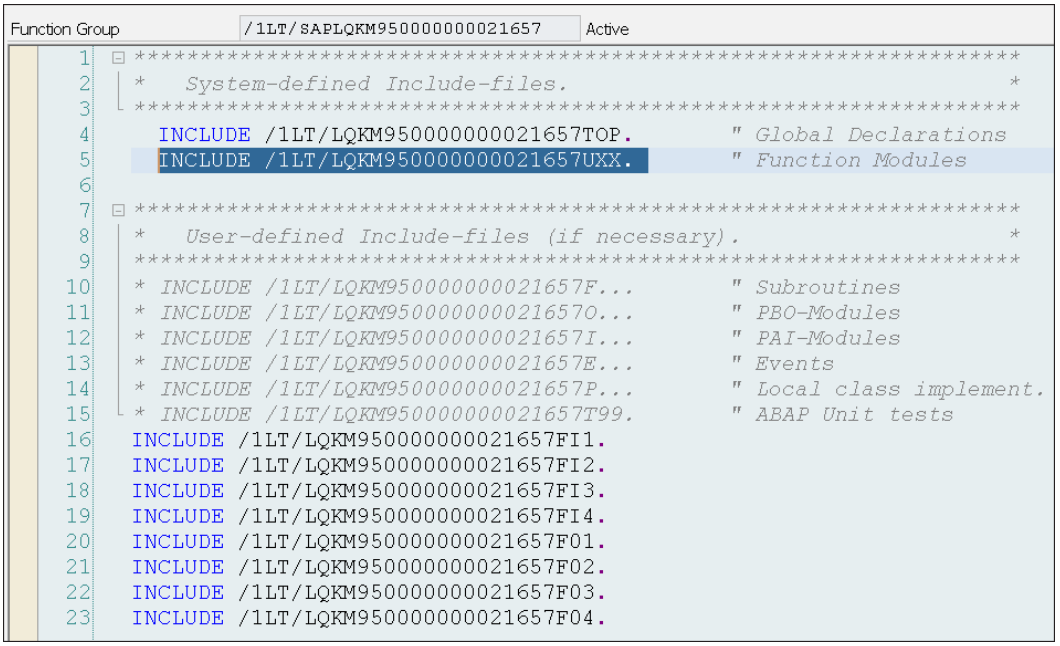


Figure 14.43 Generated Function Group

Figure 14.44 shows the individual function modules of the function group. The so-called OLO includes `INCLUDE /1LT/LQKM950000000021657U04`, which contains the function module that calls the migration API.

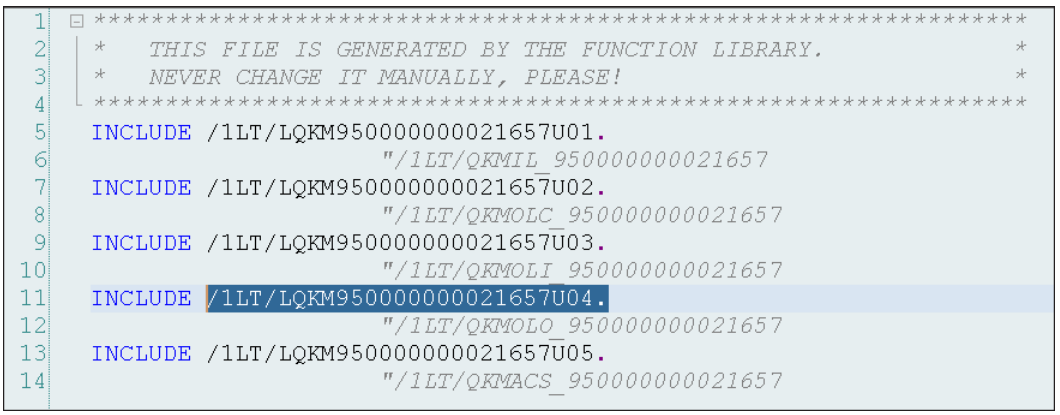


Figure 14.44 OLO Group with Migration API Call

Performing the Data Migration via the Migration Cockpit

You then start the migration cockpit and call the migration project. You should now see the new **Cost Center Text** migration object, as shown in Figure 14.45.

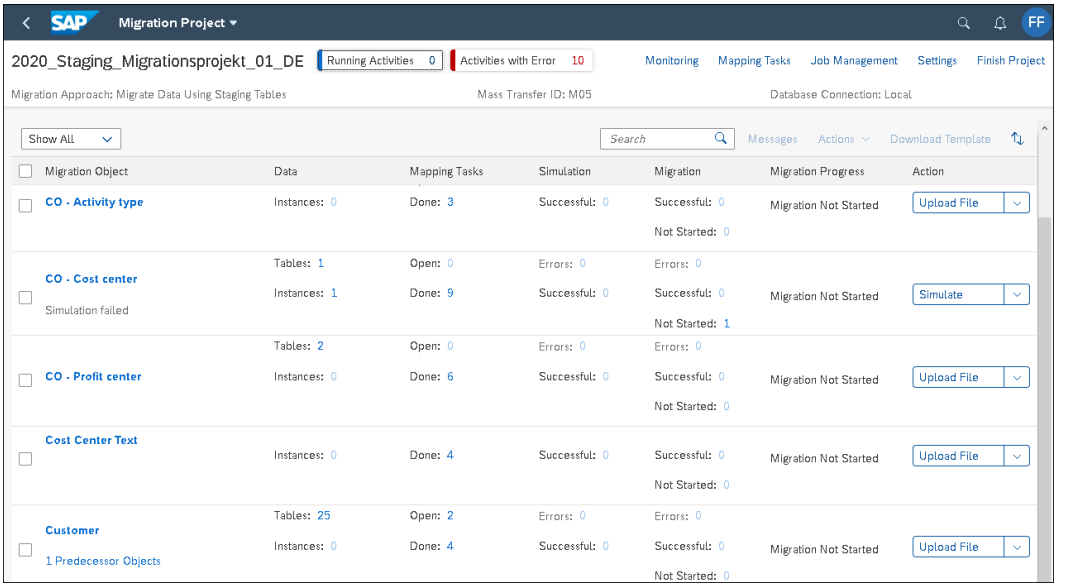


Figure 14.45 New Migration Object in Migration Cockpit

Now select the object in the migration cockpit, download the new migration template file, and migrate your cost center texts.



Creating a New Migration Object

SAP Note 2852819 provides step-by-step instructions on how to create a user-defined migration object.

14.2.6 Creating user-defined Rules and Translation Objects

You can create your own rules and translation objects if the delivered rules do not fully cover your application case or if you require user-defined rules. Translation objects can never be mapped directly to a field but must be assigned to a field-based rule in advance. If you create a rule or translation object at the migration object level, you can only use it for the specific migration object. You should create the rule or translation object at the subproject level so that it can be used by all migration objects in your project.

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Creating the Translation Object

Creating a custom translation object

You can create translation objects in the **Translation Objects** area. Choose **Create Translation Object** from the context menu. Ensure that you work at subproject level. Enter a name, ideally the customer namespace, and then select **Next**. Currently (as of August 2020), there is no check of the customer namespace yet. This is planned for the future. You should therefore directly create new rules, fixed values, and translation objects starting with `Z*`. For migration objects, it is recommended to use `Z_Z*`. In our example, we enter "Z_MAP_TEST". We enter the description "Own Translation Object" in the left workspace (see Figure 14.46). Next, we enter an import parameter `I_PARAM` with the data type `CHAR` and the parameter length `10` and an export parameter `E_PARAM` with the data type `CHAR` and the parameter length `4`. We'll use the controlling area example to show how to create a custom translation object.

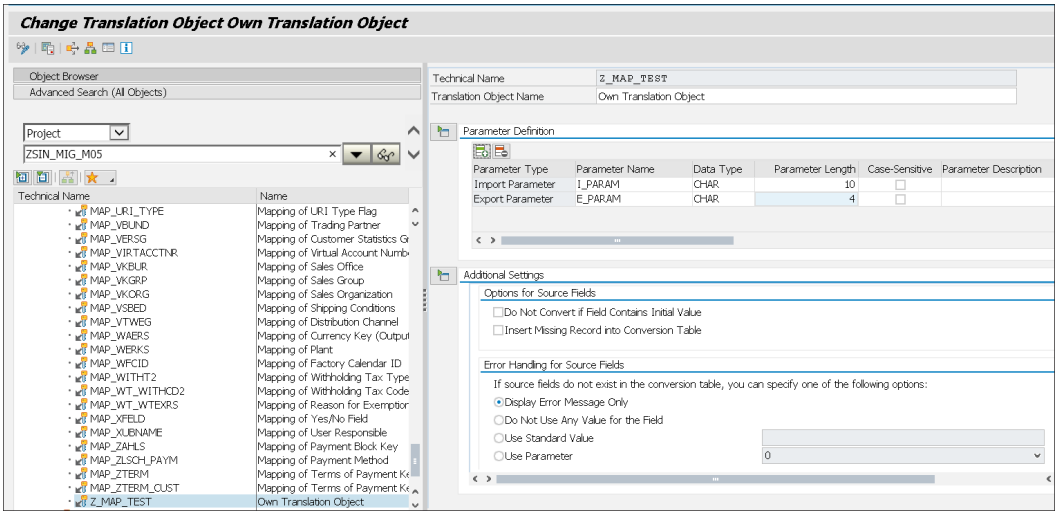


Figure 14.46 Changing Translation Object

You can a add a possible valid value range for the export parameter by selecting the **Add** button in the **Value Range** field for the export parameter. The following options are available for the value range in the additional input window:

- **Use Domain**
- **Use Value Table**
- **Use Search Help**
- **Do Not Use Value Range**

For domains and value tables, you can also check if the parameter is valid by setting the **Validate Parameter Value against Domain** or **Validate Param-**

eter Value against Value Table flag. In our example, we select the CACCD domain (**Controlling Area**) and select the field for validation (see Figure 14.47).

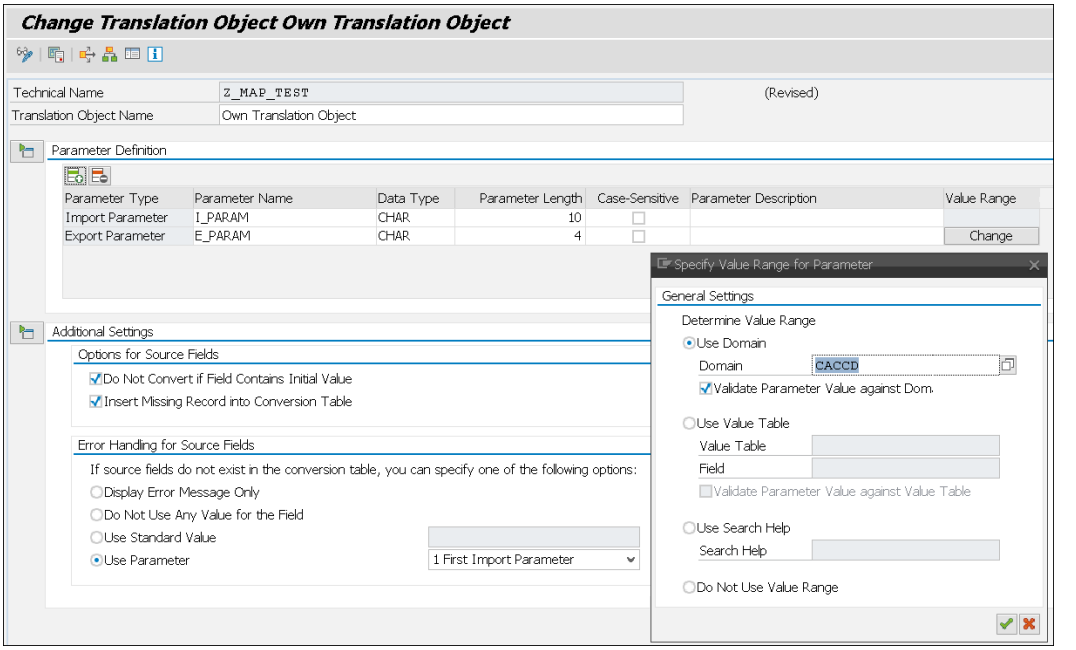


Figure 14.47 Translation Object with Value Range

In the **Additional Settings** area, you can set options for the source fields. For our example, we select the **Do Not Convert if Field Contains Initial Value** and **Insert Missing Record into Conversion Table** options. If the source field contains the initial value, the initial value is ignored, that is, it is considered as not relevant. With the second option, the system creates an entry in the conversion table (mapping table) for the import parameter's value if the source field's value does not yet exist in the conversion table. Also, if the source field doesn't exist in the conversion table, the **Error Handling for Source Fields** area provides several options. In our example, we want the system to propose the value of the source field as the value for the export parameter (target value). For this purpose, select **1 First Import Parameter** under **Use Parameter**. Then save your changes using the **Save** button.

Before you can assign the translation object to a field, you must first create a field-based rule.

Creating a Field-Based Rule

Creating a custom field-based rule

You can change the value of a target field during the migration using field-based rules. You can create a rule in the **Field-Based Rules** area. Choose

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Create Field-Based Rule from the context menu. Ensure that you work at the subproject level. First, enter a name in the customer namespace, "Z_CVT_TEST", and enter "Own Rule" as a description. Field-based rules use import and export parameters. On the **Parameter Definition** tab, you select a name for the import parameter, like `I_PARAM`, and for the export parameter, like `E_PARAM`. A rule can either reference to a fixed value or a translation object or contain free code. Because you want to assign your created translation object, on the **Properties** tab, select the **Change** button in the **Rule is based on:** field. The system displays a selection screen with the following options (see Figure 14.48):

- **Free Code**
- **Translation Object**
- **Fixed Value**

Select **Translation Object**, and click the button (**Next**).

Then select the created translation object `Z_MAP_TEST` in the **Name** field. The import and export parameters are proposed automatically (see Figure 14.49). Save your changes using the **Save** button.

You can now assign the newly created field-based rule to a field. A mapping task is then displayed for this field in the migration cockpit. In this mapping task, you can maintain, confirm, upload, and download your values just like for the mapping tasks delivered by SAP (see Figure 14.50). More information on maintaining mapping tasks is available in Chapter 13, Section 13.2.12.

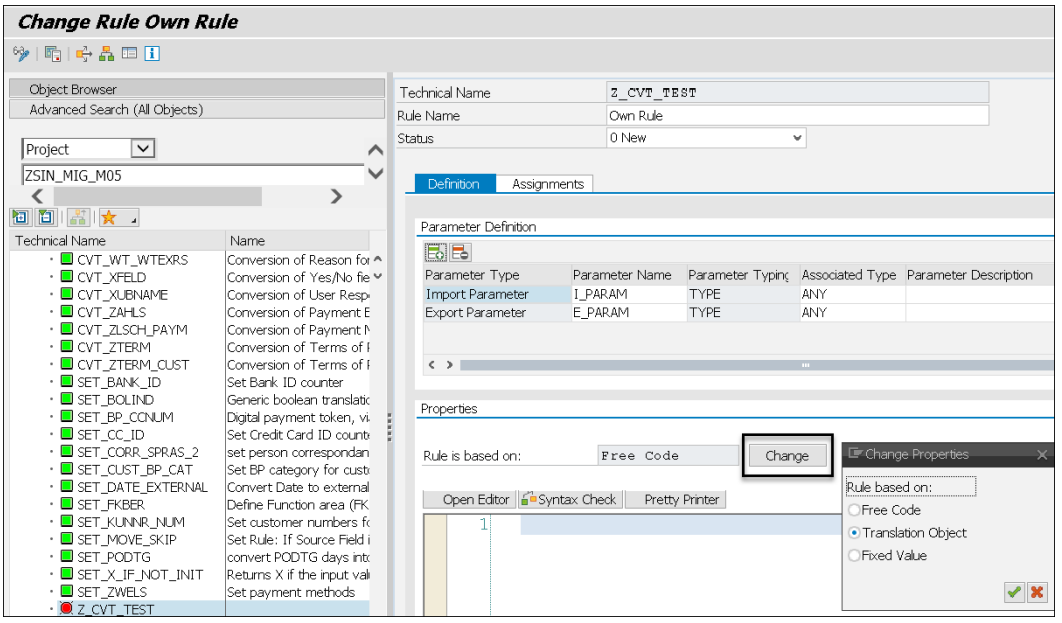


Figure 14.48 Field-Based Rule

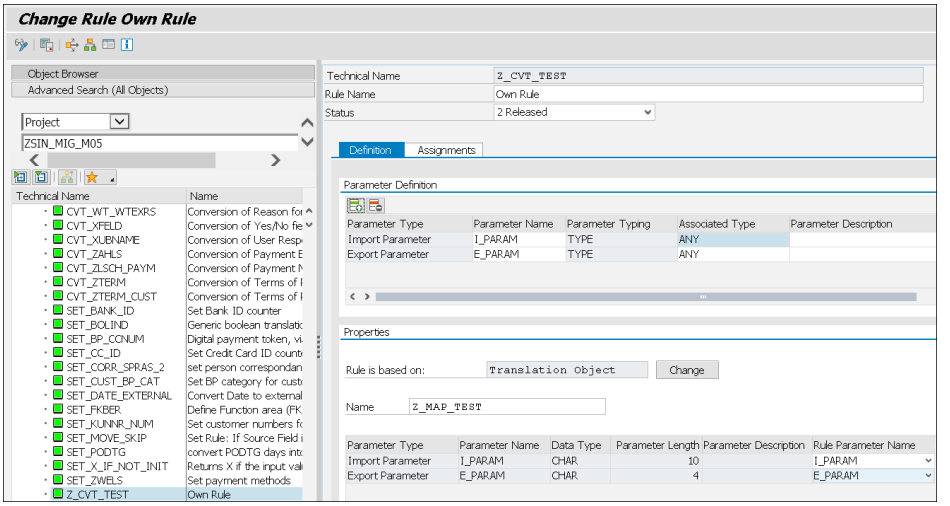


Figure 14.49 Rule Based on Translation Object

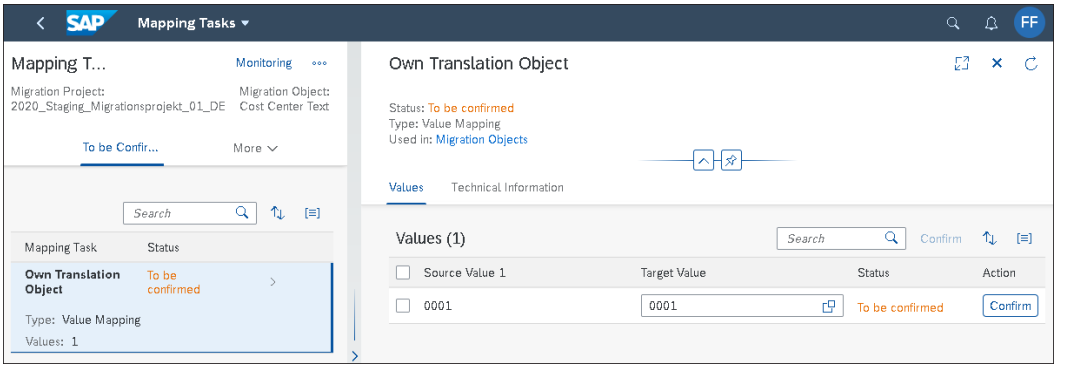


Figure 14.50 Migration Cockpit: Own Translation Object

14.2.7 Simulating or Debugging Migration Objects

If you want to test how source fields are transferred to the SAP S/4HANA target system, you can simulate the import of data from staging tables. To do so, in the migration object modeler select a migration object and switch to change mode. Choose the button (**Simulation**) to simulate the import of data from staging tables. This takes you to the view shown in Figure 14.51.

Prerequisites for simulating the data import

The following prerequisites must be met so that you can simulate a migration object:

- The migration object was generated successfully and isn't locked by another user.
- A simulation parameter was defined in the target structure.
- There are data in the staging tables.

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- If the migration object was copied from a template, no update must exist.

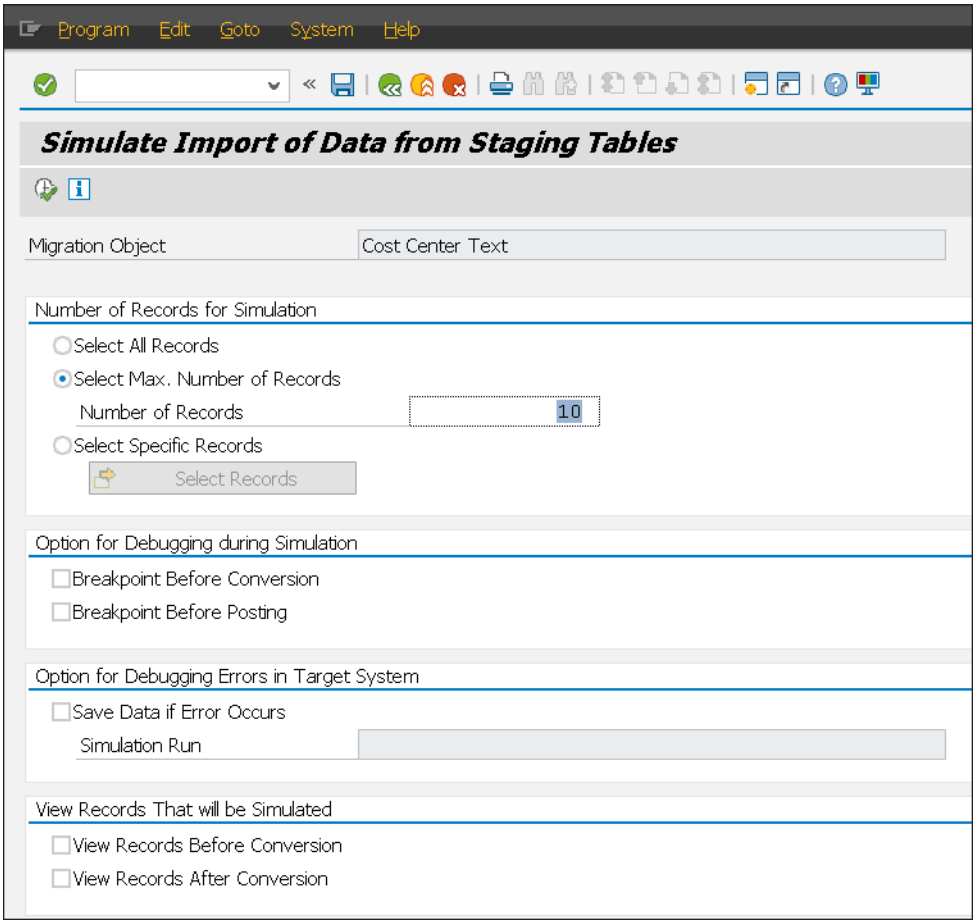


Figure 14.51 Report for Simulating Data Import

You call the documentation using the button in the simulation's selection screen.

You have the following options for selecting data for simulation:

- **Select All Records**
- **Select Max. Number of Records**
  The records are selected randomly.
- **Select Specific Records**
  Note that selection is not case-sensitive.

For all records, the general rule applies that the system only simulates records with the processing status, **Not Processed** or **Error**. In addition, you

have the option to automatically set breakpoints at specific points, either prior to conversion of data (**Breakpoint before Conversion**) or prior to posting data into the target system (**Breakpoint before Posting**). Since SAP S/4HANA 1909, you can also display data that is simulated by selecting **View Records before Conversion** or **View Records after Conversion** or both.



Report for Testing and Debugging

If you work with an older SAP S/4HANA release, you can use Report DMC_MC_SIMULATE_IMPORT_STAGING to perform a simulation run for a staging migration object. Call the report using the ABAP Editor (Transaction SE38) or the ABAP program execution (Transaction SA38). Then select your migration object. You can also use the report for debugging your migration object. It's critical that you have maintained all conversions (mappings) in the migration cockpit in advance.

The report is included in SAP Note 2665339.

If you want to simulate the import of files in an older release, use the report of SAP Note 2630183 at *http://s-prs.co/5279104*.



Resetting the Transfer Status

If you want to remigrate records that have already been migrated for testing purposes, you can choose **Goto • Reset Transfer Status** in the migration object's selection menu to display all transferred records for the migration object and reset the transfer status for these records.

14.2.8 Transferring Migration Projects from One System to Another

Transferring migration projects

You can transfer a project from one system to another. First, you export a project from one system and save the project as a ZIP file. Then you import the ZIP file into the other system. Select **Goto • Export/Import Project** in the project view of the migration object modeler (see Figure 14.52).

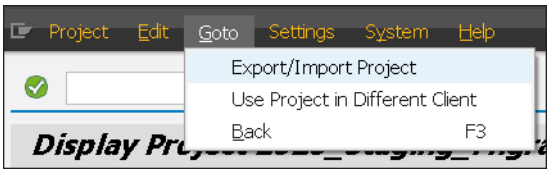


Figure 14.52 Selecting Export/Importt Project Option

As an alternative, you can also run Report /LTB/MC_PROJ_Q2P in Transaction SE38 (ABAP Editor) or Transaction SA38 (ABAP Reporting).

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Export/Import Report

The export/import report (/LTB/MC_PROJ_Q2P) is relevant only for the migration cockpit for SAP S/4HANA 2020 or higher and only for the migration approach migrate data using staging tables, and not for older versions of the migration cockpit (Transaction LTMC).

After you have called the report, enter the mass transfer ID of the project that you want to export and then import into the new system later on.



Production Systems/Systems that Cannot be Changed

It isn't possible to create or change projects in systems that can't be changed (e.g., production systems). If you need to make such adaptations, you can adapt the project in the development system and transfer (import) it again to the target system.

As you can see in Figure 14.52, you also have the option to use a migration project in another client by selecting **Goto • Use Project in Different Client** in the project view. Note that the project is not copied in this process but is only available in the newly specified client after this step. Because all mapping values are deleted here, you should download them in advance so that you can upload them again to the new client. Note that you may have to revise the mapping values prior to the upload to ensure that no value pairs are uploaded that originate from an internal numbering.



Use Project in Different Client

The **Use Project in Different Client** function is relevant only for the migration cockpit for SAP S/4HANA 2020 or higher and only for the migration approach migrate data using staging tables, and not for older versions of the migration cockpit (Transaction LTMC).

You have now learned about the options that the migration object modeler provides for migrating data using files or staging tables. The following section now discusses the functions of the migration object modeler that you can use to migrate data directly from an SAP system.

14.3 Modeling for Transfer Data Directly from SAP Systems

The migration object modeler is available for all migration approaches of the migration cockpit. This section details the specifics of the modeling

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environment for the migration approach of transfer data directly from SAP systems.

The benefit of this approach is that it already provides a predefined selection logic for each migration object. It also contains a logic for deriving organizational units.

Focus on selection

This section focuses on the modeling options for the selection from the SAP source system, but the modeling functions of the two approaches are very similar. We will point out if there are major differences in individual aspects.



Required User Roles

Assign the roles described in Chapter 13, Section 13.4.4, plus the `SAP_CA_DMC_MC_DEVELOPER` role, to be able to use Transaction LTMOM.

14.3.1 Basic Knowledge for Modeling

This section describes the basic terms for modeling. We will also explain how the migration cockpit's direct transfer approach derives organizational units for selection.

Organizational Units

To structure an SAP client, so-called organizational units are defined in all SAP applications. The organizational units are assigned to one another so that the various SAP applications can process the data in an integrated way. In financial accounting, for example, the company code is an important unit; in controlling, the controlling area is an important unit; and in logistics, the plant is an important unit. Plants are assigned to company codes, company codes are assigned to controlling areas, and so on.

If you migrate data, you must first decide from which organizational units you want to migrate data. Depending on the scenario, the appropriate organizational unit is predefined as an input parameter in the migration cockpit. This is the company code for the SAP ERP to SAP S/4HANA scenario. For the company codes selected, you then specify the migration objects for which data is to be migrated.

Organization Derivation

Integrated selection engine

A *selection engine* is integrated with the migration cockpit. It ensures that all data records are read that belong to the selected migration objects of this organizational unit. This applies even if the relevant organizational unit is

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not contained in the corresponding application table or if the relevant records must first be determined via child tables. So the migration cockpit is provided with implicit complex selection logic.

Examples of Organization Derivation

In a project, we select, for example, company code 0001 as well as the migration objects, CO—Cost Center, CO—Activity Type, and Customer. The organization derivation ensures that the data records are read from the source system that belong to company code 0001 or the next higher organizational unit. For the migration object CO—Cost Center (table `CSKS`), the **Company Code** field is contained in the master data table. As a result, you can read the records for company code 0001 directly from this table. For the CO—Activity Type object (table `CSLA`), the company code is not included in the master data table. The table only contains the Controlling Area field. There is no additional connected table for this object that contains the company code. In this case, the system selects the records of the logically next higher organizational unit, that is, the activity types which belong to the controlling area that is assigned to company code 0001. The Customer migration object is a complex, highly nested object. Various derivations are necessary to determine the relevant data records for company code 0001. For example, the system must read the company code in table `KNB1` (Customer Master/Company Code), the sales organization in table `KNVV` (Customer Master/Sales Data), and so on.

Filters

Predefined filters

As mentioned previously, the organization derivation is run by a powerful engine. In the modeling environment, the derivation is primarily controlled using so-called filters. A filter is a collection of values of the same data type that is stored centrally for the project. These values are available for all migration objects of a project. A filter can be, for example: controlling area, company code, plant, sales organization, purchasing organization, etc. The filters are defined by SAP, which specifies what filters are available for the respective scenario—for example, for the SAP ERP to SAP S/4HANA scenario. It isn't possible to create custom filters (as of August 2020). It also isn't possible to change values that are determined from a predefined company code in a concrete project (e.g., plants 0001, 0002, and 0003) or delete values from it.

Figure 14.53 shows an example. There are ten filters defined for the SAP ERP to SAP S/4HANA scenario. The only filter that has no predecessor is the one for the company code. The company code(s) are predefined by the user

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when they create the project. From the technical perspective, a rule is assigned to a filter; for the KOKRS filter, it is the GET_KOKRS_BY_BUKRS rule. This rule comprises coding that states that table TKA02 must be checked to find out which controlling area is assigned to the company code selected.

Name	Predecessors	Description
BUKRS		Company Code
KOKRS		Controlling Area
KKBER		Credit Control Area
VKORG		Sales Organization
EKORG		Purchasing Organization
KTOPL		Chart of Accounts
WERKS		Plant
IWERK		Maintenance Planning Plant
GJAHR		Fiscal Year
ALAND		Country key

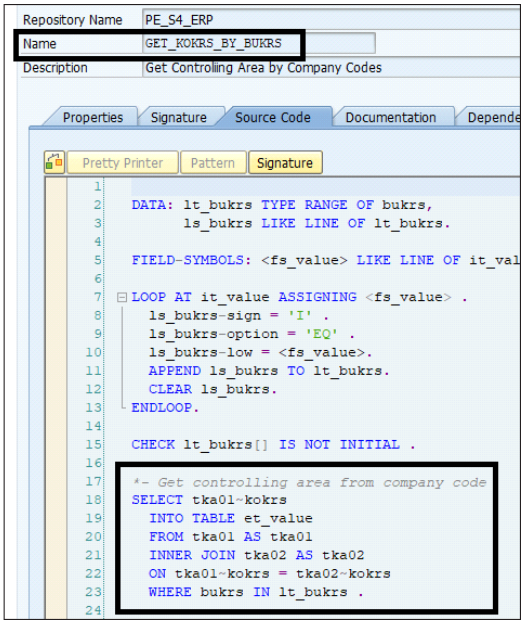


Figure 14.53 Filter for SAP ERP to SAP S/4HANA Scenario

If you process a migration object in the modeling environment, you can only assign the filters that are intended for the scenario.

Parts of a Migration Object

The *function module* which is used in the migration objects expects specific fields to be able to create a data record, for example, a cost center or an open item (financial accounting), in the target system. The *data model* of the migration object defines which fields are read from which tables. In the migration cockpit, the fields read are used to build a *migration object instance*. When you run the **Simulate** step, the system applies the *transformation rules* (often referred to as a *mapping*) to the individual fields. The instance that is thus transformed is forwarded to simulation or to the function module for posting or creating the record in the SAP S/4HANA system in the **Migration** step. Figure 14.54 illustrates the creation of a migration object instance.

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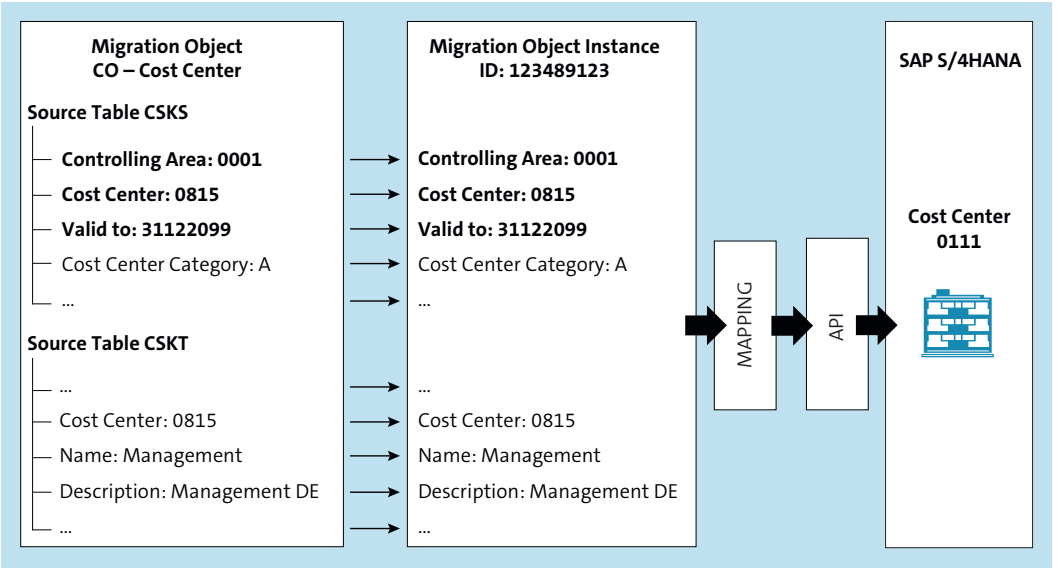


Figure 14.54 Migration Object Instance and Its Processing

Why Do You Need a Migration Object to Migrate Data from SAP to SAP?

You may ask yourself why so many steps are necessary to migrate data from one SAP system to another SAP system. The answer is that the data structures of SAP S/4HANA have changed substantially compared to SAP ERP. For this reason, the relevant fields of the data object must be specified and read in the source. They are then imported to the target using application function modules and thus automatically stored in the new structures. The function module ensures that all checks are made from the application view to create the data consistently in the target for target customizing.

14.3.2 Creating a Migration Object (Copy)

The following sections describe the available copy functions.

Creating a Migration Object from a Delivered Template

You have the option to copy the migration objects that are delivered by SAP. Call Transaction LTMOM and select your direct transfer project. Switch to change mode and select **Project • Create Migration Object • From Template • Migrate Data Directly from SAP System**. The system provides all migration objects available for the scenario that you assigned to your project—for example, SAP ERP to SAP S/4HANA.

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Copying a Migration Object

You can also copy migration objects that you have already created in your project. Note that you can copy objects only within an individual project. This has technical reasons due to the structures generated. Select **Project • Copy Migration Object**.



Copy Project Functionality Planned

The **Copy Project** function isn't yet available as of summer 2020, but it's planned for FPS 01 and thus already available in the migration cockpit, if applicable.

14.3.3 Synchronizing Structures

Changed structures or objects

Migration objects refer to ABAP Dictionary objects—for example, tables and function modules. These ABAP Dictionary objects may change from time to time. If, for example, a new version or correction is implemented, this can lead to additional import fields for a function module. Table fields in the source system can be added or deleted. You can synchronize the structures in such cases. If a structure in a migration object does not correspond to the structure in the ABAP Dictionary, the system updates the structure in the migration object. Call Transaction LTMOM and double-click the migration object. Then select **Migration Object • Synchronize Structures**.

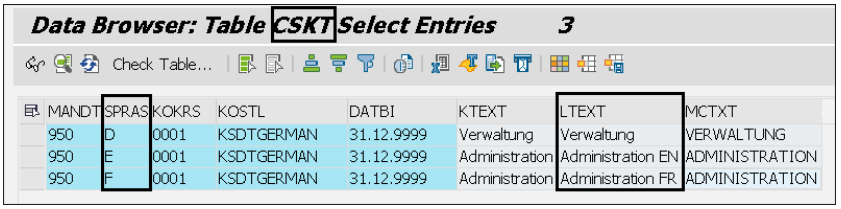
14.3.4 Creating Custom Migration Objects

Creating a custom migration object for the direct transfer of data from an SAP system is demonstrated using the same application case as in Section 14.2.4: A new migration object is created based on the change module, `BAPI_COSTCENTER_CHANGEMULTIPLE`. This object migrates the name and the descriptions of a cost center that is already created in the SAP S/4HANA system in additional languages.

Application Example

The initial situation is as follows: The SAP ERP source system contains the cost center KSDTGERMAN in the controlling area 0001, which is assigned to company code 0001. For this cost center, the name and the description were maintained in German, English, and French. The cost center texts are stored in table `CSKT`, and the cost center master record is stored table `CSKS` (see Figure 14.55).

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Data Browser: Table CSKT Select Entries 3

Check Table...

MANDT	SPRAS	KOKRS	KOSTL	DATBI	KTEXT	LTEXT	MCTXT
950	D	0001	KSDTGERMAN	31.12.9999	Verwaltung	Verwaltung	VERWALTUNG
950	E	0001	KSDTGERMAN	31.12.9999	Administration	Administration EN	ADMINISTRATION
950	F	0001	KSDTGERMAN	31.12.9999	Administration	Administration FR	ADMINISTRATION

Figure 14.55 In Table CSKT, Cost Center Texts Stored in Different Languages

Creating an object for cost center texts

The CO—Cost Center migration object migrates the cost center master data only with the name and description of the language with which you are logged on during the migration. The following we describe all steps that are required to create the new migration object for the direct transfer approach.

First call Transaction LTMOM. Switch to the change mode to create the migration object. Call the project and click **Project • Create Migration Object • User-Defined**. This opens the Create User-Defined Migration Object wizard.

Create User-Defined Migration Object (Wizard)

The wizard guides you through the steps that are required to create the basic data for a new object. In a later step, you also specify further detail settings directly in Transaction LTMOM.

Consider the Documentation!

After you have called a project using Transaction LTMOM, the upper bar shows an information button. This button provides the complete documentation for the modeling environment of the migrate data directly from SAP system approach. If you are already in a step within the wizard or within the modeler, an additional information button is available that provides more information on the respective step.

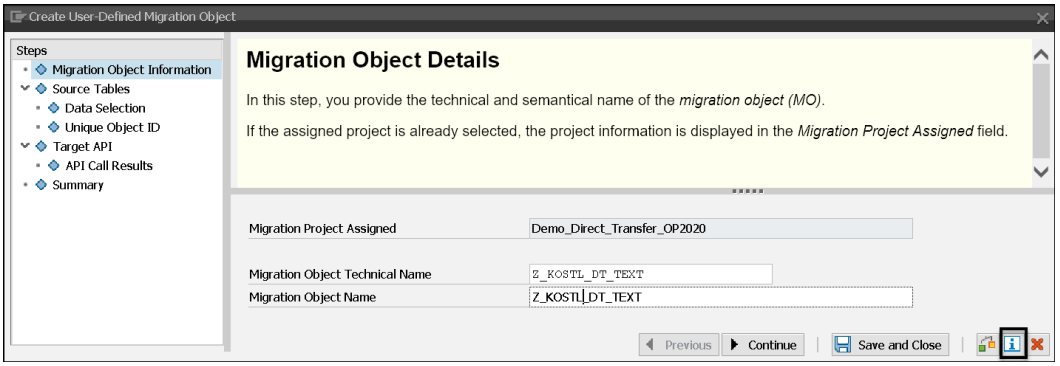


Figure 14.56 Migration Object Wizard: Migration Object Details Step

In the **Migration Object Details** step, enter a name and a description for your migration object—in this example, "Z_KOSTL_DT_TEXT" (see Figure 14.56). Note that the content of the **Migration Object Description** field is displayed as the migration object name later on in the migration cockpit. If you click **Next**, you navigate to the **Source Tables** step.

Defining source tables

Table CSKT is selected as the root table. In the next step, table CSKS is added as a subordinate table. The easiest way is to use the proposal button to automatically obtain a proposal for the foreign key relation of these two tables. In the present example, the following fields are linked: **Client** (MANDT), **Controlling Area** (KOKRS), **Cost Center** (KOSTL), and **Date To** (DATBI). The **Language Key** field (SPRAS) is not a key field and therefore is not to be linked (see Figure 14.57).

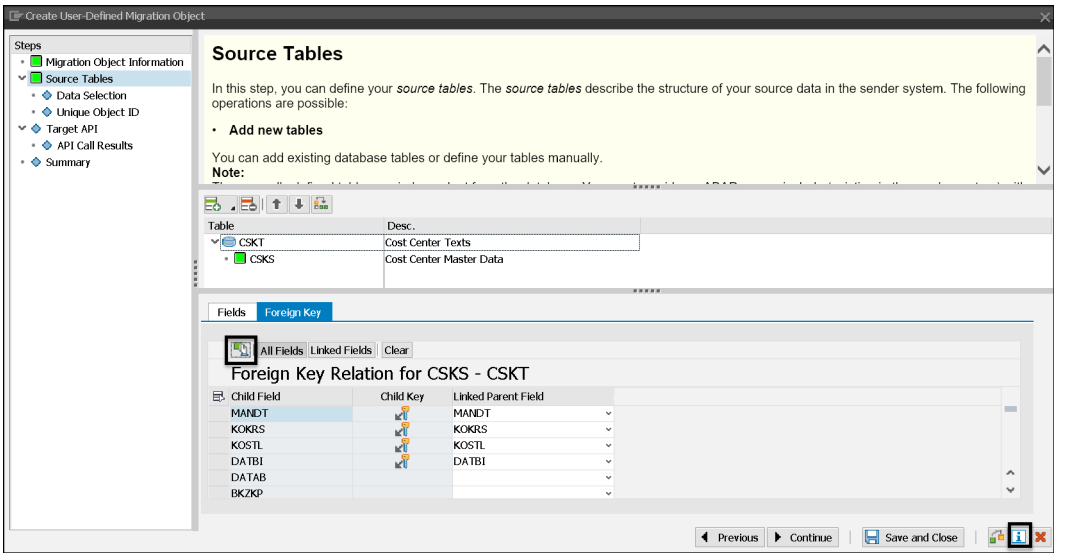


Figure 14.57 Migration Object Wizard: Source Tables, with Proposal Function Step

Defining the data selection

When you click **Next**, the system takes you to the **Data Selection** screen (see Figure 14.58). Here you define the most important selection settings for your migration object. You can specify a filter delivered by SAP. If your source table contains the relevant field for filtering, you can alternatively specify the table and field directly here, for example, table CSKS and field BUKRS.

You can define that all entries of your migration object's source table(s) are to be imported. This would apply in our example if all records of these tables would be relevant for company code 0001. If the migration object is more complex, that is, consists of several source tables, you can select the **Define Selection Later** flag. In the present example, we use this option

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because different filters are required for the two tables, CSKT and CSKS, respectively.

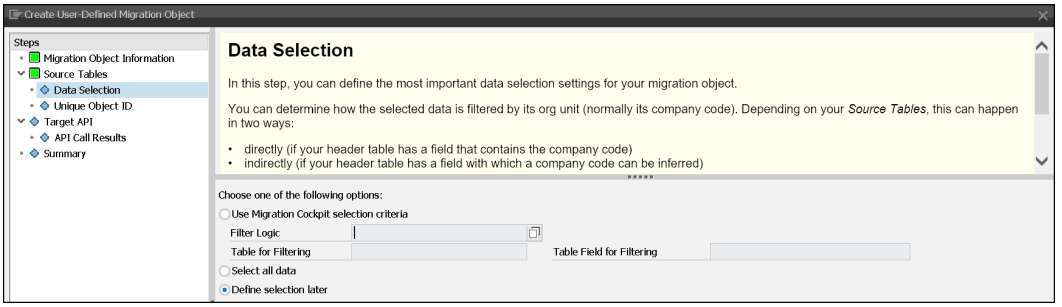


Figure 14.58 Migration Object Wizard: Data Selection Step

Defining the migration object instance

With **Next**, you go to the **Unique Object ID** screen (see Figure 14.59). Here you define which fields are uniquely defined by the migration object instance. The proposal button highlights all key fields of the root table, the key fields of table CSKT in our example.

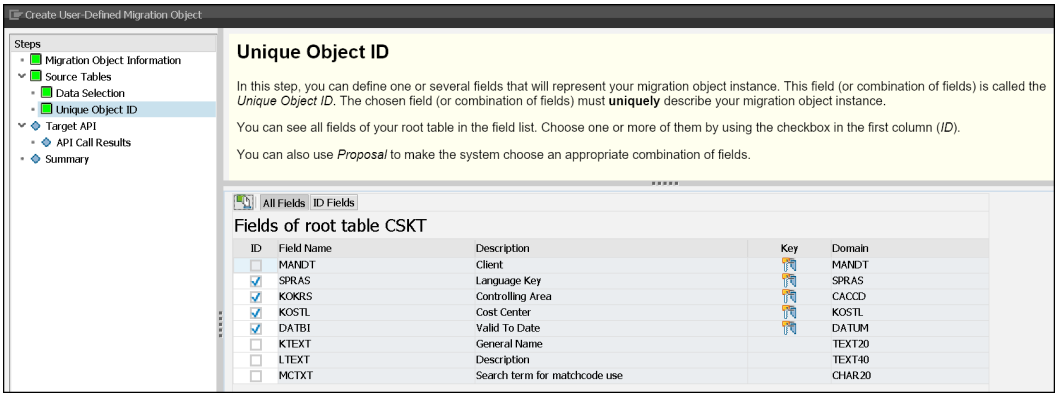


Figure 14.59 Migration Object Wizard: Unique Object ID Step

Defining the target API and simulation

With **Next**, you go to the **Target API** screen (see Figure 14.60). In our example, the BAPI_COSTCENTER_CHANGEMULTIPLE change module is to be used. It extends the cost center master data that is already available in the target with the texts in other languages. You can use both SAP function modules and custom function modules. Also refer to SAP Note 2590165 for more information on custom modules. In this step, you can specify if or how the function module will simulate the migration. Call Transaction BAPI to go to the function module documentation and check which simulation options are provided by this module and how you must populate the simulation parameter. The value help in the wizard displays the existing parameters of the selected function module for the **Parameter for Simulation** field. The TESTRUN parameter is selected in this example. As described in the function

module documentation, the field content for executing the module must be in the **Blank** simulation mode. You must enter a capital "X" for execution in real mode, that is, for an actual migration.

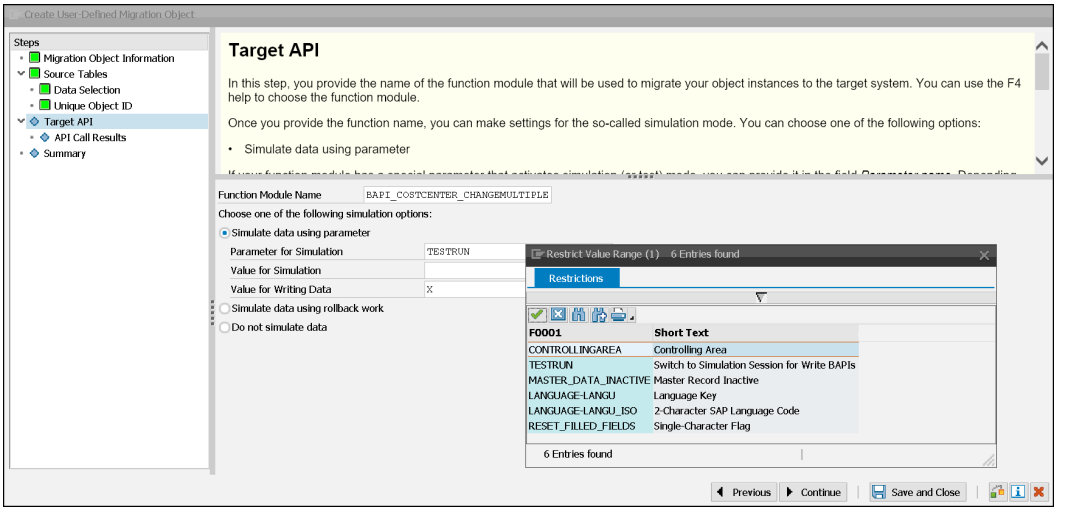


Figure 14.60 Migration Object Wizard: Define Target API and Simulation

If the selected function module doesn't provide any test run parameter, you can use the **Simulate Data Using Rollback Work** function as an alternative.

API call results

If you click **Next**, you navigate to the **API Call Results** step. This screen shows all export and table parameters that are included in the selected function module (see Figure 14.61). The proposal function automatically assigns the parameter that is suited to process the return values of the API. In this example, it's the RETURN parameter.

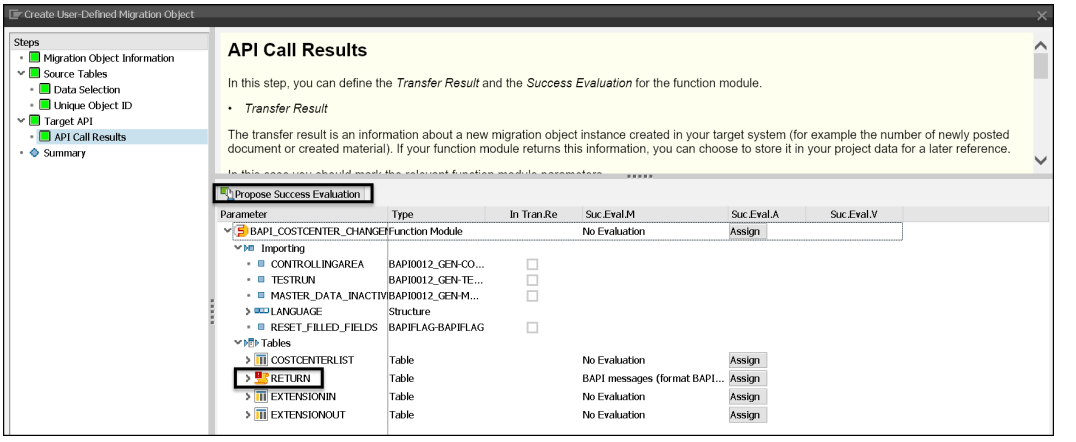


Figure 14.61 API Call Results with Proposal Function

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The last screen provides a summary of the newly created migration object (see Figure 14.62). Save the object.

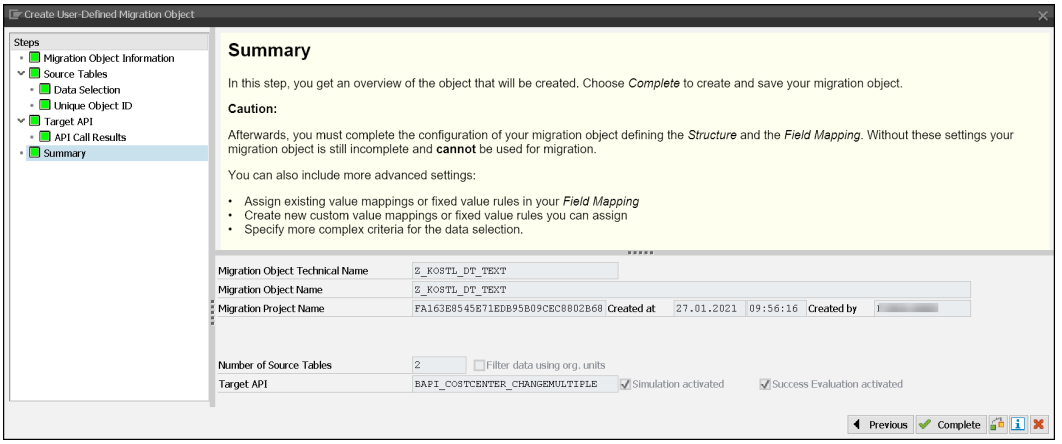


Figure 14.62 Summary of Newly Created Migration Object

Status of the New Migration Object

Note the following: although the newly created migration object is displayed in the migration cockpit (SAP Fiori), it can't be executed yet. You must make some supplementary detail settings directly in Transaction LTMOM, which we'll discuss now.

Detail Settings in Transaction LTMOM: Assigning Filters

In the example described here, the data model of the migration object has two source tables: CSKT and CSKS. In the wizard, you therefore selected the **Define Selection Later** option in the **Data Selection** step.

Defining filters for the present example

Take a closer look at the two source tables. In the root table CSKT (the text table), the **Company Code** field does not exist. It only contains the **Controlling Area** field. In the subordinate table CSKS (the master data table for cost centers) from which we require a field for the API later on, the **Company Code** field exists. In the detail settings (Transaction LTMOM), we therefore assign the filter KOKRS to the field CSKT-KOKRS and the filter BUKRS to the field CSKS-BUKRS. How does the migration cockpit proceed later on when the selection is executed?

Process of the selection in the example considered

Figure 14.63 illustrates the process. You start the selection for your Z_KOSTL_DT_TEXT migration object. The migration cockpit informs you that the data is now selected from company code 0001, as it was defined in the project. The rule defined in the KOKRS filter says that table TKA02 is read to determine

the associated controlling area in the SAP ERP source system. In our example, the rule determines controlling area 0001. As a result, the system finds all data records in table CSKT that contain controlling area 0001. From table CSKS, the system filters all data records to which company code 0001 is assigned. According to the data model of the Z_KOSTL_DT_TEXT migration object, the identified records are used to create migration object instances and are provided with a unique ID—for example, 123489123.

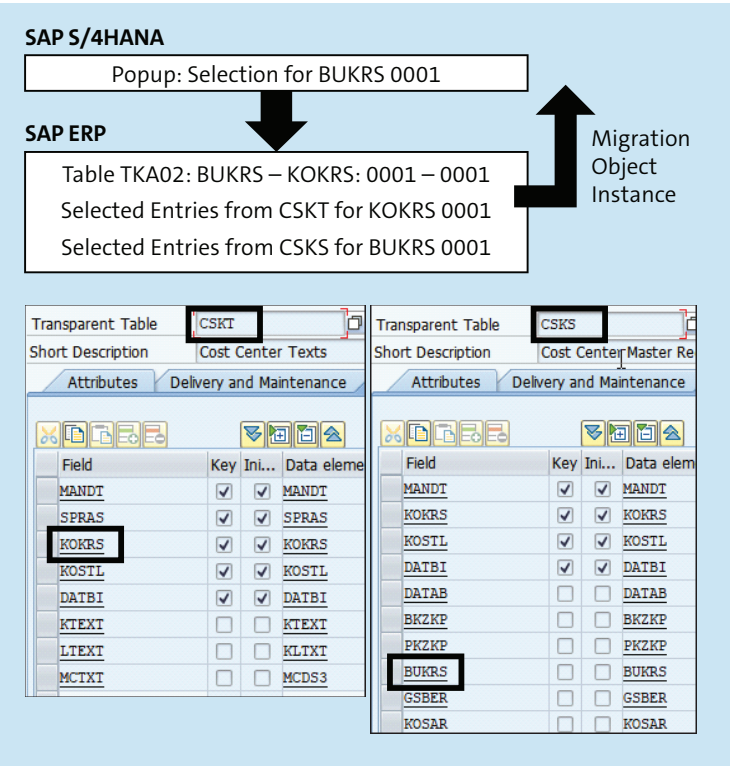


Figure 14.63 Selection Process in Running Example

Maintaining filters in the system

To specify the detail settings for data selection, open Transaction LTMOM and click **Source Tables** in your migration object. The system displays the tables, CSKT and CSKS, and you must now assign the correct filters. In Figure 14.64, the tree structure on the left-hand side of LTMOM is collapsed. Click table CSKT and then select the arrow icon in line KOKRS. A window opens.

Here you can use the value help of the **Filter Logic** field to display the filters that are available in this scenario (SAP ERP to SAP S/4HANA). The KOKRS filter is selected in this example. After you confirmed your selection, the arrow is displayed in green to indicate that a filter was defined for this field. For table CSKS, you use the same procedure to assign the BUKRS filter to the CSKS-BUKRS field.

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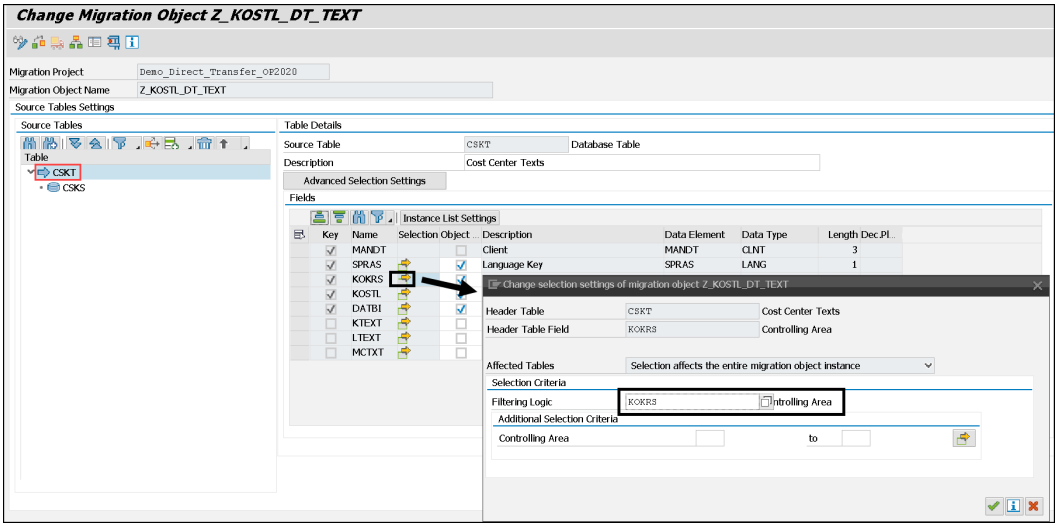


Figure 14.64 Assigning Filters in Transaction LTMOM

Detail Settings in Transaction LTMOM: Structure Assignments

In the next steps, you make structure and field assignments between the source and the target. Within the migration object, click the **Structure Mapping** node. An area opens on the right-hand side. You drag-and-drop the CSKT data source (left) to the LANGUAGE and COSTCENTERLIST data targets (right). The result is displayed in Figure 14.65.

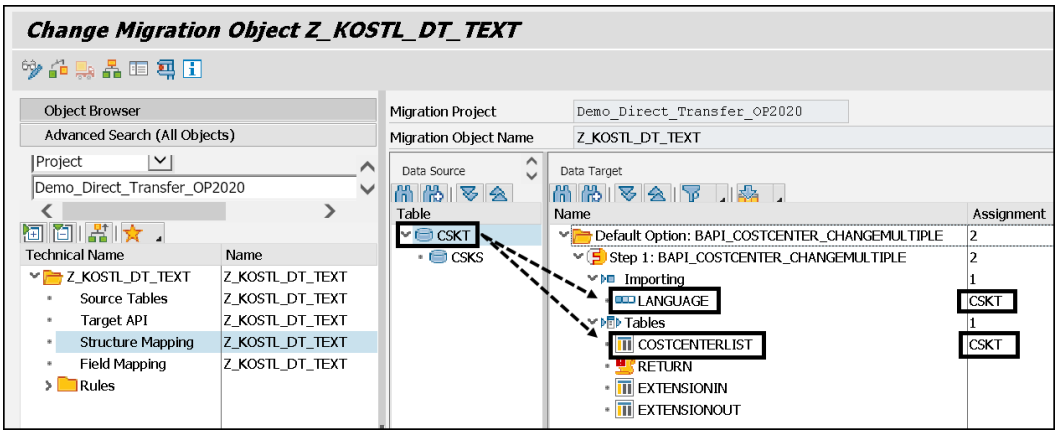


Figure 14.65 Structure Assignment of Table CSKT via Drag and Drop

Defining foreign table data access

In this example, the data model comprises a parent-child relation between the tables CSKT and CSKS. You must therefore also define the foreign table data access.

Select the **COSTCENTERLIST** entry and click the button (**Edit Assignment**). This opens a new window. Figure 14.66 shows the navigation to the foreign table data access and the option of maintaining the X structure for the target parameter in the lower area.

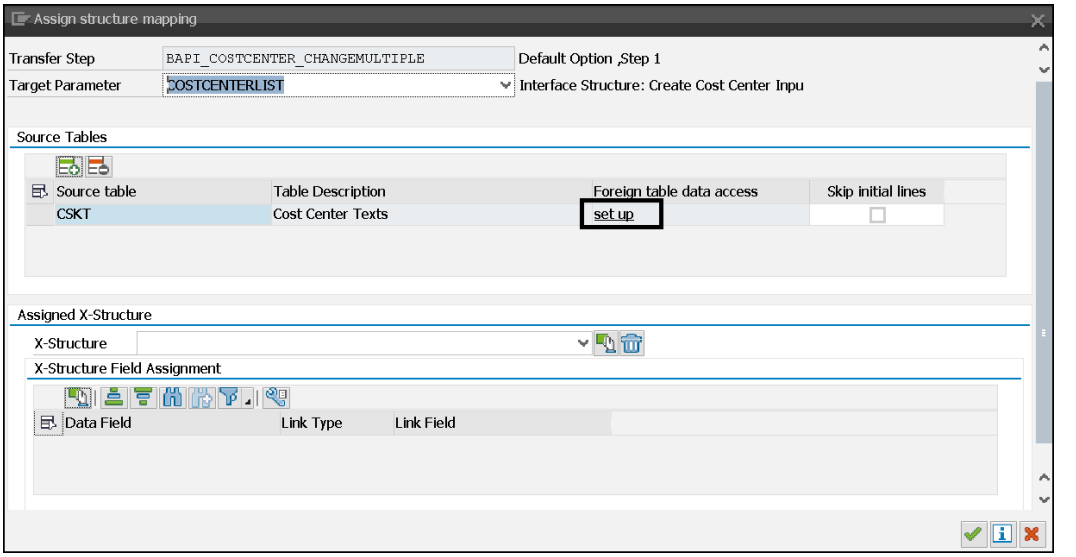


Figure 14.66 Setting Up Foreign Table Data Access

When you click **Set Up**, the system takes you to the details of the foreign table data access (see Figure 14.67).

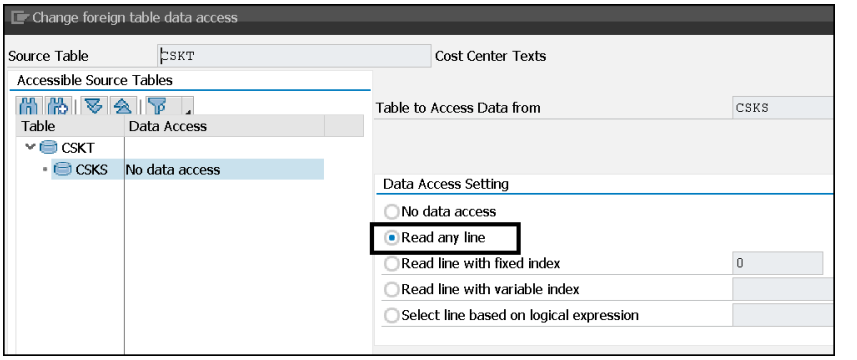


Figure 14.67 Detail Screen of Foreign Table Data Access

In our example, there is exactly one associated data record in the master data table CSKS for each data record in the text table CSKT. You therefore select the **Read Any Line** option. For more complex parent-child relations, this pop-up window provides more options like **Read Line with Fixed Index**, **Read Line with Variable Index**, and **Select Line Based on Logical Expression**.

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Detail Settings in Transaction LTMOM: Field Assignments

In our simple example, we want to copy the field content from the source system without any changes. To do so, click the **Field Mapping** node. A window opens on the right-hand side. Assign the source fields to the target fields using drag and drop, as shown in Table 14.3. Note that some target structures must be expanded.

Source Field	Target Field
CSKT-KOKRS	CONTROLLINGAREA
CSKT-SPRAS	LANGU
CSKT-KOSTL	COSTCENTER
CSKS-DATAB	VALID_FROM
CSKT-DATBI	VALID_TO
CSKT-KTEXT	NAME
CSKT-LTEXT	DESCRIPT

Table 14.3 Assignment of Source and Target Fields

Only display fields with assignment

Figure 14.68 shows the screen with assignments. You can use the **Filter** button to change the display in such a way that only parameters with assignments are displayed. This makes it easier to check the values assigned. The **Assignment** column shows the assigned source fields for which content was copied 1:1—for example, the CSKT-KOKRS field.

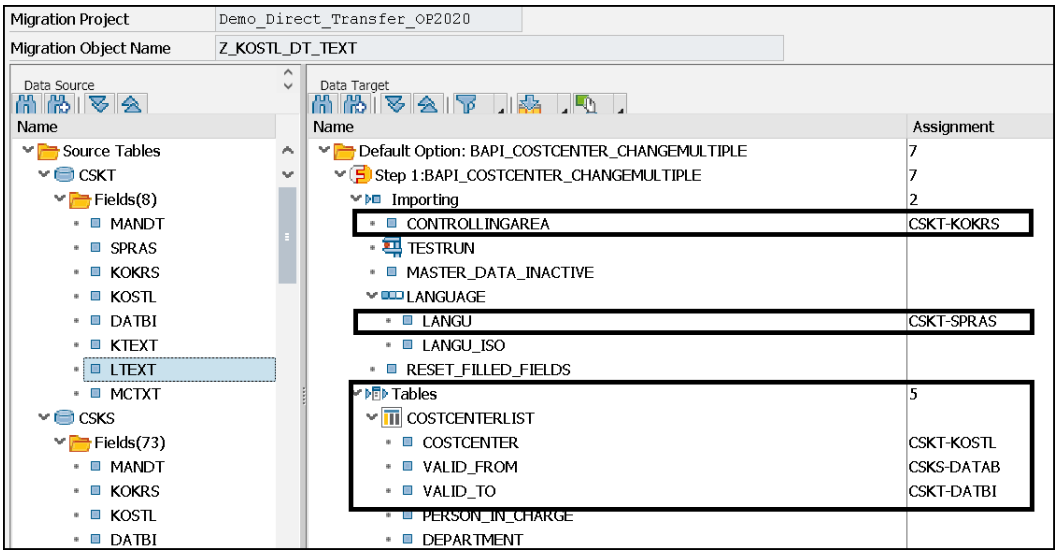


Figure 14.68 Field Assignment with Overview of Assigned Parameters

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If you select the button (**Edit Assignment**), the system displays a detail view of the individual field assignments (see Figure 14.69).

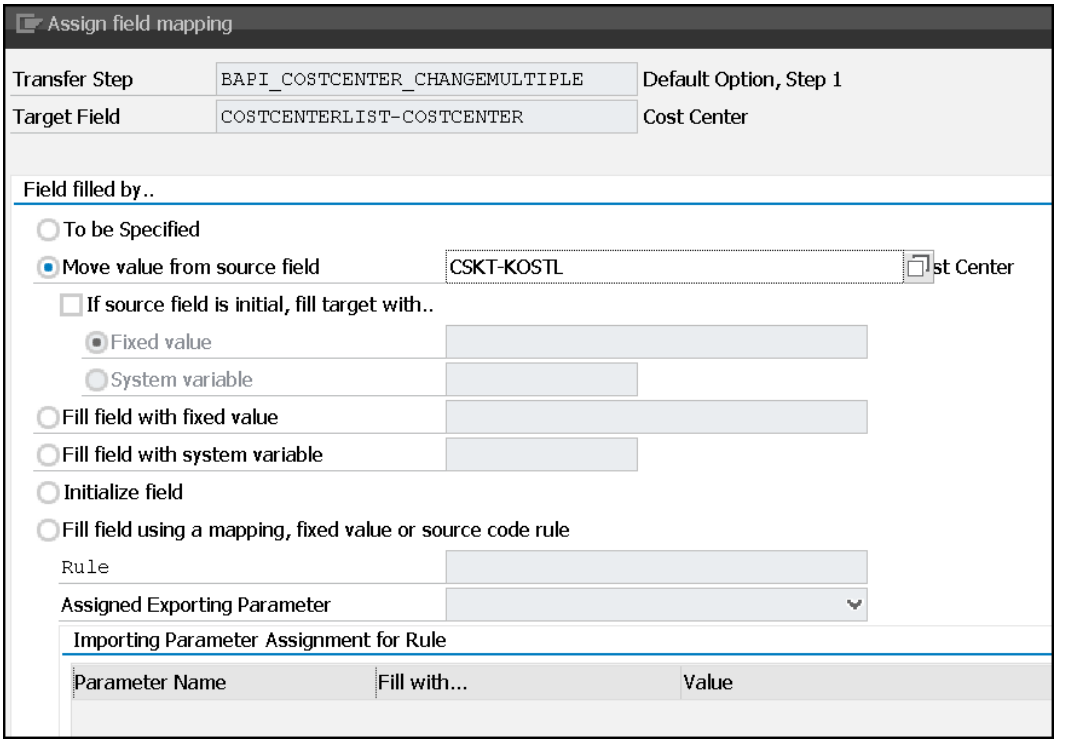


Figure 14.69 Detail View of Field Assignment, Including Field Mapping

The system displays all the options for how you can populate a target field with values. Various options are available:

- Move values from the source field (copy without any changes, `MOVE` rule). It's possible to also define a rule if the source field is initial. You can select between fixed value and system variable.
- Always fill the target field with a fixed value.
- Fill the target field with a system variable.
- Initialize the target value.
- Fill the target field using a mapping, fixed value, or source code rule. Assign the appropriate rule. For more information on this topic, refer to Section 14.3.5.

Using a New Migration Object

The `Z_KOSTL_DT_TEXT` migration object is now complete. The newly created migration object is processed just like the objects delivered by SAP. All the functions that we introduced in Chapter 13, Section 13.4 are available.

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Next, go to the migration cockpit and start the **Select** activity for the Z_KOSTL_DT_TEXT migration object. In the project, you defined that selection is made from company codes 0001 and 1000. They are assigned to controlling area 0001.

When you click the number of instances (**3**), the system displays the list of selected instances (see Figure 14.70).

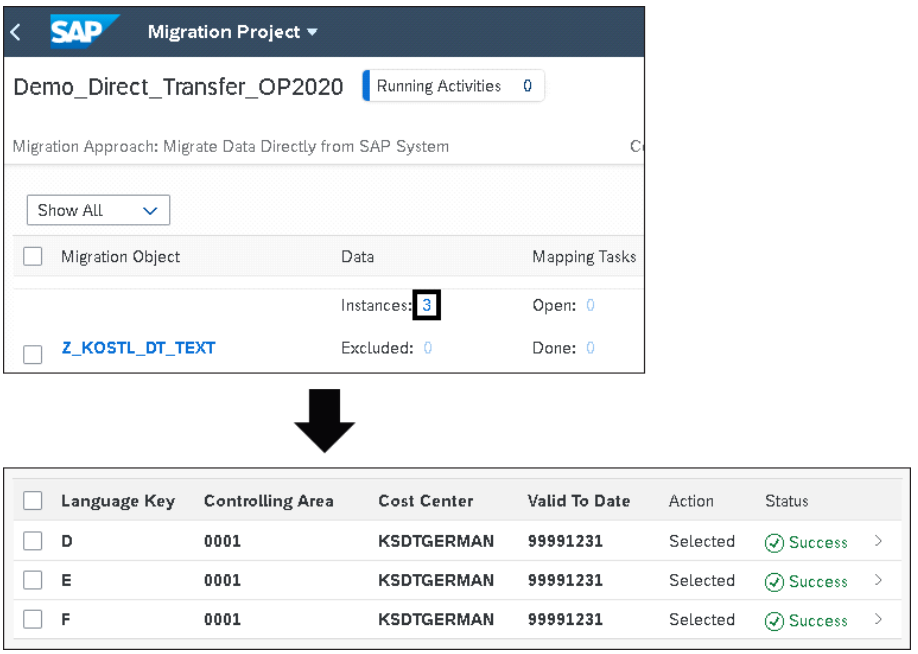


Figure 14.70 Result of Data Selection for Self-Defined Migration Object Z_KOSTL_DT_TEXT

You can see the three records that we displayed in the SAP ERP source system at the beginning of Chapter 14, Section 14.3.4, under Application Example. Chapter 13, Section 13.4.5 provides more information on how to delete migration objects from a project.

Our example is now complete. The following sections discuss selected topics that have not been discussed so far or were mentioned only briefly.

14.3.5 Creating User-Defined Rules

The central system documentation (accessed via the **Information** button after you have called Transaction LTMOM) provides comprehensive descriptions and examples on the topic of rules. You can create new rules at the migration object or project level. You can use these project rules in all migration objects in your project. Object rules, however, are only available

for configuring this specific object. There are two statuses for rules: activation and development.

In SAP S/4HANA 2020, you can create the following transformation rules:

- **Fixed values**
  A fixed value rule is a constant value that can be assigned to several target fields.
- **Value mappings**
  A value mapping rule is a container of a predefined mapping that provides a target value for a source value or a combination of different source values. Mappings can be generated automatically by the system during data selection or are provided manually by the user. In the former case, you need an additional configuration at the transfer step level. The value mapping rule must have at least one import parameter and one export parameter for the corresponding source and target values.
- **Source code**
  You create your own logic in the form of ABAP source code. Based on your source code rule, you can call other object rules (using the **Pattern** button).

If you right-click **Value Mappings**, for example, the system displays a screen for new creation (see Figure 14.71). Here, you can also download or upload mappings using the  button.

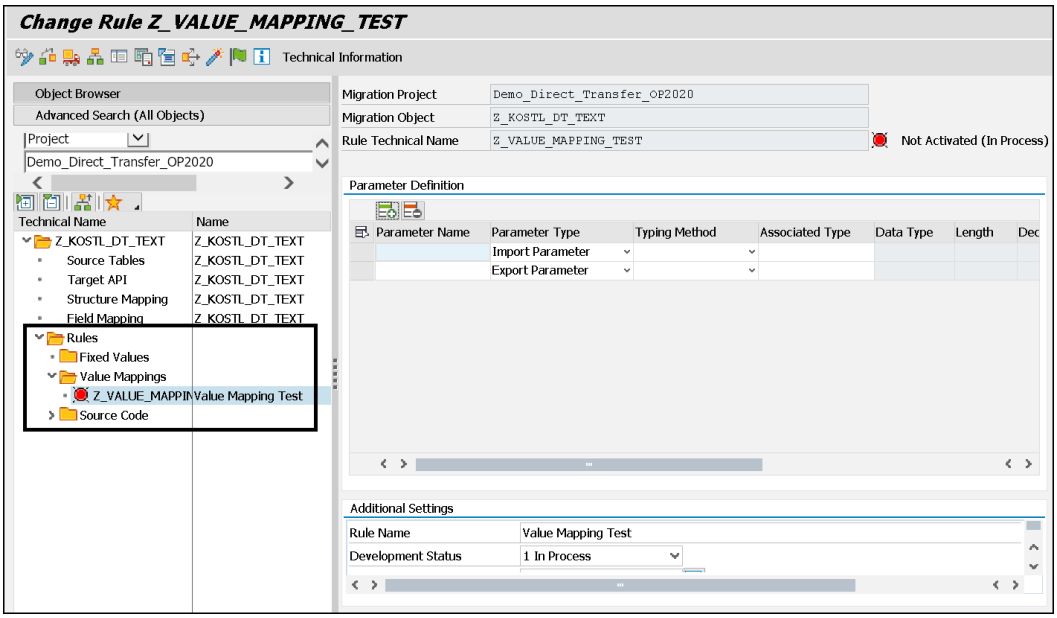


Figure 14.71 Creating Value Mapping

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You then assign the newly created rules to the target fields in the **Field Mapping** area; see the Detail Settings in Transaction LTMOM—Field Assignments section within Section 14.3.4.

Time of processing

In contrast to the file/staging approach, there are no event-based rules in the direct transfer approach (as of August 2020). The rules are always called at a specific point in time: when you execute the **Simulation** action. In this step, the rules are applied to the fields of the imported instances. The object instances are forwarded to the API using the values transformed here.

Section 14.3.8 provides information on debugging the transformation. Currently, rules cannot be copied, renamed, or deleted.



User-Defined Rules in SAP S/4HANA 1909

Creating custom source code rules is possible only with SAP S/4HANA 2020. In SAP S/4HANA 1909, you can create custom value mapping rules, but they aren't yet provided with default values for the target values. This means that for these self-created value mapping rules, you first download the Microsoft Excel template in Transaction LTMOM and populate it with source and target values. You then upload it using Transaction LTMOM. Custom `MOVE` rules and custom fixed value rules can also be created in SAP S/4HANA 1909.

14.3.6 Changing the Standard Selection

Under Detail Settings in Transaction LTMOM—Assigning Filters in Section 14.3.4, we described how to assign a collection of values of the same data type, which is stored centrally for your project (as a so-called filter), to a table field. Check out Figure 14.64 on this topic. At this point, it's possible to impact the selection directly at table level.

Selection options for database tables only

Note that these selection options can only be applied to database tables. The selection cannot be adapted for manually defined tables or enhancement tables. The same applies if it involves pool or cluster tables.



Customers Are Responsible for Changes to the Standard Selection

Once you change the standard selection that was predefined by SAP, it is within your responsibility to ensure consistency of the selected data.

Within your migration object, go to **Source Tables**, and click table `CSKT`. Then click the arrow  in the **Selection**, column, for example, in row `KOSTL`. A new dialog window opens (see Figure 14.72).

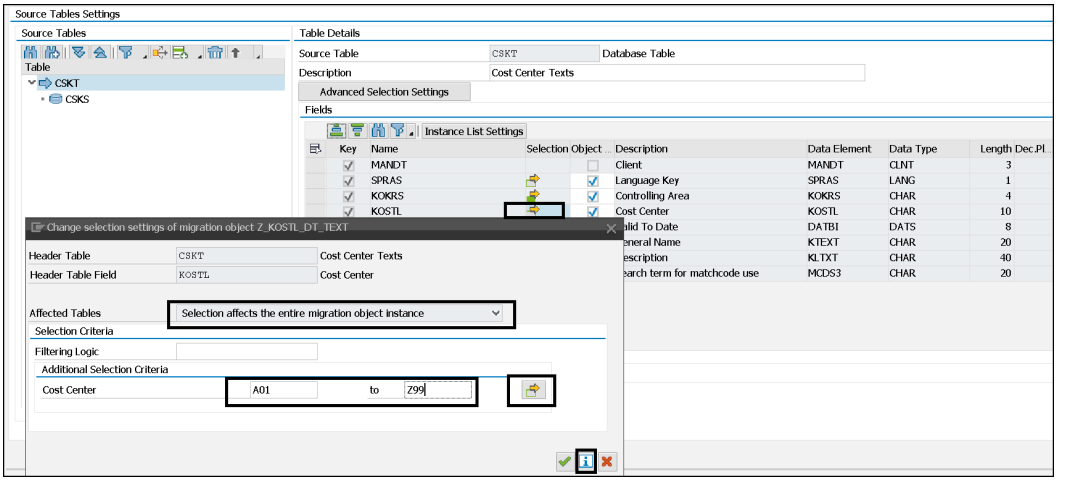


Figure 14.72 Adapting Selection at Table Level

The lower area of the dialog window shows **Additional Selection Criteria**. Here, you can specify a from-to restriction in the **Cost Center** field for the selection in table CSKT. As a result, only the texts for these cost centers are selected from text table CSKT. If you click the arrow in this dialog window, the system displays the SAP standard selection dialog, which you already know from every SAP application transaction. You can select or exclude individual values or intervals. This dialog is available for each field of the source tables.

Forwarding selection results

The middle area of the dialog window shows the **Affected Tables** field. Here you define how the selection affects each source table at level >= 2. The **Selection Affects the Entire Migration Object Instance** option means that the selection result is forwarded at all levels up to the root table (cumulative). The **Selection Only Affects This Table and Subordinate Elements** option means that the selection criteria only apply to the present table and the subordinate tables. This does not affect the selection result in the root table (restrictive).

Excluding data records explicitly from selection/SKIP

There are application cases where it is easier to exclude data records explicitly from selection instead of describing the quantity to be selected using several restrictions at table level. You can define a so-called SKIP rule for these cases. In the **Source Tables Settings** screen, click the **Advanced Selection Settings** button. A dialog window opens (see Figure 14.73). Choose the button (**Generate**) to generate the SKIP rule, which is a source code rule. The button for generating a rule then turns into a pencil icon. If you click this icon, you can navigate to the generated coding and adapt it to your requirements.

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The SKIP rule is run in the SAP S/4HANA target system as soon as the data of a migration object instance was imported from the source and before the instance is added to the instance list. The data selected is transferred to the rule using the import parameters. You apply your criteria to the data and forward the decision—create instance or not—to the export parameters. You can disable the SKIP rule at any time using the **Do Not Select an Object Instance in Some Cases** flag.

Partitioning for selection

In the lower part of the dialog window, you can find settings for partitioning the data during selection.

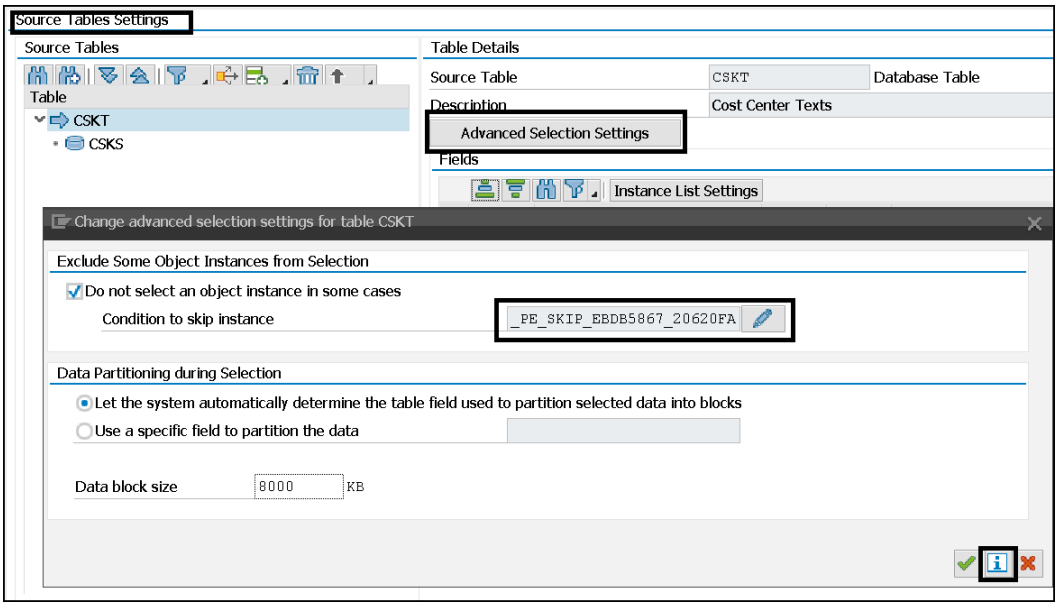


Figure 14.73 Maintaining SKIP Rule

14.3.7 Migrating Table Field Extensions (Z Fields)

The migration cockpit recognizes if the source system contains field extensions (custom fields or Z fields) for the SAP standard tables (only in the direct transfer approach). Call Transaction LTMOM and navigate to the **Source Tables** area within your migration object. The migration cockpit displays custom fields as source fields. Whether and how the custom field can be migrated to the target system depends on the structure of the BAPI that is used in the migration object.

There are three different concepts for function modules:

- Function modules that contain includes or append fields
- BAPI function modules with extension fields of type 1 (e.g., BAPI_MATERIAL_SAVEREPLICA)

- BAPI function modules with extension fields of type 2 with or without X fields

In all cases, the includes and append structures must be maintained by the customer (Transaction SE11). The user requires in-depth DDIC knowledge and an ABAP development authorization in the system. Section 14.2.5 provides comprehensive information if you want to create a custom function module.

14.3.8 Simulating and Debugging Migration Objects

You can simulate and debug individual or selected migration object instances also in the direct transfer approach. To do this, select a migration object in Transaction LTMOM and switch to change mode. The selection screen of Figure 14.74 opens if you select the button (**Simulation**).

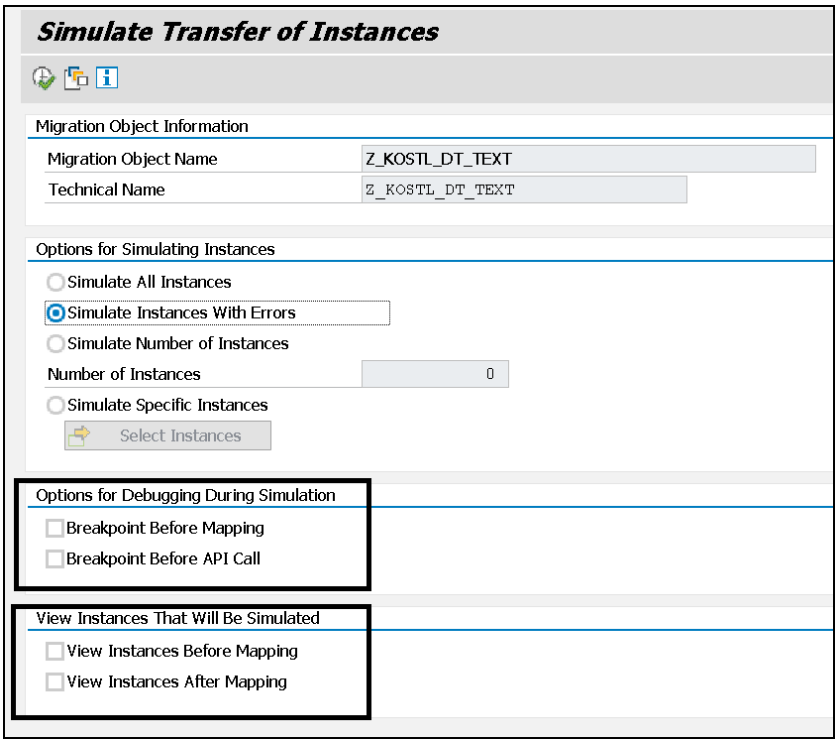


Figure 14.74 Simulating and Debugging Instances

There are two points in time when you can set a breakpoint:

- **Breakpoint Before Mapping**
  The program stops before the migration cockpit applies the mapping rules to the migration object instance. This way, you can track in which steps the system transforms individual values of the instance.

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- **Breakpoint Before API Call**
  The program stops before the migration cockpit transfers the transformed migration object instance and the transformed values to the API for simulation.

In the lower part of the screen, you can find two options that control whether the original migration object instance is displayed as it was imported from the source system or whether the converted instance is to be displayed.

14.3.9 Transporting Projects

As described in Section 13.4.5, SAP transport connection is available as of SAP S/4HANA 2020 to transfer projects to other systems. When creating a project in the migration cockpit (SAP Fiori), you must assign a transport request to this project.

In Transaction LTMOM, you can add projects, migration objects, and rules to a transport request. To do this, position your cursor on the corresponding element, and click the **Transport** button  .



Transporting Rules

Only the definition of a rule is added to transport requests. They do not contain any values—for example, mapping values. You can add them to the system via download/upload or maintain them directly in the migration cockpit.



Transports in SAP S/4HANA 1909

The transport connection is not available yet in SAP S/4HANA version 1909. Projects must be transferred manually.

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Chapter 15
Rapid Data Migration

In this chapter, you will learn about the option of migrating data using an ETL tool. In this context, data quality and data cleansing for the new implementation of SAP S/4HANA are of particular importance.

This chapter introduces the *rapid data migration* solution. During a new implementation, it's used for migrating data to SAP S/4HANA, irrespective of whether the old system is an SAP or a third-party system. Rapid data migration includes predefined migration content, the SAP Best Practices tool, and the SAP Data Services tool. The migration content is provided as an SAP Data Services project that includes all the rules and templates. It can be downloaded for free and imported into the SAP Data Services software. In this data migration approach, data quality and data validation, as well as the flexibility and enhancement options for SAP S/4HANA, are of utmost importance. Thus, rapid data migration is the solution of choice for customers with high requirements on data quality and data integrity.

SAP Data Services

15.1 Tools

The SAP Data Services tool is a product from the SAP Enterprise Information Management portfolio, which provides functions for integrating data (Data Integrator) and ensuring data quality (Data Quality). SAP Data Services is a tested and proven extract, transform, and load (ETL) tool, which has a graphical user interface (Designer) and can be connected to numerous source systems (extract) and target systems (load) through various interfaces. You'll map (transform) the data on the tool's drag-and-drop user interface.

ETL tool

SAP Data Services also enables you to continuously improve the quality of your imported data both before and during the data migration. Unlike traditional migration scenarios, you'll avoid migrating incorrect, redundant, and unnecessary data records.

Data quality

In addition, rapid data migration uses the SAP BusinessObjects Business Intelligence Suite for advanced, but optional, data migration monitoring. The platform provides predefined reports as SAP Best Practices to support

Web Intelligence

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data migration projects for analytics and troubleshooting. The reports are created as SAP BusinessObjects Web Intelligence reports, which allows you to support your migration projects by determining data quality and mapping issues at an early stage.

SAP Information Steward

In addition to SAP Data Services, which is standalone software to connect source and target systems, SAP also delivers further helpful tools in the SAP Enterprise Information Management portfolio that you can use for ensuring high data quality in data migrations. Of particular interest is the SAP Information Steward tool. Both tools provide the profiling function (to identify similarities and structures in data) and deduplication function for data (to find duplicates) and data lineage (to reconcile data between source and target systems).

Benefits

Because you'll use a standardized ETL tool, you won't have to use custom one-off programs for migrating to SAP S/4HANA but will use standard interfaces, such as IDocs, BAPIs, and SAP function modules. Moreover, SAP Data Services can help you to populate the source files of the SAP S/4HANA migration cockpit (see Chapter 13, Section 13.2) or to directly write to the staging tables (Chapter 13, Section 13.3). Using SAP Data Services for data migrations provides further advantages—for example:

- Direct connection to one or more source systems via database interfaces (both SAP ERP and non-SAP systems)
- Additional integration of data from CSV files, flat files, and Microsoft Excel files
- Standardization of source data from various legacy systems and files into a unified format
- Data record cleansing on the source system
- Deduplication of data and determination of the entire data record that merges and replaces duplicates (referred to as the *golden record*)
- Start of the mapping process and validation process before you've completed the Customizing of SAP S/4HANA
- Simple and reusable mapping via drag and drop
- Visualization of the entire data flow from the source system to the target system
- Reusable check routines to minimize custom code
- Validation of external data against SAP S/4HANA check routines without having to load data records into SAP S/4HANA
- Test runs without updating data
- Usage of SAP S/4HANA standard interfaces

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15.2 Architecture

Components

The rapid data migration solution combines SAP Data Services with migration content specifically developed for data migrations as a so-called SAP Data Services project to be imported. Technically, the SAP data migration solution consists of three components:

- The actual software
- A database server
- A web server

The database server is used to manage repositories in several separate database instances. For example, one repository contains the entire SAP Data Services content and metadata about interfaces, which describes the interface structure as *data about data*.

The web server permits access to the software through a web browser, for example, via the Central Management Console (CMC) for reporting with the SAP BusinessObjects Business Intelligence suite.

Package content

In addition to the software components, the SAP S/4HANA data migration solution package contains the following components:

- Data migration templates (content), including mappings for SAP Data Services (Section 15.3)
- The migration services tool for value mapping (Section 15.7)
- Reports from SAP BusinessObjects Web Intelligence for monitoring and reporting (Section 15.10)
- Content for the reconciliation between the SAP target system and the source system(s) (Section 15.10)

SAP Best Practices

SAP provides these components as an SAP Best Practices package for SAP S/4HANA: rapid data migration. In addition to predefined business best practices content and implementation best practices for configuration, rapid data migration packages contain services for data migration projects, provided by SAP consulting or SAP partners. However, you can use this SAP Best Practices content yourself without being supported by SAP or an SAP partner by downloading the package from the SAP Best Practices Explorer free of charge (Section 15.3).

IDocs and BAPIs

The predefined migration content for SAP Data Services contains the metadata of the SAP S/4HANA target interface, as well as validations for simplifying the source mapping. More than 50 business objects are supported. Theoretically, every IDoc, every asynchronous BAPI, and every web service can be used. Even RFC-enabled function modules or direct writing to staging tables is possible.

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Sample Migration Content

Examples of predefined templates include the following:

- For business partners with customer and supplier master data
- For logistics data such as material masters, bills of materials (BOMs), and sales documents
- For SAP Financials data, such as receivables and payables

For BAPIs without a provided IDoc interface, you can use Transaction BDBG to easily create a BAPI/ALE interface in the customer namespace. You can then also enhance SAP Data Services content without any restrictions. The SAP Best Practices package includes an enhancement guide for more information.

Data migration platform

With rapid data migration content, the ETL tool, SAP Data Services, becomes a data migration platform perfectly attuned to the on-premise version of SAP S/4HANA. Figure 15.1 illustrates the corresponding architecture, with SAP Data Services in the center.

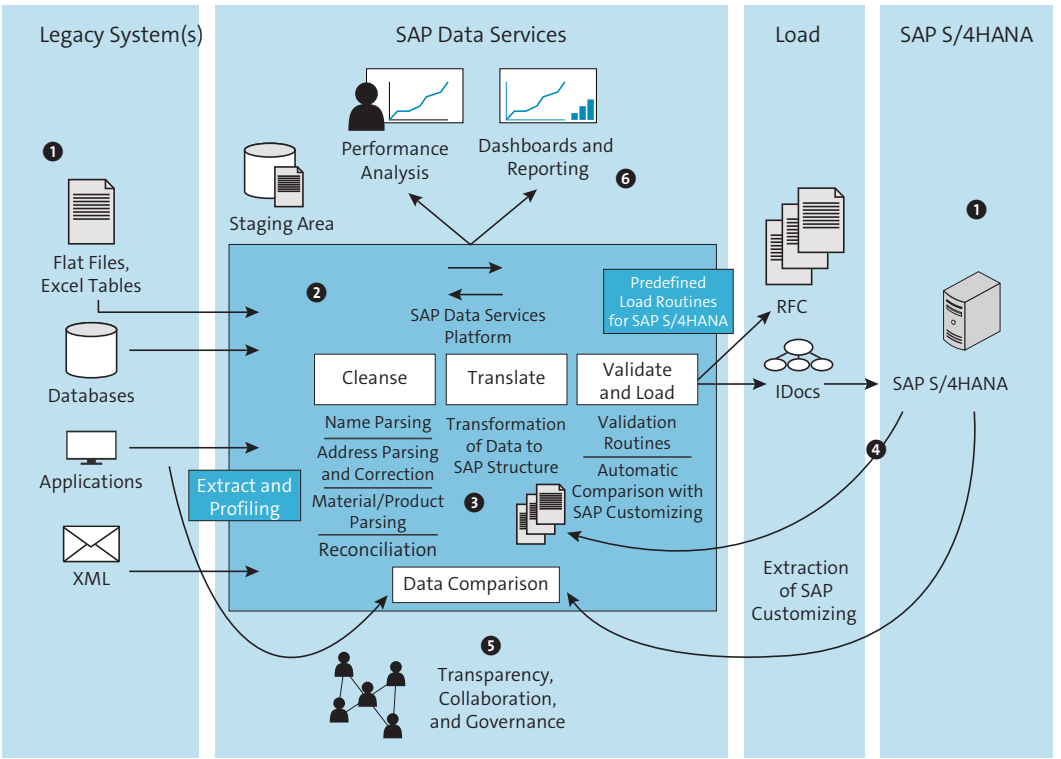


Figure 15.1 Architecture of Rapid Data Migration Solution

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The platform itself runs on a relational database that is also used as a staging area. SAP Data Services can connect to any source systems via adapter frameworks, such as Open Database Connectivity (ODBC), file interfaces, Mainframe, XML files, and Microsoft Excel files:

❶ **Source and target system**
On the left side of Figure 15.1, the system is integrated with one or more legacy systems via various interfaces; on the right side, the system is integrated with an SAP S/4HANA system. For new implementations of SAP S/4HANA, the legacy system can be an SAP ERP system or any other non-SAP system. However, legacy systems can also be mixed systems (e.g., an SAP Business Suite system and multiple external add-on systems that all will be consolidated into one SAP S/4HANA system).

❷ **Extraction and profiling**
The staging area between the source and target systems is provided by the database on which SAP Data Services runs, which may be, but not always is, the SAP HANA database. Depending on the size of the repository, we recommend maintaining a smaller landscape, for example, on the basis of an SAP Adaptive Server Enterprise database, which can also be used with an SAP HANA database license. In this step, you'll extract and analyze data from the source system. This analysis (profiling) is a critical step that provides detailed insights into the legacy system. These insights help you to detect patterns in the data and check important details. For example, do all ZIP codes for the US have five digits (plus possible four-digit extensions), and are only numbers used? What notations are used to designate the United States in your legacy system (e.g., United States of America, US, and/or USA)?

❸ **Cleansing, conversion, validation, and loading**
This step includes the cleansing of data records so that they follow a specific pattern, the conversion of certain rules, and, finally, the reconciliation with the Customizing for SAP S/4HANA. These processes can entail, for example, merging two fields into one field, dividing fields, converting values to a specific format (e.g., converting telephone numbers into the international format with "+1" added for the US), and validating mandatory fields and check tables. The cleansed and verified data is then imported to the SAP S/4HANA system.

❹ **Customizing extraction from SAP S/4HANA**
Because you can configure SAP S/4HANA, you'll need to transfer the Customizing (e.g., for company codes, plants, material types, and material groups) to the intermediate layer of SAP Data Services by replicating the Customizing in SAP Data Services using predefined content. This process enables you to ensure, in SAP Data Services, that the data records you

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want to import are compatible with the SAP S/4HANA system. You can repeat the delta reconciliation several times if required—for example, if you need to make changes to the Customizing in the SAP S/4HANA system.

❺ **Data reconciliation**
After the data has been loaded, the data that is actually imported to the SAP S/4HANA system is reconciled with the expected data for the SAP Data Services migration.

❻ **Dashboards and reporting**
The technical and functional resources involved in the data migration can trace the entire process anytime using dashboards and reports. As a result, the status of the data transfer is always transparent.

You can continue to use SAP Data Services as a fully functional connection and orchestration platform for the master data integration from several systems or for processes to ensure data quality (data governance) after the data has been transferred successfully.

15.3 Migration Content

Jobs

The data migration content, which is available in packages, contains jobs for SAP Data Services. One job is delivered for each business object, and this job usually corresponds to one IDoc type. (IDocs can also call BAPIs, as we'll discuss ahead.)



Customer Vendor Integration

SAP S/4HANA introduced innovation into the traditional customer master migration object. Customers and vendors are merged by customer-vendor integration (CVI) via the business partner interface. By always using the latest content for rapid data migration, you can ensure that you always call the correct interfaces and you do not need to worry about that. Additional information is available in SAP Note 2417298 (Business Partners with the "Customer" and "Vendor" Roles).

All provided and modeled jobs are used as templates for the SAP Data Services platform and are available in a proprietary file format (ATL; file extension .atl), which is a file format specific to SAP Data Services. Moreover, these packages also contain as documentation installation guides specific to the business content. These guides also include mapping templates for all business objects (tables for mapping on paper), enhancement guides (to add custom interfaces or customer-specific fields), and business process

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descriptions (for each business object) to enable you to understand the IDoc structure in detail.

Localization

Note that the predefined content can be localized for various countries, but technical content is provided in the English language only.

Importing the content

The import function in SAP Data Services lets you easily upload all available objects from the ATL files provided. Similarly, you can also use this function to save your mapping specifications or validations for reuse in other projects. We recommend using the export function for regular backups.

Let's turn to migrating data to SAP S/4HANA. The individual ETL functions of the SAP Data Services platform are beyond the scope of this book and not discussed in detail here.



No Separate License Required

The product license for SAP Data Services covers both the ETL part (Data Integrator) and data cleansing part (Data Quality). If you do not have a separate software license for SAP Data Services and do not have to cleanse your data, you can request a free Data Integrator key code anytime by using your SAP HANA database license.

You can then use this key code with a valid SAP HANA runtime edition for applications and SAP BW database license, or with the full SAP HANA Enterprise database license, to load data to SAP S/4HANA or to the SAP HANA database without having to pay for additional licenses. As SAP HANA database licenses, either license (SAP HANA REAB or SAP HANA Enterprise) is included in the SAP S/4HANA license package.

For more information, go to *http://s-prs.co/5279105*. Also, the following link navigates you to a guide describing how to request the required key code: *http://s-prs.co/5279106*.

15.3.1 Interfaces as Part of the Migration Content

Using IDocs

For migrating data to SAP S/4HANA, as mentioned earlier, the rapid data migration solution uses IDocs, the SAP standard interface technology, for most business objects (because all BAPIs are called via their IDoc interfaces) for sending data to SAP S/4HANA. As part of the content, the structure of the IDocs as well as their fields have been replicated as metadata in SAP Data Services. As a result, you can map the source system (your legacy system) to the SAP S/4HANA target structure in the SAP Data Services Designer.

An IDoc is a hierarchically nested structure. Individual data records in IDocs are called *segments*. IDocs are updated via function modules. Unlike direct

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updates, the Application Link Enabling (ALE) layer is used here. Consequently, the IDocs are always addressed via the same function module in the SAP S/4HANA target system: the RFC-enabled IDOC_INBOUND_ASYNCHRONOUS module. SAP Data Services is responsible for the entire process; you don't have to do anything here.

IDoc status values

IDocs always have defined statuses in the SAP system. The most important status values for the data transfer in inbound IDocs are the following:

- **Status 64 (waiting)**
  You can transfer the IDoc to the application.
- **Status 53 (IDoc successfully updated)**
  The application document was updated.
- **Status 51 (error in IDoc)**
  The application document was not updated.

Message type and basic type

You can differentiate between *IDoc message types*, which indicate the semantics of IDocs, and *IDoc basic types*, which define their syntax. For example, the IDoc message type ORDERS is responsible for order data, while the different versions of the basic types, ORDERS04 or ORDERS05, specify the exact syntax of the segments and all fields contained therein. The version concept specifies that fields and segments can always be added but never deleted. Consequently, ORDERS05 covers all functions of ORDERS04 plus additional new fields. This version control ensures that new systems can handle obsolete IDocs (upward compatibility) and send IDocs with a lower version to older systems (downward compatibility) that cannot handle more recent IDoc versions.

The relationship between a message type and a basic type, however, is not always 1:*n*, as may seem at first, but *n*:*m* because the IDoc basic type ORDERS05 transfers two logical message types: in addition to purchase orders in the ORDERS IDoc message type, the ORDRSP message type for purchase order confirmations is also available, resulting in different meanings for the IDoc messages.

IDoc type

An enhancement concept is available for IDocs, which allows for IDoc extensions, such as ZORDERS05, which combines additional customer-specific fields or customer segments in the so-called IDoc type.

Although IDocs are a broad topic, this level of detail on IDoc technology is sufficient in this context. SAP Data Services will perform the tasks for you using the rapid data migration content and will ensure that the IDocs are set up with the correct IDoc control records and syntax.

Transaction BDBG

Over time, IDocs have proven to be solid and consistent interfaces with a smart version concept. Moreover, updates of IDocs are secure because the

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IDocs are completely rolled back and available for processing again when the update is canceled. These are the reasons that SAP provides Transaction BDBG as a tool that can generate an IDoc interface on the basis of an asynchronous BAPI at the touch of a button.

Asynchronous BAPIs are BAPIs that can load data independently to a system instead of having to carry out an operation and providing a response. The only information returned is a success or failure indicator, similar to traditional IDocs. Transaction BDBG allows you to extend the IDoc world considerably.

BAPI ALE interface

Most of the BAPIs already include the BAPI ALE interface, which you can use to generate the IDoc structure and IDoc type from the BAPI. The IDoc will serve as a wrapper around the BAPI, and data will be sent as IDoc instead of directly calling a BAPI in a remote system. The inbound IDoc is then "unwrapped," and the BAPI is called locally in the target system. In general, a BAPI is an SAP function module with a defined interface and documentation. The advantage of using BAPIs is that the send process is decoupled from processing, as is the case for ALE. Otherwise, the connection between the systems must be open during the entire BAPI processing time.

15.3.2 Example: Migrating Bank Master Data

Bank master

The following sections focus on a simple example: transferring bank master data to an SAP S/4HANA system.

The object is updated in the SAP S/4HANA system using the `BAPI_BANK_CREATE` BAPI. However, the BAPI is called via the BAPI ALE interface and, thus, via an IDoc. As a result, in this case, SAP Data Services first sends an IDoc to the SAP S/4HANA system, while the BAPI is directly called in the SAP S/4HANA system if the SAP S/4HANA migration cockpit is used (see Chapter 13).

The SAP S/4HANA migration cockpit will run as an application in SAP S/4HANA, while you'll be able to use SAP Data Services for mapping as a standalone tool at an early stage without having to connect your source and target systems.

Our example is restricted to the required bank master data only and uses two IDoc segments of the generated IDoc type, `BANK_CREATE01` (message type `BANK_CREATE`). The technical SAP names of the segments are `E1BANK_CREATE` and `E1BP1011_ADDRESS`.

In the SAP Data Services content, these segments are `BANKHeader_E1BANK_CREATE_Required` and `BANKBankAddress_E1BP1011_ADDRESS_Required`. These names indicate, respectively, a header record and an address record.

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In contrast to most objects, our brief example won't include further IDoc segments at lower levels. Depending on the IDoc type definition, these deeper nested structures can be repeated several times but are not always mandatory.

Due to the default IDoc structure used, the content from SAP Data Services has the same structure for every business object and includes mapping (`*_Map`), validation (`*_Validate`), and data enrichment (`*_Enrich`).

The default structure of the user interface in the SAP Data Services Designer (see Figure 15.2) comprises **Project Area** ❶ and **Local Object Library** ❷ on the left. The entire section on the right ❸ next to the **Start Page** provides graphical illustrations of process flows. These illustrations map the flow of data records from the top left to the bottom right.

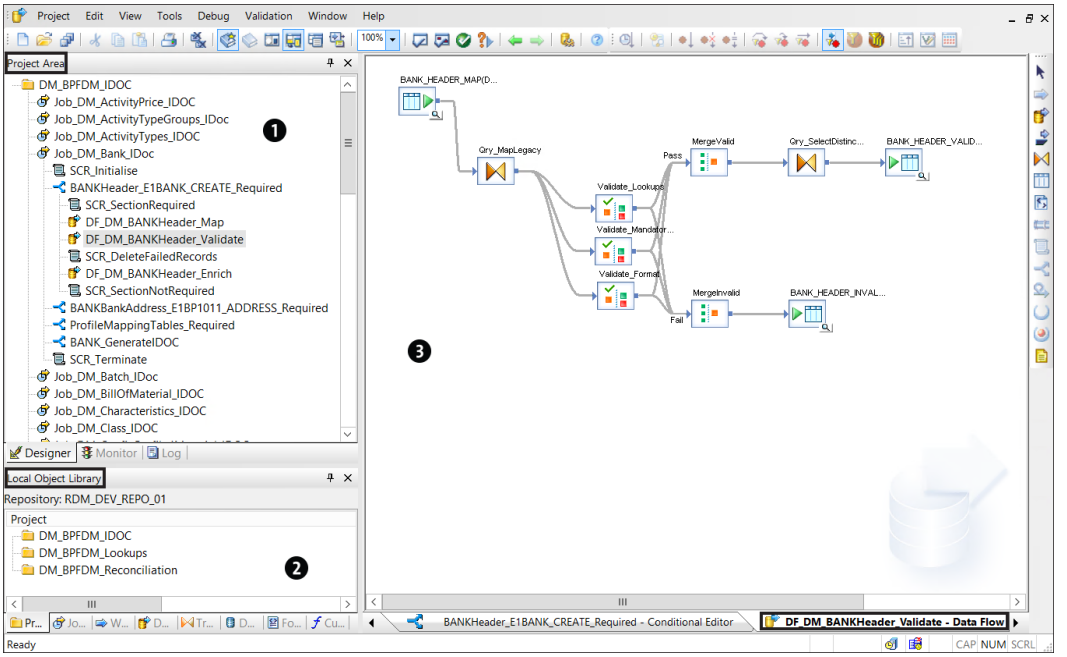


Figure 15.2 SAP Data Services Designer

Workspace The example in Figure 15.2 shows the `Job_DM_Bank_IDoc` customer job with the `DF_DM_BANKHeader_Validate` data flow for the bank header data. The system always displays new windows as tabs on the right-hand side.

Projects The imported content for SAP S/4HANA has the structure as shown in Figure 15.3. Jobs in SAP Data Services are organized in projects; one job can be assigned to several projects. If you modify a specific job, these modifications affect all projects. So the project name is basically only a collection of references to jobs in SAP Data Services. The same applies to all subordinate

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objects, such as data flows. They can be reused; modifications always affect all instances. To avoid unintentional changes, you can replicate each object and use the copy for your specific purposes.

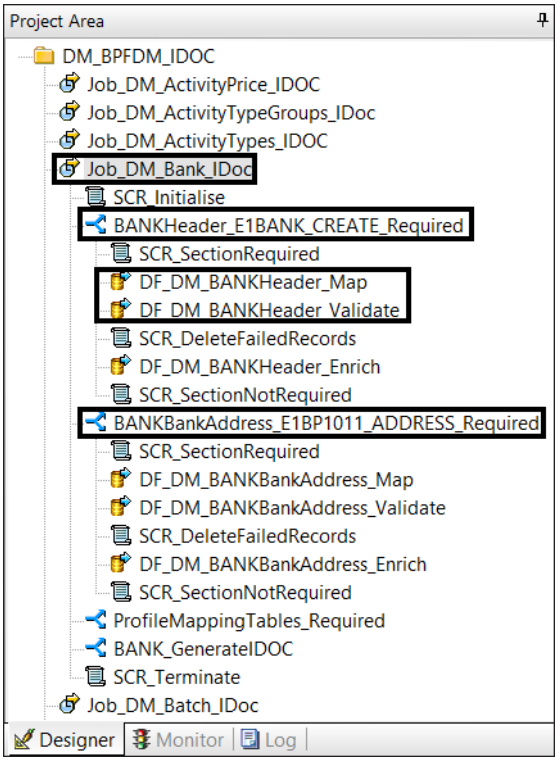


Figure 15.3 Project Structure with Job and IDoc Segments

We'll use the `DM_BPFDM_IDOC` project in our example. The project contains one job for each business object because data migration with rapid data migration—as is the case for all other methods—always migrates the data of an entire business object as a logical unit and not for each SAP table.

Data flows

We'll use the `Job_DM_Bank_IDoc` job to transfer the bank master. In general, two data flows are significant for all data migrations and will have to be processed for each IDoc segment (e.g., our first segment, `E1BANK_CREATE`, the header segment):

- `DF_DM_BANKHeader_Map` (mapping data flow; Section 15.6)
- `DF_DM_BANKHeader_Validate` (validation data flow; Section 15.8)

During the mapping, the fields are mapped, while the validation data flow enables you to display the results of various data validations after they have been carried out.

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Finally, the DF_DM_BANKHeader_Enrich data flow also exists, which is discussed in detail later in this section. To migrate your data, this step is not that important at first because empty fields will be populated with default values regardless.

Mapping template

For a mapping template, we'll create a mapping on paper. These mapping templates including content, provided for each business object, to facilitate assigning fields and values in the tool. In addition, mapping templates are an appropriate means to discuss complex field relationships with the persons responsible in the various user departments.

You can immediately enrich your mapping templates with test or production data to simplify the loading without having to carry out field mappings. To make handling template files easier in the Microsoft Excel format, templates are included in the rapid data migration package and are already filled with test data.

Figure 15.4 shows the IDoc target structure as an excerpt of the mapping template for the BANK_CREATE01 IDoc.

System Required	Enrichment Rule	Look Up Required	Text Description	Field Name	SAP_Table	SAP_Technical_Field_name	Field Length	Additional Instructions and Comments	Segment Name	Lookup Table
E1BANK_CREATE-Header Segment										
*		+	Bank country key(BANK_CTRY)	BANK_CTRY	BNKA	BANKS	3		E1BANK_CREATE	T005
*			Bank Keys(BANK_KEY)	BANK_KEY	BNKA	BANKK	15		E1BANK_CREATE	
E1BP1011_ADDRESS-Transfer structure object 1011: Bank address										
*			Name of bank(BANK_NAME)	BANK_NAME	BNKA	BANKA	60		E1BP1011_ADDRESS	
*			Bank Keys(BANK_KEY)	BANK_KEY	BNKA	BANKK	15		E1BP1011_ADDRESS	
		+	Region (State, Province, County)(REGION)	REGION	BNKA	PROVZ	3		E1BP1011_ADDRESS	T005S
			House number and street(STREET)	STREET	BNKA	STRAS	35		E1BP1011_ADDRESS	
			City(CITY)	CITY	BNKA	ORT01	35		E1BP1011_ADDRESS	
			SWIFT Code for International Payments(SWIFT_CODE)	SWIFT_CODE	BNKA	SWIFT	11		E1BP1011_ADDRESS	
			Bank number(BANK_NO)	BANK_NO	BNKA	BNKLZ	15		E1BP1011_ADDRESS	
			Bank Branch(BANK_BRANCH)	BANK_BRANCH	BNKA	BRNCH	40		E1BP1011_ADDRESS	

Figure 15.4 SAP S/4HANA Target System as Excerpt from Mapping Template

The following sections describe the most important columns of the templates with the terms used in all mapping templates (as listed in Table 15.1). The following symbols are used as abbreviations in SAP Data Services as well as in all templates:

- The asterisk (*) for mandatory fields
- The dollar sign ($) to highlight existing default values (there are no default values for bank master data)
- The plus sign (+) for fields with check tables in the SAP system

Fields with a plus sign for which value mapping is required (i.e., conversion tables), in addition to field mapping generally, are discussed in detail in Section 15.7.

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Column	Description
System Required	A mandatory field
Enrichment Rule	Populated with a default value if you have not assigned a source field
Look Up Required	A check table (lookup table) for this field (Only values from the F4 input help are permitted.)
Text Description	A unique and detailed description
Field Name	Field name in rapid data migration content
SAP_Table	Technical name of the table in the ABAP Dictionary
SAP_Technical_Field_name	Technical name of the field in the ABAP Dictionary
Field Length	Field length in the SAP target system
Additional Instructions and Comments	Default value for fields with dollar signs
Segment Name	Name of the IDoc segment
Lookup Table	Check table for the field that impacts valid values when the values are mapped later on

Table 15.1 Critical Columns on SAP S/4HANA Target Side in Mapping Template

The data migration content for SAP Data Services uses the IDoc interface to provide the same design and functionality for all business objects in the modeled data flows and for all mapping structures. As a result, you'll be able to use new business objects without deep application expertise.

15.4 Connecting to Source Systems

Source systems

Now that you're familiar with the basic structure of the content provided, let's take a look at the actual data migration process and the integration of the source system. First, you'll integrate the legacy system into SAP Data Services, which will make legacy structures and metadata known to the system.

You can also integrate several source systems to SAP Data Services using different interfaces. In our example, we won't use data from external systems; instead, we'll provide our source data using the migration templates provided in the rapid data migration content (Section 15.6).

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As an example, let's first discuss briefly customer data. Let's assume you're using a table from the legacy system database called CUSTOMERADDRESS as well as a Microsoft Excel file called Customer_Header.xls, which contains customer names from the legacy system. (Of course, direct integration using an application or by loading flat files is also possible.)

Integrating the database

To integrate table CUSTOMERADDRESS from the legacy system, first navigate to the **Datastores** tab in the local object library and create a database connection by right-clicking in the empty area.

In our example, you'll integrate the DS_LEGACY database using an ODBC interface. Each connection is provided with a subitem called **Tables**, which you can use to select all or a set of tables of the legacy system. This connection also makes metadata, such as field names and field lengths, known in SAP Data Services. This connection also enables you to view the existing data records in the table (see Figure 15.5).

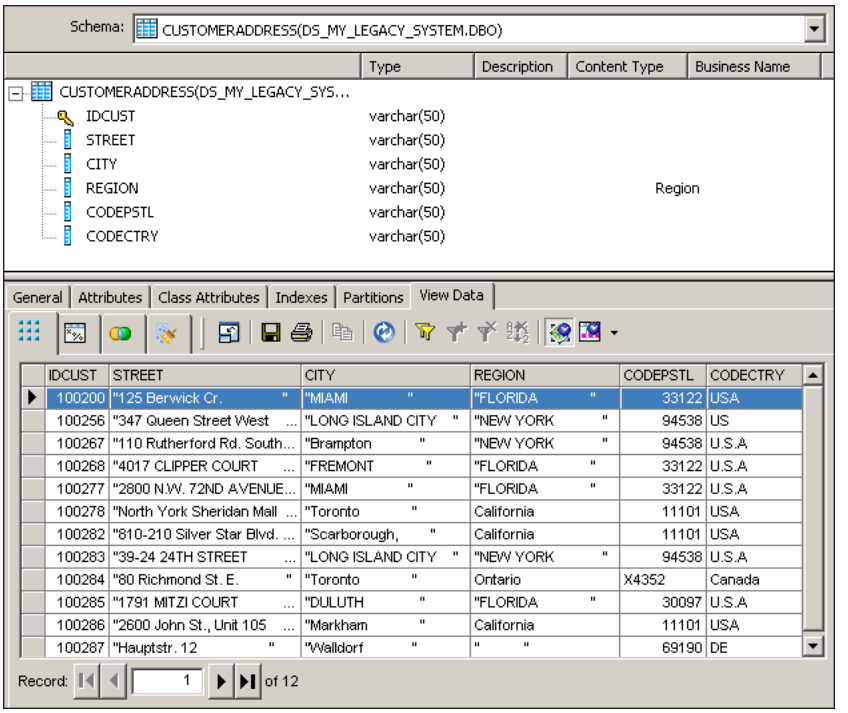


Figure 15.5 Connecting Table via ODBC

File interface

Next, you'll integrate the Microsoft Excel files by right-clicking the **Formats** tab and selecting the **New** menu item. Next, select a specific spreadsheet and an area within the table. If the table contains column names in the first row, you can copy the metadata directly from the Microsoft Excel file by

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selecting the corresponding function, as shown in Figure 15.6, and confirming your selection by clicking the **Import Schema** button.

You can adjust the default data formats, such as `varchar 255`, manually if required. Be sure to use the character data type for all purely numerical values that should not be used in mathematical operations.

Preview of data

For integrated Microsoft Excel files, you can preview data in the same way as displaying table data records if SAP Data Services can access the file. After importing your data to SAP Data Services, you won't see any major difference, and you can use the two objects in the same way. However, one restriction applies: in SAP Data Services, database tables and flat files can be the sources as well as the targets of the data, but Microsoft Excel files can only be used as a source; that is, you can't write to the Microsoft Excel file directly.

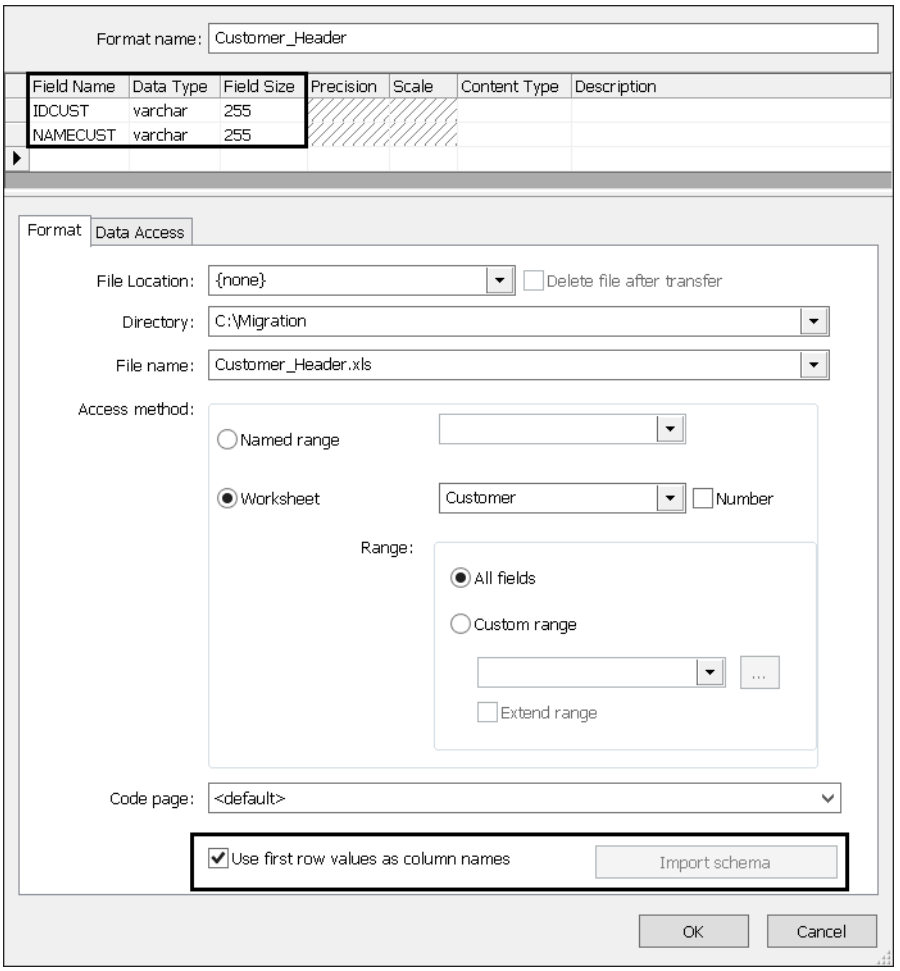


Figure 15.6 Integrating Microsoft Excel Spreadsheets

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Figure 15.6 illustrates the integration of the Microsoft Excel file, which was assigned a name based on `Customer_Header`—namely, Customer_Header.xls.



Formatting in Microsoft Excel

Because Microsoft Excel is a spreadsheet program and not a word processor, cells with numeric content are automatically formatted as numbers, which might result in undesired exponential notations and the loss of leading zeros. This issue occurs frequently for US ZIP codes, which sometimes start with a zero. You should therefore format the corresponding columns as text columns.

15.5 Data Profiling

Profiler

At this point, you have integrated the metadata of two different legacy systems (table and Microsoft Excel) into SAP Data Services. You can now use the profiler, which is embedded in SAP Data Services, to find patterns in and check the quality of the data in the legacy system prior to the mapping. For data profiling, the data must be stored either in tables or in flat files.

Column profiling

To profile your data, in **Local Object Library**, select the **CUSTOMERADDRESS** table and right-click the table name. In the context menu that opens, select the **Submit Column Profile Request** function. In the example shown in Figure 15.7, the system will submit a detailed profiling request for each column when you click **Submit**.

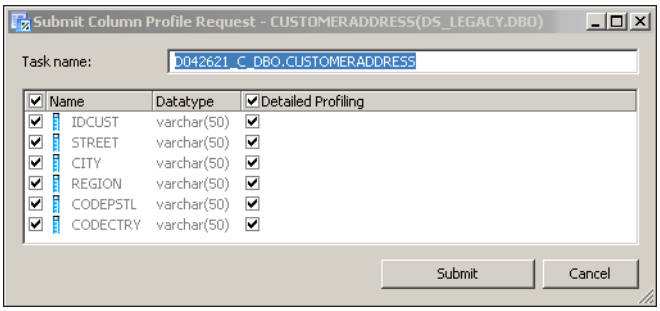


Figure 15.7 Column Profiling

The result is displayed in Figure 15.8. You can submit a new profiling request in the **View Data** section at anytime. The column profiling shows that a ZIP code may be incorrect. Of the twelve data records from the various countries, only one ZIP code contains letters instead of just numerals. This ZIP code with the value X4352 is from a customer from Canada and would be identified even if a larger dataset was profiled.

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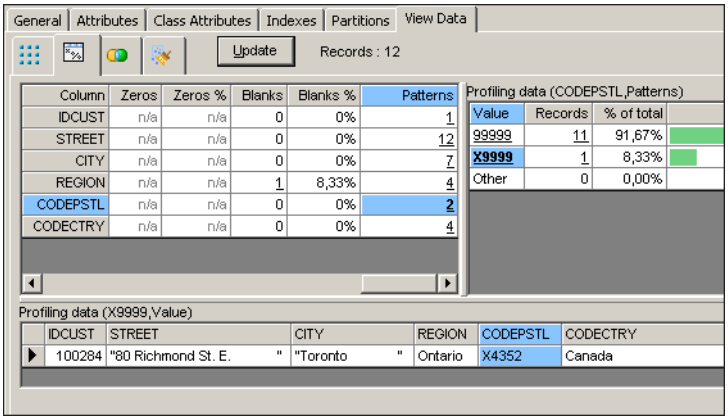


Figure 15.8 Column Profiling Result

Thus, the question now is whether a postal code in Canada is allowed to have the format X9999—that is, a letter followed by four numbers. We can answer this question by evaluating the validations embedded in SAP Data Services (Section 15.8).

In addition to the patterns of the data records used in this example, further column profiling analyses are available—for example:

- **Min**
  Minimum value according to lexicographical order
- **Max**
  Maximum value according to lexicographical order
- **Median**
  Median value
- **Min string length**
  Shortest value
- **Max string length**
  Longest value
- **Average string length**
  Value with an average length
- **Distincts**
  Number of disjoint values
- **Nulls**
  Missing values

This analysis allows you to identify incorrect values, and experienced users can use the **Max String Length** function to determine which values are too long.

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Relationship profiling

You can also start more complex profiling requests to compare database tables with one another and find incomplete data records (data records without headers, headers without items, and so on) by analyzing their relationships.

To compare database tables, start the data profiling from the first table by right-clicking on the table name and selecting **Submit Relationship Profile Request With...** in the context menu. The cursor will become a crosshair, which you'll use to select the second table (or alternatively a flat file).

In the next dialog box, you'll click **Submit** to submit a relationship profile request after having confirmed or adapted the key relationship between the two tables accordingly. In our example, table `CUSTOMERHEADER` is integrated directly from the legacy system instead of using a Microsoft Excel file. The key is the customer number in the legacy system, `IDCUST` (see Figure 15.9).

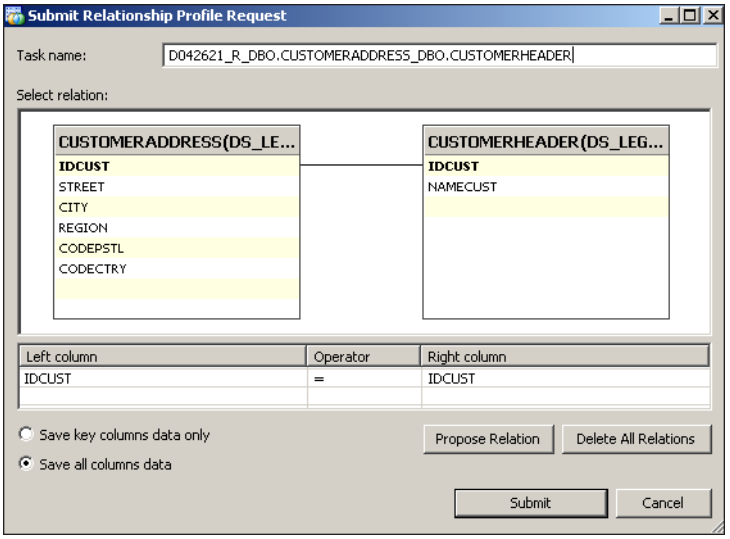


Figure 15.9 Relationship Profiling

The result of the relationship profiling, as shown in Figure 15.10, indicates that 8.33% of all addresses lack a header record and 15.38% of all header data records lack an address. In our limited example of only twelve data records, one address has not been used for a long time. This address is not assigned to any customer and is stored in the legacy system as an address without any reference. Also, two customer records lack address data in the legacy system. We know that these two data records will definitively not be transferred to SAP S/4HANA because mandatory address data is missing.

Displaying problematic data records

SAP Data Services additionally enables you to display problematic data records. In our example, as shown in Figure 15.10, the data record for legacy customer number 100289 is problematic. You can also have the system dis-

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play the missing address that the application could not find in a relational database without any problems because the header data is missing.

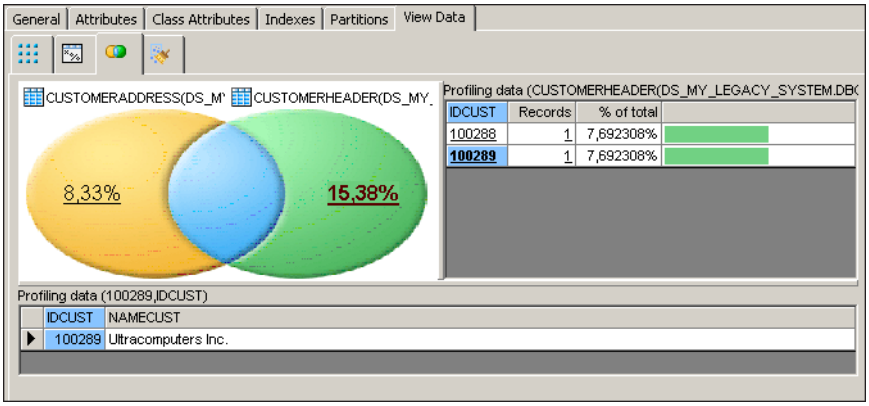


Figure 15.10 Relationship Profiling Result

The next steps depend on your specific case. However, experience has shown that deciding, in the legacy system, whether an address will be transferred or not and, if required, whether the data will be corrected will pay off. If the data in the legacy system is no longer up to date or is inconsistent, not transferring the data will save you unnecessary time and effort.

15.6 Field Mapping

Using data migration templates

Now let's return to bank data. So that you can compare our example to the file upload using the SAP S/4HANA migration cockpit, which we described in Chapter 13, we assume that the source data has already been cleansed. For simplification, we'll only use two data records in our example of migrating bank data. In contrast to direct integrations (Section 15.4), we'll use the data migration templates specifically provided for SAP S/4HANA. These Microsoft Excel files are included in the rapid data migration content, which has a separate Microsoft Excel sheet for every segment to be migrated and contains mapping notes, rules, and descriptions of mandatory fields.

If you use these migration templates, the entire field mapping is already implemented in SAP Data Services, provided with the test data used by SAP. If you want to integrate custom formats (tables or files), however, you'll have to assign the SAP fields first.

In general, mapping fields is the central step in any data migration: the available fields of the source system are assigned to the predefined fields of the target system (SAP S/4HANA). In our case, analogous to mapping templates, the target system is already defined by the IDoc segments. The

source system, instead, is defined by its source structures—in our example, by an Excel migration template.

Mapping on paper

Let's first take a look at mapping on paper for our two source structures, as shown in Figure 15.4 in Section 15.3. The left side of the table features a free area for the legacy system, not displayed in the figure, and the structure of the SAP S/4HANA system is on the right. The same concept applies to the source data in the Microsoft Excel migration template. In our example, the template has already been populated with test data, as shown in Figure 15.11, which includes all four Microsoft Excel sheets:

- **Introduction** with descriptions
- **Field List** with notes on mandatory fields and check tables
- **Header** filled with two table data records
- **BankAddress** for address data records (in our example, filled with two test data records in relation to header data records)

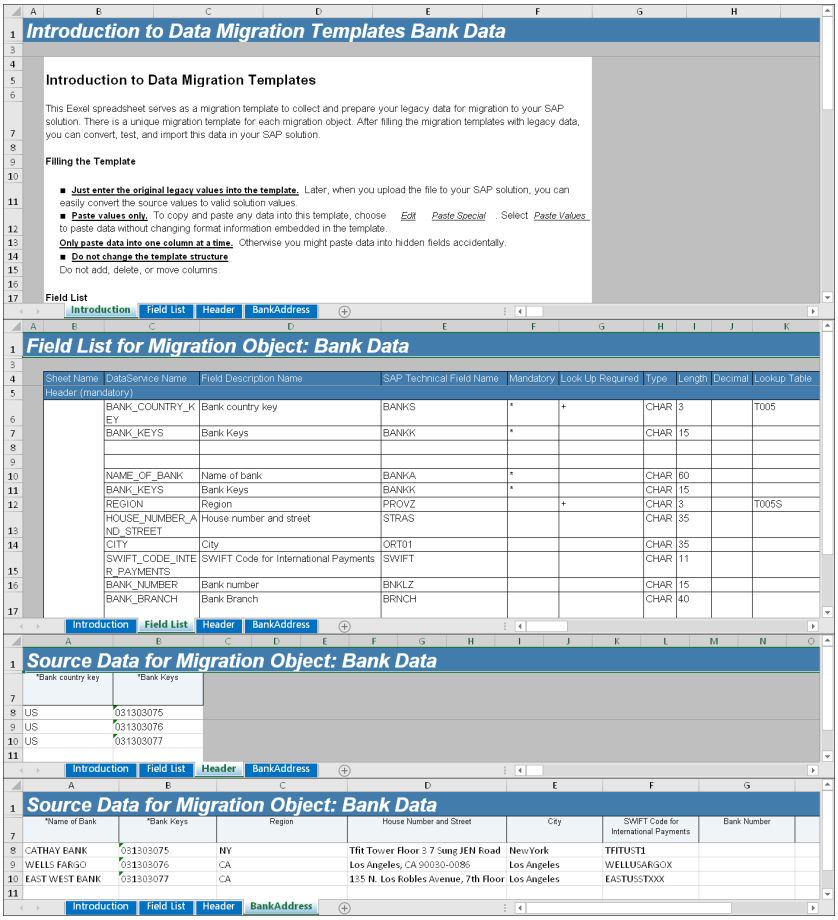


Figure 15.11 SAP S/4HANA Data Migration Template for Source Data

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At first glance, you can see that all mandatory fields (*) have been populated and that no fields contain default values ($). Despite being mandatory fields, fields with default values don't have to be mapped if you provide a constant as a global variable in SAP Data Services.

Mapping in the designer

Usually, you'd now have to implement the mapping on paper in SAP Data Services Designer. Call the mapping view by clicking the name of the `DF_DM_BANKBankAddress_Map` data flow in **Project Area** or by double-clicking the icon in the parent data flow (shown in Figure 15.12). Because we are using a migration template, we can copy the entire mapping on a 1:1 basis.

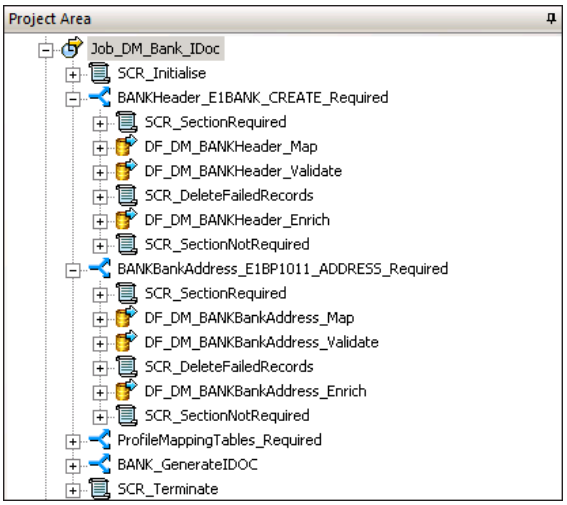


Figure 15.12 Selecting Mapping Step

Integrating the legacy system

If you now want to modify the mapping or insert specific sources, select and remove the placeholder for the source file and drag and drop the desired source (file or table) to the data flow workspace.

By connecting the source with the `Qry_BestPractices` query, the source fields in the workspace are available for simplified mapping. Figure 15.13 shows the correct data flow.

Displaying Object Content

You can use the small magnifying glass next to the objects in the data flow to have the system display the content. Now you can always keep an eye on individual or typical data records (via profiling, which is also possible in this display). Troubleshooting is thus much easier.

If you need more fields than are available in the baseline scope of SAP Best Practices, you can find them in the second query, `Qry_AllFields`. However,

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in our example, we'll only use the simplified version that contains the fields set up using SAP Best Practices for a new SAP S/4HANA system.

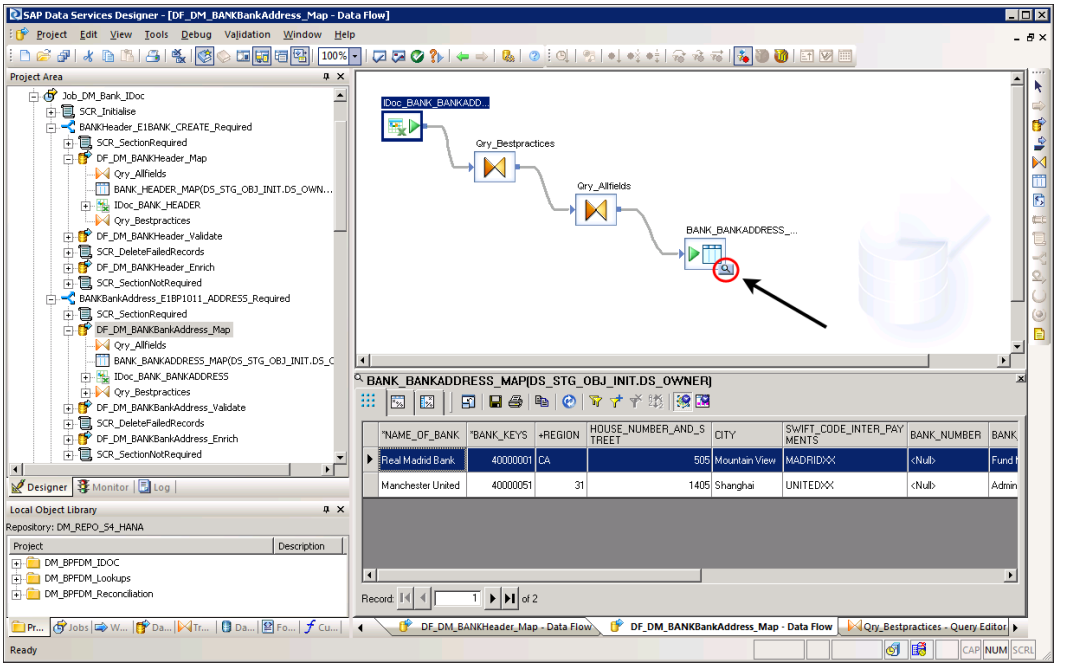


Figure 15.13 Integrating Legacy System

Internal validations

It makes sense to carry out internal validations in SAP Data Services when working in the data flow or in the queries. You can then quickly identify mapping errors or inconsistent settings. Use the **Validate Current** button to validate the local object or **Validate All** to check the syntax across all objects. Alternatively, you can select **Validation • Validate** from the main menu.

Generating the assignment script

The section under the mapping in the mapping view displays the code for assigning the script language for SAP Data Services. (This script language does not have a name.) The code is generated here for all default functions. However, you can always modify the system-generated script or insert your own custom code.

Using the Functions Provided

Use one of the numerous predefined functions and adapt the script code to meet your requirements. With predefined functions, you'll be able to create your own conversion rules easily, without having to start from scratch every time.

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Unique key relationship

If you have more than one source structure, you'll have to define a unique key relationship between the sources. You can freely define this key relationship in the script editor or use the **Propose Join** function to generate the code in the `WHERE` condition automatically. The proposed join is generated on the basis of the key relationships or on the basis of the same name in the different sources, as illustrated in Figure 15.14.

Copying the mapping

The actual mapping is now performed according to the mapping template if you don't have to make any adaptations. In our case, we'll rely on the SAP S/4HANA migration template and simply copy the mapping. If you want to adapt the mapping, select the required fields on the left, then drag and drop them on the relevant target field to the right. Figure 15.15 shows the results.

If a field has already been assigned (or has a `NULL` initial value), you'll be asked during the mapping process whether you want to remap the field. To remap a field, right-click the relevant field and select **Remap Column** in the context menu.

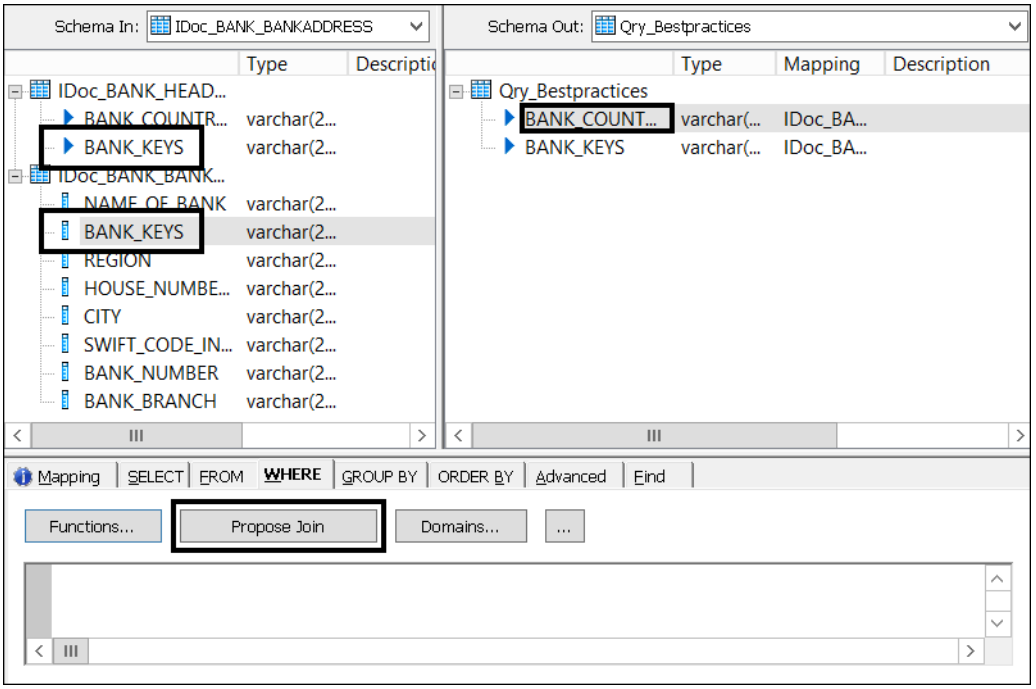


Figure 15.14 Key Relationship in Multiple Source Structures

Type conversion

After you've completed the mapping and perhaps added custom code, select the validation using the **Validate Current** button or the **Validate All** button. Alternatively, you can navigate to the **Validation • Validate** option in the main menu to validate the mapping.

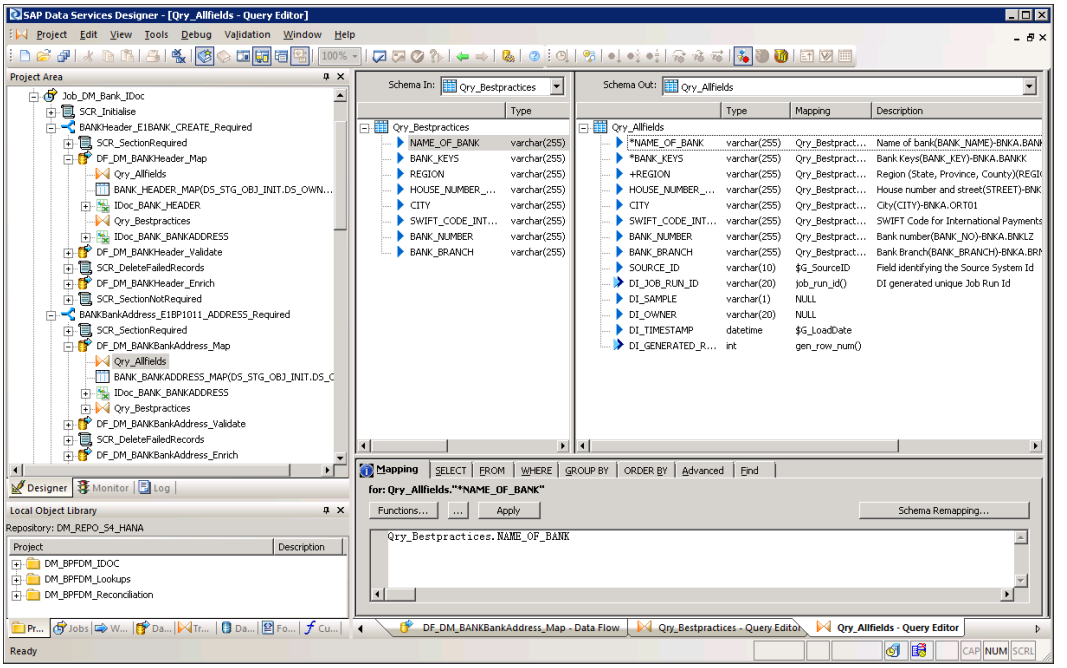


Figure 15.15 Mapping via Drag and Drop

If no error message appears, you can proceed with the remaining steps. Often, however, the system will output a warning for all fields have different data types in the source system and target system. You can ignore this warning for now because the types will be automatically converted during runtime. If this conversion works for all data records (e.g., converting number fields to text fields of the character type), further phases of the process will not be affected.

Checking the mapping

Let's now take a closer look at the mapping and explain the individual assignments in the ETL process. Up to this point, we used a direct mapping process where fields were mapped to fields without transformations or complex rules. Compare the mapping in Figure 15.16 with the migration template from Figure 15.11; this comparison illustrates how SAP Data Services has implemented the mapping.

Because the migration template uses the same names on the source and target side, the mapping is pretty straightforward.

Assigning the global variable

As an alternative to the field mapping, you can also assign global variables or constants in SAP Data Services. Figure 15.17 shows a constant, the ISO code for Germany (`'DE'`), assigned to the `Country` field.

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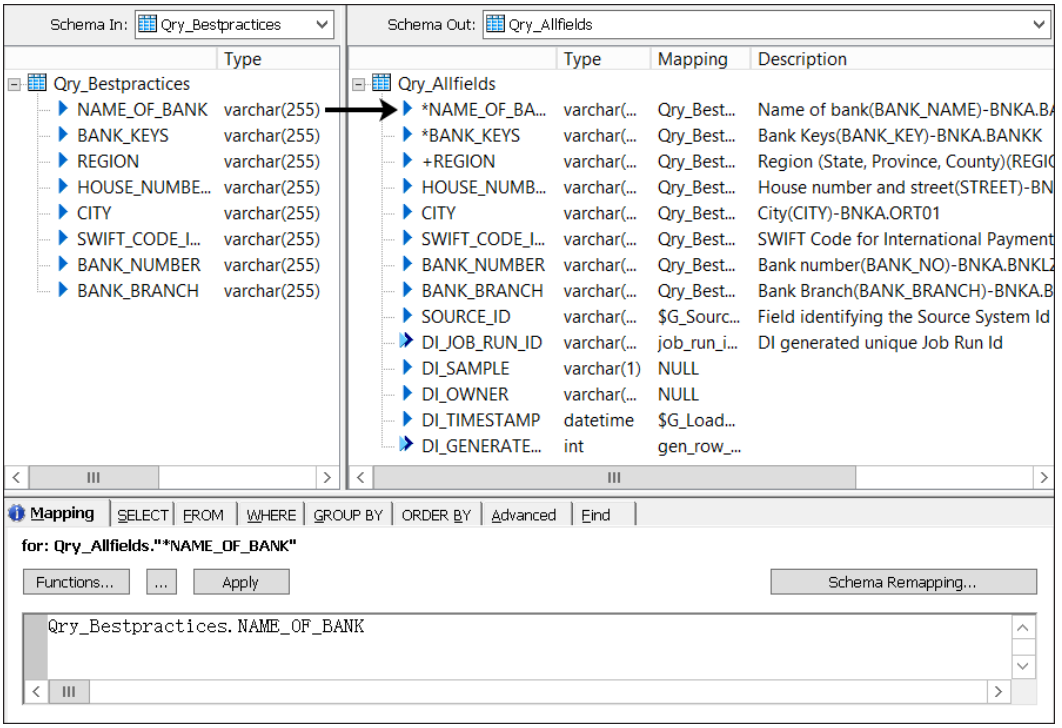


Figure 15.16 Detailed Field Mapping

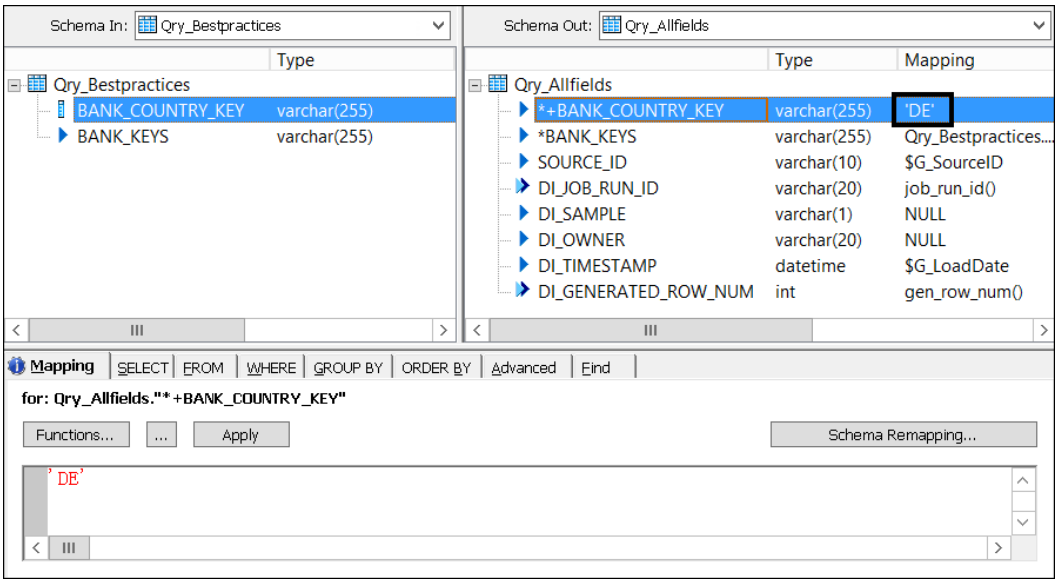


Figure 15.17 Mapping Constants



Resetting the Mapping

If you want to reset a field mapping that you have performed manually or via drag and drop, deleting the generated or custom code isn't sufficient. When validating the data, you'll see that empty mappings are not permitted. Instead, you'll have to reset the code by replacing the code in the input field with `NULL`.

15.7 Value Mapping and Conversion Tables

After completing a basic mapping in the central SAP Data Services Designer step, you can convert the remaining values—that is, perform a *value mapping*—for country (`BANK_COUNTRY_KEY`) and region (`REGION`). The region involves a multilevel conversion because this field also depends on the country and becomes unique when both region *and* the country are converted.

Migration Services

For value conversions, you'll use the Migration Services tool, which is provided in the rapid data migration content. This tool can access the staging area where all SAP check tables have been replicated from your connected SAP S/4HANA system (see Figure 15.18). The Migration Services tool enables you to assign the correct values from the legacy system to the SAP-generated values, such as the ISO code for a country.

You can only change the column for legacy data in the Migration Services tool. The side for the SAP S/4HANA system corresponds to the Customizing in SAP S/4HANA and cannot be changed. Thus, the tool is a conversion table, similar to the table from Chapter 13, Section 13.2.12 in the SAP S/4HANA migration cockpit.

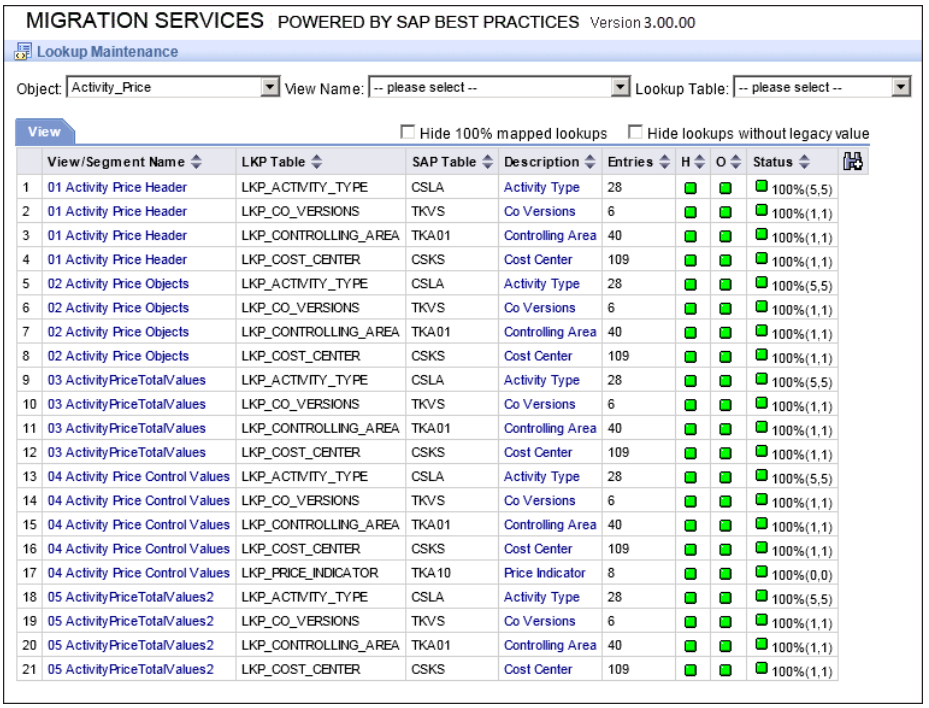
Lookup table

You should perform an initial job run before you start mapping the values, even before the actual mapping is complete. In this initial run, the internal number ranges and required buffer tables are initialized. In addition, the specifications for various values are collected in the legacy system for all fields whose values will be converted (lookup fields). This process easily identifies values that still lack data. The reason for the initial job run is that—despite the previous profiling process—you still don't know all the specifications of the values from the legacy system and thus cannot provide data for your existing specifications in the mapping process.

Starting the test job

To start a data migration job, right-click on the relevant node in **Project Area** (in our example shown in Figure 15.19, `Job_DM_Bank_IDoc`). Next, press **Execute...**.

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	View/Segment Name	LKP Table	SAP Table	Description	Entries	H	O	Status
1	01 Activity Price Header	LKP_ACTIVITY_TYPE	CSLA	Activity Type	28			100%(5,5)
2	01 Activity Price Header	LKP_CO_VERSIONS	TKVS	Co Versions	6			100%(1,1)
3	01 Activity Price Header	LKP_CONTROLLING_AREA	TKA01	Controlling Area	40			100%(1,1)
4	01 Activity Price Header	LKP_COST_CENTER	CSKS	Cost Center	109			100%(1,1)
5	02 Activity Price Objects	LKP_ACTIVITY_TYPE	CSLA	Activity Type	28			100%(5,5)
6	02 Activity Price Objects	LKP_CO_VERSIONS	TKVS	Co Versions	6			100%(1,1)
7	02 Activity Price Objects	LKP_CONTROLLING_AREA	TKA01	Controlling Area	40			100%(1,1)
8	02 Activity Price Objects	LKP_COST_CENTER	CSKS	Cost Center	109			100%(1,1)
9	03 ActivityPriceTotalValues	LKP_ACTIVITY_TYPE	CSLA	Activity Type	28			100%(5,5)
10	03 ActivityPriceTotalValues	LKP_CO_VERSIONS	TKVS	Co Versions	6			100%(1,1)
11	03 ActivityPriceTotalValues	LKP_CONTROLLING_AREA	TKA01	Controlling Area	40			100%(1,1)
12	03 ActivityPriceTotalValues	LKP_COST_CENTER	CSKS	Cost Center	109			100%(1,1)
13	04 Activity Price Control Values	LKP_ACTIVITY_TYPE	CSLA	Activity Type	28			100%(5,5)
14	04 Activity Price Control Values	LKP_CO_VERSIONS	TKVS	Co Versions	6			100%(1,1)
15	04 Activity Price Control Values	LKP_CONTROLLING_AREA	TKA01	Controlling Area	40			100%(1,1)
16	04 Activity Price Control Values	LKP_COST_CENTER	CSKS	Cost Center	109			100%(1,1)
17	04 Activity Price Control Values	LKP_PRICE_INDICATOR	TKA10	Price Indicator	8			100%(0,0)
18	05 ActivityPriceTotalValues2	LKP_ACTIVITY_TYPE	CSLA	Activity Type	28			100%(5,5)
19	05 ActivityPriceTotalValues2	LKP_CO_VERSIONS	TKVS	Co Versions	6			100%(1,1)
20	05 ActivityPriceTotalValues2	LKP_CONTROLLING_AREA	TKA01	Controlling Area	40			100%(1,1)
21	05 ActivityPriceTotalValues2	LKP_COST_CENTER	CSKS	Cost Center	109			100%(1,1)

Figure 15.18 Lookup Check Tables in Migration Services Tool

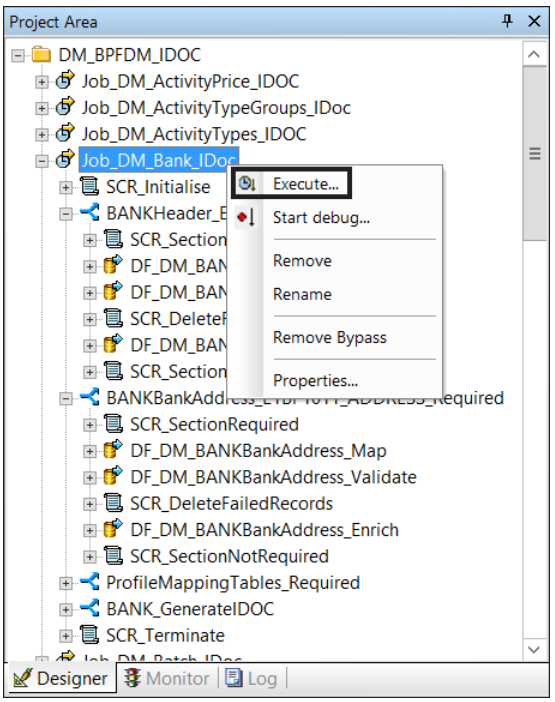


Figure 15.19 Executing Jobs in SAP Data Services

Determining job parameters

In a pop-up, SAP Data Services will let you specify parameters for the job run. Navigate to the **Global Variable** tab. For this run, be sure to set the value of the global variable `$G_ProfileMapTables` to `'Y'` for "Yes." With this selection, during the run, values from the legacy systems will be collected. This tab also provides an overview of the global variables that will be used to prepopulate the `$` fields later on (as shown in Figure 15.20).

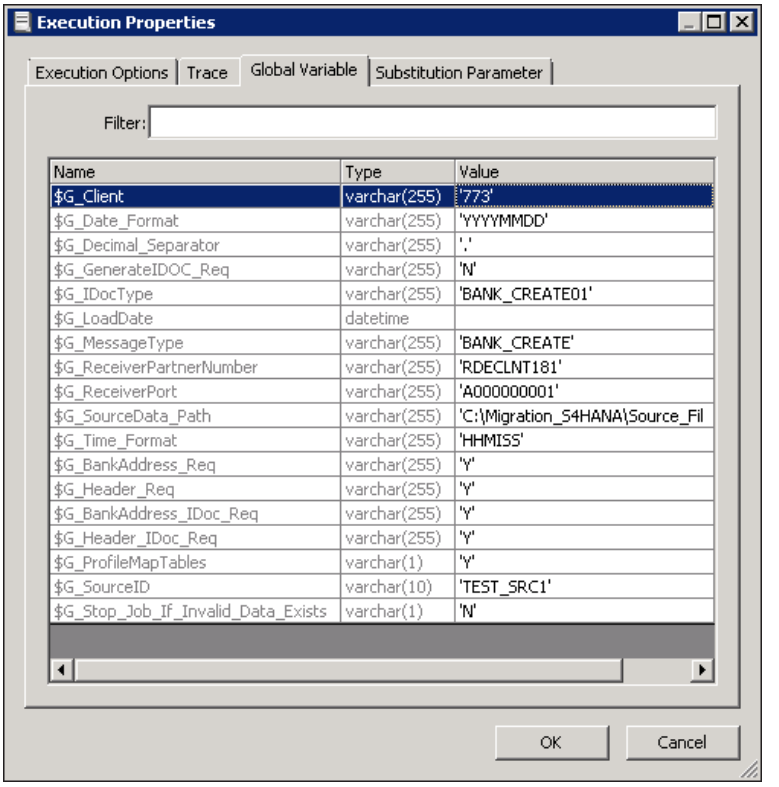


Figure 15.20 Global Variables for Job Run

You can change these values in the job run or define and store these values as a characteristic for all runs of a job by right-clicking the context menu and selecting **Properties...**. Besides prepopulating data, you can also determine the IDoc message type and the so-called SAP partner system (the technical name of SAP Data Services as the sending system and of SAP S/4HANA as the receiving system). Later, SAP Data Services will write these values to the control record of the IDoc before sending the control record to SAP S/4HANA.

The result of this job run is a log that, ideally, displays no errors (as shown in Figure 15.21).

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On the **Monitor** tab, you can monitor and stop the job runs (see Figure 15.22). The green traffic light symbol indicates that the job is still running; the red traffic light symbol indicates that the job has been completed. However, this indicator is independent of the actual status of the job; that is, the indicator does not tell you if the job has been completed successfully or terminated prematurely. If the job has been terminated, the log will display a red button, as shown in Figure 15.23. Click this button to display details about the error.

Example: value mapping for the country field

During this initial job run, SAP Data Services will "learn" which field values exist in the legacy data. You can perform this test run with a subset of the data that you want to convert or with all the data you have available. Let's return to our example with the country codes: if your legacy system includes the countries in plain text notations and does not use standard codes, you still might need different specifications for the same country to correct inconsistencies or typos. In the SAP system, with value mapping, all these fields will be merged into one value—that is, the correct ISO code for the country, as shown in Table 15.2.

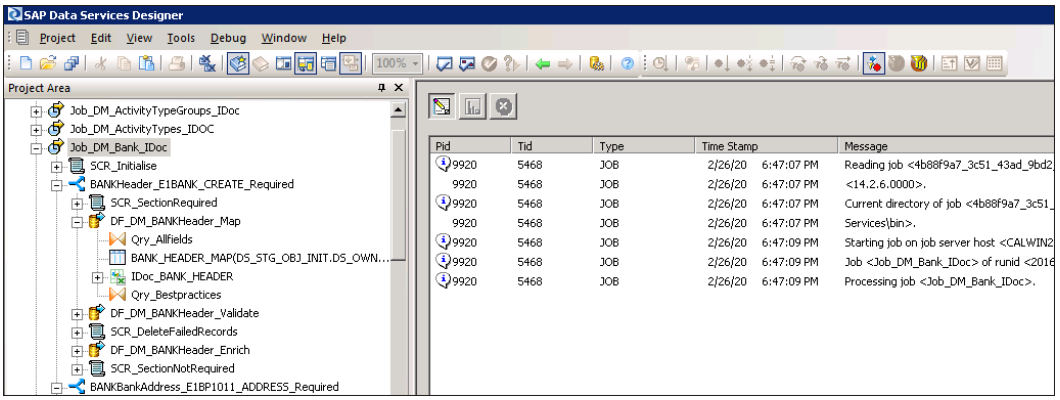


Figure 15.21 Information Messages during Job Run in Log

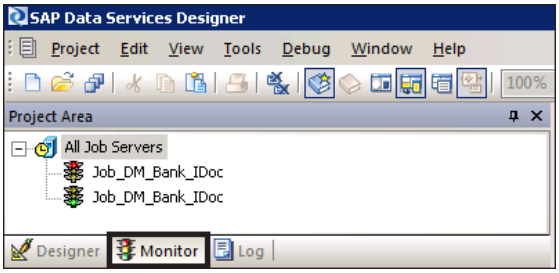


Figure 15.22 Job Monitor in Project Area

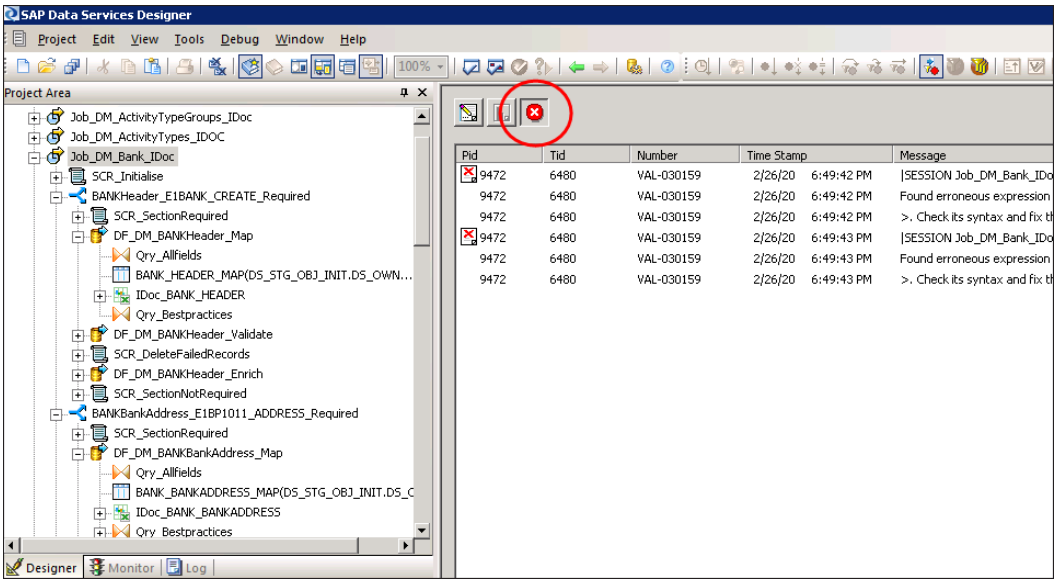


Figure 15.23 Cancelation and Error Messages in Log

Value in the Legacy System	ISO Code in the SAP System
Germany	DE
Deutschland	DE
USA	US
U.S.A.	US
United States	US

Table 15.2 Sample Value Mapping for Country Field

Maintaining field values manually

In our example, we'll use the migration template from Figure 15.11 to obtain the necessary field values for existing countries and regions. You can then maintain these field values manually in Migration Services. Because you performed an initial job run after mapping out these fields, they will be available in the tool. Thus, value mappings are as simple as field mappings.

In Migration Services, you'll now assign the collected values to the relevant SAP values via drag and drop (as shown in Figure 15.24) or by selecting from a dropdown list (as shown in Figure 15.25). A searchable help function is also available (see Figure 15.27).

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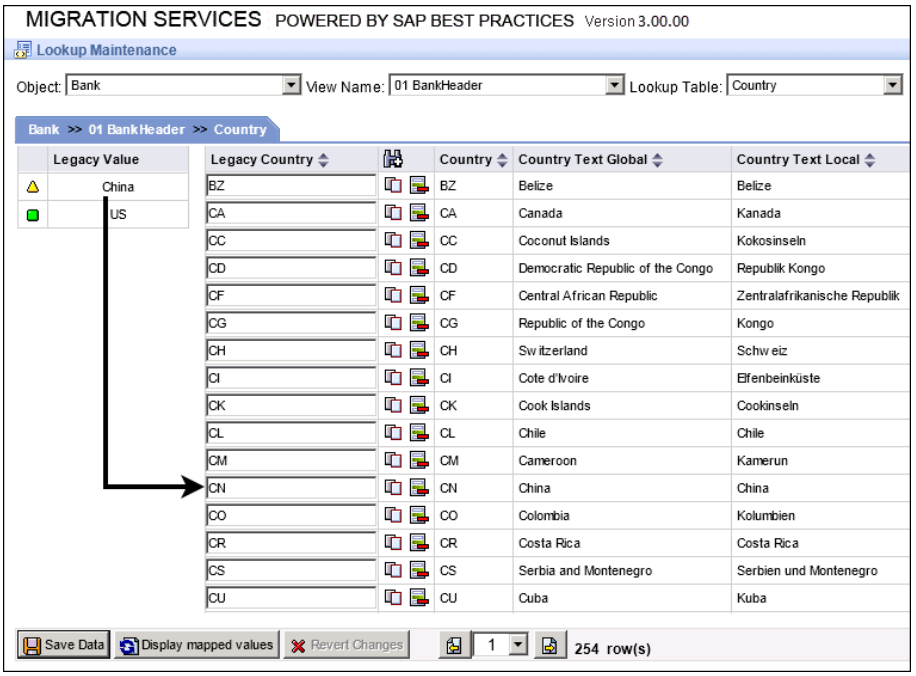


Figure 15.24 Value Mapping Using Drag and Drop

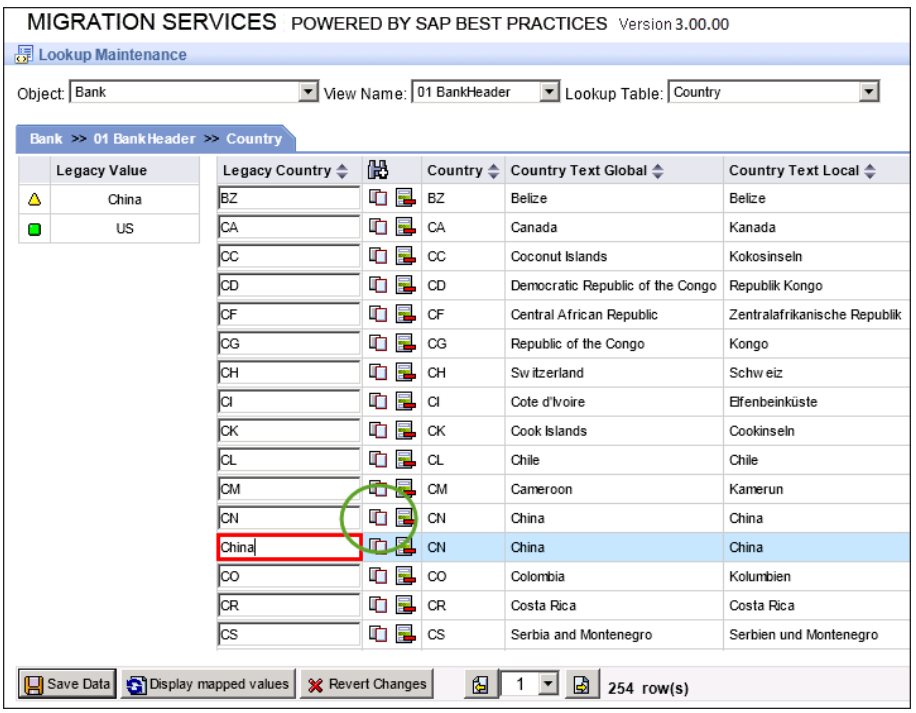


Figure 15.25 Assigning Various Legacy Values Manually

The value mapping status is indicated by traffic light symbols in Migration Services:

- *Green square:* mapped
- *Yellow triangle:* not mapped yet
- *Red circle:* mapped twice/not mapped uniquely

Figure 15.24 and Figure 15.26 show some examples. With these symbols, you'll be able to easily track progress during the value conversion. Now the data is ready for validation.

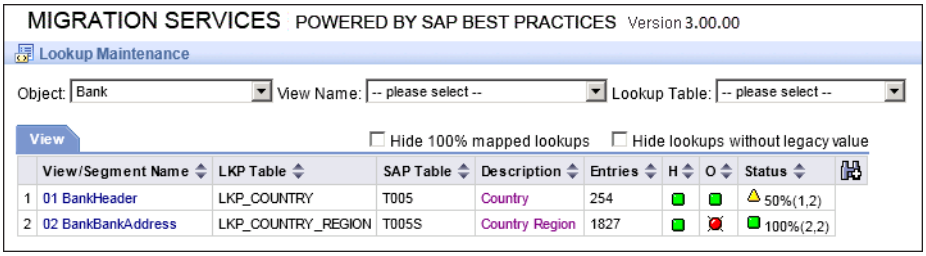


Figure 15.26 Status of Value Mapping in Migration Services

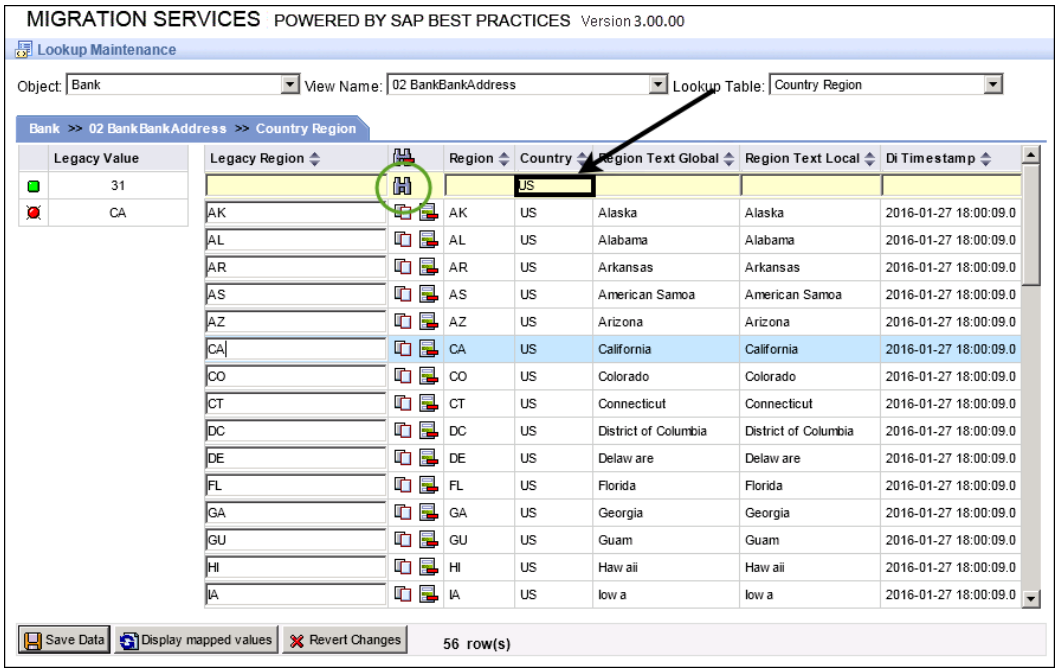


Figure 15.27 Search Help for Values in Migration Services

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15.8 Data Validation

Now that we've successfully mapped values using Migration Services, let's turn to data validations in the SAP Data Services Designer.

Validations

SAP Data Services doesn't import data records to SAP S/4HANA that haven't passed all of the three following validations (see Figure 15.28):

- **Validation using check tables (`Validate_Lookups`)**
  For all fields marked with a plus sign (+), the values are compared to the values in the SAP check tables. Only legacy values that were previously converted to a lookup value in Migration Services will pass this test.
- **Validation of mandatory fields (`Validate_Mandatory_Columns`)**
  For all fields marked with an asterisk (*), values must exist (`NOT NULL`).
- **Validation of the format (`Validate_Format`)**
  This validation is carried out for all fields subject to format checks in SAP S/4HANA if the data migration content provides for these format checks. The system will check, for example, for correct field lengths in SAP S/4HANA (see our earlier example regarding the length of the material number field in Chapter 7, Section 7.2.3) or check that ZIP codes follow the correct syntax.

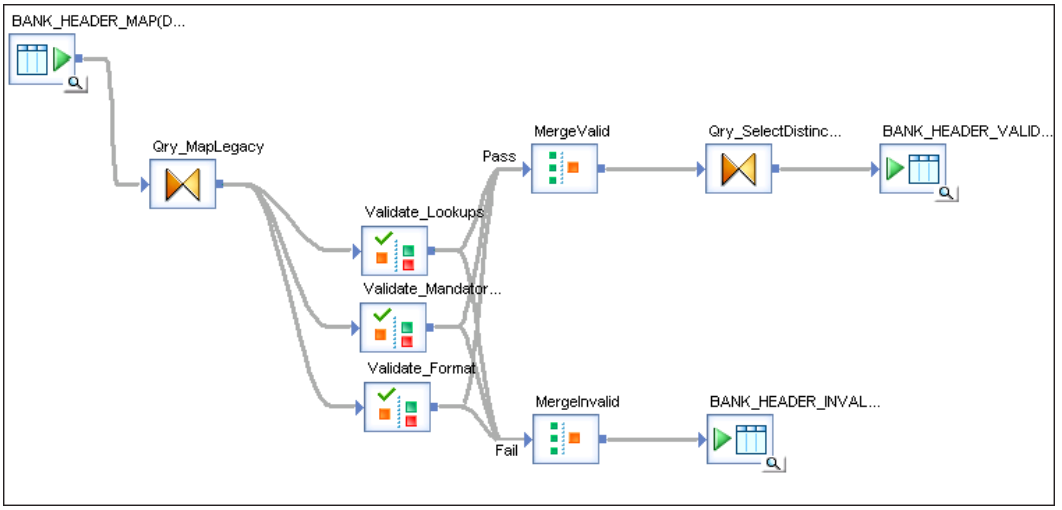


Figure 15.28 Data Flow for Validations in SAP Data Services

Job run

To execute the check routines, you'll run the `Job_DM_Bank_IDoc` job again. However, this run will not send any IDocs to the SAP S/4HANA system— a dry run that you can carry out as many times as required until satisfied with validation results.

Validation process

Validations are not carried out successively but in parallel, which means that all fields will undergo all validations and that the validations do not terminate when an error occurs, as is the case with many other methods. Also, data records can fail several validations at once. For example, if the country of a bank (`*+BANK_COUNTRY_KEY`, a mandatory field) is not populated, the field will fail validation twice. First, this mandatory field is not populated (`Validate_Mandatory_Columns`), and second, the requirement that the value be converted (`Validate_Lookups`) has not been met. According to the data flow shown in Figure 15.28, the value will receive a `Fail` status and will end up in the **Invalid** area twice.

You can use the small magnifying glass at the end point (see Figure 15.29) to display failed records in SAP Data Services Designer and identify the cause.

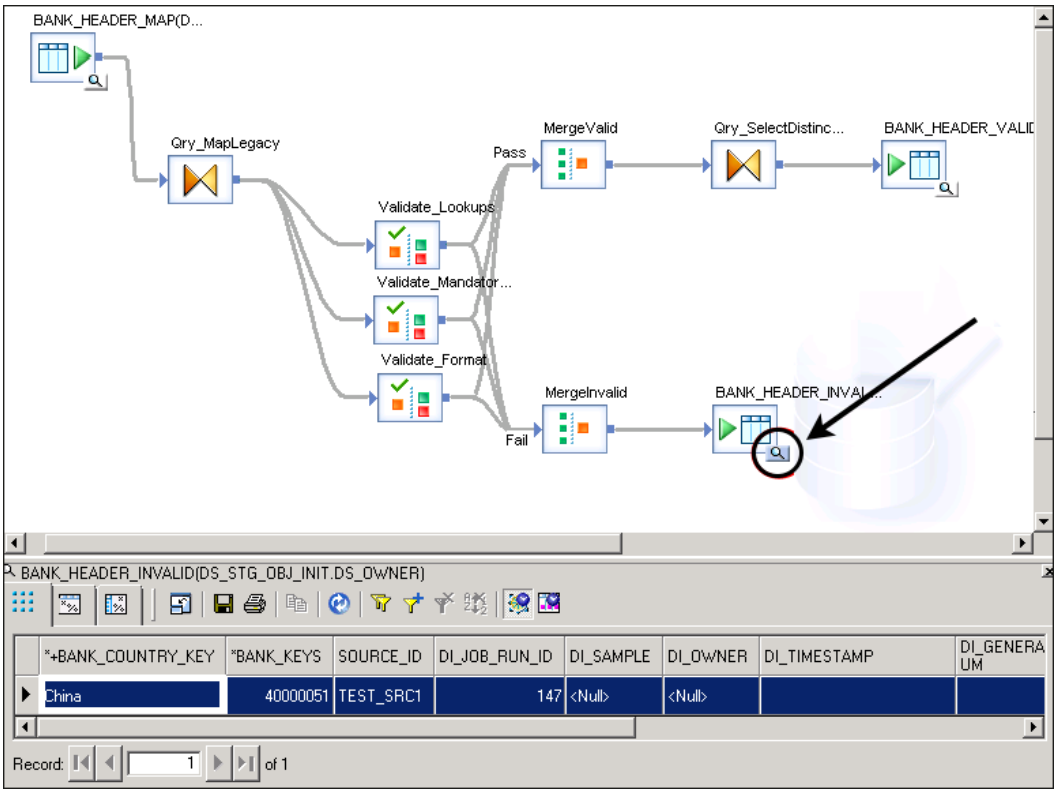


Figure 15.29 Incorrect Data Records after Test Run

So that values that received a `Pass` are not displayed twice in the **Valid** area, you can use the `SELECT DISTINCT` statement for data records that have passed the validation. Only valid data can be further processed and populated with default values or imported via IDocs.

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Embedded Validation Functions

The rapid data migration content not only provides data flows and mappings but also contains validation functions, such as a function for ZIP code validations.

In Section 15.5, we noticed a data record with a Canadian postal code, which would not pass the format validation: X4352 is not a valid postal code for Canada. Actually, Canadian postal codes have a much more complex structure. Instead of the format X9999 (one letter followed by four numbers), the syntax is X9X 9X9, which also implies that the postal code has six digits instead of five. This validation function is an ideal example of a function available with SAP Best Practices and embedded into SAP Data Services.

The code for the ZIP code validation function is written in the specific SAP Data Services script language, which can be extended to any country. The code is based on the Backus-Naur Form (BNF)—a metalanguage for grammar. Figure 15.30 shows the editor and the provided code for ZIP code validations.

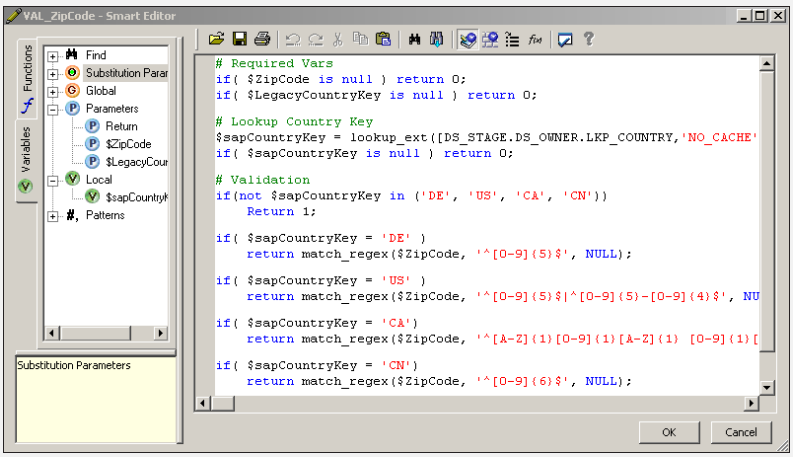


Figure 15.30 Function Editor in SAP Data Services

Note, however, that this validation only checks the syntax and doesn't include a plausibility check for the ZIP code. While validating a concrete ZIP code with the corresponding city and street can technically be implemented easily in SAP Data Services using the Data Quality function, for plausibility checks you'll have to integrate fee-based databases provided by local postal operators that must be updated continuously.

Troubleshooting

When errors exist, how do you proceed? In general, you can discard and exclude from the migration all data that was filtered by SAP Data Services.

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In this case, you won't have to do anything. However, correcting all identified inconsistencies in the legacy system makes more sense because doing so also improves your data quality. After you have cleansed your data records, they are loaded again for the next run and pass the validations. This procedure is iterative: you can repeat the process until only discarded data records are caught in SAP Data Services. These data records won't be migrated to SAP S/4HANA.

15.9 Importing Data

After successfully importing, converting, transforming, and validating your data records, you can perform the next step: loading the IDocs to the SAP S/4HANA system. In this context, be aware that the source data is always extracted from the data sources for each job run, which means that you won't work with data temporarily stored in SAP Data Services but instead with current values from the migration template or other source files or databases you use.

Connection to SAP S/4HANA

Before you can import IDocs into the SAP S/4HANA system, you'll have to modify the connection to your SAP S/4HANA system in SAP Data Services. The `DS_SAP` SAP datastore (**Local Object Library • Datastores**) is provided with a dummy connection only. To integrate your SAP S/4HANA system, you'll need to gather various system information.

Table 15.3 compares the terms used in the SAP S/4HANA world to the names used in SAP Data Services for configuring connections.

SAP S/4HANA	SAP Data Services	Example
Application server	Application server	`myserver01.me.com total`
Instance number	System number	`00`
System ID	–	`PRD system`
Client	Client number	`100`
User	User name	–
Password	Password	–

Table 15.3 Differences in Names for Configuration

Figure 15.31 shows the window for entering the SAP S/4HANA system parameters. You can also find information on the configuration in the Configuration Guide for the rapid data migration package.

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IDoc transfer via RFC

To actually load IDocs in the next run, you'll have to change the default value of a critical global variable, `$G_GenerateIDOC_Req`. If you change this value to `'Y'`, the system will not only carry out the test run but also will set up the IDocs in SAP Data Services and transfer them to the SAP S/4HANA system via RFC.

Alternatively, you can also store IDocs in local files, which may be necessary, for example, if you can't integrate the SAP S/4HANA system or if the system isn't yet available. In this case, you'll need to transfer the files to the SAP application server in a separate FTP process.

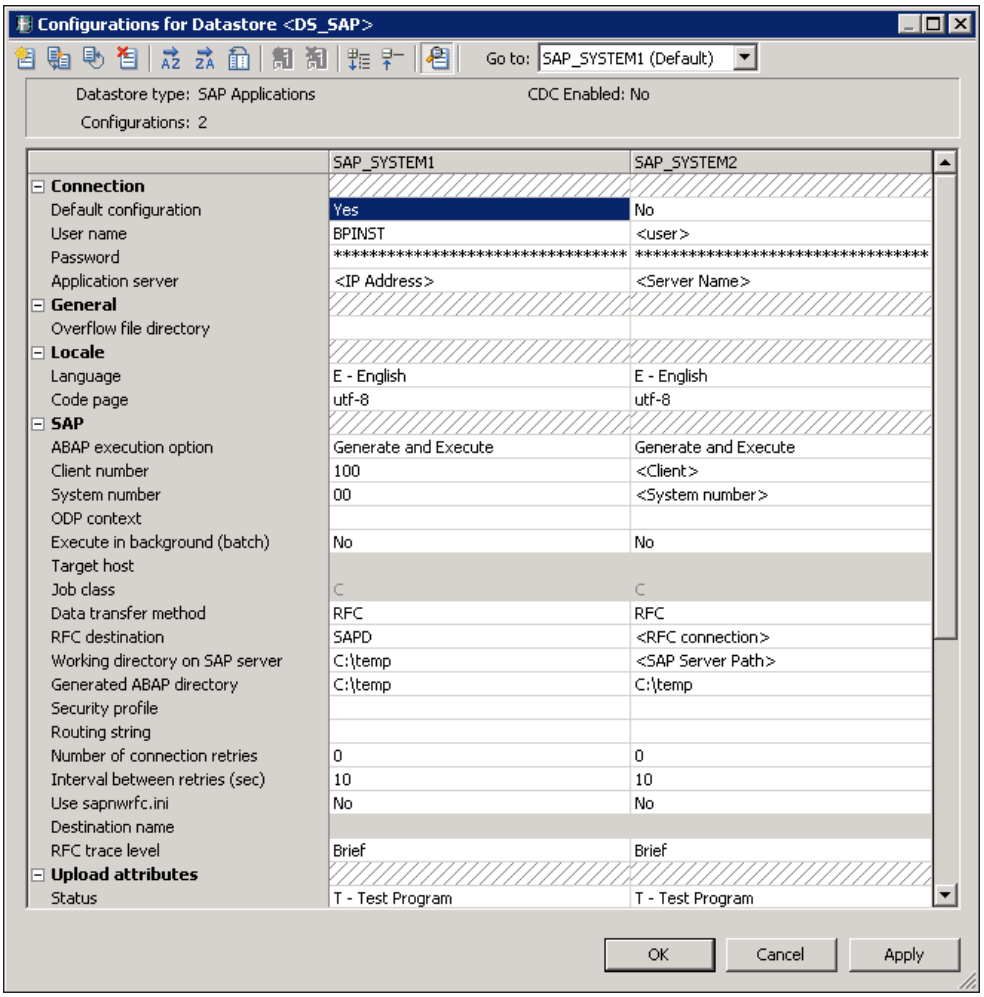


Figure 15.31 Sample Configuration of DS_SAP Datastore

Confirming update runs

Figure 15.32 shows the pop-up dialog for confirming the update run. The `BANK_CREATE` IDocs of the `BANK_CREATE01` basic type are sent to the SAP S/4HANA system with the `RDE` ID and client `181`. The global variables main-

tained here will be written to the IDoc control record, which serves as an "envelope" for the IDoc.

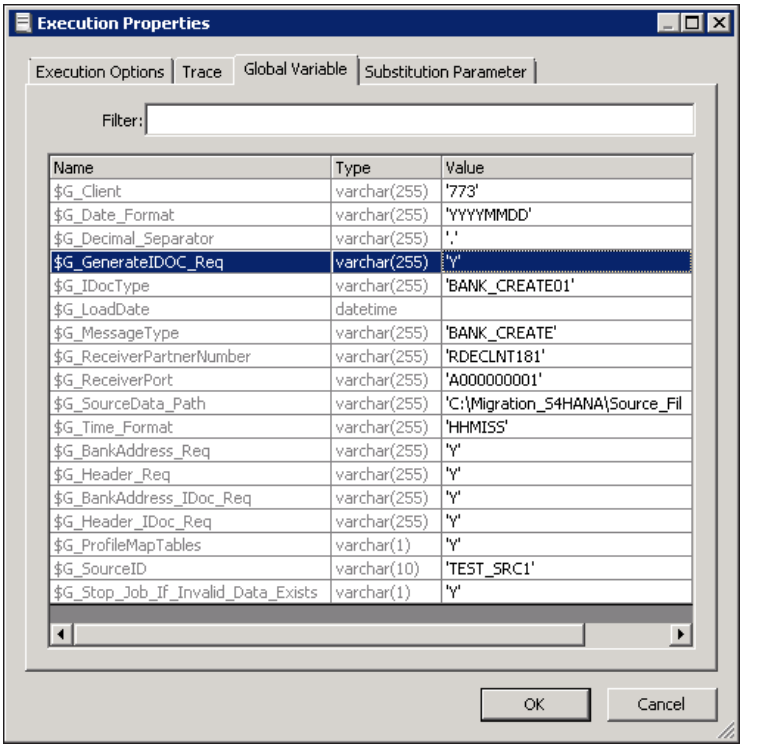


Figure 15.32 Global Variables for Sending IDocs

If the job has successfully completed, the IDocs were sent to the SAP S/4HANA system and updated there—provided the inbound IDoc is set correctly. The Rapid Data Migration Configuration Guide describes in detail the settings for IDoc Customizing in your system. You can download the guide from the SAP Best Practices Explorer and the SAP Note mentioned there.

You can now log on to the SAP S/4HANA system, use the IDoc monitor there, or have the system display the newly created banks in a corresponding application. The following section explains how you can implement this much more elegantly, without leaving SAP Data Services.

15.10 Monitoring

SAP BusinessObjects Web Intelligence reports

Integrating SAP Data Services with the SAP BusinessObjects Business Intelligence suite allows for integrating business analytics reports in an easy way. The data migration content provided contains predefined Web Intelligence reports for monitoring data migration projects (see Figure 15.33).

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You can either use these reports as templates and adapt them or use them without any modifications.

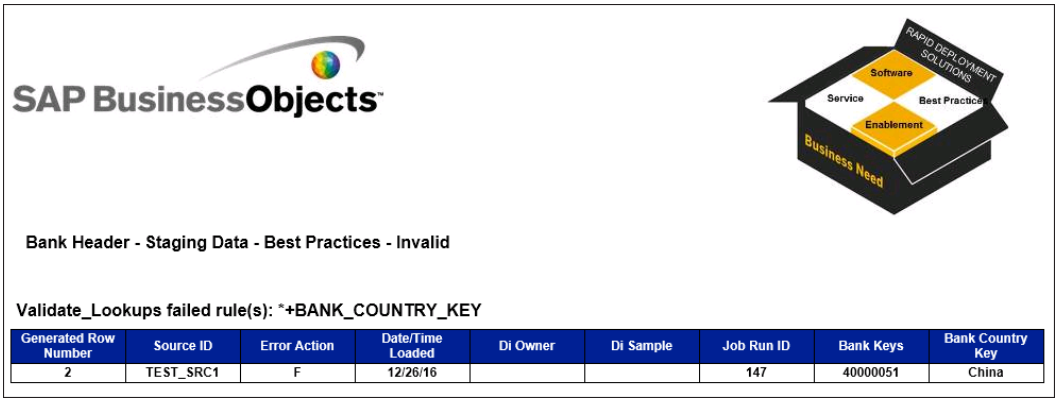


Figure 15.33 Web Intelligence Reports to Indicate Missing Data Records

Business Intelligence Launchpad

Similar to the Migration Services tool, you'll access these reports using a web browser. The Business Intelligence Launchpad (see Figure 15.34) even enables functional users that were not involved in the data migration or system setup to access and create these reports.

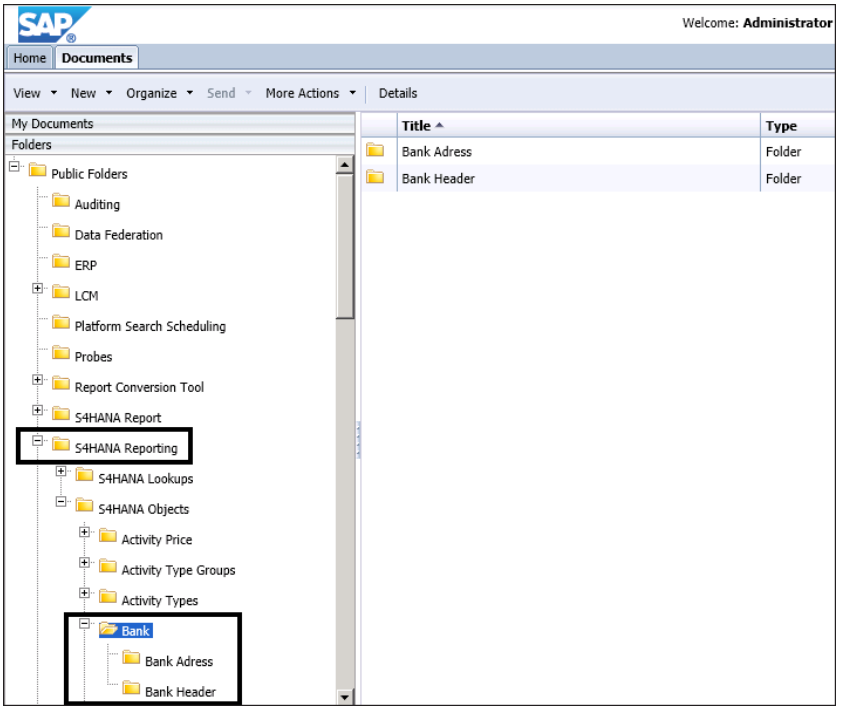


Figure 15.34 Business Intelligence Launchpad in SAP BusinessObjects Business Intelligence Suite

Usually, involving functional user departments makes sense because legacy system users will often have the required know-how to use the data records and to troubleshoot. You can analyze, update, change (without additional software), and print Web Intelligence reports. You should update the data of the report after every job run.

In addition to reports for validating business objects and IDoc segments, numerous predefined evaluations are available for mass data uploads. In our example with two banks, reporting may not play a major role, and the magnifying glass  in the data flows in the SAP Data Services Designer to view data records may be sufficient. However, if you have large data volumes, you'll appreciate these reports.

IDoc status

In the `DM_BPFDM_Reconciliation` rapid data migration project, which is included in the SAP Best Practices package, you can execute the `Job_DM_CheckIDocStatus` job in SAP Data Services to get an IDoc monitoring tool for the migration. This monitor lets you view the status of the IDocs without having to log on to the SAP S/4HANA system. The evaluation contains information that looks like the information provided by the IDoc monitors in Transactions WE02/WE05 or BD87. You can monitor the correct update of IDocs in SAP Data Services or with an available Web Intelligence report.

Data comparison

If the IDoc monitor indicates that the legacy data was successfully validated with regard to the Customizing replicated from the SAP S/4HANA system and the IDocs were loaded without any errors, the data migration project for the bank master is nearly complete. However, after the successful load process, whether the data was actually imported to the SAP S/4HANA system as expected should be examined.

You can usually only answer this question by performing extensive tests. However, using the content provided in the `DM_BPFDM_Reconciliation` project, you can compare the expected data to the current data existing in the SAP S/4HANA system with `Job_DM_Reconcile`. This assessment is quite helpful because relationships to data that had not been included previously could lead to unexpected results when the data is updated in the SAP S/4HANA system. You can also call the result of this job run using BI Launchpad.

15.11 IDoc Performance Optimization

This section provides information on how to use IDoc technology efficiently.

Background processing

The default setting in the ALE partner agreements in SAP S/4HANA (Transaction WE20) is **Trigger Immediately**, which results in the nearly synchronous processing of the IDoc after receipt. However, because this pro-

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cessing constitutes a separate work process for each IDoc, this procedure is not always ideal—for example, for large data volumes that can cause resources to quickly bottleneck. An alternative is to use background processing, which is triggered by Report RBDAPP01 running in the background.

Report RBDAPP01

To achieve high performance when mass uploading IDocs for data migrations, background processing is mandatory. Only in this way can you transfer several IDocs as packages to a work process for processing in parallel. Ideally, you'll directly use multiple SAP work processes that each process a package of IDocs, which will decouple the receiving process from the processing of the IDoc. In direct processing, a single IDoc is received via an RFC and processed. However, if you collect inbound IDocs using the **Trigger by Background Program** setting in Transaction WE20, you can improve the update performance for IDocs. Basically, triggering background processing means that the IDocs first wait in status 64 (see IDoc status values in Section 15.3) for processing.

Background processing isn't the only available option; you can also start the processing in a dialog. The best way to process IDocs is to schedule Report RBDAPP01 as an ABAP job in the background using Transaction SM36 or to start the report immediately using Transaction SE38 (see Figure 15.35).

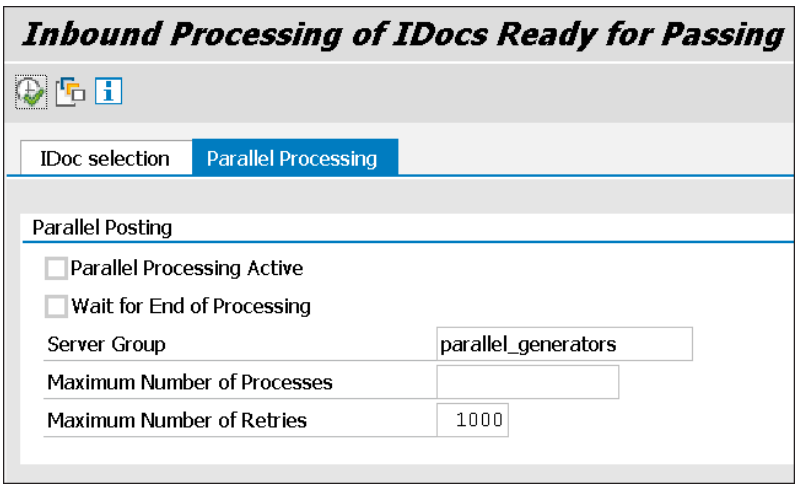


Figure 15.35 Parallel Processing in Report RBDAPP01

Configuring the report

The following settings in the selection screen of Report RBDAPP01 are critical:

- **IDoc Selection tab**
  - **Package Size**: The package size controls the maximum number of IDocs to be processed in a logical unit of work (LUW) in a dialog work

process. A large package reduces the number of required processes to a minimum but also requires a large roll area. Either the database commit is performed for the entire package, or the database is rolled back and no package data is stored.

- **Parallel Processing tab**
  - **Parallel Proc. Active**: This switch activates parallel processing. If you select this checkbox, the application server uses a free dialog process for each IDoc package for inbound processing; the packages are thus processed in parallel. If you select too many packages, all dialog processes of the server will be occupied. You should therefore specify a server group that controls how work processes are assigned (e.g., `parallel_generators`) to avoid overloading the system. If the indicator is not selected, IDocs will not be processed in parallel. Instead, each package will be transferred to the application sequentially. In total, only one work process will be occupied on the application server.
  - **Server Group**: The server group determines how resources are distributed across the existing work processes of the application server(s)—that is, how many work processes are provided in each application server. You can make the corresponding settings in Transaction RZ12 (shown in Figure 15.36).

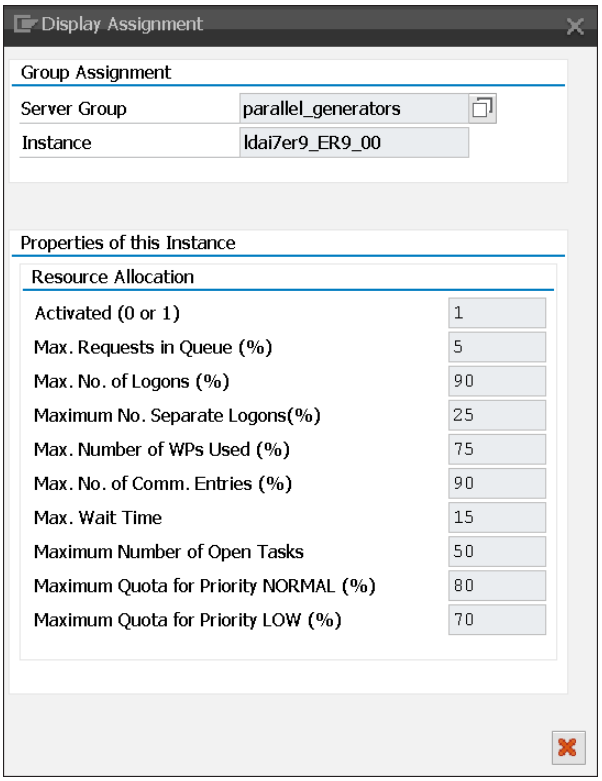


Figure 15.36 Server Group Maintenance in Transaction RZ12

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Testing the package size and number of work processes

We can't make general recommendations about package size and number of work processes in a server group for parallel processing. You should always use test data to determine the best values for you. This value depends on the IDoc types and IDoc sizes (number of the segments), as well as database performance and server performance. For large IDoc segments, 50 IDocs per package, and for smaller segments, 100 IDocs per package, are good starting values.

Tips

The following settings of Report RBDAPP01 are critical to further optimize performance and to obtain help in the migration process:

- **IDoc Selection tab**
  - **Output List**: The **Output List** flag controls whether a detailed list is displayed as a log at the end of the IDoc processing. In general, this output is not required because all information can be called via the IDoc monitor transactions and by confirming the IDoc status in SAP Data Services; the information is therefore available separately. Depending on the data volume selected, omitting this step can rather result in a corresponding performance gain.
- **Parallel Processing tab**
  - **Maximum Number of Attempts**: Here you define the time (in seconds) during which the system tries to occupy a parallel process with a package of IDocs to be processed. This attempt is made every second. If the attempt is unsuccessful, all IDocs of the package receive an error status after the specified time elapsed (the number basically defines the timeout time in seconds). If you use bulk parallelization and have not optimized the package size yet, you should select this value as high as possible (e.g., 99999) to avoid aborting the processing.
  - **Wait for End of Processing**: With this setting, you specify whether the run of Report RBDAPP01 ends as soon as all IDocs have been processed (synchronous) or whether it already ends after all packages have been transferred to the application (asynchronous). We recommend setting this flag when running the report in the background for test runs to log the entire processing time, which then will help to find the right values for optimizing the performance. For the live run, however, you should deselect it to increase performance by not having a work process blocked for waiting.

You can now make appropriate settings for performance optimization on the SAP target side—and for bulk transfer, which is frequently required for some business objects.

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15.12 Summary

In this chapter, we have introduced SAP Data Services and the rapid data migration Best Practices content. You've learned how to tackle data quality issues and got to know the right toolkit for both extracting legacy data and writing data into staging areas. You can now begin a successful data migration to SAP S/4HANA using SAP Data Services and rapid data migration content. This almost concludes our book: the next and final chapter will summarize all data migration tools and compare them to learn when to use what.

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Chapter 16

Comparing Data Migration and Modeling Tools

This chapter compares the various tools available for data migration and modeling of data migration objects.

The previous chapters of this book provided an overview of the existing data migration tools that are delivered by SAP specifically for SAP S/4HANA and SAP S/4HANA Cloud. In this chapter, Section 16.1 compares the various data migration tools. To round off the overall picture, we'll also describe the limitations of and the usage options in the Legacy System Migration Workbench for SAP S/4HANA, which is often used for SAP Business Suite. Section 16.2 describes the differences of the tools in the area of migration object modeling. Section 16.3 summarizes the chapter. Section 16.4 completes the book with a conclusion and forecast.

16.1 Comparing Data Migration Tools

In this chapter, we'll provide an orientation for when to utilize which tool optimally. First, let's dispel the myth of the alleged ban on using the LSMW.

"Forbidden" use of LSMW

The LSMW is part of SAP NetWeaver and a data migration tool for the classic SAP Business Suite. SAP Note 2287723 states that SAP no longer provides any support for the tool in SAP S/4HANA. So it is not generally forbidden to use the LSMW in SAP S/4HANA. Due to the changes and simplifications in SAP S/4HANA, however, it's no longer certain that the transfer methods offered for the SAP ERP data migration (BAPIs, IDocs, standard programs, transaction recording) will work properly. You should make sure that these transfer methods are released for SAP S/4HANA and contain the functional scope of SAP S/4HANA. In general, you should carefully test and use the LSMW only as a supporting tool in addition to the migration tools that are developed specifically for SAP S/4HANA.

In this section, we'll compare the individual SAP tools with one another—with the status as of SAP S/4HANA 2020 and SAP S/4HANA Cloud 2102. For the sake of clarity, we use the abbreviations shown in Table 16.1 in the comparison tables.

Persönliches Exemplar für Ernst Schulten

Name	Abbreviation
SAP S/4HANA migration cockpit—file/staging	MC (F/S)
SAP S/4HANA migration cockpit—staging	
SAP S/4HANA migration cockpit—direct transfer	MC (DT)
Rapid data migration using SAP Data Services	RDM
Legacy System Migration Workbench	LSMW
SAP S/4HANA migration object modeler	MOM

Table 16.1 Abbreviations for Data Migration Tools



Rapid Data Migration Using SAP Data Services

Rapid data migration using SAP Data Services is an SAP solution that based on the SAP Data Services ETL tool. We'll discuss the entire solution as a tool. For more information on this solution, refer to Chapter 15.



SAP S/4HANA versus SAP S/4HANA Cloud

SAP S/4HANA Cloud refers to SAP S/4HANA public cloud products that are technically based on the SAP S/4HANA Cloud product version SAPSCORE. SAP S/4HANA refers to SAP S/4HANA products that are based on S4CORE—that is, on-premise and private cloud products.

16.1.1 Costs

License costs for SAP tools

The SAP tools are part of the SAP S/4HANA and SAP S/4HANA Cloud products, and they are usually not subject to any further license costs. Even the rapid data migration solution based on SAP Data Services is free of license costs. However, license costs for SAP Data Services may be incurred depending on the SAP S/4HANA license and the underlying SAP HANA database license.

Possible additional costs

In addition to the license costs, additional costs for hardware or software may arise for some tools. Depending on the SAP HANA database license, additional software costs may be incurred for using the staging tables in on-premise versions.

Planning necessary consulting fees

You should also consider the costs for any possible consulting work. Data migration is a complex matter and may involve a lot of consulting depending on the migration object. Table 16.2 compares the various elements of costs for each tool.

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Costs for	MC	RDM	LSMW
Software	None	Depends on the SAP S/4HANA license	None
Hardware	None	Yes, separate hardware	None
Application consulting	Yes, recommended for mapping complex migration objects	Yes, complex product	Yes, because no migration content is predefined
Development	No, if no enhancement of the standard is necessary Yes, if changes are made to the standard No, for extraction (DT) Yes, for extraction (F/S)	No, for mapping Yes, for extraction	Yes, for mapping Yes, for extraction
Other	Depending on the SAP HANA database license, additional software, hardware, and license costs are possible when using staging tables		

Table 16.2 Comparing Costs for Migration Tools

16.1.2 Availability of Migration Tools

As you learned in previous chapters, SAP S/4HANA migration cockpit—staging is the only tool in SAP S/4HANA Cloud (SAPSCORE) that is available for migrating data. The direct transfer approach and rapid data migration are not available because they build on RFC-based protocols that must not be used for public cloud products. The LSMW isn't available for end customers in the public cloud. Although there are apps for uploading data records for some business objects, only the SAP S/4HANA migration cockpit provides an integration of conversions across all objects. Table 16.3 provides an overview of the availability of the individual tools.

Tool	SAP S/4HANA	SAP S/4HANA Cloud
MC (F/S)	Since version 1610	Since version 1511
LSMW	Yes	N/A

Table 16.3 Comparing Availability of Migration Tools

Persönliches Exemplar für Ernst Schulten

Tool	SAP S/4HANA	SAP S/4HANA Cloud
MC (DT)	Since version 1909 Access to the following SAP source systems: ■ SAP ERP 6.0 ■ SAP AFS 6.0 ■ SAP EWM ■ SAP CRM 7.0	N/A
RDM	Yes	N/A

Table 16.3 Comparing Availability of Migration Tools (Cont.)

16.1.3 Coverage of Migration Objects

Number of migration objects is growing

For the SAP S/4HANA migration cockpit and every SAP S/4HANA Cloud release, new migration objects are delivered and existing migration objects are corrected and adapted to new SAP Best Practices. This means that the number of objects in SAP S/4HANA Cloud grows with the scope of the SAP Best Practices content delivered for this solution. New migration objects for the staging approach are delivered only for the main release of the on-premise version in SAP S/4HANA. Table 16.4 shows how the individual tools are covered with predefined migration objects and provides notes on the support of custom fields and delivery of corrections.

Tool	Properties
MC (F/S) MC (DT)	■ Full SAP Best Practices coverage of migration objects (F/S) ■ Very good coverage of scenarios provided (DT) ■ Default delivery of new objects and adaptations, corrections of existing objects for every main release ■ Error corrections of existing objects are delivered via separate SAP Notes transport-based correction instructions (TCI) . ■ Usage of custom fields via in-app extensibility, compatible migration objects ■ Custom enhancements of existing migration objects and creation of new migration objects using the SAP S/4HANA migration object modeler possible in S4CORE-based systems
RDM	■ Medium object coverage for > 50 migration objects ■ Extensibility of migration objects possible ■ Creation of custom migration objects possible
LSMW	■ SAP does not deliver any content for SAP S/4HANA ■ Creation of custom migration objects possible

Table 16.4 Coverage of Migration Objects and Delivered Content

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Additional Information on SAP S/4HANA and SAP Best Practices

You can find more details on SAP Best Practices for SAP S/4HANA, including migration content, in the SAP S/4HANA Community and the SAP Best Practices Explorer, at the following links:

- SAP Community: *https://community.sap.com/*
- SAP Best Practices for SAP S/4HANA (on-premise): *http://s-prs.co/5279137*
- SAP Best Practices for SAP S/4HANA Cloud: *http://s-prs.co/5279138*

16.1.4 Technical Characteristics

Except for rapid data migration, all other tools are part of SAP S/4HANA. Table 16.5 compares some technical characteristics.

	MC	RDM	LSMW
User interface	SAP Fiori app	External application	Backend transaction
Supported migration methods	Compatible function modules (DT + F/S) and RAP BO (F/S)	Data transfer via IDoc	SAP S/4HANA–compatible IDocs, BAPIs, standard programs, transaction recordings (batch input)
Extraction of data from source systems	■ **MC (F/S)** not possible ■ **MC (DT)** call of own methods via RFC log	Database extraction via ODBC	Not possible

Table 16.5 Comparing Technical Characteristics

16.1.5 Performance

Migration method defines the performance

The performance of the data load—that is, the call of the migration method—is decisive when you consider the performance of a data migration. The number of data records to be loaded per hour depends on the hardware equipment and on the type of call of the migration method. A function module that is written specifically for the data migration is usually much faster and more powerful than a transaction recording (batch input) or a standard program that is based on it.

Persönliches Exemplar für Ernst Schulten

Parallelization improves performance

In addition to the migration method, the option of parallelization is also an important factor. Here, it's decisive which type of processes the tool or migration method uses for loading data. Does it use background processes or dialog processes? You can increase the number of dialog processes by granting access to the system only to the absolutely necessary number of users at the time of data migration. In parallel, you should switch off standard background jobs that are not required for the time of data migration. The more processes are available, the more you can use parallelization.

High-performance networks reduce response times

A high-performance network is decisive for cloud applications, for uploading large files and data volumes, and for the response times in user guidance. The faster the network, the lower the load or response times.

Let's discuss the performance aspects of the individual tools:

- **MC (F/S)**
  Parallelization of migration objects by using parallel background processes is possible as of SAP S/4HANA release 1809 or since SAP S/4HANA Cloud 1805. In SAP S/4HANA Cloud, there are approximately 10 background processes for each instance; the SAP S/4HANA migration cockpit uses a maximum of 80% thereof. In theory, 8 background processes are available in a QA system and 16 background processes are available in a production system if they are not planned otherwise. For more information on this, refer to KBA 2878945.
- **MC (DT)**
  Parallelization of migration objects is possible by using parallel background processes.
- **RDM**
  In addition to the load time, you must also include the generation of IDocs. Parallelization is possible via dialog or background processes.
- **LSMW**
  Performance highly depends on the migration method. A transaction recording is usually much slower than using an API or IDoc. In addition to the load time, you must also include the generation of the IDoc or batch input sessions. Parallelization is possible via dialog or background processes, depending on the migration method.

16.1.6 Volume and Customer Segment

The individual tools are intended for different customers and customer segments. In SAP S/4HANA Cloud, you can only use the SAP S/4HANA migration cockpit. In SAP S/4HANA, all solutions are available. Table 16.6 compares the data volume, customers, and customer segments of the individual tools.

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Tool	Migration Cockpit	RDM	LSMW
Volume	No restriction for loading or populating staging tables via ETL tools	No restriction	
Customers	**MC (F/S)** SAP and non-SAP systems	SAP and non-SAP systems	
	MC (DT) Customers with the following SAP systems: ■ SAP ERP as of 6.0 ■ SAP AFS 6.0 ■ SAP EWM as of 5.1 ■ SAP CRM 7.0		
Customer segment	**SAP S/4HANA Cloud** Small/medium **SAP S/4HANA** Small/medium/large	Small/medium/large	

Table 16.6 Volume and Customer Segment

16.2 Comparing Modeling Tools

Using the SAP S/4HANA migration object modeler is currently possible in SAP S/4HANA only. The release numbers mentioned in Table 16.7 therefore refer to the SAP S/4HANA releases.

Functionality	MOM	RDM	LSMW
Enhancement of existing migration objects	**File/staging** As of version 1610, only assignment of fields via MOVE rule possible. As of version 1709, more complex changes possible. It is recommended to use a copy instead of changing an existing object.	Yes	No migration objects are delivered.

Table 16.7 Comparing Modeling Tools

Persönliches Exemplar für Ernst Schulten

Functionality	MOM	RDM	LSMW
Creation of new migration objects	Yes; refer to SAP Note 2590165 with regard to the requirements on APIs. **File/staging** Possible as of 1709.	Yes, considering the access methods that are compatible with SAP S/4HANA.	
Enhancement of existing rules	**File/staging** Possible as of version 1709; it is recommended to create new rules. **Direct transfer** Fixed values and value mappings can be changed, source code as of version 2020.	Yes	No migration objects and therefore no rules are delivered.
Creation of new rules	**File/staging** Possible as of 1709. **Direct transfer** Fixed values and value mappings can be created, and source code as of 2020.	Yes	Yes
Programming knowledge required	ABAP for complex rules.	SAP Data Services for complex rules.	ABAP for complex rules.
Adaptation of the selection criterion for reading data from source systems	**File/staging** N/A. **Direct transfer** Filter at organization level (company code, plant, etc.). Standard selection at field level.	Yes	N/A

Table 16.7 Comparing Modeling Tools (Cont.)

16.3 Conclusion

Now the question is when to use which of these tools. There is no clear answer to this question because several solutions can be used in parallel.

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Table 16.8 compares the different migration tools we introduced in this chapter.

Tool	Advantages	Disadvantages
MC (F/S)	■ Covers the exact solution scope of SAP Best Practices ■ Easy to use ■ Migration templates in SAP S/4HANA that can be enhanced via the SAP S/4HANA migration object modeler ■ Staging tables, release-dependent, can be used as of SAP S/4HANA 1709 FPS 01 ■ Parallel loading of a migration object ■ In-app extensibility can be used for compatible migration objects	■ Fixed migration templates in SAP S/4HANA Cloud (as long as the Migration Object Modeler is not available in cloud) ■ No data extraction ■ No data cleansing ■ Limited, maximum file size of migration templates due to technical reasons ■ Population of XML templates error-prone if used incorrectly ■ Parallelization only via background processes
MC (DT)	Direct connection of SAP ERP, SAP AFS, SAP EWM, and SAP CRM source systems	Only RFC currently supported as communication interface
RDM	■ Direct connection of any source systems ■ Data cleansing	■ Separate hardware ■ Additional license for data cleansing and possible database usage
LSMW	■ Known and flexible tool ■ Usage of various migration methods possible	■ Migration methods from SAP ERP may not be usable in some circumstances ■ No migration objects predefined by SAP

Table 16.8 Advantages and Disadvantages of Individual Migration Tools



Additional Literature on LSMW and SAP Data Services

For more in-depth information on data migration using SAP Data Services or the LSMW in an SAP ERP environment, see *Data Migration with SAP* by Frank Densborn et al. (3rd edition, SAP PRESS, 2016).

Persönliches Exemplar für Ernst Schulten

16.4 Outlook

This chapter concludes our journey to SAP S/4HANA. Hopefully, we've provided useful information to better orient you during the migration process. You are now familiar with the required tools and considerations to determine the best solution for your enterprise. Whether a new implementation or system conversion, on-premise or in the cloud, now you'll make all the right decisions.

During the current coronavirus pandemic, cloud solutions are definitely an important factor as enterprises from many industries face major challenges. Within a very short period of time, enterprise IT must be restructured in such a way that employees can work remotely from their homes and that servers are not stretched to their limits. Right now, it becomes clear how important the cloud is for the digital workspace. If people work decentrally, the IT infrastructure must also be available for all of them. Then, at the latest, on-premise solutions quickly reach their limits. This sudden transfer to digital workspaces advances cloud-based solutions in many places. Employers that rely on an on-premise infrastructure, however, have had to switch to a shift system in order to meet the increased demand for access to their remote desktop systems. Here, cloud computing provides the required flexibility and scalability to be able to respond to unpredictable situations.

In conclusion: whether you're a member of the project team or a decision-maker who must determine the appropriate strategy—we hope that this book has proven to be a good guide, answering all your questions, and that it will further support you as a reference book in your migration project. Now all that remains is for us to wish you success in migrating your system to SAP S/4HANA.

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Appendix A
Available Migration Objects

The tables in this appendix list the available migration objects for each migration approach of the SAP S/4HANA migration cockpit (as of summer 2020). The first section includes the *data transfer using staging tables* approach, and the second section includes the *data transfer directly from SAP systems* (*direct transfer*) approach. The list is based on the available migration objects for SAP S/4HANA Cloud 2102 and SAP S/4HANA 2020 FSP00, unless otherwise specified.

Current lists on the SAP Help Portal

The current overview of the migration objects that are available for a release can be found on the SAP Help Portal. Here are the quick access URLs for the individual products:

- SAP S/4HANA Cloud: *https://help.sap.com/S4_CE_MO*
- SAP S/4HANA: *https://help.sap.com/S4_OP_MO*

A.1 Data Transfer Using Staging Tables

Table A.1 lists the names of the migration objects. They are grouped by components. The C column indicates whether a migration object is available for SAP S/4HANA Cloud (SAPSCORE); the O column indicates whether it is available for the on-premise version (S4CORE).

Component	Name of the Migration Object	C	O
CA-CL	Characteristic	X	X
CA-CL	Class hierarchy	X	X
CA-CL	Class (deprecated)	X	X
CA-CL	Class	X	
CA-CL	Object classification—General template	X	X
CA-CL	Object classification—Material (MARA)	X	
CA-CL	Object classification - Document (DRAW)	X	

Table A.1 Available Migration Objects: Data Transfer Using Staging Tables

Persönliches Exemplar für Ernst Schulten

Component	Name of the Migration Object	C	O
CA-CL	Object classification - Code group (QPGR)	X	
CA-CPD	Commercial project	X	
CA-DMS	Document info record	X	X
CA-GTF-CON	Consent	X	X
CA-JVA	JVA—Joint venture partner	X	X
CA-JVA	JVA—Joint venture master data	X	X
CA-JVA	JVA—Cost center suspense	X	X
CA-JVA	JVA—Project suspense	X	X
CA-JVA	JVA—Joint operating agreement	X	X
CA-JVA	JVA—Venture suspense	X	X
CA-PVL	Production volume capture	X	
CO	CO—Activity type	X	X
CO	CO—Internal order		X
CO	CO—Internal order (restricted)	X	
CO	CO—Cost center	X	X
CO	CO—Profit center	X	X
CO	CO—Statistical key figure	X	X
CO	CO—Cost rate		X
CO-OM-ABC	CO—Business process		X
CO-PC-ACT	Xceptional case—Mat price chng for global curr (deprecated)		X
CRM-S4-SRV	Service order (only open SRVO)	X	X
CRM-S4-SRV	Service contract	X	
EHS-SUS	PSS—Raw material compliance info	X	X
EHS-SUS	PSS—Substance	X	X
EHS-SUS	PSS—Product compliance info	X	X
EHS-SUS-CI	EHS—Location classifier	X	

Table A.1 Available Migration Objects: Data Transfer Using Staging Tables (Cont.)

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Component	Name of the Migration Object	C	O
EHS-SUS-DG	DG—Assessment for unpackaged product (content-based)	X	X
EHS-SUS-DG	DG—Assessment for unpackaged product (text-based)	X	X
EHS-SUS-DG	DG—Assessment for packaged product	X	X
EHS-SUS-FND	EHS—Chemical/Physical property	X	
EHS-SUS-FND	EHS—Location	X	X
EHS-SUS-FND	EHS—Location hierarchy	X	X
EHS-SUS-IM	EHS—Incident	X	
FI	Bank (deprecated)	X	X
FI	Bank	X	
FI	FI—Bank account balance	X	X
FI	FI—Historical balance	X	
FI	FI—Historical balance (restricted)		X
FI	FI—G/L account balance and open/line item	X	X
FI	FI—SEPA mandate	X	X
FI	FI—G/L account		X
FI	FI—G/L account—extend existing record by new org levels		X
FI	Exchange rate	X	X
FI-AA	Fixed asset—Master data	X	
FI-AA	Fixed asset (incl. balances and transactions)		X
FI-AA	Fixed asset—Postings	X	
FI-AP	FI—Accounts payable open item	X	X
FI-AR	FI—Accounts receivable open item	X	X
FI-CA	FI-CA—Cash security deposit	X	
FI-CA	FI-CA—Dunning history	X	
FI-CA	FI-CA—Open item	X	

Table A.1 Available Migration Objects: Data Transfer Using Staging Tables (Cont.)

Persönliches Exemplar für Ernst Schulten

Component	Name of the Migration Object	C	O
FI-CA	FI-CA—Provider contract	X	
FI-CA	FI-CA—Installment plan	X	
FI-CA	FI-CA—Contract account	X	
FI-CA	FI-CA—Contract partner	X	
FI-CA	FI-CA—Payment	X	
FI-CA	FI-CA—Interest history	X	
FI-CA	FI-CA—Provider contract	X	
FI-LOC-FI-BR	EFD—Reinf report	X	X
FI-LOC-FI-RU	Import customs declaration (Russia)	X	
FI-LOC-FI-RU	Contract number in accounting documents	X	
FIN-FSCM-CLM	FI—Cash memo record	X	X
FIN-FSCM-TRM	TRM—Bank guarantee	X	
FIN-FSCM-TRM	TRM—Foreign exchange collar-contract	X	X
FIN-FSCM-TRM	TRM—Interest rate instrument	X	X
FIN-FSCM-TRM-TM	TRM—Commercial paper	X	X
FIN-FSCM-TRM-TM	TRM—FX option	X	X
FIN-FSCM-TRM-TM	TRM—Deposit at notice	X	X
FIN-FSCM-TRM-TM	TRM—Position value	X	X
FIN-FSCM-TRM-TM	TRM—Interest rate swap	X	
FIN-FSCM-TRM-TM	TRM—Foreign exchange spot/forward transaction-contract	X	X
FIN-FSCM-TRM-TM	TRM—Foreign exchange swap-contract	X	X
FIN-FSCM-TRM-TM-TF	TRM—Letter of credit	X	
LCM-GF	Legal transaction	X	X
LE-JIT	JIT—Customer	X	X
LE-JIT	JIT—Package group	X	X
LE-JIT	JIT—Supply control	X	X

Table A.1 Available Migration Objects: Data Transfer Using Staging Tables (Cont.)

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Component	Name of the Migration Object	C	O
LO	Material- extend exist record by new org levels (deprecated)		X
LO	Material (deprecated)		X
LO	Product	X	X
LO	Product—extend existing record by new org levels	X	X
LO	Product hierarchy	X	
LO	Product hierarchy assignment	X	
LO-AB	Condition contract	X	X
LO-BM	Batch unique at plant level		X
LO-BM	Batch unique at material and client level	X	X
LO-HU-BF	LO—Handling unit	X	
LO-VC	VC—Dependency net	X	
LO-VC	VC—Object dependencies	X	
LO-VC	VC—Constraint	X	
LO-VC	VC—Assign global dependency to characteristic	X	
LO-VC	VC—Assign global dependency to characteristic value	X	
LO-VC	VC—Configuration profile	X	X
LO-VC	VC—Material variant	X	X
LO-VC	VC—Characteristics group	X	X
LO-VC	VC—Variant table entry	X	
LO-VC	VC—Variant table structure	X	
MM	Supplier	X	X
MM	Supplier—extend existing record by Thailand branch code	X	X
MM	Supplier—extend existing record by new org levels	X	X

Table A.1 Available Migration Objects: Data Transfer Using Staging Tables (Cont.)

Persönliches Exemplar für Ernst Schulten

Component	Name of the Migration Object	C	O
MM	Material—extend existing record with long text	X	X
MM	Material—Forecast planning	X	X
MM	Product consumption	X	X
MM-IM	Material inventory balance	X	X
MM-PUR	Condition record for pricing in purchasing (restricted)	X	X
MM-PUR	MM—Purchase order (only open PO)	X	X
MM-PUR	MM—Purchasing info record—extend existing record	X	X
MM-PUR	MM—Purchasing info record with conditions	X	X
MM-PUR	MM—Purchase contract	X	X
MM-PUR	MM—Purchase scheduling agreement	X	X
MM-PUR	MM—Source list	X	X
PLM-ESD-ESC	Software/Hardware constraint	X	X
PLM-WUI-OBJ-ECN	ECM—Change master	X	X
PM	PM—Equipment	X	X
PM	PM—Equipment task list	X	X
PM	PM—Equipment BOM	X	X
PM	PM—General maintenance task list	X	X
PM	PM—Maintenance notification	X	X
PM	PM—Measurement document	X	X
PM	PM—Measuring point	X	X
PM	PM—Functional location task list	X	X
PM	PM—Functional location BOM	X	X
PM	PM—Functional location	X	X
PM	PM—Maintenance plan	X	X
PM	PM—Maintenance item		X

Table A.1 Available Migration Objects: Data Transfer Using Staging Tables (Cont.)

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Component	Name of the Migration Object	C	O
PP	Routing	X	X
PP	Work center/Resource	X	X
PP	Production version	X	X
PP-BD	Material BOM	X	X
PPM	Enterprise project	X	
PS	PS—Network		X
PS	PS—Project		X
PS	PS—WBS element		X
PSM-FM	PSM—Fund	X	
QM	QM/PM—Catalog code group/code	X	X
QM	Material inspection setup	X	X
QM	QM—Selected set	X	X
QM	QM—Selected set code	X	X
QM	QM—Inspection method	X	X
QM	QM—Inspection plan	X	X
QM	QM—Inspection plan (deprecated)		X
QM	QM—Quality info record	X	
QM	QM—Master inspection characteristic	X	X
QM	QM—Certificate profile incl. assignment	X	
RE-FX	Real estate contract	X	
SCM-EWM	Warehouse fixed bin assignment	X	
SCM-EWM	Warehouse stock	X	
SCM-EWM	Warehouse storage bin	X	
SCM-EWM	Warehouse storage bin sorting	X	
SCM-EWM	Warehouse product	X	
SD	Customer—extend existing record by Thailand branch code	X	X

Table A.1 Available Migration Objects: Data Transfer Using Staging Tables (Cont.)

Persönliches Exemplar für Ernst Schulten

Component	Name of the Migration Object	C	O
SD	Condition record for pricing (general template)	X	X
SD	Customer	X	X
SD	Customer—extend existing record by Credit Management data	X	X
SD	Customer—extend existing record by new org levels	X	X
SD	Material listing and exclusion	X	X
SD	Condition record for pricing in sales (restricted)	X	X
SD	SD—Sales order (only open SO)	X	X
SD-SLS	SD—Sales scheduling agreement	X	
SD	SD—Customer Material	X	X
SD	SD—Material determination	X	X
SD	SD—Sales contract	X	X
SLL-ITR-CLS	Product classification—Commodity code	X	X
SLL-ITR-CLS	Product classification—Legal control	X	X

Table A.1 Available Migration Objects: Data Transfer Using Staging Tables (Cont.)

A.2 Data Transfer Directly from SAP Systems

In this section, you'll find the migration objects available for the following scenarios:

- SAP ERP to SAP S/4HANA: lowest supported ERP release is ERP 6.0 (SAP NetWeaver 7.0)
- SAP Apparel and Footwear (SAP AFS) to SAP S/4HANA: only release supported is AFS 6.0
- SAP Customer Relationship Management (SAP CRM) to SAP S/4HANA Service: SAP CRM release 7.0 supported (delivered with 1909 FPS 1)
- SAP Extended Warehouse Management (SAP EWM) to decentralized SAP EWM, based on SAP S/4HANA: lowest supported SAP EWM release is SAP EWM 5.1 (SAP NetWeaver 7.0).

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A.2.1 Direct Data Transfer from SAP ERP

Table A.2 contains migration objects of release 2020. The migration objects are sorted by component and migration object name.

Component	Migration Object Name
AP-MD-BP	Business partner
AP-MD-BP	RE-FX—Business partner role
CA	Object classification (general template)
CA-CL	Characteristic
CA-CL	Class
CA-CL	VC—Assign global dependency to characteristic
CA-CL	VC—Assign global dependency to class
CA-DMS	Document info record (DMS)
CA-JVA	JVA—Cost center suspense
CA-JVA	JVA—Joint operating agreement (step 1)
CA-JVA	JVA—Joint operating agreement (step 2)
CA-JVA	JVA—Joint venture master (step 1)
CA-JVA	JVA—Joint venture master (step 2)
CA-JVA	JVA—Joint venture partner
CA-JVA	JVA—Order suspense
CA-JVA	JVA—Project suspense
CA-JVA	JVA—Venture suspense
CO	CO—Activity type
CO	CO—Activity type group
CO	CO—Cost center
CO	CO—Cost center group
CO	CO—Cost element group
CO	CO—Internal order
CO	CO—Profit center

Table A.2 Available Migration Objects: Data Transfer Directly from SAP Systems: Direct Transfer from SAP ERP Systems

Persönliches Exemplar für Ernst Schulten

Component	Migration Object Name
CO	CO—Profit center group
CO	CO—Secondary cost element
CO	CO—Statistical key figure (ERP)
CO-OM	CO—Cost rate
CO-OM-ABC	CO—Business process
CO-OM-ABC	CO—Business process group
EHS-SUS-FND	EHS—Location
EHS-SUS-FND	EHS—Location hierarchy
FI	Bank
FI	Exchange rate
FI	FI—Accounts payable open item (classic G/L)
FI	FI—Accounts payable open item (new G/L)
FI	FI—Accounts receivable open item (classic GL)
FI	FI—Accounts receivable open item (new G/L)
FI	FI—Bank account
FI	FI—G/L account
FI	FI—G/L account balance (classic G/L)
FI	FI—G/L account balance (new G/L)
FI	FI—G/L open item (classic G/L)
FI	FI—G/L open item (new G/L)
FI	FI—House bank
FI	FI—Ledger group-specific open item
FI-AA	Fixed asset (including balance)
FI-AR	FI—SEPA Mandate
FIN-FSCM-TRM-TM	TRM—Additional flow
FIN-FSCM-TRM-TM	TRM—Bank guarantee

Table A.2 Available Migration Objects: Data Transfer Directly from SAP Systems: Direct Transfer from SAP ERP Systems (Cont.)

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Component	Migration Object Name
FIN-FSCM-TRM-TM	TRM—Business partner role
FIN-FSCM-TRM-TM	TRM—Cap/Floor
FIN-FSCM-TRM-TM	TRM—Commercial paper
FIN-FSCM-TRM-TM	TRM—Condition detail
FIN-FSCM-TRM-TM	TRM—Deposit at notice
FIN-FSCM-TRM-TM	TRM—Facility
FIN-FSCM-TRM-TM	TRM—Fixed term deposit
FIN-FSCM-TRM-TM	TRM—Foreign exchange collar contract
FIN-FSCM-TRM-TM	TRM—Foreign exchange spot/forward contract
FIN-FSCM-TRM-TM	TRM—Foreign exchange swap contract
FIN-FSCM-TRM-TM	TRM—FX option
FIN-FSCM-TRM-TM	TRM—Interest rate instrument
FIN-FSCM-TRM-TM	TRM—Interest rate swap
FIN-FSCM-TRM-TM	TRM—Investment certificate
FIN-FSCM-TRM-TM	TRM—Letter of credit
FIN-FSCM-TRM-TM	TRM—Main flow detail
FIN-FSCM-TRM-TM	TRM—Payment detail
FIN-FSCM-TRM-TM	TRM—Security bond
FIN-FSCM-TRM-TM	TRM—Security class
FIN-FSCM-TRM-TM	TRM—Stock
LE-JIT	JIT—Customer
LO	Product
LO-AB	Condition contract
LO-BM	Batch unique at material and client level
LO-BM	Batch unique at plant level
LO-MD-MM	MM—Material commodity

Table A.2 Available Migration Objects: Data Transfer Directly from SAP Systems: Direct Transfer from SAP ERP Systems (Cont.)

Persönliches Exemplar für Ernst Schulten

Component	Migration Object Name
LO-VC	MM—Material variant
LO-VC	VC—Configuration profile
LO-VC	VC—Interface design (characteristic group)
LO-VC	VC—Object dependency and dependency net
LO-VC	VC—Variant table entry
LO-VC	VC—Variant table structure
MM	MM—Material consumption
MM	MM—Service entry sheet
MM	Supplier
MM-IM	MM—Material inventory balance
MM-PUR	MM—Purchase contract
MM-PUR	MM—Purchase order (only open PO)
MM-PUR	MM—Purchase requisition (only open PR)
MM-PUR	MM—Purchase scheduling agreement
MM-PUR	MM—Purchasing info record
MM-PUR	MM—Quota arrangement
MM-PUR	MM—Source list
MM-SRV	MM—Service master
PLM-PLC	ECM—Change master
PM	PM—Equipment
PM	PM—Equipment BOM
PM	PM—Equipment task list
PM	PM—Functional location
PM	PM—Functional location BOM
PM	PM—Functional location task list
PM	PM—General maintenance task list

Table A.2 Available Migration Objects: Data Transfer Directly from SAP Systems: Direct Transfer from SAP ERP Systems (Cont.)

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Component	Migration Object Name
PM	PM—Maintenance item
PM	PM—Maintenance notification
PM	PM—Maintenance order
PM	PM—Maintenance plan
PM	PM—Measuring point
PM	PP—Work center
PM-EQM-SF-MPC	PM—Measurement document
PP	PP—Production order
PP	PP—Production resource/tool
PP	PP—Production version
PP	PP—Routing
PP	PP—Work breakdown structure BOM
PP-BD	PP—Material BOM
PP-BD	PP—Sales order BOM
PP-MRP	PP—Material MRP assignment
PP-MRP	PP—Planned independent requirement
PS	PS—Network
PS	PS—Project
QM	Catalog code group and code
QM	QM—Inspection method
QM	QM—Inspection plan
QM	QM—Master inspection characteristic
QM	QM—Material inspection setup
QM	QM—Quality info record
QM	QM—Selected set
QM	QM—Selected set code

Table A.2 Available Migration Objects: Data Transfer Directly from SAP Systems: Direct Transfer from SAP ERP Systems (Cont.)

Persönliches Exemplar für Ernst Schulten

Component	Migration Object Name
RE-FX	RE-FX—Business entity
RE-FX	RE-FX—Real estate contract
RE-FX	RE-FX—Rental object
RE-FX-BD	RE-FX—Architectural object
RE-FX-BD	RE-FX—Building
RE-FX-BD	RE-FX—Land
SD	Customer
SD	SD—Customer material
SD	SD—Customer quotation
SD	SD—Sales contract
SD	SD—Sales inquiry
SD	SD—Sales order (only open SO)
SD MM-PUR	Pricing condition (purchasing and sales)
SLL-ITR-CLS	Product classification (legal control)

Table A.2 Available Migration Objects: Data Transfer Directly from SAP Systems: Direct Transfer from SAP ERP Systems (Cont.)

A.2.2 Direct Data Transfer from SAP AFS

In Table A.3, the migration objects available for Release 2020 are sorted by component and migration object name.

Component	Migration Object Name
CA	Object classification (general template)
CA-CL	AFS—Dimensional characteristic
CA-CL	AFS—Nondimensional characteristic
CA-CL	Class
CA-CL	VC—Assign global dependency to characteristic
CA-CL	VC—Assign global dependency to class

Table A.3 Available Migration Objects: Data Transfer Directly from SAP Systems: Direct Transfer from SAP AFS

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Component	Migration Object Name
CA-DMS	Document info record (DMS)
CO	CO—Activity type
CO	CO—Activity type group
CO	CO—Cost center
CO	CO—Cost center group
CO	CO—Cost element group
CO	CO—Internal order
CO	CO—Profit center
CO	CO—Profit center group
CO	CO—Secondary cost element
CO	CO—Statistical key figure
CO-OM	CO—Cost rate
CO-OM-ABC	CO—Business process
CO-OM-ABC	CO—Business process group
FI	Bank
FI	Exchange rate
FI	FI—Accounts payable open item (classic G/L)
FI	FI—Accounts payable open item (new G/L)
FI	FI—Accounts receivable open item (classic GL)
FI	FI—Accounts receivable open item (new G/L)
FI	FI—Bank account
FI	FI—G/L account
FI	FI—G/L account balance (classic G/L)
FI	FI—G/L account balance (new G/L)
FI	FI—G/L open item (classic G/L)
FI	FI—G/L open item (new G/L)

Table A.3 Available Migration Objects: Data Transfer Directly from SAP Systems: Direct Transfer from SAP AFS (Cont.)

Persönliches Exemplar für Ernst Schulten

Component	Migration Object Name
FI	FI—House bank
FI	FI—Ledger group specific open item
FI-AA	Fixed asset (including balance)
FI-AR	FI—SEPA Mandate
IS-AFS-BD	AFS—Configuration class for material grid
IS-AFS-BD	AFS—Distribution curve
IS-AFS-BD	AFS—Distribution curve condition
IS-AFS-BD	AFS—Purchase grid condition record
IS-AFS-BD	AFS—Segmentation default value
IS-AFS-BD	AFS—Segmentation strategy
IS-AFS-BD	AFS—Segmentation structure
IS-AFS-MM LO-FSH	AFS—Article
IS-AFS-PP-MAN	AFS—Quantity distribution profile
IS-AFS-SD	AFS—Sales grid condition record
IS-AFS-SD	AFS—Season
IS-AFS-SD	AFS—Value-added service
LO-BM	Batch unique at plant level
LO-VC	VC—Object dependency and dependency net
MM	Supplier
MM-IM	MM—Material inventory balance
MM-PUR	MM—Purchase contract
MM-PUR	MM—Purchase order
MM-PUR	MM—Purchase scheduling agreement
MM-PUR	MM—Purchasing info record
MM-PUR	MM—Source list
PLM-PLC	ECM—Change master

Table A.3 Available Migration Objects: Data Transfer Directly from SAP Systems: Direct Transfer from SAP AFS (Cont.)

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Component	Migration Object Name
PM	PM—Equipment
PM	PP—Work center
PP	PP—Production order
PP	PP—Production version
PP	PP—Routing
PP-BD	PP—Material BOM
PP-BD	PP—Sales order BOM
PP-MRP	AFS—Planned independent requirement at material level
PP-MRP	AFS—Planned independent requirement at SKU level
PP-MRP	PP—Planned independent requirement
SD	Customer
SD	SD—Sales contract
SD	SD—Sales order
SD MM-PUR	Pricing condition (purchasing and sales)

Table A.3 Available Migration Objects: Data Transfer Directly from SAP Systems: Direct Transfer from SAP AFS (Cont.)

A.2.3 Direct Data Transfer from SAP CRM

In Table A.4, the migration objects are sorted by the migration object name.

Name of the Migration Object	Since Release
CRM—Activities	1909

Table A.4 Only Migration Object Currently Available for Data Transfer Directly from SAP Systems: Direct Transfer from SAP CRM

A.2.4 Direct Data Transfer from SAP EWM

In Table A.5, the migration objects are sorted by migration object name and the release of the first delivery.

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Name of the Migration Object	Since Release
Warehouse fixed bin assignments	1909
Warehouse stock	1909
Warehouse storage bin	1909
Warehouse storage bin sorting	1909
Warehouse product	1909
Material flow system	2020
Physical inventory settings	2020
Production supply area	2020
Resource and user maintenance	2020
Resource execution settings	2020
Resource group and queue settings	2020
Shipping and receiving settings	2020
Warehouse application log settings	2020
Work center dependent settings	2020
Work center determinations	2020

Table A.5 Available Migration Objects: Data Transfer Directly from SAP Systems: Direct Transfer from SAP EWM

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Appendix B
The Authors



Frank Densborn is a migration expert at SAP. He has occupied a multitude of roles in both Germany and the US since he started working there in 2004. Currently, he is a process lead in Cloud Service Management in Palo Alto where he is working on the migration of SAP support systems to the cloud. As a product manager, Frank was working on the SAP S/4HANA greenfield migration solution. For many years, he was responsible for the migration packages leveraging SAP Data Services and the Legacy System Migration Workbench (LSMW). He gained real-world migration experience by supporting onsite data migration projects for customers. Frank studied mathematics, physics, and computer science at the Johannes Gutenberg University in Mainz, Germany. He lives in the San Francisco Bay Area with his family and a very hungry Labrador.



Frank Finkbohner is the product owner for the development of the predefined SAP S/4HANA Cloud data migration content for the SAP S/4HANA migration cockpit at SAP. He has been working for SAP since 1999, 13 years of which was in SAP Consulting, where he supported customers in the development and enhancement of ABAP applications. His main focus was to plan and implement data migrations. In several customer projects, he used the whole spectrum of SAP's data migration tools, methods, and programs (e.g., LSMW, batch input, BAPIs, IDocs, rapid data migration). During his work as a project manager for data transfer projects, he developed a specific method for grouping migration projects into work packages (SEAMAP) and has used this method successfully in customer projects. After his move to SAP development in 2012, he was project lead and delivery manager for the rapid data load for SAP Hybris Marketing rapid deployment solution until 2016. As a product owner, he is responsible for the development of the SAP S/4HANA Cloud data migration content since 2015. He is also the author of

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various SAP PRESS books on data migration. Frank Finkbohner has a degree in computer science from the University of Applied Sciences in Fulda, Germany, and a degree in industrial engineering from the University of Esslingen, Germany.



Dr. **Jochen Freudenberg** has more than 20 years of SAP experience in the areas of ABAP development, process standards for software development, and release and maintenance strategies for SAP products. He is an expert on the concept of system landscapes in diverse SAP software products. Jochen Freudenberg has extensive experience in the concept and implementation of software lifecycle management activities. After many years of maintaining SAP ERP EHPs, SAP Fiori, and SAP S/4HANA (on-premise and in the cloud), he now focuses on the development and improvement of the cloud operating processes of the SAP Cloud Platform.



Martina Höft works in SAP S/4HANA product management in the area of data migration and data transformation, with a focus on the SAP S/4HANA migration cockpit. She has been working for SAP since 2011 and has held various positions in consulting and product management. Previously, Martina Höft worked as a senior consultant on numerous national and international projects for various consulting companies. Here, she focused on SAP Customer Relationship Management (SAP CRM) and sales and distribution with SAP. Martina is a trained office administrator and studied economics.



Kim Mathäß leads product management for SAP S/4HANA cross topics, which is responsible for data management and migration for SAP S/4HANA. He is responsible for the further development of tools and solutions for the transition to SAP S/4HANA. Kim Mathäß conducts lectures and sessions on SAP S/4HANA transition scenarios and migration regularly at national and international conventions. Kim Mathäß joined SAP in 2006 and has held various roles and positions. As a senior consultant and business development manager, he has conducted numerous projects at both international enter-

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prises and medium-sized corporations in Europe. His experience ranges from SAP new implementations to the subsequent adjustment of systems and system landscapes. These projects include system consolidations, mergers and acquisitions, and divestitures, as well as traditional data migrations from SAP and non-SAP systems.



Dr. **Boris Rubarth** has been working for SAP since 1999. Today, he is a product manager in software logistics. There he is responsible for the Software Update Manager and manages the knowledge transfer to the SAP Community and user groups. Previously, he worked as a training consultant in the area of ABAP and interfaces for many years. Subsequently, he led the product management team for the Application Server ABAP. Dr. Boris Rubarth has created countless blogs and SAP training courses on SAP topics and is author of several books. He gives regular lectures on system conversion at national and international conventions. Dr. Boris Rubarth studied physics at the Universities of Hamburg and Hannover, Germany, and holds a doctorate from the University of Oldenburg, Germany.

Contributors to This Book



Heike Jensen has been working for SAP since 1994; today she is a product manager in the area of data migration and data transformation to SAP S/4HANA. Within the SAP S/4HANA migration cockpit, her area of expertise is the direct transfer of data from SAP systems to SAP S/4HANA. She regularly conducts lectures and sessions on this topic at national and international conventions. Heike Jensen is the author of Section 13.4 and Section 14.3. In the many years of her affiliation with SAP, she has worked in many different areas: training, support, and consulting. She knows SAP products from several different perspectives. Her hobbyhorse is end-to-end test scenarios.

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Kirstin Siebenmorgen works in SAP S/4HANA product management in the areas of data migration and data transformation, with a focus on the SAP S/4HANA migration cockpit. Her specialty is the SAP S/4HANA migration object modeler for migrating data using files and staging tables. She has been working for SAP since 1998 and has held various positions in consulting, support, and product management. Before she joined SAP, she studied industrial engineering at Technical University of Karlsruhe, Germany. Kirstin Siebenmorgen is the author of Section 14.1 and Section 14.2.

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