INSTALLATION GUIDE | PUBLIC
Software Provisioning Manager 2.0 SP05
Document Version: 1.5.0 – 2020-01-20

Installation of SAP ABAP Systems on Windows : SAP HANA 2.0 Database - Using Software Provisioning Manager 2.0

This Guide is Valid for SAP Systems based on the Following SAP Product Versions:

- SAP S/4HANA 1909
- SAP S/4HANA 1809
- SAP BW/4HANA 2.0
- SAP BW/4HANA 1.0 Support Release 1

THE BEST RUN SAP

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Document History

> **i Note**
>
> Before you start reading, make sure you have the latest version of this installation guide, which is available at https://support.sap.com/sltoolset *System Provisioning* *Install a System using Software Provisioning Manager* *Installation Option of Software Provisioning Manager 2.0 SP* `<Current Number>` .

The following table provides an overview on the most important document changes:

Version	Date	Description
1.5.0	2020-01-20	Updated version for Software Provisioning Manager 2.0 SP05 (SL Toolset 1.0 SP28)
1.4.0	2019-09-16	Updated version for Software Provisioning Manager 2.0 SP04 (SL Toolset 1.0 SP27)
1.3.0	2019-05-27	Updated version for Software Provisioning Manager 2.0 SP03 (SL Toolset 1.0 SP26)
1.2.0	2019-01-21	Updated version for Software Provisioning Manager 2.0 SP02 (SL Toolset 1.0 SP25)
1.1.0	2018-09-17	Updated version for Software Provisioning Manager 2.0 SP01 (SL Toolset 1.0 SP24)
1.0.0	2018-04-23	Initial version for Software Provisioning Manager 2.0 SP00 (SL Toolset 1.0 SP23)

1 About this Document - Installation of SAP Application Server ABAP Systems on Windows : SAP HANA 2.0 Database - Using Software Provisioning Manager 2.0

This installation guide describes how to install SAP Application Server ABAP systems using Software Provisioning Manager 2.0 SP05 (the “installer” for short) on **Windows** .

It covers the following SAP ABAP system product releases (see also SAP Products Supported by Software Provisioning Manager 2.0 [page 9]):

- SAP S/4HANA Server 1909 (based on SAP S/4HANA Foundation 1909)
- SAP S/4HANA Server 1809 (based on foundation on ABAP Platform 1809, version for SAP HANA)
- SAP BW/4HANA 2.0 (based on SAP BW/4HANA Server 2.0)
- SAP BW/4HANA 1.0 Support Release 1 (based on SAP BW/4HANA Server 1.0 Support Release 1)

For information about supported operating system and database platforms, see the Product Availability Matrix at https://support.sap.com/pam.

Software Provisioning Manager **2.0** SP05 [page 8] is part of Software Logistics Toolset 1.0 SP28.

The SAP HANA database is part of the SAP HANA appliance. It is normally pre-installed by SAP partners before you start the installation. The installation accesses the SAP HANA database remotely to perform the necessary database-specific installation steps.

> **i** Note
>
> As an alternative to using Software Provisioning Manager, you can install your system with a completely automated end-to-end framework available using SAP Landscape Management. For more information, see SAP Note 1709155 and https://help.sap.com/lama.

About Software Provisioning Manager 2.0 [page 8]

Naming Conventions [page 10]

Constraints [page 11]

Before You Start [page 11]

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Accessing the SAP Online Documentation [page 13]

1.1 About Software Provisioning Manager 2.0

Software Provisioning Manager 2.0 is the new release of Software Provisioning Manager 1.0. Software Provisioning Manager as such is the successor of the product- and release-specific delivery of provisioning tools, such as SAPinst and R3setup.

Make sure that you read the most recent version of SAP Note 2568783 (*Release Note for Software Provisioning Manager 2.0*).

Before you run Software Provisioning Manager 2.0, we recommend that you always download the latest version of it. Software Provisioning Manager 2.0 is - as Software Provisioning Manager 1.0 - part of the Software Logistics Toolset 1.0 ("SL Toolset" for short) which is quarterly shipped. This way, you automatically get the latest fixes and supported processes. For more information about Software Provisioning Manager 2.0 as well as products and releases supported by it, see SAP Note 2568783 and http://scn.sap.com/docs/DOC-30236.

Software Provisioning Manager 2.0 Versus Software Provisioning Manager 1.0

The Software Provisioning Manager **2.0** SP05 exists in parallel to Software Provisioning Manager **1.0** SP28. Both Software Provisioning Manager versions are part of Software Logistics Toolset 1.0 SP 28. However, they cover system provisioning for different product versions. The decision matrix is as follows:

- Software Provisioning Manager **2.0** is used for:
  - **Installation, system copy, and system rename of ABAP single stack** systems on **SAP HANA 2.0** database, based on the following products:
    - SAP S/4HANA Server 1909 (based on SAP S/4HANA Foundation 1909)
    - SAP S/4HANA Server 1809 (based on foundation on ABAP Platform 1809, version for SAP HANA)
    - SAP BW/4HANA 2.0 (based on SAP BW/4HANA Server 2.0)
    - SAP BW/4HANA 1.0 Support Release 1 (based on SAP BW/4HANA Server 1.0 Support Release 1)
  - SAP Web Dispatcher installation and rename.

    > **i Note**
    >
    > For SAP Web Dispatcher, you can either use Software Provisioning Manager **2.0** or Software Provisioning Manager **1.0**.

  - SAP Host Agent standalone installation.

    > **i Note**
    >
    > For SAP Host Agent standalone installation, you can either use Software Provisioning Manager **2.0** or Software Provisioning Manager **1.0**.

- Software Provisioning Manager **1.0** is used for:
  - Installation, system copy, system rename of SAP Solution Manager 7.X and Diagnostics Agent.
  - Installation of standalone engines and clients.

> **i Note**
>
> For SAP Web Dispatcher or SAP Host Agent standalone installation, you can either use Software Provisioning Manager **1.0** or Software Provisioning Manager **2.0**.

- Installation, system copy, system rename, and dual-stack split of SAP systems whose **database is not SAP HANA**.
- Installation, system copy, and system rename of **Dual-stack** and **Java single stack** systems.
- Installation, system copy, and system rename of **ABAP single stack** systems whose database is **SAP HANA** database, but whose release is one of the following:
  - **SAP BW/4HANA 1.0 or lower**
  - **SAP S/4HANA 1709 or lower**
  - **SAP NetWeaver AS for ABAP 7.52 or lower**

For more information, see https://blogs.sap.com/2018/05/15/software-provisioning-manager-1.0-vs.-software-provisioning-manager-2.0/.

Naming Conventions

"SAPinst" has been renamed to "Software Provisioning Manager" ("installer" for short), but the terms "SAPinst" and "sapinst" are still used in:

- The name of the technical framework of Software Provisioning Manager. For more information about the SAPinst Framework, see SAP Note 2393060.
- Texts and screen elements in the Software Provisioning Manager GUI
- Names of executables, for example `sapinst.exe`
- Names of command line parameters, for example `SAPINST_HTTPS_PORT`

In this documentation, we generally refer to Software Provisioning Manager as the "installer". We only use the term "Software Provisioning Manager" if this is required for technical reasons, and "Software Provisioning Manager **2.0**" if there is a significant difference compared to "Software Provisioning Manager **1.0**".

1.1.1 SAP Products Supported by Software Provisioning Manager 2.0

Here you can find the list of SAP products supported by Software Provisioning Manager 2.0.

SAP Product	Based on
• SAP S/4HANA Server 1909	SAP S/4HANA Foundation 1909
• SAP S/4HANA Server 1809 • SAP ABAP Foundation 1809 on SAP HANA	foundation on ABAP Platform 1809, version for SAP HANA

SAP Product	Based on
SAP BW/4HANA 2.0	foundation on ABAP Platform 1809, version for SAP HANA FPS1
SAP BW/4HANA 1.0 Support Release 1	SAP NetWeaver 7.5

More Information

For more information about **recommended application server platforms**, see SAP Note 2620910.

1.2 Naming Conventions

- “installer” refers to “Software Provisioning Manager 2.0” and to “Software Provisioning Manager” in general.
- “SAP system” or “ABAP system” refers to SAP systems based on:
  - SAP S/4HANA Server 1909 (based on SAP S/4HANA Foundation 1909)

    > **i Note**
    >
    > For the sake of simplicity, in the following we abbreviate this product as ABAP Platform 1909.

  - SAP S/4HANA Server 1809 (based on foundation on ABAP Platform 1809, version for SAP HANA)

    > **i Note**
    >
    > For the sake of simplicity, in the following we abbreviate this product as ABAP Platform 1809.

  - SAP BW/4HANA 2.0 (based on SAP BW/4HANA Server 2.0)
  - SAP BW/4HANA 1.0 **Support Release 1**.

    > **i Note**
    >
    > For the sake of simplicity, in the following we abbreviate this product as SAP BW/4HANA.

- Since - from a Software Provisioning Manager 2.0 perspective - the “Standalone Enqueue Server 2” is installed with the ASCS instance the same way as the classic “Standalone Enqueue Server”, both are addressed as “Standalone Enqueue Server” in this documentation.
- Since - from a Software Provisioning Manager 2.0 perspective - the “Enqueue Replicator 2” is installed with the ERS instance the same way as the classic “Enqueue Replication Server”, both are abbreviated as “ERS instance” in this documentation.
- In this documentation, we always use the term “ERS instance”, regardless if it contains the “Enqueue Replicator 2” or the “Enqueue Replication Server”.
- **Operating System Names**

In this document, “Windows Server 2008 (R2) or Windows Server 2012 (R2)” – with (R2) written in parentheses – means that the information applies to **both** Windows Server 2008 and Windows Server 2008 R2, or Windows Server 2012 and Windows Server 2012 R2.

- **Only valid for Microsoft Failover Clustering**: As of Windows Server 2008 the cluster feature is called *Failover Clustering*. For practical reasons we are continuing to use the previous terminology *Microsoft Cluster Service* and abbreviation *MSCS* in some sections of this guide and the corresponding installation documentation of your release.

1.3 Constraints

This section lists the current restrictions for installation using Software Provisioning Manager 2.0.

Software Provisioning Manager 2.0 only supports the following products:

- SAP HANA 2.0 database; it does **not** support SAP HANA 1.0 database.
- SAP BW/4HANA 1.0 **SR1** ABAP; it does **not** support products based on SAP BW/4HANA 1.0 or lower.

1.4 Before You Start

Make sure that you have read the release-specific “Installation Guide” - also called “Master Guide” for SAP BW/4HANA - for your SAP S/4HANA application and the central release note 2568783 of Software Provisioning Manager 2.0, before you continue.

This guide is the central document leading you through the overall implementation process for your SAP system installation. It contains important information about the overall implementation sequence, that is activities you have to perform before and after the installation process described in this installation guide.

You can find a printed version of this guide in your installation package or you can download the latest version from https://help.sap.com.

The following table lists the “Installation Guide” - or “Master Guide” - of the SAP system application for which you can use this documentation, along with the available quick link or path to the appropriate download location:

Document	Internet Address
Installation Guide – SAP S/4HANA `<1809 or higher>`	https://help.sap.com/s4hana `<Version 1809 or higher>` > *Product Documentation* > *Installation Guide*
Master Guide - SAP BW/4HANA `<1.0 SR1 or higher>`	https://help.sap.com/viewer/p/SAP_BW4HANA *Installation and Upgrade*

1.5 New Features

The sections below provide an overview of the new features in Software Provisioning Manager 2.0 (the“ installer” for short).

Make sure that you also read the *Release Notes* for your SAP product at https://help.sap.com ▶ `<Search your SAP Product>` ▶ `<Select your SAP Product Version>` ▶ *What's New* ▶.

Feature	Description	Availability
Support of Secure Connection to SAP HANA database.	Software Provisioning Manager 2.0 supports configuring the SAP system to be installed to access the SAP HANA database using encryption.	Software Provisioning Manager 2.0 SP03 (SL Toolset 1.0 SP26)
New Look and Feel of SL Common GUI	As of version 2.0 SP01 Patch Level (PL) 5, Software Provisioning Manager comes with a new look and feel of the SL Common GUI. For more information, see https://blogs.sap.com/2018/11/10/new-look-for-software-provisioning-manager/.	Software Provisioning Manager 2.0 SP01, PL05 (SL Toolset 1.0 SP24)
Support of Standalone Enqueue Server 2 and Enqueue Replicator 2	For SAP systems based on ABAP Platform 1809 or higher, Software Provisioning Manager 2.0 installs the ASCS instance by default with the new Standalone Enqueue Server **2**, and the ERS instance with the new Enqueue Replicator **2**. For more information about the Standalone Enqueue Server **2** and the Enqueue Replicator **2**, see the SAP Online Documentation [page 13] at ▶ *Application Server ABAP Infrastructure* ▶ *Components of the Application Server for ABAP* ▶ *Standalone Enqueue Server 2* ▶ and ▶ *Application Server ABAP Infrastructure* ▶ *Components of the Application Server for ABAP* ▶ *High Availability with Standalone Enqueue Server 2* ▶.	Software Provisioning Manager 2.0 SP01 (SL Toolset 1.0 SP24)
ABAP Platform 1809 or higher: Archive-Based Installation of all Installation Software	For SAP systems based on ABAP Platform 1809 or higher, the database server and client software is provided as installation archives. which you can download from https://launchpad.support.sap.com/#/softwarecenter. Physical SAP HANA 2.0 database server and client media, as well as physical database installation export media and language media are no longer required for the installation.	Software Provisioning Manager 2.0 SP01 (SL Toolset 1.0 SP24)
Homogeneous System Copy	Software Provisioning Manager 2.0 only supports homogeneous system copy using a SAP HANA database backup.	Software Provisioning Manager 2.0 SP00 (SL Toolset 1.0 SP23)

Feature	Description	Availability
New Installer Option *Download Software Packages for Maintenance Planner Transaction*	If you perform an installation using a stack configuration file, you can now download the required software packages according to a Maintenance Plan. For more information, see https://blogs.sap.com/2018/06/01/software-provisioning-manager-new-option-for-standalone-download-service/.	Software Provisioning Manager 2.0 SP00 (SL Toolset 1.0 SP23)
Validity Check for `SUM*.SAR` Archive	If you perform an installation using a stack configuration file and choose to extract the `SUM*.SAR` archive, the validity of this archive is now checked by the installer.	Software Provisioning Manager 2.0 SP00 (SL Toolset 1.0 SP23)

1.6 Accessing the SAP Online Documentation

This section contains the paths for the product-specific online documentation referenced from this documentation.

The references to the SAP Online Documentation in this guide always refer to the following on the SAP Help Portal:

- SAP systems based on SAP S/4HANA Foundation 1909 (“ABAP Platform 1909” for short):
  https://help.sap.com/s4hana ▶ `<Release>` ▶ *Product Assistance* ▶ *SAP S/4HANA* ▶ *Enterprise Technology* ▶ *ABAP Platform*
- SAP systems based on foundation on ABAP Platform 1809, version for SAP HANA (“ABAP Platform 1809” for short):
  https://help.sap.com/s4hana ▶ `<Release>` ▶ *Product Assistance* ▶ *SAP S/4HANA* ▶ *Enterprise Technology* ▶ *ABAP Platform*
- SAP systems based on SAP BW/4HANA 2.0:
  https://help.sap.com/viewer/p/SAP_BW4HANA ▶ *2.0* `<Current SP>` ▶ *Application Help* ▶ *SAP BW/4HANA* ▶ *Application Server for ABAP* ▶ *SAP NetWeaver Library: Function-Oriented View*
- SAP systems based on SAP BW/4HANA 1.0 SR1 (`<SP08 or higher>`):
  https://help.sap.com/viewer/p/SAP_BW4HANA ▶ *1.0* `<SP08 or higher>` ▶ *Application Help* ▶ *SAP BW/4HANA* ▶ *Application Server for ABAP* ▶ *SAP NetWeaver Library: Function-Oriented View*

2 Installation Options Covered by this Guide

This section shows the installation options covered by this installation guide. You have to decide what exactly you want to install because the steps you have to perform vary according to the installation option you choose.

> **i Note**
>
> Regardless of whether you are installing a standard, distributed, or high-availability system, the SAP HANA database is normally installed on a dedicated database server. It is normally pre-installed by SAP partners before you start the installation of the SAP system instances. During the installation of the SAP system, SoftwareProvisioning Manager (the "installer") accesses the SAP HANA database remotely to perform the necessary database-specific installation steps.
>
> For more information about how to install the SAP HANA database, see the *SAP HANA Server Installation and Update Guide* at https://help.sap.com/hana_platform ▶ ▶ *Installation and Upgrade* ▶.

After you have decided on the installation option that you want to use, continue with Planning [page 24].

Standard System [page 14]

Distributed System [page 15]

High Availability System [page 17]

Additional Application Server Instance [page 17]

ASCS Instance with Integrated SAP Web Dispatcher [page 19]

ASCS Instance with Integrated Gateway [page 21]

2.1 Standard System

In a standard system, all main instances except the SAP HANA database instance run on a single host.

There are the following instances:

- ABAP Central services instance (ASCS instance)
  Contains the ABAP message server and the Standalone Enqueue Server

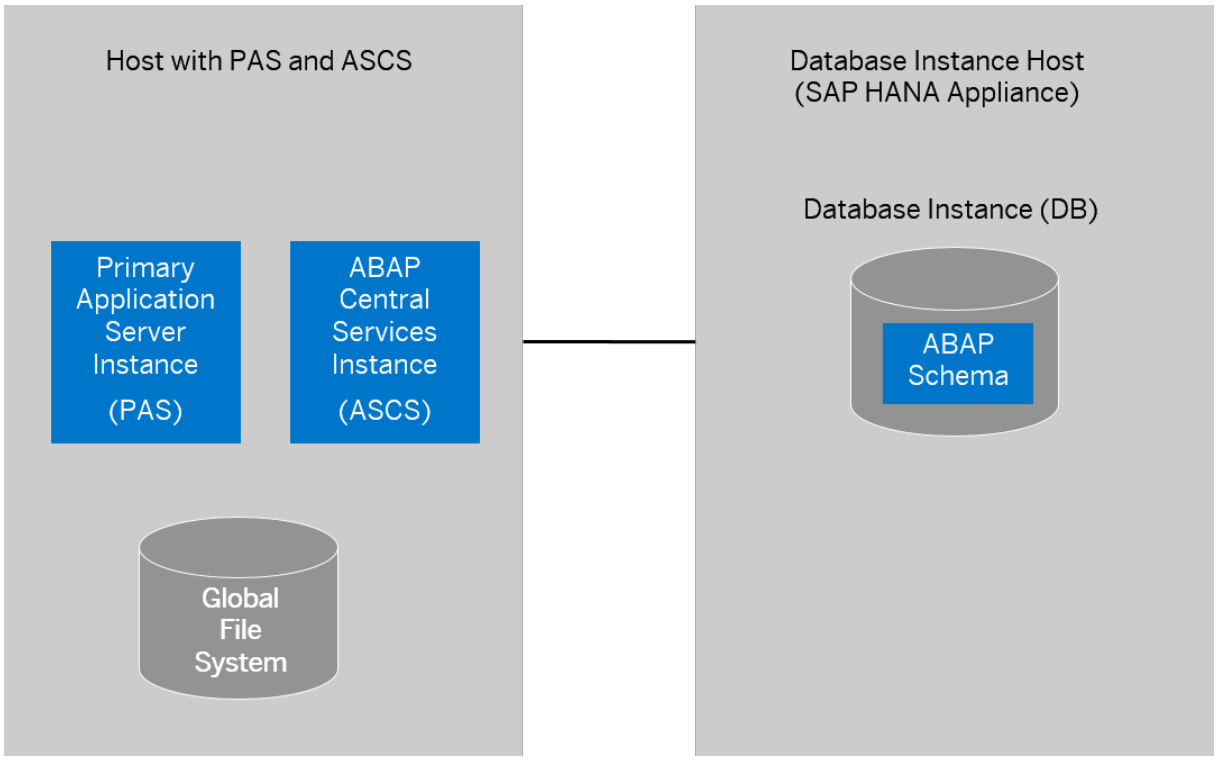
  > **i Note**
  >
  > **ASCS instance with new "Standalone Enqueue Server 2" versus ASCS instance with classic "Standalone Enqueue Server":**
  >
  > - **SAP systems based on ABAP Platform 1809 or higher:** By default, the ASCS instance is installed with the new Standalone Enqueue Server **2**. From a Software Provisioning Manager 2.0 perspective, the installation procedure for the ASCS instance with "Standalone Enqueue Server **2**" is the same as for the ASCS instance with the classic "Standalone Enqueue Server" , there are no additional or different installation parameters.

For more information, see the SAP Online Documentation [page 13] at *Application Server ABAP Infrastructure* > *Components of the Application Server for ABAP* > *Standalone Enqueue Server 2* and *Application Server ABAP Infrastructure* > *Components of the Application Server for ABAP* > *Standalone Enqueue Server 2*.

- **SAP systems based on SAP BW/4HANA 1.0 SR1 (based on SAP NetWeaver 7.5):** The ASCS instance is installed with the classic "Standalone Enqueue Server" by default. You **cannot** switch to the new "Standalone Enqueue Server **2**" after the installation has completed.

Since - from a Software Provisioning Manager 2.0 perspective - the "Standalone Enqueue Server 2" is installed with the ASCS instance the same way as the classic "Standalone Enqueue Server", both are abbreviated as "Standalone Enqueue Server" in this documentation.

  - Optionally, you can install the ASCS instance with an integrated SAP Web Dispatcher. For more information, see ASCS Instance with Integrated SAP Web Dispatcher [page 19].
  - Optionally, you can install the ASCS instance with an integrated gateway. For more information, see ASCS Instance with Integrated Gateway [page 21].
- SAP HANA database instance (DB)
- Primary application server instance (PAS instance)



Standard ABAP System

2.2 Distributed System

An SAP system consists of SAP instances. An SAP instance is a group of processes that are started and stopped at the same time.

In a distributed system, every instance can run on a separate host.

A distributed system consists of the following instances:

- ABAP Central services instance (ASCS instance)
  Contains the ABAP message server and the Standalone Enqueue Server

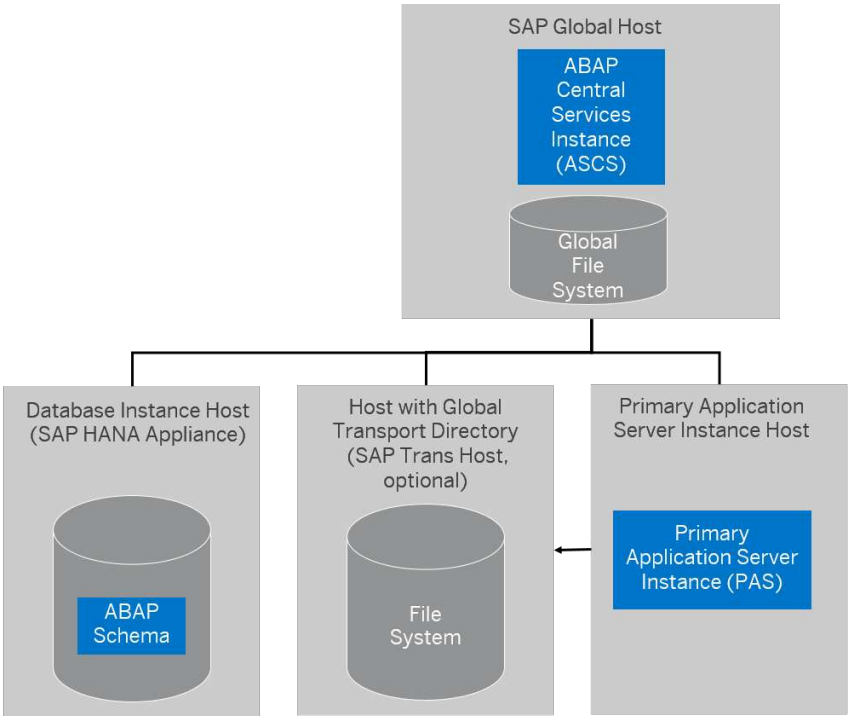
  > **i** Note
  >
  > **ASCS instance with new "Standalone Enqueue Server 2" versus ASCS instance with classic "Standalone Enqueue Server":**
  >
  > - **SAP systems based on ABAP Platform 1809 or higher:** By default, the ASCS instance is installed with the new Standalone Enqueue Server **2**. From a Software Provisioning Manager 2.0 perspective, the installation procedure for the ASCS instance with "Standalone Enqueue Server **2**" is the same as for the ASCS instance with the classic "Standalone Enqueue Server" , there are no additional or different installation parameters.
  >
  >   For more information, see the SAP Online Documentation [page 13] at *Application Server ABAP Infrastructure* > *Components of the Application Server for ABAP* > *Standalone Enqueue Server 2* and *Application Server ABAP Infrastructure* > *Components of the Application Server for ABAP* > *Standalone Enqueue Server 2*.
  > - **SAP systems based on SAP BW/4HANA 1.0 SR1 (based on SAP NetWeaver 7.5):** The ASCS instance is installed with the classic "Standalone Enqueue Server" by default. You **cannot** switch to the new "Standalone Enqueue Server **2**" after the installation has completed.
  >
  > Since - from a Software Provisioning Manager 2.0 perspective - the "Standalone Enqueue Server 2" is installed with the ASCS instance the same way as the classic "Standalone Enqueue Server", both are abbreviated as "Standalone Enqueue Server" in this documentation.

  - Optionally, you can install the ASCS instance with an integrated SAP Web Dispatcher. For more information, see ASCS Instance with Integrated SAP Web Dispatcher [page 19].
  - Optionally, you can install the ASCS instance with an integrated gateway. For more information, see ASCS Instance with Integrated Gateway [page 21].
- SAP HANA database instance (DB)
  The ABAP stack uses its own database schema in the database.
- Primary application server instance (PAS)

The following figure assumes the following:

- The ASCS and primary application server instance run on the SAP global host.
- You can also install the primary application server instance on a separate host.
- The global transport directory resides on a separate SAP transport host.

Optionally, you can install one or more additional application server instances. For more information, see Installation of an Additional Application Server Instance [page 17].



Distributed ABAP System

2.3 High Availability System

For more information about the system components you have to install and how to distribute them on the specific hosts, see System Configuration with Microsoft Failover Clustering [page 147].

> **i Note**
>
> SAP HANA can also have HA solutions. For more information contact your hardware partner and see the SAP HANA overview in the SAP HANA Data Center, which is available at http://www.saphana.com/docs/DOC-2010.

2.4 Additional Application Server Instance

You can install one or more additional application server instances for an existing SAP system. Additional application server instances are optional and can be installed on separate hosts.

An additional application server instance can run on:

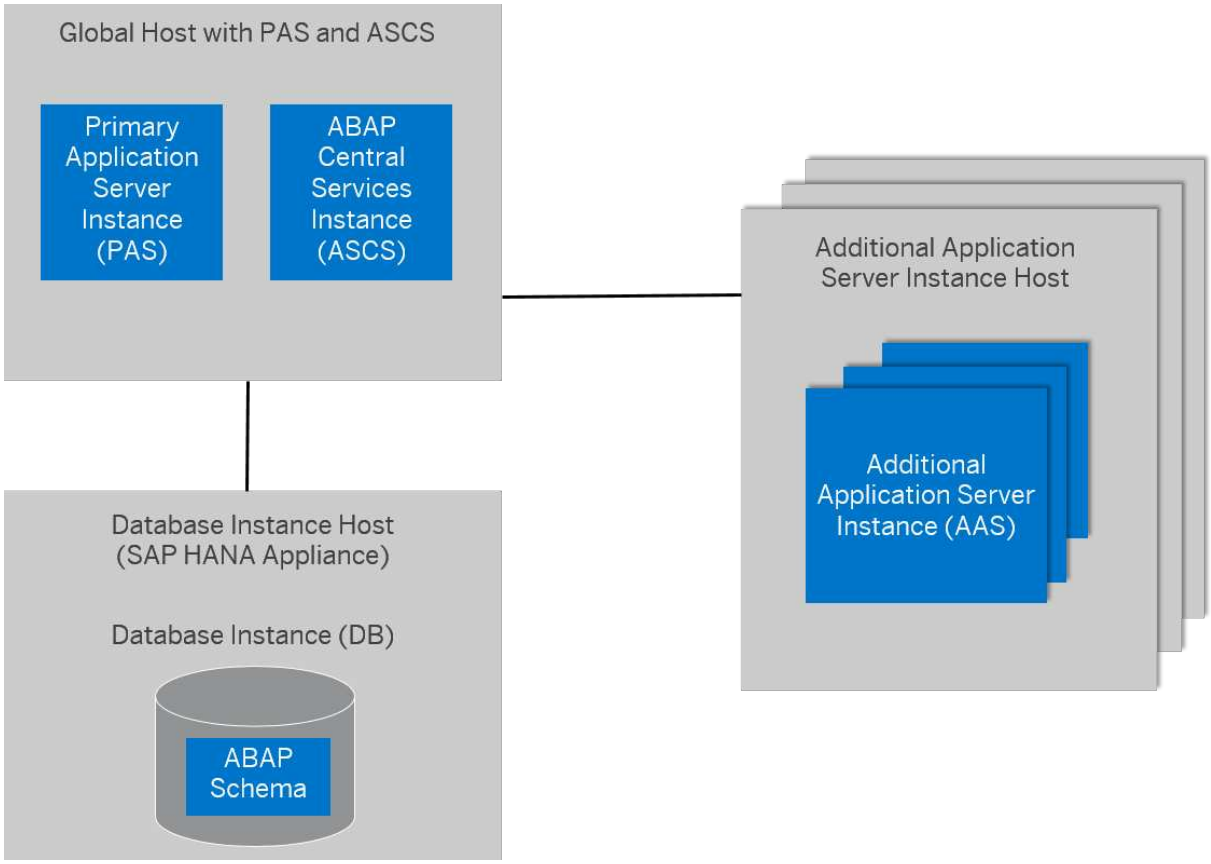
- The host of any instance of the existing SAP system
- On a dedicated host

> **i Note**
>
> We do not recommend installing additional application server instances on the SAP global host.

> **i Note**
>
> If you want to install an additional application server instance on an existing SAP system, you must perform a domain installation. You must also make sure that your existing SAP system was installed as a domain installation. For more information, see Domain or Local Installation [page 36].

Additional Application Server Instance for a Standard System

The following figure shows additional application server instances that are running on dedicated hosts.

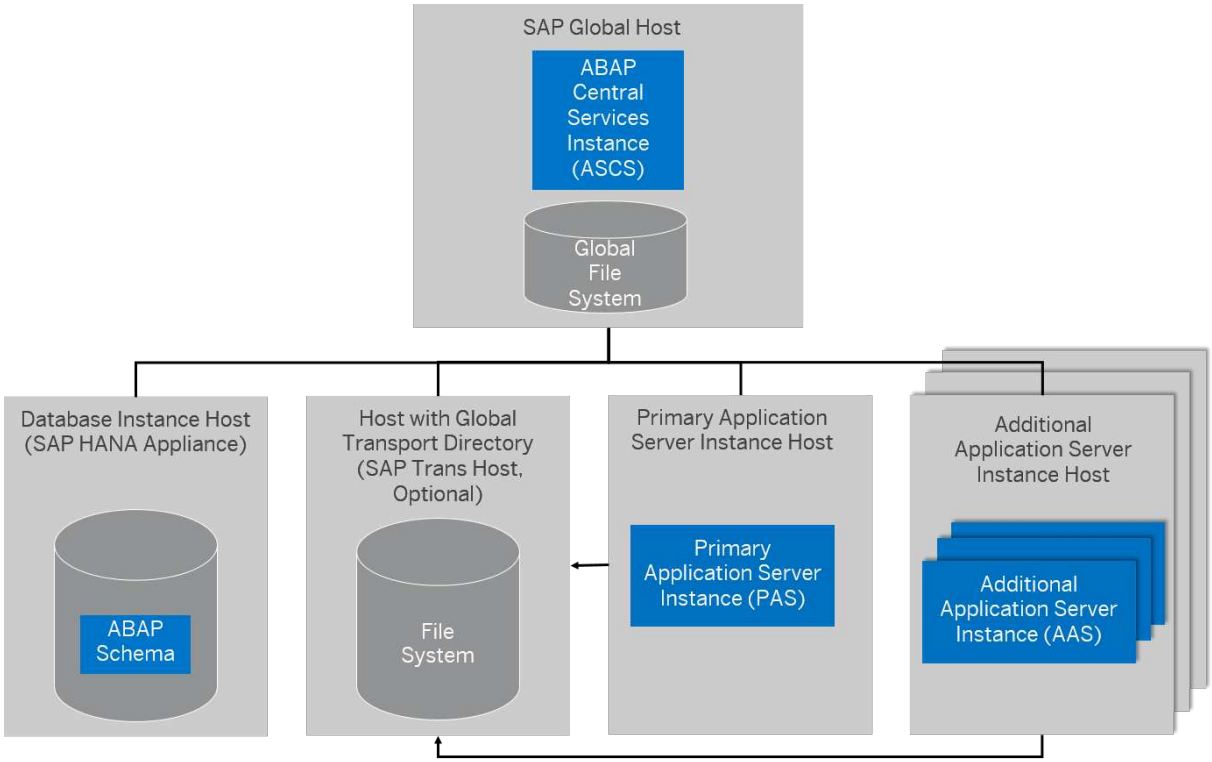


Additional Application Server Instance for a Standard ABAP System

For more information, see Standard System [page 14].

Additional Application Server Instance for a Distributed System

The following figure shows additional application server instances that are running on dedicated hosts.



Additional Application Server Instance for a Distributed ABAP System

For more information, see Distributed System [page 15].

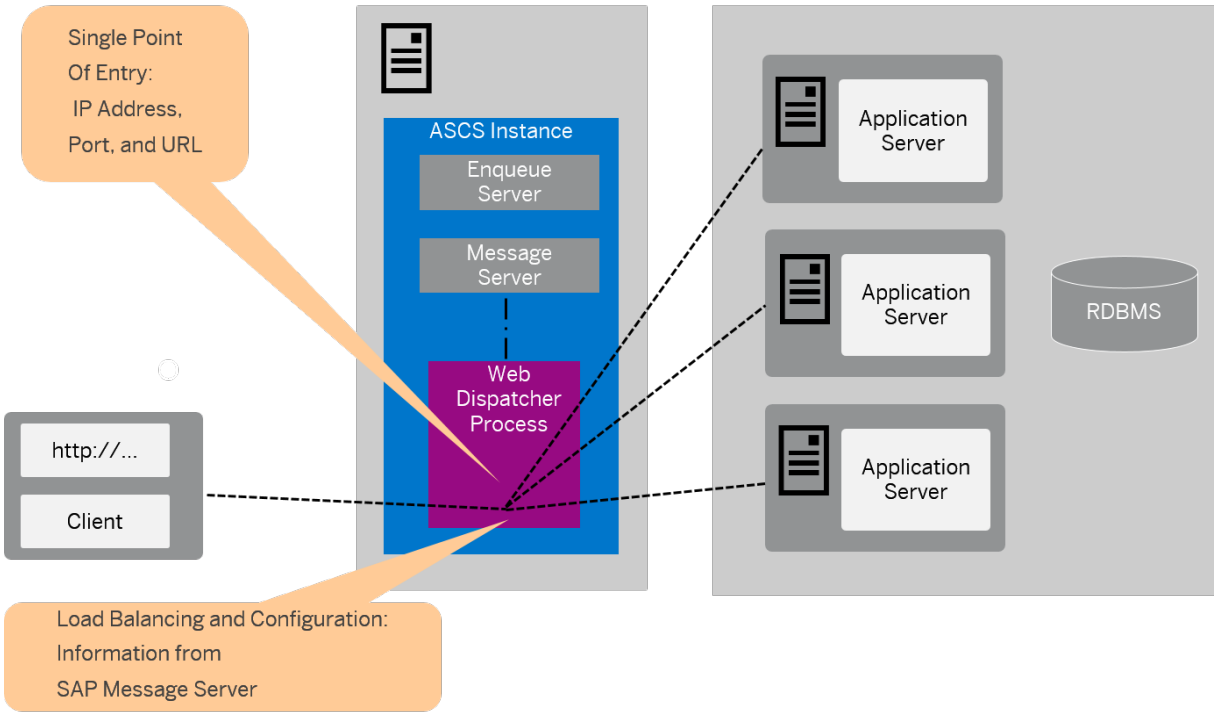
Additional Application Server Instance for a High-Availability System

In a high-availability system, you require, apart from the primary application server instance, at least one additional application server instance. For more information about how to install and distribute the application servers in an HA configuration, see section System Configuration with Microsoft Failover Clustering [page 147].

2.5 ASCS Instance with Integrated SAP Web Dispatcher

You can install an SAP Web Dispatcher integrated in the ASCS instance. If you select this option, an SAP Web Dispatcher is installed running within the ASCS instance. No separate SAP Web Dispatcher instance and no dedicated `<SAPSID>` are created for the SAP Web Dispatcher. We recommend this if you want to use the SAP Web Dispatcher for the system to which the ASCS instance belongs.

> **i Note**
>
> We only recommend this option for special scenarios. For more information, see SAP Note 908097. For an SAP Web Dispatcher installation, a standalone installation (see below) continues to be the default scenario.



ASCS Instance with Integrated SAP Web Dispatcher

The SAP Web Dispatcher is located between the Web client (browser) and your SAP system that is running the Web application.

It acts as single point of entry for incoming requests (HTTP, HTTPS), defined by the IP address, port, and URL, and forwards them in turn to the application server (AS) of the SAP system.

The SAP Web Dispatcher receives information about the SAP system that it needs for load distribution (load balancing) from the message server and application server via HTTP.

Installation of “Standalone” SAP Web Dispatcher with its own `<SAPSID>` and Instance

If you want to install an SAP Web Dispatcher for another system - that is not for the system for which you use the ASCS instance and with its own SAP system ID and instance number - you have to install SAP Web Dispatcher separately as described in the documentation which you can find under http://support.sap.com/sltoolset > *System Provisioning* > *Installation Option of Software Provisioning Manager* > *Guide for SAP Web Dispatcher for SAP NetWeaver 7.0 or Higher* >.

More Information

For more information about the architecture and the functions of SAP Web Dispatcher, see the SAP Web Dispatcher documentation in theSAP Online Documentation [page 13] at:

Application Server > *Application Server Infrastructure* > *Components of SAP NetWeaver Application Server* > *SAP Web Dispatcher*

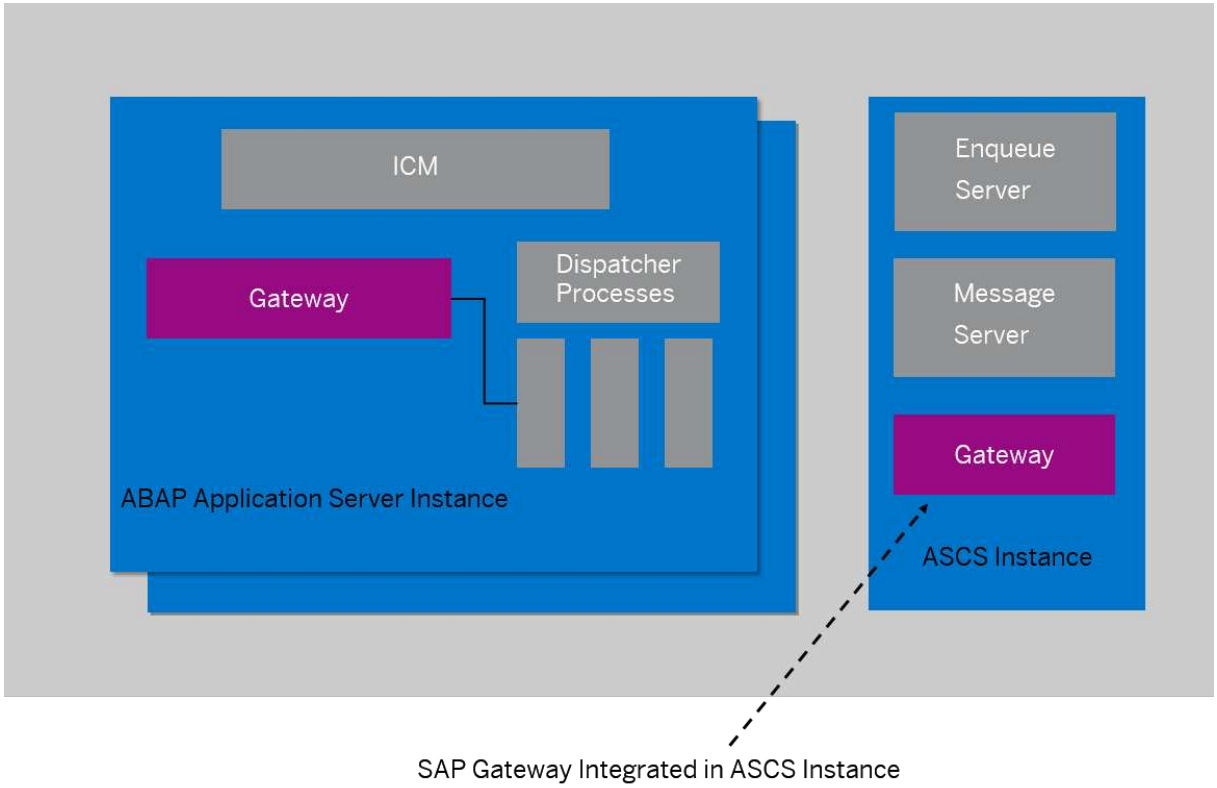
Related Information

Parameters for Additional Components to be Included in the ASCS Instance [page 50]

2.6 ASCS Instance with Integrated Gateway

You can install a gateway integrated in the ASCS instance. If you select this option, a gateway is installed **within the ASCS instance**.

> **i** Note
>
> **No separate standalone gateway instance** and **no dedicated** `<SAPSID>` are created for the gateway.



Gateway Integrated in the ASCS Instance

The gateway enables communication between work processes and external programs, as well as communication between work processes from different instances or SAP systems.

> ### → Recommendation
>
> A gateway integrated in the ASCS instance is recommended, for example, when you set up a Microsoft Failover Cluster.

You can also install a **standalone** gateway instance. For more information, see the documentation *Installation Guide – Installation of a Standalone Gateway Instance for SAP Systems Based on SAP NetWeaver* `<Release>` at http://support.sap.com/sltoolset *System Provisioning* *Installation Option*.

> ### ⚠ Caution
>
> In Microsoft Failover Cluster installations, do **not** install a **standalone** gateway on cluster nodes. Instead, follow the instructions in SAP Note 1764650.

For more information on how to configure a **standalone** gateway in an ASCS instance for High-Availability, see SAP Note 1010990.

Related Information

High Availability with Microsoft Failover Clustering [page 143]

Parameters for Additional Components to be Included in the ASCS Instance [page 50]

3 Planning

3.1 Planning Checklist

This section includes the planning steps that you have to complete for the following installation options.

- Standard, distributed, or high-availability system
- Additional application server instance

Detailed information about the steps are available in the linked sections.

Prerequisites

1. You have planned your SAP system landscape according to the release-specific (Master) Installation Guide for your SAP NetWeaver application as described in Before You Start [page 11].
2. You have decided on your installation option (see Installation Options Covered by this Guide [page 14]).

Standard, Distributed, or High-Availability System

> **i Note**
>
> In a standard system [page 14], all mandatory instances except the database instance are normally installed on one host. Therefore, if you are installing a standard system, you can ignore references to other hosts.
>
> The SAP HANA database is normally pre-installed by SAP partners before you start the installation. For more information about how to install the SAP HANA database, see the *SAP HANA Server Installation and Update Guide* at https://help.sap.com/hana_platform *Installation and Upgrade*. The database instance is remotely installed by SoftwareProvisioning Manager (the "installer") from the primary application server host.

> **i Note**
>
> You **cannot** install multiple SAP systems in a single tenant database (MCOD). Instead, you must use different tenant databases for each SAP System.

1. If you want to install an SAP ABAP system along with the required Support Package stack and ABAP Add-Ons in one implementation run, you need to plan the desired installation target using the maintenance planner at https://apps.support.sap.com/sap/support/mp.
   In the maintenance planner, a stack XML file with the desired Support Package stack and Add-On information is generated, which you then hand over to Software Provisioning Manager (the "installer" for

short) by calling it with command line parameter `SAPINST_STACK_XML=<Absolute_Path_To_Stack_XML_File>`. Included constraints and defaults defined in the stack XML file are then used for the initial installation by Software Provisioning Manager and for the application of Support Package stacks and Add-Ons by the Software Update Manager (SUM). For more information, see Installation Using a Stack Configuration File (Optional) [page 25].

> → Recommendation
>
> We recommend that you perform the installation using a stack configuration file for all new products such as SAP S/4HANASAP on Premise.

2. You check the hardware and software requirements [page 27] on every installation host.
3. You plan how to set up user and access management [page 35].
4. You identify Basic SAP System Installation Parameters [page 36].
5. You decide whether you want to perform a domain or local installation [page 36].
6. You decide on the transport host to use [page 51].
7. You decide whether you want to integrate LDAP Directory Services in your SAP system [page 121].
8. To install a high-availability system with **Microsoft Failover Clustering**, you perform the HA-specific planning steps [page 145].
9. Continue with Preparation [page 52].

Additional Application Server Instance

1. You check the hardware and software requirements [page 27] for every installation host on which you want to install one or more additional application server instances.
2. You identify Basic SAP System Installation Parameters [page 36].
3. Continue with Preparation [page 52].

3.2 Installation Using a Stack Configuration File

The option to perform an installation using a stack configuration file (also called “up-to-date installation” or “UDI” for short) improves the process of provisioning an up-to-date SAP system by creating a unified consumption experience and a direct close collaboration between the involved tools, namely:

- The Maintenance Planner
- The Landscape Management Database (LMDB) in SAP Solution Manager
- Software Provisioning Manager (the “installer” for short)
- Software Update Manager (“SUM”)

The installer then can take over more default settings that are already predefined in the Maintenance Planner.

Prerequisites

- To be able to use the Maintenance Planner at https://apps.support.sap.com/sap/support/mp, your SAP Solution Manager system must have at least one of the following release and Support Package (SP) level:
  - SAP Solution Manager 7.2
  - SAP Solution Manager 7.1 SP06 or higher
  - SAP Solution Manager 7.0 SP 23 or higher
    In addition, you must have applied the following SAP Notes:
    - 1646604
    - 1783371
    - 1743695
- You must have implemented SAP Note 1940845 in your SAP Solution Manager system.
- For additional information about involved tools and supported SAP system releases, see SAP Note 2277574.

Features

An installation using a stack configuration file provides the following features:

- You can use a stack configuration file generated by the Maintenance Planner at https://apps.support.sap.com/sap/support/mp. The parameters contained in the stack configuration file can then be processed by the installer to get better integrated with SUM and to simplify the process of installation for a new system on a target software level. This makes IT administration easier by reducing the efforts in Total Cost of Ownership (TCO). For more information, see the *Best Practice Guide to Planning Landscape Changes* at https://support.sap.com/en/tools/software-logistics-tools/landscape-management-process.html.
- When processing a stack configuration file, the installer can take over more default settings that are already predefined in the Maintenance Planner and offers more possibilities for automation as compared to when running without it. For more information about the benefits by comparing the existing process with the new improved process, see *Up-To-Date Installation* at https://blogs.sap.com/2016/10/21/up-to-date-installation-2/.

  > **i** Note
  >
  > The procedure and the screenshots provided in the linked document are **only an example** to show how an up-to-date installation works in general for an example SAP product, and what the benefits are. This document is **not** intended to serve as a detailed instruction for an up-to-date-installation of any supported SAP product.

- You can use the installer to directly download the installation software from SAP by providing the Maintenance Plan to the installer while running installer option *Download Software Packages for Maintenance Planner Transaction*.
  For more information, see Downloading Software Packages for a Maintenance Planner Transaction [page 69]

Integration

For the additional input parameters that you need to specify, see *Additional Parameters When Using a Stack Configuration File (Optional)*. You can find the link to this section in *Related Information* below.

In addition, each section in this guide describing steps that are completely or at least partially automatized when using a stack configuration files is marked with an appropriate note at the beginning. These are the following sections as listed in the adjacent section *Related Information*:

Related Information

Additional Parameters When Using a Stack Configuration File [page 48]
Downloading Software Packages for a Maintenance Planner Transaction [page 69]
Running the Installer [page 80]
Configuring the Change and Transport System [page 104]
Applying the Latest Kernel and Support Package Stacks [page 108]
Installing Additional Languages and Performing Language Transport [page 111]

3.3 Hardware and Software Requirements

Ensure that your hosts meet the hardware and software requirements for your operating system and the SAP instances. Otherwise you might experience problems when working with the SAP system.

Prerequisites

- Make sure that the host name meets the requirements listed in SAP Note 611361.
- Contact your OS vendor for the latest OS patches.

Procedure

1. Check the *Product Availability Matrix* at http://support.sap.com/pam for supported operating system releases.
2. Check the hardware and software requirements using:
   - The **Prerequisite Checker**:
     - Standalone (optional) before the installation process
       For more information, see Running the Prerequisites Check Standalone [page 28].
     - Integrated in the installation tool (mandatory) as part of the installation process

For more information, see Running the Installer [page 80].

- The hardware and software requirements tables in Requirements for the SAP System Hosts [page 29]

3. If you want to install a **production** system, the values provided by the Prerequisite Checker and the hardware and software requirements checklists are not sufficient. In addition, do the following:
   - You use the `Quick Sizer` tool available at http://sap.com/sizing.
   - You contact your hardware vendor, who can analyze the load and calculate suitable hardware sizing depending on:
     - The set of applications to be deployed
     - How intensively the applications are to be used
     - The number of users

3.3.1 Running the Prerequisites Check in Standalone Mode (Optional)

This section describes how to run the prerequisites check in standalone mode. Running the prerequisites check in standalone mode is optional.

Context

When you install an SAP system, the installer automatically starts the prerequisites check and checks the hardware and software requirements in the background. As an optional step during planning, you can also run the prerequisites check in standalone mode to check the hardware and software requirements for your operating system and the SAP instances before the actual installation.

> → Recommendation
>
> We recommend that you use **both** the prerequisites check and the requirements tables for reference.

Procedure

1. Download and unpack the Software Provisioning Manager archive to a local directory as described in Downloading and Extracting the Software Provisioning Manager 2.0 Archive [page 64].
2. Make either the separate `SAPEXE<Version>.SAR` archive or the complete kernel medium available as described in Downloading the SAP Kernel [page 65] .
3. Start the installer as described in Running the Installer [page 80].
4. On the *Welcome* screen, choose `<SAP_Product>` > `<Database>` > *Preparations* > *Prerequisites Check*.
5. Follow the instructions in the installer dialogs and enter the required parameters.

> **Note**
>
> To find more information on each parameter during the *Define Parameters* phase, position the cursor on the required parameter input field , and choose either F1 or the *HELP* tab. Then the available help text is displayed in the *HELP* tab.

After you have finished, the *Parameter Summary* screen appears. This screen summarizes all parameters that you have entered and that you want to have checked. If you want to make a change, select the relevant parameters and choose *Revise*.

6. To start the prerequisites check, choose *Next*.

Results

The *Prerequisite Checker Results* screen displays the results found. If required, you can also check the results in file `prerequisite_checker_results.html`, which you can find in the installation directory.

Related Information

Downloading and Extracting the Software Provisioning Manager 2.0 Archive [page 64]
Downloading the SAP Kernel [page 65]

3.3.2 Requirements for the SAP System Hosts

Hardware and Software Requirements

The following tables show the hardware and software requirements. Most of the requirements are valid for every installation host whereas some requirements are instance-specific and are marked accordingly.

> **Note**
>
> - The listed values are sufficient for **development systems** or **quality assurance systems** but **not** for **production systems**.
> - If you install several SAP instances on one host, you need to add up the requirements.
> - For up-to-date information on the released and supported operating system versions for your SAP product and database, see the *Product Availability Matrix (PAM)* at: http://support.sap.com/pam.

Hardware Requirements

Hardware Requirement	Requirement	How to Check

Minimum disk space	• ABAP central services instance (ASCS) (not including paging file): 5 GB (x64)
	  ○ If you install the ASCS instance with an integrated SAP Web Dispatcher, for the installation as such you require at least 1 GB of hard disk space in addition. For production use of the SAP Web Dispatcher, you need to reserve at least 5 GB.
	  ○ If you install an SAP Gateway with the ASCS instance, you require at least 1 GB of hard disk space in addition.
	• **High Availability only:** Enqueue replication server instance (ERS) (not including paging file): 5 GB (x64)
	• Primary application server instance (not including paging file): 5 GB (x64)
	• Additional application server instance (not including paging file): 2.5 GB (x64)
	• SAP Host Agent: 256 MB
	• Temporary disk space for every required installation medium that you have to copy to a local hard disk: Up to 6 GB
		To check disk space:
		• Windows Server 2012 (R2) and higher:
		  1. Open PowerShell in elevated mode, and enter the following command: `get-volume`
		  2. Check the value *SizeRemaining* of the disk you want to install on.
		• Windows Server 2008 (R2):
		  1. Choose *Start* > *All Programs* > *Administrative Tools* > *Storage* > *Computer Management* > *Disk Management*.
		  2. Right-click the drive and choose *Properties*.

Hardware Requirement	Requirement	How to Check
Minimum RAM	• All instances, except SAP Host Agent: 4 GB If you install the ASCS instance with an integrated SAP Web Dispatcher, see SAP Note 2007212 for memory consumption in productive use. • SAP Host Agent: 0.5 GB	To check RAM: • Windows Server 2012 (R2) and higher: Open PowerShell in elevated mode, and enter the following command: `Get-WmiObject Win32_ComputerSystem` • Windows Server 2008 (R2): Choose *Start* > *Control Panel* > *System*. **Note** If *System* is not visible, change *View by:* from *Category* into *Large icons*.

Hardware Requirement	Requirement	How to Check
Paging file size	For more information, see SAP Note 1518419.	To check paging file size: • Windows Server 2012 (R2) and higher: For more information, see Checking and Changing the Paging File Settings on Windows Server 2012 (R2) [page 130] • Windows Server 2008 (R2): 1. Choose *Start* > *Control Panel* > *System*. **Note** If *System* is not visible, change *View by:* from *Category* into *Large icons*. 2. Choose *Advanced system settings*. 3. In section *Performance*, select *Settings...* > *Advanced*. 4. If required, in section *Virtual memory*, choose *Change*. **Note** Do **not** select *Automatically managed paging file*

Hardware Requirement	Requirement	How to Check
		size for all drives. **i Note** **High Availability only:** You must adjust the size of the paging file on **all** cluster nodes.
Processing units	**For application server instances and database instances**: The number of physical or virtual processing units usable by the operating system image must be equal to or greater than 2. **For an ASCS instance running on a separate host**: One physical or virtual processing unit usable by the operating system image might be sufficient. Examples of processing units are processor cores or hardware threads (multithreading). In a virtualized environment, ensure that adequate processor resources are available to support the workloads of the running SAP systems.	
Suitable backup system		

Software Requirements

Software Requirement	Requirement	How to Check

Windows operating system	• **64-bit version** of one of the following Windows Server Editions:
	  ○ Windows Server 2012 (R2) and higher:
	  ○ ○ Windows Server Standard Edition
	  ○ ○ Windows Server Datacenter Edition
	  ○ ○ Windows Server Enterprise Edition
	  ○ ○ Windows Server Datacenter Edition
	
	⚠ Caution
	For up-to-date information on the released and supported operating system versions for your SAP product and database, see the Product Availability Matrix (PAM) at http://support.sap.com/pam.
	
	⚠ Caution
	Make sure that you install the **English** language pack so that your support requests can be handled quickly.
	
	• For any version of Windows Server, you need the latest supported service pack
		To check your Windows version:
		• Windows Server 2012 (R2) and higher: Open PowerShell in elevated mode, and enter the following command: `Get-WmiObject Win32_OperatingSystem | select caption`
		• Windows Server 2008 (R2):
		1. Choose *Start* > *All Programs* > *Accessories* > *Command Prompt*
		2. Enter the command **winver**
		
		i Note
		• You must add the operating system feature *Failover Clustering* on **all** cluster nodes.

Windows regional settings	*English (United States)* must be set by default. For more information about localized Windows versions, see SAP Note 362379. You can install additional languages but the default setting for new users must always be *English (United States)*.	Choose *Start* > *Control Panel* > *Clock, Language, and Region* > *Language*.

Software Requirement	Requirement	How to Check
Minimum Web Browser	Make sure that you have at least one of the following web browsers installed on the host where you run the installer GUI: • Microsoft Internet Explorer 11 or higher • Microsoft Edge • Mozilla Firefox • Google Chrome Always use the latest version of these web browsers. You need a web browser to be able to run the SL Common GUI, and to display the Evaluation Form and send it to SAP.	Choose *Start* > *Control Panel* > *Programs and Features*.

3.4 Planning User and Access Management

You have to plan how to configure user and access management for the SAP system to be installed.

Before you add a newly installed SAP system to your system landscape, you must decide which kind of user management you want to use:

- Central User Administration (CUA)
- An LDAP directory as the data source for user data

Procedure

To specify the initial data source of the User Management Engine (UME), proceed as described in Specifying the Initial Data Source of the User Management Engine [page 78].

More Information

For more information about configuring the user management of your SAP system to be installed, see the SAP Online Documentation [page 13] at:

Security > *Identity Management* > *User and Role Administration of Application Server ABAP* > *Configuration of User and Role Administration* > *Directory Services* > *LDAP Connector*

3.5 Domain or Local Installation

Use

Before you install the SAP system, you have to decide whether you want to perform a **domain** or **local** installation, since this affects how the user account information is stored and accessed.

For more information about the differences between a local and domain installation, go to *Start* > *Help and Support* and search for *What is the difference between a domain and a workgroup?*.

Domain Installation

In a domain installation, the user account information is stored centrally in one database on the domain controller and is accessible to all hosts in the system.

You have to perform a domain installation if one of the following applies:

- You install a distributed system.
- You install a high-availability system with Microsoft Failover Clustering.
- You use a common transport host for several SAP systems running on different computers.

Local Installation

In a local installation, all Windows account information is stored locally on one host and is not visible to any other hosts in the system.

> **i Note**
>
> If your SAP system was installed as a local installation and you want to later change to a domain installation, you can use the system rename option. For more information, see the *System Rename Guide* for your SAP system at:
>
> https://support.sap.com/sltoolset > *System Provisioning*

More Information

Required User Authorization for Running the Installer [page 57]

3.6 Basic Installation Parameters

The installer prompts for input parameters during the *Define Parameters* phase of the installation.

You can install your SAP system either in *Typical* or *Custom* mode:

- *Typical*

If you choose *Typical*, the installation is performed with default settings. This means that the installer prompts you only for a small selection of installation parameters. These parameters include at least the following:

- SAP system ID and database connectivity parameters
- Master password
- SAP system profile directory – only for systems with instances on separate hosts
- Individual encryption key for the secure storage

For more information about the installation parameters, see the corresponding tables below in this document. If you want to change any of the default settings, you can do so on the *Parameter Summary* screen.

- *Custom*
  If you choose *Custom*, you are prompted for all parameters. At the end, you can still change any of these parameters on the *Parameter Summary* screen.

> **i Note**
>
> You cannot change from *Custom* to *Typical* mode or from *Typical* to *Custom* mode on the *Parameter Summary* screen.

> **i Note**
>
> - If you want to install an ASCS instance with an integrated SAP Web Dispatcher [page 19], you must choose *Custom*. Otherwise, you are not prompted for the SAP Web Dispatcher installation parameters [page 50] during the *Define Parameters* phase of the ASCS instance installation.
> - If you want to install an ASCS instance with an integrated Gateway [page 21], you must choose *Custom*. Otherwise, you are not prompted for the SAP Gateway installation during the *Define Parameters* phase of the ASCS instance installation.
> - **High Availability only:** If you decide to install an SAP Web Dispatcher or a Gateway in the ASCS instance, note that a failure of the SAP Web Dispatcher or the Gateway causes failover of the ASCS instance to another cluster node. The failover cluster monitors all processes that are started by the SAP start service (sapstartsrv.exe). For an ASCS instance this is: `msg_server.exe` (message server), `enserver.exe` (enqueue server), gwrd.exe (Gateway), and `sapwebdisp.exe` (SAP Web Dispatcher). To prevent failover, see SAP Note 2375999.

The tables in the sections below list the basic SAP system installation parameters that you need to specify before installing your SAP system. For all other installation parameters, use the tool help on the installer screens.

Related Information

SAP System Parameters [page 38]
SAP System Database Parameters [page 47]
Additional Parameters When Using a Stack Configuration File [page 48]
Parameters for Additional Components to be Included in the ASCS Instance [page 50]

3.6.1 SAP System Parameters

The tables in this section lists the basic SAP system installation parameters that you need to specify before installing your SAP system. For all other installation parameters, use the tool help on the installer screens.

General Parameters

Parameter	Description
SAP System ID `<SAPSID>`	The SAP system ID (`<SAPSID>`) identifies the entire SAP system. The installer prompts you for the `<SAPSID>` when you execute the **first** installation option to install a new SAP system. If there are further installation options to be executed, the installer prompts you for the `profile` directory. For more information, see the description of the parameter *SAP System Profile Directory*. **Example** This prompt appears when you install the ASCS instance, which is the first instance to be installed in a distributed system. **Caution** Choose your SAP system ID carefully since renaming requires considerable effort. Make sure that your SAP system ID: • Is unique throughout your organization. Do not use an existing `<SAPSID>` when installing a new SAP system. • Consists of exactly three alphanumeric characters • Contains only uppercase letters • Has a letter for the first character • Does not include any of the reserved IDs listed in SAP Note 1979280. • If you want to install an additional application server instance, make sure that no Gateway instance with the same SAP System ID (SAPSID) exists in your SAP system landscape.

Parameter	Description
SAP System Instance Numbers	Technical identifier for internal processes. It consists of a two-digit number from 00 to 97. The instance number must be unique on a host. That is, if more than one SAP instance is running on the same host, these instances must be assigned different numbers. If you do not enter a specific value, the instance number is set automatically to the next free and valid instance number that has not yet been assigned to the SAP system to be installed or to SAP systems that already exist on the installation host. **i Note** If you install the central instance and the dialog instances on the cluster nodes of a Microsoft failover cluster, SAPinst by default assigns the same instance number. If you install the central instance and the dialog instances on hosts that are not part of a Microsoft failover cluster, we recommend that you use the same instance number for them. If the instance number is already used on other hosts, you have to assign a different instance number for the central instance and the dialog instances. To find out the instance numbers of SAP systems that already exist on the installation host, look for subdirectories ending with `<Instance Number>` of local `\usr\sap\<SAPSID>` directories. For more information, see SAP Directories [page 124]. **⚠ Caution** Do **not** use 43, and 89 for the instance number because: • 43 is part of the port number for high availability • 89 is part of the port number for Windows Terminal Server
Virtual Host Name	Virtual host name (network name) of the `SAP<SAPSID>` cluster group containing the ASCS instance. Virtual host name (network name) of the `SAP<SAPSID> ERS` cluster group containing the ASCS instance (only applies if Enqueue Replicator 2 is used). You can assign a virtual host name for the instance to be installed, by specifying it in the `<Instance_Name>` *Host Name* field of the `<Instance Name>` *Instance* screen. Then this instance is installed with this virtual host name. After the installation has completed, all application servers can use this virtual host name to connect to the instance. If you do not provide the virtual host name, the instance is installed automatically using the physical host name (= Windows host name) of the host where you run the installer. You must have already reserved the virtual host name (network name) and its IP address on a DNS server before you run the installer. For more information, see Using Virtual Host Names [page 58]. **i Note** Fully qualified host names, `IPv4`, `IPv6` are not accepted as virtual host names.

Parameter	Description
SAP System Profile Directory	`\\<SAPGLOBALHOST>\sapmnt\<SAPSID>\SYS\profile` The installer retrieves parameters from the SAP system profile directory of an existing SAP system. SAP profiles are operating system files that contain instance configuration information. The installer prompts you to enter the location of the `profile` directory when the installation option that you execute is not the first one belonging to your SAP system installation, for example if you are installing a distributed system or an additional application server instance to an existing SAP system. See also the description of the parameters *SAP System ID* and *Database ID*.
Destination drive	Base directory for the SAP system. **Note** If you install a subsequent SAP system, the `saploc` share already exists and you cannot select the installation drive. The installer uses the installation drive where the `saploc` share points to.

Parameter	Description
Master Password	Common password for all users that are created during the installation: • Operating system users (for example `<sapsid>adm`, `SAPService<sapsid>`) **⚠ Caution** If you did not create the operating system users manually before the installation, the installer creates them with the common master password (see *Operating System Users*). In this case, make sure that the master password meets the requirements of your operating system. • ABAP users: `SAP*`, `DDIC`, and `EARLYWATCH`. • Secure Store key phrase For more information, see line *Key Phrase for Secure Store Settings* and line *Individual Encryption Key for the Secure Storage* in this table. **i Note** If a user already exists, you are prompted to confirm the password for this user. **Basic Password policy** The master password must meet the following requirements: • It must be 8 to 14 characters long • It must contain at least one letter (a-z, A-Z) • It must contain at least one digit (0-9) • It must not contain `\` (backslash) or `"` (double quote). **Additional restrictions depending on Windows:** • If a user already exists, you are prompted to confirm the password for this user. • Depending on the configuration of the password policy, additional restrictions might apply. **Additional restrictions depending on SAP HANA database:** • It must consist of at least one number, one lowercase letter, and one uppercase letter. • It can only contain the following characters: `_`, `a-z`, `A-Z`, `0-9`, `#`, `@`, `$`, `!` and must not start with a number or an underscore (`_`). Depending on the installation option, additional restrictions may apply.

Parameter	Description
Message Server Access Control List	You can specify if you want to have a message server Access Control List (ACL) created. The ACL is created as a file in the `/<sapmnt>/<SAPSID>/global` directory. If it exists, it defines the hosts from which the message server accepts requests. **⚠ Caution** Only trigger the creation of this file if you do not plan to install any additional instances for this system. With the creation of this ACL, you overwrite existing settings and prevent instances from being installed on additional hosts. If you decide to install an additional instance later, you need to remove this file manually before the installation and create it again after the installation of the additional instance. For more information, see the information about `ms/acl_info` in SAP Notes 1495075 and 826779.
Individual Encryption Key for the Secure Storage	You can set a randomly generated individual encryption key for the secure storage in the file system and the secure storage in the database. If you skip this step, the system is installed with a default key which provides obfuscation only, but it can be changed later. • For more information on the secure storage in the file system, see the SAP Online Documentation [page 13] at: *Security > System Security > System Security for SAP NetWeaver AS ABAP Only > Secure Storage in the File System (AS ABAP)* • For more information on the secure storage in the database, see the SAP Online Documentation [page 13] at: *Security > System Security > System Security for SAP NetWeaver AS ABAP Only > Secure Storage (ABAP) > Key Management > Using Individual Encryption Keys > Generating Encryption Keys*
DNS Domain Name for SAP System	If you want to use HTTP-based URL frameworks such as Web Dynpro applications, you have to specify the DNS domain name for the SAP system. The DNS Domain Name is used to calculate the Fully Qualified Domain Name (FQDN), which is configured in profile parameter `SAPLOCALHOSTFULL`. FQDN is the fully qualified domain name for an IP address. It consists of the host name and the domain name: `<Host_Name>.<Domain_Name>` The DNS Domain Name is needed to define the URLs for the ABAP application servers. It is appended to the server name to calculate the FQDN. **Example** If your application server host is called `kirk.wdf.sap.com`, the DNS Domain Name is `wdf.sap.com`.

Parameter	Description
SAP Host Agent Upgrade (Optional)	If there already exists an SAP Host Agent on the installation host, the installer asks you if you want to upgrade it to a newer patch level version. If you want the existing version to be upgraded, you must provide the new target version of the `SAPHOSTAGENT<Version>.SAR` archive. For more information, see Downloading the SAP Kernel [page 65]

Ports

Parameter	Description
ABAP Message Server Port	**⚠ Caution** The message server port number must be unique on the host where the message server for the SAP system is running. If there are several message servers running on one host, the message server ports must all be unique. If you do not specify a value, the default port number is used. **ABAP Message Server Port** There is an external messagev server port and an internal message server port. The ABAP message server uses both the internal and the external message server ports. The default profile contains the configuration for both message server ports. The **external** message server port uses the parameter `rdisp/msserv` with default value `36<ABAP_Message_Server_Instance_Number>`. The **internal** message server port uses the parameter `rdisp/msserv_internal` with default value `39<ABAP_Message_Server_Instance_Number>`. During the installation of an SAP system from scratch or an additional application server instance to an existing SAP system , the message server is configured to only accept secure connections. The DEFAULT.PFL profile parameter `system/secure_communication` is set to `ON` (**`system/secure_communication = ON`**) if the kernel supports secure connections to the message server. For more information, see SAP Note 2040644 .

Operating System Users

Parameter	Definition

Password of Operating System Users	The passwords of the operating system users **must** comply with the Windows password policy. The installer processes the passwords of operating system users as follows:
	• If the operating system users do **not** exist, SAP creates the following users:
	  ○ `<sapsid>adm`
	  This user is the SAP system administrator user. It is a member of the local `Administrators` group.
	  ○ `SAPService<SAPSID>`
	  This user is the Windows account to run the SAP system. It is not a member of the local `Administrators` group.
	  ○ `sapadm`
	  The SAP Host Agent user `sapadm` is used for central monitoring services. The installer creates this user by default as a local user although it is not a member of the local `Administrators` group.
	  If required, you can change this user to become a domain user on the *Parameter Summary* screen. For more information, see Performing a Domain Installation Without Being a Domain Administrator [page 127].
	  For security reasons, however, SAP strongly recommends you to create this user as a local user.
	The installer sets the master password for these users by default. You can overwrite and change the passwords either by using the parameter mode *Custom* or by changing them on the *Parameter Summary* screen.
	• If the operating system users already exist, the installer prompts you for the existing password, except the password of these users is the same as the master password.
	⚠ Caution
	Make sure that you have the required user authorization [page 57] for these accounts before you start the installation.

Windows Domain Organizational Units	You can choose the organizational units (OUs) within the Windows domain where you want to create the SAP system accounts. By default, the installer creates the domain users `SAPService<SAPSID>`, `<SAPSID>adm`, and the domain group `SAP_<SAPSID>_Globaladmin` in the domain Users container. Here you can specify an optional organizational unit where the installer creates these domain users and group. The user who performs the installation needs read and write permissions to this organizational unit. The OU feature is only available when you select *Custom mode* in SWPM and choose *Use Domain of current user*. For more information, see SAP Note 2247673  .

User Management Engine Parameters

Parameter	Definition
Java Administrator User **i Note** This user is only created during the installation of the application server ABAP for an SAP NetWeaver 7.5 Process Integration (PI) system or for an SAP Solution Manager 7.2 system.	The installer creates this user in the ABAP system. After the installation, this user is available both in the ABAP and in the Java system. The installer sets the user name `J2EE_ADMIN` and the master password by default. If required, you can choose another user name and password according to your requirements.
Java Guest User **i Note** This user is only created during the installation of the application server ABAP for an SAP NetWeaver 7.5 Process Integration (PI) system or for an SAP Solution Manager 7.2 system.	This user is for employees who do not belong to a company or who have registered as company users and who are waiting for approval. Guest users belong to the default group `Authenticated Users`. The installer creates this user in the ABAP system. After the installation, it is available both in the ABAP and in the Java system. The installer sets the user name `J2EE_GUEST` and the master password by default. If required, you can choose another user name and password according to your requirements. For more information about supported UME data sources and change options, see SAP Note 718383.
Communication User **i Note** This user is only created during the installation of the application server ABAP for an SAP NetWeaver 7.5 Process Integration (PI) system or for an SAP Solution Manager 7.2 system.	The installer creates this user in the ABAP system. After the installation, it is available both in the ABAP and in the Java system This user is used for the communication between the ABAP system and the Java system. The installer sets the user name `SAPJSF` and the master password by default. If required, you can choose another user name and password according to your requirements. For more information about supported UME data sources and change options, see SAP Note 718383.

System Landscape Directory

Parameter	Definition
SLD Destination for the System	The System Landscape Directory (SLD) registers the systems and the installed software of your entire system landscape. You can choose between the following options: • *Register in existing SLD* Choose this option to register the SAP system you are installing in an existing SAP System Landscape Directory (SLD) by specifying the SLD connection parameters listed below in this table. • *No SLD destination* Choose this option if you do **not** want to register the SAP system you are installing in an existing SAP System Landscape Directory (SLD). You then have to configure the SLD destination manually after the installation has finished. For more information, see Performing Post-Installation Steps for the ABAP Application Server [page 109]
SLD Host	The host name of the existing SLD.
SLD HTTP(S) Port	HTTP port of the SAP system based on AS Java on which the System Landscape Directory (SLD) resides. The following naming convention applies: `5<Primary_Application_Server_Instance_Number>00`. **Example** If the primary application server instance number of the AS Java on which the System Landscape Directory (SLD) resides is 01, the SLD HTTP Port is 50100.
SLD Data Supplier User and password	The existing SLD Data Supplier user and password of the existing SLD

3.6.2 SAP System Database Parameters

Parameters	Description
SYSTEM_ID	The SYSTEM_ID identifies the tenant database instance. This is the result of the following query: **select SYSTEM_ID from M_DATABASE** If your SAP HANA SYSTEM_ID is the same as the chosen SAP System ID <SAPSID>, there are following restrictions: • The ABAP system and SAP HANA database have to be installed on different hosts • Database installation has to done on the ABAP host. Otherwise Database installation procedure with Software Provisioning Manager (the“ installer”) could overwrite the environment files (sapenv.*) of the SAP HANA database and the database will not start any more after reboot.
DATABASE_NAME, Database ID, <DBSID>	The <DBSID> identifies the tenant database. This is the result of the following query: **select DATABASE_NAME from M_DATABASE**
Database schema	The ABAP database schema is named SAPHANADB. This name cannot be changed. The database schema already exists in the database export. You need to specify a password of your choice.
Virtual Host Name	Virtual host name (network name) of the SAP<SAPSID> cluster group You can assign virtual host names to the SAP HANA database instance by starting the installer with the **SAPINST_USE_HOSTNAME** property. For more information, see Running the Installer [page 80]. After the installation has completed, all application servers can use this virtual host name to connect to the SAP HANA database instance. The virtual host name is also a global host name. If you do not provide the virtual host name, the instance is installed automatically using the physical host name of the host where you run the installer. You must have already reserved the virtual host name (network name) and its IP address on a DNS server before you run the installer. For more information, see Using Virtual Host Names [page 58]. **i Note** Fully qualified host names, IPv4, IPv6 are not accepted as virtual host names.

3.6.3 Additional Parameters When Using a Stack Configuration File

The parameters in this section are only required if you use a stack configuration file generated from the Maintenance Planner.

Parameter	Description
Transport Domain	The ABAP Transport Management System (TMS) must be configured before ABAP correction packages can be applied. You can also run the configuration or even reconfigure the TMS after the installation has finished. To be able to transport changes between the SAP systems in your system landscape, you need to configure the Transport Management System (TMS) for all SAP systems in your system landscape and configure one transport domain controller. To start the TMS in your ABAP system for later reconfiguration, call transaction STMS. At least one transport landscape with this system as transport domain controller is required before you can apply corrections, support packages, or upgrades to the SAP system. The name of the Transport Domain must not contain blank characters. You cannot change the name afterwards without reconfiguring the transport domain controller and thereby the entire Transport Domain. By default use `DOMAIN_<SAPSID>` for the Transport Domain of a single transport landscape with this system as transport domain controller.
Directory with Transport Files	Location of the ABAP transport files that are to be included after the ABAP load during the installation. All transport files in this directory are imported with the transport control program (`tp`).
Location of SPAM/SAINT Update Archive	A SPAM/SAINT update contains updates and improvements to the Support Package Manager (SPAM) and the Add-On Installation Tool (SAINT). Provide the full path to the SPAM/SAINT update archive. SPAM/SAINT is delivered with the ABAP load. SAP recommends that you always use the latest version of SPAM/SAINT before applying Support Packages.
Decide whether you want to prepare for the Software Update Manager run at the end of the installation	With the Software Update Manager 1.0 (SUM), you can apply support packages stacks at the end of the installation. • Do not start SUM automatically • Start SUM automatically at the end of the installation Choose to start SUM automatically, if you want to have the SUM STARTUP script called in the default `<Update Directory>/SUM/` directory at the end of the installation.

Parameter	Description
Extract the `SUM*.SAR` Archive	If you choose to extract the `SUM*.SAR` archive, the provided archive is validated and extracted to the default update directory: **Windows:** `<Installation Drive>\usr\sap\<SAPSID>\`
SUM HTTP port	If you are running several SAP system updates on the same host, you have to use different port numbers for each update. You can adjust the default SUM HTTP port by entering the required port number in the SUM HTTP Port field. When doing so you set the SUM GUI Port number to (**`=<HTTP port number+2>`**). Dependencies See also the Software Update Manager documentation at: http://support.sap.com/sltoolset *System Maintenance* *Software Update Manager (SUM) 1.0 SPS*`<Number>` *Guides for SUM 1.0 SP* `<Number>`
SUM Batch Input File	You can specify a batch file with some default values for the update. SUM then starts with parameter `batchfile=<XML file with input parameters>`. Enter the full path to the existing batch file. Placeholders like `@PARAMETER_VALUE@` inside the file are replaced by values known from the installation.
Install Additional SAP System Languages	A set of default languages is delivered with the installation export. From the language archives or - if you want to install SAP BW/4HANA 1.0 SR1 - language media delivered with your product version, you can select additional languages that you want to have installed during SAP system installation. If you want to install additional languages, you must provide the directory with the additional language packages for the ABAP installation load, for example with subdirectories like `DATA_UNITS/ES`.

For more information, see Installation Using a Stack Configuration File (Optional) [page 25].

Related Information

Installation Using a Stack Configuration File [page 25]

3.6.4 Parameters for Additional Components to be Included in the ASCS Instance

You only need to specify the following parameters during the ASCS instance installation if you perform an integrated installation of additional components.

> **i Note**
>
> You must choose *Custom* parameter mode. Otherwise you are not prompted for the parameters related to these additional components during the *Define Parameters* phase.

Parameters	Description
Install a gateway integrated in the ASCS instance	When processing the screens for the ASCS instance installation, you are prompted to mark this checkbox on the screen *Additional Components to be Included in the ASCS Instance*.
Install an SAP Web Dispatcher integrated in the ASCS instance	When processing the screens for the ASCS instance installation, you are prompted to mark this checkbox on the screen *Additional Components to be Included in the ASCS Instance*. If you mark the checkbox for SAP Web Dispatcher, you are prompted for the additional parameters required for the SAP Web Dispatcher installation on the subsequent screens:
	Message Server Host The name of the host on which the message server is located (profile parameter `rdisp/mshost`)
	Message Server HTTP Port HTTP port of the message server (profile parameter `ms/server_port_<xx>`)
	Password for the Internet Communication Management (ICM) user In order to use the web administration interface for the Internet Communication Manager (ICM) and SAP Web Dispatcher, an administration user `webadm` is created by the installer. You have to assign a password for this user.

Related Information

ASCS Instance with Integrated SAP Web Dispatcher [page 19]
ASCS Instance with Integrated Gateway [page 21]

3.7 SAP System Transport Host

The transport host contains the transport directory used by the SAP transport system to store transport data and change SAP system information, such as software programs, write dictionary data, or customizing data. If you have several SAP systems it depends on your security requirements whether you want them to share a transport directory or whether you use separate directories.

When you install an SAP system, you have to decide which transport host and directory you want to use for your SAP system:

- Use the transport directory that the installer creates during the installation of the SAP system by default on the global host.
  The installer by default creates the transport directory on the global host in `\usr\sap\trans`.
- Use a transport directory located on a host other than the default host:
  - You can use an **existing** transport directory and host in your SAP system landscape.
  - You can set up a **new** transport directory on a different host.

  In either case, you must prepare this host for use by the new SAP system [page 59].

More Information

- SAP Directories [page 124]
- See the SAP Online Documentation [page 13] at:
  Solution Life Cycle Management > *Software Logistics* > *Change and Transport System* > *Change and Transport System – Overview* > *Basics of the Change and Transport System* > *Transport Management System – Concept*

4 Preparation

4.1 Preparation Checklist

This section includes the preparation steps that you have to perform for the following installation options:

- Standard, distributed, or high-availability system
- Additional application server instance

Detailed information about the steps are available in the linked sections.

Standard, Distributed, or High-Availability System

> **i Note**
>
> In a standard system [page 14], all mandatory instances except the database instance are normally installed on one host. Therefore, if you are installing a standard system, you can ignore references to other hosts.
>
> The SAP HANA database is normally pre-installed by SAP partners before you start the installation. For more information about how to install the SAP HANA database, see the *SAP HANA Server Installation and Update Guide* at https://help.sap.com/hana_platform ▶ *Installation and Upgrade* ◀. The database instance is remotely installed by SoftwareProvisioning Manager (the "installer") from the primary application server host.

1. You make sure that the SAP HANA database is installed on the SAP HANA host [page 53].
2. You decide how to set connectivity data for your SAP HANA database [page 53].
3. Windows Server 2008 (R2) or higher: you disable the Windows Server firewall [page 54] on each host.
4. You perform basic preparations on Windows [page 55].
5. You check that you have the required user authorization for running the installer [page 57].
6. If required, you prepare the SAP system transport host [page 59] for your SAP system.
7. You install the SAP front-end software [page 60] on the desktop of the user.
8. If required, you configure host names for the SAP HANA database [page 61].
9. You specify parameter `sslEnforce` to determine how the installer will configure the secure connection of the SAP system instances to the SAP HANA database [page 61] .
10. You check that the required installation software [page 63] is available for each installation host.
11. To install a high-availability system with Microsoft Failover Clustering, you also perform the HA-specific preparation steps [page 145].
12. You continue with Installation [page 76].

Additional Application Server Instance

You have to perform the following preparations on the host where you install the additional application server instances:

1. Windows Server 2008 (R2) or higher: you disable the Windows Server firewall [page 54] on each host.
2. You perform basic preparations on Windows [page 55].
3. You check that you have the required user authorization for running the installer [page 57].
4. If required, you prepare the SAP system transport host [page 59].
5. You install the SAP front-end software [page 60] on the desktop of the user.
6. You check the time zones of the ABAP application server and the SAP HANA system [page 62].
7. You check that the required installation software [page 63] is available on each installation host.
8. You continue with Installation [page 76].

4.2 Installing the SAP HANA Database

Make sure that the SAP HANA database has been installed before you start the SAP system installation.

For more information about how to install the SAP HANA database, see the *SAP HANA Server Installation and Update Guide* at https://help.sap.com/hana_platform ▶ ▶ *Installation and Upgrade* ▶.

To make sure that the installed SAP HANA database has the required minimum version for Software Provisioning Manager 2.0, see SAP Note 2610954.

The SAP HANA database is normally part of the SAP HANA appliance. It is normally pre-installed by SAP partners before you start the installation using Software Provisioning Manager (the “installer”). The installer accesses the SAP HANA database remotely to perform the necessary database-specific installation steps.

4.3 Setting Connectivity Data for the SAP HANA Database

An SAP ABAP system needs connectivity data to log on to the SAP HANA database. This section describes methods for setting up connectivity data.

For SAP HANA database, you can set up the connectivity data using the following methods:

- Local hdbuserstore container (default method)
  The local hdbuserstore container has always been available with SAP HANA. It is used in all versions of software provisioning manager. It is the default when you are doing an installation of SAP HANA or a migration to SAP HANA. One hdbuserstore is created for each host for which you installing an ABAP instance.
  The hdbuserstore is stored in the Windows registry. The hdbuserstore is used by the SAP kernel tools without further options and by SAP HANA client tools such as hdbsql using the option `-U <ENTRY>`
  You can trace the connect method of R3trans by checking the log file `trans.log`.

The disadvantage of this method is that there is one hdbuserstore container on each SAP application server. This means that, if you want to change the connectivity data, you have to log on to each server of the system and change the data separately on each server.
To use this method, you need take no further action since it is the default.

- If you want to use virtual host names, you must start the installer with the `SAPINST_USE_HOSTNAME` parameter.
  For more information, see Running the Installer [page 80].
- ABAP secure storage in the file system (SSFS)
  ABAP SSFS is a database-independent method of storing data located inside the SAP system. For more information, see SAP Note 1639578.
  To use this method, you start the installation with the parameter `HDB_ABAP_SSFS=YES`. For more information, see Running the Installer [page 80].
  Note that only SAP kernel tools can read from ABAP SSFS. This means that SAP HANA client tools such as hdbsql cannot use ABAP SSFS. Therefore, you might want to choose one application server where you still maintain one hdbuserstore container.

4.4 Disabling the Windows Server Firewall on Windows Server 2008 (R2) and Higher

Use

The Windows firewall – which is turned on by default as of Windows Server 2008 (R2) – is configured to allow only a small set of Windows-specific inbound IP connections. By default, outbound connections are not limited to rules and are therefore not restricted by the firewall.

The default firewall settings are valid for the out-of-the-box installation of Windows Server 2008 (R2) and higher. These settings apply to local policies. For domain policies that override local policies, other rules might apply.

To avoid any problems with non-configured TCP/IP ports that are used by the SAP system, you need to disable the firewall on all Windows hosts before you install the SAP system with the installer. We recommend that you secure network access to the SAP application servers with a real physical firewall or use a router Access Control List (ACL).

Procedure

> **i Note**
>
> In a high-availability system, you have to disable the firewall on **all** failover cluster nodes.

- Windows Server 2012 (R2) and higher:
  Open PowerShell in elevated mode, and enter the following command:
  ```
  Set-NetFirewallProfile -enabled false
  ```

- Windows Server 2008 (R2):
  1. Choose *Start* > *Administrative Tools* > *Windows Firewall with Advanced Security*.
  2. Right-click *Windows Firewall with Advanced Security* and choose *Properties*.
  3. Choose the relevant profile (in most cases *Domain Profile*) and set the *Firewall state* to *Off*.

4.5 Performing Basic Windows Preparation Steps

Use

This section informs you about basic preparation steps that you have to perform before you install the SAP system, including the following:

- Checking the Windows file system
- Checking the Windows domain structure (domain installation only)
- Deciding whether you want to use organizational units (OUs) in the Windows domain (domain installation only)

Procedure

Checking the Windows File System

You need to check which Windows file system you are using on hosts where you want to install the SAP system.

As of Windows Server 2012 R2, you should use the Windows file system ReFs or NTFS. Older Windows Server versions must use NTFS.

> **i** Note
>
> Do **not** install the SAP system on a FAT partition.

Perform the check as follows:

- Windows Server 2012 R2 and higher:
  1. Open PowerShell in elevated mode, and enter the following command:
     ```
     get-volume
     ```
  2. Check that the value *FileSystem* is ReFs or NTFS.
- Windows Server 2008 (R2) and Windows Server 2012:
  1. Open the Windows Explorer.
  2. Select the relevant disk.
  3. Choose *Properties* > *General*.
     The system displays the type of file system in use.
  4. Check that the file system is NTFS.

Checking the Windows Domain Structure

> **i Note**
>
> You do **not** need this step for a local installation.

For a domain installation, we recommend that you check that all SAP system hosts are members of a single Windows domain. We recommend this for all SAP system setups.

We assume that you are familiar with checking Windows domain structures. For more information, see the Windows documentation.

In Windows, you can implement either of the following domain models for the SAP system:

- Extra domain
  In this model, the SAP system is embedded in its own domain, which is specially defined for SAP. A second domain exists for the user accounts.
  In Windows, the SAP domain and user domain must be incorporated in a domain tree. In this tree, the user accounts must form the root domain and the SAP domain must be a child domain of this.
- Single domain
  In this model, the SAP system, and the user accounts are included in a single domain.

> **⚠ Caution**
>
> You cannot create local users and groups on the host that is used as domain controller. Therefore, we do **not** support running an SAP instance (including the database instance) on the host where the domain controller is installed.

Deciding Whether to Use Organizational Units (OUs) in the Windows Domain

> **i Note**
>
> You do **not** need this step for a local installation.

For a domain installation, the installer needs to create certain OS users for SAP and database operations in the Windows domain, also called the “Active Directory” (AD). These users are created by default in the AD container “Users”.

Depending on a customer's AD landscape and security policy, there are certain restrictions on where to store users and groups in AD. Contact the administrator of your AD infrastructure to understand where to store all SAP and database-related domain users and domain groups.

The SAP installer offers to define an existing OU in AD to create all needed SAP and database users in this OU.

There are many different scenarios and prerequisites concerning how to use OUs. For more information, see SAP Note 2247673, which explains these issues in detail and shows some examples of how to use them.

> **⚠ Caution**
>
> The installer does **not** create OUs. The installer does **not** move existing domain users or groups. The installer does **not** delete existing users, groups, OUs, nor any other object in a Windows domain.
>
> The only exception to this rule is the Uninstall option in SWPM.

4.6 Required User Authorization for Running the Installer

Although the installer automatically grants the rights required for the installation to the user account used for the installation, you have to check whether this account has the required authorization to perform the installation. The authorization required depends on whether you intend to perform a **domain** or **local** installation. If necessary, you have to ask the system administrator to grant the account the necessary authorization **before** you start the installation. If you attempt the installation with an account that does not have the required authorization, the installation aborts.

This section informs you about the authorization required for a domain and a local installation.

Procedure

> ⚠ Caution
>
> Do **not** use the user `<sapsid>adm` for the installation of the SAP system.

Domain Installation

For a domain installation the account used for the installation needs to be a member of the local `Administrators` and the domain `Admins` group of the relevant domain. All machines in the system must belong to the same domain. In a domain installation, the user information is stored centrally on the domain controller and is accessible to all hosts in the system.

If the SAP system is to be distributed across **more than one** machine, SAP strongly recommends you to perform a domain installation to avoid authorization problems.

> ⚠ Caution
>
> - If you install a distributed system as a local installation, this can lead to authorization problems for the operating system users `<sapsid>adm` and `SAPService<SAPSID>`. It can also lead to problems with the transport directory, which is usually shared by several SAP systems. SAP does **not** support distributed SAP systems running with local user accounts.
> - In a high-availability configuration, you always have to perform a **domain** installation.
> - For performance and security reasons, SAP does not support an SAP system installation on a domain controller.
> - If for any reason, the account used for the installation is not a member of the domain `Admins` group, you can perform the installation with a domain user who is a member of the local `Administrators` group. However, the domain administrator has to prepare the system appropriately for you.
>   For more information, see Performing a Domain Installation without being a Domain Administrator [page 127].

For a domain installation, you need to:

1. Check that the account used for the installation is a member of the domain `Admins` group.
2. If required, obtain these rights by asking the system administrator to enter the account as a member of the domain `Admins` group.

Local Installation

For a local installation the account used for the installation needs to be a member of the local `Administrators` group of the machine involved. In a local installation, all Windows account information is stored locally on one host and is not visible to any other hosts in the system.

> ⚠ Caution
>
> Do not use the Windows built-in account `Administrator` or the renamed built-in account to install your SAP system. The built-in account only has restricted network access rights that are required by the installer. If you renamed the built-in account `Administrator`, do not create a new account named `Administrator`.

For a local installation, you need to:

1. Check that the account used for the installation is a member of the local `Administrators` group.
2. If required, obtain these rights by asking the system administrator to enter the account as a member of the local `Administrators` group.

Related Information

Performing a Domain Installation Without Being a Domain Administrator [page 127]

4.7 Using Virtual Host Names

You can use one or more virtual `TCP/IP` host names for SAP servers within an SAP server landscape to hide their physical network identities from each other. This can be useful when quickly moving SAP servers or complete server landscapes to alternative hardware since you do not need to reinstall or reconfigure.

Prerequisites

- Make sure that the virtual host name can be correctly resolved in your Domain Name System (DNS) setup.
- Make sure that you configured the Windows operating system properly to use virtual host names. For more information, see SAP Note 1564275.

Context

> ⚠ Caution
>
> **High Availability only:**
>
> - Only use virtual host names if this is explicitly stated in the parts of this installation guide specific to high availability. Otherwise, use the physical host name.

- Do **not** start the installer with the command line parameter SAPINST_USE_HOSTNAME=<virtual hostname> on failover cluster nodes.

Procedure

1. Assign the required virtual host names to the instance to be installed by specifying them in one of the following ways:
   - By starting the installer with the `SAPINST_USE_HOSTNAME` property. For more information, see Running the Installer [page 80].
   - Alternatively by specifying vitual host names in the `<Instance Name>` *Host Name* field of the `<Instance Name>` *Instance* screen.

   For more information, see the *Virtual Host Name* parameter description in SAP System Parameters [page 38] and SAP Note 962955.
2. To install a **non-high-availability** system, proceed as described in SAP Note 1564275.

4.8 Preparing the SAP System Transport Host

The transport host has a directory structure that is used by the SAP transport system to store transport data and metadata.

Context

When you install an SAP system, the installer by default creates the transport directory on the global host in `\usr\sap\trans`.

If you do not intend to use the directory structure of the system you are going to install, but want to use another new transport directory on another host, or an existing transport directory in your system landscape, you need to prepare that transport host:

- If the directory structure already exists, you must set up its security to allow the new system to write to it.
- If it does not yet exist, you must create the core directory structure and a share to export it for other computers as well as set the security on it.

The transport directory `\usr\sap\trans` is used by the Change and Transport System (CTS). The CTS helps you to organize development projects in the ABAP Workbench and in Customizing, and then transport the changes between the SAP systems in your system landscape. For more information, see the SAP Online Documentation [page 13] at:

Solution Life Cycle Management > *Software Logistics* > *Change and Transport System* > *Change and Transport System – Overview* > *Basics of the Change and Transport System* > *Transport Management System – Concept*

Procedure

1. If the transport directory does not yet exist, do the following:
   a. Create the directory `\usr\sap\trans` on the host to be used as the transport host.
   b. Share the `usr\sap` directory on the transport host as `SAPMNT` and set the permission for *Everyone* to *Full Control* for this share.

      This enables the installer to address the transport directory in the standard way as `\\SAPTRANSHOST\SAPMNT\trans`.
2. Grant *Everyone* the permission *Full Control* for the transport directory.

> ⚠ Caution
>
> Remove the *Full Control to Everyone* permission after you have finished the installation and only grant *Full Control* on this directory to the `SAP_<SAPSID>_GlobalAdmin` groups of all the systems that are part of your transport infrastructure. The installer assigns the appropriate rights with the help of an additional `SAP_LocalAdmin` group. For more information, see Automatic Creation of Accounts and Groups [page 138].

4.9 Installing the SAP Front-End Software

Before you start the installation, make sure that the SAP front-end software is installed on at least **one** computer in your system environment to be able to log on to the SAP system after the installation has finished.

Procedure

1. Check SAP Note 147519 for the recommended SAP front-end release.
2. Install the SAP front-end software required for your SAP system release as described in the documentation *SAP Frontend Installation Guide - <Release>* at: https://wiki.scn.sap.com/wiki/display/ATopics/SAP+GUI+Family

4.10 Configuring Host Names for the SAP HANA Database

You need to perform this procedure if you want to use virtual host names or if your SAP HANA database is located in a separate network.

Context

During the *Define Parameters* phase, the installer prompts you for the parameters to connect to your SAP HANA database. However, the database host name that you enter is not used for the user store. Instead, the external host name of the database is determined and subsequently used. If the SAP HANA database was installed using a virtual host name and you want this host to be used in the user store connection environment, make sure the host can be resolved from the installation host as well.

Procedure

Make sure that the external host name of the database is correctly maintained.

For more information on how to do this, see SAP Note 1930853 or section *Mapping Host Names for Database Client Access* in the *SAP HANA Administration Guide*, available here:

https://help.sap.com/viewer/p/SAP_HANA_PLATFORM *Administration*

4.11 Enabling Secure Connection to SAP HANA Database

Depending on how you have specified parameter `sslEnforce`, the installer will configure the connection of the SAP system instances to the SAP HANA database.

Prerequisites

For enabling SAP HANA SSL, at least SAP HANA Client 2.0 SPS04 is required. For more information, see SAP Note 2784500.

Context

Due to enhanced security standards, you can set up your SAP HANA database using parameter `sslEnforce` in a way that SAP system instances are only allowed to access it using secured and encrypted connections.

For more information, see the information about parameter `sslEnforce` in section *Enforced TLS/SSL for Client Connections* in the SAP HANA Securtiy Guide at: https://help.sap.com/viewer/p/SAP_HANA_PLATFORM ▶ *Security* ▶

Procedure

1. Start the SAP HANA Database Studio as described in the SAP HANA Administration Guide at: https://help.sap.com/viewer/p/SAP_HANA_PLATFORM ▶ *Administration* ▶
2. If not yet done, add your SAP HANA database system .
3. Log on as user `SYSTEM`.
4. Choose *Configuration*
5. Filter for the **`sslenforce`** parameter and change the value according to your requirements.

   Default is `false`.

4.12 Checking Time Zones

Before you start the installer, you need to check time zone settings.

Context

Before you start the installer, compare the following time zone settings:

- The time zone of the target host for the ABAP application server
- The time zone of the `<sid>adm` user of the SAP HANA system
  Check the relevant SAP HANA time zone by logging on to the system at the command line with your user `<sid>adm` and then using command **`date`**.

Procedure

If the systems have different time zones, proceed as follows:

- Change the time zone of the ABAP system (recommended solution)
- If the time zone of the ABAP system cannot be changed, change the time zone of the SAP HANA system.
  For more information, see https://help.sap.com/viewer/p/SAP_HANA_PLATFORM ▶ *Installation and Upgrade* ▶ *SAP HANA Server Installation and Update Guide* ▶

4.13 Providing the Installation Software

This section provides information about how to provide the required installation archives and software.

> **i Note**
>
> The signature of **installation archives and installation media** is checked **automatically** by the installer during the *Define Parameters* phase while the *Software Package Browser* or *Media Browser* screens are processed (see also Running the Installer [page 80]). The installer only accepts archives and media whose signature has been checked. For more information, see SAP Note 2393060.

1. Download and extract the Software Provisioning Manager 2.0 archive. [page 64]
   The Software Provisioning Manager 2.0 archive is required on each installation host. Make sure that you always download the latest version.
2. Download the SAP Kernel [page 65].
   SAP BW/4HANA 1.0 SR1 only: You can either download the SAP Kernel archives separately or download the complete SAP Kernel medium. We recommend downloading the SAP Kernel archives instead of using the complete SAP Kernel medium because the installer verifies each archive separately.
   - Downloading the SAP Kernel Archives (Archive-Based Installation) [page 66]
   - Downloading the Complete SAP Kernel Medium (Only Valid for SAP BW/4HANA 1.0 SR1) [page 68]

   The SAP Kernel archives are required for the installation of the ASCS instance and of each application server instance.
   If you perform the installation using a stack configuration file, you can use the installer to download the SAP Kernel archives from a Maintenance Planner transaction. For more information, see Downloading Software Packages for a Maintenance Planner Transaction [page 69].
3. Download the SAP HANA database client software [page 71].
   The RDBMS media and archives are required for the installation of the SAP HANA database on the SAP HANA host. For more information, see Installing the SAP HANA Database [page 53].

   > **i Note**
   >
   > If you are installing a standard system **on one Linux host**, you can install your SAP system on the **same host** as the SAP HANA database. For more information, see SAP Note 1953429. In this case, you must make sure that the SAP HANA database RDBMS media are also available on the installation host.

   The SAP HANA database client software is required for the installation of each application server instance.
4. Downloading the Database Installation Export and Languages Software [page 74]. The installation export media are required for the installation of the primary application server instance on the primary application server instance host, and for the SAP HANA database on the SAP HANA host.

4.13.1 Downloading and Extracting the Software Provisioning Manager 2.0 Archive

You must always download and extract the Software Provisioning Manager 2.0 archive from the SAP Software Download Center because you must use the latest version.

Context

You require the `SAPCAR` tool to be able to unpack and verify software component archives (*.SAR files). *.SAR is the format of software lifecycle media and tools that you can download from the SAP Software Download Center. For more information about how to get this tool, see the *Procedure* section below.

Procedure

1. Download the latest version of the Software Provisioning Manager 2.0 archive `SWPM20SP<Support Package Number>_<Version Number>.SAR` from:

   https://support.sap.com/sltoolset > *System Provisioning* > *Download Software Provisioning Manager*
2. Make sure that you use the **latest** version of the `SAPCAR` tool when manually extracting the Software Provisioning Manager archive.

   > **i Note**
   >
   > An older `SAPCAR` version might extract archive files in a wrong way and this could prevent the installer from working consistently.

   Proceed as follows to get the latest version of `SAPCAR`:

   a. Go to https://launchpad.support.sap.com/#/softwarecenter > *SUPPORT PACKAGES & PATCHES* > *By Category* > *SAP TECHNOLOGY COMPONENTS* > *SAPCAR*.
   b. Select the archive file for your operating system and download it to an empty directory.
   c. To check the validity of the downloaded executable, right-click the executable and choose *Properties*. On the *Digital Signatures* tab you can find information about the SAP signature with which the executable was signed.
   d. Rename the executable to **`sapcar.exe`**.

   For more information about `SAPCAR`, see SAP Note 212876.
3. Using the latest version of SAPCAR, you can verify the signature of the downloaded `SWPM20SP<Support Package Number>_<Version Number>.SAR` archive as follows:
   a. Get the latest version of the `SAPCRYPTOLIB` archive to your installation host as follows:
      1. Go to https://launchpad.support.sap.com/#/softwarecenter > *SUPPORT PACKAGES & PATCHES* and search for "**`sapcryptolib`**".

2. Select the archive file for your operating system and download it to the same directory where you have put the `SAPCAR` executable.
3. Go to the `SAPCAR` directory and use the following command to extract the `SAPCRYPTOLIB` archive to the same directory where you have put the `SAPCAR` executable:
   `sapcar.exe -xvf sapcryptolibp_84…sar`
4. Download the `Certificate Revocation List` from **`https://tcs.mysap.com/crl/crlbag.p7s`** and move it to the `SAPCAR` directory.

b. Verify the signature of the downloaded `SWPM20SP<Support Package Number>_<Version Number>.SAR` archive by executing the following command:

> **i Note**
>
> Check SAP Notes 2178665 and 2568783 whether additional information is available.

```
<Path to SAPCAR>\sapcar.exe -tvVf<Path to Download Directory>
\SWPM20SP<Support Package Number>_<Version Number>.SAR -crl<File Name of
Revocation List>
```

4. Unpack the Software Provisioning Manager 2.0 archive to a local directory using the following command:

```
<Path to SAPCAR>\sapcar.exe -xvf <Path to Download Directory>\SWPM20SP<Support
Package Number>_<Version Number>.SAR -R <Path to Unpack Directory>
```

> **i Note**
>
> Make sure that all users have read permissions for the directory where you want to unpack the installer.

> **⚠ Caution**
>
> Make sure that you unpack the Software Provisioning Manager archive to a dedicated folder. Do not unpack it to the same folder as other installation media or archives.

4.13.2 Downloading the SAP Kernel

This section describes how to download the SAP Kernel.

You can either download the separate *.SAR archives of the SAP Kernel or the complete SAP Kernel medium.

Related Information

Downloading the SAP Kernel Archives (Archive-Based Installation) [page 66]
Downloading the Complete SAP Kernel Medium (Only Valid for SAP BW/4HANA 1.0 SR1) [page 68]

4.13.2.1 Downloading the SAP Kernel Archives (Archive-Based Installation)

This section describes how to download the SAP kernel *.SAR archives required for an archive-based installation.

Context

The signature of **installation archives** is checked **automatically** by the installer [page 80] during the *Define Parameters* phase while processing the *Software Package Browser* screens. The installer only accepts archives whose signature has been checked. After scanning the archives and verifying the signature, an info file is written where you can find detailed information about matching and non-matching archive files. You can access this info file by choosing the *info file* link in the Archive Scanning Result section of the *Software Package Browser* screen. The info file contains only the results of the latest archive scan. For more information, see SAP Note 2393060.

Procedure

1. Go to https://launchpad.support.sap.com/#/softwarecenter > *SUPPORT PACKAGES & PATCHES* > *By Category*
2. Choose the required software component and release:
   - If you want to install SAP S/4HANA Server `<Release>`, choose *SAP APPLICATION COMPONENTS* > *SAP S/4HANA* > *SAP S/4HANA* `<Release>` > *SAP S/4HANA SERVER*
   - If you want to install SAP S/4HANA Foundation 1909, choose *SAP APPLICATION COMPONENTS* > *SAP S/4HANA* > *SAP S/4HANA* `<Release>` > *SAP S/4HANA FOUNDATION* > *SAP S/4HANA FOUNDATION 1909*
   - If you want to install foundation on ABAP Platform 1809, version for SAP HANA , choose *SAP APPLICATION COMPONENTS* > *ABAP FND ON HANA* > *ABAP FND 1809 ON HANA*
   - If you want to install an SAP BW/4HANA 2.0 server, choose *SAP NetWeaver and complementary products* > *SAP BW/4HANA* > *SAP BW/4HANA 2.0* > *BW/4HANA SERVER*
   - If you want to install an SAP BW/4HANA 1.0 server, choose *SAP NetWeaver and complementary products* > *SAP BW/4HANA* > *SAP BW/4HANA 2.0* > *BW/4HANA SERVER*
3. Choose the required package:

> **i Note**
>
> If you perform an additional application server installation, kernel archives - such as `SAPEXE<Version>.SAR`, `SAPEXEDB<Version>.SAR`, `IGSEXE<Version>.SAR`, `igshelper<version>.sar` - are only prompted if they cannot be retrieved from the primary application server instance or the ASCS instance of the existing SAP system.

⚠ Caution

- Make sure that you always use the highest available patch level unless special patch levels are specified for the relevant package in SAP Note 2568783.
- Make sure that you always choose `SAPEXE<Version>.SAR`, `SAPEXEDB<Version>.SAR` of the **same** SAP kernel release and extension.

  ✤ Example

  If `SAPEXE<Version>.SAR` is of version **7.77 64-BIT UNICODE**, then `SAPEXEDB<Version>.SAR` must also be of version **7.77 64-BIT UNICODE**.
- If you provide the archives in one download folder, and there is more than one version of the same archive available - for example `SAPEXE<Version>.SAR` - and these versions match the product-specific requirements, the installer selects one of these archive versions. If you want a specific archive version to be used, make sure that this is the only version available in the download folder. When running system provisioning in GUI mode, you can also check in the GUI which archive is being used. So even if there is more than one version of the same archive available in the download folder, you can select the exact archive version you want to use and enter the exact path to the required archive file.

- `SAPEXE<Version>.SAR`

  SAP KERNEL `<Version>` `<UC>` `<Operating System>` *#DATABASE INDEPENDENT*
- `SAPEXEDB<Version>.SAR`

  Choose the version corresponding to the `SAPEXE<Version>.SAR` from *SAP KERNEL* `<Version>` `<UC>` `<Operating System>` `<DATABASE>`
- `igsexe<version>.sar`

  SAP IGS `<Version>` `<Operating System>`
- `igshelper<version>.sar`

  SAP IGS HELPER *# OS independent*
- `SAPHOSTAGENT<Version>.SAR`

  SAP HOST AGENT 7.21 `<Operating System>`

  i Note

  The `SAPHOSTAGENT<Version>.SAR` archive is only prompted if there is either no SAP Host Agent available on the installation host or you specified during the Define Parameters phase that you want to upgrade an existing version of the SAP Host Agent already available on the installation host. In the latter case, you must specify a higher version of the `SAPHOSTAGENT<Version>.SAR` .Otherwise, the existing SAP Host Agent is not upgraded.

4.13.2.2 Downloading the Complete SAP Kernel Medium (Only Valid for SAP BW/4HANA 1.0 SR1)

This section describes how to download the complete kernel medium required for the installation.

> **i Note**
>
> A complete SAP kernel medium is only available for SAP systems based on SAP BW/4HANA 1.0 SR1 . For SAP systems based on ABAP Platform 1809 or higher, you can only download the SAP kernel archives [page 66].

Context

The signature of **installation media** is checked **automatically** by the installer during the *Define Parameters* phase while the *Media Browser* screens are processed (see also Running the Installer [page 80]). The installer only accepts media whose signature has been checked. For more information, see SAP Note 2393060.

Procedure

1. Create a download directory on the host where you want to run the installer.
2. You can download the complete kernel medium for your operating system as a `*.zip` file from the following path: https://launchpad.support.sap.com/#/softwarecenter > *INSTALLATION & UPGRADE* > *By Category* > *SAP NetWeaver and complementary products* > *SAP BW/4HANA* > *SAP BW/4HANA 1.0* > *INSTALLATION*

   > **i Note**
   >
   > All download objects that are part of an installation medium have the same material number and an individual sequence number:
   >
   > `<Material_Number>_<Sequence_Number>`
   >
   > > **Example**
   > >
   > > `51031387_1`
   > >
   > > `51031387_2`
   > >
   > > `...`

3. Download the objects to the download directory.
4. To correctly re-combine the media that are split into small parts, unpack all parts into the same directory.

   In the unpacking directory, the system creates a subdirectory with a short text describing the medium and copies the data into it. The data is now all in the correct directory, the same as on the medium that was physically produced. For more information, see SAP Note 1258173.

> ⚠ Caution
>
> Make sure that you unpack each installation media to a separate folder. Do not unpack installation media to the same folder where you unpack the Software Provisioning Manager archive.
>
> Do not unpack installation media to the same folder where you unpack the SAP kernel archives for archive-based installation.

4.13.3 Downloading Software Packages for a Maintenance Planner Transaction

Software Provisioning Manager (the installer) is now enabled to download all software packages that have been defined in a Maintenance Planner Transaction.

> i Note
>
> This feature is only available if you perform an installation using a stack configuration file.

Prerequisites

Plan your new SAP system including the required Support Package level (applicable for SAP S/4 HANA, SAP NetWeaver, SAP Business Suite, and SAP Financials) as available in the Maintenance Planner and run **`sapinst SAPINST_STACK_XML=<stack configuration file>`** in order to benefit from an automated installation process.

Procedure

1. Specify a download directory for the artifacts (SAP archives) to be downloaded.
2. Start the installer as described in Running the Installer [page 80] .
3. On the *Welcome* screen, choose *Generic Options* > *Download Software Packages for Maintenance Planner Transaction*
4. Follow the instructions on the installer screens.

   The installer prompts you for the following input parameters:

   - Maintenance Planner Transaction ID
     You can find the Maintenance Planner Transaction ID by one of the following ways:
     - In the `MP_Plan_<Transaction ID>_<Generation Date>_.pdf` file which you can download during the *Completed* step in the Maintenance Planner by choosing the *Download PDF* button.
     - From the *Transaction ID* column in the list of transactions displayed in the *Transactions* panel in the maintenance planner.

- From the parameter `mopz-transaction-id` in the stack configuration file `MP_Stack_<Transaction ID>_<Generation Date>.xml` which you can download during the *Download Files* step in the Maintenance Planner by choosing the *Download Stack XML* button.

> **i Note**
>
> If you started the installer using a stack configuration file, the Maintenance Planner Transaction ID is only displayed.

- Your S-UserID and password
  You call *Software Provisioning Manager* with command line parameter **`SAPINST_STACK_XML=<Absolute_Path_To_Stack_XML_File>`** to get the *Maintenance Planner Transaction ID* extracted from the stack configuration file.
  You must perform this option directly after creating the Maintenance Planner Transaction, because the contained download links usually expire soon.
  Ensure the following for your *S-User*:
  1. You have download permissions for all artifacts on https://launchpad.support.sap.com/#/softwarecenter to be able to download them.
  2. Consider the SAP Support Portal and the SAP ONE Support Launchpad password policies: Your **password must be the same** for both of them. If the passwords are not the same, you will lock the S-User in the SAP Support Portal. The **password must meet all of the following requirements**:
     - Must be **exactly** eight characters long
     - Contains at least one upper-case letter (A-Z)
     - Contains at least one lower-case letter (a-z)
     - Contains at least one decimal digit (0-9)
     - Contains at least one of the following special characters: ! \ @ $ % / ({ [ ] }) + - * = ? ' ~ # _ . , ; : <>
     - Must not start with ? or !
     - Must not contain any blanks
     - Must not begin with three identical characters
     - Must be different from the last five passwords you have already used
     - Only one password change is allowed per day

     If required, request a change of your SAP Support Portal Password **and** of your SAP ONE Support Password at https://support.sap.com/en/my-support/users.html.
- Location of download folder for the installation software packages to be downloaded
- If you have a proxy configured in your network, provide the proxy host and port.

5. You get a list of all downloadable artifacts (SAP archives) as specified in the stack configuration file along with their file size.

   You can still deselect downloadable artifacts (SAP archives) that you do not need to be downloaded.
6. Choose *Next* to start the download.

   If you get a download error, this is the result of an unsuccessful network connection. Check your network connection and proxy configuration. If the download of some artifacts finishes without any error, but still with a status other than *OK*, you must do one of the following:

   - Create an up-to-date Maintenance Plan and perform again the download of the files which were not downloaded successfully. In case of an error, the installer skips the download of the artifact (SAR archive) in question and continue with the next one in the list.

- Download the still missing files directly from the SAP Software Center at https://launchpad.support.sap.com/#/softwarecenter.

Results

You have downloaded the artifacts (SAP archives) required for your SAP system installation with Software Provisioning Manager (the installer) - corresponding to the archives listed in section Downloading the SAP Kernel [page 65] - and for applying the required kernel and support packages using Software Update Manager (SUM) after the installation has completed.

4.13.4 Downloading the SAP HANA Database Software

This section describes how to download the SAP HANA 2.0 database client and - if you want to install your SAP system on the same host as the SAP HANA database - the SAP HANA database server software required for the installation.

Prerequisites

For enabling SAP HANA SSL, at least SAP HANA Client 2.0 SPS04 is required. For more information, see SAP Note 2784500.

Context

For SAP systems based on ABAP Platform 1809 or higher, the SAP HANA 2.0 database RDBMS and client software is available as installation **archives**.

For SAP systems based on SAP BW/4HANA 1.0 SR1, the SAP HANA 2.0 database RDBMS and client software is available as physical installation **media**.

> **i** Note
>
> The SAP HANA database server software is only required if you are installing a standard system **on one Linux host**, you can install your SAP system on the **same host** as the SAP HANA database. For more information, see SAP Note 1953429.

The signature of **installation archives** is checked **automatically** by the installer [page 80] during the *Define Parameters* phase while processing the *Software Package Browser* screens. The installer only accepts archives whose signature has been checked. After scanning the archives and verifying the signature, an info file is written where you can find detailed information about matching and non-matching archive files. You can access this info file by choosing the *info file* link in the Archive Scanning Result section of the *Software Package Browser* screen. The info file contains only the results of the latest archive scan. For more information, see SAP Note 2393060.

The signature of **installation media** is checked **automatically** by the installer during the *Define Parameters* phase while the *Media Browser* screens are processed (see also Running the Installer [page 80]). The installer only accepts media whose signature has been checked. For more information, see SAP Note 2393060.

Procedure

1. Create a download directory on the host where you want to run the installer.
2. To download SAP HANA database client software, choose the download path for your product:
   - If you want to install an SAP system based on ABAP Platform 1809 or higher, go to:
     https://launchpad.support.sap.com/#/softwarecenter > *Installations & Upgrades* > *By Category* > *SAP APPLICATION COMPONENTS* > *SAP S/4HANA* > `<Release>` > *INSTALLATION*
     Make the database client archive available on the installation host. Do **not** unpack it but just provide it when you are prompted during the installation process.
   - If you want to install SAP BW/4HANA 1.0 SR1, go to:
     https://launchpad.support.sap.com/#/softwarecenter > *Installations & Upgrades* > *By Category* > *SAP NETWEAVER AND COMPLEMENTARY PRODUCTS* > *SAP BW/4HANA* > *SAP BW/4HANA 1.0* > *INSTALLATION*
     Unpack the ZIP archive and make it available on the installation host.

     > **i Note**
     >
     > All download objects that are part of an installation medium have the same material number and an individual sequence number:
     >
     > `<Material_Number>_<Sequence_Number>`
     >
     > > **Example**
     > >
     > > `51031387_1`
     > >
     > > `51031387_2`
     > >
     > > `...`

     1. Download the objects to the download directory.
     2. To correctly re-combine the media that are split into small parts, unpack all parts into the same directory.
        In the unpacking directory, the system creates a subdirectory with a short text describing the medium and copies the data into it. The data is now all in the correct directory, the same as on the medium that was physically produced. For more information, see SAP Note 1258173.

        > **⚠ Caution**
        >
        > Make sure that you unpack each installation media to a separate folder. Do not unpack installation media to the same folder where you unpack the Software Provisioning Manager archive.
        >
        > Do not unpack installation media to the same folder where you unpack the SAP kernel archives for archive-based installation.

3. To download the SAP HANA 2.0 database RDBMS media, go to https://launchpad.support.sap.com/#/softwarecenter > *Installations & Upgrades* > *By Category* > *SAP IN-MEMORY (SAP HANA)* > *SAP HANA PLATFORM EDITION 2.0* > *INSTALLATION* .

> **i Note**
>
> This step is only required if you are installing a standard system **on one Linux host**, you can install your SAP system on the **same host** as the SAP HANA database. For more information, see SAP Note 1953429. Only in this case, you must make sure that the SAP HANA database RDBMS media are also available on the installation host.

   - If you want to install an SAP system based on ABAP Platform 1809 or higher, download the database RDBMS archives and make them available on the installation host. Do **not** unpack it but just provide it when you are prompted during the installation process.
     Make the database client archive available on the installation host. Do **not** unpack it but just provide it when you are prompted during the installation process.
   - If you want to install SAP BW/4HANA 1.0 SR1, download the database RDBMS media and make them available on the installation host.

     > **i Note**
     >
     > All download objects that are part of an installation medium have the same material number and an individual sequence number:
     >
     > `<Material_Number>_<Sequence_Number>`
     >
     > > **Example**
     > >
     > > `51031387_1`
     > >
     > > `51031387_2`
     > >
     > > `...`

     1. Download the objects to the download directory.
     2. To correctly re-combine the media that are split into small parts, unpack all parts into the same directory.
        In the unpacking directory, the system creates a subdirectory with a short text describing the medium and copies the data into this subdirectory. The data is now all in the correct directory, the same as on the medium that was physically produced. For more information, see SAP Note 1258173.

        > **⚠ Caution**
        >
        > Make sure that you unpack each installation media to a separate folder. Do not unpack installation media to the same folder where you unpack the Software Provisioning Manager archive.
        >
        > Do not unpack installation media to the same folder where you unpack the SAP kernel archives for archive-based installation.

4.13.5 Downloading the Database Installation Export and Languages Software

This section describes how to download the database installation export and languages required for the installation of the SAP HANA 2.0 database instance.

Context

Physical database installation export **media** are only available for SAP systems based on SAP BW/4HANA 1.0 SR1.

For SAP systems based on ABAP Platform 1809 or higher, the database installation export is only available as installation **archives**.

The signature of **installation archives** is checked **automatically** by the installer [page 80] during the *Define Parameters* phase while processing the *Software Package Browser* screens. The installer only accepts archives whose signature has been checked. After scanning the archives and verifying the signature, an info file is written where you can find detailed information about matching and non-matching archive files. You can access this info file by choosing the *info file* link in the Archive Scanning Result section of the *Software Package Browser* screen. The info file contains only the results of the latest archive scan. For more information, see SAP Note 2393060.

The signature of **installation media** is checked **automatically** by the installer during the *Define Parameters* phase while the *Media Browser* screens are processed (see also Running the Installer [page 80]). The installer only accepts media whose signature has been checked. For more information, see SAP Note 2393060.

Ensure that you make the SAP HANA database installation export available both on the SAP HANA host and on the primary application server instance host.

Procedure

1. Create a download directory.
2. Go to https://launchpad.support.sap.com/#/softwarecenter > *INSTALLATION & UPGRADE* > *By Category*
3. Download the database installation export for the product you want to install.
   - For an SAP system based on ABAP Platform 1809 or higher, download the database installation export **archives** and language installation **archives** from the following path:
     > *SAP APPLICATION COMPONENTS* > *SAP S/4HANA* > *SAP S/4HANA* `<Release>` > *SAP S/4HANA SERVER*
     Make the database installation export archives available on the installation host. Do **not** unpack them but just provide them when you are prompted during the installation process.
   - For an SAP system based on SAP BW/4HANA 1.0 SR1, download the database installation export **media** and language installation **media** from the following path:
     > *SAP NetWeaver and complementary products* > *SAP BW/4HANA* > *SAP BW/4HANA 1.0*

> **Note**
>
> All download objects that are part of an installation medium have the same material number and an individual sequence number:
>
> `<Material_Number>_<Sequence_Number>`
>
> > **Example**
> >
> > ```
> > 51031387_1
> > 51031387_2
> > ...
> > ```

1. Download the objects to the download directory.
2. To correctly re-combine the media that are split into small parts, unpack all parts into the same directory.
   In the unpacking directory, the system creates a subdirectory with a short text describing the medium and copies the data into it. The data is now all in the correct directory, the same as on the medium that was physically produced. For more information, see SAP Note 1258173.

   > **Caution**
   >
   > Make sure that you unpack each installation media to a separate folder. Do not unpack installation media to the same folder where you unpack the Software Provisioning Manager archive.
   >
   > Do not unpack installation media to the same folder where you unpack the SAP kernel archives for archive-based installation.

5 Installation

5.1 Installation Checklist

This section includes the installation steps for the following:

- Standard system
- Distributed system
- High-availability system
- Additional application server instance

Detailed information about the steps are available in the linked sections.

> **i Note**
>
> The SAP HANA database is normally pre-installed by SAP partners before you start the installation. For more information about how to install the SAP HANA database, see the *SAP HANA Server Installation and Update Guide* at https://help.sap.com/hana_platform *Installation and Upgrade*. The contents of the database instance are remotely installed by SoftwareProvisioning Manager (the “installer”) from the primary application server host.
>
> On the *Database for SAP System* screen, enter the *Database Host* and the *Instance Number* for your SAP HANA database host. If the instance does not exist, a **new SAP HANA database instance will be installed on the same host as the SAP system.**.

Standard System

1. You check the prerequisites [page 78] and run the installer [page 80] to install the SAP system.

   > **i Note**
   >
   > In a standard system, all mandatory instances except the database instance are installed on one host.

2. You continue with Post-Installation [page 93].

Distributed System

1. On the ASCS instance host, you check the prerequisites [page 78] and run the installer [page 80] to install the ABAP central services instance.

> **i Note**
>
> If you want to install an ASCS instance with integrated SAP Web Dispatcher [page 19] or with integrated SAP Gateway [page 21] or both, you must choose the *Custom* parameter mode.
>
> When processing the screens for the ASCS instance installation, you are prompted to mark the corresponding checkbox on the screen *Additional Components to be Included in the ASCS Instance*.
>
> If you mark the checkbox for SAP Web Dispatcher, you are prompted for the additional parameters required for the SAP Web Dispatcher installation on the subsequent screens.

2. On the primary application server instance host, you check the prerequisites [page 78] and run the installer [page 80] to install the contents of the database instance.
3. On the primary application server instance host, you check the prerequisites [page 78] and run the installer [page 80] to install the primary application server instance.
4. If required, you install *1* to `<N>` additional application server instances on the respective hosts, as described later in this section.
5. You continue with Post-Installation [page 93].

High-Availability System

1. To install a high-availability system with Microsoft Failover Clustering, you perform the HA-specific installation steps [page 145].
2. You continue with Post-Installation [page 93].

Additional Application Server Instance

You perform the following steps on each host where you install the additional application server instances.

1. You check the prerequisites [page 78] and run the installer [page 80] to install the additional application server instances.

   > **⚠ Caution**
   >
   > In a high-availability system, you must install at least **one** additional application server instance.

2. You continue with Post-Installation [page 93].

5.2 Specifying the Initial Data Source of the User Management Engine

During the installation of your SAP system, you have to specify the initial data source of the User Management Engine (UME).

Prerequisites

You have planned how you want to configure user and access management for your SAP system to be installed as described in Planning User and Access Management [page 35].

Procedure

Using Central User Management

1. You install your SAP system as described in this installation guide.
2. Add the system to Central User Administration (CUA). For more information, see Configuring User Management [page 112].

Using an LDAP directory as Source for User Data

1. You install your SAP system as described in this installation guide.
2. Configure the user management of the newly installed SAP system to use an LDAP directory. For more information, see Configuring User Management [page 112].

5.3 Prerequisites for Running the Installer

Make sure you fulfil the following prerequisites before running the installer.

- For the SL Common GUI, make sure that the following web browser requirements are met:
  - You have one of the following supported browsers on the device where you want to run the SL Common GUI:
    - Google Chrome (recommended)
    - Mozilla Firefox
    - Microsoft Edge
    - Microsoft Internet Explorer 11 or higher.

    Always use the latest version of these web browsers.
  - If you copy the SL Common GUI URL manually in the browser window, make sure that you open a new Web browser window in private browsing mode (Internet Explorer), incognito mode (Chrome) or private browsing mode (Firefox). This is to prevent Web browser plugins and settings from interfering with the SL Common GUI.

> ⚠ Caution
>
> The installer uses a self-signed certificate, which is used temporarily only while the installer is running. This certificate is not trusted by the browser unless it is imported manually by the user running the installer. This behavior is intentionally designed in this way because - unlike ordinary public web servers - the installer has different usage patterns. You must configure your browser do trust the self-issued certificate of the installer after carefully performing the "thumbprint" verification described in Running the Installer [page 80] . For more information about adding trusted certificates, see the documentation of your browser.

For more information about the SL Common GUI, see Useful Information about the Installer [page 84].

- If you want to enable Internet Protocol Version 6 (IPv6), make sure that you set **`SAP_IPv6_ACTIVE=1`** in the environment of the user with the required authorization [page 57] to run the installer. While running the installer, this setting is then also added to the environment of the `<sapsid>adm` user.

> ℹ Note
>
> By applying this setting the SAP system administrator is responsible for configuring the IP version on each host of the system landscape, before installing any additional instance to it.

- You need at least 300 MB of free space in the installation directory for each installation option. In addition, you need 300 MB free space for the installer executables. The installer creates an installation directory `sapinst_instdir`, where it keeps its log files, and which is located directly in the `%ProgramFiles%` directory. For more information, see Useful Information About the Installer [page 84].
- Make sure that you have defined the most important SAP system parameters as described in Basic Installation Parameters [page 36] **before** you start the installation.
- Check that your installation host meets the requirements for the installation options that you want to install.
  For more information, see Running the Prerequisite Checker [page 28].
- Make sure that the database is **up and running** before starting the installation.
- If you want to install an additional application server instance in an existing SAP system, make sure that:
  - The service definitions for the SAP start services are configured correctly and refer to the correct profile files.
  - There are no profile backup files with an underscore "_" in their profile name. If so, replace the "_" with a ".".

    > ✤ Example
    >
    > Rename `<Drive>:\usr\sap\S14\SYS\profile\S14_D20_wsi6408_12` to **`<Drive>:\usr\sap\S14\SYS\profile\S14_DVEBMGS20_wsi6408.12`**.

- Make sure that the following ports are not used by other processes:
  - Port 4237 is used by default as HTTPS port for communication between the installer and the SL Common GUI.
    If this port cannot be used, you can assign a free port number by executing `sapinst.exe` with the following command line parameter:
    `SAPINST_HTTPS_PORT=<Free Port Number>`
  - Port 4239 is used by default for displaying the feedback evaluation form at the end of the installer processing.
    The filled-out evaluation form is then sent to SAP using HTTPS.

If this port cannot be used, you can assign a free port number by executing `sapinst.exe` with the following command line parameter:
`SAPINST_HTTP_PORT=<Free Port Number>`

- If you want to perform the installation in unattended mode, see SAP Note 2230669 which describes an improved procedure using `inifile.params`.

5.4 Running the Installer

This section describes how to run the installer.

Prerequisites

For more information, see Prerequisites for Running the Installer [page 78].

Context

The installer has a web browser-based GUI named "SL Common GUI of the Software Provisioning Manager" - "SL Common GUI" for short.

This procedure describes an installation where you run the installer and use the SL Common GUI, that is you can control the processing of the installer from a browser running on any device.

For more information about the SL Common GUI, see Useful Information About the Installer [page 84].

Procedure

1. Log on to the installation host using an account with the required user authorization to run the Installer [page 57].

   > ⚠ Caution
   >
   > Do **not** use an existing `<sapsid>adm` user.

   If your security policy requires that the person running the installer is not allowed to know administrator credentials on the installation host, you can specify another operating system user for authentication purposes. You do this using the `SAPINST_REMOTE_ACCESS_USER` parameter when starting `sapinst.exe` from the command line. You must confirm that the user is a trusted one. For more information, see SAP Note 1745524.
2. Make the installation software available.

executable from the command line. You must confirm that the user is a trusted one. For more information, see SAP Note

For more information, see Providing the Installation Software [page 63].

> **i Note**
>
> **SAP BW/4HANA 1.0 SR1 only:** Even if you use the complete SAP kernel media, the installer might prompt you during the provisioning process for additional archives (*.SAR files) due to special Patch Level (PL) requirements depending on categories such as the product, operating system, and database platform.
>
> For example: The installer might require a certain PL of `<X>` of the `SAPEXEDB.SAR` (for DBTYPE `<Y>`), but this PL of the `SAPEXEDB.SAR` is not contained in the SAP kernel media . In this case you must download the required PL from https://launchpad.support.sap.com/#/softwarecenter following the instructions given in Downloading the SAP Kernel Archives (Archive-Based Installation) [page 66].

3. Start the installer from the directory to which you unpacked the Software Provisioning Manager archive with the following command:

   `sapinst.exe` (in a command prompt)

   `.\sapinst.exe` (in PowerShell)

   > **i Note**
   >
   > If you are using a stack configuration file (see Installation Using a Stack Configuration File (Optional) [page 25]), you must call `sapinst.exe` with command line parameter `SAPINST_STACK_XML=<Absolute_Path_To_Stack_XML_File>`:
   >
   > **`sapinst.exe SAPINST_STACK_XML=<Absolute_Path_To_Stack_XML_File>`** (in a command prompt)
   >
   > **`.\sapinst.exe SAPINST_STACK_XML=<Absolute_Path_To_Stack_XML_File>`** (in PowerShell)

   By default, the SL Common GUI uses the default browser defined for the host where you run the installer. However, you can also specify another supported web browser available on the host where you start the installer. You can do this by starting the `sapinst` executable with command line option **`SAPINST_BROWSER=<Path to Browser Executable>`**, for example **`SAPINST_BROWSER=firefox.exe`**.

   > **i Note**
   >
   > If you want to set the connectivity data for your SAP HANA database, you can add a parameter when calling `sapinst` as follows:
   >
   > - ABAP secure storage in the file system (SSFS):
   >   **`sapinst.exe HDB_ABAP_SSFS=YES`**
   > - If you want to assign virtual host names, you must start the installer with the `SAPINST_USE_HOSTNAME` command line parameter as follows:
   >   1. Open a command prompt or `PowerShell` window in elevated mode and change to the directory to which you unpacked the Software Provisioning Manager archive.
   >   2. Start the installer with the following command:
   >   **`sapinst.exe SAPINST_USE_HOSTNAME=<Virtual_Host_Name>`** (in a command prompt)
   >   **`.\sapinst.exe SAPINST_USE_HOSTNAME=<Virtual_Host_Name>`** (in `PowerShell`)

For more information, see Setting Connectivity Data for the SAP HANA Database [page 53].

4. The installer is starting up.

   The installer now starts and waits for the connection with the SL Common GUI. If you have a supported web browser (see Prerequisites for Running the Installer [page 78]) installed on the host where you run the installer, the SL Common GUI starts automatically by displaying the *Welcome* screen.

   If the SL Common GUI does not open automatically, you can find the URL you require to access the SL Common GUI at the bottom of the *Program Starter* window of the installer. You find the icon of the *Program Starter* window in the taskbar of your Windows host. Open a supported web browser and run the URL from there.

```
...
**********************************************************************
Open your browser and paste the following URL address to access the GUI
https://[<hostname>]:4237/sapinst/docs/index.html
Logon users: [<users>]
**********************************************************************
...
```

> **i Note**
>
> If the host specified by `<hostname>` cannot be reached due to a special network configuration, proceed as follows:
>
> 1. Terminate the installer as described in Useful Information about the Installer [page 84].
> 2. Restart the installer from the command line with the **`SAPINST_GUI_HOSTNAME=<hostname>`** property.
>   You can use a fully-qualified host name.

> **⚠ Caution**
>
> After opening the browser URL, make sure that the URL in the browser starts with “https://” to avoid security risks such as SSL stripping .
>
> Before you reach the *Welcome* screen, your browser warns you that the certificate of the `sapinst` process on this computer could not be verified.
>
> Proceed as follows to avoid security risks such as a man-in-the-middle attack:
>
> 1. Click on the certificate area on the left hand side in the address bar of your browser, and view the certificate.
> 2. Open the certificate fingerprint or thumbprint, and compare all hexadecimal numbers to the ones displayed in the console output of the installer.
>   Proceed as follows to get the certificate fingerprint or thumbprint from the server certificate printed in the installer console:
>   1. Go to the `sapinst_exe.xxxxxx.xxxx` directory in the temporary directory to which the installer has extracted itself:
>   `%userprofile%\.sapinst\`
>   2. In the `sapinst_exe.xxxxxx.xxxx` directory, execute the `sapgenpse` tool with the command line option **`get_my_name -p`**.
>
>   As a result, you get the server fingerprint or thumbprint from the server certificate.
> 3. Accept the warning to inform your browser that it can trust this site, even if the certificate could not be verified.

The SL Common GUI opens in the browser by displaying the *Welcome* screen.

5. On the *Welcome* screen, choose the required option:
   - To install a complete SAP system, choose *Installation* > *Application Server ABAP* > `<System_Variant>`.
   - To install an additional SAP system instance, choose `<Product>` > `<Database>` > *Additional SAP System Instances*.
   - To perform other tasks or install additional components, choose *Generic Options* > `<Database>` and choose the required task.
6. Choose *Next*.

   > **i Note**
   >
   > If there are errors during the self-extraction process of the installer, you can find the log file `dev_selfex.out` in the temporary directory.

7. If the installer prompts you to log off from your system, log off and log on again.

   The installer restarts automatically.
8. Follow the instructions on the installer screens and enter the required parameters.
9. To start the installation, choose *Next*.

   The installer starts the installation and displays the progress of the installation. When the installation has finished, the installer shows the message: `Execution of <Option_Name> has completed`.
10. If required install an additional application server instance for a standard (central) or distributed system.
11. If you copied the installer software to your hard disk, you can delete these files when the installation has successfully completed.
12. For security reasons, we recommend that you delete the `.sapinst` directory within the home directory of the user with which you ran the installer:

    ```
    %userprofile%\.sapinst\
    ```
13. The installer log files contain IP addresses and User IDs such as the ID of your S-User. For security, data protection, and privacy-related reasons we strongly recommend that you delete these log files once you do not need them any longer.

    You find the installer log files in the `sapinst_instdir` directory. For more information, see Useful Information about the Installer [page 84].

5.5 Additional Information about the Installer

The following sections provide additional information about the installer.

Useful Information about the Installer [page 84]

How to Avoid Automatic Logoff by the Installer [page 85]

Interrupted Processing of the Installer [page 86]

Entries in the Services File Created by the Installer [page 90]

Troubleshooting with the Installer [page 90]

Using the Step State Editor (SAP Support Experts Only) [page 91]

5.5.1 Useful Information about the Installer

This section contains some useful technical background information about the installer and the installer GUI.

- Software Provisioning Manager (the “installer” for short) has the web browser-based “SL Common GUI of the Software Provisioning Manager” - “SL Common GUI” for short.
  The SL Common GUI uses the SAP UI Development Toolkit for HTML5 - also known as SAPUI5 - a client-side HTML5 rendering library based on JavaScript. The benefits of this new user interface technology for the user are:
  - Zero foot print, since only a web browser is required on the client
  - New controls and functionality, for example, view logs in web browser.

  As of version 2.0 SP01 Patch Level (PL) 5, Software Provisioning Manager comes with a new look and feel of the SL Common GUI. For more information, see https://blogs.sap.com/2018/11/10/new-look-for-software-provisioning-manager/.
  The SL Common GUI connects the web browser on a client with the `sapinst` executable - which is part of Software Provisioning Manager - running on the installation host using the standard protocol HTTPS.
  For the SL Common GUI, the installer provides a pre-generated URL in the *Program Starter* window. If you have a supported web browser installed on the host where you run the installer, the SL Common GUI starts automatically.
  By default, the SL Common GUI uses the default browser defined for the host where you run the installer. However, you can also specify another supported web browser available on the host where you start the installer. You can do this by starting the `sapinst` executable with command line option **`SAPINST_BROWSER=<Path to Browser Executable>`**, for example **`SAPINST_BROWSER=firefox.exe`**.
  Alternatively you can open a supported web browser on any device and run the URL from there.
  For more information about supported web browsers see Prerequisites for Running the Installer [page 78].
  If you need to run the **SL Common GUI** in **accessibility mode**, apply the standard accessibility functions of your web browser.

- As soon as you have started the `sapinst.exe` executable, the installer creates a `.sapinst` directory underneath the `<Drive>:\Users\<User>` directory where it keeps its logs and other technical files. `<User>` is the user which you used to start the installer.
  After you have reached the *Welcome* screen and selected the relevant installer option for the SAP system or instance to be installed , the installer creates a directory `sapinst_instdir`, where it keeps its logs and other technical files, and which is located directly in the `%ProgramFiles%` directory. If the installer is not able to create `sapinst_instdir` there, it tries to create `sapinst_instdir` in the directory defined by the `TEMP` environment variable.
  All log files which have been stored so far in the `.sapinst` folder are moved to the `sapinst_instdir` directory as soon as the latter has been created.
  The installer records its progress in the `keydb.xml` file located in the `sapinst_instdir` directory. Therefore, if required, you can continue with the installer from any point of failure, without having to repeat the already completed steps and without having to reenter the already processed input parameters. For security reasons, a variable encryption key is generated as soon as the `sapinst_instdir` directory is created by the installer. This key is used to encrypt the values written to the `keydb.xml` file.

> → Recommendation
>
> We recommend that you keep all installation directories until the system is completely and correctly installed.

- The installer extracts itself to a temporary directory (`TEMP`, `TMP`, `TMPDIR`, or `SystemRoot`). These executables are deleted after the installer has stopped running.
  Directories called `sapinst_exe.xxxxxx.xxxx` sometimes remain in the temporary directory after the installer has finished. You can safely delete them.
  The temporary directory also contains the log file `dev_selfex.out` from the self-extraction process of the installer, which might be useful if an error occurs.

  > ⚠ Caution
  >
  > If the installer cannot find a temporary directory, the installation terminates with the error `FCO-00058`.

- To see a list of all available installer properties, go to the directory `%TEMP%\sapinst_exe.xxxxxx.xxxx` after you have started the installer, and enter the following command:
  ```
  sapinst.exe -p
  ```
- If you want to perform the installation in unattended mode, see SAP Note 2230669 which describes an improved procedure using `inifile.params`.
- If required, stop the installer by choosing the *Cancel* button.

  > i Note
  >
  > If you need to terminate the installer, choose *File* > *Exit* in the menu of the *Program Starter* window.

5.5.2 How to Avoid Automatic Logoff by the Installer

When you install the SAP system, the installation tool checks whether the user account used for the installation has the required privileges and authorization.

For a domain installation, the account needs to be both a member of the local `Administrators` group and the domain `Admins` group. For a local installation, the account needs to be a member of the local group `Administrators` group.

In both cases, the user account must be authorized to do the following:

- Act as part of the operating system
- Adjust memory quotas for a process
- Replace a process level token

If the user account does not have these rights assigned, the installer assigns them and automatically logs the account off to activate them. To avoid the installer logging the account off, you can set these rights manually before you start the installation.

Procedure

You perform the following steps to assign these rights to the user account used for the installation.

> ⚠ Caution
>
> Be aware that domain policies override locally defined policies. This means that if you want to grant domain administrator rights to a user who belongs to the local `Administrators` group, make sure that you have also defined domain administrator rights for this user on domain level.

1. Windows Server 2012 (R2) and higher: Press `Ctrl` + `Esc` and choose *Administrative Tools* > *Local Security Policy*.
2. Windows Server 2008 (R2): Choose *Start* > *Control Panel* > *Administrative Tools* > *Local Security Policy*.
3. In the *Local Security Settings* window, choose *Local Policies* > *User Rights Assignment.*.
4. Double-click the required right under *Policy* and choose *Add User or Group*.
5. In the *Select Users and Groups* window, choose the required user and choose *Add*.
   The selected user appears in the box below.
6. Confirm your entry and then repeat the steps for each remaining policy that the user requires for the installation.
7. Log off and log on again to apply the changes.

More Information

Required User Authorization for Running the Installer [page 57]

5.5.3 Interrupted Processing of the Installer

Here you find information about how to restart the installer if its processing has been interrupted.

Context

The processing of the installer might be interrupted for one of the following reasons:

- An error occurred during the *Define Parameters* or *Execute* phase:
  The installer does not abort the installation in error situations. If an error occurs, the installation pauses and a dialog box appears. The dialog box contains a short description of the choices listed in the table below as well as a path to a log file that contains detailed information about the error.
- You interrupted the processing of the installer by choosing *Cancel* in the SL Common GUI.

> ⚠ Caution
>
> If you stop an option in the *Execute* phase, any system or component **installed** by this option is incomplete and not ready to be used. Any system or component **uninstalled** by this option is not completely uninstalled.

The following table describes the options in the dialog box:

Option	Definition
Retry	The installer retries the installation from the point of failure without repeating any of the previous steps. This is possible because the installer records its progress in the `keydb.xml` file. We recommend that you view the entries in the log files, try to solve the problem, and then choose *Retry*. If the same or a different error occurs, the installer displays the same dialog box again.
Stop	The installer stops the installation, closing the dialog box, the installer GUI, and the GUI server. The installer records its progress in the `keydb.xml` file. Therefore, you can continue with the installer from the point of failure without repeating any of the previous steps. See the procedure below.
Continue	The installer continues the installation from the current point.
View Log	Access installation log files.

The following procedure describes the steps to restart an installation, which you stopped by choosing *Stop*, or to continue an interrupted installation after an error situation.

Procedure

1. Log on to the installation host as a user with the required permissions as described in Running the Installer [page 80] .
2. Make sure that the installation software is still available.

   For more information, see Providing the Installation Software [page 63].

   > → Recommendation
   >
   > Make the installation software available **locally**. For example, if you use remote file shares on other Windows hosts, CIFS shares on third-party SMB-servers, or Network File System (NFS), reading from software mounted with NFS might fail.
3. Make sure that the installation software are still available.

   For more information, see Providing the Installation Software [page 63].

→ Recommendation

Make the installation software available **locally**. For example, if you use remote file shares on other Windows hosts, CIFS shares on third-party SMB-servers, or Network File System (NFS), reading from software mounted with NFS might fail.

4. Restart the installer by double-clicking **`sapinst.exe`** from the directory to which you unpacked the Software Provisioning Manager archive.

   By default, the SL Common GUI uses the default browser defined for the host where you run the installer. However, you can also specify another supported web browser available on the host where you start the installer. You can do this by starting the `sapinst` executable with command line option **`SAPINST_BROWSER=<Path to Browser Executable>`**, for example **`SAPINST_BROWSER=firefox.exe`**.

5. The installer is restarting.

   The installer now starts and waits for the connection with the SL Common GUI. If you have a supported web browser (see Prerequisites for Running the Installer [page 78]) installed on the host where you run the installer, the SL Common GUI starts automatically by displaying the *Welcome* screen.

   If the SL Common GUI does not open automatically, you can find the URL you require to access the SL Common GUI at the bottom of the *Program Starter* window of the installer. You find the icon of the *Program Starter* window in the taskbar of your Windows host. Open a supported web browser and run the URL from there.

```
...
********************************************************************
Open your browser and paste the following URL address to access the GUI
https://[<hostname>]:4237/sapinst/docs/index.html
Logon users: [<users>]
********************************************************************
...
```

ℹ Note

If the host specified by `<hostname>` cannot be reached due to a special network configuration, proceed as follows:

1. Terminate the installer as described in Useful Information about the Installer [page 84].
2. Restart the installer from the command line with the **`SAPINST_GUI_HOSTNAME=<hostname>`** property.
   You can use a fully-qualified host name.

⚠ Caution

After opening the browser URL, make sure that the URL in the browser starts with “https://” to avoid security risks such as SSL stripping .

Before you reach the *Welcome* screen, your browser warns you that the certificate of the `sapinst` process on this computer could not be verified.

Proceed as follows to avoid security risks such as a man-in-the-middle attack:

1. Click on the certificate area on the left hand side in the address bar of your browser, and view the certificate.

2. Open the certificate fingerprint or thumbprint, and compare all hexadecimal numbers to the ones displayed in the console output of the installer.
   Proceed as follows to get the certificate fingerprint or thumbprint from the server certificate printed in the installer console:
   1. Go to the `sapinst_exe.xxxxxx.xxxx` directory in the temporary directory to which the installer has extracted itself:
      `%userprofile%\.sapinst\`
   2. In the `sapinst_exe.xxxxxx.xxxx` directory, execute the `sapgenpse` tool with the command line option **`get_my_name -p`**.

   As a result, you get the server fingerprint or thumbprint from the server certificate.
3. Accept the warning to inform your browser that it can trust this site, even if the certificate could not be verified.

The SL Common GUI opens in the browser by displaying the *Welcome* screen.

6. From the tree structure on the *Welcome* screen, select the installation option that you want to continue and choose *Next*.

   The *What do you want to do?* screen appears.
7. On the *What do you want to do?* screen, decide between the following alternatives and continue with *Next*:

Alternative	Behavior

Perform a new run	The installer does not continue the interrupted installation option. Instead, it moves the content of the old installer directory and all installer-specific files to a backup directory. Afterwards, you can no longer continue the old option.
	The following naming convention is used for the backup directory:
	`log_<Day>_<Month>_<Year>_<Hours>_<Minutes>_<Seconds>`
	Example
	`log_01_Oct_2016_13_47_56`
	Note
	All actions taken by the installation before you stopped it (such as creating directories or users) are not revoked.
	Caution
	The installer moves all the files and folders to a new log directory, even if these files and folders are owned by other users. If there are any processes currently running on these files and folders, they might no longer function properly.

Continue with the existing one	The installer continues the interrupted installation from the point of failure.

5.5.4 Entries in the Services File Created by the Installer

After the installation has finished successfully, the installer has created the following entries for port names in `<Drive>:\WINDOWS\system32\drivers\etc\services`:

`sapdp<Instance_Number> = 32<Instance_Number>/tcp`

`sapdp<Instance_Number>s = 47<Instance_Number>/tcp`

`sapgw<Instance_Number> = 33<Instance_Number>/tcp`

`sapgw<Instance_Number>s = 48<Instance_Number>/tcp`

`sapms<SAPSID> = 36<Instance_Number>/tcp` (unless you specified another value during the installation)

> **i** Note
>
> - There is a port created for every possible instance number, regardless of which instance number you specified during the installation. For example, for `sapgw<Instance_Number> = 33<Instance_Number>/tcp` the following range of entries is created:
>
>  ```
>  sapgw00 = 3300/tcp
>  sapgw01 = 3301/tcp
>  sapgw02 = 3302/tcp
>  [...]
>  sapgw98 = 3398/tcp
>  sapgw99 = 3399/tcp
>  ```
>
> - If there is more than one entry for the same port number, this is **not** an error.

5.5.5 Troubleshooting with the Installer

This section tells you how to proceed when errors occur while the installer is running.

Context

If an error occurs, the installer:

- Stops processing
- Displays a dialog informing you about the error

Procedure

1. Check SAP Note 2393060 for known installer issues.
2. If an error occurs during the *Define Parameters* or the *Execute Service* phase, do one of the following:

- Try to solve the problem:
  - To check the installer log files (`sapinst.log` and `sapinst_dev.log`) for errors, choose the *LOG FILES* tab.

    > **Note**
    >
    > The *LOG FILES* tab is only available if you have selected on the *Welcome* screen the relevant installer option for the SAP product to be installed .
    >
    > If you need to access the log files before you have done this selection, you can find the files in the `.sapinst` directory underneath the `<Drive>:\Users\<User>` directory, where `<User>` is the user that you used to start the installer.
    >
    > For more information, see Useful Information about the Installer [page 84].

  - To check the log and trace files of the installer GUI for errors, go to the directory `%userprofile%\.sapinst\`
  - Then continue by choosing *Retry*.
- If required, abort the installer by choosing *Cancel* in the tool menu and restart the installer. For more information, see Interrupted Processing of the Installer [page 86].

3. If you cannot resolve the problem, report an incident using the appropriate subcomponent of BC-INS*.

   For more information about using subcomponents of BC-INS*, see SAP Note 1669327.

5.5.6 Using the Step State Editor (SAP Support Experts Only)

This section describes how to use the `Step State Editor` available in the installer.

> **Note**
>
> Only use the `Step State Editor` if the SAP Support requests you to do so, for example to resolve a customer incident.

Prerequisites

- SAP Support requests you to use the `Step State Editor`.
- Make sure that the host where you run the installer meets the requirements listed in Prerequisites for Running the Installer [page 78].

Procedure

1. Start the installer from the command line as described in Running the Installer [page 80] with the additional command line parameter **`SAPINST_SET_STEPSTATE=true`**

2. Follow the instructions on the installer screens and fill in the parameters prompted during the *Define Parameters* phase until you reach the *Parameter Summary* screen.
3. Choose *Next*.

   The `Step State Editor` opens as an additional dialog. Within this dialog you see a list of all steps to be executed by the installer during the *Execute Service* phase. By default all steps are in an initial state. Underneath each step, you see the assigned installer component. For each step you have a *Skip* and a *Break* option.

   - Mark the checkbox in front of the *Break* option of the steps where you want the installer to pause.
   - Mark the checkbox in front of the *Skip* option of the steps which you want the installer to skip.
4. After you have marked all required steps with either the *Break* or the *Skip* option, choose *OK* on the *Step State Editor* dialog.

   The installer starts processing the *Execute Service* phase and pauses one after another when reaching each step whose *Break* option you have marked. You can now choose one of the following:

   - Choose *OK* to continue with this step.
   - Choose *Step State Editor* to return to the `Step State Editor` and make changes, for example you can repeat the step by marking the checkbox in front of the *Repeat* option.
   - Choose *Cancel* to abort the installer.
5. Continue until you have run through all the steps of the *Execute Service* phase of the installer.

6 Post-Installation

6.1 Post-Installation Checklist

This section includes the post-installation steps that you have to perform for the following:

> **i Note**
>
> You can automate some of these post-installation steps by running task list `SAP_BASIS_SETUP_INITIAL_CONFIG` in the ABAP task manager for lifecycle management automation (transaction `STC01`). For more information, see Performing Automated Initial Setup (Optional) [page 96].
>
> The sections describing these steps are marked with a corresponding note at the beginning.

- Standard, distributed, or high-availability system
- Additional application server instance

More detailed information about the steps are available in the linked sections.

> **i Note**
>
> We highly recommend that you apply the latest Support Package as described in Applying the Latest Kernel [page 108]. The minimum requirement for running SAP BW on the SAP HANA database is SP4.

Standard, Distributed, or High-Availability System

> **i Note**
>
> In a standard system, all mandatory instances except the database instance are installed on one host. Therefore, if you are installing a standard system, you can ignore references to other hosts.
>
> The SAP HANA database is normally pre-installed by SAP partners before you start the installation. During the SAP system installation, the database instance was remotely installed by Software Provisioning Manager (the “installer”) from the primary application server host.

1. You check whether you can log on to the Application Server ABAP [page 95].
2. You perform the automated initial setup [page 96].

   > **i Note**
   >
   > This step is optional.
3. If you have not enabled SAP EarlyWatch Alert in your SAP Solution Manager, you enable SAP EarlyWatch Alert for ABAP Systems on SAP HANA [page 97].
4. You configure the remote connection to SAP support [page 101].

5. You enable the Note Assistant to apply note corrections [page 101].
6. You perform the consistency check [page 102].
7. If required, you set up symbolic links for application servers [page 103].
8. You configure the Transport Management System [page 104].
9. For production systems it is highly recommended that you connect the system to SAP Solution Manager [page 105].
10. Run installer option *Check and Adjust ABAP System* to apply necessary configuration steps.
11. You apply the latest kernel and Support Packages [page 108].
12. If required, you install additional languages and perform language transport [page 111].
13. You perform IP Multicast Configuration [page 112].
14. You configure the user management [page 112].
15. You ensure user security [page 113].
16. You perform the client copy [page 115].
17. You install or upgrade SAP HANA studio [page 116].
18. You back up the SAP HANA database [page 116].
19. If required, you change the keys for the secure storage [page 116].
20. You perform a full system backup [page 117].
21. If you chose to install an integrated SAP Web Dispatcher within the ASCS instance, you log on to the SAP Web Dispatcher Management Console [page 118]
22. If you chose to install an integrated SAP Web Dispatcher within the ASCS instance, you configure the SAP Web Dispatcher [page 119]
23. If you chose to install an integrated Gateway within the ASCS instance, you configure the SAP Gateway [page 119].
24. You check section *Installation Follow-Up Activities* in the release-specific "Installation Guide" - also called "Master Guide" for SAP BW/4HANA - [page 11] for additional implementation and configuration steps.

Additional Application Server Instance

1. You check whether you can log on to the Application Server ABAP [page 95].
2. You ensure user security [page 113].
3. If required, you set up symbolic links for application servers [page 103].
4. You perform a full system backup [page 117].

6.2 Logging On to the Application Server ABAP

You need to check that you can log on to the Application Server ABAP with the standard users, given in the table below.

Prerequisites

- The SAP system is up and running.
- You have installed the SAP front-end software.

Context

> **i Note**
>
> Client 066 is no longer available in newly installed SAP systems based on SAP NetWeaver 7.5 or higher. For more information, see SAP Note 1749142.

> **i Note**
>
> Client 001 is no longer available in newly installed SAP systems based on SAP S/4HANA and SAP BW/4HANA.

User	User Name	Client
SAP system user	SAP*	000, 001, 066
	DDIC	000, 001

You access the application server ABAP using *SAP Logon*.

Procedure

1. Start *SAP Logon* on the host where you have installed the SAP front-end software as follows:
   - SAP GUI for **Windows**:
     - Windows Server 2012 (R2) and higher:
       1. Press Windows + Q, and enter *SAP Logon* in the *Search* field.
       2. Choose *SAP Logon*.
     - Windows Server 2008 (R2) and higher:
       Choose *Start* > *All Programs* > *SAP Front End* > *SAP Logon*.

- SAP GUI for **Java**:
  - Windows Server 2012 (R2) and higher:
    1. Press `Windows` + `Q`, and enter *SAP GUI for Java* `<Release>`
    2. Choose *SAP GUI for Java* `<Release>`.
  - Windows Server 2008 (R2):

    Choose *Start* > *All Programs* > *SAP Clients* > *SAP GUI for Java* `<Release>`.

  The *SAP Logon* appears.

  > **i Note**
  >
  > You can alternatively enter the command **`guilogon`** in the SAP GUI installation directory to start SAP GUI for Java.

2. Create a logon entry for the newly installed system in the *SAP Logon*.

   For more information about creating new logon entries, press `F1`.
3. When you have created the entry, log on as user `SAP*` or `DDIC`.

6.3 Performing Automated Initial Setup (Optional)

After the installation of a new SAP system you have to configure the system to enable its usage. For example, you have to install an SAP license, create logon groups, and configure the Transport Management System (TMS) and security settings. You can profit from an automated initial setup which executes these steps automatically.

Prerequisites

Note that the best point in time when you perform automated initial setup depends on the following:

- If you have run the installation using a stack configuration file (also called “up-to-date installation”), we recommend that you proceed as follows:
  1. Perform the **complete** installation and update process - that is the installation with Software Provisioning Manager **and** the update with Software Update Manager.
  2. Perform the automated initial setup.

  By running first the update and then the automated initial setup, you can profit from latest features and fixes in the initial setup configuration content.
  Background: As of Software Logistics Toolset 1.0 SPS12, the installation procedure with Software Provisioning Manager 1.0 SP07 and higher also includes basic configuration activities, such as initial basic configuration of transport management, which are a prerequisite for the subsequent maintenance process. In previous SP versions of Software Logistics Toolset 1.0, this prerequisite had to be fulfilled by running automated initial setup before the update process.
- If you have **not** run the installation using a stack configuration file (also called “up-to-date installation”), we recommend that you proceed as follows:
  1. Run automated initial setup directly after the installation, using the automation content provided with the system load.

2. Apply the Support Packages to benefit from the already performed initial configuration – for example, using the already configured Transport Management System.
3. Consider running the automated initial setup a second time, especially if you want to benefit from the latest improvements and fixes offered by the updated automation content provided by the applied Support Package.

For more information about automated initial setup, see the SAP Community Network at https://wiki.scn.sap.com/wiki/display/SL/Automated+Initial+Setup+of+ABAP-Based+Systems.

Procedure

1. Start the ABAP Task Manager by calling transaction STC01.
2. Choose task list `SAP_BASIS_SETUP_INITIAL_CONFIG`.
3. Select the tasks you want to get executed.

   For this, the task list offers sophisticated online documentation of the comprised activities.
4. Choose *Execute*.

   You are guided through the configuration steps where you can enter the required values.

Related Information

Installation Using a Stack Configuration File [page 25]
Installing the SAP License [page 99]
Configuring the Remote Connection to SAP Support [page 101]
Configuring the Change and Transport System [page 104]
Applying the Latest Kernel and Support Package Stacks [page 108]
Performing Post-Installation Steps for the ABAP Application Server [page 109]
Performing the Consistency Check [page 102]

6.4 Enabling SAP EarlyWatch Alert for ABAP Systems on SAP HANA

Context

After the installation of any new SAP ABAP system running on SAP HANA, you have to enable the SAP EarlyWatch Alert (EWA) and send corresponding data to SAP – either by using SAP Solution Manager for SAP EarlyWatch Alert or by performing the automated configuration described below.

The SAP EarlyWatch Alert identifies potential problems early, avoids bottlenecks, and monitors the performance of your ABAP and Java systems and your most important business processes regularly, automatically, and effectively. For more information, see http://support.sap.com/ewa.

If you have not enabled SAP EarlyWatch Alert in your SAP Solution Manager (for more information, see SAP Note 1257308), we provide an automated procedure using our automation framework ABAP Task Manager, which is already part of the ABAP system. The automation task list "Early Watch Alert to SAP Configuration" sets up a periodical EWA data collection and transfers this data to SAP in Service Data Control Center (SDCCN), when executed by the ABAP Task Manager.

The task list comprises the following detailed tasks:

1. Configuration of SAPOSS Connection (OSS1)
   Creates standard RFC SAPOSS if it does not yet exist.
2. SDCC_OSS Connection
   Creates an RFC SDCC_OSS by copying RFC SAPOSS and adds this RFC to the SDCCN RFC list if it does not yet exist. This RFC is used in SDCCN to communicate with the SAP backend.
3. SDCCN Activation
   Activates the SDCCN in the system if not yet activated. An hourly job /BDL/TASK_PROCESSOR is scheduled after the activation.
4. SDCCN Refresh Service Definition
   Gets the newest Service Definitions from SAP. The Service Definitions define the data to be collected for the EWA session.
5. SDCCN Schedule EWA to SAP
   Schedules a weekly EWA session (with session number 000Z*) in SDCCN, if no session exists.

Procedure

1. Download the archive `SAPK-74005INSTPI` or higher at:

   http://support.sap.com/installations *Software Downloads* > *Support Packages and Patches* > *By Alphabetical Index (A-Z)* > *S* > *ST-PI* > *ST-PI 740* > *SUPPORT PACKAGES*.
2. Apply the downloaded ST-PI archive via SPAM/SAINT.

   For more information, see http://help.sap.com/spmanager.
3. Start the ABAP Task Manager by calling transaction STC01.
4. Choose the task list /BDL/SDCCN_EWA_CONFIG.
5. Choose *Execute*.

   You are guided through the configuration steps.

6.5 Installing the SAP License

You must install a **permanent** SAP license. When you install your SAP system, a **temporary** license is automatically installed.

> ℹ Note
>
> You can automate this step by running task list `SAP_BASIS_SETUP_INITIAL_CONFIG` in the ABAP task manager for lifecycle management automation (transaction `STC01`). For more information, see Performing Automated Initial Setup (Optional) [page 96].

Context

> ⚠ Caution
>
> **Before** the temporary license expires, you must apply for a permanent license key from SAP.
>
> We recommend that you apply for a permanent license key as soon as possible after installing your system.

> ℹ Note
>
> The license key is bound to the hardware key of the host where the message server is running.
>
> **High Availabiltiy only:**
>
> In a high-availability system with Microsoft Failover Clustering, the message server is part of the ASCS instance that can run on a different cluster node. Therefore you must install the SAP license on both nodes.
>
> You have to do failover from the first cluster node where the ASCS instance is installed to the second cluster node. Use the hardware key of the second cluster node for the installation of the second SAP license.

For more information about SAP license keys and how to obtain them, see http://support.sap.com/licensekey.

Procedure

Install the SAP license as described in the SAP Online Documentation [page 13] at:

Solution Life Cycle Management > *SAP Licenses*

6.6 High Availability: Setting Up Licenses

You need to install a **permanent** license, which is determined by the hardware environment of the message server.

Prerequisites

The SAP system is up and running.

Context

SAP has implemented a license mechanism for switchover solutions and clustered environments. Your customer key is calculated on the basis of local information on the message server host. This is the host machine where the ABAP central services instance (ASCS instance) runs.

To be able to perform a switchover, the **temporary** license that is installed automatically with the ASCS instance is not sufficient. You first need to install a **permanent** license, which is determined by the hardware environment of the message server. Since SAP's high-availability (HA) solution stipulates two or more cluster nodes (host machines) where the message server is enabled to run, you have to order as many license keys [page 99] as you have cluster nodes.

When we receive confirmation from your vendor that you are implementing a switchover environment, we provide the required license keys for your system, one key for each machine.

Procedure

1. To find the hardware ID of the primary host, log on to any application server instance of the SAP system and call transaction `SLICENSE`.
2. Perform a switchover of the ABAP central services instance (ASCS) to another node in the cluster and repeat the previous step.

   Repeat this for all remaining nodes in the cluster.
3. To obtain the two license keys, enter the hardware IDs for each cluster node, where message server is enabled to run: http://support.sap.com/licensekey
4. To import the files containing the two licenses, log on to any application server instance of the SAP system and call transaction SLICENSE.
5. Perform a switchover of the ABAP central services instance (ASCS) to another node in the cluster and repeat the previous step.

   Repeat this for all remaining nodes in the cluster.

Results

The license is no longer a problem during switchover. This means you do **not** need to call `saplicense` in your switchover scripts.

6.7 Configuring the Remote Connection to SAP Support

SAP offers its customers access to support and a number of remote services such as the `Early Watch Service` or the `GoingLive Service`. Therefore, you have to set up a remote network connection to SAP.

> **i** Note
>
> You can automate this step by running task list `SAP_BASIS_SETUP_INITIAL_CONFIG` in the ABAP task manager for lifecycle management automation (transaction `STC01`). For more information, see Performing Automated Initial Setup (Optional) [page 96].

For more information, see SAP Support Portal at https://support.sap.com/remote-support.html.

6.8 Enabling Note Assistant to Apply Note Corrections

Use the Note Assistant to implement note corrections in your ABAP system.

Context

The Note Assistant allows you to automatically implement note corrections in your ABAP system. For more information about the Note Assistant, see https://support.sap.com/noteassistant and https://help.sap.com/netweaver > *SAP NetWeaver Platform* > `<Release>` > *Application Help* > *SAP NetWeaver Library: Function-Oriented View* > *Solution Life Cycle Management* > *Software Logistics* > *Note Assistant*.

Procedure

1. Follow the instructions in SAP Note 2836302 for enabling the Note Assistant for TCI and Digitally Signed SAP Notes.
2. Apply important SAP Notes for SAP_BASIS as described in SAP Note 1668882.

6.9 Performing the Consistency Check

We recommend that you check the consistency of the newly installed SAP ABAP system.

> **i** Note
>
> You can automate this step by running task list `SAP_BASIS_SETUP_INITIAL_CONFIG` in the ABAP task manager for lifecycle management automation (transaction `STC01`). For more information, see Performing Automated Initial Setup (Optional) [page 96].

Prerequisites

- If the installation finished successfully, your SAP system should be up and running. Otherwise, start it as described in Starting and Stopping the SAP System [page 132].
- You have logged on to the SAP system [page 95].

Context

When logging on to the system for the first time, you need to trigger a consistency check manually. The function is then called automatically whenever you start the system or an application server.

The following checks are performed:

- Completeness of installation
- Version compatibility between the SAP release and the operating system
  The initial consistency check determines whether:
  - The release number in the SAP kernel matches the release number defined in the database system
  - The character set specified in the SAP kernel matches the character set specified in the database system
  - Critical structure definitions that are defined in both the data dictionary and the SAP kernel are identical. The structures checked by this function include `SYST`, `T100`, `TSTC`, `TDCT` and `TFDIR`.
- Accessibility of the message server
- Availability of all work process types
- Information about the standalone enqueue server and the update service

Procedure

1. Perform a system check:

   Call transaction `SICK`.

   You should see the entry `SAP System Check | no errors reported`

2. Perform a database check:

   In the DBA Cockpit (transaction `DBACOCKPIT`), check for missing tables or indexes by choosing *Diagnostics* > *Missing Tables and Indexes*.

6.10 Creating Symbolic Links on Windows Server 2008 (R2) and Higher for Application Servers

Use

As of Windows Server 2008 (R2) you can create symbolic links for additional application server instances to simplify their administration.

In a high-availability system, you can additionally create symbolic links for the primary application server instance.

Symbolic links for application servers let you access from your local host the `SYS` directory that is located on the global host, without having to specify its UNC path. Instead you can browse, for example, in the Windows explorer on your local host to the `SYS` directory and its subdirectories on the global host.

Procedure

Windows Server 2012 (R2) and higher

To create symbolic links, perform the following steps:

1. Open a PowerShell command in elevated mode, and enter the following PowerShell command in a single line:
   `cmd /c mklink /d <localdisk>:\usr\sap\<SAPSID>\SYS \\<sapglobalhost>\sapmnt\<SAPSID>\SYS`

   > **i** Note
   >
   > Enter a blank before `\\<sapglobalhost>\...`.

2. If you use a central transport directory, you can also create the following link in PowerShell:
   `cmd /c mklink /d <localdisk>:\usr\sap\trans \\<trans_dir_host>\sapmnt\trans`

   > **i** Note
   >
   > The transport directory host `<trans_dir_host>` and the `<sapglobalhost>` can be identical.

> **⚠** Caution
>
> The command `mklink` creates the link without checking whether the link target exists or is accessible. If the link does not work after you created it, make sure that it exists and check the accessibility of the UNC path.

Windows Server 2008 (R2)

To create symbolic links, perform the following steps:

1. In the *Start* menu, right-click on *Command Prompt* and choose *Run as administrator*.
2. Enter the following command in a single line:
   `mklink /d <localdisk>:\usr\sap\<SAPSID>\SYS \\<sapglobalhost>\sapmnt\<SAPSID>\SYS`

   > **i Note**
   >
   > Enter a blank before `\\<sapglobalhost>\...`.

3. If you use a central transport directory, you can also create the following link:
   `mklink /d <localdisk>:\usr\sap\trans \\<trans_dir_host>\sapmnt\trans`

   > **i Note**
   >
   > The transport directory host `<trans_dir_host>` and the `<sapglobalhost>` can be identical.

> **⚠ Caution**
>
> The command `mklink` creates the link without checking whether the link target exists or can be accessed. If the link does not work after you created it, make sure that it exists and check that the UNC path can be accessed.

6.11 Configuring the Change and Transport System

You have to perform some steps in the Transport Management System to be able to use the Change and Transport System (TMS).

> **i Note**
>
> You can automate this step by running task list `SAP_BASIS_SETUP_INITIAL_CONFIG` in the ABAP task manager for lifecycle management automation (transaction `STC01`). For more information, see Performing Automated Initial Setup (Optional) [page 96].

> **i Note**
>
> `SAP_BASIS_SETUP_INITIAL_CONFIG` only covers the configuration of TMS as single system.

> **i Note**
>
> If you are using a stack configuration file (see Installation Using a Stack Configuration File (Optional) [page 25]) and chose *Run TMS Configuration (for Single System)* during the installation, you have already completed this step and and skip this section.

Context

Procedure

1. Call transaction `STMS` in the ABAP system to configure the domain controller in the Transport Management System (TMS).

   For more information, see the SAP Online Documentation [page 13] at:

   Solution Life Cycle Management > *Software Logistics* > *Change and Transport System* > *Change and Transport System – Overview* > *Basics of the Change and Transport System* > *Transport Management System – Concept*
2. In addition, you must configure the system change options.

   For more information, see the SAP Online Documentation [page 13] at:

   Solution Life Cycle Management > *Software Logistics* > *Change and Transport System* > *Transport Organizer (BC-CTS-ORG)* > *Requirements for Working with the Transport Organizer* > *Setting the System Change Option*
3. In a high-availability system with Microsoft Failover Clustering, you must configure **all** systems in the TMS landscape. To do this, implement SAP Note 943334.
4. Call transaction `SE38` to schedule a dispatcher job for transport programs by executing report `RDDIMPDP`.

   You schedule the transport dispatcher in the current client. This is equivalent to the execution of job `RDDNEWPP` in transaction `SE38`

6.12 Connecting the System to SAP Solution Manager

Here you find information about how to connect your newly installed SAP system to SAP Solution Manager.

Prerequisites

An SAP Solution Manager system must be available in your system landscape. For more information, see http://help.sap.com/solutionmanager.

Context

SAP Solution Manager gives you central access to tools, methods, and preconfigured content that you can use to evaluate and implement your solutions.

When your implementation is running, you can use SAP Solution Manager to manage, monitor, and update systems and business processes in your solution landscape, and also to set up and operate your own solution support.

Procedure

You connect a technical system to SAP Solution Manager by the following steps:

1. On the technical systems of your landscape, **data suppliers** are implemented, for example, with transaction `RZ70` for Application Server ABAP and with Visual Administrator for Application Server Java.

   For more information, see the SAP Solution Manager Application Help:

   - If your SAP Solution Manager release is 7.1:
     http://help.sap.com/solutionmanager ▶ *Version 7.1 SPS* `<No>` ▶ *Application Help (English)* ▶ *SAP Solution Manager Operations* ▶ *Managing System Landscape Information* ▶ *Managing Technical System Information* ▶ *Register Technical Systems Automatically by Data Suppliers*
   - If your SAP Solution Manager release is 7.2:
     http://help.sap.com/solutionmanager ▶ *Version 7.2 SPS* `<No>` ▶ *Application Help (English)* ▶ *Technical Infrastructures* ▶ *Landscape Management Database (LMDB)* ▶ *Managing Technical System Information* ▶ *Registering Technical Systems Automatically by Data Suppliers*
2. The data suppliers send information about the hardware and installed software to a central **System Landscape Directory (SLD)**. Updates are sent to the SLD as well.

   For more information, see the *Planning Guide - System Landscape Directory* in the SAP Community Network at System Landscape Directory (SLD) - Overview
3. From the SLD, this information is regularly synchronized with **SAP Solution Manager** where it is managed in the Landscape Management Database (LMDB).

   For more information, see the SAP Solution Manager Application Help:

   - If your SAP Solution Manager release is 7.1:
     http://help.sap.com/solutionmanager ▶ *Version 7.1 SPS* `<No>` ▶ *Application Help (English)* ▶ *SAP Solution Manager Operations* ▶ *Managing System Landscape Information* ▶ *Setting Up the Landscape Management Infrastructure* ▶ *Connecting LMDB to System Landscape Directory (SLD)*
   - If your SAP Solution Manager release is 7.2:
     http://help.sap.com/solutionmanager ▶ *Version 7.2 SPS* `<No>` ▶ *Application Help (English)* ▶ *Technical Infrastructures* ▶ *Landscape Management Database (LMDB)* ▶ *Setting Up the Landscape Management Infrastructure* ▶ *Connecting LMDB to System Landscape Directory (SLD)*
4. In the LMDB, you complete the information from the SLD manually.

   For more information, see the SAP Solution Manager Application Help:

   - If your SAP Solution Manager release is 7.1:
     Managing Technical System Information and *Managing Product System Information* at http://help.sap.com/solutionmanager ▶ *Version 7.1 SPS* `<No>` ▶ *Application Help (English)* ▶ *SAP Solution Manager Operations* ▶ *Managing System Landscape Information*

- If your SAP Solution Manager release is 7.2:
  http://help.sap.com/solutionmanager ▶ *Version 7.2 SPS <No>* ▶ *Application Help (English)* ▶ *Technical Infrastructures* ▶ *Landscape Management Database (LMDB)* ▶ *Managing Technical System Information* ▶

Next Steps

For more information, see the following pages in the SAP Community Network:

- System Landscape Directory (SLD) - Overview
- Documentation for Landscape Management Database - LMDB

6.13 Running Installer Option “Check and Adjust ABAP System”

Run installer option *Check and Adjust ABAP System* to apply some necessary configuration steps.

Procedure

1. Start the installer as described in Running the Installer [page 80].
2. On the Welcome screen, choose installer option ▶ *Generic Options* ▶ *SAP HANA Database* ▶ *Check and Adjust ABAP System* ▶
   Follow the instructions on the installer screens and enter the parameters for the ABAP system to be checked and adjusted.

   On the *Check Adjust SAP System* screen, select the required option:
   - *HDI_CHECK_ENABLE*
     If your SAP system is based on ABAP Platform 1809 or higher, running this option applies some necessary configuration for the HANA Deployment Infrastructure (HDI) content. If you do not run this option, updating the ABAP system using transaction SPAM might fail.
   - *REPAIR_PRIVILEGES*
     With this option you can check and recreate the privileges for the ABAP schema user.

6.14 Applying the Latest Kernel and Support Package Stacks

We strongly recommend that you apply the latest kernel and Support Package stacks before you start configuring your SAP system.

> **i Note**
>
> If you are using a stack configuration file (see Installation Using a Stack Configuration File (Optional) [page 25]), you already downloaded the `stack.xml` file and the delta archives using the Maintenance Optimizer in your SAP Solution Manager. If you then already called the Software Update Manager (SUM) from the installer and applied the Support Package Stacks after the installation had finished, you can skip this section.

Context

For more information about release and roadmap information for the kernel versions, and how this relates to SAP NetWeaver support packages - including important notes on downward compatibility and release dates - see SAP Note 1969546.

Procedure

- Download and apply the latest Kernel and Support Package stacks using the Software Update Manager (SUM) as described in the documentation *Updating SAP Systems Using Software Update Manager* `<Release>` available at https://support.sap.com/sltoolset *System Maintenance* *Software Update Manager (SUM) scenarios* *Software Update/Upgrade with SUM* `<Release>`
- If you want to update the kernel manually, proceed as described below:
  a. Log on as user `<sapsid>adm` to the hosts of the SAP system instances to be updated.
  b. Download the latest kernel for your operating system and database platform as described in SAP Note 19466.
  c. Back up the kernel directory that is specified by the profile parameter `DIR_CT_RUN`.
  d. Extract the `SAR` files of the kernel Support Packages of the target SP level to a temporary directory using the `SAPCAR` tool.
  e. Copy or move the extracted programs from the temporary directory to the local kernel directory.

6.15 Performing Post-Installation Steps for the ABAP Application Server

This section describes the post-installation steps you have to perform for the ABAP application server.

> **i** Note
>
> You can automate this step by running task list `SAP_BASIS_SETUP_INITIAL_CONFIG` in the ABAP task manager for lifecycle management automation (transaction `STC01`). For more information, see Performing Automated Initial Setup (Optional) [page 96].

Prerequisites

You have logged on to the ABAP application server as described in Logging On to the Application Server [page 95].

Context

You have to perform the following post-installation steps for the ABAP application server:

- Upload and set system profiles using transaction `RZ10`
- Create logon and RFC server groups using transactions `SMLG` and `RZ12`
- Create operation modes using transaction `RZ04`
- Schedule standard jobs using transaction `SM36`
- Configuration of SLD data supplier using transaction `RZ70`
- Perform load generation using transaction `SGEN`

For more information, see the appropriate sections below.

Procedure

- **Upload and Set System Profiles using Transaction RZ10**

  You upload system profiles, such as default profile and instance profile, from the file system into the database of the target system using transaction `RZ10`.

  For more information about how to maintain SAP system profiles, see the SAP Online Documentation [page 13] at:

  Application Server > *Application Server ABAP* > *Administration of Application Server ABAP* > *Monitoring and Administration Tools for Application Server ABAP* > *Configuration in the CCMS* > *Profiles* > *Maintaining Profiles / Profile Maintenance*

- **Create Logon and RFC Server Groups using Transactions SMLG and RZ12**

  You create the following:

  - Logon groups using transaction `SMLG`
  - RFC server groups using transaction `RZ12`

  Specify the following:

  - Name of the logon or RFC server group
  - Instance name (application server)
  - Group type attributes are optional

  If required, you create the RFC server group `parallel_generators`.
- **Create Operation Modes using Transaction RZ04**

  You check for existing operation modes and - if required - create a new operation mode using transaction `RZ04`.

  Specify the following:

  - Name of the operation mode
  - Short description
  - Optional: monitoring properties variant

  Select the corresponding checkbox to assign the operation mode to the following:

  - Time table (assignment only from 0-24 h)
  - Current application server instance
- **Schedule Standard Jobs using Transaction SM36**

  You schedule SAP standard jobs using transaction `SM36`.

  If a standard job is already scheduled, it is kept. Only missing jobs are scheduled.
- **Configure the SLD Data Supplier using Transaction RZ70**

  a. Make sure that the SLD and the SLD bridge (the receiving thread of the SLD, which runs on a Java EE engine) are running.
  b. Configure the System Landscape Directory (SLD) data supplier with default settings, using transaction `RZ70`.

  SLD configuration is a prerequisite for the connection of an SAP system to SAP Solution Manager.

  For more information, see Connecting the System to SAP Solution Manager [page 105]
- **Perform Load Generation using Transaction SGEN**

  You generate the ABAP loads using transaction `SGEN`. ABAP loads are platform-dependent programs that are generated during runtime and stored in database tables. Using transaction `SGEN` you can generate ABAP loads of a number of programs, function groups, classes, and so on.

  Choose one of the following generation modes:

  - Generate All Objects
    All existing objects of all software components are generated synchronously. Job `RSPARGENER8M` starts the generation directly after all ABAP objects have been prepared for generation and have been stored in table `GENSETC`. Be aware that this is a time-consuming process.

> **Note**
>
> Make sure that you have sufficient space available on your database. The generation of all existing objects requires around 2 - 9 GB of free space.

- Prepare All Objects for Generation
  All objects to be generated are prepared for generation and stored in table `GENSETM`. You can start the generation of these objects later with transaction `SGEN`. Choose this strategy if object generation is to be done outside the configuration task due to performance issues.

6.16 Installing Additional Languages and Performing Language Transport

This section describes how to install and transport additional languages.

> **Note**
>
> You do not have to perform these steps or at least some of these steps if you are using a stack configuration file (see Installation Using a Stack Configuration File (Optional) [page 25]) and processed the *Install Additional Languages* screen during the installation.

Context

If you have problems during the language installation, see SAP Note 2456868.

Procedure

1. Configure the language settings by using transaction `I18N` and choosing *I18N Customizing* > *I18N System Configuration* or by executing report `RSCPINST` directly.

   For more information, see SAP Note 42305.
2. Perform the language transport using transaction SMLT:

   > **Note**
   >
   > German is already available in the system. Do not transport it via SMLT.

   a. Classify the language.
   b. Schedule the language transport.
   c. Schedule the language supplementation.

Next Steps

> **i** Note
>
> You can also install additional languages later, but if you install any Support Packages in the meantime, you have to do one of the following:
>
> - Install the Support Packages again.
> - Use the report `RSTLAN_IMPORT_OCS` to extract the language-relevant information from each Support Package.

For information about the language transport, see the SAP Online Documentation [page 13] at:

Solution Life Cycle Management > *Software Logistics* > *Change and Transport System* > *Language Transport (BC-CTS-LAN)*

6.17 IP Multicast Configuration and Wake-Up Mechanism

The ABAP application server (AS ABAP) uses IP multicast datagrams with host local scope to wake up the internal processes (such as dispatcher, Gateway, internet communication manager, work processes) when dispatching requests.

The dispatcher checks during startup whether local IP multicast communication is working properly. You have to adjust the network configuration of AS ABAP as described in SAP Note1931675.

A new event-based wake-up mechanism is available that replaces the multicast mechanism. SAP recommends using this new mechanism in case of problems with multicast. For details on activating the new mechanism see SAP Note 2050408 to ensure that local IP multicast communication works properly.

6.18 Configuring the User Management

After the installation has completed, configure the user management of your SAP system.

Procedure

After the installation of your SAP system has finished, you must decide whether you want to do the following:

- Add the system to Central User Administration (CUA)
- Use Lightweight Directory Access Protocol (LDAP) synchronization

For more information, see the SAP Online Documentation [page 13] at:

Security > *Identity Management* > *Identity Management for System Landscapes* > *Integration of User Management in Your System Landscape* > *Adding an ABAP System to Your System Landscape*

6.19 Ensuring User Security

You need to ensure the security of the users that the installer created during the installation.

The tables below at the end of this section list the following users:

- Operating system users
- SAP system users

During the installation, the installer by default assigned the master password to all users created during the installation unless you specified other passwords.

> → Recommendation
>
> In all cases, the user ID and password are encoded only when transported across the network. Therefore, we recommend using encryption at the network layer, either by using the Secure Sockets Layer (SSL) protocol for HTTP connections, or Secure Network Communications (SNC) for the SAP protocols dialog and RFC.

> ⚠ Caution
>
> Make sure that you perform this procedure **before** the newly installed SAP system goes into production.

For the users listed below, take the precautions described in the relevant SAP security guide.

You can find the security guide in the *Security* section of the product page for your SAP product at https://help.sap.com/

Operating System and Database Users

After the installation, operating system users for SAP system, database, and SAP Host Agent are available as listed in the following table:

Operating System and Database Users

User Type	User	Comment
Operating system user	`<sapsid>adm`	SAP system administrator
	`SAPService<SAPSID>`	User to run the SAP system
SAP HANA database user	`SAP<SAPSID>`	SAP HANA database owner

SAP Host Agent User

User Type	User	Comment
Operating system user	`sapadm`	SAP Host Agent administrator is the user for central monitoring services. You do not need to change the password of this user after the installation. This user is for administration purposes only. You are not able to log on as `sapadm` as this user is locked.

SAP System Users

After the installation, ABAP system users are available. The following table shows these users with the SAP system clients in which they are available, together with recommendations on how you can ensure the security of these users.

> **i Note**
>
> Client 066 is no longer available in newly installed SAP systems based on SAP NetWeaver 7.5 or higher. For more information, see SAP Note 1749142.

> **i Note**
>
> Client 001 is no longer available in newly installed SAP systems based on SAP S/4HANA and SAP BW/4HANA.

SAP System Users

User	User Name	Comment
SAP system user	`SAP*`	User exists in SAP system client 000.
	`DDIC`	User exists in SAP system client 000.

6.20 Performing the Client Copy

To get a production client, you have to perform a copy of the SAP reference client.

Context

The installer creates ABAP client 000 during the installation.

Use client 000 as source client for the client copy.

Procedure

1. Maintain the new client with transaction `SCC4`.
2. Activate kernel user `SAP*`:
   a. Set the profile parameter `login/no_automatic_user_sapstar` to `0`.
   b. Restart the application server.
3. Log on to the new client with kernel user **`SAP*`** and password **`PASS`**.
4. Copy the client with transaction `SCCL` and profile `SAP_CUST`.
5. Check the log files with transaction `SCC3`.
6. Create the required users. These users must have at least the authorizations required for user administration and system administration. Create a user SAP* with all required authorizations for this user. If you want to have other users for system administration, you can also create user SAP* without authorizations.
7. Deactivate kernel user `SAP*`:
   a. Reset `login/no_automatic_user_sapstar` to `1`.
   b. Restart the application server.

Next Steps

For more information about the client copy and about how to perform it, see the SAP Online Documentation [page 13] at :

Application Server > *Application Server ABAP* > *Administration of Application Server ABAP* > *Change and Transport System* > *BC – Client Copy and Transport*

6.21 Installation or Upgrade of SAP HANA Studio

Here you find documentation about how to install or upgrade the SAP HANA Studio.

To install or upgrade SAP HANA studio, see the documentation *SAP HANA Studio Installation and Update Guide* at https://help.sap.com/viewer/p/SAP_HANA_PLATFORM ▸ *Installation and Upgrade* ▸.

6.22 Backing Up the SAP HANA Database

We recommend that you back up the SAP HANA database after the installation has completed.

Back up the SAP HANA database as described in section *SAP HANA Database Backup and Recovery* of the *SAP HANA Administration Guide*, which you can find here:

https://help.sap.com/viewer/p/SAP_HANA_PLATFORM ▸ *Administration* ▸

Alternatively, as of SAP HANA 2.0, you can use the SAP HANA cockpit to do so. For more information, see section *Backup and Recovery* of the documentation *SAP HANA Administration with SAP HANA Cockpit*, which you can find here:

https://help.sap.com/viewer/product/SAP_HANA_COCKPIT/ ▸ *Administration* ▸

> ℹ Note
>
> Make sure that you perform a “Complete Data Backup”.

6.23 Changing Keys for the Secure Storage

The secure storage in the file system and the secure storage in the database have been encrypted with a randomly generated individual encryption key or with a default key.

In the first case, you have made a backup of the individual key because you need this value in case of failure to recover the data.

No matter what you chose during installation, you can change the encryption key at any time using the respective maintenance tool.

> → Recommendation
>
> SAP recommends using an individual encryption key.

- For the secure storage in the file system, the key change is described in the SAP Online Documentation [page 13] at:
  ▸ *Security* ▸ *System Security* ▸ *System Security for SAP NetWeaver AS ABAP Only* ▸ *Secure Storage in the File System (AS ABAP)* ▸

- For the secure storage in the database, the key change is described in the SAP Online Documentation [page 13] at:
  Security > *System Security* > *System Security for SAP NetWeaver AS ABAP Only* > *Secure Storage (ABAP)* > *Key Management* > *Using Individual Encryption Keys* > *Generating Encryption Keys*

More Information

See also the entry *Individual Encryption Key for the Secure Storage* in table *SAP System Parameters* in SAP System Parameters [page 38].

6.24 Performing a Full System Backup

You must perform a full system backup, including the operating system disk, system state, and all other disks, after the configuration of your SAP system. If required, you can also perform a full system backup after the installation (recommended). In addition, we recommend you to regularly back up your database.

Prerequisites

- You are logged on as user `<sapsid>adm`.
- You have shut down the SAP system and database.

Procedure

For more information about backing up your SAP system on Windows, see the SAP Online Documentation [page 13] at:

Solution Life Cycle Management > *Backup and Recovery* > *Backing Up and Restoring your SAP System on Windows*

6.25 Logging on to the SAP Web Dispatcher Management Console

This section describes how to log on to the SAP Web Dispatcher.

Context

> **i** Note
>
> This step is only required if you chose to install an integrated SAP Web Dispatcher instance within the ASCS instance.

You must log on to the SAP Web Dispatcher Management Console to do the following:

- Check whether the SAP Web Dispatcher was installed successfully,
- Change the password of the `webadm` user,
- Access monitoring and administration tools.

Procedure

1. Open a web browser.
2. Enter the following URL, depending on whether you use HTTP or HTTPS:

   `http(s)://<Webdispatcher_Host>:<HTTP(S)_PORT>/sap/wdisp/admin/public/default.html`

   > Example
   >
   > **`https://plx282:44300/sap/wdisp/admin/public/default.html`**

3. Log on as user `webadm` with the password that you entered during the input phase of the installation.

   The *SAP Web Dispatcher Monitor* screen appears.
4. We recommend that you change the password of `webadm` immediately after the installation for security reasons.

   For more information, see the Web Dispatcher documentation in the SAP Online Documentation [page 13] at: *Application Help* > *Function-Oriented View* > *Application Server Infrastructure* > *Components of SAP NetWeaver Application Server* > *SAP Web Dispatcher* > *Administration of the SAP Web Dispatcher* > *Using the Web Administration Interface* > *Area menu* > *Section "HTTP Handler"*

Related Information

ASCS Instance with Integrated SAP Web Dispatcher [page 19]

6.26 SAP Web Dispatcher Configuration (Optional)

After installing SAP Web Dispatcher, you must configure it to be able to use it.

> **i Note**
>
> This step is only required if you chose to install an integrated SAP Web Dispatcher instance within the ASCS instance.

You can find the configuration information in the SAP Online Documentation [page 13] at:

Application Server > *Application Server Infrastructure* > *Components of SAP NetWeaver Application Server* > *SAP Web Dispatcher*

Related Information

ASCS Instance with Integrated SAP Web Dispatcher [page 19]

6.27 Gateway Configuration (Optional)

You have to configure the gateway to be able to use it.

> **i Note**
>
> This step is only relevant if you installed a gateway integrated in the ASCS instance. For more information, see ASCS Instance with Integrated Gateway [page 21].

You can find all relevant configuration information in the gateway documentation in the SAP Online Documentation [page 13] at:

Application Server > *Application Server Infrastructure* > *Components of SAP NetWeaver Application Server* > *Gateway*

Related Information

ASCS Instance with Integrated Gateway [page 21]

7 Additional Information

The following sections provide additional information about **optional** preparation, installation, and post-installation tasks.

There is also a section describing how to delete an SAP system.

7.1 Integration of LDAP Directory Services

This section explains the benefits of using the SAP system with the Lightweight Directory Access Protocol (LDAP) directory and gives an overview of the configuration steps required to use an SAP system with the directory.

LDAP defines a standard protocol for accessing directory services, which is supported by various directory products such as Microsoft Active Directory, and `OpenLDAP slapd`. Using directory services enables important information in a corporate network to be stored centrally on a server. The advantage of storing information centrally for the entire network is that you only have to maintain data once, which avoids redundancy and inconsistency.

If an LDAP directory is available in your corporate network, you can configure the SAP system to use this feature. For example, a correctly configured SAP system can read information from the directory and also store information there.

> **i** Note
>
> The SAP system can interact with the Active Directory using the LDAP protocol, which defines:
>
> - The communication protocol between the SAP system and the directory
> - How data in the directory is structured, accessed, or modified
>
> If a directory other than the Active Directory also supports the LDAP protocol, the SAP system can take advantage of the information stored there. For example, if there is an LDAP directory on a UNIX or Windows server, you can configure the SAP system to use the information available there. In the following text, directories other than the Active Directory that implement the LDAP protocol are called **generic LDAP directories**.

This section does **not** provide information about the use of LDAP directories with the LDAP Connector. For more information about using and configuring the LDAP Connector for an ABAP system, see the SAP Online Documentation [page 13] at:

Security > *Identity Management* > *User and Role Administration of Application Server ABAP* > *Configuration of User and Role Administration* > *Directory Services* > *LDAP Connector*

Prerequisites

You can only configure the SAP system for Active Directory services or other LDAP directories if these are **already available** on the network. As of Windows 2000 or higher, the Active Directory is automatically available on all domain controllers. A generic LDAP directory is an additional component that you have to install separately on a UNIX or Windows server.

Features

In the SAP environment, you can exploit the information stored in an Active Directory or generic LDAP directory by using:

- SAP Logon
- The SAP Microsoft Management Console (SAP MMC)
  For more information about the automatic registration of SAP components in LDAP directories and the benefits of using it in SAP Logon and SAP MMC, see the documentation *SAP System Information in Directory Services* at:
  https://archive.sap.com/documents/docs/DOC-14384
- The SAP Management Console (SAP MC)

SAP Logon

Instead of using a fixed list of systems and message servers, you can configure SAP Logon in the `sapmsg.ini` configuration file to find SAP systems and their message servers from the directory. If you configure SAP logon to use the LDAP directory, it queries the directory each time *Server* or *Group* selection is chosen to fetch up-to-date information on available SAP systems.

To use LDAP operation mode, check that the `sapmsg.ini` file contains the following:

```
[Address]

Mode=LDAPdirectory

LDAPserver=

LDAPnode=

LDAPoptions=
```

Distinguish the following cases:

- If you use an Active Directory, you must set **`LDAPoptions="DirType=NT5ADS"`**. For more information, see the SAP system profile parameter `ldap/options`.
- You must specify the directory servers (for example, `LDAPserver=pcintel6 p24709`) if one of the following is true:
  - The client is not located in the same domain forest as the Active Directory
  - The operating system does not have a directory service client (Windows NT and Windows 9X without installed *dsclient*).

  For more information, see the SAP system profile parameter `ldap/servers`.
- For other directory services, you can use *LDAPnode* to specify the distinguished name of the SAP root node. For more information, see the SAP system profile parameter `ldap/saproot`.

SAP MMC

The SAP MMC is a graphical user interface (GUI) for administering and monitoring SAP systems from a central location. It is automatically set up when you install an SAP system on Windows. If the SAP system has been prepared correctly, the SAP MMC presents and analyzes system information that it gathers from various sources, including the Active Directory.

Integrating the Active Directory as a source of information has advantages for the SAP MMC. It can read system information straight from the directory that automatically registers changes to the system landscape. As a result, up-to-date information about all SAP application servers, their status, and parameter settings is always available in the SAP MMC.

If you need to administer distributed systems, we especially recommend that you use the SAP MMC together with Active Directory services. You can keep track of significant events in all of the systems from a single SAP MMC interface. You do not need to manually register changes in the system configuration. Instead, such changes are automatically updated in the directory and subsequently reflected in the SAP MMC.

If your SAP system is part of a heterogeneous SAP system landscape that comprises systems or instances both on Unix and Windows operating systems, you can also use the SAP MMC for operating and monitoring the instances running on Unix.

SAP MC

You can also use the SAP Management Console (SAP MC) for administering and monitoring SAP systems from a central location.

For more information about the SAP MC and about how to configure it to access LDAP directories, see the documentation *SAP Management Console* in the SAP Online Documentation [page 13] at:

Solution Life Cycle Management > *SAP Management Console*

Configuration Tasks for LDAP Directories

This section describes the configuration tasks for the Active Directory or other (generic) LDAP directories.

- **Configuration Tasks for Active Directory**
  To enable an SAP system to use the features offered by the Active Directory, you have to configure the Active Directory so that it can store SAP system data.
  To prepare the directory, you use the installer to automatically:
  - Extend the Active Directory schema to include the SAP-specific data types
  - Create the domain accounts required to enable the SAP system to access and modify the Active Directory. These are the group `SAP_LDAP` and the user `sapldap`.
  - Create the root container where information related to SAP is stored
  - Control access to the container for SAP data by giving members of the `SAP_LDAP` group permission to read and write to the directory

  You do this by running the installer [page 80] and choosing: *Generic Installation Options* > `<Database>` > *Preparations* > *LDAP Registration* > *Active Directory Configuration*.

  > **i** Note
  >
  > You have to configure the directory server only **once**. Then all SAP systems that need to register in this directory server can use this setup.

- **Configuration Tasks for Generic LDAP Directories**

To configure other LDAP directories, refer to the documentation of your directory vendor. The installer software contains schema extensions for directory servers Netscape/iPlanet (`ldregns4.txt`, `ldregns5.txt`) and OpenLDAP slapd (`ldregslapd.schema`). Both files are located in the directory `\<Unpack_Directory>\COMMON\ADS`. After you have applied the schema extension, you need to create a root container to store the SAP-related information and create a directory user that the SAP application server can use to write information to the directory.
For more information about how to set up a Netscape/iPlanet directory server, see the documentation *SAP System Information in Directory Services* at:
https://archive.sap.com/documents/docs/DOC-14384

- **Enabling the SAP System LDAP Registration**
  Once you have correctly configured your directory server, you can enable the LDAP registration of the SAP system by setting some profile parameters in the default profile.
  To do this, run the installer [page 80] **once** for your system and choose:
  Generic Installation Options > `<Database>` > *Preparations* > *LDAP Registration* > *LDAP Support*
  If you use a directory server other than Microsoft Active Directory and/or non-Windows application servers, you have to store the directory user and password information by using `ldappasswd pf=<any_instance_profile>`. The information is encrypted for storage in `DIR_GLOBAL` and is therefore valid for all application servers. After restarting all application servers and start services, the system is registered in your directory server. The registration protocols of the components are `dev_ldap*`. The registration is updated every time a component starts.

7.2 SAP Directories

This section describes the directories that are available in an SAP system.

If you want to install a high-availability system, see also Directories in a Microsoft Failover Cluster Configuration [page 159].

The installer automatically creates the following directories during the installation:

- `\usr\sap`
  This directory is created on the:
  - **Global** host and **shared** with the network share `sapmnt`
    On global hosts, the `\usr\sap` directory contains general SAP software, global, and local (instance-specific) data.
    For this, the installer creates the global directory `usr\sap\<SAPSID>\SYS`, which physically exists only once for each SAP system. It consists of the following subdirectories:
    - `global` – contains globally shared data
    - `profile` – contains the profiles for all instances
    - `exe` – contains executable replication directory for all instances and platforms
  - **Local** host and **shared** with the name `saploc`.
    In a high availability system this directory is located on a local disk. You have at least two disk drives with a `usr\sap` directory structure.
    On local hosts, the `\usr\sap\<SAPSID>\<Instance_Name>` directory contains copies of the SAP software and local (instance-specific) data.

> **i Note**
>
> - Since SAP traces for the instance are created in `\usr\sap`, make sure that there is sufficient space available in this directory. Changes in SAP profiles can also affect the disk space.
> - The executables on the local host are replicated from those on the global host every time the local instance is started. The SAP copy program `sapcpe` compares the binaries in the `<Platform>` directory on the global host and the binaries in the `exe` directory on the application server. If the binaries in the `exe` directory are older than those in the `<Platform>` directory, `sapcpe` replaces them with the newer version of the global host.

Other application servers access the global data using the Universal Naming Convention (UNC) path `\\<SAPGLOBALHOST>\sapmnt`. The SAP programs access their instance-specific data with the UNC path `\\<SAPLOCALHOST>\saploc`. If the UNC path points to a local directory, the local path (and not the UNC path) is used to access the directory.
The parameters `SAPGLOBALHOST` and `SAPLOCALHOST` have the **same** values on the global host.

> **i Note**
>
> Windows Server 2008 (R2) and higher:
>
> In a high-availability system, file shares pointing to directories on shared disks are only visible or can be accessed with the virtual host name of the cluster group the shared disks belong to.

- `\usr\sap\trans`
  The transport directory contains SAP software for the transport of objects between SAP systems. The installer by default creates it on the `SAPGLOBALHOST`.
  If you want to have it created on another host, or if you want to use an already existing transport host of your SAP system landscape, you can specify another host during the installation. In this case, you have to prepare that host to allow the new SAP system to use it as transport host. For more information, see Preparing the SAP System Transport Host [page 59].

Directory Structure

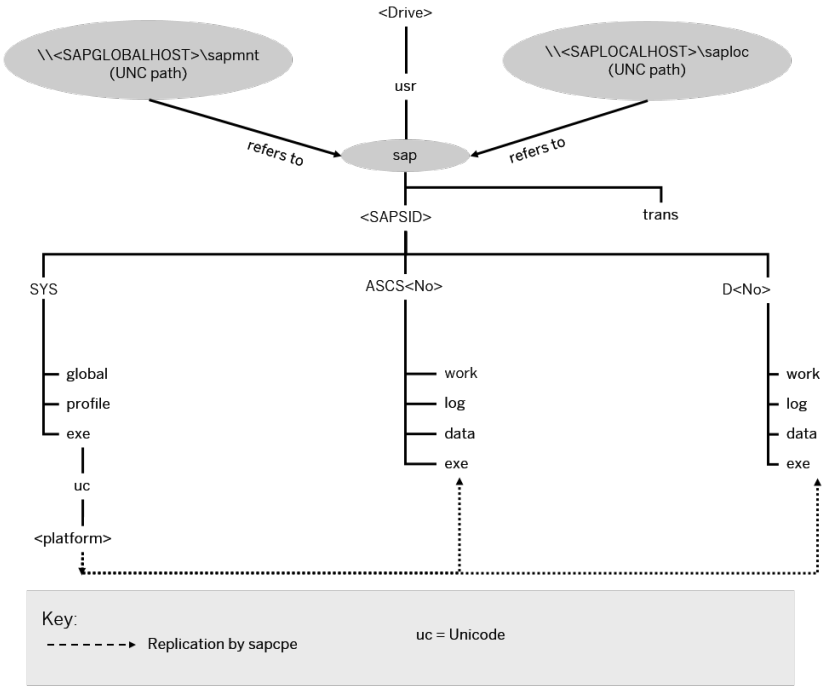
The following figures show how the physical directory `\usr\sap` is shared on the global host in a standard and in a distributed system. In both cases, the UNC paths are used as follows:

- `\\<SAPGLOBALHOST>\sapmnt` to access global directories
- `\\<SAPLOCALHOST>\saploc` to access local instance-specific data

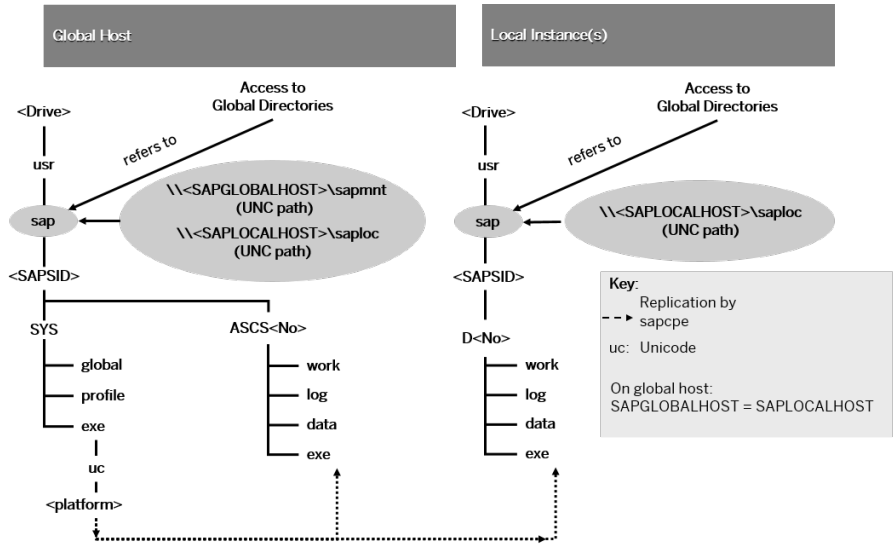
> **i Note**
>
> There are the following instance names available in an SAP system:
>
> ABAP central services instance: `ASCS<Instance_Number>`
>
> Primary application server instance: `D<Instance_Number>`
>
> Additional application server instance: `D<Instance_Number>`
>
> **High Availability only:** Enqueue Replication Server instance: `ERS<Instance_Number>`

Directory Structure on the Global Host in a Standard (Central) ABAP System

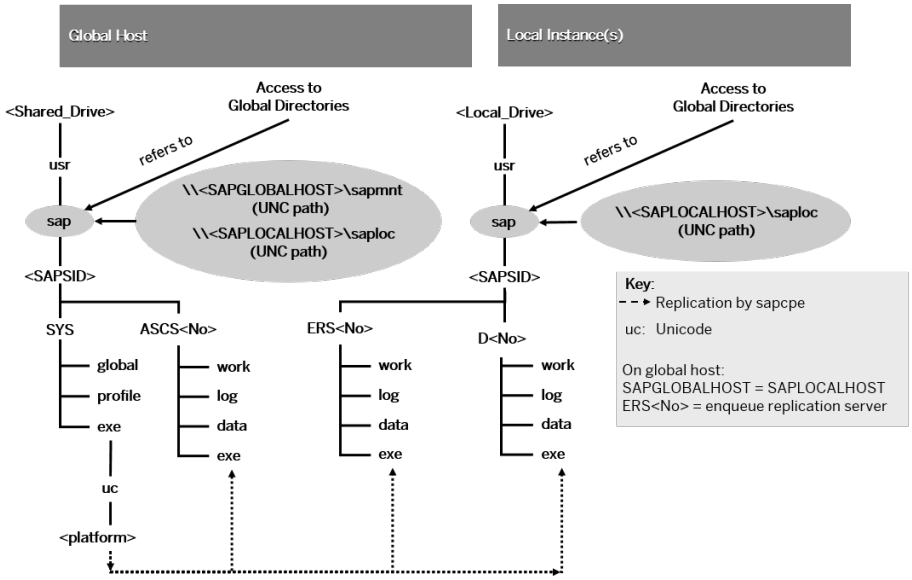
On the global host in a standard (central) ABAP system , all application server instances, including the primary application server instance, are named `D<Instance_Number>`.



Directory Structure on the Global Host in a Standard (Central) ABAP System



Directory Structure for a Distributed ABAP System



Directory Structure for a High-Availability ABAP System

7.3 Performing a Domain Installation Without Being a Domain Administrator

You normally perform a domain installation of the SAP system with a user who is a member of the domain `Admins` group, as described in Required User Authorization for Running the Installer [page 57]. If for any reason, the account used for the installation is not a member of the domain `Admins` group, you can perform the installation with a domain user who is a member of the local `Administrators` group. In this case, the domain administrator has to prepare the system appropriately for you. The domain administrator can perform the following steps either using the installer or manually:

1. Create the new global group `SAP_<SAPSID>_GlobalAdmin`.
2. Create the two new SAP system users `<sapsid>adm` and `SAPService<SAPSID>`.
3. Add the users `<sapsid>adm` and `SAPService<SAPSID>` to the newly created group `SAP_<SAPSID>_GlobalAdmin`.

> ### i Note
>
> The installer creates the operating system user for the SAP Host Agent by default as a local user that is not a member of the local `Administrators` group. If you want to create this user manually as a domain user, you must perform the following steps:
>
> Creating the SAP Host Agent User and Group Manually
>
> 1. Create the new global group `SAP_SAP_GlobalAdmin`.
> 2. Create the SAP system user `sapadm`.
> 3. Add the user `sapadm` to the newly created group `SAP_SAP_GlobalAdmin`.
>
> However, for security reasons we strongly recommend you to create this user as a local user.

Prerequisites

- You must be domain administrator to perform the required steps.
- You must have installed the feature *Remote Server Administration Tools* as follows:
  - Windows Server 2012 (R2) and higher:
    Open PowerShell in elevated mode, and enter the following command:
    `add-windowsfeature RSAT-ADDS`
  - Windows Server 2008 (R2):
    1. Choose *Start* > *Administrative Tools* > *Server Manager*.
    2. In the *Server Manager* window, select *Features*.
    3. Select the feature *Remote Server Administration Tools* > *Role Administration Tools* > *Active Directory Domain Services Tools*.

Procedure

Creating the Required Users and Groups Using the Installer

On the host where the SAP system is to be installed, the domain administrator starts the installer as described in Running the Installer [page 80] and chooses *Generic Installation Options* > *<Database>* > *Preparations* > *Operating System Users and Groups* to have the group and users created automatically.

Creating the Required Users and Groups Manually

> **Note**
>
> To create the users and groups specific to the SAP Host Agent, you must follow the procedure below, and replace the users and groups with those for the SAP Host Agent.

Creating the New Global Group SAP_<SAPSID>_GlobalAdmin

Perform the following steps:

- Windows Server 2012 (R2) and higher:
  Open PowerShell in elevated mode, and enter the following command:
  `net group SAP_<SAPSID>_GlobalAdmin /add /domain`
- Windows Server 2008 (R2):
  1. Log on as domain administrator.
  2. Start the *Active Directory Users and Computers Console* by choosing:
     Start > *Control Panel* > *Administrative Tools* > *Active Directory Users and Computers*.
  3. Right-click *Users* in *Tree*, and choose *New* > *Group*.
  4. Enter the following:
     Group name: `SAP_<SAPSID>_GlobalAdmin`
  5. Select the following:
     1. *Group scope*: Global
     2. *Group type*: Security
  6. Choose *OK*.

Creating the New SAP System Users <sapsid>adm and SAPService<SAPSID>

Perform the following steps:

- Windows Server 2012 (R2) and higher:
  1. Open PowerShell in elevated mode.
  2. Create the `<sapsid>adm` user with the following command:
     `net user <sapsid>adm <Password> /add /domain`
  3. Create the `SAPService<SAPSID>` user with the following command:
     `net user SAPService<SAPSID> <Password> /add /domain`
- Windows Server 2008 (R2):
  1. In *Active Directory Users and Computers Console*, right-click *Users* in *Tree* and choose:
     New > *User*
  2. Enter the following:

Field	Input for <sapsid>adm	Input for SAPService<SAPSID>
First name:	None	None
Initials:	None	None
Last name:	None	None
Full name:	`<sapsid>adm`	`SAPService<SAPSID>`
User logon name:	`<sapsid>adm`	`SAPService<SAPSID>`

  3. Choose *Next* and enter the following:
     Password: **`<Password>`**
     Confirm password: **`<Password>`**
  4. Select *Password never expires*.

     > **i Note**
     >
     > Make sure that no other options are selected.

  5. Choose *Next* > *Finish*.

Adding the Manually Created Users to Groups

> **i Note**
>
> To add the users specific to the SAP Host Agent to the relevant groups, you must follow the procedure below, and replace the users and groups with those for the SAP Host Agent.

Adding the <sapsid>adm User to the SAP_<SAPSID>_GlobalAdmin Group

- Windows Server 2012 (R2) and higher:
  Open PowerShell in elevated mode, and enter the following command:
  `net group SAP_<SAPSID>_GlobalAdmin <sapsid>adm /add /domain`
- Windows Server 2008 (R2):
  1. In the *Users* folder, double-click the newly created user account `<sapsid>adm` in the list on the right.

2. Choose *Member* > *Add*.
3. Select the new *SAP_<SAPSID>_GlobalAdmin* group and choose *Add* to add it to the list.

> **i Note**
>
> By default, the user is also a member of the `Domain Users` group.

4. Choose *OK* twice.

Adding the SAPService<SAPSID> User to the SAP_<SAPSID>_GlobalAdmin Group

- Windows Server 2012 (R2) and higher:
  Open PowerShell in elevated mode, and enter the following command:
  `net group SAP_<SAPSID>_GlobalAdmin SAPService<SAPSID> /add /domain`
- Windows Server 2008 (R2):
  1. In the *Users* folder, double-click the newly created user account *SAPService<SAPSID>* in the list on the right.
  2. Choose *Member* > *Add*.
  3. Select the new *SAP_<SAPSID>_GlobalAdmin* group.
  4. Choose *Add* to add it to the list, and then *OK*.
  5. Choose *OK* to close *SAPService<SAPSID>Properties*.
  6. Close the *Active Directory Users and Computers Management Console*.

7.4 Checking and Changing the Paging File Settings on Windows Server 2012 (R2) and Higher

Use

This section describes how to check and change the paging file size on Windows Server 2012 (R2) and higher with PowerShell.

The PowerShell commands also work in previous Windows versions where PowerShell is available.

> **i Note**
>
> Some paging file operations require a reboot of the server to activate the changes you made. Wmi-commands do not indicate whether a reboot is required or not. Therefore, we recommend rebooting your system every time you change the paging file settings with PowerShell.

Prerequisites

Always start the PowerShell in elevated mode (run as administrator).

Procedure

Checking the Size of a Paging File

1. Start Windows PowerShell.
2. Check whether the default value *Automatic manage pagefile size for all devices* is activated.

   > **i** Note
   >
   > We do not support automatically managed page file sizes.

   To check this, enter the following command:
   `(Get-WmiObject Win32_Pagefile) -eq $null`
   If *Automatic manage pagefile size for all devices* is enabled, the output value is *True*.
   If necessary, disable *Automatic manage pagefile size for all devices* with the following command:
   ```
   $sys = Get-WmiObject Win32_Computersystem -EnableAllPrivileges
   $sys.AutomaticManagedPagefile = $false
   $sys.put()
   ```
3. Check the size of the paging files with the following command:
   `Get-WmiObject WIN32_Pagefile | Select-Object Name, InitialSize, MaximumSize, FileSize`
   The output looks like the following:

   ```
   Name                 InitialSize
   MaximumSize              FileSize
   ----                 -----------
   -----------              --------
   C:\pagefile.sys                0                     0
   41943040000
   E:\pagefile.sys            40000                 80000
   41943040000
   ```

   In this example, in the first line, the *InitialSize* and *MaximumSize* values of a paging file are 0, which means that the paging file size is *system managed* (not recommended).
   In the second line, the paging file size has a minimum and a maximum size (recommended).

Changing the Size of a Single Paging File

Changing the *InitialSize* and *MaximumSize* values of a paging file to a size other than 0, will automatically switch off *system managed size*.

In the following example, we change the size of the paging file on *C:* to the *InitialSize* of 40 GB and to the *MaximumSize* of 80 GB.

Use the following commands in a PowerShell:

```
$Pagefile = Get-WmiObject Win32_PagefileSetting | Where-Object {$_.name -eq "C:\pagefile.sys"}

$Pagefile.InitialSize = 40000

$Pagefile.MaximumSize = 80000

$Pagefile.put()
```

Typically, you choose the same value for *InitialSize* and *MaximumSize*.

> **i Note**
>
> The sum of all paging files *InitialSize* values must be equal to or higher than the value recommended for your SAP system.

Creating a Second Paging File on Another Disk

You might want to create a second or additional paging files to improve system performance, or if your disk does not have enough space.

To do so, enter the following commands in a PowerShell:

```
$Pagefile = Get-WmiObject Win32_PagefileSetting

$pagefile.Name = "E:\pagefile.sys"

$pagefile.Caption = "E:\pagefile.sys"

$pagefile.Description = "'pagefile.sys' @ E:\"

$pagefile.SettingID ="pagefile.sys @ E:"

$pagefile.InitialSize = 80000

$pagefile.MaximumSize = 80000

$pagefile.put()
```

Deleting a Paging File on a Specific Device

To delete a paging file, enter the following commands in a PowerShell:

```
$pagefile = Get-WmiObject Win32_PagefileSetting | Where-Object {$_.name -eq "E:
\pagefile.sys"}

$pagefile.delete()
```

7.5 Starting and Stopping the SAP System

You use this procedure to start and stop the SAP system or single instances after the installation with the **SAP Microsoft Management Console (SAP MMC)** or SAPControl.

> **⚠ Caution**
>
> Note the following restrictions about starting and stopping the database instance with the SAP MMC or SAPControl:
>
> In a high-availability system, you can neither start nor stop the database instance with the SAP MMC or SAPControl. For more information, see Starting and Stopping the SAP System in an HA Configuration [page 174].

Prerequisites

The user who wants to start and stop the SAP system with the SAP MMC, must be a member of the local administrators group.

Procedure

Starting and Stopping the SAP System with the SAP MMC

With the SAP MMC, you can start or stop installed SAP instances – except the database instance – locally on the host that you are logged on to. If the SAP MMC is configured for central system administration, you can start or stop the entire system from a single host.

> **i Note**
>
> - To stop the database instance you must use the relevant database administration tools.
> - You can also start and stop a UNIX system with the SAP MMC.
> - The SAP MMC is not available on Server Core for Windows Server 2012 (R2) and higher.

For more information about the SAP MMC, see the SAP Online Documentation [page 13] at:

Solution Life Cycle Management > *SAP Microsoft Management Console: Windows*

To start or stop the SAP system – except the database instance – with the SAP MMC, perform the following steps:

1. Start the SAP MMC on the SAP system host.
2. Right-click the SAP system node and choose *Start* or *Stop*.
   All SAP instances listed under the system node start or stop in the correct order.
3. To stop the database instance, use the relevant database administration tools.
4. If the SAP system is installed on multiple hosts, you have the following options to start or stop your system:
   - You start or stop the SAP instances – except the database instance – using the SAP MMC on each host.
   - You add the remote instances to the SAP MMC configuration to start or stop all instances from a single SAP MMC.
     To do so, do one of the following:
     - You configure the SAP MMC manually. For more information, see *Changing the Configuration of the SAP MMC* in the SAP MMC documentation.
     - You use the automatic LDAP registration. For more information, see *Configuring SAP MMC for Active Directory Services* in the SAP MMC documentation.

Starting and Stopping the SAP System with SAPControl

To start or stop the SAP system – except the database instance – with SAPControl (`sapcontrol.exe`), perform the following steps:

- To start or stop the complete SAP system with SAPControl, open a PowerShell in elevated mode, and enter the following command:

```
sapcontrol -prot PIPE -nr <Instance_Number> -function StartSystem
sapcontrol -prot PIPE -nr <Instance_Number> -function StopSystem
```

- To start or stop a single instance with SAPControl, open a PowerShell in elevated mode, and enter the following command:
  ```
  sapcontrol -prot PIPE -nr <Instance_Number> -function Start
  sapcontrol -prot PIPE -nr <Instance_Number> -function Stop
  ```
- To stop the database instance, use the relevant database administration tools.

7.6 Configuring the Windows Server Firewall on Windows Server 2008 (R2) and higher (Optional)

Use

As of Windows Server 2008 (R2), the firewall is configured to allow only a small set of Windows-specific inbound IP connections.

Therefore, we recommend that you do **not** turn on the Windows firewall after you have installed your SAP system. Instead, we recommend that you secure network access to your SAP system with the physical firewall or a router Access Control List (ACL) within your datacenter.

If, for some reason, you want to use the Windows Server firewall, you have to configure the Windows firewall and define a set of *Inbound Rules* for the TCP/IP port numbers that are used by your system. Otherwise, your SAP system might not operate.

For more information about the port numbers used, see the documentation *TCP/IP Ports of All SAP Products* at:https://help.sap.com/viewer/ports.

Ports listed with the default value *Not active* in this document are not configured.

> ⚠ Caution
>
> In a high-availability system, you have to configure the firewall on **all** cluster nodes.

Prerequisites

You turn on the disabled firewall [page 54] as follows:

- Windows Server 2012 (R2) and higher:
  Open Windows PowerShell in elevated mode, and enter the following command:
  ```
  Set-NetFirewallProfile "public","domain","private" -enabled true
  ```
- Windows Server 2008 (R2):
  1. Choose *Start* > *Administrative Tools* > *Windows Firewall with Advanced Security*.
  2. Right-click *Windows Firewall with Advanced Security* and choose *Properties*.
  3. Set the *Firewall state* to *On*.

Procedure

This procedure provides an example how to set *Inbound Rules* for the ports of an ABAP server that was installed with the following settings:

Instance number	00
Port type	TCP
Ports	3200, 3300, 4800, 8000, 3600, 50013, 1433, 1434

- Windows Server 2012 (R2) and higher:
  Open Windows PowerShell in elevated mode, and enter the following command:
  `New-NetFirewallRule -DisplayName "SAP ABAP Server 00" -Direction Inbound -Protocol TCP -LocalPort 3200,3300,4800,8000,3600,50013,1433,1434 -Action Allow`
- Windows Server 2008 (R2):
  1. Choose *Start* > *Administrative Tools* > *Windows Firewall with Advanced Security*.
  2. Right-click *Inbound Rules* and choose *New Rule*.
     The *New Inbound Rule Wizard* starts.
  3. For *Rule Type*, select *Port* and choose *Next*.
  4. For *Protocol and Ports*, select port type *TCP* or *UDP* depending on the port type used.
     Note that the final two digits of the port number correspond to the instance number.
  5. Choose *Next*.
  6. For *Action*, select *Allow the connection*, and choose *Next*.
  7. For *Profile*, keep *Domain*, *Private* and *Public* selected, and choose *Next*.
     For more information, see the link *Learn more about profiles* on this screen.
  8. Enter the *Name*, for example `SAP ABAP Server 00`, and *Description* for the new rule.
  9. Choose *Next*.
  10. Choose *Finish* to save the rule.
      The new inbound rule appears in the *Inbound Rules* list. To modify the settings, right-click on the rule and choose *Properties*.

> **i Note**
>
> If you want to use, for example, a different IP scope for port 50013, which is used by the connection SAP Start Service – SAP Management Console, you can restrict the IP access to a small number of SAP administrators. Then delete this port from the SAP ABAP Server 00 rule and create a new rule for port 50013 with a more restrictive scope.

7.7 SAP System Security on Windows

In a standard SAP system installation, the installer automatically performs all steps relevant for security. Although the installer makes sure that the system is protected against unauthorized access, you must still check that no security breaches can occur.

For central and straightforward administration of the SAP system, you have to install distributed SAP systems with multiple application servers in a Windows **domain**. This section describes the user accounts and groups that the installer creates during a domain installation and shows how these are related to the SAP directories.

User Accounts

The installer creates the following accounts for SAP system administration:

User account	Description
`<sapsid>adm`	This is the SAP system administrator account that enables interactive administration of the system.
`SAPService<SAPSID>`	This is the user account that is required to start the SAP system. It has the local user right to log on as a service. The advantage of the additional `SAPService<SAPSID>` account is that it does not allow interactive logon, which prevents abuse of the account. Therefore, you do not need to set an expiration date for the password and you do not have to set the option *user must change password at next logon*.
`sapadm`	This is the user for the SAP Host Agent. By default it is a local user and not a member of the local `Administrators` group. You can change this user into a domain user on the *Parameter Summary* screen. For security reasons, however, SAP strongly recommends to create this user as a local user. The SAP Host Agent contains all of the required elements for centrally monitoring any host with the Alert Monitor or the SAP NetWeaver Administrator.

Domain and Local Groups

The only function of a domain group is to group users at the domain level so that they can be placed in the appropriate local groups.

Only local groups are created and maintained on each local host. A local group can only be given permissions and rights to the system where it is located. The system is part of a particular domain, and the local group can contain users and domain (global) groups from this domain.

During a domain installation, the installer creates the following domain and local groups:

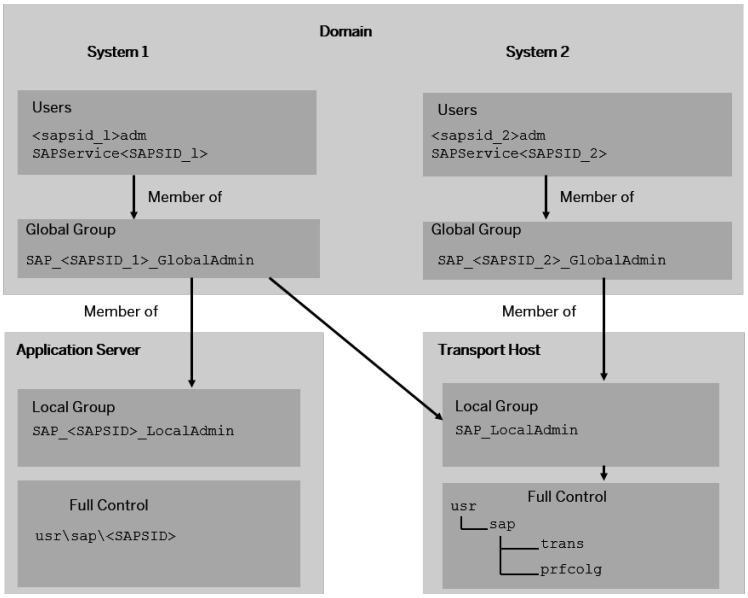
Group	Description
`SAP_<SAPSID>_GlobalAdmin`	This domain (global) group is a domain-level SAP administration group for organizing SAP system administrators.
`SAP_SAP_GlobalAdmin`	This domain group for the SAP Host Agent is only created if you create the SAP Host Agent user `sapadm` as a domain user.
`SAP_<SAPSID>_LocalAdmin`	This local group is created on each host.
`SAP_SAP_LocalAdmin`	If you create the SAP Host Agent user as domain user, the group `SAP_SAP_LocalAdmin` is also created.

Group	Description
`SAP_LocalAdmin`	This local group is created on all hosts, but is particularly important for the transport host. Members of the group have full control over the transport directory (`\usr\sap\trans`) that allows transports to take place between systems.

SAP Directories

The installer protects the SAP directories under `\usr\sap\<SAPSID>` by only granting the group `SAP_<SAPSID>_LocalAdmin` full control over these directories.

The following graphic illustrates the users and groups that are created by the installer for the `<sapsid>adm` and `SAPService<SAPSID>` users in a system infrastructure consisting of two SAP systems.



User Groups and Accounts

> ### Note
>
> An access control list (ACL) controls access to SAP system objects. For maximum security in the SAP system, only the following are members of **all** SAP system object ACLs:
>
> - Local group `SAP_<SAPSID>_LocalAdmin`
> - Group `Administrators`
> - User `SYSTEM`

More Information

Automatic Creation of Accounts and Groups [page 138]

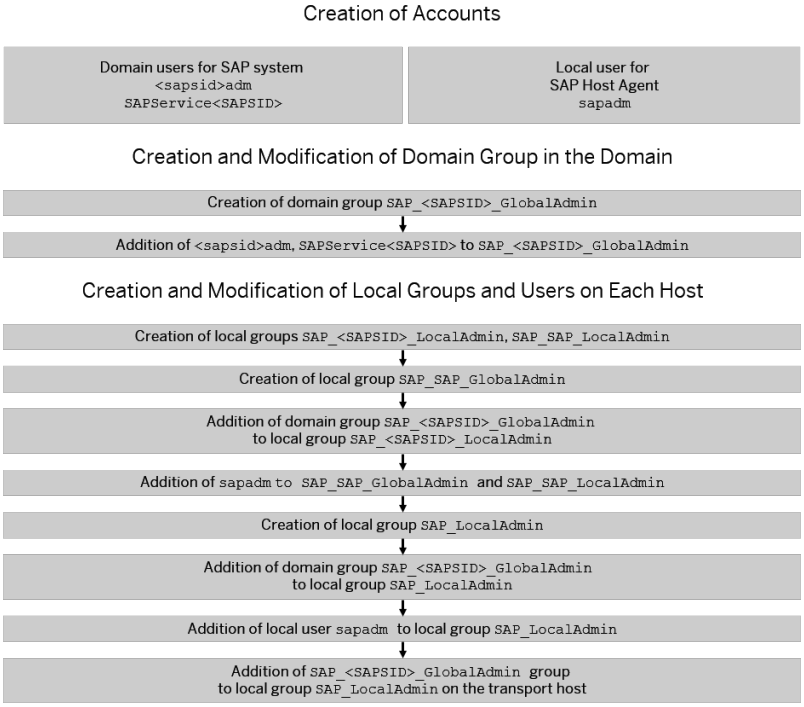
7.8 Automatic Creation of Accounts and Groups

The installer automatically creates the accounts and groups required for the secure operation of the SAP system with Windows during the installation, as described in SAP System Security on Windows [page 135].

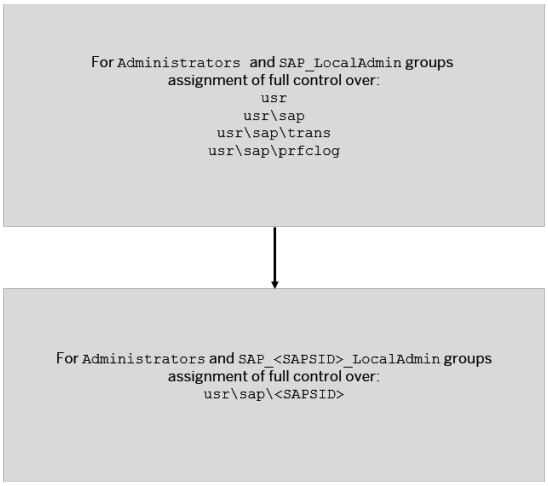
Features

The following figures show the steps that the installer performs to create the users and groups and assign the required rights to SAP directories.

The first figure shows the users that are created during a domain installation, with the SAP Host Agent operating system users being local users.



Creating Users and Groups



Assigning Rights to SAP Directories

7.9 Deleting an SAP System or Single Instances

This section describes how to delete a complete SAP system or single SAP instances with the *Uninstall* option of the installer.

Prerequisites

- You have installed your SAP system with standard SAP tools according to the installation documentation.
- You are logged on with a user account that has the required authorization to run the installer and the SAP system. For more information, see Required User Authorization for Running the Installer [page 57].

  > ⚠ Caution
  >
  > Do **not** use the `<sapsid>adm` user to delete the SAP system.

- Make sure that the SAP system, or single instance, or standalone engine, or optional standalone unit to be deleted is down and that you are not logged on as one of the SAP system users. Also check that all SAP-related processes are stopped. If there is a lock on one of the SAP system objects, the uninstall fails.

  > i Note
  >
  > You do not have to stop the SAP Host Agent. The SAP Host Agent is stopped automatically during the uninstall process.

- When starting the uninstall, make sure that there are no SAP system user sessions still open.

Context

Note the following when deleting an SAP system or single instances:

- You cannot delete an SAP system remotely.
- If you delete network-wide users, groups or service entries in an environment with Network Information System (NIS), other SAP installations might also be affected. Make sure that the users, groups, and service entries to be deleted are no longer required.
- During the uninstall process, all file systems and subdirectories of the selected SAP system or single instance are deleted. Before you start uninstalling, check that you have saved a copy of all files and directories that you want to keep to a secure location.
- The uninstall process is designed to remove as much as possible of the SAP system to be deleted. If an item cannot be removed, a message informs you that you have to remove this item manually. You can do this either at once or after the uninstall process has finished. As soon as you confirm the message, the uninstall process continues.
- If you uninstall an SAP instance and you plan to install another SAP instance with the same System ID, first reboot the Windows host to clear all user cached information. For more information, see SAP Note 2296310.

Procedure

1. Start the installer as described in Running the Installer [page 80].
2. On the *Welcome* screen, choose:

   Generic Installation Options > `<Database>` > *Uninstall* > *Uninstall SAP Systems or Single Instances*
3. Follow the instructions on the installer screens to delete a complete SAP system or single instances.

   > **i Note**
   >
   > To find more information on each parameter during the *Define Parameters* phase, position the cursor on the required parameter input field , and choose either `F1` or the *HELP* tab. Then the available help text is displayed in the *HELP* tab.

   The following table provides information about deleting a complete system or single instances with the installer.

Deletion of	Remarks
Standard system	You can delete a standard system (where all instances except the database instance reside on the same host) in one installer run.

Deletion of	Remarks
Distributed or high-availability system	If you want to delete a distributed or high-availability system, you have to run the installer to delete the required instances **locally** on each of the hosts belonging to the SAP system in the following sequence: **⚠ Caution** Only select checkbox *Uninstall all instances of the SAP system from this host* when removing the last remaining instance of the SAP system. Otherwise the contents of mounted global directories under `\\<sapglobalhost>\<sapmnt>\<SAPSID>\`, such as instance profiles and kernel executables, are also deleted. 1. Additional application server instances, if there are any 2. Primary application server instance If the installer stops responding while trying to delete the primary application server instance, close the installer with *Cancel* and *Exit*. Log off and log on again. To complete the uninstall process of the primary application server instance, restart the installer. 3. Database instance Do **not** delete the SAP HANA database instance. However, you can delete the database clients and the database users on the SAP application servers. 4. ABAP Central services instance (ASCS)
Additional application server	If you want to delete additional application server instances of an existing SAP system, you have to run the installer to delete them **locally** on each additional application server instance host.
Standalone SAP Host Agent	The SAP Host Agent is automatically uninstalled from a host together with the last remaining SAP system instance. If you want to uninstall a **standalone** SAP Host Agent, deselect *Profiles Available* and select *Uninstall Standalone SAP Host Agent* on the *General SAP System Parameters* screen.

4. When you have finished, delete the relevant directory structure on the global host.
5. Delete the local user group `SAP_<SAPSID>_LocalAdmin` manually as follows:
   - Windows Server 2012 (R2) and higher:
     Open a PowerShell in elevated mode and enter the following command:
     `net localgroup SAP_<SAPSID>_LocalAdmin /delete`
   - Windows Server 2008 (R2):
     1. Choose *Start* > *Programs* > *Administrative Tools* > *Computer Management*.
     2. Choose *Local Users and Groups* > *Groups*.
     3. Right-click the local group `SAP_<SAPSID>_LocalAdmin` and choose *Delete*.
6. If required, you can delete the directory `\usr\sap\trans` and its contents manually.

   The installer does not delete `\usr\sap\trans` because it might be shared.

7. To remove obsolete SLD data, see the following document: https://wiki.scn.sap.com/wiki/display/SL/More+on+System+Landscape+Directory *How-to Manage House-Cleaning in the System Landscape Directory - Duplicate System Entries*

8 High Availability with Microsoft Failover Clustering

You can install a high-availability SAP system with *Microsoft Failover Clustering*. The Failover Clustering software improves the availability of the system and protects it against failure and unplanned downtime, enabling 24-hour operation, 365 days a year.

With high availability, you enable critical system components, known as “Single Points of Failure (SPOFs)”, to be automatically switched from one machine to the other, if hardware or software problems arise on one machine. With the help of this switchover – or failover – the system can continue functioning.

Apart from enabling failover when hardware problems occur, you can also use Failover Clustering to avoid downtime when you perform essential system maintenance. If you need to maintain one host (failover cluster node), you can deliberately switch the cluster resources to the other host (failover cluster node) and temporarily operate it there while maintenance is in progress. When maintenance work is finished, you can easily move the resources back to their original node and continue operating them there.

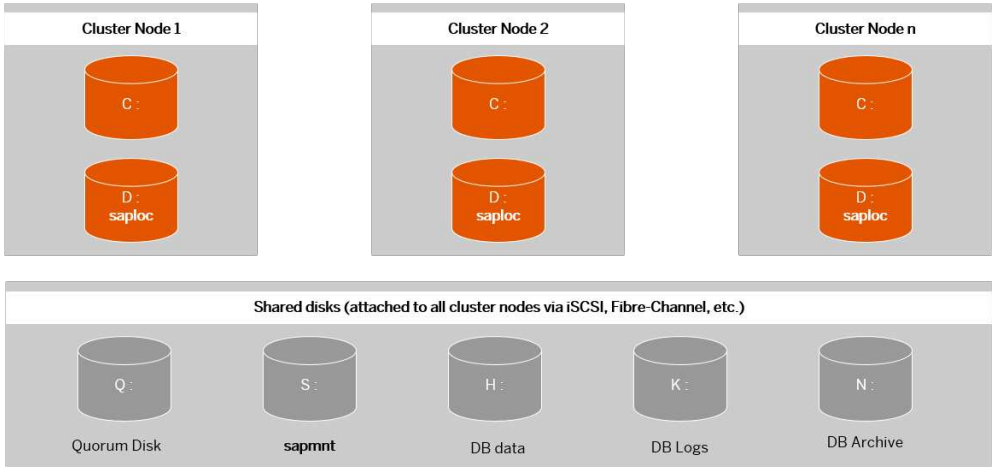
When you are setting up the SAP system with Microsoft Failover Clustering, you combine standard installation steps, described earlier in this documentation, with cluster-specific steps, described here.

You have the following options to install a high-availability SAP system with Microsoft Failover Clustering:

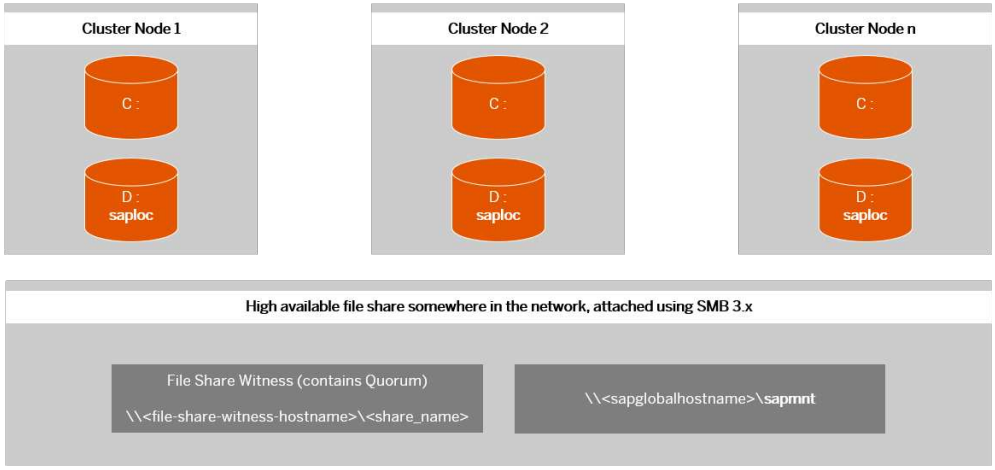
- You install the SAP related parts (for example: ASCS instance, additional standalone Gateways, Web Dispatcher instance, etc.) in **one** Microsoft Failover Cluster.
- You install the SAP related parts (for example: ASCS instance, additional standalone Gateways, Web Dispatcher instance, etc.) in **two** Microsoft Failover Clusters.

You have the following options to install a Microsoft Failover Cluster:

- CSD (Cluster Shared Disks)
  - A Failover Cluster which contains shared disks.
    A database can be optionally installed in this Cluster in its own cluster group.
- FSC (File Share Cluster)
  - A Failover Cluster which does not contain shared disks and uses a remote file share instead.
    A database cannot be installed in this cluster because databases need shared disks. One exception: MS SQL using “AlwaysOn” option.
- > **i** Note
  >
  > The user starting the installer must have full access rights on the file share `\\<sapglobalhost>\sapmnt`.



Landscape of a Cluster using Shared Disks



Landscape of a File Share Cluster

You have the following options to install the database instance with a high-availability SAP system:

- You install the database instance on a different host or cluster on either the same or a different operating system.
- You use third-party high-availability solutions to improve the availability of your database instance.

Important Information

To install a new SAP system with Microsoft Failover Clustering, you have to perform a number of extra steps specially required for the cluster and configure the SAP system so that it can take advantage of the cluster functionality:

- Since the correct configuration of network addresses is absolutely essential for the cluster to function properly, you have to perform a number of additional steps that are necessary to set up and check address resolution.
- Since the cluster hardware has at least two nodes that have access to all local and shared storage devices, you have to install some components on all nodes and pay attention to special rules for distributing components to local disks, shared disks, or external file shares.

- You have to install and configure the ASCS instance to run on two cluster nodes in one Microsoft Failover Cluster.

> **i** Note
>
> If you have an existing SAP system and plan to migrate to a failover cluster with new hardware, you install the SAP system using a **system copy**.
>
> For more information about the system copy, see the *System Copy Guide* for your SAP system at:
>
> http://support.sap.com/sltoolset *System Provisioning* *System Copy Option*
>
> The system copy guide does **not** include the cluster-specific information, which is described here.

Terminology

- In this documentation the hosts in a Microsoft Failover Cluster are referred to as first cluster node and additional cluster node(s):
  - The **first** cluster node is the cluster node where you perform the general installation of an SAP system, for example where the database or ASCS instance is to be installed.
  - The **additional** cluster node is the node where you configure the already installed SAP instances to run in Microsoft Failover Clustering.
- As of Windows Server 2008, there are the following terminology changes for a cluster configuration:
  - The cluster feature is called *Failover Clustering*. You might still find the previous terminology *Microsoft Cluster Service* and abbreviation *MSCS* in some sections of this guide.
  - *Cluster groups* are called *services and applications* (Windows Server 2008 (R2)), or *roles* (Windows Server 2012 (R2) and higher).
    In some sections we are continuing to use the old term. In this case, “cluster group” also means “service and application”, or “role”.
  - The *Cluster Administrator* is called *Failover Cluster Manager*.

8.1 Checklist for a High-Availability System

This section includes the steps that you have to perform for your SAP system using Microsoft Failover Clustering. Detailed information about the steps is available in the relevant section.

Planning

1. You check that you have completed the same planning activities [page 24] as for a non-HA system, including the hardware and software requirements [page 27].
2. You decide how to set up your SAP system components in an HA configuration [page 147].
3. You decide how to distribute SAP system components to disks for HA [page 157].

4. You read Directories in an HA Configuration [page 159].
5. You read IP Addresses in an HA Configuration [page 160].
6. You obtain IP addresses for HA [page 163].

> **i Note**
>
> The user starting the installer must have full access rights on the file share `\\<sapglobalhost>\sapmnt`.

Preparation

1. You check that you have completed the same preparations [page 52] as for a non-HA system.
2. To make sure that all preparation steps have been correctly performed, check that the storage resources are available to all cluster nodes. If you want to run the CSD option, check if you can move the disk resources from one cluster node to another so that they are accessible from a single node at any time. If you want to run the FSC option, check if the external file share is accessible by your installation user from all cluster nodes.

Installation

1. You make sure that:
   1. You are logged on as domain administrator or as a domain user who is a local administrator on all cluster nodes, unless otherwise specified.

      > **i Note**
      >
      > When starting SWPM with a domain user who has Domain Admin rights:
      >
      > In Failover Cluster configurations, make sure that the account of the cluster (<clustername>$) has full rights in the OU (Organizational Unit) on which your Domain administrator configures the SAP users and the SAP group.
      >
      > If these rights are missing, SWPM will try to add the cluster network name resource to the SAP cluster group. However, because the cluster itself has no rights to add the related computer object (CNO) to the OU, SWPM will stop and show the error message `<access denied>`.

   2. You do **not** use the user `<sapsid>adm` unless specified.
   3. If you are prompted during the installation process, log off and log on again.
2. You configure the first cluster node [page 166].
3. You run the installer on the first cluster node to install the database instance [page 168].
4. You configure the additional cluster node [page 169].
5. You install the primary application server instance [page 170].
6. You install at least one additional application server instance [page 171].

Post-Installation

1. You install the permanent SAP licenses on all cluster nodes.
2. You perform the post-installation checks for the enqueue replication server.
3. You perform the same post-installation steps [page 93] as for a non-HA system.

Additional Information

- Moving Cluster Groups, or Services and Applications, or Roles [page 172]
- Starting and Stopping the SAP System in a HA Configuration [page 174].

8.2 Planning

The following sections provide information about how to plan the installation of the SAP system for Microsoft Failover Clustering. For a complete list of all steps, see section *Planning* in the Installation Checklist for a High-Availability System [page 145].

8.2.1 System Configuration with Microsoft Failover Clustering

The following chapters provide information about the configuration of your SAP system with Microsoft Failover Clustering. It describes the components you have to install for an SAP system running in a Microsoft Failover Cluster, and how to distribute them on the specific host. For more information, see:

- SAP System Components in a Microsoft Failover Cluster [page 148]
- Enqueue Replication Server in a Microsoft Failover Cluster [page 155]

8.2.1.1 SAP System Components in a Microsoft Failover Cluster

In a Microsoft Failover Cluster configuration, you have the following mandatory components for your SAP system:

SAP System Components in an Failover Cluster Configuration

Component	Number of Components per SAP System	Single Point of Failure
ASCS instance (message services and enqueue services)	1	yes
Application server instance (primary application server, additional application server)	1-<n>	no

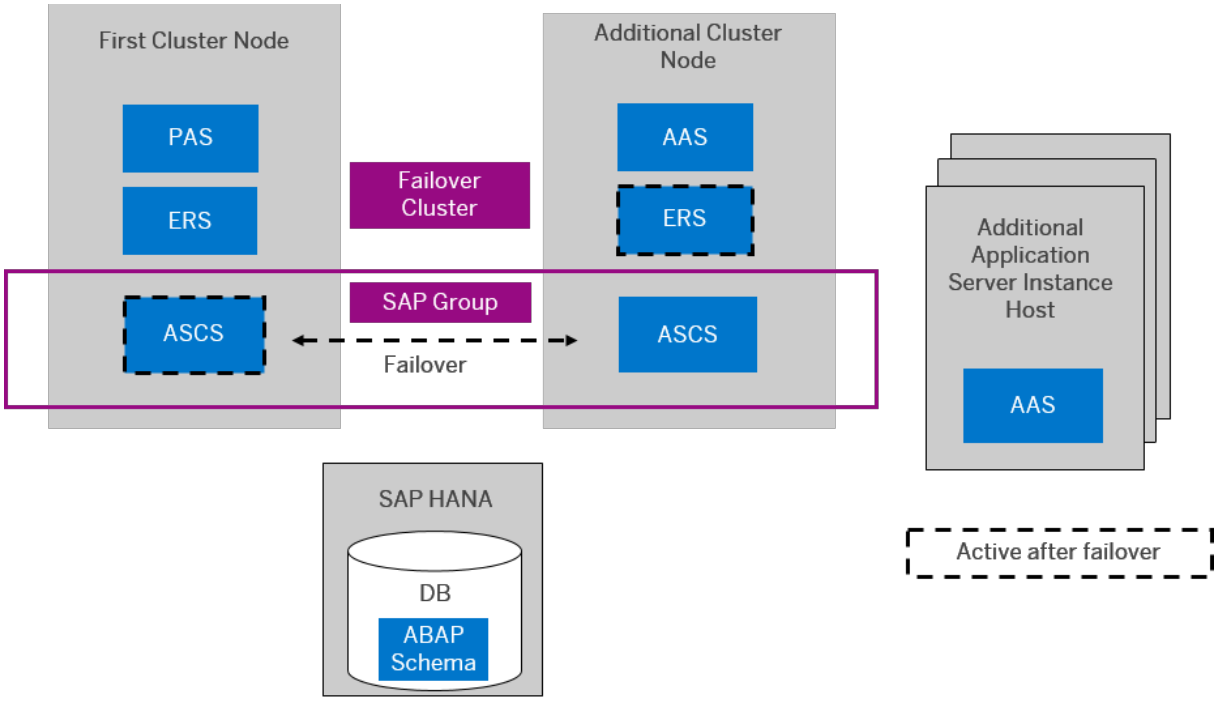
- To protect the SPOFs (ASCS instance and database instance), you have to use Microsoft Failover Clustering.
  If a hardware or software problem occurs on the first cluster node, the clustered ASCS instance automatically fails over to another node.
  If you need to maintain the cluster node where the ASCS instance is running, you can switch this instance to another node. When maintenance work is finished, you move the ASCS instance back to the original node.
- To protect system components that are non-SPOFs, for example application servers, you have to install them as multiple components. In this case, you must install at least two application servers (the primary application server instance and one additional application server instance) on two different hosts. You have the following options:
  - You install the primary application server and the additional application server instance on the cluster nodes of a Microsoft Failover Cluster. You install them on a **local** disk or external file share. Any additional application server instances are installed on hosts outside of the Microsoft failover cluster.
    If you have to maintain a cluster node, you have to stop the primary application server or the additional application server instance on that node. When you have finished maintenance, you restart the instances.

    > **i Note**
    >
    > If you install the primary application server and the additional application server instance on the cluster nodes, you must perform the hardware sizing for the failover cluster host, as in this case the application server is always running on this host. This increases system load and might impact performance.
    >
    > Note that, as usual in a failover cluster setup, the ASCS instance also switch to run on the failover cluster host in the event of failover, which temporarily also increases system load.
  - You install the primary application server and all additional application server instances on hosts, which are not part of a Microsoft Failover Cluster.

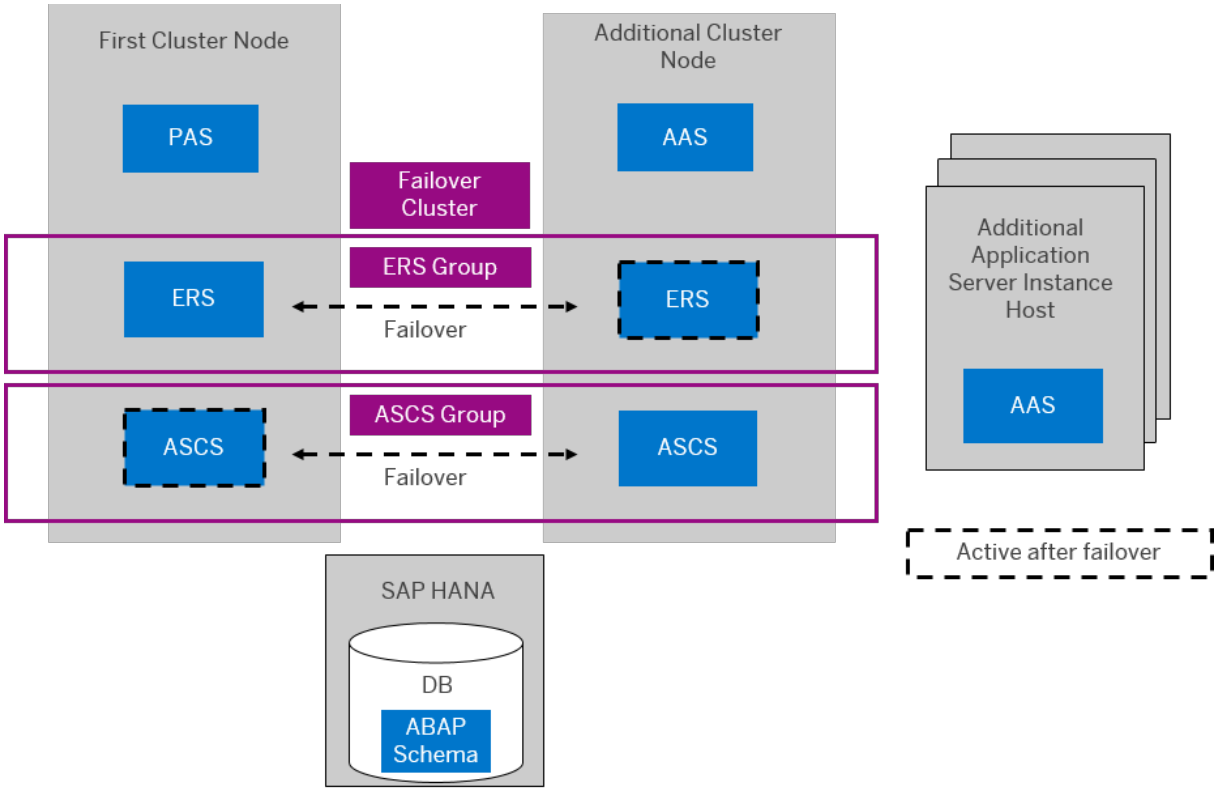
SAP System Components in One Microsoft Failover Cluster

The following figures show examples for the installation of SPOFs and non-SPOFs of an SAP system in one Microsoft Failover Cluster with two nodes.

The first figure shows an Microsoft Failover Cluster configuration where the non-SPOFs components (primary application server instance, additional application server instance) are installed locally on the cluster nodes. Any additional application server instances are installed outside the Microsoft Failover Cluster on separate hosts.

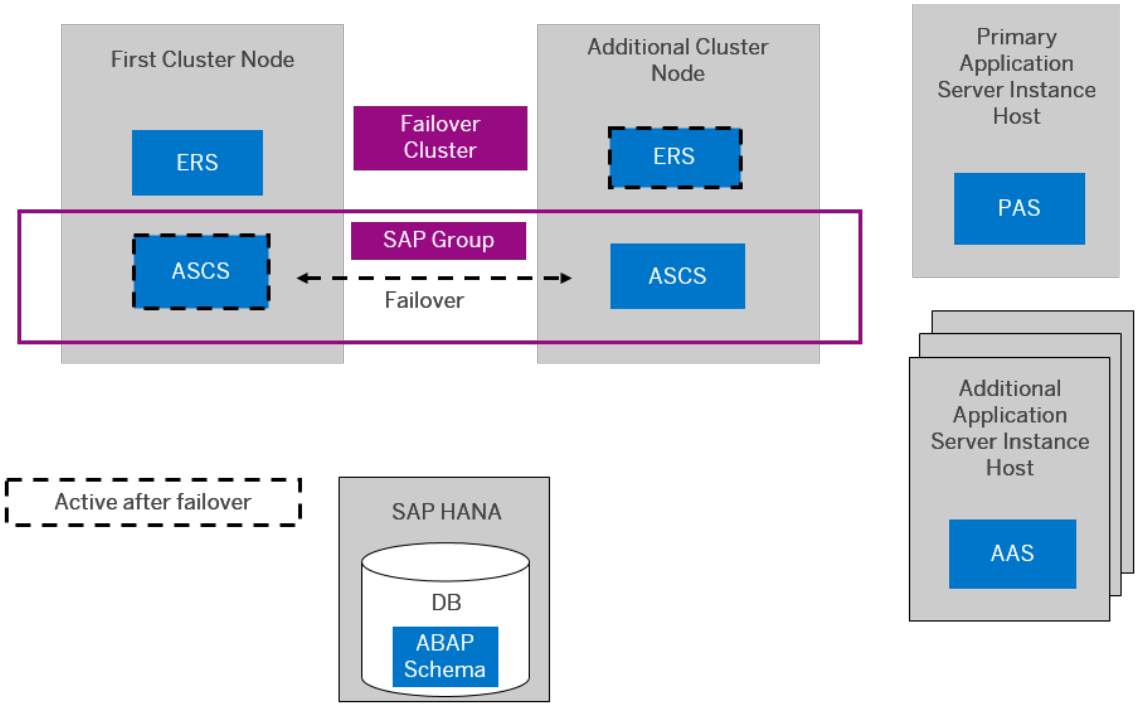


ABAP System Based on SAP BW/4HANA 1.0 SR1



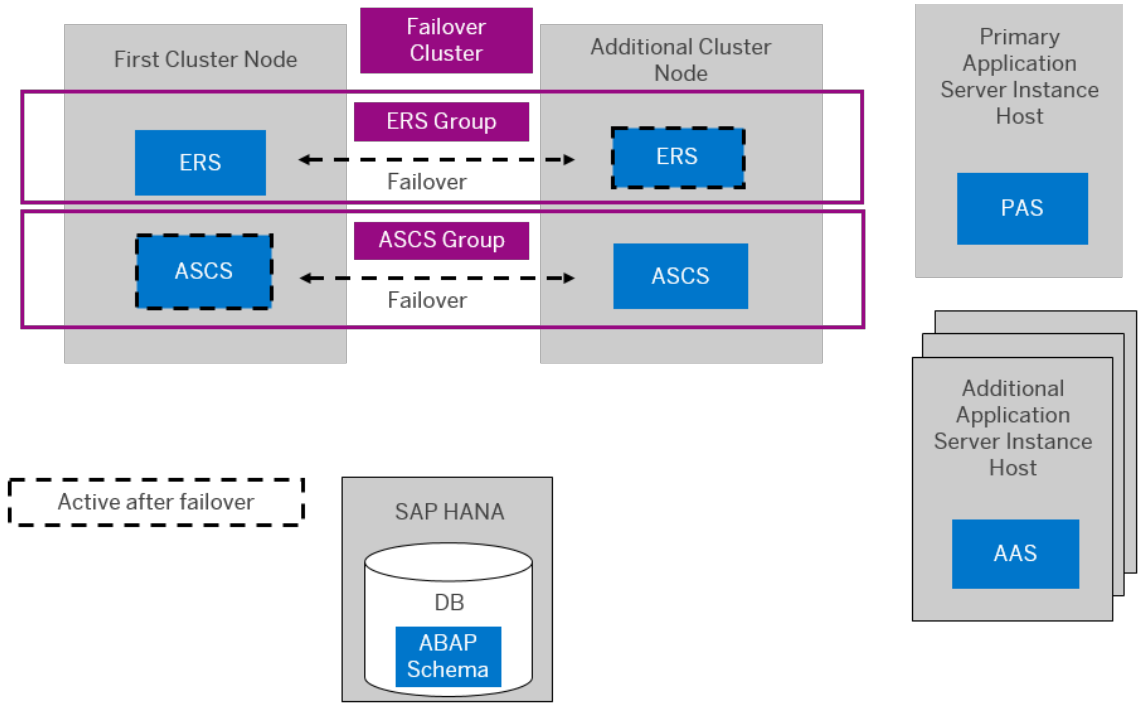
ABAP System Based on ABAP Platform 1809 or higher

The following figure shows an HA configuration, where the non-SPOFs components (primary application server instance, additional application server instance) are installed on separate hosts that are not part of the failover cluster.



PAS = Primary Application Server Instance
AAS = Additional Application Server Instance
DB = Database Instance
ERS = Enqueue Replication Server Instance
ASCS = ABAP Central Services Instance

ABAP System Based on SAP BW/4HANA 1.0 SR1



ABAP System Based on ABAP Platform 1809 or higher

8.2.1.2 Multiple SAP Systems In One Microsoft Failover Cluster

Before SAP NetWeaver 7.0, SAP only supported the installation of **one** clustered SAP system in **one** Microsoft Failover Cluster with two cluster nodes. The reason was that the cluster share `sapmnt` resource could only be assigned to **one** cluster group and could only point to one shared drive.

The solution was to rename the cluster share `sapmnt` resource into `sapmnt<SAPSID>`, and use junctions, which pointed to the local disk. This is no longer required.

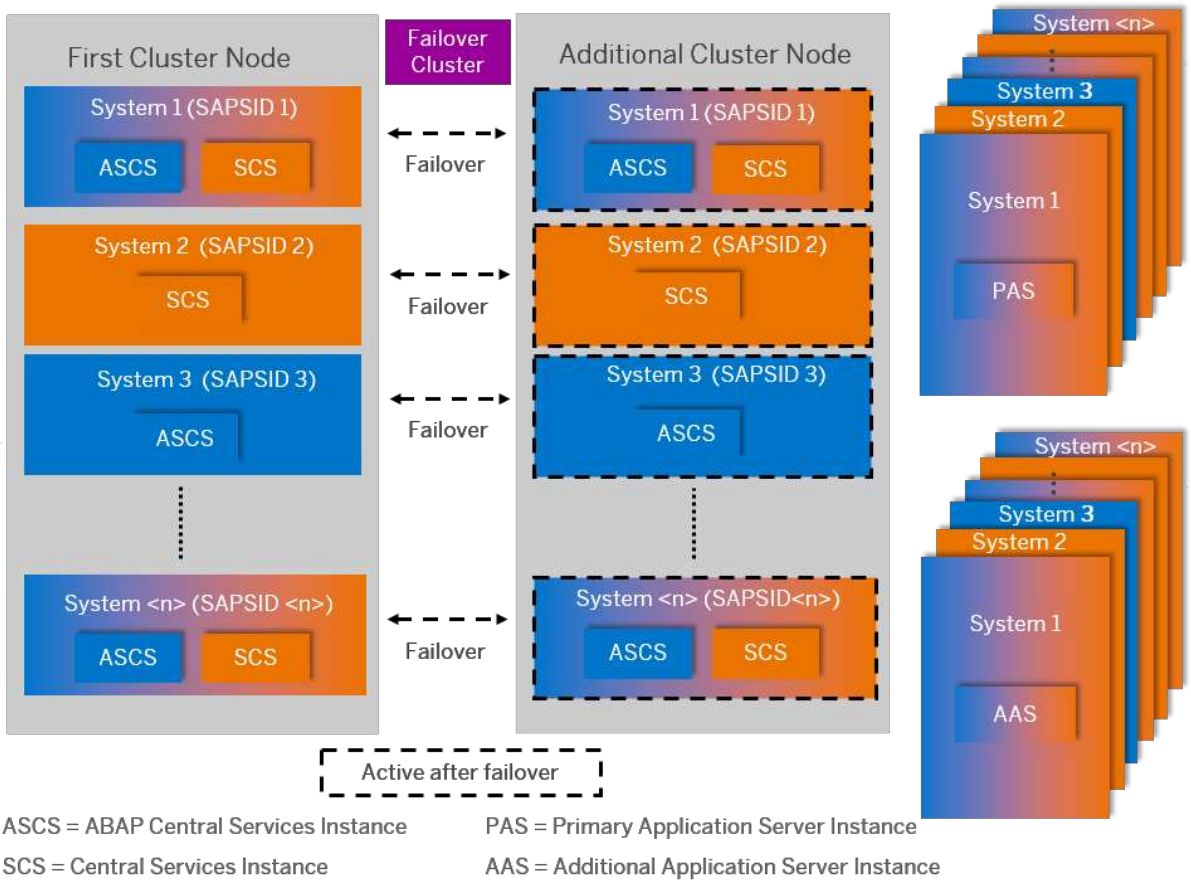
> ⚠ Caution
>
> All local instances such as an enqueue replication server, primary or additional application server and the local part of the ASCS when you use a file share cluster are installed on the local disk where the `saploc` share is pointing to. Make sure that you have enough space on this local disk.

Every SAP system is placed in a separate cluster group with the unique name `SAP <SAPSID>`. Each SAP cluster group has its own IP address, network name, as well as the SAP service resource (or generic service resource), and the SAP instance resource. If you use the CSD option, the cluster group also contains a shared disk and a sapmnt share. In case of the FSC option, the group does not contain a shared drive and the sapmnt share is located on a file share.

If you have an HA configuration with three or more cluster nodes, the following restrictions apply:

- The ASCS instance must be configured to be able to perform a fail over between two cluster nodes in one Microsoft Failover Cluster.
  For more information, see SAP Note 1634991.
- If the database supports the installation on several cluster nodes, the database instance can be installed on more than two cluster nodes in one Microsoft Failover Cluster.

The following figure shows the installation of multiple SAP systems in one Microsoft Failover Cluster. For each SAP system you have to install one primary and at least one additional application server.



Multiple SAP Systems in one Microsoft Failover Cluster

8.2.1.3 Multiple SAP Systems In Multiple Microsoft Failover Clusters

Besides installing multiple SAP systems in one Microsoft Failover Cluster, you can also install multiple SAP systems in several Microsoft Failover Clusters with two or more cluster nodes.

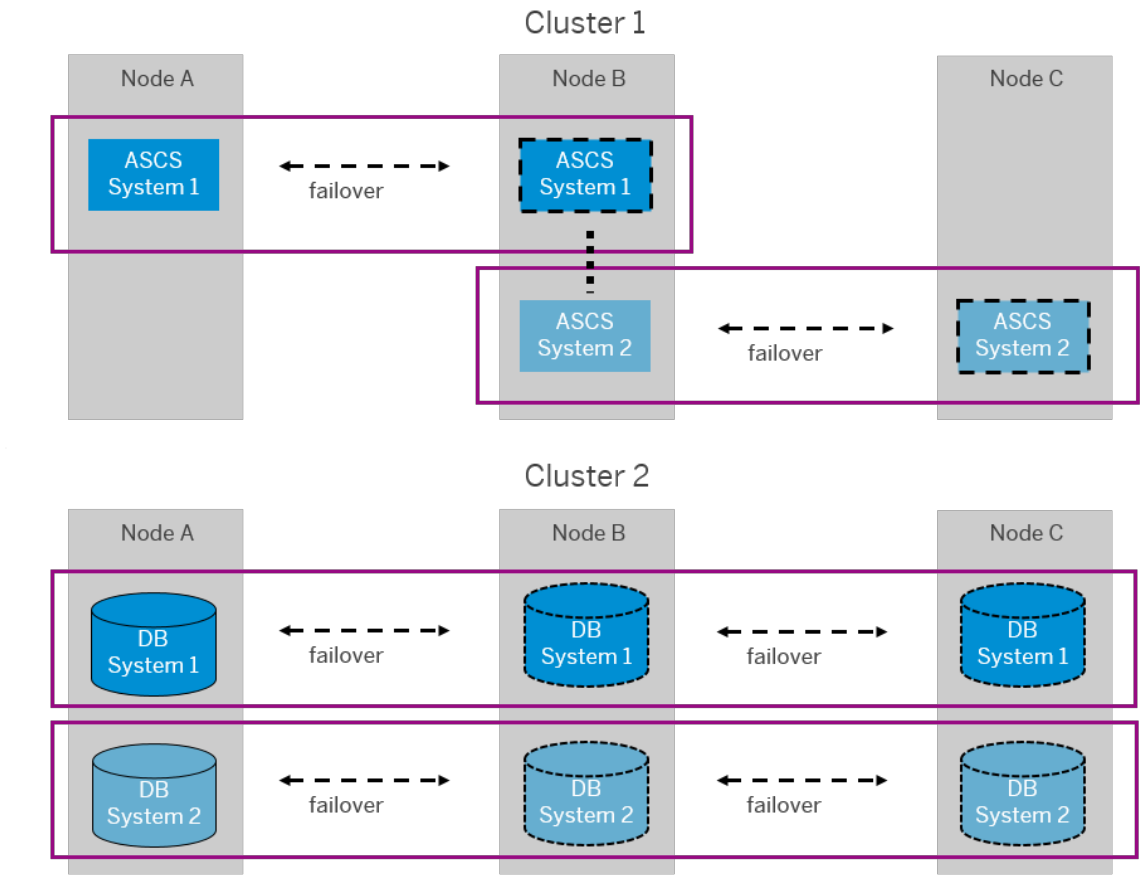
> **i Note**
>
> As of Windows Server 2012, the Microsoft Failover Clustering software supports up to 64 cluster nodes.

For this failover cluster configuration, the following restrictions apply:

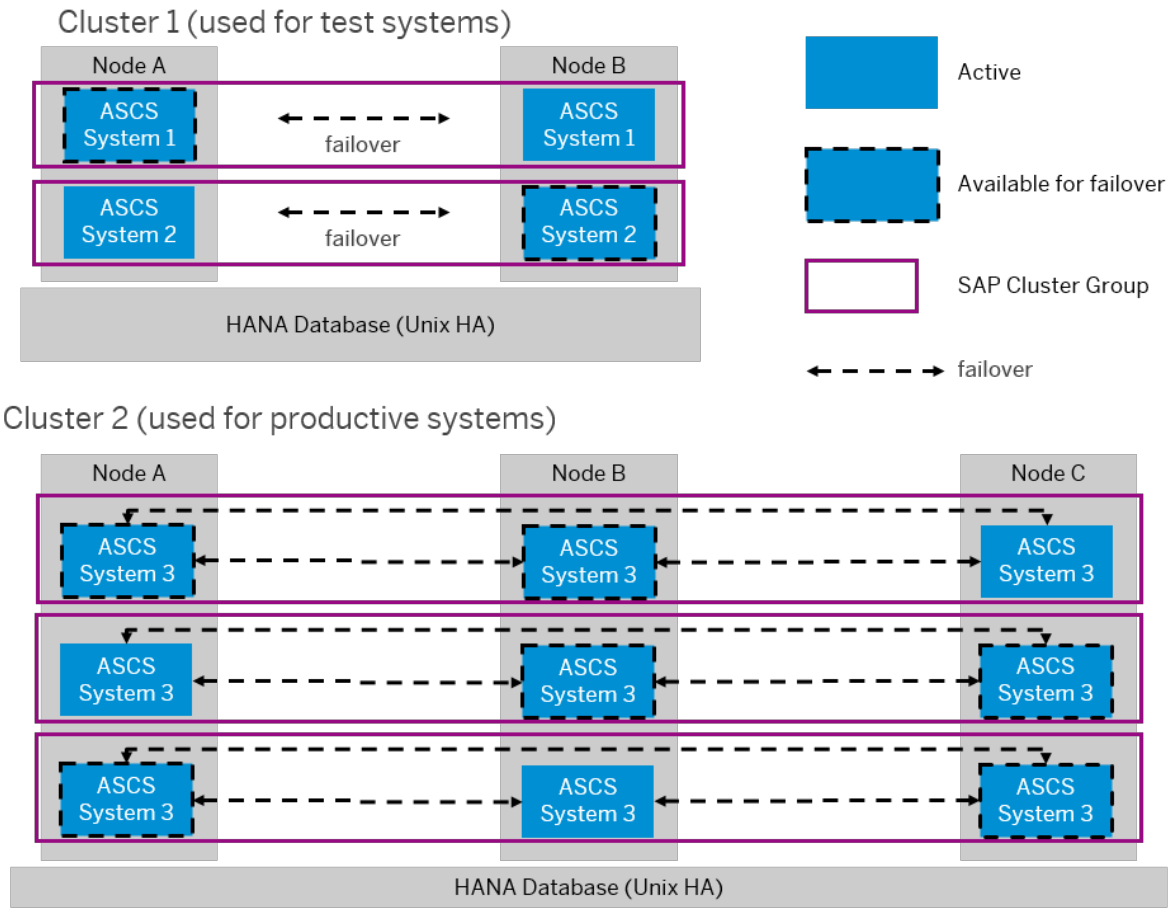
- The ASCS instance must be configured to run on two cluster nodes in one Microsoft Failover Cluster. For more information, see SAP Note 1634991.
- If the database supports the installation on several cluster nodes, the database instance can be installed on more than two cluster nodes in one Microsoft Failover Cluster.

The following figure shows the installation of multiple SAP systems in two Microsoft Failover Clusters with three cluster nodes, called Node A, B, and C. In this example, the ASCS instances are installed in the first Microsoft Failover Cluster, and the database instances for the two SAP systems are installed on the second Microsoft Failover Cluster. The application servers can be either installed on a local disk on the cluster nodes or outside the Microsoft Failover Cluster on separate hosts.

> **i Note**
>
> If you use an enqueue replication server, you must configure the enqueue replication server, and the ASCS instance on **two** nodes.
>
> For more information, see SAP Note 1634991.



Multiple SAP Systems in Two Microsoft Failover Clusters for SAP BW/4HANA 1.0 SR1



Multiple SAP Systems in Two Microsoft Failover Clusters for ABAP Platform 1809 or higher

8.2.1.4 Enqueue Replication Server in a Microsoft Failover Cluster

The enqueue replication server contains a replica of the lock table (replication table) and is an essential component in a high-availability setup. It is installed on the two cluster nodes where the ASCS instance is installed and configured to run, even if you have more than two cluster nodes.

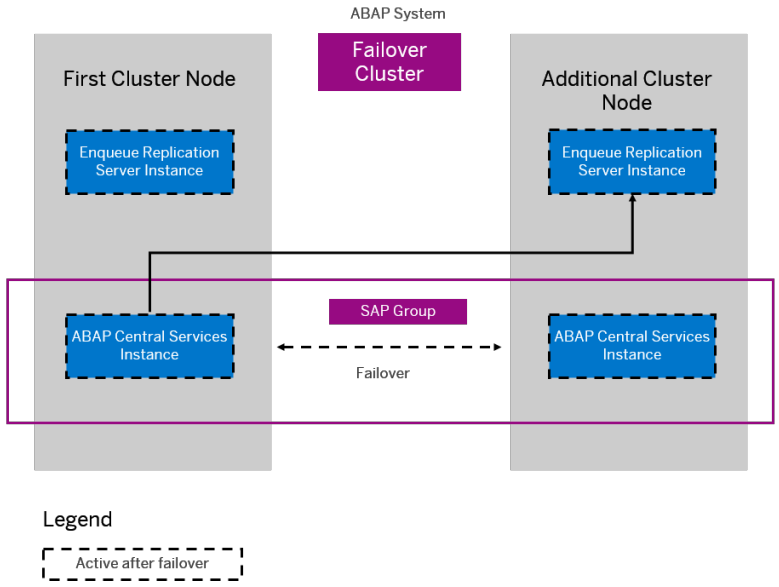
In normal operation the enqueue replication server is always active on the host where the ASCS instance is **not** running.

If an enqueue server in a Microsoft Failover Cluster with two nodes fails on the first cluster node, the enqueue server on the additional cluster node is started. It retrieves the data from the replication table on that node and writes it in its lock table. The enqueue replication server on the first cluster node then becomes inactive. If the first cluster node is available again, the enqueue replication server on the second cluster node becomes active again.

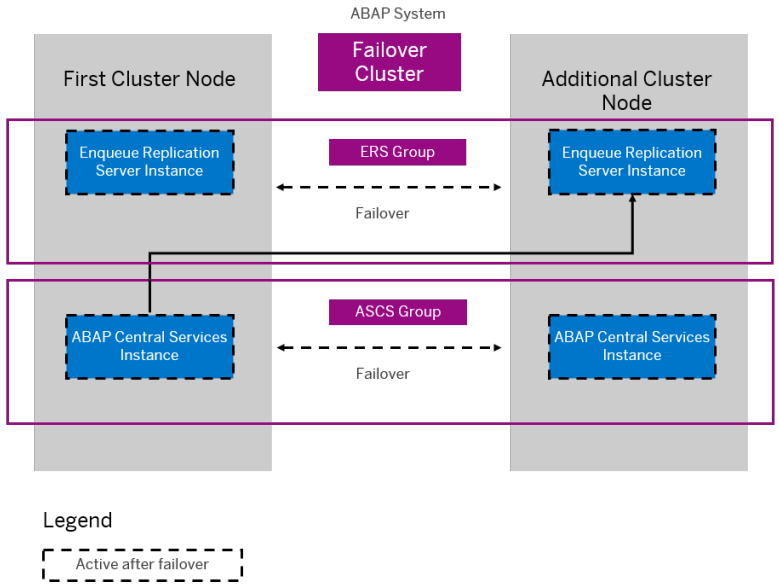
The following applies if Enqueue Replicator 2 is used: If an enqueue server in a Microsoft Failover Cluster with two nodes fails on the first cluster node, the enqueue server on the additional cluster node is started. It retrieves the data from the Enqueue Replicator 2 on that node and writes it in its lock table. If the first cluster node is available again, the enqueue replication server must be moved by the Failover Cluster to the first cluster node to guarantee that both will not remain on one cluster node if at least on additional cluster node is available for operations. With this operations model, more than two cluster nodes are possible.

The following figure shows the enqueue replication server mechanism in an Microsoft failover cluster configuration with two nodes:

> **i Note**
>
> **New “Standalone Enqueue Server 2” and “Enqueue Replicator” versus classic “Standalone Enqueue Server” and “Enqueue Replication Server” :**
>
> - **SAP systems based on ABAP Platform 1809 or higher:** By default, the new Standalone Enqueue Server **2** and Enqueue Replicator **2** are installed. From a Software Provisioning Manager 2.0 perspective the “Standalone Enqueue Server **2**” and “Enqueue Replicator **2**” are installed the same way as the classic “Standalone Enqueue Server” and “Enqueue Replicator”.
>
> For more information, see the SAP Online Documentation [page 13] at *SAP NetWeaver Application Server for ABAP* > *Components of SAP NetWeaver Application Server for ABAP* > *Standalone Enqueue Server 2* >.
> - **SAP systems based on SAP BW/4HANA 1.0 SR1 (based on SAP NetWeaver 7.5):** The classic “standalone enqueue server” and “enqueue replication server” are installed by default. You **cannot** switch to “ standalone enqueue server **2**” and “enqueue replicator” after the system installation has completed.
>
> Since - from a Software Provisioning Manager 2.0 perspective - the “Enqueue Replicator 2” is installed with the ERS instance the same way as the classic “Enqueue Replication Server”, both are abbreviated as “ERS instance” in this documentation.



Enqueue Replication Server Mechanism on One Microsoft Failover Cluster with Two Nodes for SAP Systems Based on SAP BW/4HANA 1.0 SR1



Enqueue Replication Server Mechanism on One Microsoft Failover Cluster with Two Nodes for SAP Systems Based on ABAP Platform 1809 or higher

8.2.2 Distribution of SAP System Components to Disks for Failover Clustering

When planning the Microsoft Failover Cluster installation, keep in mind that the cluster hardware uses different storage resources:

- Local Resources
  - Local disks that are connected directly to the cluster nodes
- Shared Storage Resources
  - Shared disks that can be accessed by all cluster nodes via a shared interconnect if CSD option is used

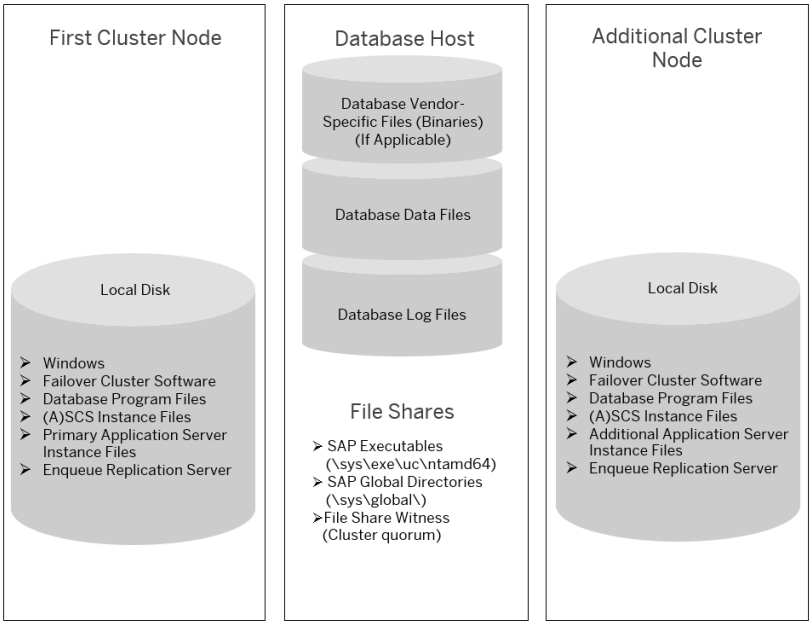
    > **i Note**
    >
    > Shared disk is a synonym for the cluster *Resource type* `Physical disk`.

  - An external file share if the FSC option is used

You need to install the SAP system components in both the following ways:

- Separately on all cluster nodes to use the local storage on each node
- You have two options to distribute the shared files which are used by all cluster nodes:
  - You install the following on **different** shared disks:
    - ASCS instance
    - Single quorum device, if used
  - On an external file share that is made accessible to all cluster nodes:
    - All database files are installed on an external host, or an additional cluster in this scenario
    - If a quorum is used, it is configured as a file share quorum on the file share host

> **⚠ Caution**
>
> You **must not** install any SAP components on the quorum disk.



Distribution of SAP System Components for an SAP System in a Failover Cluster with an External File Share (FSC)

Quorum Configurations on Windows

On Windows, there are several quorum configurations available. The configuration to use mainly depends on the cluster setup, such as the number of cluster nodes, the storage type (single or distributed), the distribution to shared disk and file share, and the number of data centers. For more information, see the Windows documentation.

If the number of cluster nodes is odd, you need no quorum. For a cluster with an even number of nodes you can configure a disk quorum, a file share quorum, or a cloud quorum.

The default quorum configuration is called *Node and Disk Majority* for clusters with more than two nodes.

With a quorum configuration, each node and the witness maintain its own copy of the cluster configuration data. This ensures that the cluster configuration is kept running even if the active node fails or is offline.

> ⚠ Caution
>
> If you do not use the default quorum configuration for your operating system, contact your hardware partner, who can help you to analyze your needs and set up your cluster model. SAP supports these configurations if they are part of a cluster solution offered by your Original Equipment Manufacturer (OEM), or Independent Hardware Vendor (IHV).

Geographically Dispersed Cluster (Geospan)

The standard cluster configuration consists of two cluster nodes and a shared storage with all technical components located in the same data center. In a geographically dispersed cluster, also known as a geospan cluster, the cluster nodes are distributed across at least two data centers to avoid the full outage of a data center in the event of disaster.

A geospan configuration requires a more sophisticated storage architecture since a standard shared storage can only be located in one data center and might therefore be a single point of failure (SPOF). To prevent the disk storage becoming a SPOF, you have to configure the storage system in each data center and to replicate its content to the storage system of the other data center.

Replication can either be synchronous or asynchronous, depending on the:

- Functionality of the storage subsystem
- Acceptable amount of data loss during a failover
- Physical layout of the storage area network
  This includes the distance between the storage systems, signal latency, capacity, and speed of the network connection.
- Customer budget

> ⚠ Caution
>
> - Currently, it is only possible to configure geospan clusters in the same subnet since on Windows Server 2008 (R2), you must **not** change a virtual IP address during failover.
> - The numerous variants with geospan cluster configurations and the complex technical requirements are the reasons why the installation and configuration of such high-availability (HA) systems are not directly supported by SAP. Instead, the hardware vendors of this cluster configuration are responsible for the installation, configuration, and operation of the HA components running in geospan clusters. SAP only supports the standard operation and function of the SAP components running in such cluster configurations.

All functionality to set up geospan clusters is available as of Windows Server 2008 (R2).

8.2.3 Directories in a Microsoft Failover Cluster Configuration

The following tables show the directories where the main software components for a high-availability system are stored:

Directories on Local Disks on Cluster Nodes

Component	Default Directory
A supported operating system [page 29]	`%windir%`
Microsoft Failover Clustering software	`%windir%\Cluster`
Only if FSC option is used: ASCS instance	`<Local_Drive>:\usr\sap\<SAPSID>\ASCS<Instance_Number>`
Application server	`<Local_Drive>:\usr\sap\<SAPSID>\<Instance>`
Enqueue replication server	`<Local_Drive>:\usr\sap\<SAPSID>\ERS<Instance_Number>`

Component	Default Directory
Diagnostics Agent (optional)	`<Local_Drive>:\usr\sap\<DASID>\SMDA<Instance_Number>`
SAP Host Agent	`%Program Files%\SAP\hostctrl`

Directories on Shared Disks

Component	Default Directory
Cluster *quorum resource* (if used)	`<Drive>:\Cluster`
SAP global and instance directories	`<Drive>:\usr\sap ...`

8.2.4 Hostnames in a Failover Cluster Configuration

A part of the installation process that is unique to Microsoft Failover Clustering is the configuration of host names and IP addresses in the network. This is a particularly important task because the addressing plays a key role in the switchover procedure. Addressing must be set up correctly so that the system can take advantage of the cluster functionality and switch between nodes when hardware problems arise.

This section explains the different types of IP addresses and their function in the switchover mechanism of **one** Microsoft Failover Cluster with **two** cluster nodes.

> **i** Note
>
> As of Windows Server 2008, besides static IP addresses, you can also have DHCP-based (dynamic) IP addresses.
>
> DHCP-based IP configurations are not supported for high-availability SAP systems. If the virtual IP address of the SAP cluster group changes during a failover, your clients can no longer reach the system due to caching.

Types of IP Addresses

In a proper configured cluster with at least two nodes, there are at least seven IP addresses and corresponding host names for your SAP system. You have two IP addresses for each cluster node, one IP address for the cluster, one address for the SAP cluster group and one for the database cluster group.

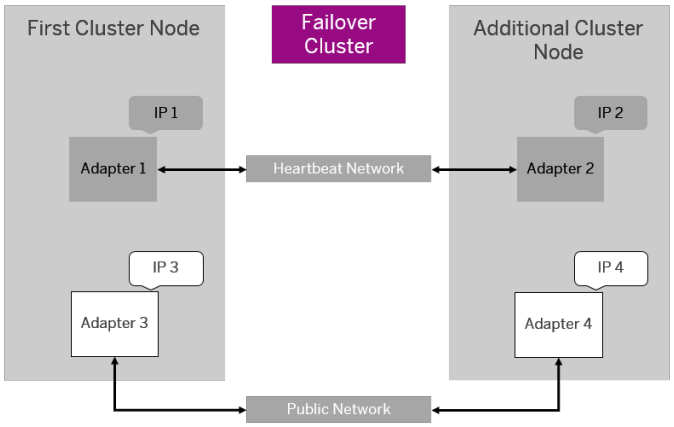
Some of the addresses are assigned to the **network adapters** (network interface card, NIC) whereas others are virtual IP addresses that are assigned to the **cluster groups**.

Physical IP Addresses Assigned to Network Adapters

A Microsoft Failover Cluster configuration has at least two networks:

- A public network that is used for the communication between the primary application server, additional application servers, and the LAN.
- A private network that is used internally for communication between the nodes of the cluster, also called heartbeat.

The following figure shows a Microsoft Failover Cluster with two nodes and illustrates the adapters required for the public and private networks, and their corresponding physical IP addresses. A physical IP address, in contrast to a virtual one, is stationary and permanently mapped to the same adapter.



Adapters and IP Addresses Required for Public and Private Networks in an Microsoft Failover Cluster with Two Nodes

Host Names Assigned to Network Adapters

Each of the physical IP addresses of the network adapters must have a corresponding host name. For example, on the left-hand node in the figure above, you might assign the IP addresses of the public and private network adapters as follows:

IP Addresses and Host Names

Network Adapter	IP Address	Host Name
Adapter 1 (private network)	10.1.1.1	`clusA_priv`
Adapter 3 (heartbeat network)	192.168.1.1	`clusA`

⚠ Caution

- The IP address and host name of the **public** network adapter is also the IP address and name of the machine. In our example, this means that the machine that is the cluster node on the left in the figure has the name `clusA`.
- Do **not** confuse the **host name** with the **computer name**. Each node also has a computer name, which is usually the same as the host name.
  The computer name is displayed in the node column of the *Failover Cluster Management*. However, it is **not** required for the TCP/IP communication in the cluster. When you configure IP addresses and

corresponding names, keep in mind that it is the **host names** that are important for the cluster, not the computer names.

Virtual IP Addresses Assigned to Cluster Groups

After you have installed the SAP system and fully configured the cluster, the critical system resources are bound together in two different groups or three different groups, if **Enqueue Replicator 2** is used.

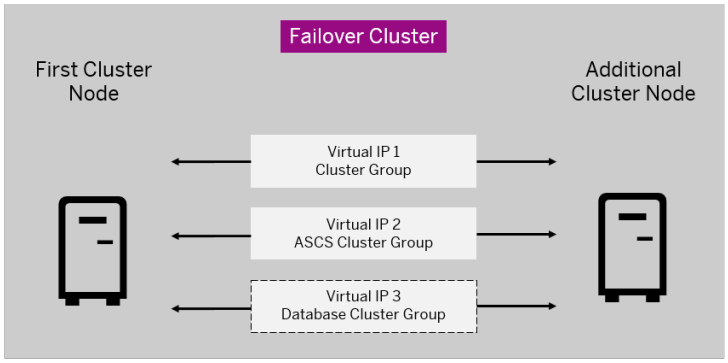
After you have installed the SAP system and fully configured the cluster, the critical system resources are bound together in two different **groups**.

Each of these groups requires a virtual IP address and network name that is permanently mapped to the group and not to a particular node. The advantage of this is that, whenever a group is moved between nodes, its IP address and network name move together with the group.

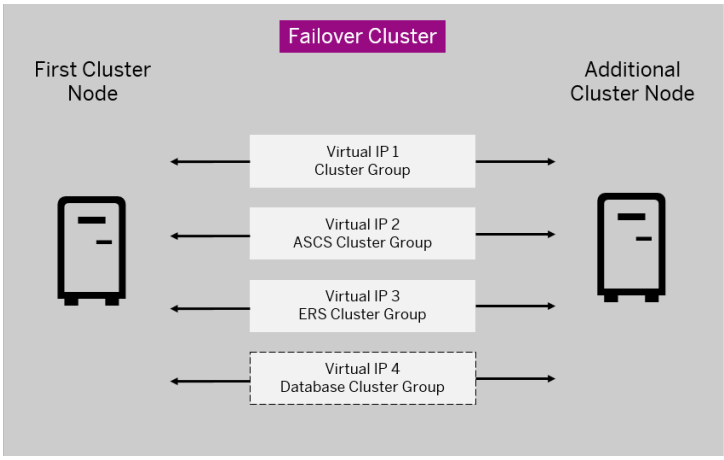
An HA configuration has the following groups:

- SAP cluster group for each clustered SAP system
- SAP cluster group containing the ERS for each clustered SAP system (only applies if **Enqueue Replicator 2** is used).
- Cluster group

The following figure illustrates how the virtual IP addresses of the SAP group can move from one node to the other during a failover.



Failover of Virtual IP Addresses for SAP BW/4HANA 1.0 SR1



Failover of Virtual IP Addresses for ABAP Platform 1809 or higher

8.2.5 Obtaining IP Addresses for a Microsoft Failover Cluster Configuration

This chapter describes how to obtain the IP addresses for the network adapters (cards) that are required to install and run your high-availability system.

Context

For a clustered system, you have to configure IP addresses correctly. During the installation procedure you have to assign at least seven IP addresses and host names. You normally obtain these names and addresses from the system administrator.

Procedure

Ask the system administrator to give you the addresses and host names listed in the tables below, which show an example for a configuration with one Microsoft failover cluster with two nodes. You need to enter the addresses and host names later during the installation process.

The column *Defined During* indicates at which stage of the installation of the operating system and the SAP system the addresses are defined in the system.

> ⚠ Caution
>
> Use the names **exactly** as specified by the system administrator.

> ℹ Note
>
> Note: In the following tables we are still using the terminology *cluster group*, and not the Windows Server 2008 (R2) terminology *services and applications* or the Windows Server 2012 (R2) terminology *Roles*.

Physical IP Addresses

Component	Example for Physical IP Address	Example for Physical Host Name	Purpose	Defined During
First cluster node: adapter for heartbeat network	10.1.1.1	`clusA_priv`	Address for internode communication on the heartbeat network	Windows installation
First cluster node: adapter for public network	129.20.5.1	`clusA`	Address of the first cluster node for communication with application servers and LAN (this is the same as the address of the first cluster node)	Windows installation
Additional cluster node: adapter for heartbeat network	10.1.1.2	`clusB_priv`	Address for internode communication on the heartbeat network	Windows installation
Additional cluster node: adapter for public network	129.20.5.2	`clusB`	Address of the additional cluster node for communication with application servers and LAN (this is the same as the address of the additional cluster node)	Windows installation

Virtual IP Addresses

Component	Example for Virtual IP Address	Example for Host Name	Purpose	Defined During
Cluster group	`129.20.5.3`	`clusgrp`	Virtual address and name of the cluster group. It identifies the cluster and is used for administration purposes.	Failover cluster software configuration
Database cluster group	`129.20.5.4`	`dbgrp`	Virtual address and name for accessing the group of database resources, regardless of the node it is running on	Execution of HA-wizard or database-specific cluster scripts

Component	Example for Virtual IP Address	Example for Host Name	Purpose	Defined During
SAP cluster group (ASCS)	`129.20.5.5`	`ascsgrp`	Virtual address and name for accessing the group of ASCS resources, regardless of the node it is running on	Configuration of SAP system for high availability with the installer on the first node
SAP cluster group (ERS)	`129.20.5.6`	`ersgrp`	Virtual address and name for accessing the group of ERS resources, regardless of the node it is running on (only applies if Enqueue Replicator 2 is used)	Configuration of SAP system for high availability with the installer on the first node

8.3 Preparation

This section provides information about how to prepare the installation of the SAP system for Microsoft Failover Clustering. For a complete list of all steps, see section *Preparation* in the Installation Checklist for a High-Availability System [page 145].

1. You check that you have completed the same preparations [page 52] as for a non-HA system.
2. To make sure that all preparation steps have been correctly performed, check that the storage resources are available to all cluster nodes. If you want to run the CSD option, check if you can move the disk resources from one cluster node to another so that they are accessible from a single node at any time. If you want to run the FSC option, check if the external file share is accessible by your installation user from all cluster nodes.

8.4 Installation

The following sections provide information about how to install the SAP system in a high-availability environment. For a complete list of all steps, see section *Installation* in the Installation Checklist for a High-Availability System [page 145].

You have the following options to install the database instance:

- CSD (Cluster Shared Disk)
  - You use a high available database outside the cluster used for the ASCS instance. This scenario requires a shared disk for the ASCS instance and requires an additional cluster used for the database which may also require shared disks.

- You install the database on a shared disk in the same cluster used for the ASCS instance.

- FSC (File Share Cluster)
  - You use a high available database outside the cluster used for the ASCS instance. This scenario does not require shared disks for the ASCS instance and requires an additional cluster used for the database which may require shared disks.

> **i** Note
>
> The user starting the installer must have full access rights on the file share `\\<sapglobalhost>\sapmnt`.

8.4.1 Configuring the First Cluster Node

At the beginning of the SWPM installation, you will be asked to choose between FSC and CSD installation option. For more information, see Installation [page 165].

When you run the *First Cluster Node* option, the installer:

- Creates the `saploc` share, pointing to a local disk
- Creates the `sapmnt` share, pointing to a local disk if the CSD option is used, or to the external file share if the FSC option is used
- Installs the ABAP central services instance (ASCS) and prepares this host as the SAP global host

  > **i** Note
  >
  > **ASCS instance with new "Standalone Enqueue Server 2" versus ASCS instance with classic "Standalone Enqueue Server":**
  >
  > - **SAP systems based on ABAP Platform 1809 or higher:** By default, the ASCS instance is installed with the new Standalone Enqueue Server **2**. From a Software Provisioning Manager 2.0 perspective, the installation procedure for the ASCS instance with "Standalone Enqueue Server **2**" is the same as for the ASCS instance with the classic "Standalone Enqueue Server" , there are no additional or different installation parameters.
  >
  >   For more information, see the SAP Online Documentation [page 13] at *Application Server ABAP Infrastructure* > *Components of the Application Server for ABAP* > *Standalone Enqueue Server 2* and *Application Server ABAP Infrastructure* > *Components of the Application Server for ABAP* > *Standalone Enqueue Server 2*.
  > - **SAP systems based on SAP BW/4HANA 1.0 SR1 (based on SAP NetWeaver 7.5):** The ASCS instance is installed with the classic "Standalone Enqueue Server" by default. You **cannot** switch to the new "Standalone Enqueue Server **2**" after the installation has completed.
  >
  > Since - from a Software Provisioning Manager 2.0 perspective - the "Standalone Enqueue Server 2" is installed with the ASCS instance the same way as the classic "Standalone Enqueue Server", both are abbreviated as "Standalone Enqueue Server" in this documentation.

- Creates the SAP cluster group and adds the ASCS instance to the SAP cluster group
- Installs the enqueue replication server instance (ERS instance) for the ASCS instance

> **i Note**
>
> **ERS instance with new “Enqueue Replicator 2” versus ERS instance with classic “Enqueue Replication Server”:**
>
> - **SAP systems based on ABAP Platform 1809 or higher:** By default, the ERS instance is installed with the new “Enqueue Replicator 2”. From a Software Provisioning Manager 2.0 perspective, the installation procedure for the ERS instance with the “Enqueue Replicator 2” is the same as for the ERS instance with the classic “Enqueue Replication Server”, there are no additional or different installation parameters.
>
>   For more information, see the SAP Online Documentation [page 13] at *Application Server ABAP Infrastructure* > *Components of the Application Server for ABAP* > *Standalone Enqueue Server 2* and *Application Server ABAP Infrastructure* > *Components of the Application Server for ABAP* > *Standalone Enqueue Server 2* > *High Availability with Standalone Enqueue Server 2*.
> - **SAP systems based on SAP BW/4HANA 1.0 SR1 (based on SAP NetWeaver 7.5):** The ERS instance is installed with the classic “Enqueue Replication Server” by default. You **cannot** switch to the new “ Enqueue Replicator 2 ” after the installation has completed.
>
> Since - from a Software Provisioning Manager 2.0 perspective - the “Enqueue Replicator 2” is installed with the ERS instance the same way as the classic “Enqueue Replication Server”, both are abbreviated as “ERS instance” in this documentation.

- Installs the SAP Host Agent

> **⚠ Caution**
>
> When you reboot during the conversion to Failover Clustering, resources fail over to the other cluster node. Therefore, after each reboot you have to return the system to the state it was in before the reboot.

Prerequisites

- You are logged on to the **first** cluster node as domain administrator or as a local user with domain administration rights. For more information, see Performing a Domain Installation without being a Domain Administrator [page 127].
- CSD: You must install the ASCS instance on a shared disk, and the ERS instance and SAP Host Agent on a local disk.
  FSC: You must install the ASCS instance on a local disk, like ERS instance and SAP Host Agent.

  > **i Note**
  >
  > If you are installing SAP NetWeaver 7.5 Process Integration (PI) system, it is mandatory to use different shared disks for the ASCS and the SCS instance if you’re using a shared disk cluster. In case you use a File Share Cluster, you have to use different `sapmnt` shares for both instances.
- If you select the FSC option at the beginning of the installation, the global parts of a SAP system are stored on an external file share. The ASCS instance, the ERS instance, and SAP Host Agent are installed on a local disk.

Procedure

1. Run the installer [page 80] and on the *Welcome* screen, choose *<Product>* ▸ *<Database>* ▸ *SAP Systems* ▸ *<System>* ▸ *High-Availability System* ▸ *First Cluster Node*.

   > **i** Note
   >
   > If the installer prompts you to log off from your system, log off and log on again.

2. Enter the required parameter values.

   > **i** Note
   >
   > - For more information about the input parameters, position the cursor on a parameter and press F1 in the installer.
   > - If you have a Microsoft cluster configuration with more than two nodes in one cluster, apply SAP Note 1634991.

More Information

Moving Cluster Groups, or Services and Applications, or Roles [page 172]

8.4.2 Installing the Database Instance

Use

This procedure describes how to install the database instance.

Prerequisites

- The SAP cluster group is *Online* on the first cluster node.

Procedure

Perform the following steps on the **first** cluster node.

1. Run the installer [page 80] and on the *Welcome* screen, choose *<Product>* ▸ *<Database>* ▸ *SAP Systems* ▸ *<System>* ▸ *High-Availability System* ▸ *Database Instance*.
2. Follow the instructions in the installer dialogs and enter the required parameter values.

> **Note**
>
> For more information about the input parameters, position the cursor on a parameter and press the F1 key in the installer.

8.4.3 Configuring the Additional Cluster Node

Use

When you run the *Additional Cluster Node* option it:

- Configures the additional cluster node to run the SAP cluster group
- Creates the `saploc` share, pointing to a local disk
- If you chose the FSC option:
  Installs the ASCS instance
- Installs the enqueue replication server instance (ERS) for the ASCS instance
- Installs the SAP Host Agent

> **Caution**
>
> You must install the instances and SAP Host Agent on a local disk.

Prerequisites

- You are logged on to the **additional** cluster node as domain administrator or as a domain user who is a local administrator on all cluster nodes. For more information, see Performing a Domain Installation without being a Domain Administrator [page 127].
- You have already performed the First Cluster Node [page 166] option.

Procedure

1. Run the installer [page 80] and on the *Welcome* screen, choose *<Product>* ▸ *<Database>* ▸ *SAP Systems* ▸ *<System>* ▸ *High-Availability System* ▸ *Additional Cluster Node* ▸.

   > **Note**
   >
   > If the installer prompts you to log off from your system, log off and log on again.

2. Enter the required parameter values.

> **Note**
>
> For more information about the input parameters, position the cursor on the parameter and press F1 in the installer.

8.4.4 Installing the Primary Application Server Instance

Use

You have the following options to install the primary application server instance:

- You install the primary application server instance on a cluster node.
- You install the primary application server instance on a host outside of Microsoft Failover Cluster.

Procedure

1. Run the installer [page 80] and on the *Welcome* screen, choose *<Product>* > *<Database>* > *SAP Systems* > *<System>* > *High-Availability System* > *Primary Application Server Instance*.
2. If the installer prompts you to log off, choose *OK* and log on again.
3. Follow the instructions in the installer dialogs and enter the required parameter values.

   > **Note**
   >
   > - For more information about the input parameters, position the cursor on a parameter and press F1 in the installer.
   > - If you install the primary application server instance on an cluster node, make sure that on the screen *General SAP System Parameters* for the:
   >   - *Profile Directory*, you use the **UNC** path (not the local path) of the `SAPGLOBALHOST` host name, for example:, for example: `\\<SAPGLOBALHOST>\sapmnt\<SAPSID>\SYS\profile`.
   >   If CSD option is used, the virtual host name of the ASCS instance is the same as the `SAPGLOBALHOST` host name.
   >   If FSC option is used the virtual host name of the ASCS instance is different from the `SAPGLOBALHOST` host name.
   >
   >   > **Note**
   >   >
   >   > If you are installing a SAP NetWeaver 7.5 Process Integration (PI) system, make sure that the virtual host names for the ASCS instance and the SCS instance are different.
   >
   >   - *Installation Drive*, you choose the local disk where you want to install the primary application server instance.
4. Check that the primary application server instance is running.

8.4.5 Installing the Additional Application Server Instance

Use

You have to install at least one additional application server instance for Microsoft Failover Clustering.

You have the following options, to install the additional application server instance:

- You install the additional application server instance on a cluster node.
- You install the additional application server instance on a host outside of the failover cluster.

Procedure

1. Run the installer [page 80] and on the *Welcome* screen, choose *<Product>* ▸ *<Database>* ▸ *SAP Systems* ▸ *<System>* ▸ *High-Availability System* ▸ *Additional Application Server Instance*.
2. If the installer prompts you to log off, choose *OK* and log on again.
3. Follow the instructions in the installer dialogs and enter the required parameter values.

   > **i** Note
   >
   > - For more information about the input parameters, position the cursor on a parameter and press F1 in the installer.
   > - If you install the additional application server instance on an cluster node, make sure that on the screen *General SAP System Parameters* for the:
   >   - *Profile Directory*, you use the **UNC** path (not the local path) of the `SAPGLOBALHOST` host name, for example:
   >   `\\<SAPGLOBALHOST>\sapmnt\<SAPSID>\SYS\profile`.
   >   If CSD option is used, the virtual host name of the ASCS instance is the same as the `SAPGLOBALHOST` host name.
   >   If FSC option is used, the virtual host name of the ASCS instance is different from the `SAPGLOBALHOST` host name.
   >   - *Installation Drive*, you choose the **local** disk where you want to install the additional application server instance.
   >   - *Additional application server instance*, you enter the **same** instance number as for the primary application server.
4. When you have finished, change the instance profile of the additional application server instance so that the number of its work processes equals the number of work processes of the primary application server instance.
5. If required, install more additional application server instances outside of the failover cluster.

   > **i** Note
   >
   > Make sure that on the screen *General SAP System Parameters* for the *Profile Directory*, you use the UNC path of the **virtual** ASCS host name, for example:
   >
   > `\\<SAPGLOBALHOST>\sapmnt\<SAPSID>\SYS\profile`.

> In a HA-system, the virtual host name of the ASCS instance is the same as the SAP global host name.

8.5 Post-Installation

To complete and check the installation of the SAP system for a high-availability configuration, you need to perform the following steps:

1. You install the permanent SAP licenses on all cluster nodes.
2. After a new installation of a clustered ASCS instance, make sure that you update the `saprc.dll` (part of the `NTCLUST.SAR`) package in `c:\windows\system32` as soon as possible. For more information, see SAP Note 1596496.
3. For information about Rolling Kernel Switch on Windows Failover Clusters, see SAP Note 2199317.
4. You perform the post-installation checks for the enqueue replication server.
   For more information, see the SAP Online Documentation [page 13] at:
   Application Server > *Application Server Infrastructure* > *Components of SAP NetWeaver Application Server* > *Standalone Enqueue Server* > *Installing the Standalone Enqueue Server* > *Replication Server: Check Installation*
5. If required, you perform the general post-installation steps [page 93] listed in this guide.

8.6 Additional Information

The following sections provide additional information about:

- Moving Cluster Groups, or Services and Applications, or Roles [page 172]
- Starting and Stopping the SAP System in a Microsoft Failover Cluster Configuration [page 174].

8.6.1 Moving Cluster Groups, or Services and Applications, or Roles

Use

When you reboot during the conversion to Microsoft Failover Clustering, cluster resources fail over to the other cluster node. Therefore, you have to return the system to the state it was in before the reboot, and move the resources back to the original node.

To move the database, ERS (only applies if Enqueue Replicator 2 is used), or ASCS from one cluster node to the other, you use the following:

- *PowerShell* (Windows Server 2012 (R2) and higher)

- *Failover Cluster Manager* (Windows Server 2008 (R2))

> **i Note**
>
> As of Windows Server 2008 (R2) there are the following terminology changes:
>
> - Cluster groups are called *services and applications* (Windows Server 2008 (R2), or *Roles* (Windows Server 2012 (R2) and higher)
>   We do not always use all names in this section.
> - The *Cluster Administrator* is now called *Failover Cluster Manager*.

Prerequisites

Windows Server 2008 (R2):

The services or applications you want to move are configured and are visible in the *Failover Cluster Manager*.

Procedure

Moving Roles, or Services and Applications, or Groups

To move the roles (Windows Server 2012 (R2) and higher) or services and applications (Windows Server 2008 (R2)), proceed as follows:

- Windows Server 2012 (R2) and higher:
  1. To move a role, open PowerShell in elevated mode, and enter the following command:
     ```
     move-clustergroup "<role name>"
     ```
  2. Repeat these steps for each role that you want to move.
- Windows Server 2008 (R2):
  1. Start the *Failover Cluster Manager* with *Start* > *Administrative Tools* > *Failover Cluster Manager*.
  2. In the *Failover Cluster Manager*, right-click the service and application you want to move.
  3. Choose *Move this service or application to another node* > *Move to <relevant node>*.
  4. Repeat the previous step for each service and application that you want to move.

> **i Note**
>
> You can only move disks that are assigned to *Services and Applications* (Windows Server 2008 (R2)) or *Roles* (Windows Server 2012 (R2)and higher).
>
> The disks that are added to the cluster are automatically added to a group named *Available Storage*. Although the groups *Available Storage* and *Cluster Group* exist in a failover cluster on Windows Server 2008 (R2) or higher, they are not visible under *Services and Applications* (Windows Server 2008 (R2)) or *Roles* (Windows Server 2012 (R2) and higher). Therefore, you cannot move these groups with the *Failover Cluster Manager*.
>
> - If you use Windows Server 2012 (R2) and higher, proceed as follows:
>   - To move *Cluster Group*, open PowerShell in elevated mode, and enter the following command:
>     ```
>     move-clustergroup "cluster group"
>     ```

- To move *Available Storage*, open PowerShell in elevated mode, and enter the following command:
  ```
  move-clustergroup "Available Storage"
  ```
- If you use Windows Server 2008 (R2) proceed as follows:
  - To move *Cluster Group*, open a command prompt and enter:
    ```
    cluster group "cluster group" /move
    ```
  - To move *Available Storage*, open a command prompt and enter:
    ```
    cluster group "Available Storage" /move
    ```

8.6.2 Starting and Stopping the SAP System in a Microsoft Failover Cluster Configuration

Use

An SAP System in an HA configuration is typically configured into at least two HA groups: one cluster resource group contains the database resources, the other group contains the ASCS instance, and a third group contains the ERS instance (only applies if Enqueue Replicator 2 is used).

> **i** Note
>
> When starting a whole SAP system, you first need to start the database instance, the ASCS instance, the ERS instance (only applies if Enqueue Replicator 2 is used) and then the remaining SAP instances.
>
> When stopping a whole SAP system, you first need first to stop all SAP instances and then the database instance.

With the *SAP MMC*, or *SAPControl* you can start and stop all SAP instances whether they are clustered or not, except the database instance.

With certain HA administration tools (*Cluster Administrator* , *Failover Cluster Manager* , or *PowerShell*), you can only start or stop clustered SAP instances, such as the ASCS instance, ERS instance (only applies if Enqueue Replicator 2 is used), or the database instance.

Procedure

Starting and Stopping a Complete System or a Single Instance with SAP MMC or SAPControl

With the *SAP MMC*, or the command line tool *SAPControl*, you can start or stop the complete SAP system or a single clustered or non-clustered SAP instance, except the database instance.

To start or stop the database instance, you have to use the tools described in “Starting and Stopping the clustered ASCS, ERS (only applies if Enqueue Replicator 2 is used), and Database Instance”.

For more information about *SAP MMC* or *SAPControl*, see Starting and Stopping the SAP System [page 132].

> **i Note**
>
> - To use *SAP MMC* or *SAPControl* for starting or stopping a clustered SAP instance, the "SAP <SAPSID> <Instance_Number> Service" resource of the clustered instance must be online. Therefore, SAP recommends keeping the "SAP <SAPSID> <Instance_Number> Service" cluster resource always online, and using the *SAP MMC* or *SAPControl* to start or stop a clustered instance.
> - You can also start *SAPControl* in the *PowerShell*.

Starting and Stopping the clustered ASCS, ERS (only applies if Enqueue Replicator 2 is used), and Database Instance

With certain HA administration tools, such as *PowerShell* (Windows Server 2012 (R2) and higher), or *Failover Cluster Manager* (Windows Server 2008 (R2)), you can only start or stop clustered SAP instances, such as the ASCS instance, ERS instance (only applies if Enqueue Replicator 2 is used), or the database instance. For all other non-clustered instances, such as additional application server instances or the primary application server instance, you must use the SAP MMC or *SAPControl*.

- Using *PowerShell* (Windows Server 2012 (R2) and higher)
  To start or stop the clustered ASCS instance, ERS instance (only applies if Enqueue Replicator 2 is used), or the database instance with *PowerShell* do the following:
  1. To start the clustered database instance, open *PowerShell* in elevated mode, and enter the following command:
     `start-clusterresource <database resource>`
  2. To start the clustered ASCS instance, open *PowerShell* in elevated mode, and enter the following command:
     `start-clusterresource "SAP <SAPSID> <Instance_Number> Instance"`
  3. To start the clustered ERS instance, open *PowerShell* in elevated mode, and enter the following command:
     `start-clusterresource "SAP <SAPSID> ERS <Instance_Number> Instance"`
  4. To stop the clustered ASCS instance, open *PowerShell* in elevated mode, and enter the following command:
     `stop-clusterresource "SAP <SAPSID> <Instance_Number> Instance"`
  5. To stop the clustered ERS instance, open *PowerShell* in elevated mode, and enter the following command:
     `stop-clusterresource "SAP <SAPSID> ERS <Instance_Number> Instance"`
  6. To stop the clustered database instance, open *PowerShell* in elevated mode, and enter the following command:
     `stop-clusterresource <database resource>`
- Using the *Failover Cluster Manager* (Windows Server 2008 (R2))
  For all other non-clustered instances, such as additional application server instances or the primary application server instance, you must use the *SAP MMC* or *SAPControl*.
  1. Start the *Failover Cluster Manager* by choosing *Start* > *Administrative Tools* > *Failover Cluster Manager*.
  2. To start the ASCS instance, select the relevant service and application *SAP <SAPSID>*.
     In the right-hand pane, under *Other Resources*, right-click the resource *SAP <SAPSID> <Instance_Number> Instance*, and choose *Bring this resource online*.
  3. To start the ERS instance, select the relevant service and application *SAP <SAPSID> ERS*.
     In the right-hand pane, under *Other Resources*, right-click the resource *SAP <SAPSID> ERS <Instance_Number> Instance*, and choose *Bring this resource online*.

4. To stop the ERS instance, select the relevant service and application *SAP <SAPSID> ERS*. In the right-hand pane, under *Other Resources*, right-click the resource *SAP <SAPSID> ERS <Instance_Number> Instance*, and choose *Take this resource offline*.
5. To stop the ASCS instance, select the relevant service and application *SAP <SAPSID>*. In the right-hand pane, under *Other Resources*, right-click the resource *SAP <SAPSID> <Instance_Number> Instance*, and choose *Take this resource offline*.

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