INSTALLATION GUIDE | PUBLIC
Software Provisioning Manager 1.0 SP27
Document Version: 3.4 – 2019-09-16

Installation of SAP Systems Based on the Application Server ABAP of SAP NetWeaver 7.1 to 7.52 on Windows: Oracle

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Content

Document History

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

> **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 1.0 SP* `<Current Number>` .

Version	Date	Description
3.4	2019-09-16	Updated version for Software Provisioning Manager 1.0 SP27 (SL Toolset 1.0 SP27) • New Features: ○ Oracle 18 c or higher: Support of Transparent Data Encryption (TDE), documented in: *New Features*, *SAP System Database Parameters*, *Support of Oracle Transparent Data Encryption (Oracle TDE)*
3.3	2019-05-27	Updated version for Software Provisioning Manager 1.0 SP26 (SL Toolset 1.0 SP26)

3.2	2019-01-21	Updated version for Software Provisioning Manager 1.0 SP25 (SL Toolset 1.0 SP25)
		Only valid for 'High Availability': HA (Windows)
		• New Features
		  ○ Support of Oracle 18, documented in: *New Features*, *Installing the Oracle Database Software*
		  ○ High-availability system on Microsoft Cluster: Option to install the ASCS instance distributed to local disks and a file share instead of a shared disk, documented in: *High Availability with Microsoft Failover Clustering*
		End of 'High Availability': HA (Windows)

3.1	2018-09-17	Updated version for Software Provisioning Manager 1.0 SP24 (SL Toolset 1.0 SP24) Only valid for 'High Availability': HA (Windows) • New Features ○ New Look and Feel of SL Common GUI with Software Provisioning Manager 1.0 SP24, Patch Level 05, documented in: *New Features*, *Prerequisites for Running the Installer* End of 'High Availability': HA (Windows)

Version	Date	Description

3.0	2018-05-07	Updated version for software provisioning manager 1.0 SP23 (SL Toolset 1.0 SP23)
		• New Features:
		  ○ New Installer Option *Download Media for a Maintenance Plan*, documented in: *New Features*, *Downloading the Media for a Maintenance Planner Transaction*
		  ○ Validity Check for `SUM*.SAR` Archive, documented in: *New Features*, *Additional Parameters When Using a Stack Configuration File (Optional)*
		• Information "enqueue server" versus "enqueue server 2", "enqueue replication server" versus "enqueue replication server 2" added: *High Availability with Microsoft Failover Clustering*, *System Based on SAP NetWeaver AS for ABAP 7.52 only: Switching to Enqueue Server 2 and Enqueue Replication Server 2*

2.9	2018-01-15	Updated version for software provisioning manager 1.0 SP22 (SL Toolset 1.0 SP22)
		• New Features:
		  ○ Signature check for installation archives, documented in: *New Features*, *Downloading SAP Kernel Archives (Archive-Based Installation) Archive-Based Installation for Diagnostics Agent*, *Downloading the SAP Kernel Archives Required for the Dual-Stack Split (Without Operating System and Database Migration)*, *Downloading the SAP Kernel Archives Required for Operating System and Database Migration*
		  ○ Installer Log Files Improvements, documented in: *New Features*, *Useful Information about the Installer*, *Troubleshooting with the Installer*
		  ○ Secure ABAP message server connection, documented in: *New Features*, *SAP System Parameters*
		  ○ Enabling IPv6, documented in: *New Features*, *Prerequisites for Running the Installer*
		• *New Features* section restructured: As of SP22, a dedicated subsection for each new SP has been created. New features below SP22 remain in a common table.
		• The Java SDT GUI - which was in the SP21 version still available in parallel to the SL Common GUI - has been deprecated with SP22. As of SP22, SL Common GUI is the only available installer GUI:
		  ○ The following sections which were explicitely related to Java SDT GUI were completely removed from this documentation: *Performing a Remote Installation Remote Processing of the Installer (Java SDT GUI only)*, *Starting the Java SDT GUI Separately*, *Running the Installer in Accessibility Mode* (general accessibility information was moved to *Useful Information About the Installer*).
		  ○ The Java SDT GUI-specific information was removed from the common installer sections: *Running the Installer*, *Useful Information About the Installer*, *Interrupted Processing of the Installer*, *Troubleshooting with the Installer*, *Deleting an SAP System or Single Instances*
		• New section *Using the Step State Editor (SAP Support Experts Only)* was added to section *Additional Information About the Installer*

Version	Date	Description
2.8	2017-09-11	Updated version for software provisioning manager 1.0 SP21 (SL Toolset 1.0 SP21) • New Features: ○ Media Signature Check, documented in: *New Features*, *Running the Installer*, *Preparing the Installation Media* . This feature implies that section *Creating Kernel Archives from an Existing SAP System* has been deleted from this documentation because the related option in the installer had to be removed. ○ Download Media for a Maintenance Plan, documented in: *New Features*, *Downloading Media for a Maintenance Plan* ○ SAP Host Agent Upgrade , documented in: *New Features*, *SAP System Parameters*, *Downloading SAP Kernel Archives (Archive-Based Installation)* ○ Load tools are now available as `LOADTOOLS.SAR` in the Software Provisioning Manager archive, documented in: *New Features*, *Downloading and Extracting the Software Provisioning Manager Archive* ○ Simplified additional application server instance installation, documented in: *New Features*, *Preparing the Installation Media*, *Downloading SAP Kernel Archives (Archive-Based Installation)* ○ Support of Oracle 12.2, documented in: *New Features*, *Installing the Oracle 12c Database Software* ○ Support of Oracle Database Vault, documented in: *New Features*, *Planning Checklist*, *SAP System Database Parameters*, *Preparation Checklist*, *Post-Installation Checklist*, *Implementing Oracle Database Vault Using the Installer*
2.7	2017-05-22	Updated version for software provisioning manager 1.0 SP20 (SL Toolset 1.0 SP20) • New Features: ○ New SAPUI5-based graphical user interface (GUI) "SL Common GUI", documented in: *Prerequisites for Running the Installer*, *Running the Installer*, *Useful Information About the Installer* ○ Option for choosing to install an integrated SAP Gateway during the ASCS instance installation, documented in: *Installation Options Covered by this Guide*, *SAP System Parameters*, *Parameters for Additional Components to be Included in the ASCS Instance* , *Post-Installation Checklist*, *SAP Gateway Configuration*
2.6	2017-02-07	Updated version for software provisioning manager 1.0 SP19 (SL Toolset 1.0 SP19) • New Features: Verification of the integrity of data units in Software Provisioning Manager, documented in: *New Features*, *Downloading the Software Provisioning Manager Archive* Archive-based Language Installation, documented in: *Additional Parameters When Using a Stack Configuration File*

Version	Date	Description
2.5	2016-10-07	Updated version for software provisioning manager 1.0 SP18 (SL Toolset 1.0 SP18) • New Features: Option to choose installing an integrated SAP Web Dispatcher during the ASCS instance installation, documented in: ASCS Instance with Integrated SAP Web Dispatcher [page 30]. Oracle Multitenant Installation, documented in: Multitenant Database Installation of Oracle Database 12c or Higher [page 192] Using RMOSSWPM*.SAR instead of SWPM*.SAR for outdated OS versions not supported by SAP kernel 7.40 and higher, documented in: *Introduction* > *Constraints*
2.4	2016-06-06	Updated version for software provisioning manager 1.0 SP17 (SL Toolset 1.0 SP17): • New Features: “ Archive-Based Installation”, documented in: ○ New Features [page 17] ○ Preparing the Installation Media [page 84] > *Downloading Specific Installation Archives (Archive-Based Installation)*
2.31	2016-03-23	Correction of command in *Installing the Oracle Database 12c Server Software*.
2.3	2016-02-15	Updated version for software provisioning manager 1.0 SP10 (SL Toolset 1.0 SP16)
2.2	2015-10-12	Updated version for software provisioning manager 1.0 SP09 (SL Toolset 1.0 SP15)
2.1	2015-09-14	Updated version for software provisioning manager 1.0 SP09 (SL Toolset 1.0 SP14)
2.0	2015-04-27	Updated version for software provisioning manager 1.0 SP08 (SL Toolset 1.0 SP13)
1.9	2014-11-24	Updated version for software provisioning manager 1.0 SP07 (SL Toolset 1.0 SP12)
1.8	2014-09-24	Updated version for software provisioning manager 1.0 SP06 (SL Toolset 1.0 SP11) Updates for migration to SAP HANA database added
1.7	2014-07-07	Updated version for software provisioning manager 1.0 SP06 (SL Toolset 1.0 SP11)
1.6	2014-03-17	Updated version for software provisioning manager 1.0 SP05 (SL Toolset 1.0 SP10)
1.5	2013-10-28	Updated version
1.4	2013-07-15	Updated version
1.3	2013-04-02	Updated version
1.2	2012-11-27	Updated version
1.1	2012-09-25	Updated version
1.0	2012-08-06	Initial version

1 About this Document

This installation guide describes how to install an SAP system based on the application server **ABAP** of SAP NetWeaver 7.1 to 7.52 using the installation tool Software Provisioning Manager 1.0 SP27 (“installer” for short), which is part of SL Toolset 1.0 SP27.

> **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.

This guide covers the SAP system products and releases listed in SAP Products Based on SAP NetWeaver 7.1 to 7.52 Supported for Installation Using Software Provisioning Manager 1.0 [page 11].

For information about **maintenance of SAP Business Suite and corresponding SAP NetWeaver versions**, see SAP Note 1648480.

For information about supported operating system and database platforms for the SAP product you want to install, see the Product Availability Matrix at http://support.sap.com/pam

> **⚠ Caution**
>
> Make sure you have read Before You Start [page 14] before you continue with this installation guide.

SAP Products Based on SAP NetWeaver 7.1 to 7.52 Supported for Installation Using Software Provisioning Manager 1.0 [page 11]
: Here you can find a list of SAP products based on SAP NetWeaver 7.1 to 7.52 ABAP that are supported for installation using Software Provisioning Manager 1.0.

Naming Conventions [page 12]
: This section lists the naming conventions that are currently apply for Software Provisioning Manager 1.0 (the “installer”) and terms used in this documentation.

Constraints [page 13]
: This section lists the naming constraints that are currently valid for Software Provisioning Manager 1.0 (the “installer”) and this documentation.

Before You Start [page 14]
: Make sure that you have read the release-specific “Master Guide” for your SAP Business Suite application, SAP NetWeaver application , or SAP Solution Manager system before you continue with this installation guide.

SAP Notes for the Installation [page 15]
: This section lists the most important SAP Notes relevant for an installation using Software Provisioning Manager

New Features [page 17]
: This section provides an overview of the new features in Software Provisioning Manager 1.0 (the“ installer” for short).

1.1 SAP Products Based on SAP NetWeaver 7.1 to 7.52 Supported for Installation Using Software Provisioning Manager 1.0

Here you can find a list of SAP products based on SAP NetWeaver 7.1 to 7.52 ABAP that are supported for installation using Software Provisioning Manager 1.0.

SAP Product	Based on the following SAP NetWeaver Release
SAP Business Suite 7i 2016: • EHP4 for SAP CRM 7.0 ABAP • EHP4 for SAP CRM 7.0 Java • EHP8 for SAP ERP 6.0 ABAP • EHP8 for SAP ERP 6.0 ABAP including SAP S/4HANA Finance 1605 SP03 • EHP8 for SAP ERP 6.0 Java • EHP4 for SAP SRM 7.0 ABAP • EHP4 for SAP SRM 7.0 Java • EHP4 for SAP SCM 7.0 ABAP	SAP NetWeaver 7.5
SAP Business Suite 7i 2013 Support Release 2: • EHP3 for SAP CRM 7.0 ABAP Support Release 2 • EHP3 for SAP CRM 7.0 Java Support Release 2 • EHP7 for SAP ERP 6.0 ABAP Support Release 2 • EHP7 for SAP ERP 6.0 ABAP including SAP Simple Finance 1.0 / 1503 • EHP7 for SAP ERP 6.0 Java Support Release 2 • EHP3 for SAP SRM 7.0 ABAP Support Release 2 • EHP3 for SAP SRM 7.0 Java Support Release 2 • EHP3 for SAP SCM 7.0 ABAP Support Release 2	SAP NetWeaver 7.4 Support Release 2
SAP NetWeaver 7.5	SAP NetWeaver 7.5
SAP Solution Manager 7.2 Support Release 1	SAP NetWeaver 7.4 Support Release 2
AS ABAP 7.4, OEM version 1.0	SAP NetWeaver 7.4 Support Release 2
SAP NetWeaver 7.4 Support Release 2	SAP NetWeaver 7.4
SAP Enhancement Package 1 for SAP NetWeaver 7.3	SAP NetWeaver 7.3
SAP NetWeaver 7.3	SAP NetWeaver 7.3
SAP EHP1 for SAP NetWeaver Adaptive Computing Controller 7.1	SAP NetWeaver 7.1 EHP1
SAP NetWeaver Adaptive Computing Controller 7.1	SAP NetWeaver 7.1

SAP Product	Based on the following SAP NetWeaver Release
SAP EHP1 for SAP NetWeaver Mobile 7.1	SAP NetWeaver 7.1 EHP1
SAP NetWeaver Mobile 7.1	SAP NetWeaver 7.1
SAP EHP1 for SAP NetWeaver 7.1 for banking services from SAP	SAP NetWeaver 7.1 EHP1
SAP NetWeaver 7.1 for banking services from SAP	SAP NetWeaver 7.1

1.2 Naming Conventions

This section lists the naming conventions that are currently apply for Software Provisioning Manager 1.0 (the "installer") and terms used in this documentation.

- Software Provisioning Manager 1.0 is the successor of the product- and release-specific delivery of provisioning tools, such as "SAPinst".
  Before you perform an installation from scratch or a target system installation in the context of a system copy, we strongly recommend that you always download the latest version of the Software Provisioning Manager 1.0 which is part of the Software Logistics Toolset 1.0 ("SL Toolset" for short). For more information, see Preparing the Installation Media [page 84].
  This way, you automatically get the latest version with the latest fixes of the tool and supported processes. For more information about Software Provisioning Manager 1.0 as well as products and releases supported by it, see SAP Note 1680045 and https://wiki.scn.sap.com/wiki/display/SL/Software+Provisioning+Manager+1.0+and+2.0.
  "SAPinst" has been renamed to "Software Provisioning Manager" ("installer" for short) in this documentation, 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_STACK_XML`
- "usage type", "technical usage", and "product instance"
  As of Software Provisioning Manager 1.0 SP07 (SL Toolset 1.0 SP12), the term "product instance" replaces the terms " usage type" and "technical usage" for SAP systems based on SAP NetWeaver 7.3 including enhancement package 1 and higher. For more information, see SAP Note 1970349. Note that there is no terminology change for older releases and all mentioned terms can be used as synonyms. As this guide is a generic document, the currently used terms remain but only "product instance" is used from now on when referring to SAP NetWeaver 7.3 EHP1 and higher.
  For more information, see New Features [page 17].
- "installer" refers to "Software Provisioning Manager".
- "SAP system" refers to SAP system based on the application server of SAP NetWeaver Mobile / Banking 7.1 / 7.1 including Enhancement Package 1 / SAP NetWeaver 7.3 / 7.3 including Enhancement Package 1 / Application Server ABAP 7.4 / SAP NetWeaver 7.4 / SAP NetWeaver 7.5 / SAP NetWeaver Application Server for ABAP 7.51 innovation package / SAP NetWeaver Application Server for ABAP 7.52 .

- “ABAP system” refers to SAP system based on the application server ABAP of SAP NetWeaver Mobile / Banking 7.1 / 7.1 including Enhancement Package 1 / SAP NetWeaver 7.3 / 7.3 including Enhancement Package 1 / Application Server ABAP 7.4 / SAP NetWeaver 7.4 / 7.4 SR1.
- “Diagnostics Agent” refers to the SAP Solution Manager Diagnostics Agent which is the remote component of End-to-End Root Cause Analysis. It allows having a connection between SAP Solution Manager and managed systems, and then to collect information from the managed systems for reporting purposes.
- **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.
- **Profiling for High Availability**

  Only valid for 'High Availability': HA (Windows)

  The profile bars with the wording *Only valid for: HA (Windows)* – for example, as in this section – refer to content that is only valid if you are installing a high-availability (HA) system with Microsoft Failover Clustering. The Windows Server Failover Clustering feature was previously called Microsoft Cluster Service (MSCS). For practical reasons we are continuing to use the abbreviation MSCS in the profile bars and in some sections of this guide.

  End of 'High Availability': HA (Windows)

1.3 Constraints

This section lists the naming constraints that are currently valid for Software Provisioning Manager 1.0 (the “installer”) and this documentation.

- The Dual Stack option, which integrates an AS ABAP and AS Java in a single system (common System ID `<SAPSID>`, common startup framework, common database), is no longer supported in SAP systems based on SAP NetWeaver 7.5. So if you want to install a new SAP NetWeaver 7.5 Process Integration (PI) system which is based on SAP NetWeaver 7.5, do not use the documentation *Installation Guide - SAP Systems Based on the Application Server ABAP+Java of SAP NetWeaver on <OS>: <DB>*. Instead, use the *Installation Guide - SAP Systems Based on the Application Server ABAP of SAP NetWeaver on <OS>: <DB>* to install the ABAP stack with its own `<SAPSID>` and the *Installation Guide - SAP Systems Based on the Application Server Java of SAP NetWeaver on <OS>: <DB>* to install the Java stack with its own `<SAPSID>`. For more information, see the implementation sequence in the *Master Guide - SAP NetWeaver 7.5* at http://help.sap.com/netweaver > `<Release>` > *Installation and Upgrade*.
- Not all SAP NetWeaver releases or SAP Business Suite applications that are available in Software Provisioning Manager 1.0 and are described in this installation guide have already been released. Always check SAP Note 1680045 to ensure that the installation options you want to perform are already supported. For information about supported operating system and database platforms, see the Product Availability Matrix at http://support.sap.com/pam.
- Note that a complete system installation from scratch is not available for every product. For some products - such as SAP NetWeaver 7.4 - a complete new system installation from scratch is only provided for the highest support release. If there are one or more support releases, then a complete system installation is

only available for the highest of these support releases. As for the lower support releases, only options for system copy and additional application server instances are provided.

- Your operating system platform must be **64-bit**.
- 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.

1.4 Before You Start

Make sure that you have read the release-specific "Master Guide" for your SAP Business Suite application, SAP NetWeaver application , or SAP Solution Manager system before you continue with this installation guide.

The "Master Guide" is the central document leading you through the overall implementation process for your SAP system installation. It contains crucial 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 "Master Guide" of the SAP system application for which you can use this installation guide, along with the available quick link or path to the appropriate download location:

Document	Internet Address
Master Guide – SAP NetWeaver AS for ABAP 7.52	http://help.sap.com/nw752abap *Installation and Upgrade*
Master Guide – SAP NetWeaver AS for ABAP 7.51 innovation package	http://help.sap.com/nw751abap *Installation and Upgrade*
Master Guide – SAP NetWeaver 7.5	http://help.sap.com/nw75 *Installation and Upgrade*
Master Guide – SAP Solution Manager 7.2	http://help.sap.com/solutionmanager *7.2* <SP> *Installation and Upgrade*
Master Guide – SAP NetWeaver 7.4	http://help.sap.com/nw74 *Installation and Upgrade*
Master Guide SAP Supply Chain Management 7.0 <Including SAP Enhancement Package <Number> *Powered by SAP NetWeaver*	http://help.sap.com/scm <Release> *Installation and Upgrade*

Document	Internet Address
Master Guide (Including Upgrade Information) - SAP Customer Relationship Management 7.0 `<Including SAP Enhancement Package <Number>`	http://help.sap.com/crm `<Release>` > *Installation and Upgrade*
Master Guide (Including Upgrade Information) - SAP Supplier Relationship Management 7.0 `<Including SAP Enhancement Package <Number>`	http://help.sap.com/srm `<Release>` > *Installation and Upgrade*
Master Guide - SAP Enhancement Package `<Number>` *for SAP ERP 6.0*	http://help.sap.com/erp `<Release>` > *Installation and Upgrade*
Master Guide – SAP Enhancement Package 1 for SAP NetWeaver 7.3	http://help.sap.com/nw731 *Installation and Upgrade*
Master Guide – SAP NetWeaver 7.3	http://help.sap.com/nw73 *Installation and Upgrade*
Master Guide - SAP NetWeaver Mobile 7.1	http://help.sap.com/nwmobile711 *Installation and Upgrade*
Master Guide – SAP for Banking Release 5.0 or 6.0	http://help.sap.com/bankingservices `<Release>` > *Installation and Upgrade*

1.5 SAP Notes for the Installation

This section lists the most important SAP Notes relevant for an installation using Software Provisioning Manager

You **must** read the following SAP Notes **before** you start the installation. These SAP Notes contain the most recent information on the installation, as well as corrections to the installation documentation.

Make sure that you have the up-to-date version of each SAP Note, which you can find at https://support.sap.com/notes.

SAP Notes for the Installation

SAP Note Number	Title	Description
1680045	Release Note for Software Provisioning Manager 1.0	Software Provisioning Manager 1.0 with installation and system copy for SAP NetWeaver-based systems
1710950	Inst. SAP Systems Based on SAP NetWeaver 7.1 and higher: Windows	Windows-specific information about the SAP system installation and corrections to this documentation
2172935	Installation - SAP Systems based on SAP NetWeaver on Oracle	Oracle-specific information about the SAP system installation and corrections to this documentation
2396282	Installation, System Copy, and Rename of NW 7.3x and NW 7.2x AS Java Systems with Oracle 12c	Since the Java DVD containing open*sql.jar does not support Oracle 12c, this note describes a workaround for the installation, system copy, and system rename with Oracle 12x, which is necessary for the installation, system copy or rename directly with Oracle12c.
2660020	Central Technical Note for Oracle Database 18c	Information about Oracle 18c with multiple links to notes on Oracle18c
2470660	Central Technical Note for Oracle Database 12c Release 2 (12.2)	Information about Oracle 12c Release 2 (12.2) with multiple links to notes on Oracle 12c Release 2 (12.2)
1914631	Central Technical Note for Oracle Database 12c Release 1 (12.1)	Information about Oracle 12c Release 1 (12.1) with multiple links to notes on Oracle 12c Release 1 (12.1)
1431800	Oracle 11.2.0: Central Technical Note	Information about Oracle 11g with multiple links to notes on Oracle 11g
1732161	SAP Systems on Windows Server 2012 (R2)	Windows Server 2012 (R2)-specific information for the SAP system installation
2384179	Planned support of Windows Server 2016 for SAP products	Windows Server 2016-specific information for the SAP system installation
2751450	SAP Systems on Windows Server 2019	Windows Server 2019-specific information for the SAP system installation
73606	Supported Languages and Code Pages	Information on possible languages and language combinations in SAP systems
1067221	Composite SAP Note for heterogeneous installation	This SAP Note and its related SAP Notes describe the released operating system and database combinations for heterogeneous SAP systems landscapes.

SAP Note Number	Title	Description
789220	Support Package levels for SAP NetWeaver installations/upgrades	Information about the ABAP Support Package levels and kernel patch levels contained in the current SAP NetWeaver release
819722	Support Package levels for SRM installations/upgrades	Information about the ABAP Support Package levels and kernel patch levels contained in the current SAP SRM release
774615	Support Package levels of ERP/ECC installations/upgrades	Information about the ABAP Support Package levels and kernel patch levels contained in the current SAP ERP release
837413	Support Package levels for CRM installations/upgrades	Information about the ABAP Support Package levels and kernel patch levels contained in the current SAP CRM release
850038	Support Package levels for SCM/APO installations/upgrades	Information about the ABAP Support Package levels and kernel patch levels contained in the current SAP SCM release
1990240	Support of mixed landscapes (Unicode and Non-Unicode)	Temporarily your system landscape is mixed with Unicode and Non-Unicode systems. You have third party software in your system landscape which does not support Unicode at all. You wonder whether such a heterogeneous system landscape is supported without restrictions.
886535	Downloading multispanning archives	Downloading multispanning archives

1.6 New Features

This section provides an overview of the new features in Software Provisioning Manager 1.0 (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
Oracle 18 c or higher: Support of Transparent Data Encryption (TDE)	Software Provisioning Manager 1.0 supports Oracle Transparent Data Encryption (TDE) for SAP NetWeaver-based systems. For more information, see Support of Oracle Transparent Data Encryption (Oracle TDE) [page 195].	Software Provisioning Manager 1.0 SP27 (SL Toolset 1.0 SP27)

Feature	Description	Availability
Support of Oracle 18	You can now perform all Software Provisioning Manager 1.0 tasks (installation, system copy, system rename) for SAP systems with the Oracle 18 database. For more information, see Installing the Oracle 18 Database Software [page 101] and https://support.sap.com/pam.	Software Provisioning Manager 1.0 SP25 (SL Toolset 1.0 SP25)
High-availability system on Microsoft Cluster: Option to install the ASCS instance in a file share on a local disk.	As an alternative to the "classic" way to install the ASCS instance on a shared disk, you can now choose to install the ASCS instance in a file share on a local disk. For more information, see High Availability with Microsoft Failover Clustering [page 216].	Software Provisioning Manager 1.0 SP25 (SL Toolset 1.0 SP25)
New Look and Feel of SL Common GUI	As of version 1.0 SP24 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 1.0 SP24, PL05 (SL Toolset 1.0 SP24)
New Installer Option *Download Software Packages for Maintenance Planner Transaction*	If you perform an installation using a stack configuration file, you can now download media according to a Maintenance Plan. For more information, see Installation Using a Stack Configuration File [page 37] , Downloading Software Packages for a Maintenance Planner Transaction [page 94], and https://blogs.sap.com/2018/06/01/software-provisioning-manager-new-option-for-standalone-download-service/.	Software Provisioning Manager 1.0 SP23 (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. For more information , see entry *Extract the* `SUM*.SAR` *Archive* in Additional Parameters When Using a Stack Configuration File [page 66].	Software Provisioning Manager 1.0 SP23 (SL Toolset 1.0 SP23)
Secure ABAP Message Server Connection	The installer now uses secure connections to the ABAP message server of the SAP system being installed. For more information, see the *ABAP Message Server Port* entry within the *Ports* table in SAP System Parameters [page 53].	Software Provisioning Manager 1.0 SP22 (SL Toolset 1.0 SP22)
Installer Log Files Improvements	Installer log files are now available immediately after the installer has been started, that is **before** a product has been selected on the *Welcome* screen. For more information, see Useful Information about the Installer [page 125] and Troubleshooting with the Installer [page 132].	Software Provisioning Manager 1.0 SP22 (SL Toolset 1.0 SP22)
Signature Check of Installation Archives	The signature of installation archives is checked **automatically** by the installer during the *Define Parameters* phase while processing the *Software Package Browser* screens. As of now the installer only accepts archives whose signature has been checked. For more information, see Downloading SAP Kernel Archives (Archive-Based Installation) [page 91] .	Software Provisioning Manager 1.0 SP22 (SL Toolset 1.0 SP22)

Feature	Description	Availability
`LOADTOOLS.SAR` archive in Software Provisioning Manager enabled for NUC	The load tools in `SWPM10SP<Support_Package_Number>_<Version_Number>.SAR` are now also enabled for an installation using **non**-Unicode (NUC) SAP kernel version 7.40 or higher. For more information, see Downloading and Extracting the Software Provisioning Manager 1.0 Archive [page 89] **i Note** This feature enhances feature `LOADTOOLS.SAR` *archive in Software Provisioning Manager* of Software Provisioning Manager 1.0 SP21 (SL Toolset 1.0 SP21) (see entry `LOADTOOLS.SAR` *archive in Software Provisioning Manager* below in this table).	Software Provisioning Manager 1.0 SP22 (SL Toolset 1.0 SP22)
Enabling IPv6	You can now set up a new SAP system or SAP system instance using Internet Protocol Version 6 (IPv6). For more information, see Prerequisites for Running the Installer [page 117].	Software Provisioning Manager 1.0 SP22 (SL Toolset 1.0 SP22)
Media Signature Check	The signature of media is checked **automatically** by the installer during the *Define Parameters* phase while processing the *Media Browser* screens. As of now the installer only accepts media whose signature has been checked. See also the description of this new security feature in SAP Note 2393060. For more information, see Preparing the Installation Media [page 84] and Running the Installer [page 119].	Software Provisioning Manager 1.0 SP21 (SL Toolset 1.0 SP21)
SAP Host Agent Upgrade During the Installation (Optional)	During the *Define Parameters* phase of the installation, the installer prompts you whether you want to upgrade an existing version of the SAP Host Agent on the installation host. If there is no SAP Host Agent on the installation host, it is installed automatically without prompt. For more information, see the *General Parameters* table in SAP System Parameters [page 53] .	Software Provisioning Manager 1.0 SP21 (SL Toolset 1.0 SP21)
Simplified Additional Application Server Instance Installation	During an additional application server installation, SAP kernel archives are only prompted if they cannot be retrieved from the primary application server instance of the existing SAP system. For more information, see Preparing the Installation Media [page 84].	Software Provisioning Manager 1.0 SP21 (SL Toolset 1.0 SP21)

Feature	Description	Availability
`LOADTOOLS.SAR` archive in Software Provisioning Manager	An up-to-date version of the load tools - such as `R3load`, `R3szchk`, `R3ldctl`, `SAPuptool` - which were available so far only in the `SAPEXEDB.SAR` archive of the kernel media, has now been made available in the Software Provisioning Manager archive. For an installation using Unicode kernel version 7.40 or higher, the load tools from the `SWPM10SP<Support_Package_Number>_<Version_Number>.SAR` are used automatically. For more information, see Downloading and Extracting the Software Provisioning Manager 1.0 Archive [page 89]	Software Provisioning Manager 1.0 SP21 (SL Toolset 1.0 SP21)
Support of Oracle Database Vault	Oracle Database Vault 12c has been certified for SAP products that are based on SAP NetWeaver technology. You can now install a new SAP system with Oracle Database 12c and configure Oracle Database Vault in its database. For more information, see Implementing Oracle Database Vault with Software Provisioning Manager 1.0 [page 190].	Software Provisioning Manager 1.0 SP21 (SL Toolset 1.0 SP21)
Support of Oracle 12.2	Software Provisioning Manager (the "installer") now supports SAP system installations with Oracle 12.2. For more information, see Installing the Oracle 12c Database Software [page 104].	Software Provisioning Manager 1.0 SP21 (SL Toolset 1.0 SP21)
SL Common GUI with SAPINST 7.49	With the new installer framework version SAPINST 7.49, you can now use the new SAPUI5-based graphical user interface (GUI) "SL Common GUI". For more information, see Useful Information about the Installer [page 125], Running the Installer [page 119] .	Software Provisioning Manager 1.0 SP20 (SL Toolset 1.0 SP20)
Option to install an SAP Gateway in an ASCS instance	You can now install an SAP Gateway in an ASCS instance. You can choose this option while running the ASCS instance installation. For more information, see ASCS Instance with Integrated Gateway [page 32]	Software Provisioning Manager 1.0 SP20 (SL Toolset 1.0 SP20)
Verification of Integrity of Data Units in Software Provisioning Manager	The integrity of data units extracted from the Software Provisioning Manager archive is verified. For more information, see Downloading and Extracting the Software Provisioning Manager 1.0 Archive [page 89] . In addition, check SAP Note 1680045 whether additional information is available.	Software Provisioning Manager 1.0 SP19 (SL Toolset 1.0 SP19)
Archive-based Language Installation	If you perform an installation using a stack configuration file, you can now add language archives to the download basket and use them for language installation. This feature is currently restricted to the latest products only. For more information, see Additional Parameters When Using a Stack Configuration File [page 66]	Software Provisioning Manager 1.0 SP19 (SL Toolset 1.0 SP19)

Feature	Description	Availability
Oracle Multitenant Installation	The multitenant option introduced in Oracle Database 12c allows a single container database (CDB) to host multiple separate pluggable databases (PDB). In the Software Provisioning Manager you can create a CDB, PDB, and also a new pluggable database in an existing container database. For more information, see Multitenant Database Installation of Oracle Database 12c or Higher [page 192].	Software Provisioning Manager 1.0 SP18 (SL Toolset 1.0 SP18)
Option to install an SAP Web Dispatcher in an ASCS instance	You can now install an SAP Web Dispatcher in an ASCS instance. You can choose this option while running the ASCS instance installation. For more information, see ASCS Instance with Integrated SAP Web Dispatcher [page 30]	Software Provisioning Manager 1.0 SP18 (SL Toolset 1.0 SP18)
Archive-Based Installation	You can now download the required **installation archives** instead of the complete SAP kernel installation media. For more information, see section *Downloading Specific Installation Archives (Archive-Based Installation)* in Preparing the Installation Media [page 84] .	Software Provisioning Manager 1.0 SP17 (SL Toolset 1.0 SP17)
Diagnostics Agent	The Diagnostics Agent is no longer installed automatically with the SAP system. The *Install Diagnostics Agent* check box on the *Install Diagnostics Agent* screen is no longer available. You now have to install the Diagnostics Agent always separately. We recommend that you install it prior to the installation of your SAP system(s). For more information, see the Diagnostics Agent Installation Strategy attached to SAP Note 1365123, to SAP Note 1833501, and to SAP Note 1858920 and the attached *Diagnostics Agent Setup Guide*.	Software Provisioning Manager 1.0 SP10 (SL Toolset 1.0 SP16)

Feature	Description	Availability
System Provisioning for SAP NetWeaver 7.5 and SAP NetWeaver 7.5-based Products	All system provisioning tasks (installation, system copy, system rename) are available for the new SAP NetWeaver 7.5 release. The Dual Stack option, which integrates an AS ABAP and AS Java in a single system (common System ID `<SAPSID>`, common startup framework, common database), is no longer supported in SAP systems based on SAP NetWeaver 7.5. • After upgrading to SAP NetWeaver 7.5 PI, you first have to split the still existing dual stack-system before you can use SAP NetWeaver 7.5 PI productively. For more information, see the *Upgrade Master Guide - SAP NetWeaver 7.5* at: http://help.sap.com/nw75 ▶ *Installation and Upgrade* • SAP NetWeaver 7.5 is Unicode only • The primary application server instance directory has been renamed from `/usr/sap/<SAPSID>/DVEBMGS<Instance_Number>` to `/usr/sap/<SAPSID>/D<Instance_Number>`. For more information, see SAP Directories [page 178]. • Declustering and depooling of tables during the installation is enabled by default. For more information, see SAP Note 1892354.	Software Provisioning Manager 1.0 SP09 (SL Toolset 1.0 SP15)
System Provisioning for SAP Solution Manager 7.2	All system provisioning tasks (installation, system copy, system rename) are available for the new SAP Solution Manager 7.2 release. Compared to previous SAP Solution Manager releases, SAP Solution Manager 7.2 is no longer provided as a classical dual-stack system (ABAP system with Java Add-in), but consists of a separate ABAP and Java stack.	Software Provisioning Manager 1.0 SP09 (SL Toolset 1.0 SP15)
Windows Domain Organizational Units	You can now specify an optional organizational unit (OU) within the Windows domain where you want the installer to create the SAP system accounts. For more information, see SAP System Parameters [page 53].	Software Provisioning Manager 1.0 SP09 (SL Toolset 1.0 SP14)

Feature	Description	Availability
Creating Kernel Archives from existing SAP System	You can reuse the binaries of a dedicated SAP system for a new SAP system installation or target system installation in the context of a system copy by creating `*.SAR` archives based on the `*.lst` files from the executable (`exe`) directories of the source SAP system. **i Note** This feature is only available for Unicode systems. **⚠ Caution** This feature has been deprecated with Software Provisioning Manager 1.0 SP21 (SL Toolset 1.0 SP21) and the related option has been removed from the *Welcome* screen. This deprecation has been accomplished to ensure compliancy with the new feature "Media Signature Check" of Software Provisioning Manager 1.0 SP21 (SL Toolset 1.0 SP21) described above in this table.	Software Provisioning Manager 1.0 SP09 (SL Toolset 1.0 SP14)
Support of Oracle 12 Database	You can now perform all Software Provisioning Manager 1.0 tasks (installation, system copy, system rename, dual-stack split) for SAP systems with the Oracle 12 database. For more information, see http://support.sap.com/pam.	Software Provisioning Manager 1.0 SP08 (SL Toolset 1.0 SP13)
Installation Using a Stack Configuration File	You can start the installer using a stack configuration file generated by the Maintenance Planner. The configuration parameters in this file can then be used by the installer to improve the integration with SUM and to simplify the process of installation for a new system on target software level. For more information, see Installation Using a Stack Configuration File (Optional) [page 37].	Software Provisioning Manager 1.0 SP07 (SL Toolset 1.0 SP12)
Adaptive Installation	You can assign virtual host names to SAP system instances during the input phase of the installation directly on the screens where you define the instance parameters. For more information, see SAP System Parameters [page 53].	Software Provisioning Manager 1.0 SP07 (SL Toolset 1.0 SP12)
Feedback Evaluation Form	SAP SE's aim is to provide fast and efficient procedures. To evaluate the procedure you just carried out, we need information generated by the tool during process execution and your experience with the tool itself. A new evaluation form contains a simple questionnaire and XML data generated during the procedure. Port 4239 is used for displaying the feedback evaluation form. For more information, see Prerequisites for Running the Installer [page 117].	Software Provisioning Manager 1.0 SP07 (SL Toolset 1.0 SP12)

Feature	Description	Availability
Option *Verify Signed Media*	The digital signature ensures that the signatory of a digital document can be identified unambiguously and signatory's name is documented together with the signed document, the date, and the time. For more information, see SAP Note 1979965.	Software Provisioning Manager 1.0 SP06 (SL Toolset 1.0 SP11)

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.

After you have decided on the installation option that you want to use, continue with Planning [page 35].

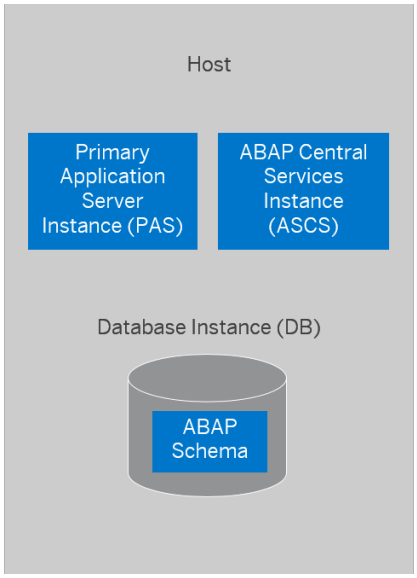
2.1 Standard System

You can install a **standard** system on a **single** host.

In a standard system, all main instances 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
  - 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 30].
  - Optionally, you can install the ASCS instance with an integrated gateway. For more information, see ASCS Instance with Integrated Gateway [page 32].
- 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.

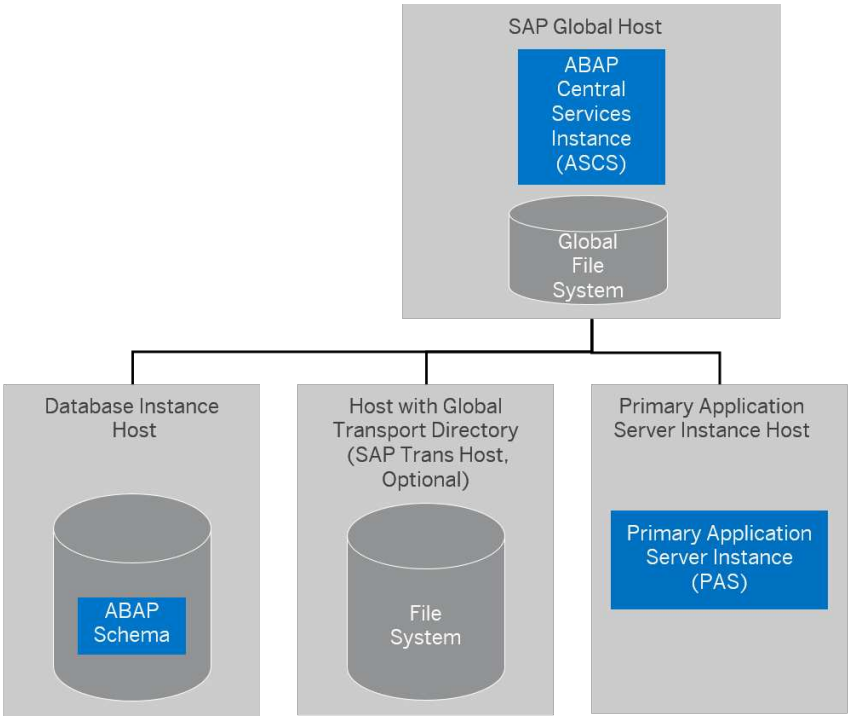
A distributed system consists of the following instances:

- ABAP Central services instance (ASCS instance)
  Contains the ABAP message server and the Standalone Enqueue Server
  - 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 30].
  - Optionally, you can install the ASCS instance with an integrated gateway. For more information, see ASCS Instance with Integrated Gateway [page 32].
- 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 27].



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 220].

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:

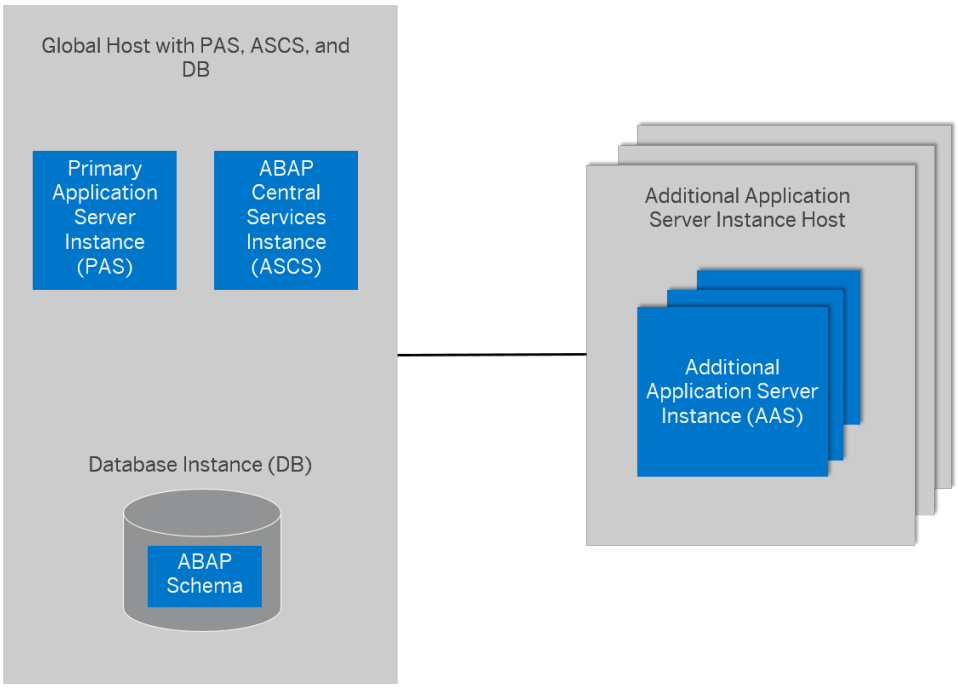
- The host of any instance of the existing SAP system
- On a dedicated host

> **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 51].

Additional Application Server Instance for a Standard System

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

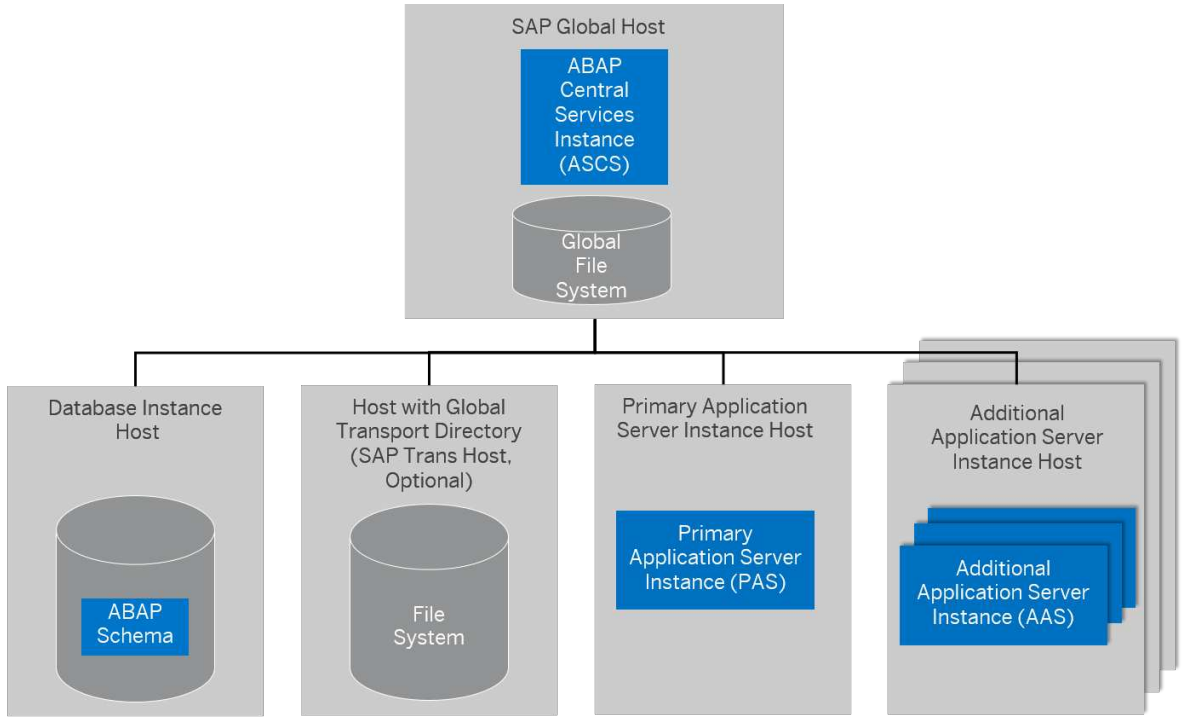


Additional Application Server Instance for a Standard ABAP System

For more information, see Standard System [page 25].

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 26].

Only valid for 'High Availability': HA (Windows)

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 220].

End of 'High Availability': HA (Windows)

2.5 Splitting off an ABAP Central Services Instance from an Existing Primary Application Server Instance

The ABAP central services instance (ASCS instance) consists of the essential enqueue and message system services only. This has been standard for the Java stack and is now also standard for the ABAP stack.

The benefit of having a separate ASCS instance is mainly in the area of high-availability. This approach concentrates the possible single points of failure of a system into a single instance and, therefore, restricts failure to a single instance.

Every newly installed SAP system based on SAP NetWeaver 7.3 and higher is automatically installed with an ASCS instance, even if you install all SAP system instances on one host (standard system).

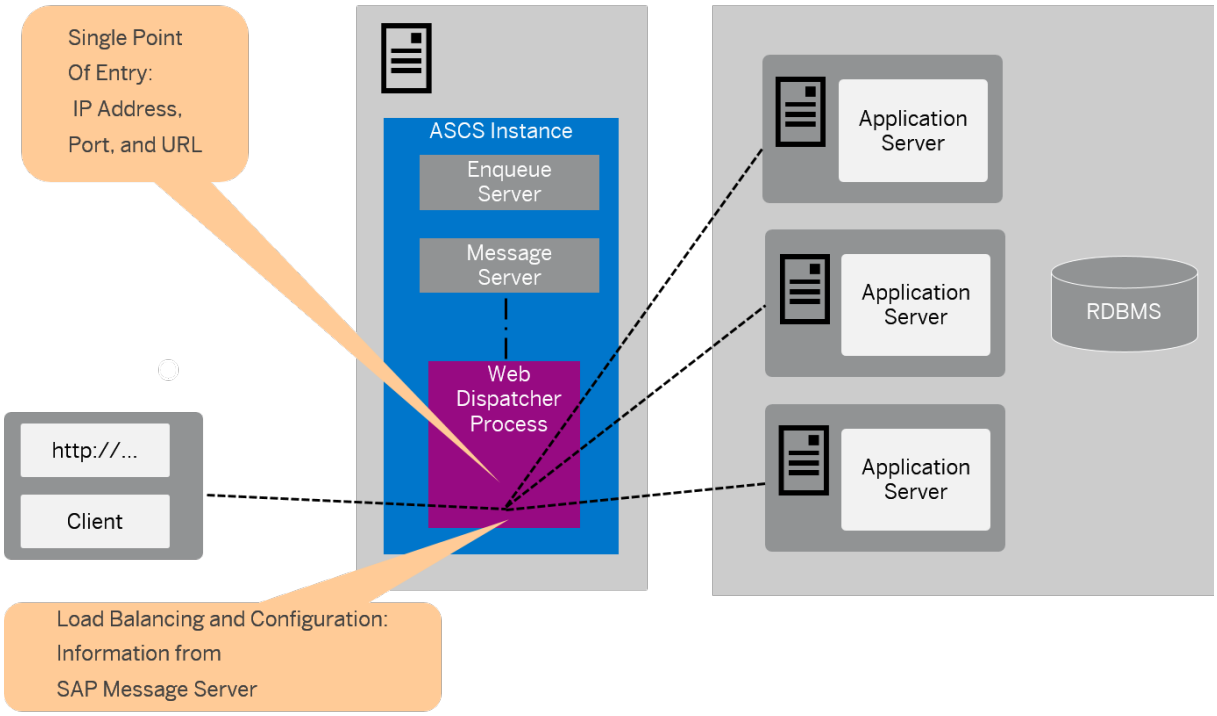
However, if you upgraded your SAP system from a release based on a SAP NetWeaver release lower than 7.3, your SAP system might not yet have a separate ASCS instance.

The section Splitting Off an ABAP Central Services Instance from an Existing Primary Application Server Instance [page 197] describes how you can move the message server and the enqueue work process from an existing primary application server instance to a newly installed ABAP central services instance (ASCS instance).

2.6 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 Library at:

SAP Release and SAP Library Quicklink	SAP Library Path (Continued)
• SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 • SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *Function-Oriented View* > *Application Server Infrastructure* > *Components of SAP NetWeaver Application Server* > *SAP Web Dispatcher*
• SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 • SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library. **i Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.

SAP Release and SAP Library Quicklink	SAP Library Path (Continued)
• SAP NetWeaver 7.3 http://help.sap.com/nw73 • SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 • SAP NetWeaver 7.4 http://help.sap.com/nw74 • SAP NetWeaver 7.5 http://help.sap.com/nw75 • SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap • SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View* > *Application Server* > *Application Server Infrastructure* > *Components of SAP NetWeaver Application Server* > *SAP Web Dispatcher*

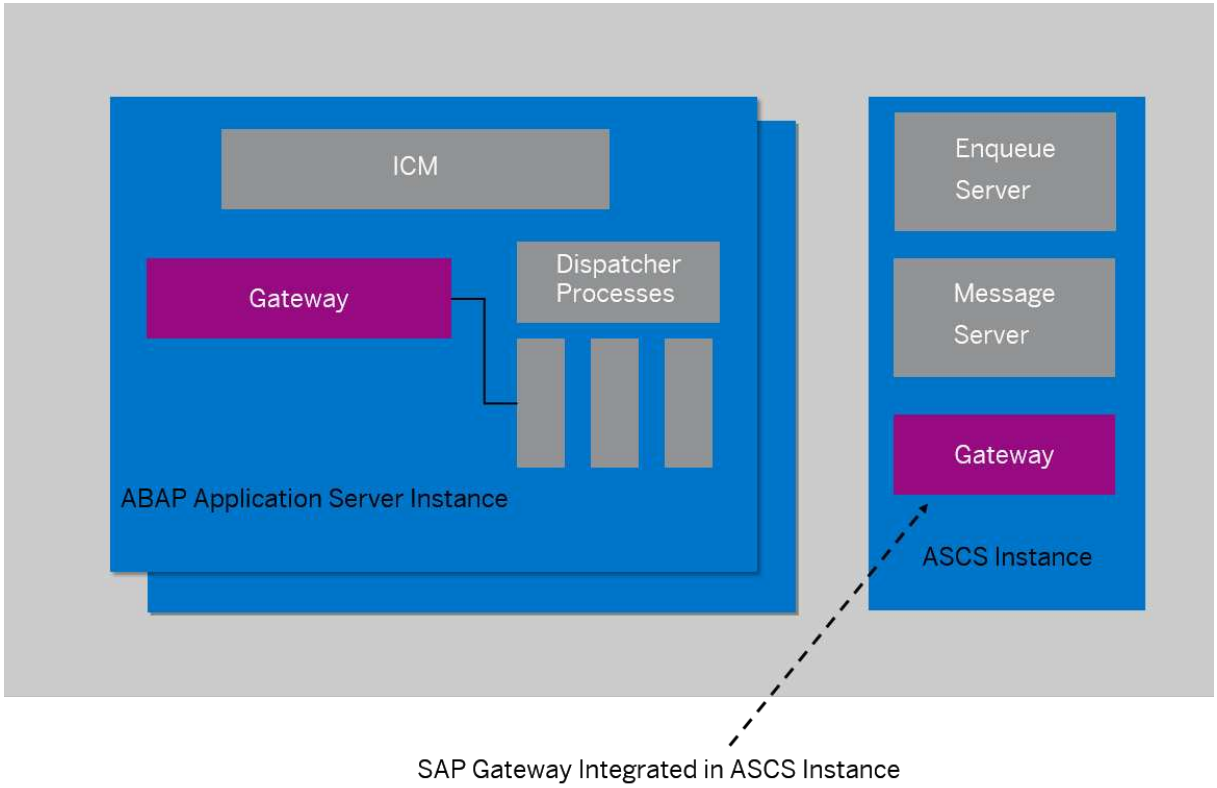
Related Information

Parameters for Additional Components to be Included in the ASCS Instance [page 68]

2.7 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 216]

Parameters for Additional Components to be Included in the ASCS Instance [page 68]

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 Master Guide available at the appropriate download location as described in Before You Start [page 14] .
2. You have decided on your installation option (see Installation Options Covered by this Guide [page 25]).

Standard, Distributed, or High-Availability System

> **i Note**
>
> In a standard system, all mandatory instances are installed on one host. Therefore, if you are installing a standard system, you can ignore references to other hosts.

1. Make yourself familiar with the changed file system structure and profiles for SAP systems based on SAP NetWeaver 7.1 and higher compared to SAP systems based on lower SAP NetWeaver releases. For more information, see Changed File System Structure and Profiles for SAP Systems Based on SAP NetWeaver 7.1 and Higher [page 36].
2. 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 37].

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

3. You check the hardware and software requirements [page 39] on every installation host.
4. You plan how to set up user and access management [page 50].
5. You identify Basic SAP System Installation Parameters [page 52].
6. You decide whether you want to perform a domain or local installation [page 51].
7. For the database installation, you decide on how to distribute your database components to disk [page 69].
8. If your database release is Oracle 12c and you want to install it as a pluggable database in a container database (multitenant database installation), consider the additional steps described in Multitenant Database Installation of Oracle Database 12c or Higher [page 192].
9. You decide on the transport host to use [page 73].
10. You decide whether you want to integrate LDAP Directory Services in your SAP system [page 174].
11. You decide if you want to use multiple Oracle homes [page 74].
12. Only valid for 'High Availability': HA (Windows)
    To install a high-availability system with **Microsoft Failover Clustering**, you perform the HA-specific planning steps [page 218].
    End of 'High Availability': HA (Windows)
13. Optionally, you decide whether you want to install multiple components in one database (MCOD) [page 188].
14. If you want to implement Oracle Database Vault, make sure that you have read section Implementing Oracle Database Vault with Software Provisioning Manager 1.0 [page 190].
15. Continue with Preparation [page 76].

Additional Application Server Instance

1. You check the hardware and software requirements [page 39] 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 52].
3. Continue with Preparation [page 76].

3.2 Changed File System Structure and Profiles for SAP Systems Based on SAP NetWeaver 7.1 and Higher

File system structure

- For SAP system releases based on SAP NetWeaver 7.1 and higher, the directory structure was changed compared to SAP NetWeaver 7.0, in order to support heterogeneous system installations and updates more efficiently.

> ⚠ Caution
>
> The directory structure of systems based on SAP NetWeaver 7.1 or higher is not supported on systems based on SAP NetWeaver 7.0 including Enhancement Packages.

- For a manual switch, see the details about targeted file system structure in this documentation and adjust your file system accordingly to avoid later issues for system transformation such as system copy and system rename.

Profiles

- As of SAP NetWeaver 7.3, the start profile as separate file has been removed. In earlier versions of SAP NetWeaver there was one default profile per SAP system, one start profile per Instance and one Instance profile per instance. Now the start profile contents are merged with the instance profile. With the help of the new instance profile, SAP processes are started and at the same time instance-specific parameters are read. This reduces the total number of profile files to one default profile per SAP System, and one instance profile per instance.
  For more information, see the SCN blog *What's new in SAP NetWeaver 7.3 - A Basis perspective* at: https://blogs.sap.com/2012/05/22/whats-new-in-sap-netweaver-73-a-basis-perspective/.

  > ⚠ Caution
  >
  > The merged profiles are not supported for SAP NetWeaver 7.0 including Enhancement Packages because this could lead to issues for SAP system copy. If you are not sure which SAP NetWeaver product version you have, see SAP Note 1877731 for more information.

- For more information about merging the start profile with the instance profiles, see SAP Note 1528297.
- **Additional application server instances:** Double-check the values with the profile values from the primary application server - for example for parameters `DIR_CT_RUN` , `DIR_EXECUTABLE`, `DIR_SAPJVM` - to avoid startup issues.

3.3 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.

→ Recommendation

We recommend that you perform the installation using a stack configuration file for new products, such as SAP S/4HANA or *SAP Solution Manager 7.2*.

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 94]

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 66]
Downloading Software Packages for a Maintenance Planner Transaction [page 94]
Running the Installer [page 119]
Configuring the Change and Transport System [page 147]
Applying the Latest Kernel and Support Package Stacks [page 151]
Installing Additional Languages and Performing Language Transport [page 156]

3.4 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 40].
     - Integrated in the installation tool (mandatory) as part of the installation process
       For more information, see Running the Installer [page 119].
   - The hardware and software requirements tables in Requirements for the SAP System Hosts [page 41]
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

3.4.1 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 1.0 Archive [page 89] .
2. Make either the separate `SAPEXE<Version>.SAR` archive or the complete kernel medium available as described in Preparing the Installation Media [page 84] .
3. Start the installer as described in Running the Installer [page 119].
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.

   > **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.

   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 1.0 Archive [page 89]
Preparing the Installation Media [page 84]

3.4.2 Requirements for the SAP System Hosts

This section provides information about the hardware and software requirements for the:

- ABAP central services instance (ASCS)
- Database instance
- Primary application server instance
- Additional application server instance

> **i Note**
>
> The additional application server instance is optional in a non-HA system, but mandatory in an HA system.

- Only valid for 'High Availability': HA (Windows)
  High Availability only: Enqueue Replication Server instance (ERS)
  End of 'High Availability': HA (Windows)
- SAP Host Agent

Only valid for 'High Availability': HA (Windows)

General Requirements for a High-Availability System

- Windows Server 2012 (R2) and higher:
  1. Check that your cluster hardware is certified for Windows Server 2012 (R2), Windows 2016, or Windows Server 2019 and has the corresponding Windows Server logo.
  2. You must validate your failover cluster configuration by running the command `test-cluster` in a PowerShell.
     The *Failover Cluster Validation Report* must not show any errors.
- Windows Server 2008 (R2):
  1. Check that your cluster hardware is certified for Windows Server 2008 (R2) and has the Windows Server 2008 (R2) logo.
  2. You must validate your failover cluster configuration by running the *Validate a Configuration Wizard*, which is included in the *Failover Cluster Management* snap-in. This must not show any errors.
- The cluster nodes of the cluster must be connected by a private and public network:
  - The public network enables communication from the cluster nodes of the cluster to other resources in the local area network (LAN).
  - The private network enables internal communication between the cluster nodes. In particular, it enables the Cluster Service running on all cluster nodes to regularly exchange messages on the state of the cluster nodes so that the failure of resources is quickly detected.
- Each of the cluster nodes in the cluster must have its own local disks and have access to an external file share or shared disks that can be reached by the cluster nodes via a shared bus.
  For more information about the distribution of components to local and shared disk, see Distribution of SAP System Components to Disks for Failover Clustering [page 228].
- All disk controllers must be able to support hardware-based RAID.

> ⚠ Caution
>
> You **cannot** use a host with a domain controller as a cluster node.

End of 'High Availability': HA (Windows)

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.

> ℹ 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.
> - Only valid for 'High Availability': HA (Windows)
>
>   If you install **multiple** SAP systems in one Failover Cluster, make sure that together with your hardware partner you have set up the correct sizing for your system configuration.
>
>   End of 'High Availability': HA (Windows)
> - 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	• Database software:
	2 to 5 GB
	• ABAP central services instance (ASCS) (not including paging file):
	5 GB (x64)
	8 GB (IA64)
	  ○ In addition, you require 4 GB (x64), or 8 GB (IA64) per additional platform.
	  ○ 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.
	• Database instance (not including paging file):
	35 GB
	• **Multitenant Database Installation of Oracle Database 12c or Higher [page 192]:**
	  ○ For a container database (CDB), you need additional disk space for the following tablespaces:
	  ○ `SYSTEM DEFAULT`: 2x* 350 MB
	  ○ `PSAPTEMP DEFAULT`: 2x* 350 MB
	  ○ `SYSAUX DEFAULT`: 2x* 200MB
	i Note
	* These tablespaces are created two times in the CDB, because all further pluggable databases (PDB) are created out of them.
	  ○ For each further PDB, you need the same disk space as for a normal single database instance installation.
	• Only valid for 'High Availability': HA (Windows)
	High Availability only: Enqueue replication server instance (ERS) (not including paging file):
	5 GB (x64)
	8 GB (IA64)
	End of 'High Availability': HA (Windows)
	• Primary application server instance (not including paging file):
	5 GB (x64)
	8 GB (IA64)
	  ○ In addition you require 4 GB (x64), or 8 GB (IA64) per additional platform.
	• Additional application server instance (not including paging file):
	2.5 GB (x64)
	5 GB (IA64)
		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
	• 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	
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*. **i 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 186] • 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. Only valid for 'High Availability': HA (Windows) **i Note** **High Availability only:** You must adjust the size of the paging file on **all** cluster nodes. End of 'High Availability': HA (Windows)
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 2008 (R2):
	  ○ Only valid for 'High Availability': non-HA
	  Windows Server Standard Edition
	  End of 'High Availability': non-HA
	  ○ Windows Server Enterprise Edition
	  ○ Windows Server Datacenter Edition
	  ○ Windows Server 2008 (R2) for Itanium-Based Systems 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**
		
		Only valid for 'High Availability': HA (Windows)
		i Note
		• You must add the operating system feature *Failover Clustering* on **all** cluster nodes.
		End of 'High Availability': HA (Windows)

Software Requirement	Requirement	How to Check

Database software	• Database instance:
	  ○ Database server software for Oracle 11g or 12c
	  ○ Current Oracle patches, if available.
	  ○ Oracle Fail Safe software
	
	⚠ Caution
	For up-to-date information on the released and supported database versions for your SAP product and database, see the Product Availability Matrix (PAM) at http://support.sap.com/pam.	

SAP kernel releases and versions	SAP kernel 7.40 and higher: IP Multicast Configuration Make sure that you have applied the operating system patches required for IP Multicast Configuration. For more information, see SAP Note 1931675.	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.
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*.
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*.

3.5 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 117].

More Information

For more information about configuring the user management of your SAP system to be installed, see the SAP Library at:

SAP Release and SAP Library Quicklink	SAP Library Path (Continued)
• SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 • SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *SAP NetWeaver Library: Function-Oriented View* > *Security* > *Identity Management* > *Identity Management of the Application Server ABAP*
• SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 • SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library. **i Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.
• SAP NetWeaver Process Integration 7.1 http://help.sap.com/nwpi71 • SAP NetWeaver Process Integration 7.1 Including Enhancement Package 1 http://help.sap.com/nwpi711	*Application Help* > *SAP NetWeaver Library: Function-Oriented View* > *Security* > *Identity Management* > *Identity Management of the Application Server ABAP*

SAP Release and SAP Library Quicklink	SAP Library Path (Continued)
• SAP NetWeaver 7.3 http://help.sap.com/nw73 • SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 • SAP NetWeaver 7.4 http://help.sap.com/nw74 • SAP NetWeaver 7.5 http://help.sap.com/nw75 • SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap • SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *SAP NetWeaver Library: Function-Oriented View* > *Security* > *Identity Management* > *User and Role Administration of Application Server ABAP* > *Configuration of User and Role Administration* > *Directory Services* > *LDAP Connector*

3.6 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.
- Only valid for 'High Availability': HA (Windows)
  You install a high-availability system with Microsoft Failover Clustering.
  End of 'High Availability': HA (Windows)
- 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.

If the SAP system is to run on a **single** machine (standard system), you can perform a local installation.

> **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 79]

3.7 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
  - **SAP systems based on SAP NetWeaver 7.40 and higher:** 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.

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

> **Note**
>
> - If you want to install an ASCS instance with an integrated SAP Web Dispatcher [page 30], you must choose *Custom*. Otherwise, you are not prompted for the SAP Web Dispatcher installation parameters [page 68] during the *Define Parameters* phase of the ASCS instance installation.

- If you want to install an ASCS instance with an integrated Gateway [page 32], you must choose *Custom*. Otherwise, you are not prompted for the SAP Gateway installation during the *Define Parameters* phase of the ASCS instance installation.
- Only valid for 'High Availability': HA (Windows)

  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.

  End of 'High Availability': HA (Windows)

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 53]
SAP System Database Parameters [page 63]
Additional Parameters when Installing SAP Process Integration 7.5 or SAP Solution Manager 7.2 [page 65]
Additional Parameters When Using a Stack Configuration File [page 66]
Parameters for Additional Components to be Included in the ASCS Instance [page 68]

3.7.1 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
Unicode System	Every **new** installation of an SAP system is Unicode. **SAP systems based on SAP NetWeaver 7.1 to 7.4:** You can only deselect this option if you perform the target system installation in the context of a system copy for a non-Unicode SAP system that has been upgraded to the current release. **SAP systems based on SAP NetWeaver 7.5 or higher** are Unicode only. If you install an additional application server instance in an existing non-Unicode system (that has been upgraded to the current release), the additional application server instance is installed automatically as a non-Unicode instance. The installer checks whether a non-Unicode system exists and chooses the right executables for the system type.

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. Only valid for 'High Availability': HA (Windows) **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. End of 'High Availability': HA (Windows) 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 178]. **⚠ 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

Parameter	Description
Virtual Host Name	Virtual host name (network name) of the `SAP<SAPSID>` cluster group You can assign a virtual host name to an SAP instance in one of the following ways: • 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. • Alternatively you can assign virtual host names also by starting the installer with the `SAPINST_USE_HOSTNAME` property. For more information, see Running the Installer [page 119]. 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 81]. **i Note** Fully qualified host names, `IPv4`, `IPv6` are not accepted as virtual host names.
SAP Process Integration (PI) 7.5, SAP Solution Manager 7.2: Application Server Gateway Communication Setup	If you want to install the primary application server instance of the **Java** system on a host **different** from the host of the primary application server instance of the ABAP system, then you must specify the host of the Java primary application server instance during the *Define Parameters* phase of the primary application server instance installation of the ABAP system. This is to set up the connection between the ABAP and the Java system.
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. **i 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 **SAP systems based on SAP NetWeaver 7.4 and Higher:** 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 the Oracle database:** • It must not begin with a digit or an underscore • It can contain the following characters: _, #, $, ., a-z, A-Z, 0-9 Depending on the installation option, additional restrictions may apply.
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.

Parameter	Description
SAP systems based on SAP NetWeaver 7.4 and Higher only: 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 Library - depending on the SAP NetWeaver release your SAP system is based on - at: http://help.sap.com/nw74 http://help.sap.com/nw75 https://help.sap.com/nw751abap https://help.sap.com/nw752abap *Application Help* > *Function-Oriented View: English* > *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 Library - depending on the SAP NetWeaver release your SAP system is based on - at: http://help.sap.com/nw74 http://help.sap.com/nw75 https://help.sap.com/nw751abap https://help.sap.com/nw752abap *Application Help* > *Function-Oriented View: English* > *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`.
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 SAP Kernel Archives (Archive-Based Installation) [page 91]

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 183].
	  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 79] 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 152]
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

3.7.2 SAP System Database Parameters

Parameters	Description
Database ID <DBSID>	The <DBSID> identifies the database instance. The installer prompts you for the <DBSID> when you are installing the database instance. The <DBSID> can be the same as the <SAPSID>. **⚠ Caution** Choose your database ID carefully. Renaming is difficult and requires you to reinstall the SAP system. • If you want to install a new database: Make sure that your database ID: ○ Is unique throughout your organization ○ 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. • **MCOD only:** If you want to use an existing database system, enter exactly the database ID of the existing database to which you want to add the system. For more information, see Installation of Multiple Components in One Database [page 188]. • If you want to perform a Multitenant Database installation,you have to specify one database system ID (<DBSID>) for the container database (CDB) and one <PDBSID> for each pluggable database (PDB). SAP A <PDBSID> cannot be equal to the assigned <DBSID>. The <DBSID> must be different from the <SAPSID>, because the default and recommended value for the <PDBSID> is the <SAPSID> of the SAP system running with the PDB. For more information, see Multitenant Database Installation of Oracle Database 12c or Higher [page 192].
Database schema, Password	The ABAP database schema is named SAP<SCHEMA_ID>. Default name is SAPSR3. **→ Recommendation** Choose a <SCHEMA_ID> that is different from your <SAPSID>. It might cause problems when you copy a system where <SCHEMA_ID> is the same as <SAPSID>, and the database-specific method used for the copy does not allow you to rename the database schemas. In certain situations, you might create a system copy with a new <SAPSID>, but where the database schema has the old <SAPSID>. This is not a technical problem but it might confuse the system administrator.

Parameters	Description
Oracle parameters	• Oracle home • SAPDATA drives • Drives for redolog and archives (`oraarch`)

Oracle Listener Name, Oracle Listener Port, Oracle Listener Domain	• If you install the database instance on a host where no other Oracle database is installed, you normally do not have to change the default values for Listener Name and Listener Port.
	• If you install the database instance on a host where another Oracle database is already installed you have the following options:
	  ○ If you install it in the same Oracle home, you use the default values for Listener Name and Listener Port.
	  ○ If you install it in a different Oracle home, you specify an unused Listener Name and Listener Port for the new Oracle Listener.
	• All additional application server instances of an SAP system must use the same Listener Port than the database instance.
	• The default domain in the network configuration files is `WORLD`.

Install Oracle Database Vault	If you want to implement Oracle Database Vault, make sure that you specify this when entering the Oracle Database parameters. For more information, see Implementing Oracle Database Vault with Software Provisioning Manager 1.0 [page 190]
User Accounts for Oracle Database Vault	If you want to implement Oracle Database Vault, make sure that you specify the passwords for the Oracle Database Vault user accounts `secadmin` and `secacctmgr` to be created . For more information, see Implementing Oracle Database Vault with Software Provisioning Manager 1.0 [page 190]
Install Oracle TDE	If you want to implement Oracle Transparent Data Encryption (TDE), you must select checkbox *Install Oracle TDE* on the *Oracle Database* parameter screen. For more information, see Support of Oracle Transparent Data Encryption (Oracle TDE) [page 195].
Password of Oracle TDE Master Key	If you want to implement Oracle Transparent Data Encryption (TDE), you must specify the *Password of TDE Master Key* on the *Oracle TDE Configuration* screen. For more information, see Support of Oracle Transparent Data Encryption (Oracle TDE) [page 195].

3.7.3 Additional Parameters when Installing SAP Process Integration 7.5 or SAP Solution Manager 7.2

The parameters in this section are only required if you want to install SAP Process Integration 7.5 or SAP Solution Manager 7.2.

Parameter	Description
Communication Port for ABAP	For a secure communication of connected SAP systems to the ABAP stack you have to define the HTTPS port that is to be configured in the application server instance profile. Further post-installation steps [page 155] are required to fully enable HTTPS communication. For more information about HTTPS enablement, see SAP Note 510007. In addition you can configure an HTTP port. However, this is not recommended for productive SAP systems due to security reasons. → Recommendation If you are about to install an **SAP NetWeaver 7.5 Process Integration** system and you intend to run automated configuration using the Central Technical Configuration (CTC) Wizard after the installation, it is strongly recommended that you configure the ABAP communication port for ABAP already during the installation process, because you can only run the CTC Wizard if the ABAP port is either completely configured for HTTPS or optionally for HTTP (see also PI: Configuring the Process Integration System After the Install [page 158]).
Application Server Gateway Communication Setup	If you want to install the primary application server instance of the **Java** system on a host **different** from the host of the primary application server instance of the ABAP system, then you must specify the host of the Java primary application server instance during the *Define Parameters* phase of the primary application server instance installation of the ABAP system. This is to set up the connection between the ABAP and the Java system.

3.7.4 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 ABAP load. From the language media delivered with your product version or - if already provided by the Maintenance Planner for the respective product - using language archives, 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 37].

Related Information

Installation Using a Stack Configuration File [page 37]

3.7.5 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 30]
ASCS Instance with Integrated Gateway [page 32]

3.8 Distribution of SAP System and Oracle Database Components to Disks

When you install the SAP system, the main directories required for the system are automatically created. However, during the installation procedure, the installer prompts you to enter drive letters for the main components of the system. This gives you the opportunity to distribute components to disks in the system as you wish.

How you do this significantly affects system throughput and data security, and must therefore be carefully planned. The best distribution depends on your specific environment and must take into consideration factors such as the size of the components involved, security requirements, and the expected workload.

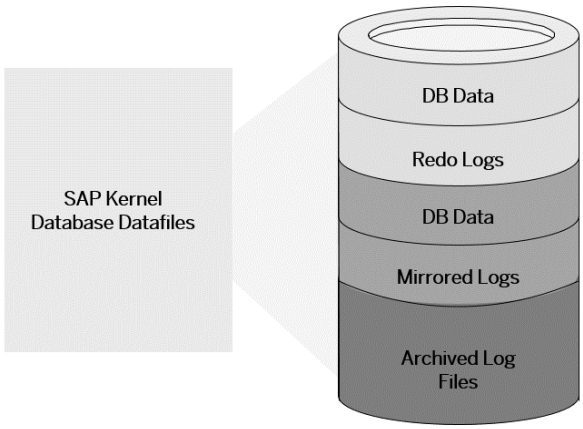
When you work out the assignment of components to disks, you first need to get an overview of the main components and their corresponding directories. Then, on the basis of sample configurations and the recommendations provided in this documentation, you can decide which assignment is best for your particular system.

SAP systems are normally installed on RAID arrays that ensure data redundancy. This documentation therefore focuses on RAID subsystems and drives.

Minimal Configuration

The following figure illustrates an example for a disk configuration for a small test or demo system. Since security and performance play a less crucial role in this type of system, many different configurations are feasible.

> ⚠ Caution
>
> Use the illustrated configuration exclusively for test or demo systems. It is unsuitable for production systems because it only minimally satisfies security and performance requirements.



Configuration for Test or Demo System

Distribution of Database Directories to Disks

Disk	Directories
Disk 1	/oracle/<DBSID>/<DB-Release 11x|12x|18x>
	\ORACLE\<DBSID>\origlogA
	\ORACLE\<DBSID>\origlogB
	\ORACLE\<DBSID>\sapdata1
	\ORACLE\<DBSID>\sapdata2
Disk 2	\ORACLE\<DBSID>\mirrlogA
	\ORACLE\<DBSID>\mirrlogB
	\ORACLE\<DBSID>\sapreorg
	\ORACLE\<DBSID>\saptrace
	\ORACLE\<DBSID>\saparch
	\ORACLE\<DBSID>\sapbackup
	\ORACLE\<DBSID>\sapcheck
	\ORACLE\<DBSID>\sapdata3
	\ORACLE\<DBSID>\sapdata4
	\ORACLE\<DBSID>\sapprof
Disk 3	\ORACLE\<DBSID>\oraarch

> **i Note**
>
> - The configuration ensures that no data can be lost, but the process for recovering a damaged database is complicated and time-consuming.
> - The redo logs and database files are located on the same disks. This means that a single disk failure can result in the loss of both the redo logs and database data.
> - The I/O-intensive redo logs are on the same disk volumes as the data files. This can impede performance.
> - An equally good alternative would be to simply place all components on a single RAID 5 array.
> - If you want to perform a Multitenant Database installation, for the complete seed database tablespaces the same `sapdata` directories are used as for the original database (SYSTEM, SYSAUX, and PSAPTEMP).

Related Information

Oracle Database File Names for Multitenant Installation [page 71]
Multitenant Database Installation of Oracle Database 12c or Higher [page 192]

3.8.1 Oracle Database File Names for Multitenant Installation

This section contains information about seed database paths, pluggable database files and tablespace names in pluggable databases.

Seed Database Path

> **i Note**
>
> The `sapdata` path cannot be changed in the installer screen for all seed tablespaces

Tablespace Name	File Path
System tablespace seed	`<drive>: \oracle\<DBSID>\sapdata1\seed_system_1\seed_system.data1`
Sysaux tablespace seed	`<drive>: \oracle\<DBSID>\sapdata1\seed_sysaux_1\seed_sysaux.data1`

Tablespace Name	File Path
Temp tablespace seed	<drive>: \oracle\<DBSID>\sapdata1\seed_temp_1\seed_temp.data1

The <sapdata> path to the SEED tablespaces is set to the same path as the original tablespaces of SYSTEM, SYSAUX, and PSAPTEMP.

Pluggable Database Files

Tablespace Name	File Path
System tablespace pluggable database	<drive>: \oracle\<DBSID>\<pdbsid>_sapdata1\<pdbsid>_system_1\<pdbsid>_system.data1
Sysaux tablespace pluggable database	<drive>: \oracle\<DBSID>\<pdbsid>_sapdata1\<pdbsid>_sysaux_1\<pdbsid>_sysaux.data1
Temp tablespace pluggable database	<drive>: \oracle\<DBSID>\<pdbsid>_sapdata1\<pdbsid>_temp_1\<pdbsid>_temp.data1

Tablespace Names in a Pluggable Database

Tablespace Name	File Path
PSAP<SCHEMAID> tablespace	<drive>: \oracle\<DBSID>\<pdbsid>_sapdata2\<pdbsid>_<schemaid>_1\<pdbsid>_<schemaid>.data1

Required Disk Space

The disk space required for the seed database is the same as for the original tablespaces SYSTEM, SYSAUX, and TEMP.

A pluggable database as such requires the same disk space as, for example, an MCOD database. This is because a pluggable database uses only the data tablespaces PSAPSR3, PSAPSR3<REL>, and PSAPSR3USR.

For more information about MCOD, see Installation of Multiple Components in One Database [page 188].

Naming Conventions Used in this Section

`<SCHEMAID>`: Default is “SR3”

`<schemaid>`: Default is “sr3”

`<pdbsid>`: Pluggable database ID (DBSID) in lower case letters

`<DBSID>`: Database ID (DBSID) of the container database in capital letters

Related Information

Distribution of SAP System and Oracle Database Components to Disks [page 69]
Requirements for the SAP System Hosts [page 41]

3.9 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 82].

More Information

- SAP Directories [page 178]

- See the SAP Library at:

Release	SAP Library Path
○ SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 ○ SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 (use the SAP Library for SAP NetWeaver Mobile 7.1) ○ SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711 ○ SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0 (use the SAP Library for SAP NetWeaver Mobile 7.1 including Enhancement Package 1)	*Application Help* > *Function-Oriented View* > *ABAP Technology / Application Server ABAP* > *Administration Tools for AS ABAP* > *Change and Transport System* > *Change and Transport System – Overview* > *Basics of the Change and Transport System* > *Transport Management System – Concept*
○ SAP NetWeaver 7.3 http://help.sap.com/nw73 ○ SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 ○ SAP NetWeaver 7.4 http://help.sap.com/nw74 ○ SAP NetWeaver 7.5 http://help.sap.com/nw75 ○ SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap ○ SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View* > *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*

3.10 Multiple Oracle Homes

The Oracle database software is installed in a directory structure which is referenced as Oracle Home. Before you install your Oracle database software, you need to decide whether you want to set up a single or multiple Oracle Homes as this influences the installation procedure.

If you install more than one database instance on the same host you have the following options:

- You use a **single** Oracle Home
  - You can use a single Oracle Home, if you use the same Oracle database version on one host for different database instances.
  - With a single Oracle Home, you have to install the database software only once.

- With a single Oracle Home, you cannot administer your databases independently.

- You use **multiple** Oracle Homes
  - If you use multiple Oracle Homes, you must set up one Oracle Listener for each Oracle Home. Each listener must have a different TCP/IP port number.
  - With multiple Oracle Homes, you can administer your databases independently.
  - Multiple Oracle Homes are necessary, if you need to install different Oracle databases versions on the same host.
  - Windows Server 2008 (R2) and higher:
    Multiple Oracle Homes are not supported in a Microsoft failover cluster.

Related Information

Setting Up Multiple Oracle Homes [page 115]

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, all mandatory instances are installed on one host. Therefore, if you are installing a standard system, you can ignore references to other hosts.

1. Windows Server 2008 (R2) or higher: you disable the Windows Server firewall [page 77] on each host.
2. You perform basic preparations on Windows [page 78].
3. You check that you have the required user authorization for running the installer [page 79].
4. If required, you prepare the SAP system transport host [page 82] for your SAP system.
5. You install the SAP front-end software [page 84] on the desktop of the user.
6. You check that the required installation media [page 84] are available for each installation host.
7. Only valid for 'High Availability': HA (Windows)
   To install a high-availability system with Microsoft Failover Clustering, you also perform the HA-specific preparation steps [page 218].
   End of 'High Availability': HA (Windows)
8. If you want to implement Oracle Database Vault, make sure that you have completed the required preparation steps. For more information, see Implementing Oracle Database Vault with Software Provisioning Manager 1.0 [page 190].
9. You continue with Installation [page 98].

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 77] on each host.
2. You perform basic preparations on Windows [page 78].

3. You check that you have the required user authorization for running the installer [page 79].
4. If required, you prepare the SAP system transport host [page 82].
5. You install the SAP front-end software [page 84] on the desktop of the user.
6. You check that the required installation media [page 84] are available on each installation host.
7. You continue with Installation [page 98].

4.2 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

Only valid for 'High Availability': HA (Windows)

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

End of 'High Availability': HA (Windows)

- 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*.

4.3 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.

4.4 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.
> - Only valid for 'High Availability': HA (Windows)
>   In a high-availability configuration, you always have to perform a **domain** installation.
>   End of 'High Availability': HA (Windows)
> - 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 183].

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.

If the SAP system is to run on a **single** machine, you can perform a local installation.

> ⚠ 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 183]

4.5 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

Only valid for 'High Availability': HA (Windows)

⚠ 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.

End of 'High Availability': HA (Windows)

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 119].
   - 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 53] and SAP Note 962955.
2. To install a **non-high-availability** system, proceed as described in SAP Note 1564275.

4.6 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 Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
• SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 • SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library **i Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.
• SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 • SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *Function-Oriented View* > *ABAP Technology / Application Server ABAP* > *Administration Tools for AS ABAP* > *Change and Transport System* > *Change and Transport System – Overview* > *Basics of the Change and Transport System* > *Transport Management System – Concept*
• SAP NetWeaver 7.3: http://help.sap.com/nw73 • SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 • SAP NetWeaver 7.4 http://help.sap.com/nw74 • SAP NetWeaver 7.5 http://help.sap.com/nw75 • SAP NetWeaver Application Server for ABAP 7.51 innovation package http://help.sap.com/nw751abap • SAP NetWeaver AS for ABAP 7.52 http://help.sap.com/nw752abap	*Application Help* > *SAP NetWeaver Library: Function-Oriented View* > *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 206].

4.7 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

4.8 Preparing the Installation Media

This section describes how to prepare the installation media.

Installation media are available as follows:

- The Software Provisioning Manager 1.0 archive containing the installer
  You always have to download the latest version of the Software Provisioning Manager 1.0 archive.
  For more information, see Downloading and Extracting the Software Provisioning Manager 1.0 Archive [page 89].
- The media containing the software to be installed. These are the following:
  - Kernel media:
    You can make them available in one of the following ways:
    - Download the specific **kernel archives** from the SAP Software Download Center - this is the recommended way.
    - Download the **SAP kernel archives** (`SAR` files) from the SAP Software Center.
      If you are performing an Installation Using a Stack Configuration File [page 37], you can directly download the artefacts (SAR archives) as specified in the Maintenance Plan.

- Use the physical installation media as part of the installation package.
- Download the complete kernel media from the SAP Software Center.

- RDBMS and export media.
  You can make them available in one of the following ways:
  - Use the physical installation media as part of the installation package.
  - Download the complete kernel media from the SAP Software Center.

For detailed information about how to obtain these media, see Media Required for the Installation - Listed by SAP System Instance [page 85].

Media Required for the Installation - Listed by SAP System Instance [page 85]
This section provides a list of the media required for the installation, listed by SAP system instance to be installed.

4.8.1 Media Required for the Installation - Listed by SAP System Instance

This section provides a list of the media required for the installation, listed by SAP system instance to be installed.

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 119]). The installer only accepts media whose signature has been checked. For more information, see SAP Note 2393060.

For more information about which kernel version to use, see SAP Note 1680045. In addition, check the Product Availability Matrix at: http://support.sap.com/pam.

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.

Proceed as follows to make the media available:

1. Identify the required media for your installation [page 25] as listed below.

SAP Instance Installation	Required Software Packages from Installation Media
ABAP Central services instance (ASCS instance)	○ Software Provisioning Manager 1.0 archive ○ UC or NUC Kernel (folder `K_<Version>_<N or U>_<OS>`) where `U` means Unicode and `N` means non-Unicode. **i Note** Every **new** installation of an SAP system is Unicode. You can only use the non-Unicode kernel if you perform the system copy for a non-Unicode SAP system that has been upgraded to the current release.

SAP Instance Installation	Required Software Packages from Installation Media
Database instance	○ Software Provisioning Manager 1.0 archive ○ UC or NUC Kernel (folder `K_<Version>_<N or U>_<OS>`) where `U` means Unicode and `N` means non-Unicode. **i Note** Every **new** installation of an SAP system is Unicode. You can only use the non-Unicode kernel if you perform the system copy for a non-Unicode SAP system that has been upgraded to the current release. ○ Database software ○ ○ Database patches (if available) ○ `DBATOOLS<Version>.SAR` **i Note** If you have Oracle client version >= 12, the `DBATOOLS<Version>.SAR` must be at least from kernel 7.40 or 720 EXT. *SAP KERNEL* `<Version> <NUC>` is only available for SAP systems based on SAP NetWeaver 7.4 or lower. ○ Installation Export (folders `EXP*`) **i Note** For an MCOD system you require the database client software instead of the database software and the database patches (if available).
Enqueue Replication Server	○ Software Provisioning Manager 1.0 archive ○ UC or NUC Kernel (folder `K_<Version>_<N or U>_<OS>`) where `U` means Unicode and `N` means non-Unicode. **i Note** Every **new** installation of an SAP system is Unicode. You can only use the non-Unicode kernel if you perform the system copy for a non-Unicode SAP system that has been upgraded to the current release.

SAP Instance Installation	Required Software Packages from Installation Media
Primary application server instance	○ Software Provisioning Manager 1.0 archive ○ UC or NUC Kernel (folder `K_<Version>_<N or U>_<OS>`) where `U` means Unicode and `N` means non-Unicode. **i Note** Every **new** installation of an SAP system is Unicode. You can only use the non-Unicode kernel if you perform the system copy for a non-Unicode SAP system that has been upgraded to the current release. ○ Installation Export (folders `EXP*`) ○ **SAP SCM only:** SAP liveCache ○ Database Client Software ○ CLI Driver / JDBC Driver
Additional application server instance	○ Software Provisioning Manager 1.0 archive ○ UC or NUC Kernel (folder `K_<Version>_<N or U>_<OS>`) where `U` means Unicode and `N` means non-Unicode. **i Note** If you install an additional application server instance in an existing non-Unicode system, the additional application server instance is created automatically as a non-Unicode instance. The installer checks whether a non-Unicode system exists and chooses the right executables for the system type. ○ **SAP SCM only:** SAP liveCache ○ Database Client Software

SAP Host Agent (Separate Installation Only)

SAP Instance Installation	Required Media
SAP Host Agent (separate installation only)	○ Software provisioning manager 1.0 archive ○ UC Kernel (folder `K_<Version>_U_<OS>`) where `U` means Unicode.

2. Make the installation media available on each installation host as follows:
   1. Download and unpack the latest version of Software Provisioning Manager as described in Downloading and Extracting the Software Provisioning Manager 1.0 Archive [page 89].
   2. Make the kernel media available.
      You can do this in one of the following ways:
      - Download the dedicated kernel archives - this is the recommended way.
        For more information, see Downloading SAP Kernel Archives (Archive-Based Installation) [page 91].

        i Note

        If you are using a stack configuration file (see Installation Using a Stack Configuration File [page 37]), you have the installation media defined when generating the Landscape Plan. The

media link provided in the Landscape Plan guides you to the location in the SAP Software Download Center at https://launchpad.support.sap.com/#/softwarecenter where you can download the installation media required for your SAP product, operating system and database.

Using the installer, you can also directly download the artefacts (SAR archives) as specified in the Maintenance Plan. For more information, see Downloading Software Packages for a Maintenance Planner Transaction [page 94].

- Use the physical kernel medium from the installation package.
  You can do this in one of the following ways:
  - Copy the required media folders directly to the installation hosts.
  - Mount the media on a central media server that can be accessed from the installation hosts.

  ⚠ Caution

  - If you copy the media to disk, make sure that the paths to the destination location of the copied media do not contain any blanks.
  - If you perform a domain installation and do not want to copy the media but use network drives for mapping the installation media, make sure that the `<sapsid>adm` user has access to the UNC paths of the network drives.
    If the user does not yet exist, you have to create the user manually before you install the SAP system.
- Download the kernel medium from the Software Download Center.
  For more information, see Downloading Complete Installation Media [page 96].

i Note

Even if you use the complete 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 at the end of this section.

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 have to download the required PL from https://launchpad.support.sap.com/#/softwarecenter following the instructions in Downloading SAP Kernel Archives (Archive-Based Installation) [page 91].

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.

3. Make the RDBMS and export media. available.
   You can do this in one of the following ways:
   - Copy the required media folders directly to the installation hosts.
   - Mount the media on a central media server that can be accessed from the installation hosts.

> ⚠ Caution
>
> - If you copy the media to disk, make sure that the paths to the destination location of the copied media do not contain any blanks.
> - If you perform a domain installation and do not want to copy the media but use network drives for mapping the installation media, make sure that the `<sapsid>adm` user has access to the UNC paths of the network drives.
>
> If the user does not yet exist, you have to create the user manually before you install the SAP system.

3. If you want to perform target system installation in the context of a **heterogeneous system copy** you need a migration key. You can generate it at https://support.sap.com/migrationkey.

Related Information

Downloading and Extracting the Software Provisioning Manager 1.0 Archive [page 89]
Downloading SAP Kernel Archives (Archive-Based Installation) [page 91]
Downloading Software Packages for a Maintenance Planner Transaction [page 94]
Downloading Complete Installation Media [page 96]

4.8.1.1 Downloading and Extracting the Software Provisioning Manager 1.0 Archive

You must always download and extract the Software Provisioning Manager 1.0 archive from the SAP Software Download Center because you must use the latest version.

Prerequisites

You require the **latest** version of the `SAPCAR` tool to unpack the Software Provisioning Manager 1.0 archive `SWPM10SP<Support_Package_Number>_<Version_Number>.SAR`. For more information about how to get this tool, see the *Procedure* section below.

Context

An up-to-date version of the load tools - such as `R3load`, `R3szchk`, `R3ldctl`, `SAPuptool` - which were available so far only in the `SAPEXEDB.SAR` archive of the kernel media, has now been made available in the Software Provisioning Manager archive (`SWPM10SP<Support_Package_Number>_<Version_Number>.SAR`), in a sub-archive named `LOADTOOLS.SAR`, located in the `COMMON/LOADTOOLS` folder. For an installation using kernel version 7.40 or

higher, the load tools from the SWPM10SP<Support_Package_Number>_<Version_Number>.SAR are used **automatically** instead of the loadtools available in the SAPEXEDB.SAR archive of the kernel media. **There is no action required from your side**, the installer uses the relevant loadtools automatically once you run it from the extracted SWPM10SP<Support_Package_Number>_<Version_Number>.SAR archive.

Procedure

1. Download the latest version of the Software Provisioning Manager 1.0 archive SWPM10SP<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. Unpack the Software Provisioning Manager archive to a local directory using the following command:

   ```
   <Path to SAPCAR>\sapcar.exe -xvf <Path to Download Directory>
   \SWPM10SP<Support_Package_Number>_<Version_Number>.SAR -R <Path to Unpack
   Directory>
   ```

   > **i** Note
   >
   > Make sure that all users have at least read permissions for the directory to which you 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.

4.8.1.2 Downloading SAP Kernel Archives (Archive-Based Installation)

Instead of downloading the complete SAP kernel media, we recommend that you download the SAP kernel archives specificly required for your installation option. During the installation, you can either specify the path to each archive separately, or provide the path to a download basket with all downloaded archives.

> **i** Note
>
> If you are performing an installation using a stack configuration file, you can use the service Downloading Software Packages for a Maintenance Planner Transaction [page 94].

Context

The signature of **installation archives** is checked **automatically** by the installer [page 119] 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. Download and unpack the latest version of Software Provisioning Manager as described in Downloading and Extracting the Software Provisioning Manager 1.0 Archive [page 89].
2. Go to https://launchpad.support.sap.com/#/softwarecenter ▶ *SUPPORT PACKAGES & PATCHES* ▶ *By Category* ▶
3. Choose the required software component, release, and technical stack:
   - If you want to install SAP NetWeaver AS for ABAP 7.52, choose ▶ *SAP NetWeaver and complementary products* ▶ *NW AS ABAP INNOVATION PKG* ▶ *NW AS ABAP 7.52* ▶
   - If you want to install SAP NetWeaver AS for ABAP 7.51 innovation package, choose ▶ *SAP NetWeaver and complementary products* ▶ *NW AS ABAP INNOVATION PKG* ▶ *NW AS ABAP 7.51 INNOVATION PKG* ▶
   - If you want to install AS ABAP FOR OOEM, choose ▶ *SAP NetWeaver and complementary products* ▶ *SAP NETWEAVER ABAP FOR OOEM* ▶
   - If you want to install SAP NetWeaver Mobile 7.1, choose ▶ *SAP NetWeaver and complementary products* ▶ *SAP NETWEAVER MOBILE* ▶ `<Release>` ▶ *Entry by Component* ▶
   - If you want to install an SAP NetWeaver ABAP system, choose ▶ *SAP NetWeaver and complementary products* ▶ *SAP NetWeaver* ▶ `<Release>` ▶ *[For releases lower than 7.5: Entry by Component]* ▶ *Application Server ABAP* ▶

- If you want to install an SAP Business Suite system based on SAP NetWeaver, choose *SAP Application Components* > `<SAP CRM | SAP ERP | SAP SCM | SAP SRM>` > `<Release>` > *Entry by Component* > `<ABAP Product Instance>`

4. 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 1680045 .
> - 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 **7.53 DCK**, then `SAPEXEDB<Version>.SAR` must also be of version **7.53 DCK**.
> > - If `SAPEXE<Version>.SAR` is of version **7.49**, then `SAPEXEDB<Version>.SAR` must also be of version **7.49**.
>
> - 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 | NUC>` > `<Operating System>` > *#DATABASE INDEPENDENT*

  > **i Note**
  >
  > *SAP KERNEL* `<Version>` `<NUC>` is only available for SAP systems based on SAP NetWeaver 7.4 or lower.

  - If you want to install an SAP system based on SAP NetWeaver AS for ABAP 7.52 or higher, you can only choose 7.49 UNICODE for *SAP KERNEL* `<Version>`.
  - If you want to install an SAP system based on SAP NetWeaver AS for ABAP 7.51 innovation package or higher, you can either choose or 7.53 DCK UNICODE or 7.49 UNICODE for *SAP KERNEL* `<Version>`.
  - If you want to install an SAP system based on SAP NetWeaver 7.5, you can choose either 7.53 DCK or 7.49 UNICODE for *SAP KERNEL* `<Version>`.

- If you want to install an SAP system based on SAP NetWeaver 7.4, you can choose either 7.53 DCK or 7.49 UNICODE for *SAP KERNEL* `<Version>`.
- If you want to install an SAP system based on SAP NetWeaver 7.3 EHP1 or lower, choose 7.21 EXT for *SAP KERNEL* `<Version>`.

- `SAPEXEDB<Version>.SAR`

  Choose the version corresponding to the `SAPEXE<Version>.SAR` from ▶ *SAP KERNEL* `<Version> <UC | NUC>` ▶ `<Operating System>` ▶ `<DATABASE>` ◀

  > **i Note**
  >
  > *SAP KERNEL* `<Version> <NUC>` is only available for SAP systems based on SAP NetWeaver 7.4 or lower.

- `DBATOOLS<Version>.SAR`

  ▶ *SAP KERNEL* `<Version> <UC | NUC>` ▶ `<Operating System>` ▶ *Oracle* ◀

  > **i Note**
  >
  > If you have Oracle client version >= 12, the `DBATOOLS<Version>.SAR` must be at least from kernel 7.40 or 720 EXT.
  >
  > *SAP KERNEL* `<Version> <NUC>` is only available for SAP systems based on SAP NetWeaver 7.4 or lower.

- `igsexe<Version>.sar`

  ▶ *SAP IGS* `<Version>` ▶ `<Operating System>` ◀
  - If you want to install an SAP system based on SAP NetWeaver Application Server for ABAP 7.52, choose ▶ *SAP IGS* `<7.53 or higher>` ▶ *# OS independent* ◀.
  - If you want to install an SAP system based on SAP NetWeaver Application Server for ABAP 7.51 innovation package, choose ▶ *SAP IGS* `<7.53 or higher>` ▶ *# OS independent* ◀.
  - If you want to install an SAP system based on SAP NetWeaver 7.5, choose ▶ *SAP IGS* `<7.53 or higher>` ▶ *# OS independent* ◀.
  - If you want to install an SAP system based on SAP NetWeaver 7.4, choose ▶ *SAP IGS* `<7.53 or higher>` ▶ *# OS independent* ◀.
  - If you want to install an SAP system based on SAP NetWeaver 7.3 EHP1, choose ▶ *SAP IGS 7.20_EXT* ▶ *# OS independent* ◀
  - If you want to install an SAP system based on SAP NetWeaver 7.3 or lower and use SAP kernel 7.21_EXT, choose ▶ *SAP IGS 7.20_EXT* ▶ `<Operating System>` ◀
  - If you want to install an SAP system based on SAP NetWeaver 7.3 or lower and use SAP kernel 7.21, choose ▶ *SAP IGS 7.20* ▶ `<Operating System>` ◀
- If you want to install an SAP system based on SAP NetWeaver 7.3 EHP1 or higher, you require the `igshelper<Version>.sar`.

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

  ▶ *SAP HOST AGENT 7.21* ▶ `<Operating System>` ◀

→ Recommendation

It is highly recommended that you always choose the highest SP version of the `SAPHOSTAGENT<SP-version>.SAR` archive.

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.

5. If you want to install an SAP system based on SAP NetWeaver 7.3 EHP1 or lower - that is you have to use SAP kernel 7.21 - download the latest patch level of `SAPCRYPTOLIB <Version>.SAR` from the following path:

   https://launchpad.support.sap.com/#/softwarecenter ▶ *Support Packages and Patches* ▶ *By Category* ▶ *Additional Components* ▶ *SAPCRYPTOLIB* ▶ *COMMONCRYPTOLIB*`<Version>` ▶ `<Operating System>` ▶

6. Make the RDBMS and the export media available - either by using physical media as described in Media Required for the Installation - Listed by SAP System Instance [page 85] or by downloading them as described in Downloading Complete Installation Media [page 96].

Related Information

Downloading Software Packages for a Maintenance Planner Transaction [page 94]

4.8.1.3 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 119] .
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 SAP Kernel Archives (Archive-Based Installation) [page 91] - and for applying the required kernel and support packages using Software Update Manager (SUM) after the installation has completed.

SAP BW/4HANA 1.0 SR1 only: RDBMS and export **media** are **not** covered by this feature. You have to provide them either as physical media or download them from the SAP Software Center as described in Downloading Complete Installation Media [page 96] .

4.8.1.4 Downloading Complete Installation Media

This section describes how you can download complete media from the SAP Software Download Center.

Procedure

1. Download and unpack the latest version of Software Provisioning Manager as described in Downloading and Extracting the Software Provisioning Manager 1.0 Archive [page 89].

2. Create a download directory on the host where you want to run the installer.
3. You identify the required media als listed in Media Required for the Installation - Listed by SAP System Instance [page 85] .
4. Identify **all** download objects that belong to one medium according to one of the following:

   > **i Note**
   >
   > Installation media might be split into several files. In this case, you have to reassemble the required files after the download.

   - Download path or location:
     - To download the complete kernel media, go to https://support.sap.com/sltoolset > *System Provisioning* > *Software Provisioning Manager 1.0 SP*`<Current Version>` > *Download Kernel releases delivered for SL Toolset* > *SL TOOLSET 1.0 (INSTALLATIONS AND UPGRADES)* > *KERNEL FOR INSTALLATION/SWPM* .
     - To download all media required for your SAP product, you can use one of the following navigation paths:
       - https://launchpad.support.sap.com/#/softwarecenter > *INSTALLATIONS & UPGRADES* > *By Category* > *SAP NETWEAVER AND COMPLEMENTARY PRODUCTS* > `<Product>` > `<Product Release>`
       - https://launchpad.support.sap.com/#/softwarecenter > *INSTALLATIONS & UPGRADES* > *By Alphabetical Index (A-Z)* > `<First Letter of Product>` > `<Product>` > `<Product Release>`
   - Material number
     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
     > ...
     > ```

5. Download the objects to the download directory.
6. 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.

Standard System

> **i Note**
>
> In a standard system, all mandatory instances are installed on one host. Therefore, if you are installing a standard system, you can ignore references to other hosts.

1. You install the Oracle database software.

   > **i Note**
   >
   > This step is not required if you install a system into an existing database (MCOD) [page 188].

   > **i Note**
   >
   > If your database release is Oracle 12c and you want to install it as a container database (CDB) or as a pluggable database PDB in an existing CDB (multitenant database installation), perform the additional steps as described in Multitenant Database Installation of Oracle Database 12c or Higher [page 192].

2. If required, you set up multiple Oracle Homes [page 115] on the host where you install the SAP system.

   > **i Note**
   >
   > This step is not required if you install a system into an existing database (MCOD) [page 188].

3. You check the prerequisites [page 117] and run the installer [page 119] to install the SAP system.

   > **i Note**
   >
   > In a standard system, all mandatory instances are installed on one host in one installation run.

> **i Note**
>
> If your database release is Oracle 12c and you want to install it as a container database (CDB) or as a pluggable database PDB in an existing CDB (multitenant database installation), perform the additional steps as described in Multitenant Database Installation of Oracle Database 12c or Higher [page 192].

4. You continue with Post-Installation [page 134].

Distributed System

1. On the database instance host, you install the Oracle database software [page 100].

   > **i Note**
   >
   > This step is not required if you install a system into an existing database (MCOD) [page 188].

   > **i Note**
   >
   > If your database release is Oracle 12c and you want to install it as a container database (CDB) or as a pluggable database PDB in an existing CDB (multitenant database installation), perform the additional steps as described in Multitenant Database Installation of Oracle Database 12c or Higher [page 192].

2. If required, on the database instance host, you set up multiple Oracle Homes [page 115].

   > **i Note**
   >
   > This step is not required if you install a system into an existing database (MCOD) [page 188].

3. On the ASCS instance host, you check the prerequisites [page 117] and run the installer [page 119] to install the ABAP central services instance.

   > **i Note**
   >
   > If you want to install an ASCS instance with integrated SAP Web Dispatcher [page 30] or with integrated SAP Gateway [page 32] 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.

4. On the database instance host, you check the prerequisites [page 117] and run the installer [page 119] to install the database instance.
5. On the primary application server instance host, you check the prerequisites [page 117] and run the installer [page 119] to install the primary application server instance.
6. If required, you install *1* to <N> additional application server instances on the respective hosts, as described later in this section.
7. You continue with Post-Installation [page 134].

Only valid for 'High Availability': HA (Windows)

High-Availability System

1. To install a high-availability system with Microsoft Failover Clustering, you perform the HA-specific installation steps [page 218].
2. You continue with Post-Installation [page 134].

End of 'High Availability': HA (Windows)

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 117] and run the installer [page 119] to install the additional application server instances.

   Only valid for 'High Availability': HA (Windows)

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

   End of 'High Availability': HA (Windows)

   > i Note
   >
   > If your database release is Oracle 12c, during the installation you need to specify how the application server instance is to connect to a pluggable database or a “normal” database. For more information, see Installing a Distributed Application Server Instance [page 193].

2. You continue with Post-Installation [page 134].

5.2 Installing the Oracle Database Software

Continue with the section relevant for the release of the Oracle database that you want to install.

Installing the Oracle 18 Database Software [page 101]
: You must install the Oracle 18 database software before you start installing the instances of the SAP system.

Installing the Oracle 12c Database Software [page 104]
: This section describes the installation of the Oracle 12c server software and patches.

Installing the Oracle 11g Database Software [page 109]
: This section describes the installation of the Oracle 11g server software and patches.

Using PowerShell [page 112]

SAP uses Windows PowerShell to run and describe Windows commands.

5.2.1 Installing the Oracle 18 Database Software

You must install the Oracle 18 database software before you start installing the instances of the SAP system.

1. Installing the Oracle 18 Database Server Software [page 101]
   Proceed as described in this section to install the Oracle 18 database software.
2. Installing Required Patches [page 103]
   After the database software installation, you need to install all required Oracle database patches, which on Windows include one patch collection and one or more additional (generic) patch.

5.2.1.1 Installing the Oracle 18 Database Server Software

Proceed as described in this section to install the Oracle 18 database software.

Prerequisites

- Only valid for 'High Availability': HA (Windows)
  High Availability only: You have to install the Oracle database server software on **all** failover cluster nodes.
  End of 'High Availability': HA (Windows)
- Create an Oracle installation user using a dedicated Windows administrator account.
  On Windows, the user installing the Oracle software must have a Windows administrator account. This user is similar to the Oracle software owner in UNIX environments.

  > → Recommendation
  >
  > We recommend that you do **not** use the SAP administrator `<DOMAIN>\<sapsid>adm` as the Oracle installation user.

  For MSCS or domains, create this user as a domain user that is a member of the local administrator group. For more information, see SAP Note 1915302.

  > Example
  >
  > To create a local Oracle installation user called `Oracle`, you enter the following commands:
  >
  > ```
  > net user /add Oracle Welcome1 /fullname:"Oracle Installation User" /comment:
  > "Administrator for Oracle Software Installation and Patching"
  >
  > net localgroup administrators Oracle /add
  > ```

- Starting with Oracle Database 18c, the Oracle Database software is available as an image file (zip file). In order to extract the Oracle home image file with the built-in Windows Powershell capability, you must have Powershell 5.0 or higher installed on your system.
  If you do not meet this requirement to extract the Oracle home image file (for example: winzip, winrar, unzip, ...), you receive the warning `WARNING: Powershell version is too old`. In this case you should upgrade your Windows Powershell to a higher version.
  If you cannot upgrade Powershell, you can manually extract the Oracle home image file as described in SAP Note 2660018.

Context

For more information about identifying and installing the correct Oracle database software version, see SAP Note 266020.

For information about the installation of Oracle Database 18c software on Windows, see SAP Note 2660018.

Procedure

1. Log on as `Administrator` or Oracle installation user, such as `oracle`.

   Oracle Database 12c and higher supports the use of an Oracle home user such as `oraclehome01`, which must be specified at installation time.

   A Windows local user as Oracle home user can be created during the Oracle software installation. A Windows domain user as Oracle home user must exist before starting the Oracle software installation.

   MSCS or domain installation only: The Oracle home user must be a domain user that you have to create **before** starting the software installation.
2. On the database server, make the Oracle RDBMS Software medium available, and change to the directory:
   `<media>\WINDOWS_X86_64\db_home\SAP\`
3. Installing a new Oracle home start the *Oracle Universal Installer* (OUI) with the PowerShell script.

   To install the new Oracle home in one step (extract and register), run the following command: **`PS> .\sapserver.ps1 [options]`**. This command will extract the Oracle home image file into the new Oracle home and then register the new Oracle home.

   For more information, see SAP Note 2660027.
4. After the installation of the Oracle database software you must install the current Bundle Patch. The bundle patch contains important functional fixes and security fixes. For more information which patches are available, see SAP Note 2660020.

Only valid for 'High Availability': HA (Windows)

> **i Note**
>
> **High Availability only:** You have to install the Oracle patches (if available) on all failover cluster nodes.

End of 'High Availability': HA (Windows)

Task overview: Installing the Oracle 18 Database Software [page 101]

Next task: Installing Required Patches [page 103]

5.2.1.2 Installing Required Patches

After the database software installation, you need to install all required Oracle database patches, which on Windows include one patch collection and one or more additional (generic) patch.

Prerequisites

1. Changing the Oracle Home
   - With OPatch, you install the Bundle Patch into the Oracle Home. This updates the Oracle home software to the new Bundle Patch
   - You must perform this step before (!) you create or upgrade the database.
2. Changing the Database
   - The database must be adapted to the new Bundle Patch by performing certain post-installation tasks and by adapting database parameters.
   - The step must be done after the database has been upgraded. For detailed instructions see `SBP README` file.

Patches for Oracle

Patches for Oracle Database (SI/FS, Windows)	SAP Note 2660044
Patches for Oracle Grid Infrastructure (RAC, ASM)	SAP Note 2660046
Patches for Oracle Exadata / SuperCluster	SAP Note 2660052
Patches for Oracle Database Appliance (ODA)	SAP Note 2660053
Patches for Oracle Exadata Cloud Service	SAP Note 2660062

You must install a Bundle Patch in your Oracle database to ensure that the database is working properly. From a security and functional perspective you should always install the latest Bundle Patch (best practice) which contains the most current security fixes for theOracle database and functional patches for an SAP Oracle database. Generic Oracle database patches must be installed in addition to the Bundle patch.

Procedure

1. Download the required patches.

2. Log on the Oracle installation user.
3. To install the bundle patch with OPatch follow the instructions of the Bundle Patch README.
4. To install the generic patch(es) with OPatch follow the instructions in SAP Note 2660044.
5. **Note:** You do not need to stop any Oracle services, databases or listeners. The patches are installed in <New_Oracle_Home> from which no database instance is currently running.

Task overview: Installing the Oracle 18 Database Software [page 101]

Previous task: Installing the Oracle 18 Database Server Software [page 101]

5.2.2 Installing the Oracle 12c Database Software

This section describes the installation of the Oracle 12c server software and patches.

Procedure

1. You install the Oracle 12c database server software [page 104].
2. You install required patches [page 108].

5.2.2.1 Installing the Oracle Database 12c Server Software

Proceed as follows to install the Oracle 12c database software.

Prerequisites

- > ⚠ Caution
  >
  > If you copy the files from the RDBMS medium to a local disk, do **not** use directory names containing blanks.
- You need 5-10 GB disk space for the Oracle server software.
- Make sure that you have enough space for the Oracle inventory and that you have full access to the directories (inventory, installation location, temp directory). Otherwise, the Oracle Universal Installer cannot perform installation prerequisite checks.
- Only valid for 'High Availability': HA (Windows)
  High Availability only: You have to install the Oracle database server software on **all** failover cluster nodes.
  End of 'High Availability': HA (Windows)
- Create an Oracle installation user using a dedicated Windows administrator account.

On Windows, the user installing the Oracle software must have a Windows administrator account. This user is similar to the Oracle software owner in UNIX environments.

> → Recommendation
>
> We recommend that you do **not** use the SAP administrator `<DOMAIN>\<sapsid>adm` as the Oracle installation user.

For MSCS or domains, create this user as a domain user that is a member of the local administrator group. For more information, see SAP Note 1915302.

> Example
>
> To create a local Oracle installation user called `Oracle`, you enter the following commands:
>
> ```
> net user /add Oracle Welcome1 /fullname:"Oracle Installation User" /comment:
> "Administrator for Oracle Software Installation and Patching"
> ```
>
> ```
> net localgroup administrators Oracle /add
> ```

Context

For more information about identifying and installing the correct Oracle database software version, see SAP Note 2470660.

For information about the installation of Oracle Database 12c software on Windows, see SAP Note 1915302.

Procedure

1. Log on as `Administrator` or Oracle installation user, such as `oracle`.

   For more information on the Oracle users, see SAP Note 1915302.

   Oracle Database 12c supports the use of an Oracle home user such as `oraclehome01`, which must be specified at installation time. A Windows local user as Oracle home user can be created during the Oracle software installation. A Windows domain user as Oracle home user must exist before starting the Oracle software installation.

   MSCS or domain installation only: The Oracle home user must be a domain user that you have to create **before** starting the software installation.
2. On the database server, make the Oracle RDBMS medium available, and change to the directory:

   `<Media_DRIVE>:\<OS>\database\SAP\`
3. Start the *Oracle Universal Installer* (OUI) with the PowerShell script `sapserver.ps1`.

   > i Note
   >
   > - We recommend to use the PowerShell script `sapserver.ps1`, which you can also use with UNC paths to start the OUI. To run the script, right-click and select *Run with Powershell*. When running the script the first time, confirm that you want to change the execution policy.

> For more information about PowerShell, see Using PowerShell [page 112].

When the Powershell command window appears, respond to the prompts of the script. For a Windows domain user, enter `<Domain>\<Oracle_Home_User>`. For a Windows local user, you only need to enter the name of the local `<Oracle_Home_User>`. For more information, see SAP Note 1915302.

4. In the *Oracle Universal Installer*, enter the information as shown in the following table:

Installing the Oracle Database Software

Window	Task
Configure Security Updates	Do **not** select the check box *I wish to receive security updates via My Oracle Support*. Choose *Next*. The installer issues a warning. Choose *Yes*.
Installation Option	Confirm the default selection *Install database software only* and then choose *Next*.
Database Installation Options	Confirm the default selection *Single instance database installation* and then choose *Next*.
Database Edition	Confirm the default option *Enterprise Edition* and then choose *Next*.
Oracle Home User Selection	Select *Create New Windows User* and enter the *User Name* and *Password*, or if you want to use an existing user, choose *Use existing Windows User*. Then choose *Next*. **i Note** As of 12c, you can specify an Oracle home user when you install a new Oracle home. For enhanced security, Oracle recommends that you use an Oracle home user (instead of Windows built-in account 'local system'). **MSCS or domain installation only:** select *Use existing Windows User* and enter the Oracle home user `<Domain>\<Oracle_Home_User>` that you created before starting the software installation. For more information, see SAP Note 1915302.

Window	Task
Installation Location	Set these fields as follows, depending on whether you have a standard Windows account (recommended) or a Windows built-in account, and then choose *Next*: ○ Standard Windows account (recommended) *Software location* (that is, Oracle home): **<Drive>:\oracle\<DBSID>\<Release>** *Oracle base* : **<Drive>:\oracle\<DBSID>** **Example** *Software location* (that is, Oracle home): **D:\oracle\OQ1\12201** *Oracle base*: **D:\oracle\OQ1** ○ Windows built-in account *Oracle home*: **<Drive>:\oracle\<DBSID>\<Release>** *Oracle base*: **<Drive>:\oracle** **Example** *Oracle home*: **D:\oracle\OQ1\12201** *Oracle base*: **D:\oracle** For more information, see SAP Note 1915302.
Prerequisite Checks	This window checks if all the required system prerequisites for the installation of the database software have been met. If some of the checks are displayed as *Failed*, you can fix these problems and run the check again by choosing *Check Again*. **→ Recommendation** We strongly recommend that you make sure there are no failed checks before starting the software installation.
Summary	Review the information displayed in this window and choose *Finish* or *Install*.
Install Product	This window shows the progress of the installation. You can monitor the installation progress details in an additional window.
Close	After the installation has finished successfully, choose *Close* to close the Oracle Universal Installer.

5. Install the required Oracle patches [page 108] (if available). for this database release. (if available). For more information, see SAP Note 1915316.

Only valid for 'High Availability': HA (Windows)

> **i Note**
>
> **High Availability only:** You have to install the Oracle patches (if available) on all failover cluster nodes.

End of 'High Availability': HA (Windows)

5.2.2.2 Installing Required Patches

After the database software installation, you need to install all required Oracle database patches, which on Windows include one patch collection and one or more additional (generic) patch.

Prerequisites

Use an up-to-date version of OPatch to install the patches. Check SAP Note 839182 for instructions on how to use OPatch.

Context

Check SAP Note 2470660 and SAP Note 2507228 for the corresponding Oracle database patches to be installed.

You can download the patches from:

http://support.sap.com/software/databases.html ▶ *Oracle* > *ORACLE PATCHES* > *ORACLE PATCHES* `<Release>` >

Procedure

1. Log on the Oracle installation user.
2. Install all the recommended patches into the <New_Oracle_Home>. For more information, see SAP Note 2507228. For the upgrade scripts patch, see SAP Note 2477382.
3. Note: You do not need to stop any Oracle services, databases or listeners. The patches are installed in <New_Oracle_Home> from which no database instance is currently running.

5.2.3 Installing the Oracle 11g Database Software

This section describes the installation of the Oracle 11g server software and patches.

Procedure

1. You install the Oracle 11g database server software [page 109].
2. You install the required patches [page 111].

5.2.3.1 Installing the Oracle 11g Server Software

Proceed as follows to install the Oracle 11g database software.

Prerequisites

> ⚠ Caution
>
> If you copy the files from the RDBMS medium to a local disk, do **not** use directory names containing blanks.

> i Note
>
> Only valid for 'High Availability': HA (Windows)
>
> **High Availability only:** You have to install the Oracle database server software on **all** failover cluster nodes.
>
> End of 'High Availability': HA (Windows)

Context

As of Oracle 11.2.0.2, Oracle database patch sets are full installations of the Oracle database software. Patch sets now replace existing installations. For more information about identifying and installing the correct Oracle database software version, see SAP Note 1431799.

Procedure

1. On the database server, make the Oracle RDBMS medium available, and change to the directory:

   ```
   <media_DRIVE>:\database\SAP\
   ```

2. Start the *Oracle Universal Installer* (OUI) with the PowerShell or by double-clicking the file `sapserver.cmd`.

> **i Note**
>
> - You cannot directly invoke `sapserver.cmd`, if you use UNC paths (`\\<Host_Name>\<Share>\sapserver.cmd`). Instead, you must map a drive letter to the shared directory and start `sapserver.cmd` via the drive letter.
> - You can also use the PowerShell script `sapserver.ps1`, which you can also use with UNC paths to start the OUI. To run the script, do not double-click on it, since this by default in the Windows explorer opens the *edit mode*. Instead, open PowerShell in elevated mode and run: `<Path_To_Media_DRIVE>\database\SAP\sapserver.ps1`.
> For more information about PowerShell, see Using PowerShell [page 112].
> - For support reasons, do **not** use the `setup.exe` file in the directory `<media_DRIVE>:\database\`. Using `sapserver.cmd` or `sapserver.ps1` guarantees a unique setup of the ORACLE_HOME that is common to SAP systems.
> - Windows Server 2008 (R2) and Windows Server 2012 (R2) with activated UAC:
> If you have drive letters that were created in unelevated mode, you cannot access them in elevated mode. Therefore, if you want to double-click `sapserver.cmd`, you have to copy the Oracle RDBMS medium to a local disk. If you want to invoke `sapserver.cmd` from within a command prompt or PowerShell window, you have to elevate (run as administrator) the command prompt or PowerShell window before you create the network drive.
> Note that there is no UAC in Server Core for Windows Server 2012 (R2).

If a command prompt window appears, specify the drive letter of the local disk where you want to install the Oracle software, and the `<DBSID>`. The command prompt window only appears if you perform a new installation (under a different user), or if the ORACLE_HOME and `<DBSID>` are not set.

3. In the *Oracle Universal Installer*, enter the information as shown in the following table:

Installing the Oracle 11.2.0 Database Software

Window	Task
Configure Security Updates	Do **not** select the check box. Choose *Next*. The installer issues a warning. Choose *Yes* and then *Next*.
Select Installation Option	Confirm the default selection *Install database software only* and then choose *Next*.
Grid Installation Options	Confirm the default selection *Single instance database installation* and then choose *Next*.
Select Product Languages	Confirm the default option *English* and then choose *Next*.
Select Database Edition	Confirm the default option *Enterprise Edition* and then choose *Next*.

Window	Task
Specify Installation Location	This window displays the value for `ORACLE_BASE`, which must be set in the environment to `<drive_containing_oracle_home>:\oracle`. It also displays the value for `ORACLE_HOME`, which is `\oracle\<DBSID>\1120\<x>` (where `1120<x>` is the Oracle version number, for example, `11203` for Oracle 11.2.0.3, `11204` for Oracle 11.2.0.4, and so on). Select this option and then *Next*.
Perform Prerequisite Checks	This window checks if all the required system prerequisites for the installation of the database software have been met. If some of the checks are displayed as *Failed*, you can fix these problems and run the check again by choosing *Check Again*. → Recommendation We strongly recommend you to make sure that there are no failed checks before starting the software installation.
Summary	Review the information displayed in this window and choose *Finish*.
Install Product	This window shows the progress of the installation.
Finish	After the installation has finished successfully, choose *Finish* and close the Oracle Universal Installer.

4. Install the required Oracle patches [page 111] (if available). For more information, refer to SAP Note 1503709.

Only valid for 'High Availability': HA (Windows)

> **i Note**
>
> **High Availability only:** You have to install the Oracle patches (if available) on all failover cluster nodes.

End of 'High Availability': HA (Windows)

5.2.3.2 Installing Required Patches

After the database software installation, you need to install all required Oracle database patches, which on Windows include one patch collections and one or more additional (generic) patches.

Prerequisites

Use an up-to-date version of OPatch to install the patches. Check SAP Note 839182 for instructions on how to use OPatch.

Context

Check SAP Note 1631931 for Oracle 11.2.0.3 and SAP Note 1949250 for Oracle 11.2.0.4 for the patches to be installed.

You can download the patches from:

http://support.sap.com/software/databases.html ▶ *Oracle* > *ORACLE PATCHES* > *ORACLE PATCHES 11.2.0.<x>*

Procedure

1. Log on as administrator.
2. Install the patches, following the instructions in the relevant `README` file.

   i Note

   - The patch collection `README` file uses the term “bundle patch” instead of “patch collection”.
   - Only valid for 'High Availability': HA (Windows)
     High Availability only: You have to install the patches on all cluster nodes.
     End of 'High Availability': HA (Windows)

5.2.4 Using PowerShell

SAP uses Windows PowerShell to run and describe Windows commands.

For Windows Server 2012 (R2) and higher, SAP only uses Windows PowerShell to run and describe Windows commands.

Windows PowerShell is a powerful tool integrated in the Windows operating system. It uses object-oriented methodology, which allows fast and stable script development.

For more information about the Windows PowerShell, see:

http://technet.microsoft.com/en-us/scriptcenter/dd742419.aspx

There you can find links to the online help, online documentation, scripting repository, downloads, and blogs.

If you want to use the PowerShell feature, note the following:

- Windows Server 2016
  Windows Server 2016 contains PowerShell 5.0
  You can update to PowerShell 5.0 (search the internet for *Windows Management Framework 5.0*).
- Windows Server 2012 R2
  Windows Server 2012 R2 contains PowerShell 4.0.
- Windows Server 2012
  Windows Server 2012 contains PowerShell 3.0.
  You can update to PowerShell 4.0 (search the internet for *Windows Management Framework 4.0*).

- Windows Server 2008 R2
  Windows Server 2008 R2 contains PowerShell 2.0.
  For more information about PowerShell 2.0, see http://support.microsoft.com/kb/968929 .
  You can update to PowerShell 3.0 or 4.0 (search the internet for *Windows Management Framework 3.0* or *Windows Management Framework 4.0*).
- Windows Server 2008
  Windows Server 2008 contains PowerShell 1.0.
  You have to activate the PowerShell feature with *Start* > *Administrative Tools* > *Server Manager* > *Features*.
  On Windows Server 2008, you can update to PowerShell 3.0 (search the internet for *Windows Management Framework 3.0*).

How to Start PowerShell

> ⚠ Caution
>
> Make sure that you start the PowerShell in administrator mode.

- Windows Server 2012 (R2) and higher
  Open the command prompt and enter the command:
  `powershell.exe`

To start PowerShell on Windows Server 2008 (R2), you have the following options:

- From the command prompt, by entering the command:
  `powershell.exe`
- From the *Start* Menu:
  - PowerShell 1.0:
    Choose *Start* > *All Programs* > *Windows PowerShell 1.0* > *Windows PowerShell*.
  - PowerShell 2.0:
    Choose *Start* > *All Programs* > *Windows PowerShell* > *Windows PowerShell*.

How to Work with PowerShell

Most commands that are used in `cmd.exe` are also available in the PowerShell (defined as aliases).

You can use well-known commands, such as `cd`, `type`, `copy`, `move`, `mkdir`, `delete`, `rmdir`. There is also online help available, which you can access by typing the command: **`help`** (or **`help <command>`**).

This is a list of differences between PowerShell and `cmd.exe`:

- Before you can run PowerShells scripts (text files with the file extension `.ps1` that contain PowerShell statements), you might have to change the default security setting to allow the execution of non-signed scripts as follows:
  `set-executionpolicy ("unrestricted")`
- By default, when double-clicking PowerShell scripts (`.PS1` files) in the Windows explorer, this does not execute the script as is the default for `.cmd` files, but opens the script in an editor. If you want to activate

automatic script execution after a double-click, you have to change the value `HKEY_CLASSES_ROOT\Microsoft.Powershellscript.1\Shell\Open\Command` from `notepad.exe` to the full path of the PowerShell executable.

- The output of PIPE commands is not just a stream of characters (strings) but a stream of objects. You can easily access the properties and methods for these objects (see the process list DLL example below).
- The current working directory is not part of the directory search path that the PowerShell looks at for scripts and programs. The PowerShell only searches directories listed in the environment variable path. Therefore, you might have to run a local program with `./sapcontrol.exe` or specify its full path.
- You can use the UNIX-like directory delimiters, such as `cd /usr/sap/C11`.
- You can have your current working directory in a UNC path (`cd \\sapglobalhost\sapmnt`).
- The shell distinguishes between environment variables and shell variables:
  - Use of shell variables:
    Definition: **`$x="hello"`**
    Reference: **`write-host $x`**
  - Use of an environment variable:
    Definition: **`$env:x="hello"`**
    Reference: **`write-host $env:x`**
- The PowerShell has an interesting container concept called `ps-drives`. Within `ps-drives` you can navigate in other objects, such as the registry or shell internal lists in the same way as you typically navigate in a file system (`cd, dir, del`, and so on).
  `dir env`: to get a list of environment variables
  `dir variable`: to get the list of shell variables
  `dir HKLM`: to get a list of registry keys in HKEY_LOCAL_MACHINE
  `get-psdrive` to get a list of available ps-drives
- Windows PowerShell has full access to the .NET runtime. You can directly access missing functions in the PowerShell via .NET.
- With Windows PowerShell, you can create GUI-class user interfaces using Windows forms.

PowerShell Commands

The following table lists some PowerShell commands that are available on Windows Server 2012 (R2) and higher:

Command	Explanation
`stop-service sap*`	Stops all Windows services with service name starting with “SAP”
`stop-service oracle*`	Stops all Windows services with service name starting with “Oracle”
`get-process`	Lists currently started processes on your system
`get-process | sort starttime | select -last 1`	Lists the last started process on your computer

Command	Explanation
`get-process | sort starttime | select -last 1 | format-list -proper *`	Lists all properties of the last started process
`get-process | sort starttime | select -last 1 | get-member`	Lists all process class members (properties and methods) of the last started process
`get-process | %{$_.name;"----------";$_.modules}`	Lists all processes, and the executables and DLLs the processes loaded
`$processes = (get-process | sort starttime)`	Defines a shell variable `$processes`, which contains an array of process objects
`$processes.length`	The number of processes in the array (is equivalent to the number of processes on your computer)
`$processes[$processes.length-1].kill()`	Invokes the kill method (terminate process) of the last started process
`(dir a.txt).set_attributes("readonly")`	Sets the file `a.txt` to "read-only"

5.3 Setting Up Multiple Oracle Homes

This section only applies if you want to use multiple Oracle Homes.
For more information, see Multiple Oracle Homes [page 74].

> **i Note**
>
> This step is not required if you install a system into an existing database (MCOD) [page 188].

> **i Note**
>
> Windows Server 2008 (R2) and higher:
>
> Multiple Oracle Homes are not supported in a Microsoft failover cluster.

Procedure

1. Remove all parts referring to `<Oracle_home>\bin` from the system environment variable `PATH`:
   a. Start the Oracle Universal Installer as follows:
      - Windows Server 2012 (R2):
        Start a PowerShell in elevated mode, and enter the following command:
        `<Oracle_home>\oui\bin\setup.exe`

- Windows Server 2008 (R2) :
  Choose *Start* > *All Programs* > *Oracle - <Home_Name>* > *Oracle Installation Products* > *Universal Installer* .

b. On the *Welcome* screen, choose *Installed Products*.
c. On the *Inventory* screen, choose the *Environment* tab.
d. Deselect all components and choose *Apply*.

2. Update or create, if not available, the user environment variable `PATH` of the user who performs the installation of the SAP system (at least the `sap<sapsid>adm` user).

> **i Note**
>
> You also have to modify the user environment variable `PATH` for all other users using the Oracle software. You can only change the environment variable, if the user already exists. Otherwise, you have to do this after you have installed at least one instance of the SAP system with the installer.

Perform the following steps:

- Windows Server 2012 (R2):
  1. Retrieve the current environment variable in PowerShell with the following command:
     `[environment]::GetEnvironmentVariable("PATH","user")`

     > **Example**
     >
     > You get, for example, the following result:
     >
     > `c:\tools`

  2. Append this path to the current Oracle path in PowerShell by entering the following command in a single line:
     `[environment]::SetEnvironmentVariable("PATH","<old_environment_variable_value>;<oracle_home>\bin","user")`

     > **⚠ Caution**
     >
     > Make sure that there is no space before or after the ";" (colon).

     > **Example**
     >
     > If the environment variable is `c:\tools` and the `Oracle_home` is `c:\oracle\X11\112`, you have to enter the following command in PowerShell:
     >
     > **`[environment]::SetEnvironmentVariable("PATH","c:\tools;c:\oracle\X11\112\bin", "user")`**

- Windows Server 2008 (R2):
  1. Choose *Start* > *Control Panel* > *System* > *Advanced system settings* > *Environment Variables* .
  2. Under *User variable for* `<user>`, modify or create, if not available, the value `PATH` to include the `<Oracle_home>\bin`, which you want to use for the installation.

5.4 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 50].

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 159].

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 159].

5.5 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 119] . 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 125].

- 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 79] 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 125].
- Make sure that you have defined the most important SAP system parameters as described in Basic Installation Parameters [page 52] **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 40].
- If you are installing a second or subsequent SAP system in an existing database (MCOD), make sure that the database is **up and running** before starting the installation.
  Check that the SYSTEM tablespace contains at least 400 MB of free space. If there is not enough space left, increase the size of this tablespace with BRSPACE or BRTOOLS.
  For more information, see Installation of Multiple Components in One Database [page 188].
- 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`.

5.6 Running the Installer

This section describes how to run the installer.

Prerequisites

For more information, see Prerequisites for Running the Installer [page 117].

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 125].

Procedure

1. Log on to the installation host using an account with the required user authorization to run the Installer [page 79].

   > ⚠ 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 media 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 Preparing the Installation Media [page 84] .

   > **i Note**
   >
   > 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 SAP Kernel Archives (Archive-Based Installation) [page 91].

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 37]), 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 need to assign a virtual host name to the instance to be installed and you do not want to assign it by entering it as a parameter using the installer screens (see SAP System Parameters [page 53]), you can alternatively assign it 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 Using Virtual Host Names [page 81].

> **i Note**
>
> If you are running a system copy with parallel export/import using the Migration Monitor with the R3load socket option and started the export with command line option **`SUPPORT_DECLUSTERING=false`**, you must start the installer for the installation of the target database instance with command line option **`SUPPORT_DECLUSTERING=true`** for the import during the target system installation.
>
> For more information, see the system copy guides at http://support.sap.com/sltoolset *System Provisioning* *System Copy Option of Software Provisioning Manager* *System Copy Guides*

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 117]) 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 125].
> 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:
   - Perform preparations
     Go to *Generic Options* > `<Database>` > *Preparations* and choose the required task.
     To install SAP Host Agent separately, choose *Generic Options* > `<Database>` > *Preparations* > *SAP Host Agent*.
   - Install an SAP system:
     - To install an SAP system based on SAP NetWeaver AS ABAP **from scratch**, choose `<Product>` > `<Database>` > *Installation* > *Application Server ABAP* > `<System_Variant>`.

       i Note

       To install an SAP NetWeaver Mobile 7.1 / 7.1 EHP1 system or an "SAP NetWeaver 7.1 / 7.1 EHP1 for banking services from SAP" system, choose: *SAP NetWeaver Process Integration 7.1* > `<Database>` > *Installation* > *Application Server ABAP for Banking* > `<System_Variant>`
     - To install the application server ABAP for an SAP Process Integration system based on SAP NetWeaver 7.5 **from scratch**, choose *SAP NetWeaver 7.5* > `<Database>` > *Installation* > *Application Server ABAP for SAP Process Integration* > `<System Variant>`.
     - To install the application server ABAP for an SAP Solution Manager 7.2 system **from scratch**, choose *SAP Solution Manager 7.2* `<Support_Release>` > `<Database>` > *Installation* > *Application Server ABAP* > `<System Variant>`.
     - To install an SAP system based on SAP NetWeaver AS ABAP **as target system of a system copy**, choose `<Product>` > `<Database>` > *System Copy* > *Target System* > `<System_Variant>` > *Based on AS ABAP*.
     - To install the application server ABAP for an SAP Process Integration system based on SAP NetWeaver 7.5 **as target system of a system copy**, choose *SAP NetWeaver 7.5* > `<Database>` > *System Copy* > *Target System* > `<System_Variant>` > *Based on AS ABAP*.
     - To install the application server ABAP for an SAP Solution Manager 7.2 system **as target system of a system copy**, choose *SAP Solution Manager 7.2* `<Support_Release>` > `<Database>` > *System Copy* > *Target System* > `<System_Variant>` > *Based on AS ABAP*.
   - Install an additional SAP system instance, go to `<Product>` > `<Database>` > *Additional SAP System Instances* > *Additional Application Server Instance*.

- Perform other tasks or install additional components

  Go to *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.

> **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.

> **i Note**
>
> If you want to install an ASCS instance with integrated SAP Web Dispatcher [page 30] or with integrated SAP Gateway [page 32] 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.

- Only valid for 'High Availability': HA (Windows)

  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.

  End of 'High Availability': HA (Windows)

> **i Note**
>
> If you are performing the target system installation in the context of a system copy with parallel export/import using the Migration Monitor and the target database is declustered - that is you started the installer for the target database instance installation with command line option **`SUPPORT_DECLUSTERING=true`** as described above - add the following load options parameter in the *SAP System Advanced Load Configuration* screen:
>
> **`-datacodepage <datacodepage_of_source_system>`**
>
> The advanced screen for load configuration only appears if you run the installer in *Custom* parameter mode. You can check the parameter within the `import_monitor_cmd.properties` file located in the installation directory, in the `loadArgs` entry.

> For more information, see the system copy guides at http://support.sap.com/sltoolset > *System Provisioning* > *System Copy Option* > *Guide for Systems Based on SAP NetWeaver 7.1 & Higher* > .

> ⚠ Caution
>
> The signature of installation media and installation archives is checked **automatically** during the *Define Parameters* phase while processing the *Media Browser* and - if you perform an archive-based installation - the *Software Package Browser* screens.
>
> Note that this automatic check is only committed once and **not** repeated if you modify artifacts such as SAR archives or files on the media **after** the initial check has been done. This means that - if you modify artefacts later on either during the remaining *Define Parameters* phase or later on during the *Execute Service* phase - the signature is not checked again.
>
> For more information, see SAP Note 2393060.

After you have entered all requested input parameters, the installer displays the *Parameter Summary* screen. This screen shows both the parameters that you entered and those that the installer set by default. If required, you can revise the parameters before starting the installation.

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`.

   > ⚠ Caution
   >
   > **Multiple Oracle Homes only:** The installer uses default values for the Oracle Home and Listener configuration. Therefore, if you use multiple Oracle Homes, you must specify the new Oracle home, as well as the listener port number. You can change these values on the installer *Summary* screen during the database instance installation. On the *Summary* screen, check both *Oracle > Database System* and *Oracle > Listener Configuration* and use the *Revise* button. On the upcoming screen, change the Oracle Home and the Listener port number. Make sure that you use a free port number, and do **not** use the numbers 1521 or 1527 as these might already be in use by default.

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 125].

5.7 Additional Information about the Installer

The following sections provide additional information about the installer.

5.7.1 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 1.0 SP24 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 117].
  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.

5.7.2 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 79]

5.7.3 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 119] .
2. Make sure that the installation media are still available.

   For more information, see Preparing the Installation Media [page 84] .

   > → Recommendation
   >
   > Make the installation media 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 media mounted with NFS might fail.

3. Make sure that the installation media are still available.

   For more information, see Preparing the Installation Media [page 84] .

   > → Recommendation
   >
   > Make the installation media 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 media 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 117]) 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 125].
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.

5.7.4 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)

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.

5.7.5 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.

       > **i 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 125].

     - 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 128].
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.

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

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

> **i 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 117].

Procedure

1. Start the installer from the command line as described in Running the Installer [page 119] 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
>
> **SAP systems based on SAP NetWeaver 7.4** You can skip some of these post-installation steps if you have already completed them as a step in task list `SAP_BASIS_SETUP_INITIAL_CONFIG`, when running the ABAP task manager for lifecycle management automation (transaction `STC01`) immediately after the installation was completed. For more information, see SAP NetWeaver 7.4 and Higher: Performing Automated Initial Setup (Optional) [page 137].
>
> 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.

Standard, Distributed, or High-Availability System

> **i** Note
>
> In a standard system, all mandatory instances are installed on one host. Therefore, if you are installing a standard system, you can ignore references to other hosts.

1. If required, you perform a full system backup [page 167] immediately after the installation has finished.
2. You check whether you can log on to the Application Server ABAP [page 136].
3. **SAP systems based on SAP NetWeaver 7.4 and higher only:** You perform the automated initial setup [page 137].

   > **i** Note
   >
   > This step is optional.
4. You install the SAP license [page 139].
5. You configure the remote connection to SAP support [page 142].
6. You configure the documentation provided on the SAP Help Portal [page 142].
7. You perform the consistency check [page 144].
8. If required, you set up symbolic links for application servers [page 145].
9. You configure the Transport Management System [page 147].

10. For production systems it is highly recommended that you connect the system to SAP Solution Manager [page 149].
11. You apply the latest kernel and Support Packages [page 151].
12. You perform post-installation steps for the application server ABAP [page 152].
13. If you installed a high-availability system based on SAP NetWeaver AS for ABAP 7.52, you can decide whether you want to switch to the new standalone enqueue server 2 and enqueue replicator 2 [page 155].
14. If you installed the ABAP part of an SAP Solution Manager 7.2 or SAP Process Integration 7.5 system, enable HTTPS communication with the Java part of the system.
    For more information, see SAP Solution Manager 7.2, SAP Process Integration 7.5 only: Enabling HTTPS Communication for ABAP [page 155].
15. If required, you install additional languages and perform language transport [page 156].
16. **SAP Kernel Release 7.4 and Higher:** You perform IP Multicast Configuration [page 158].
17. You configure the Process Integration system after installation [page 158].

    > **i** Note
    >
    > This post-installation step is only relevant if you have installed an **SAP NetWeaver 7.5** Process Integration (PI) system.

18. You configure the user management [page 159].
19. You ensure user security [page 160].
20. You perform the client copy [page 163].
21. On the database instance host, you perform Oracle-specific post-installation steps [page 165].
22. If you have chosen to enable Oracle Database Vault, make sure that you perform the required configuration steps. For more information, see Implementing Oracle Database Vault with Software Provisioning Manager 1.0 [page 190].
23. **SAP systems based on SAP NetWeaver 7.4 and higher only:** If required, you change the keys for the secure storage [page 166].
24. You perform a full system backup [page 167].
25. 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 169]
26. If you chose to install an integrated SAP Web Dispatcher within the ASCS instance, you configure the SAP Web Dispatcher [page 171]
27. If you chose to install an integrated Gateway within the ASCS instance, you configure the SAP Gateway [page 172].
28. You check the Master Guide for your SAP Business Suite application or SAP NetWeaver application (section *Configuration of Systems and Follow-Up Activities*) for additional implementation and configuration steps, such as language installation, monitoring, work processes, transports, SAP license, printers, system logs, and connectivity to system landscape directory (SLD).

Additional Application Server Instance

1. You check whether you can log on to the Application Server ABAP [page 136].
2. You configure the documentation provided on the SAP Help Portal [page 142].
3. You ensure user security [page 160].
4. If required, you set up symbolic links for application servers [page 145].

5. You perform a full system backup [page 167].

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

In a distributed or high-availability system, you check whether you can log on to every instance of the SAP system that you installed.

> **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.

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 SAP NetWeaver 7.4 and Higher: 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. If your SAP system is based on SAP NetWeaver 7.4 and higher, 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 37]
Installing the SAP License [page 139]
Configuring the Remote Connection to SAP Support [page 142]
Configuring the Change and Transport System [page 147]
Applying the Latest Kernel and Support Package Stacks [page 151]
Performing Post-Installation Steps for the ABAP Application Server [page 152]
Performing the Consistency Check [page 144]

6.4 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
>
> **SAP systems based on SAP NetWeaver 7.4 or higher only:**
>
> You can skip this task if you have already completed it as a step in task list `SAP_BASIS_SETUP_INITIAL_CONFIG` when running the ABAP task manager for lifecycle management automation (transaction `STC01`) immediately after the installation was completed. For more information, see SAP NetWeaver 7.4 and Higher: Performing Automated Initial Setup (Optional) [page 137].

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 Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
○ SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 ○ SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library **i Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.
○ SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 ○ SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *SAP Library* > *SAP NetWeaver Mobile Library* > *Administrator's Guide* > *Configuration* > *General Configuration Tasks* > *License Configuration*
○ SAP NetWeaver 7.3 http://help.sap.com/nw73 ○ SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 ○ SAP NetWeaver 7.4 http://help.sap.com/nw74 ○ SAP NetWeaver 7.5 http://help.sap.com/nw75 ○ SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap ○ SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View: English* > *Solution Life Cycle Management* > *SAP Licenses*

6.5 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 139] 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.

6.6 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**
>
> **SAP systems based on SAP NetWeaver 7.4 or higher only:**
>
> You can skip this task if you have already completed it as a step in task list `SAP_BASIS_SETUP_INITIAL_CONFIG` when running the ABAP task manager for lifecycle management automation (transaction `STC01`) immediately after the installation was completed. For more information, see SAP NetWeaver 7.4 and Higher: Performing Automated Initial Setup (Optional) [page 137].

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

6.7 Configuring Documentation Provided on the SAP Help Portal

In transaction `SR13`, you can configure the settings of your backend system to point to documentation that is provided on the SAP Help Portal.

Context

You can configure your backend system to access documentation that is provided on the SAP Help Portal.

Prerequisites

- The documentation you want to access must be available on the SAP Help Portal.
- The users who access the documentation must have access to the Internet.
- You can configure an ABAP system to connect to only one combination of product and version.

If you cannot fulfill one or more of these prerequisites, you must install the documentation in your local system landscape using the download packages or DVDs/CDs provided.

> **i Note**
>
> For more information about installing the documentation in your local system landscape, see the Installation of SAP Library guide.

Procedure

1. Open transaction `SR13`.
2. Select the tab *PlainHtmlHttp*.
3. Choose *New Entries*.

> ⚠ Caution
>
> You have to create entries for both documentation and XML documentation areas for each platform you are using and each language in which you want to provide documentation.
>
> You must use the exact combination of uppercase and lowercase characters specified in the product and version.

To find the correct entry for the Path field, see the list of products and versions attached to SAP Note 2652009.

4. To create entries for the documentation area, enter the following values:

Name	Value to be entered
Variant	Enter a name for the variant.
Platform	Select the platform relevant for your implementation from the list of available platforms, for example, WN32.
Area	Select *Documentation* from the list; this will display as IWBHELP in the table.
Server Names	https://help.sap.com/http.svc/ahp2
Path	`<product/version>` To find the correct entry for the Path field, see the list of products and versions attached to SAP Note 2652009.
Language	Select the language you need from the list.

5. To create entries for the XML documentation area, enter the following values:

Name	Value to be entered
Variant	Enter a name for the variant (any name).
Platform	Select the platform relevant for your implementation from the list of available platforms, for example, WN32.
Area	Select *XML Documentation* from the list; this will display as XML_DOCU in the table.
Server Names	https://help.sap.com/http.svc/ahp2
Path	`<product/version>` To find the correct entry for the Path field, see the list of products and versions attached to SAP Note 2652009.
Language	Select the language you need from the list.

6. Repeat steps 4 and 5 for each relevant platform and language.

7. Select one entry as the default language for each platform and area.
8. Save your entries.

Results

You have configured the settings to point to documentation that is provided on the SAP Help Portal.

Related Information

Installation of SAP Library
SAP Note 2149786
SAP Note 2652009

6.8 Performing the Consistency Check

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

> **i** Note
>
> **SAP systems based on SAP NetWeaver 7.4 or higher only:**
>
> You can skip this task if you have already completed it as a step in task list `SAP_BASIS_SETUP_INITIAL_CONFIG` when running the ABAP task manager for lifecycle management automation (transaction `STC01`) immediately after the installation was completed. For more information, see SAP NetWeaver 7.4 and Higher: Performing Automated Initial Setup (Optional) [page 137].

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 200].
- You have logged on to the SAP system [page 136].

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*.

6.9 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.

Only valid for 'High Availability': HA (Windows)

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

End of 'High Availability': HA (Windows)

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.

6.10 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 skip this task if one of the following is true:
>
> - **Only valid for SAP systems based on SAP NetWeaver 7.4 and higher:** You already completed these steps as part of task list `SAP_BASIS_SETUP_INITIAL_CONFIG` have to perform these steps or at least some of these steps when running the ABAP task manager for lifecycle management automation (transaction `STC01`) immediately after the installation had completed.
>   Note that `SAP_BASIS_SETUP_INITIAL_CONFIG` only covers the configuration of TMS as single system.
> - You are using a stack configuration file (see Installation Using a Stack Configuration File (Optional) [page 37]) and chose *Run TMS Configuration (for Single System)* during the installation.

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 Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
○ SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 ○ SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library **i Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
○ SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 ○ SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *Function-Oriented View: English* > *Application Server ABAP / ABAP Technology* > *Administration Tools for AS ABAP* > *Change and Transport System* > *Transport Management System (BC-CTS-TMS)* > *Configuring TMS*
○ SAP NetWeaver 7.3 http://help.sap.com/nw73 ○ SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 ○ SAP NetWeaver 7.4 http://help.sap.com/nw74 ○ SAP NetWeaver 7.5 http://help.sap.com/nw75 ○ SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap ○ SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View: English* > *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 Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
○ SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 ○ SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library **i Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.
○ SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 ○ SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *Function-Oriented View: English* > *Application Server ABAP / ABAP Technology* > *Administration Tools for AS ABAP* > *Change and Transport System* > *Transport Organizer (BC-CTS-ORG)* > *Requirements for Working with the Transport Organizer* > *Setting the System Change Option*

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
○ SAP NetWeaver 7.3 http://help.sap.com/nw73 ○ SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 ○ SAP NetWeaver 7.4 http://help.sap.com/nw74 ○ SAP NetWeaver 7.5 http://help.sap.com/nw75 ○ SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap ○ SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View: English* > *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. Only valid for 'High Availability': HA (Windows)
   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.
   End of 'High Availability': HA (Windows)
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`

6.11 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

6.12 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 37]), 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.

> **i** Note
>
> If you have installed an **SAP Solution Manager 7.2** system, you must apply at least Support Package Stack (SPS) 01. You cannot use SAP Solution Manager 7.2 with SPS 00.

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.

6.13 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**
>
> **SAP systems based on SAP NetWeaver 7.4 or higher only:**
>
> You can skip this task if you have already completed it as a step in task list `SAP_BASIS_SETUP_INITIAL_CONFIG` when running the ABAP task manager for lifecycle management automation (transaction `STC01`) immediately after the installation was completed. For more information, see SAP NetWeaver 7.4 and Higher: Performing Automated Initial Setup (Optional) [page 137].

Prerequisites

You have logged on to the ABAP application server as described in Logging On to the Application Server [page 136].

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 Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
○ SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 ○ SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library **i Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.
○ SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 ○ SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *Function-Oriented View: English* > *Application Server ABAP / ABAP Technology* > *Administration Tools for AS ABAP* > *Configuration in the CCMS* > *Profiles* > *Maintaining Profiles*
○ SAP NetWeaver 7.3 http://help.sap.com/nw73 ○ SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 ○ SAP NetWeaver 7.4 http://help.sap.com/nw74 ○ SAP NetWeaver 7.5 http://help.sap.com/nw75 ○ SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap ○ SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View: English* > *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 149]
- **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.

    > **i 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.

6.14 Systems Based on SAP NetWeaver AS for ABAP 7.52 only: Switching to Standalone Enqueue Server 2 and Enqueue Replicator 2

If you installed a high-availability SAP system based on SAP NetWeaver AS for ABAP 7.52 , you can switch to "Standalone Enqueue Server **2**" and "Enqueue Replicator **2**".

When installing an SAP system based on SAP NetWeaver AS for ABAP 7.52 or lower, Software Provisioning Manager 1.0 installs the ASCS instance with the classic "Standalone Enqueue Server" and the ERS instance with the classic "Enqueue Replication Server" by default. However, if you installed an SAP system based on SAP NetWeaver AS for ABAP 7.52 , you can switch to" Standalone Enqueue Server **2**" and "Enqueue Replicator **2**".

For more information, see https://help.sap.com/nw752abap *Application Help* > *SAP NetWeaver Library: Function-Oriented View* > *SAP NetWeaver Application Server for ABAP Infrastructure* > *Components of SAP NetWeaver Application Server for ABAP* > *Standalone Enqueue Server 2* > *Switching to the Standalone Enqueue Server 2* .

Related Information

Enqueue Replication Server in a Microsoft Failover Cluster [page 227]
Configuring the First Cluster Node [page 242]

6.15 SAP Solution Manager 7.2, SAP Process Integration 7.5 only: Enabling HTTPS Communication for ABAP

For secure communication between the SAP systems connected to the ABAP stack, further post-installation steps are required to fully enable HTTPS communication.

Prerequisites

- You have installed the application server ABAP for an SAP Solution Manager 7.2 or SAP Process Integration 7.5.
- You entered the HTTPS port that is to be configured in the application server instance profile when processing the *Communication Port for ABAP* screen. For more information, see *Additional Parameters when Installing SAP Process Integration 7.5 or SAP Solution Manager 7.2*.

Procedure

Proceed as described in the SAP Note 510007.

Related Information

Additional Parameters when Installing SAP Process Integration 7.5 or SAP Solution Manager 7.2 [page 65]

6.16 Installing Additional Languages and Performing Language Transport

This section describes how to install and transport additional languages.

> **i 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 37]) 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:

   > **i 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 Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
• SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 • SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library **i Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.
• SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 • SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *Function-Oriented View: English* > *Application Server ABAP / ABAP Technology* > *Administration Tools for AS ABAP* > *Change and Transport System* > *Language Transport (BC-CTS-LAN)*
• SAP NetWeaver 7.3 http://help.sap.com/nw73 • SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 • SAP NetWeaver 7.4 http://help.sap.com/nw74 • SAP NetWeaver 7.5 http://help.sap.com/nw75 • SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap • SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View: English* > *Solution Life Cycle Management* > *Software Logistics* > *Change and Transport System* > *Language Transport (BC-CTS-LAN)*

6.17 SAP Kernel 7.40 and Higher: IP Multicast Configuration and Wake-Up Mechanism

Since SAP kernel release 7.40, 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.

Since SAP kernel release 7.40 Patch Level (PL) 46 and 7.41 PL 13, 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.

Since SAP kernel 7.41 PL 47 and 7.42 PL 14, 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 PI 7.5 Only: Configuring the Process Integration System After the Installation

To configure your SAP Process Integration 7.5 (SAP PI 7.5) system after installation, execute the Central Technical Configuration (CTC) Wizard.

Prerequisites

If you have installed an SAP PI 7.5 system and you intend to run automated configuration using the Central Technical Configuration (CTC) Wizard after the installation, make sure that the ABAP communication port is either completely configured for HTTPS or optionally for HTTP, for example by configuring the ABAP communication port during the installation process (see the *Ports* table in section SAP System Parameters [page 53]). You can only run the CTC Wizard if the ABAP communication port is configured.

Procedure

To configure your SAP PI 7.5 system, execute the “SAP NetWeaver initial setup” CTC Wizard described in SAP Note 1309239.

> **i Note**
>
> The CTC Wizard automatically executes all required technical configuration steps.

For more details about all single configuration steps executed by the CTC Wizard and how to apply them manually, see the SAP Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
SAP NetWeaver 7.5 http://help.sap.com/nw75	*Application Help* > *Function-Oriented View: English* > *Process Integration* > *Configuring Process Integration After Installation* > *Configuring Process Integration (PI) Dual Usage Type* > *Basic Configuration for SAP Process Integration (PI)*

6.19 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 Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
○ SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 ○ SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library **i Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.
○ SAP NetWeaver Mobile 7.1 https://help.sap.com/nwmobile71 ○ SAP NetWeaver Mobile 7.1 including Enhancement Package 1 https://help.sap.com/nwmobile711	*Application Help* > *Function-Oriented View: English* > *Security* > *Identity Management* > *Identity Management for System Landscapes* > *Integration of User Management in Your System Landscape* > *Adding an ABAP System to Your System Landscape*

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
○ SAP NetWeaver 7.3 https://help.sap.com/nw73/ ○ SAP NetWeaver 7.3 including Enhancement Package 1 https://help.sap.com/nw731 ○ SAP NetWeaver 7.4 https://help.sap.com/nw74 ○ SAP NetWeaver 7.5 https://help.sap.com/nw75 ○ SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap ○ SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View: English* > *Security* > *Identity Management* > *Identity Management for System Landscapes* > *Integration of User Management in Your System Landscape* > *Adding an ABAP System to Your System Landscape*

6.20 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	User Name	Comment
Operating system user	<sapsid>adm	SAP system administrator
	SAPService<SAPSID>	User to run the SAP system
Oracle database user	SAP<SCHEMA_ID>	Oracle database owner (that is, the owner of the database tables)
	SYSTEM	Oracle standard database user
	SYS	Oracle standard database user
	OUTLN	Oracle standard database user
	DBSNMP	Oracle standard database user

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.

SAP System Users

User	User Name	Comment
SAP system user	SAP*	User exists in at least SAP system clients 000, 001, and 066.
	DDIC	User exists in at least SAP system clients 000 and 001.
	EARLYWATCH	User exists in at least SAP system client 066.
Application Server Java Administrator **i Note** This user has only been created if you have installed the application server ABAP for an SAP Process Integration (PI) 7.5 system or for an SAP Solution Manager 7.2 system.	The name that you gave this user during the installation or the default name J2EE_ADMIN (see SAP System Parameters [page 53])	This user exists in at least clients 000 and 001 of the ABAP system and in the User Management Engine (UME) of the Java system. It has administrative permissions for user management. The password of this user is stored in secure storage. Therefore, whenever you change the password of the administrator password, you must also change the password in secure storage. **→ Recommendation** We recommend that you use strong password and auditing policies for this user.
Application Server Java Guest **i Note** This user has only been created if you have installed the application server ABAP for an SAP Process Integration (PI) 7.5 system or for an SAP Solution Manager 7.2 system.	The name that you gave this user during the installation or the default name J2EE_GUEST (see SAP System Parameters [page 53])	This user exists in at least clients 000 and 001 of the ABAP system and in the User Management Engine (UME) of the Java system. It is used for anonymous access.
Communication user for Application Server Java **i Note** This user has only been created if you have installed the application server ABAP for an SAP Process Integration (PI) 7.5 system or for an SAP Solution Manager 7.2 system.	The name that you gave this user during the installation or the default name SAPJSF (see SAP System Parameters [page 53])	This user exists in at least clients 000 and 001 of the ABAP system and in the User Management Engine (UME) of the Java system. It is used for a remote function call (RFC) between the ABAP system and the Java system.

6.21 Performing the Client Copy

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

Context

The installer creates three ABAP clients during the installation, client 000, client 001, and client 066.

> **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.

Use client 000 as source client for the client copy.

> **i** Note
>
> **SAP SCM:** If you want to mark the client 001 as **not** relevant for liveCache, run report `/SAPAPO/OM_NON_LC_RELEVANT_CLT` or `/SLCA_NON_LC_RELEVANT_CLIENT` using transaction `SE38`.

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 Library at :

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
• SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 • SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library **i Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.
• SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 • SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *Function-Oriented View: English* > *Application Server ABAP / ABAP Technology* > *Administration Tools for AS ABAP* > *Change and Transport System* > *BC – Client Copy and Transport*
• SAP NetWeaver 7.3 http://help.sap.com/nw73 • SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 • SAP NetWeaver 7.4 http://help.sap.com/nw74 • SAP NetWeaver 7.5 http://help.sap.com/nw75 • SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap • SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View: English* > *Application Server* > *Application Server ABAP* > *Administration of Application Server ABAP* > *Change and Transport System* > *BC – Client Copy and Transport*

6.22 Performing Oracle-Specific Post-Installation Steps

You have to perform the following Oracle-specific post-installation steps.

Procedure

- **Checking the Recommended Oracle Database Parameters**

  When installing the Oracle database, a standard database parameter set is used. To take into account the size and configuration of your SAP system, and to enable new Oracle features, check and apply the parameter settings as described in SAP Note 1431798 (Oracle 11g) or SAP Note 1888485 (Oracle 12.1) or SAP Note 2470718 (Oracle 12.2 and 18.x) .

  You can find an automated script in SAP Note 1171650 to help you check whether your SAP system complies with the database parameter recommendations at any given point in time.
- **Configuring Database User Profiles**

  If the SAP-specific database user profile `SAPUPROF` is not yet installed in the database, configure it as described in SAP Note 1519872.
- **Updating Oracle Optimizer Statistics**

  To update the Oracle optimizer statistics, do the following:

  a. Execute the following commands as the `<dbsid>adm` user:

  ```
  brconnect -u / -c -f stats -t system_stats;

  brconnect -u / -c -f stats -t oradict_stats;
  ```

  b. Execute the following commands with SQLPlus:

  ```
  SQL> exec dbms_scheduler.disable('GATHER_STATS_JOB');

  SQL> exec dbms_scheduler.disable('ORACLE_OCM.MGMT_CONFIG_JOB');

  SQL> exec dbms_scheduler.disable('ORACLE_OCM.MGMT_STATS_CONFIG_JOB');
  ```

  For Oracle 11g, also execute the following command:

  ```
  SQL> exec DBMS_AUTO_TASK_ADMIN.DISABLE
  ```

  For more information, see SAP Note 974781.
- **Installing the Latest Version of BR*Tools for your Oracle database.**

  Depending on the release of your Oracle Database, follow the instructions in the relevant SAP Note to install the most recent version of BR*Tools:

  - If you have Oracle 18, follow the instructions in SAP Note 2763733.
  - If you have Oracle 12, follow the instructions in SAP Note 2087004.
  - If you have Oracle 11, follow the instructions in SAP Note 1430669.

6.23 SAP Systems Based on SAP NetWeaver 7.4 and Higher: 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 Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
○ SAP NetWeaver 7.4 http://help.sap.com/nw74 ○ SAP NetWeaver 7.5 http://help.sap.com/nw75 ○ SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap ○ SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View: English* > *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 Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
○ SAP NetWeaver 7.4 http://help.sap.com/nw74 ○ SAP NetWeaver 7.5 http://help.sap.com/nw75 ○ SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap ○ SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View: English* > *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 53].

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 Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
• SAP NetWeaver Mobile 7.1 • SAP NetWeaver Mobile 7.1 including Enhancement Package 1 • SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 • SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP Library path for SAP NetWeaver 7.3 and higher

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
• SAP NetWeaver 7.3 http://help.sap.com/nw73 • SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 • SAP NetWeaver 7.4 http://help.sap.com/nw74 • SAP NetWeaver 7.5 http://help.sap.com/nw75 • SAP NetWeaver Application Server for ABAP 7.51 innovation package http://help.sap.com/nw751abap • SAP NetWeaver AS for ABAP 7.52 http://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View: English* > *Solution Life Cycle Management* > *Backup and Recovery* > *Backing Up and Restoring your SAP System on Windows*

When backing up your Oracle database, note the following:

- You must configure your third-party backup tool, if used, for the database backup.
- If you use BR*TOOLS for the database backup, refer to the following Oracle documentation in the SAP Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
○ SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 ○ SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library **i Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.
○ SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 ○ SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *SAP Library* > *SAP NetWeaver Mobile Library* > *Administrator's Guide* > *Technical Operations for SAP NetWeaver (TOM)* > *Administration of Databases* > *Database Administration for Oracle*

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
○ SAP NetWeaver 7.3 http://help.sap.com/nw73 ○ SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 ○ SAP NetWeaver 7.4 http://help.sap.com/nw74 ○ SAP NetWeaver 7.5 http://help.sap.com/nw75 ○ SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap ○ SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View: English* > *Database Administration* > *Database Administration for Oracle*

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 on how to change passwords of existing users using the `Admin Handler`, see the SAP Library at:

SAP Release and SAP Library Quicklink	SAP Library Path (Continued)
○ SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 ○ SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *Function-Oriented View* > *Application Server Infrastructure* > *SAP Web Dispatcher* > *Administration of the SAP Web Dispatcher* > *Using the Web Administration Interface* > *Area menu* > *Section "HTTP Handler"*
○ SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 ○ SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library. **Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.
○ SAP NetWeaver Process Integration 7.1 http://help.sap.com/nwpi71 ○ SAP NetWeaver Process Integration 7.1 Including Enhancement Package 1 http://help.sap.com/nwpi711	*Application Help* > *Function-Oriented View* > *Application Server Infrastructure* > *SAP Web Dispatcher* > *Administration of the SAP Web Dispatcher* > *Using the Web Administration Interface* > *Area menu* > *Section "HTTP Handler"*
○ SAP NetWeaver 7.3 http://help.sap.com/nw73 ○ SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731	*Application Help* > *Function-Oriented View* > *Application Server* > *Application Server Infrastructure* > *Components of SAP NetWeaver Application Server* > *SAP Web Dispatcher* > *Administration of the SAP Web Dispatcher* > *Area menu* > *Section "HTTP Handler"*

SAP Release and SAP Library Quicklink	SAP Library Path (Continued)
○ SAP NetWeaver 7.4 http://help.sap.com/nw74 ○ SAP NetWeaver 7.5 http://help.sap.com/nw75 ○ SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap ○ SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View* > *Application Server* > *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 30]

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 Library at:

SAP Release and SAP Library Quicklink	SAP Library Path (Continued)
• SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 • SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *Function-Oriented View* > *Application Server Infrastructure* > *Components of SAP NetWeaver Application Server* > *SAP Web Dispatcher*

SAP Release and SAP Library Quicklink	SAP Library Path (Continued)
• SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 • SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library. **i Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.
• SAP NetWeaver 7.3 http://help.sap.com/nw73 • SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 • SAP NetWeaver 7.4 http://help.sap.com/nw74 • SAP NetWeaver 7.5 http://help.sap.com/nw75 • SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap • SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View* > *Application Server* > *Application Server Infrastructure* > *Components of SAP NetWeaver Application Server* > *SAP Web Dispatcher*

Related Information

ASCS Instance with Integrated SAP Web Dispatcher [page 30]

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 32].

You can find all relevant configuration information in the gateway documentation in the SAP Library at:

SAP Release and SAP Library Quicklink	SAP Library Path (Continued)
• SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 • SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *Function-Oriented View* > *Application Server Infrastructure* > *Connectivity* > *SAP Gateway*
• SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 • SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library. **i Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.
• SAP NetWeaver Process Integration 7.1 http://help.sap.com/nwpi71 • SAP NetWeaver Process Integration 7.1 Including Enhancement Package 1 http://help.sap.com/nwpi711	*Application Help* > *Function-Oriented View* > *Application Server Infrastructure* > *Connectivity* > *SAP Gateway*
• SAP NetWeaver 7.3 http://help.sap.com/nw73 • SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731	*Application Help* > *SAP NetWeaver Library: Function-Oriented View* > *Application Server* > *Application Server Infrastructure* > *Connectivity* > *Gateway*
• SAP NetWeaver 7.4 http://help.sap.com/nw74 • SAP NetWeaver 7.5 http://help.sap.com/nw75 • SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap • SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *SAP NetWeaver Library: Function-Oriented View* > *Application Server* > *Application Server Infrastructure* > *Components of SAP NetWeaver Application Server* > *Gateway*

Related Information

ASCS Instance with Integrated Gateway [page 32]

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 Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
• SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 • SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *Function-Oriented View* > *Security* > *Identity Management* > *Identity Management of the Application Server ABAP* > *Configuration of User and Role Administration* > *Directory Services* > *LDAP Connector*
• SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0 • SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP 5.0 and 6.0	See the SAP NetWeaver Mobile Library. **i Note** Since the SAP NetWeaver Mobile 7.1 Library is the only available SAP Library for ABAP systems based on SAP NetWeaver 7.1, in this guide we always refer to it also for SAP NetWeaver 7.1 for Banking Services from SAP 5.0 and 6.0.
• SAP NetWeaver Process Integration 7.1 http://help.sap.com/nwpi71 • SAP NetWeaver Process Integration 7.1 Including Enhancement Package 1 http://help.sap.com/nwpi711	*Application Help* > *Function-Oriented View* > *Security* > *Identity Management* > *Identity Management of the Application Server ABAP* > *Configuration of User and Role Administration* > *Directory Services* > *LDAP Connector*
• SAP NetWeaver 7.3 http://help.sap.com/nw73 • SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 • SAP NetWeaver 7.4 http://help.sap.com/nw74 • SAP NetWeaver 7.5 http://help.sap.com/nw75 • SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap • SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View: English* > *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 Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
• SAP NetWeaver Mobile 7.1 http://help.sap.com/nwmobile71 • SAP NetWeaver Mobile 7.1 including Enhancement Package 1 http://help.sap.com/nwmobile711	*Application Help* > *Function-Oriented View* > *Application Server Infrastructure* > *SAP Management Console*
• SAP NetWeaver 7.3 http://help.sap.com/nw73 • SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 • SAP NetWeaver 7.4 http://help.sap.com/nw74 • SAP NetWeaver 7.5 http://help.sap.com/nw75 • SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap • SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View: English* > *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 119] 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 119] **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.

Only valid for 'High Availability': HA (Windows)

If you want to install a high-availability system, see also Directories in a Microsoft Failover Cluster Configuration [page 232].

End of 'High Availability': HA (Windows)

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`

    Only valid for 'High Availability': non-HA

    In a non-high-availability-system, you can install the primary application server instance or the (A)SCS instance on the global host or on any other host.

    End of 'High Availability': non-HA

    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`.

    Only valid for 'High Availability': HA (Windows)

    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.

    End of 'High Availability': HA (Windows)

    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.

Only valid for 'High Availability': HA (Windows)

> **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.

This lets you have several shares with the same name pointing to different disks (multi-SID).

End of 'High Availability': HA (Windows)

- `\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 82].

Directory Structure

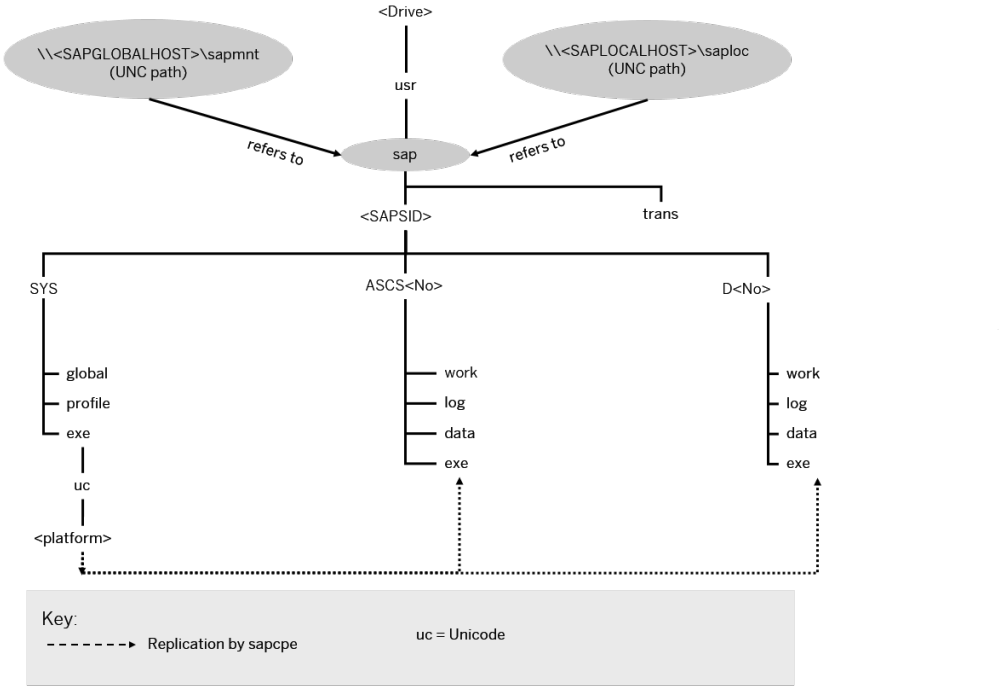
The following figures show how the physical directory `\usr\sap` is shared on the global host in a standard and in a distributed system. In both cases, the UNC paths are used as follows:

- `\\<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>`
>
> SAP systems based on SAP NetWeaver 7.1 to 7.4: Primary application server instance: `DVEBMGS<Instance_Number>`
>
> SAP systems based on SAP NetWeaver 7.5 and higher: Primary application server instance: `D<Instance_Number>`
>
> Additional application server instance: `D<Instance_Number>`
>
> Only valid for 'High Availability': HA (Windows)
>
> **High Availability only:** Enqueue Replication Server instance: `ERS<Instance_Number>`
>
> End of 'High Availability': HA (Windows)

Directory Structure on the Global Host in a Standard (Central) ABAP System for SAP Systems Based on SAP NetWeaver 7.5 and higher

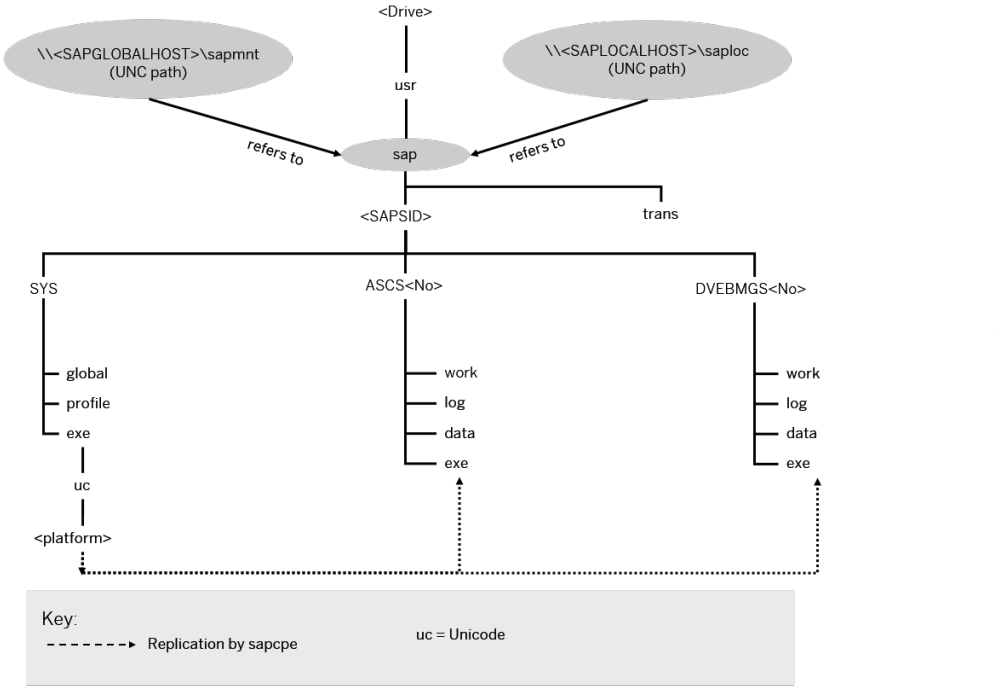
On the global host in a standard (central) ABAP system for SAP systems based on SAP NetWeaver 7.5 and higher, all application server instances, including the primary application server instance, are named `D<Instance_Number>`.



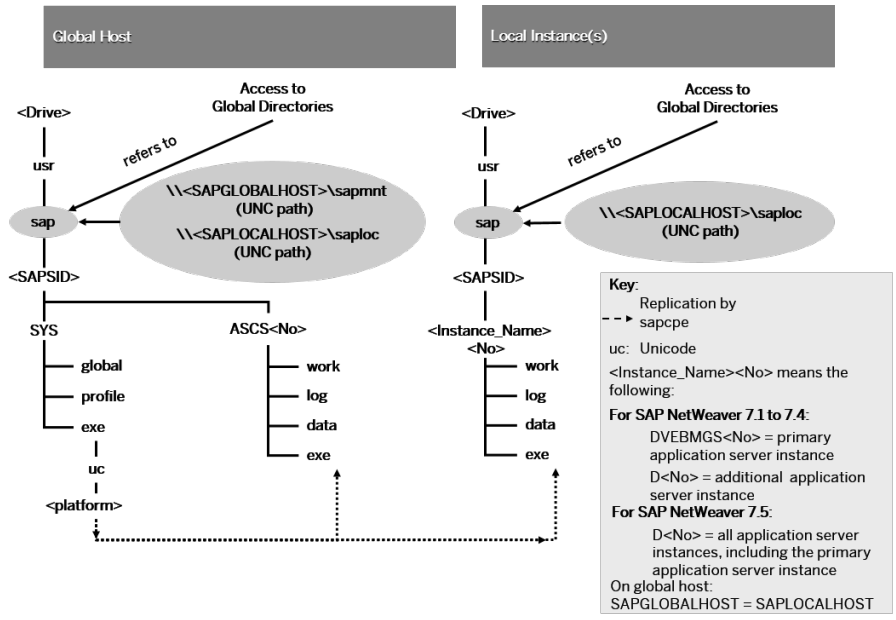
Directory Structure on the Global Host in a Standard (Central) ABAP System for SAP Systems Based on SAP NetWeaver 7.5 and higher

Directory Structure on the Global Host in a Standard (Central) ABAP System for SAP Systems Based on SAP NetWeaver 7.1 to 7.4

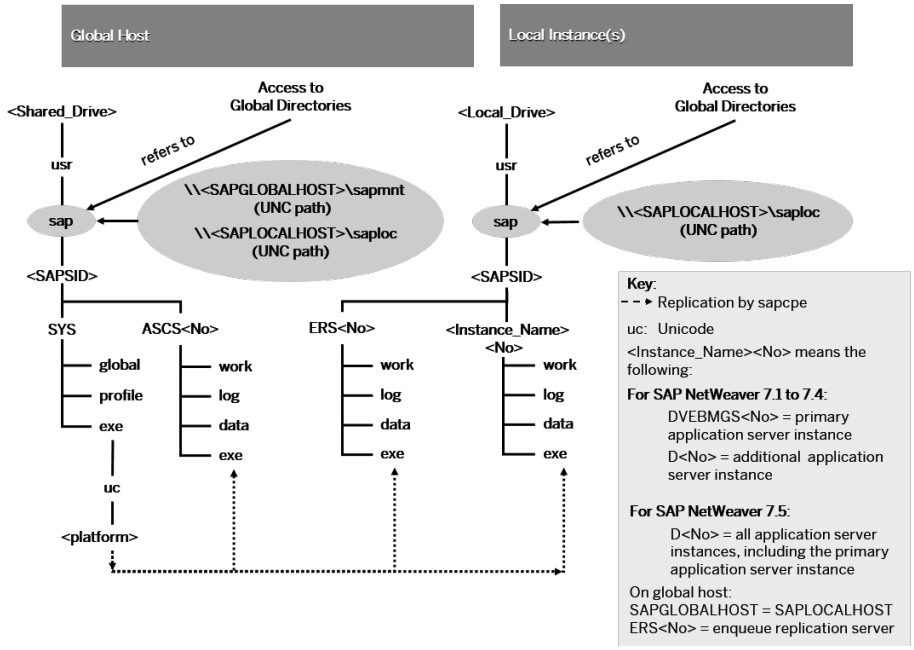
For the global host in a standard (central) ABAP system for SAP systems based on SAP NetWeaver 7.1 to 7.4, the primary application server instance is named `DVEBMGS<Instance_Number>`.



Directory Structure on the Global Host in a Standard (Central) ABAP System for SAP Systems Based on SAP NetWeaver 7.1 to 7.4



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 79]. 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 119] 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

> **i 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 Installation of Multiple Components in One Database

You can install **multiple** SAP systems in a **single** database. This is called Multiple Components in One Database (MCOD).

> **→** Recommendation
>
> MCOD is generally available and there is no intention to de-support this installation feature.
>
> However, SAP recommends that customers should **not** use the MCOD feature when installing new systems.
>
> The major drawbacks are as follows:
>
> - Previous-point-in-time (PPT) recovery of a single system within an MCOD installation becomes a highly complex and time-consuming procedure.
> - SAP Landscape Management (LaMa) is generally not supported for MCOD installations. For more information, see SAP Note 1709155.
> - There are strong dependencies, for example on the database version used for the MCOD system.

- Downtime - planned or unplanned - always affects all systems sharing the same database.

Exception: In case of a dual-stack split you can use the “Keep Database” option thus keeping ABAP and Java stack in one database. There, the PPT recovery problem does not apply because both stacks belong logically together and would always be recovered jointly anyhow. However, keep in mind that even for this specific case the introduction of SAP Landscape Management would require a split into separate database subsystems.

Additional information is available in SAP Note 2146542.

MCOD is available with all SAP components and all the major databases for the SAP system. No extra effort is required because the MCOD installation is fully integrated into the standard installation procedure. MCOD is not an additional installation option. Instead, it is an option of the database instance installation.

With MCOD we distinguish two scenarios:

- The installation of an SAP system in a new database
  The system then creates new tablespaces and a new database schema.
- The installation of an additional SAP system in an existing database (MCOD)
  The system then automatically creates additional tablespaces in the existing database and a schema user in the existing database.

Prerequisites

- For more information about MCOD and its availability on different platforms, see *Multiple Components in One Database (MCOD)* at: https://wiki.scn.sap.com/wiki/pages/viewpage.action?pageId=448466580.
- Since SAP does not support mixed solutions with MCOD, your SAP system must contain Unicode SAP instances only.
- Improved sizing required
  You calculate the CPU usage for an MCOD database by adding up the CPU usage for each individual SAP system. You can do the same for memory resources and disk space.
  You can size multiple components in one database by sizing each individual component using the `Quick Sizer` tool and then adding the requirements together. For more information about the `Quick Sizer`, see http://sap.com/sizing.

Features

- Reduced administration effort
- Consistent system landscape for backup, system copy, administration, and recovery
- Increased security and reduced database failure for multiple SAP systems due to monitoring and administration of only one database
- Independent upgrade
  In an MCOD landscape, you can upgrade a single component independently from the other components running in the same database, assuming that the upgraded component runs on the same database version. However, if you need to restore a backup, be aware that all other components are also affected.

> **i Note**
>
> Special MCOD considerations and differences from the standard procedure are listed where relevant in the installation documentation.

Constraints

- We **strongly recommend** that you test MCOD in a test or development system. We recommend that you run MCOD systems in the same context. We do not recommend that you mix test, development, and production systems in the same MCOD.
- In the event of database failure, all SAP systems running on the single database are affected.
- Automated support in an MCOD landscape for the following administrative tasks depends on your operating system and database:
  - Copying a single component from an MCOD landscape to another database at database level.
  - Uninstalling a single component from an MCOD landscape requires some additional steps. You can use a remote connection to SAP support to request help with these tasks. For more information, see http://support.sap.com/remoteconnection.
- You **cannot** install a Unicode ABAP system with a non-Unicode ABAP system in one database.
- Only valid for 'High Availability': HA (Windows)
  You **cannot** install multiple components in one database with Microsoft Failover Clustering. For more information, see High Availability with Microsoft Failover Clustering [page 216].
  End of 'High Availability': HA (Windows)
- For the second SAP system, you must use the same `<DBSID>` as for the first SAP system.
- If you install an MCOD system, the `SYSTEM` tablespace must contain at least 400 MB of free space. If there is not enough space left, increase the size of this tablespace with `BRSPACE` or `BRTOOLS`.
- If you decide to turn off archive log mode during the database load phase of the installation, you need to plan downtime for all MCOD systems sharing the database.

7.6 Implementing Oracle Database Vault with Software Provisioning Manager 1.0

Software Provisioning Manager 1.0 (the “installer” for short) supports Oracle Database Vault. This section provides information about implementing Oracle Database Vault (DV) with the installer.

Prerequisites

- Your Oracle database version must be 12.1 or higher.
- Check the prerequisites, restrictions, and patch requirements as listed in SAP Note 2218115.

Context

For a new system installation, the installer prompts whether DV is to be installed.

DV requires the following addional users:

- `secadmin`
- `secacctmgr`

These users are created by the installer.

For more information about Oracle Database Vault, see the Oracle Database documentation referred to in SAP Note 2218115.

Procedure

1. Start the installer and choose the installation option for your system variant as described in Running the Installer [page 119].
2. On the *Oracle Database* screen where you are prompted to enter the required Oracle database parameters, mark the *Install Oracle Database Vault* checkbox.
3. On the *Database Accounts for Oracle Database Vault* screen, specify the following:
   - Provide the passwords for the Oracle Database Vault user accounts `secadmin` and `secacctmgr` which are to be created by the installer.
   - If you want to be enabled after the installation has completed, mark the *Enable Oracle Database Vault* checkbox.

Next Steps

Configure Oracle Database Vault as described in SAP Note 2218115.

7.7 Multitenant Database Installation of Oracle Database 12c or Higher

The multitenant option introduced in Oracle Database 12c or higher allows a single container database (CDB) to host multiple separate pluggable databases (PDB). Using Software Provisioning Manager (the “ installer”) you can create a CDB, PDB, and also a new pluggable database in an existing container database.

Container Database (CDB)

The container database is the body of a seed and a pluggable (PDB) database and is called `CDB$ROOT`. In this special database the common user, SGA, control file, and more are stored. Every CDB has a “seed” database. This “seed” is the template for creating additional PDBs. The seed database has the internal name `PDB$SEED` .

Pluggable Database (PDB)

The pluggable database includes the customer data, for SAP the `SAP<SCHEMAID>` data. Every PDB shares the SGA, control file, redo logs and undo tablespace from the CDB. Every PDB has its own system and `sysaux` tablespace and can have its own temporary tablespace.

Installation Features in the Installer

The installation has the following restrictions:

- This installation is only available for `SWPM 7.*` where * is greater than 1.
- This installation is only available for single instance installation on file system.
- SAP kernel version must be 7.45 or higher.

The installation is possible for the following scenarios:

- Install the CDB and PDB.
- Install one or more PDBs in an existing CDB.

For more information, see 2336881

Related Information

Installing the Container Database and a Pluggable Database [page 193]
Installing a Distributed Application Server Instance [page 193]
Installing an Additional Pluggable Database in a Pre-Installed Container Database [page 194]

7.7.1 Installing the Container Database and a Pluggable Database

In this section we describe how you install the container database (CDB) and a pluggable database (PDB).

Procedure

1. Start the installer on the database instance host to perform the database instance installation as described in Running the Installer [page 119].
2. On the *SAP System Database* screen, you have to specify the container database (CDB) system id (SID) in the field *Database ID*. The SID cannot have the same SID as the PDB.

   > → Recommendation
   >
   > We recommend that you assign the CDB a different SID than the SAP system ID (`<SAPSID>`) because the default SID of the pluggable database (PDB) equals the `<SAPSID>`.

3. On the*Oracle Multitenant Database* screen, you select the PDB SID (default is SAP SID). CDB SID cannot have the same SID as PDB SID. When you select No, a normal database installation is done.

Related Information

Multitenant Database Installation of Oracle Database 12c or Higher [page 192]
SAP System Database Parameters [page 63]

7.7.2 Installing a Distributed Application Server Instance

For a distributed application server installation, you need to specify how the application server is to connect to a pluggable database (PDB) or a “normal” database.You can install one or more additional PDBs in an existing container database (CDB).

Procedure

1. Start the installer on the application server instance host as described in Running the Installer [page 119].
2. On the *SAP System Database* screen, enter the CDB SID of your existing CDB where your pluggable database is located.
3. On the *Oracle Multitenant Database* screen, you select the PDB SID where you want to install the application server instances.

Related Information

Multitenant Database Installation of Oracle Database 12c or Higher [page 192]
SAP System Database Parameters [page 63]

7.7.3 Installing an Additional Pluggable Database in a Pre-Installed Container Database

This section describes how you install an additional pluggable database (PDB) in a Pre-Installed container database (CDB).

Procedure

1. Start the installer on the database instance host to perform the database instance installation as described in Running the Installer [page 119].
2. On the *SAP System Database* screen, enter the container database system ID (CDB SID) of an existing container database installation.

   The installer recognizes that a normal database installation or a pre-installed CDB already exists.
3. If you want to install an additional PDB, on the Oracle Database screen enter Install Additional Pluggable DB in Existing Container DB.
4. On the *Oracle Multitenant Database* screen, the installer displays all available PDBs. Select *Install or Connect to Multitenant PDB* and specify the SID of PDB (PDBSID)

Related Information

Multitenant Database Installation of Oracle Database 12c or Higher [page 192]
SAP System Database Parameters [page 63]

7.8 Support of Oracle Transparent Data Encryption (Oracle TDE)

Oracle Transparent Data Encryption (TDE) for Oracle 18c is supported as of Software Provisioning Manager 1.0 SP27 (the “installer” for short) for SAP systems based on SAP NetWeaver.

Prerequisites

- Oracle database 18c or higher
- Software Provisioning Manager 1.0 SP 27 or higher
- SAP system is based on SAP NetWeaver 7.0 or higher
- If you perform a system copy or a database refresh with R3load, the Oracle database on the target system does not need to have the same encryption type as the Oracle database on the source system. You can always change the encryption type when the Oracle database or the Oracle tablespaces are recreated, and the data are reloaded again in the Oracle database by R3load.

Constraints

- Oracle Database 18c only supports TDE tablespace encryption, but not yet TDE full database encryption. For more information, see SAP Note 2485122.
- With Software Provisioning Manager 1.0 you cannot configure TDE and encrypt tablespaces in the database of an already existing SAP System. You have to do this manually.
  - You can manually configure TDE in an SAP system that already exists.
  - You can manually convert a non-encrypted Oracle SAP database into an encrypted Oracle SAP database.
- With Software Provisioning Manager 1.0 you cannot deconfigure TDE and decrypt the data in the database of an existing SAP system. You have to do this manually.

For more information, see SAP Note 2485122.

Supported Software Provisioning Manager 1.0 Scenarios

- SAP system installation from scratch
  SAP System Database Parameters [page 63]
- SAP system copy
  When you copy an SAP system with Software Provisioning Manager 1.0, there are two options for copying the database. From a security perspective, the first option is the preferred option as the SAP data remains security encrypted during the whole system copy process.

See section *Support of Oracle Transparent Data Encryption (Oracle TDE)* in the system copy guides at https://support.sap.com/sltoolset > *System Provisioning* > *Copy a System using Software Provisioning Manager* > *System Copy Option of Software Provisioning Manager 1.0*

- SAP system rename
  See section *Support of Oracle Transparent Data Encryption (Oracle TDE)* in the system rename guides at https://support.sap.com/sltoolset > *System Provisioning* > *Rename a System using Software Provisioning Manager* > *System Rename Option of Software Provisioning Manager 1.0*
- SAP system database refresh
  See section *Support of Oracle Transparent Data Encryption (Oracle TDE)* in the system copy guides at https://support.sap.com/sltoolset > *System Provisioning* > *Copy a System using Software Provisioning Manager* > *System Copy Option of Software Provisioning Manager 1.0*

For more information, see SAP Note 2485122.

Supported Oracle 18c Configuration Scenarios

- Oracle single instance installation
  Software keystore is located in filesystem
- CDB architecture (Singletenant, Multitenant)
  Multitenant Database Installation of Oracle Database 12c or Higher [page 192]
  Only united mode software keystore is supported.
- Oracle Database Vault
  Implementing Oracle Database Vault with Software Provisioning Manager 1.0 [page 190]
  Oracle TDE and Oracle DV can be combined together.

For more information, see SAP Note 2485122.

Supported TDE Encryption Algorithms

- Software Provisioning Manager 1.0 allows you to choose which encryption key to use.
- Default Encryption is TDE or AES128.
- NOTDE is the value for No Transparent Data Encryption.
- Currently only user tablespaces can be encrypted.
- Tablespaces `System`, `Psaptemp`, and `Sysaux` are not supported.

Log und SQ files in installation directory for TDE

During the installation, Database Refresh and Systemcopy with R3load/Jload with Software Provisioning Manager 1.0 the TDE will be set and installed when the *Install Oracle TDE* checkbox is marked.

For a database rename, the wallet is already available with the same master key as before. Only the Auto Login Wallet will be reset. The following log and sql files are created in the installation directory for TDE.

- CreateKeystore.log & CreateKeystore.sql
  - Create keystore log and sql file
  - During the installation or system copy the keystore is created in `$SAPDATA_HOME/orawallet/tde`
- CreateKSKey.log & CreateKSKey.sql
  - Create keystore key log and sql file
  - The Master Key is written to the keystore file `ewallet.p12` and a backup file `ewallet_<number>.p12` is created as well.
- CreateKSAutologin.log & CreateKSAutologin.sql
  - Create keystore auto login log and sql file
  - During startup the wallet will be open automatically. The `Auto Login Wallet` file is `cwallet.sso` in the keystore.

7.9 Installing the SAP Host Agent Separately

The SAP Host Agent is installed automatically during the installation of new SAP instances with SAP kernel 7.20 or higher (integrated installation). If you need to install the SAP Host Agent separately, use the documentation *Installation of SAP Host Agent on Windows - Using Software Provisioning Manager 1.0* at:

https://support.sap.com/sltoolset *System Provisioning* *Install a System using Software Provisioning Manager* *Installation Option of Software Provisioning Manager 1.0 SP* `<Current Version>` *Installation Guides - Standalone Engines and Clients* *SAP Host Agent*

7.10 Splitting Off an ABAP Central Services Instance from an Existing Primary Application Server Instance

With the installation option *Split Off ASCS Instance from existing Primary Application Server Instance*, you can move the message server and the enqueue work process from an existing primary application server instance to a newly installed ABAP central services instance (ASCS instance). The new ASCS instance is installed while the split is done.

Prerequisites

The existing SAP system of the primary application server instance must meet the following requirements:

- It was upgraded from an SAP system release based on SAP NetWeaver lower than 7.1.
- It does not yet have an ASCS instance

Context

Only valid for 'High Availability': HA (Windows)

> **i Note**
>
> This installation option is not supported in a high-availability system.

End of 'High Availability': HA (Windows)

Before the Split

The primary application server instance includes:

- ABAP dispatcher and work processes (dialog, batch, spool, enqueue, or update)
- Gateway
- Internet communication manager (ICM)
- Internet graphics service (IGS)
- ABAP message server

After the Split

An ABAP central services instance (ASCS instance) has been split off from the existing primary application server instance.

The primary application server instance now includes:

- ABAP dispatcher and work processes (dialog, batch, spool, or update)
- Gateway
- Internet communication manager (ICM)
- Internet graphics service (IGS)

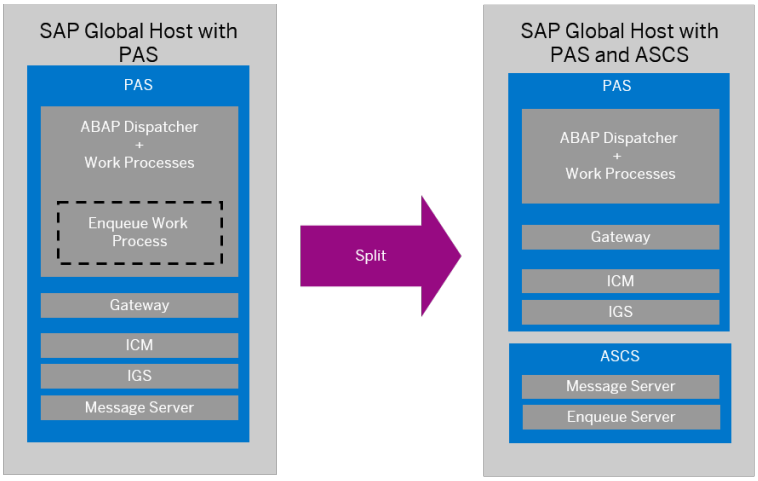
The newly created ABAP central services instance (ASCS instance) includes:

- ABAP message server
- ABAP standalone enqueue server
  The ABAP enqueue work process is now replaced with the ABAP standalone enqueue server.

> **i Note**
>
> **ASCS instance with "Standalone Enqueue Server" versus ASCS instance with new "Standalone Enqueue Server 2":** Software Provisioning Manager 1.0 installs the "Standalone Enqueue Server" by default for all SAP system releases in the ASCS instance. However, if you have installed the ASCS instance for an SAP system based on SAP NetWeaver AS for ABAP 7.52, you can switch to the new "Standalone Enqueue Server **2**" after the installation has completed. For more information, see https://help.sap.com/nw752abap ▶ *Application Help* ▶ *SAP NetWeaver Library: Function-Oriented View* ▶ *SAP NetWeaver Application Server for ABAP* ▶ *Components of SAP NetWeaver Application Server for ABAP* ▶ *Standalone Enqueue Server 2* ▶ *High Availability with Standalone Enqueue Server 2* ▶, and Systems Based on SAP NetWeaver AS for ABAP 7.52 only: Switching to Standalone Enqueue Server 2 and Enqueue Replicator 2 [page 155] .

The Effect of the Split

The following graphic provides an overview of the components contained in the primary application server instance before and after the split, along with the newly created ASCS instance:



PAS = Primary Application Server Instance
ASCS = Central Services Instance for ABAP

Splitting Off an ASCS Instance in an ABAP System

Procedure

1. Plan the basic parameters, as described in SAP System Parameters [page 53]:
   - Choose an instance number for the ASCS instance to be created.
   - Note that the message server port is not changed during the split.
2. Check the hardware and software requirements for the ASCS instance to be created as described in Hardware and Software Requirements [page 39].
3. Specify basic SAP System Parameters [page 53] for the ASCS instance to be created.
4. Check the prerequisites [page 117] and start the installer [page 119] on the host where the ASCS instance is to be created.
5. On the *Welcome* screen, choose *Generic Options* > `<Database>` > *Split Off ASCS Instance from Existing Primary Application Server Instance* .
6. Follow the instructions on the installer screens and enter the required parameters.

   > **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.

   After you have entered all requested input parameters, the installer displays the *Parameter Summary* screen. This screen shows both the parameters that you entered and those that the installer set by default. If required, you can revise the parameters before starting the installation.
7. To start the installation, choose *Start*.

> ⚠ Caution
>
> All SAP system instances are stopped during the split procedure.

The installer starts the installation and displays the progress of the installation. When the installation has successfully completed, the installer shows the dialog *Execution of Split Off ASCS Instance from existing Primary Application Server Instance has completed.*

8. Restart the application server instances [page 200] (primary application server instance and additional application server instances if they exist) that were not already restarted by the installer.
9. Check whether you can log on to the application servers [page 136].
10. Ensure user security [page 160] for the operating system users of the newly created ASCS instance.
11. If you installed a high-availability system based on SAP NetWeaver AS for ABAP 7.52, you can decide whether you want to switch to standalone enqueue server 2 and enqueue replication server .
12. If required, perform an installation backup [page 167].

7.11 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:
>
> Only valid for 'High Availability': non-HA
>
> In a non-high-availability system, you can use the SAP MMC or SAPControl to start the database instance. To stop the database instance, however, you must use the relevant database administration tools.
>
> End of 'High Availability': non-HA
>
> Only valid for 'High Availability': HA (Windows)
>
> 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 258].
>
> End of 'High Availability': HA (Windows)

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 Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
• SAP NetWeaver 7.1 for Banking Services from SAP • SAP NetWeaver 7.1 including Enhancement Package 1 for Banking Services from SAP	See the SAP Library path for SAP NetWeaver 7.3 and higher.
• SAP NetWeaver Mobile 7.1 • SAP NetWeaver Mobile 7.1 including Enhancement Package 1	See the SAP Library path for SAP NetWeaver 7.3 and higher.
• SAP NetWeaver 7.3 http://help.sap.com/nw73 • SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731 • SAP NetWeaver 7.4 http://help.sap.com/nw74 • SAP NetWeaver 7.5 http://help.sap.com/nw75 • SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap • SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View: English* > *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.

7.12 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.

Only valid for 'High Availability': HA (Windows)

> ⚠ Caution
>
> In a high-availability system, you have to configure the firewall on **all** cluster nodes.

End of 'High Availability': HA (Windows)

Prerequisites

You turn on the disabled firewall [page 77] 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.
     Select *Specific local ports*, and enter the port numbers for which you want to apply the new rule, for example:
     `3200,3300,4800,8000,3600,50013,1527`
     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.

7.13 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*.

User account	Description
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.

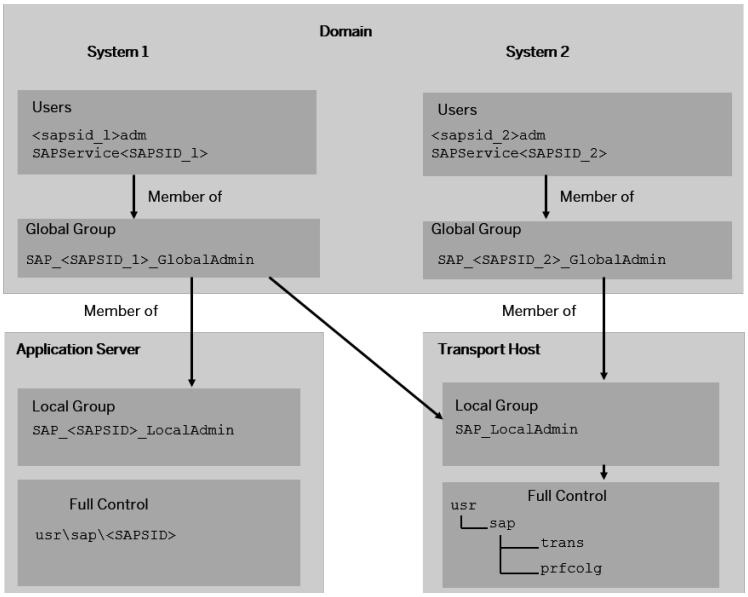
During a domain installation, the installer creates the following domain and local groups:

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.
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. The SAP_<SAPSID>_GlobalAdmin groups of all the SAP systems that are part of the transport infrastructure are added to the SAP_LocalAdmin group. Therefore, the users <sapsid>adm and SAPService<SAPSID> of all systems in the transport infrastructure are members of the SAP_LocalAdmin group and have the required authorizations necessary to initiate and execute transports.

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

> **i** 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 206]

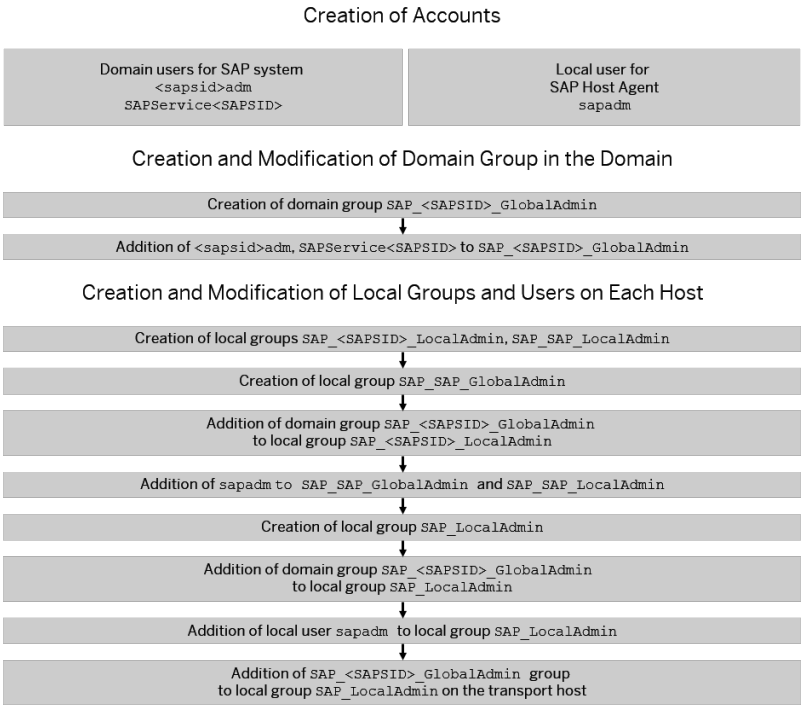
7.14 Automatic Creation of Accounts and Groups

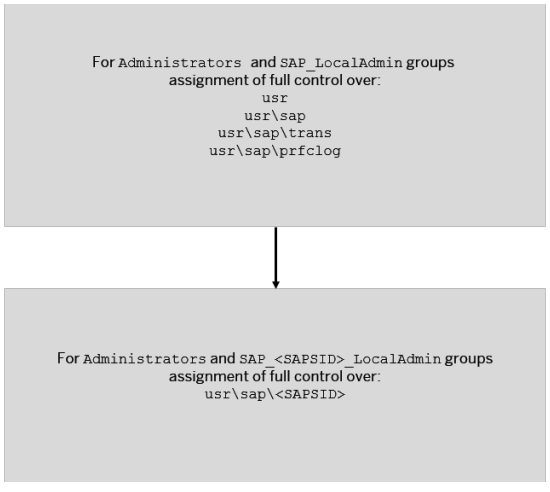
The installer automatically creates the accounts and groups required for the secure operation of the SAP system with Windows during the installation, as described in SAP System Security on Windows [page 204].

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.





Assigning Rights to SAP Directories

7.15 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 79].

  > ⚠ 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

> ℹ Note
>
> With this installer option you do **not** delete the database software.

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 119].
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 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 Choose whether you want to drop the entire database instance or only one or more database schemas. Since the installer only stops local instances automatically, make sure that before deleting the database instance of a distributed system, you stop all remaining instances. You must stop the instance with the message server only after having entered all installer parameters for the deletion of the database instance. Before deleting any database schema, make sure that: ○ You have performed a recent offline database backup. ○ You have stopped or deleted all SAP instances belonging to this database schema. ○ You only delete the tablespaces that belong to the selected schema. The database tablespace `PSAP<SCHEMA_ID>DB` belongs by default to the Java schema `SAP<SCHEMA_ID>DB`. All other SAP tablespaces belong to the ABAP schema `SAP<SCHEMA_ID>` (or `SAPR3` for older SAP systems). 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. Uninstall the Oracle database software with the Oracle Universal Installer (OUI).
   For more information, see Deleting the Oracle Database Software [page 211].

6. 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*.
7. 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.
8. 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*

7.16 Deleting the Oracle Database Software

You use the Oracle Universal Installer to delete the Oracle database software.

7.16.1 Deleting the Oracle 18 Database Software

Here you find information about how to delete the Oracle 18 database software.

Procedure

Proceed as described in SAP Note 1915314.

7.16.2 Deleting the Oracle Database Software on Windows Server 2012 (R2)

This section describes how to delete the Oracle database software on Windows Server 2012 (R2).

Prerequisites

Before you delete the database software, make sure that you delete the groups `ORA_<DBSID>_DBA` and `ORA_<DBSID>_OPER` as follows:

To delete local groups, open a PowerShell in elevated mode, and enter the following command:

```
net localgroup ORA_<DBSID>_DBA /delete
```

```
net localgroup ORA_<DBSID>_OPER /delete
```

To delete domain groups, open a PowerShell in elevated mode, and enter the following command:

```
net group ORA_<DBSID>_DBA /delete /domain
```

```
net group ORA_<DBSID>_OPER /delete /domain
```

Context

The Oracle software is installed on all hosts where an SAP instance is running, for example, on a primary application server instance host, database host, or additional application server instance host. Do **not** delete the Oracle database software, if another SAP instance is running on the same host.

> ⚠ Caution
>
> **High Availability only:**
>
> - Deinstall the Oracle Fail Safe (OFS) software with Oracle Universal Installer before deleting the Oracle database software on both nodes.
> - Delete the Oracle database software on both nodes.

Procedure

1. Stop all Oracle services and the Microsoft *Distributed Transaction Coordinator* (MSDTC) service.

   To do so, open a PowerShell in elevated mode, and enter the following command:

   ```
   stop-service <Service Name>
   ```

2. Delete the Oracle database software with the Oracle Universal Installer as follows:
   a. Start the Oracle Universal Installer by pressing `Ctrl` + `Esc` and then `Ctrl` + `Tab`.

b. Choose *Installed Products* or *Deinstall Products*.
c. Select the database product (<Oracle_Home_name>) you want to uninstall.
d. Choose *Remove*.
e. Confirm with *Yes* and choose *EXIT*.

3. Delete the Oracle home directory and all its subdirectories under <DRIVE>:\ORACLE_HOME.
4. Delete the key for the corresponding Oracle_Home at *HKEY_LOCAL_MACHINE* > *SOFTWARE* > *ORACLE* > *KEY_<Oracle_Home>*.

   To do so use the following PowerShell command:

   ```
   remove-item -path:"HKLM:\SOFTWARE\ORACLE\KEY_<Oracle_Home>"
   ```

5. Delete all Oracle references for the respective Oracle Home at *HKEY_LOCAL_MACHINE* > *SYSTEM* > *CURRENTCONTROLSET* > *SERVICES*.
   - To display all Oracle keys, use the following PowerShell command:
     ```
     get-childitem -path:"HKLM:\SYSTEM\CURRENTCONTROLSET\SERVICES\Oracle*"
     ```
   - To delete all Oracle keys, use the following PowerShell command:
     ```
     remove-item -path:"HKLM:\SYSTEM\CURRENTCONTROLSET\SERVICES\<Oracle Key>"
     ```
6. Delete all corresponding Oracle references from the Windows user and system environment:
   For example, delete the variables:

   TNS_ADMIN, NLS_LANG, ORACLE_HOME, ORACLE_<DBSID>.

   To do so, use the following PowerShell command:

   ```
   remove-itemproperty -path:HKCU:\Environment -name <variable>
   ```

7. Delete Oracle from the PATH variable.
8. Delete Oracle from the registry key:
   HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\Environment\Path
9. Select and delete the folders and shortcuts for Oracle in:
   C:\ProgramData\Microsoft\Windows\Start Menu\Programs

7.16.3 Deleting the Oracle Database Software on Windows Server 2008 (R2)

This section describes how to delete the Oracle database software on Windows Server 2008 (R2).

Prerequisites

Before you delete the database software, make sure that you delete the groups ORA_<DBSID>_DBA and ORA_<DBSID>_OPER as follows:

1. Choose *Start* > *Control Panel* > *Administrative Tools* > *Computer Management*
2. Choose *Local Users and Groups* > *Groups.*.

3. Select and delete the local groups `ORA_<DBSID>_DBA` and `ORA_<DBSID>_OPER` with *Action* > *Delete*.

Context

The Oracle software is installed on all hosts where an SAP instance is running, for example, on a primary application server instance host, database host, or additional application server instance host. Do **not** delete the Oracle database software, if another SAP instance is running on the same host.

> ⚠ Caution
>
> **High Availability only:**
>
> - Deinstall the Oracle Fail Safe (OFS) software with Oracle Universal Installer before deleting the Oracle database software on both nodes.
> - Delete the Oracle database software on both nodes.

Procedure

1. Stop all Oracle Services and the Microsoft *Distributed Transaction Coordinator* (MSDTC) service.

   To access the services, choose *Start* > *Control Panel* > *Administrative Tools* > *Services*.

   Select a service and then choose *Action* > *All Tasks* > *Stop*.
2. Delete the Oracle database software with the Oracle Universal Installer as follows:
   a. Start the Oracle Universal Installer with *Start* > *All Programs* > *Oracle-*`<Oracle_Home_name>` > *Oracle Installation Products* > *Universal Installer*.
   b. Choose *Installed Products* or *Deinstall Products*.
   c. Select the database product (`<Oracle_Home_name>`) you want to uninstall.
   d. Choose *Remove*.
   e. Confirm with *Yes* and choose *EXIT*.
3. Delete the relevant Oracle home directory and all its subdirectories under `<DRIVE>:\ORACLE_HOME`.
4. Edit the Oracle Registry entries as follows:
   a. Choose *Start* > *Run* and enter **`REGEDIT`**.
   b. Delete the key for the corresponding Oracle_Home at *HKEY_LOCAL_MACHINE* > *SOFTWARE* > *ORACLE* > *KEY_*`<Oracle_Home>`.
   c. Delete all Oracle references for the respective Oracle Home at *HKEY_LOCAL_MACHINE* > *SYSTEM* > *CURRENTCONTROLSET* > *SERVICES*.
5. Delete all Oracle references from the Windows user and system environment:
   a. Choose *Start* > *Control Panel* > *System*.
   b. Choose *Advanced system settings* and select *Environment Variables*.
   c. For example, delete the variables:

      `TNS_ADMIN, NLS_LANG, ORACLE_HOME, ORACLE_<DBSID>`.

d. Delete `Oracle` from the `PATH` variable.

6. Delete the corresponding Oracle entries from the *Start* menu:

   a. Choose *Start* > *Settings* > *Taskbar & Start Menu*.
   b. On the *Advanced* tab, click *Advanced*.
   c. On the *Start Menu* screen, look at *All Users\Start Menu\Programs*.

      Select and delete the folders for Oracle with *File* > *Delete*.
   d. Delete the Oracle shortcut from the desktop.

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.

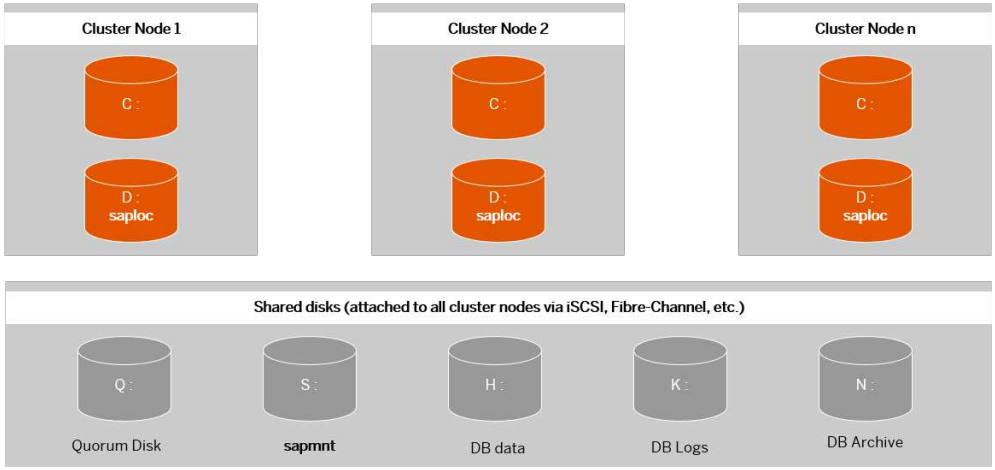
When you are setting up the SAP system with Microsoft Failover Clustering, you combine standard installation steps, described earlier in this documentation, with cluster-specific steps, described here.

You have the following options to install a high-availability SAP system with Microsoft Failover Clustering:

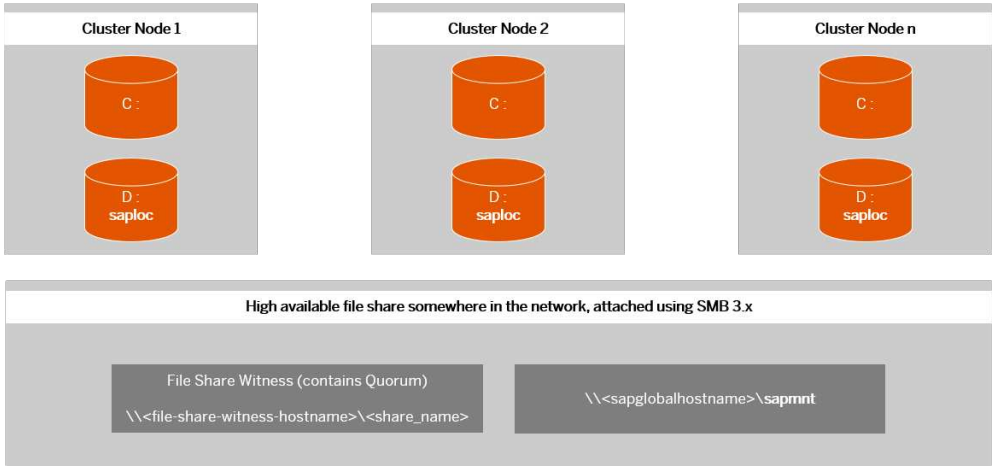
- You install the SAP related parts (for example: ASCS instance, additional standalone Gateways, Web Dispatcher instance, etc.) in **one** Microsoft Failover Cluster.
- You install the SAP related parts (for example: ASCS instance, additional standalone Gateways, Web Dispatcher instance, etc.) in **two** Microsoft Failover Clusters.
- You install **several** SAP systems in **one** or **more** Microsoft Failover Clusters with two or more Microsoft Failover Cluster nodes.

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 35] as for a non-HA system, including the hardware and software requirements [page 39].
2. You decide how to set up your SAP system components in an HA configuration [page 220].
3. You decide how to distribute SAP system components to disks for HA [page 228].

4. You read Directories in an HA Configuration [page 232].
5. You read IP Addresses in an HA Configuration [page 234].
6. You obtain IP addresses for HA [page 236].

> **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 76] 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. On **all** cluster nodes of the database instance host, you install the Oracle database software [page 100].
3. If required, you set up multiple Oracle Homes [page 115].
4. On **all** cluster nodes of the database instance host, you install the Oracle Fail Safe software [page 239].
5. You configure the first cluster node [page 242].
6. You create the Oracle Fail Safe group [page 244] on the host where the database instance runs.
7. You install the database instance on the first cluster node [page 246] of the host where the database instance is to run.
8. You set up a shared database directory in your Oracle Home [page 247] on the host where the database instance runs.

9. You add the Oracle database resource to the Fail Safe group [page 249] on the host where the database instance runs.
10. You configure the additional cluster node [page 251].
11. You perform additional steps for the Oracle Fail Safe configuration [page 252] of the host where the database instance is to run.
12. You install the primary application server instance [page 254].
13. You install at least one additional application server instance [page 254].

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 134] as for a non-HA system.

Additional Information

- Moving Cluster Groups, or Services and Applications, or Roles [page 257]
- Starting and Stopping the SAP System in a HA Configuration [page 258].

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 218].

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 221]
- Multiple SAP Systems in One Microsoft Failover Cluster [page 224]
- Multiple SAP Systems in Multiple Microsoft Failover Clusters [page 225]
- Enqueue Replication Server in a Microsoft Failover Cluster [page 227]

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
Database instance (*)	1	yes
Application server instance (primary application server, additional application server)	1-<n>	no

(*) the database instance can also be installed outside the Microsoft Failover Cluster.

- 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 and the clustered database automatically fail over to another node.
  If you need to maintain the cluster node where the ASCS instance and database are running, you can switch these instances to another node. When maintenance work is finished, you move the ASCS and database 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.

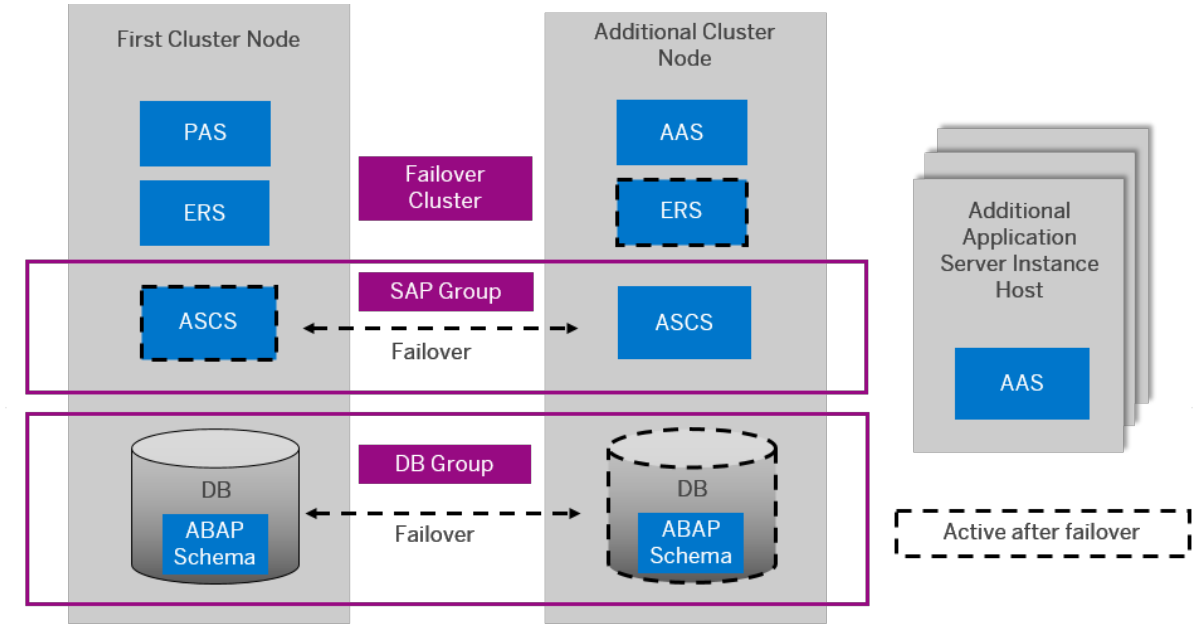
    > **i Note**
    >
    > If you install the primary application server and the additional application server instance on the cluster nodes, you must perform the hardware sizing for the failover cluster host, as in this case the application server is always running on this host. This increases system load and might impact performance.
    >
    > Note that, as usual in a failover cluster setup, the ASCS and database instances also switches 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.

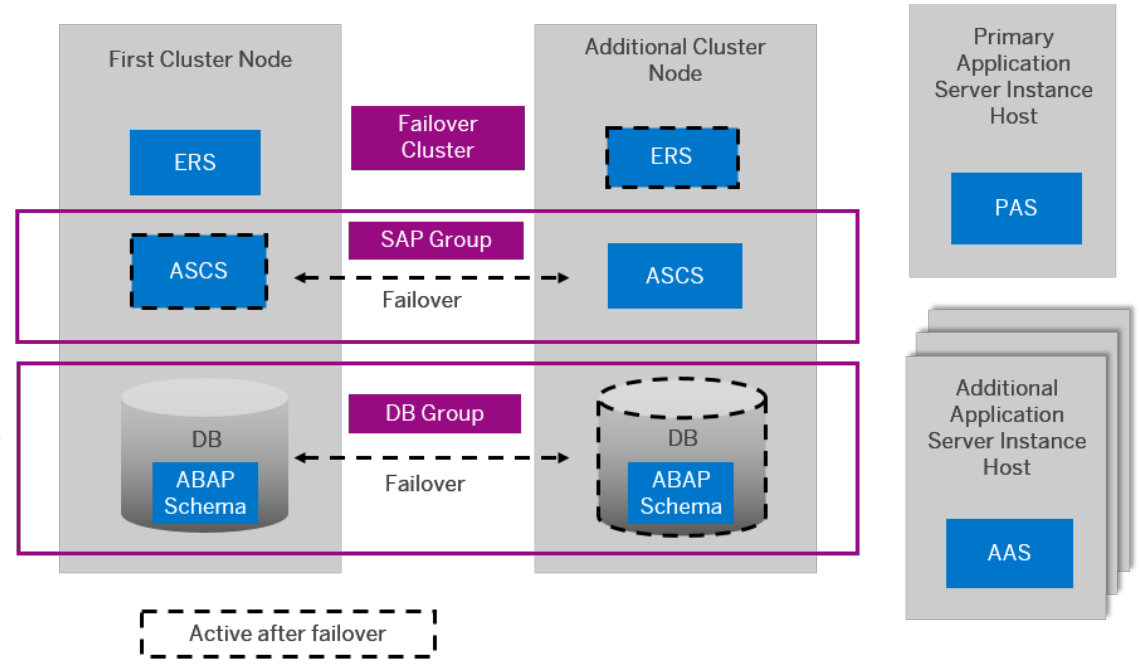
The first figure shows an Microsoft Failover Cluster configuration where the non-SPOFs components (primary application server instance, additional application server instance) are installed locally on the cluster nodes. Any additional application server instances are installed outside the Microsoft Failover Cluster on separate hosts.



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

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.



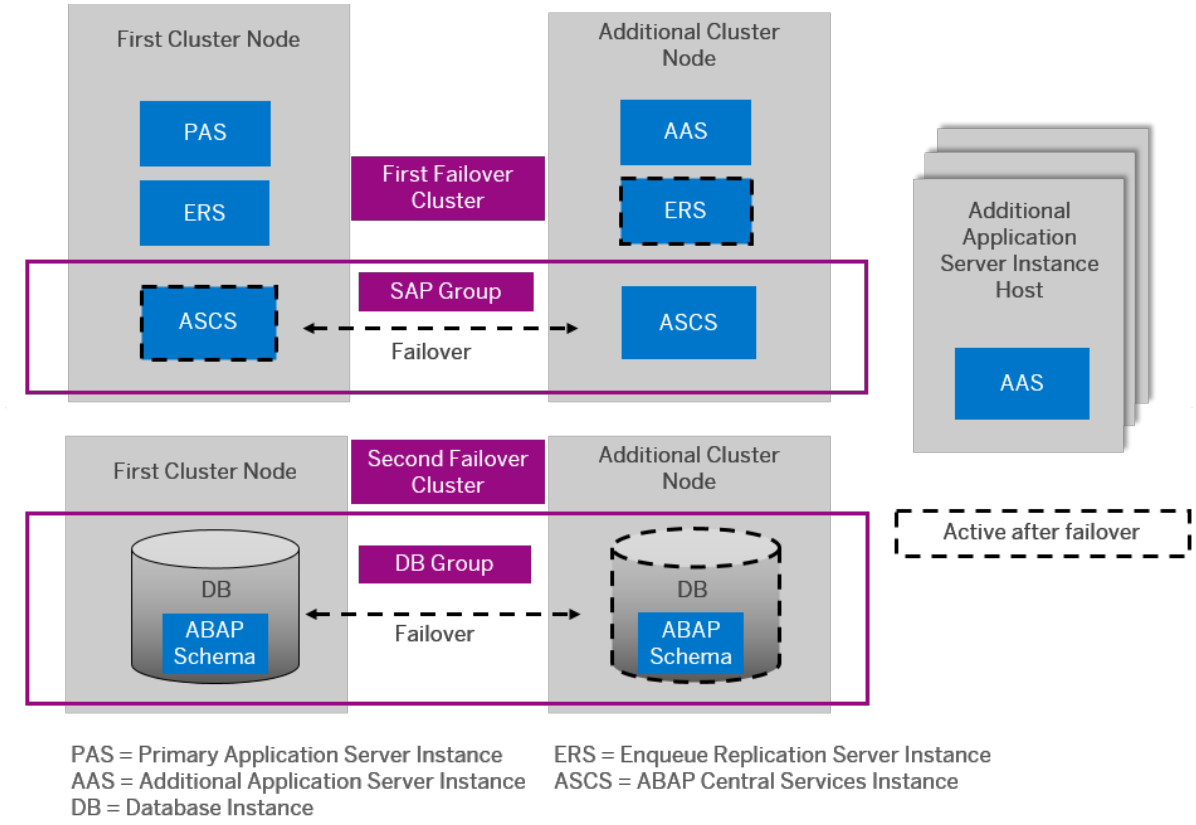
PAS = Primary Application Server Instance
AAS = Additional Application Server Instance
DB = Database Instance
ERS = Enqueue Replication Server Instance
ASCS = ABAP Central Services Instance

ABAP System

SAP System Components in Two Microsoft Failover Clusters

Besides installing your SAP system in one Microsoft Failover Cluster, you can also set up two failover clusters and distribute the SPOF system components on these clusters to protect them against system failure.

The following figure shows an example where the database instance for the SAP system is installed in one Microsoft Failover Cluster, and the ASCS instance is installed on the second failover cluster. The application servers (primary application server instance, additional application server instance) can either be installed on a local disk on the cluster nodes or on separate hosts that are not part of the Microsoft Failover Cluster.



ABAP System

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.

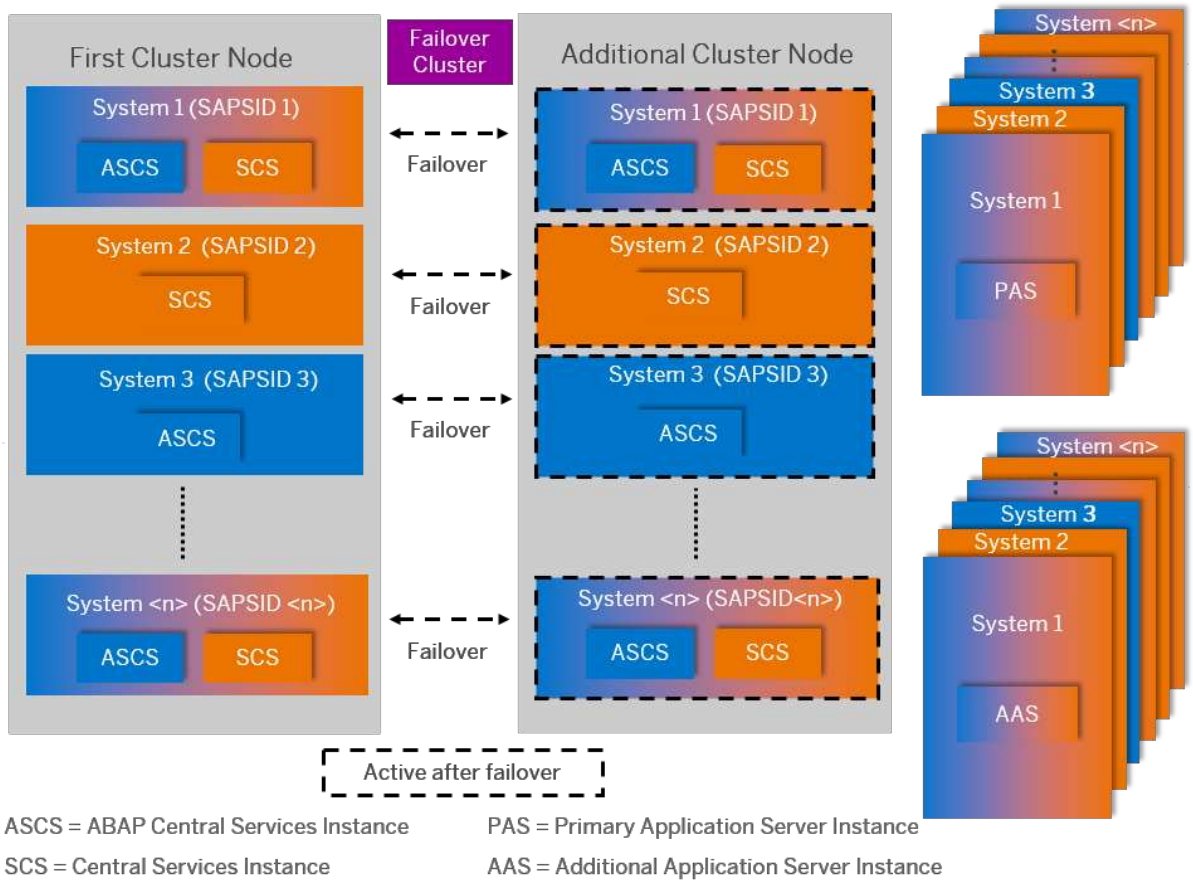
> ⚠ Caution
>
> All local instances such as an enqueue replication server, primary or additional application server and the local part of the ASCS when you use a file share cluster are installed on the local disk where the `saploc` share is pointing to. Make sure that you have enough space on this local 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.

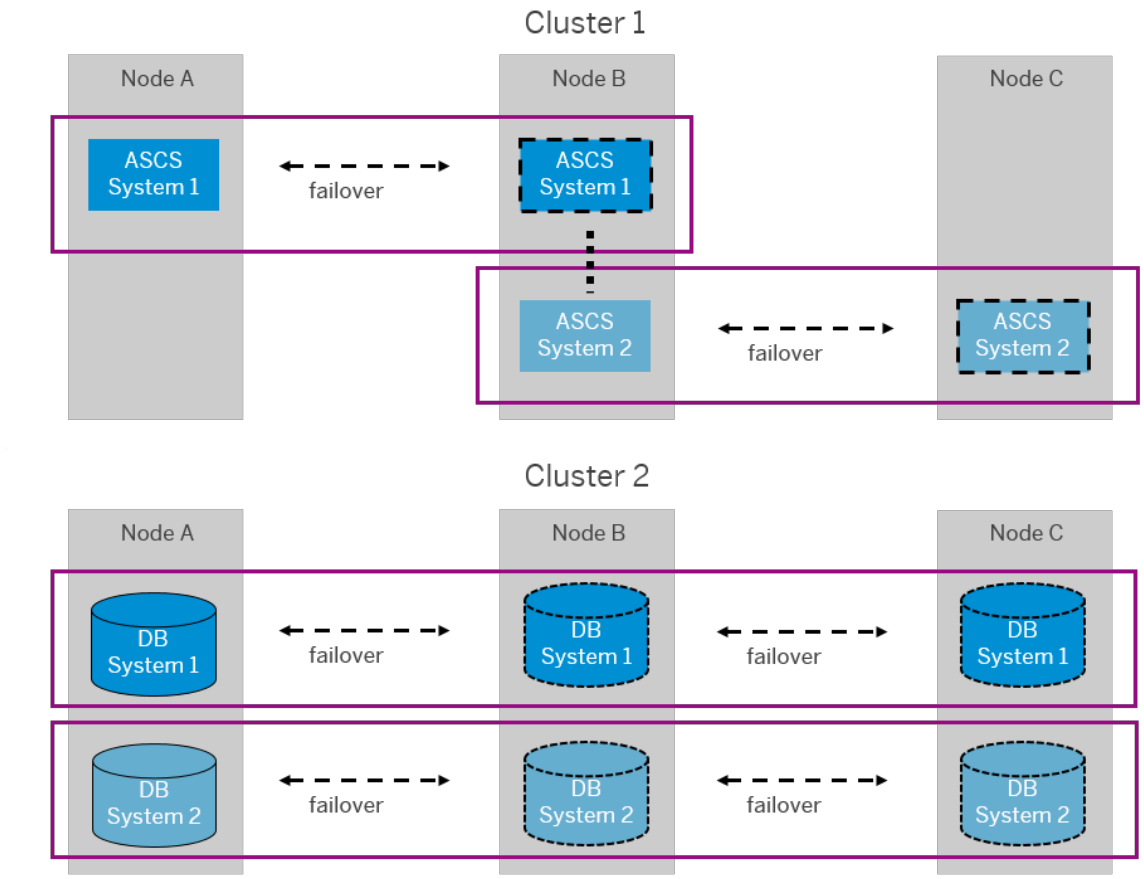
> **i Note**
>
> As of Windows Server 2012, the Microsoft Failover Clustering software supports up to 64 cluster nodes.

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

8.2.1.4 Enqueue Replication Server in a Microsoft Failover Cluster

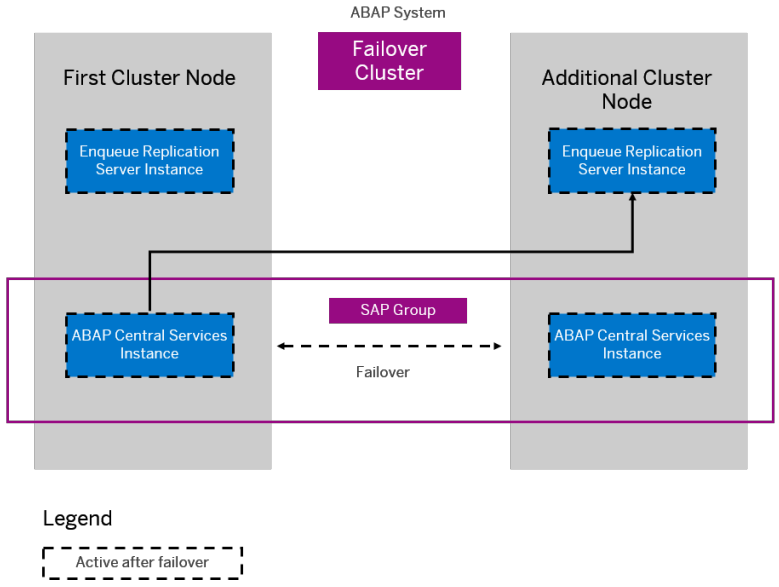
The enqueue replication server contains a replica of the lock table (replication table) and is an essential component in a high-availability setup. It is installed on the two cluster nodes where the ASCS instance is installed and configured to run, even if you have more than two cluster nodes.

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 figure shows the enqueue replication server mechanism in an Microsoft failover cluster configuration with two nodes:

> **i** Note
>
> **"enqueue server" versus "enqueue server 2", "enqueue replication server" versus "enqueue replication server 2":** Software Provisioning Manager 1.0 installs the "enqueue server" and "enqueue replication server" by default for all SAP system releases in the ASCS instance. However, if you have installed an SAP system based on SAP NetWeaver AS for ABAP 7.52, you can switch to" enqueue server **2**" and " enqueue replication server **2**" after the installation has completed. For more information, see https://help.sap.com/nw752abap *Application Help* *SAP NetWeaver Library: Function-Oriented View* *SAP NetWeaver Application Server for ABAP* *Components of SAP NetWeaver Application Server for ABAP* *Standalone Enqueue Server 2* *High Availability with Standalone Enqueue Server 2*, and Systems Based on SAP NetWeaver AS for ABAP 7.52 only: Switching to Standalone Enqueue Server 2 and Enqueue Replicator 2 [page 155] .



Enqueue Replication Server Mechanism on One Microsoft Failover Cluster with Two Nodes

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
- Local disks that are connected directly to the cluster nodes
- Shared disks that can be accessed by all cluster nodes via a shared interconnect

> **i Note**
>
> Shared disk is a synonym for the cluster resource of *Resource type* `Physical disk`.

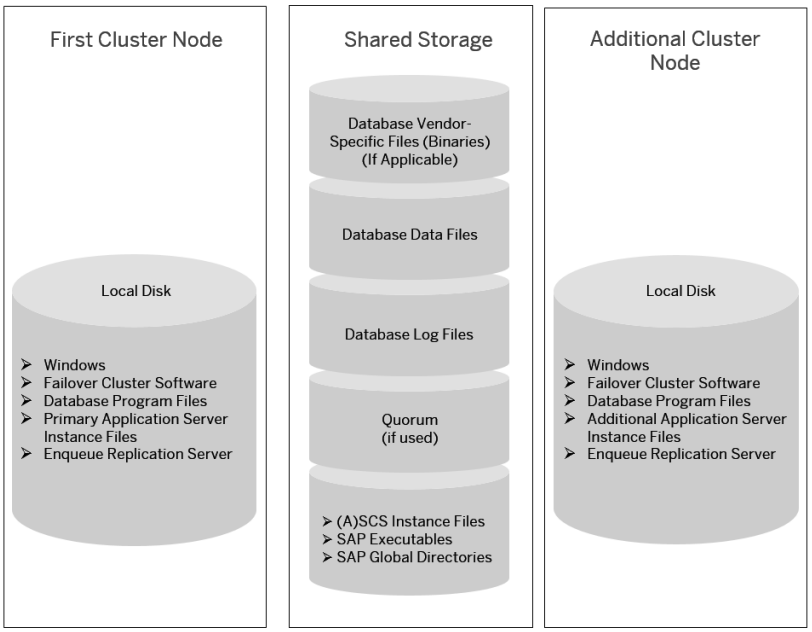
You need to install the SAP system components in both the following ways:

- Separately on all cluster nodes to use the local storage on each node
  You install the Oracle database server software and the Oracle Fail Safe software on local disks.
- On the shared storage used in common by all cluster nodes
  You install the following on **different** shared disks:
  - Database instance files, if the database instance is installed in the failover cluster
  - ASCS instance
  - Single quorum device, if used
- Separately on all cluster nodes to use the local storage on each node
  You install the Oracle database server software and the Oracle Fail Safe software on local disks.
- You have two options to distribute the shared files which are used by all cluster nodes:
  - You install the following on **different** shared disks:
    - Database instance files, if the database instance is installed in the failover cluster
    - 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

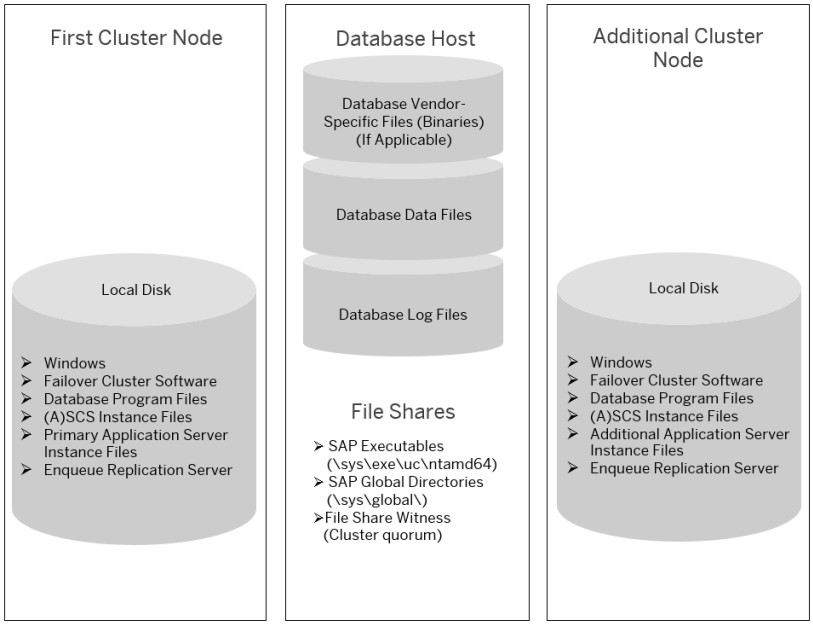
> **⚠ Caution**
>
> You **must not** install any SAP or database components on the quorum disk.

The following figure shows a cluster configuration for an SAP system, where the (A)SCS and database instance are installed in the same cluster. It illustrates how to distribute the database data files, the SAP system

executables, and the quorum resource (if used) to **different** disks. Only with this distribution of files to distinct disks is it possible to move the SAP system and database as separate entities in a failover situation.



Distribution of SAP System Components for an SAP System in a Failover Cluster with Shared Disks (CSD)



Distribution of SAP System Components for an SAP System in a Failover Cluster with an External File Share (FSC)

> **i Note**
>
> The Oracle server software in the Oracle HOME directory must have the same drive letter and path on all cluster nodes.

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
- Functionality supported by the database vendor

The database components in geospan configurations are often no longer part of the cluster and the database is replicated by pure database techniques, such as shadow database, log shipping, and mirrored database.

> ⚠ 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.

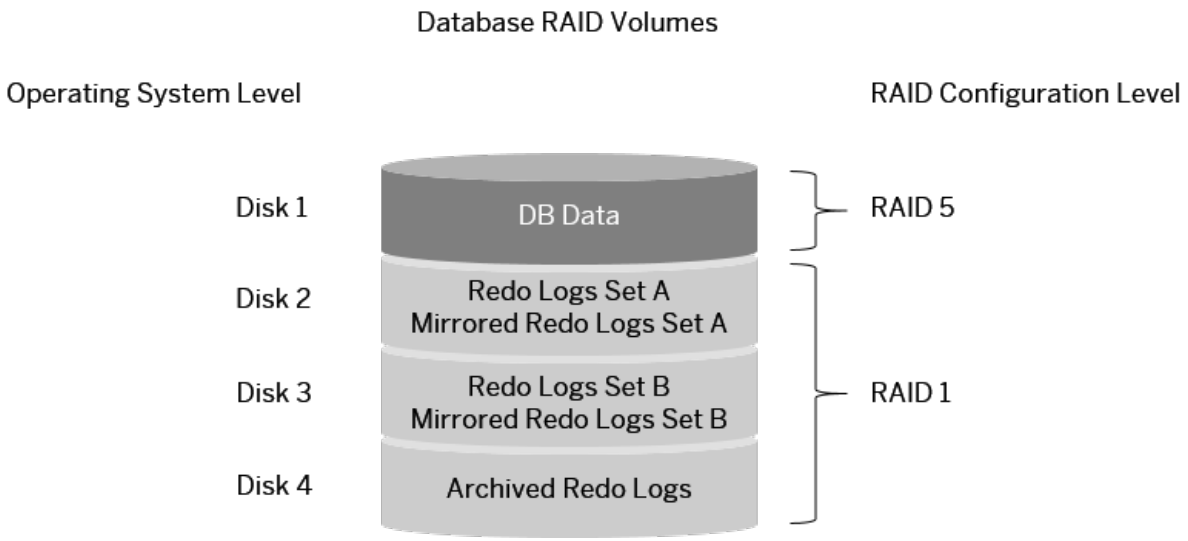
All functionality to set up geospan clusters is available as of Windows Server 2008 (R2).

Distribution of Database Files in a RAID Configuration

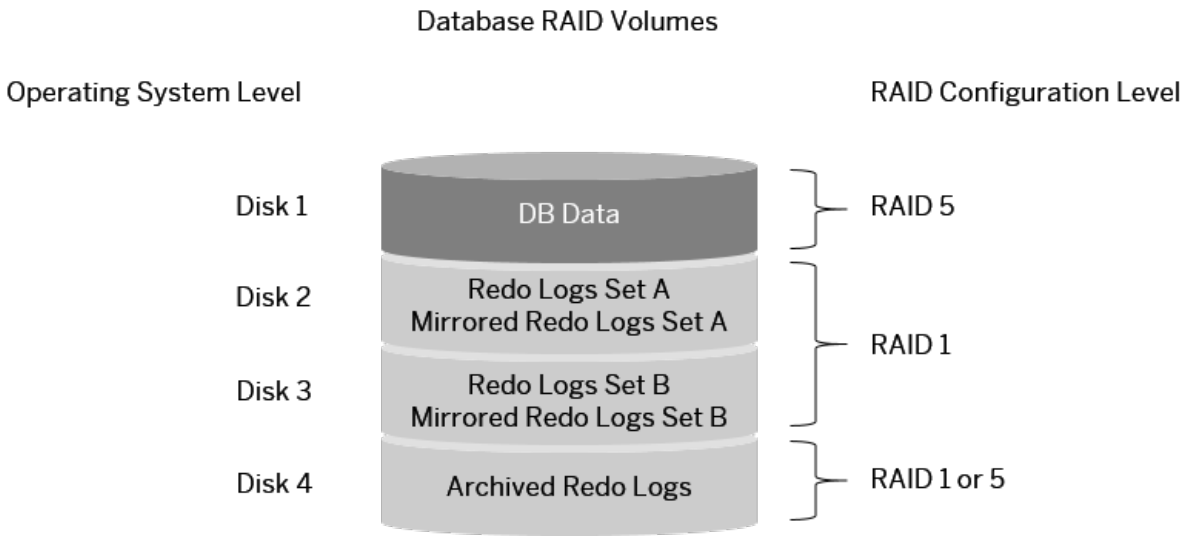
> ⚠ Caution
>
> Microsoft does **not** support a host-based RAID configuration (Dynamic Disks) on shared disks.

The following figures show a secure method to distribute the database files to different RAID volumes.

You must always locate the database data and redo logs on **separate** RAID volumes.



Distribution of Database Files to Different RAID Volumes for Test or Development Systems



Distribution of Database Files to Different RAID Volumes for Production Systems

For high-performance production systems, we recommend that you locate the database files on different RAID volumes.

Note that the BR*Tools directories `\sapreorg`, `\saptrace`, `\sapbackup`, and `\sapcheck` are not shown in the figures. You can locate these directories on any of the database volumes as they do not require special security measures.

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 41]	`%windir%`
Microsoft Failover Clustering software	`%windir%\Cluster`
Application server	`<Local_Drive>:\usr\sap\<SAPSID>\<Instance>`
Enqueue replication server	`<Local_Drive>:\usr\sap\<SAPSID>\ERS<Instance_Number>`
Diagnostics Agent (optional)	`<Local_Drive>:\usr\sap\<DASID>\SMDA<Instance_Number>`
SAP Host Agent	`%Program Files%\SAP\hostctrl`

Component	Default Directory
Oracle server software	Oracle 18: <Local_Drive>:\oracle\<SAPSID>\18<x> Oracle 12: <Local_Drive>:\oracle\<Oracle_home_user>\<DBSID>\12<x> Oracle 11: <Local_Drive>:\oracle\<DBSID>\11<x>
Oracle Fail Safe software	<Drive>:\oracle\OFS<version>

Directories on Shared Disks

Component	Default Directory
Cluster *quorum resource* (if used)	<Drive>:\Cluster
SAP global and instance directories	<Drive>:\usr\sap ...
SAP data files	<Drive>:\ORACLE\<SAPSID>\<SAPSID>DATA1 ... \<SAPSID>DATA<N>
Online redo logs, set A	<Drive>:\ORACLE\<SAPSID>\origlogA
Online redo logs, set B	<Drive>:\ORACLE\<SAPSID>\origlogB
Mirrored online redo logs, set A	<Drive>:\ORACLE\<SAPSID>\mirrlogA
Mirrored online redo logs, set B	\ORACLE\<SAPSID>\mirrlogB
Archive of online redo logs	<Drive>:\ORACLE\<SAPSID>\oraarch
BR*Tools directories	...\sapreorg, \saptrace, ...\sapbackup, \sapcheck, ...\saparch

> **i Note**
>
> In a live system with excessive I/O activity, you must reserve at least three times the minimum amount of space specified above for the redo logs and mirrored redo logs.

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.

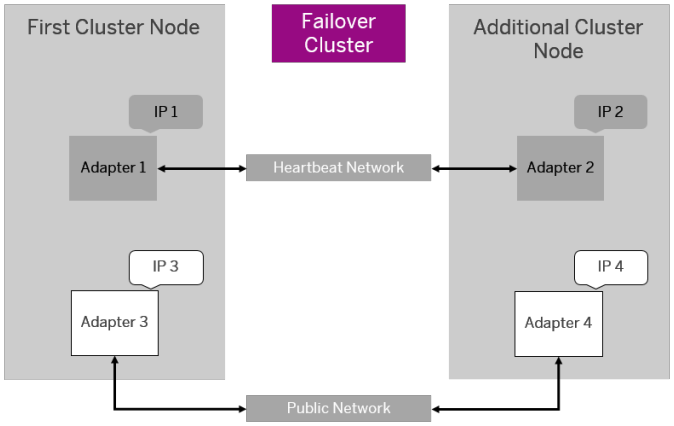
Some of the addresses are assigned to the **network adapters** (network interface card, NIC) whereas others are virtual IP addresses that are assigned to the **cluster groups**.

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 three different **groups**.

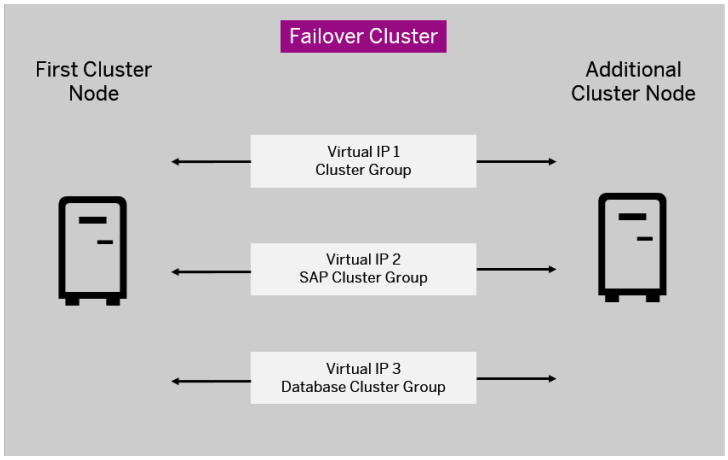
Each of these groups requires a virtual IP address and network name that is permanently mapped to the group and not to a particular node. The advantage of this is that, whenever a group is moved between nodes, its IP address and network name move together with the group.

> ⚠ Caution
>
> If you have more SAP systems in the same Microsoft Failover Cluster, you need for each system an extra IP address and network name for the SAP and database cluster group.

An HA configuration has the following groups:

- SAP cluster group for each clustered SAP system
- Database cluster group for each clustered SAP system
- Cluster group

The following figure illustrates how the virtual IP addresses of the database group and SAP group can move from one node to the other during a failover.



Failover of Virtual IP Addresses

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
SAP cluster group	`129.20.5.5`	`sapgrp`	Virtual address and name for accessing the group of SAP resources, regardless of the node it is running on	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 218].

1. You check that you have completed the same preparations [page 76] 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 218].

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 Installing the Oracle Fail Safe Software

To use the cluster functionality for the Oracle database, you have to install the Oracle Fail Safe (OFS) software.

To check which OFS version is supported for your database and operating system, see SAP Note 1972760.

8.4.1.1 Installing the Oracle Fail Safe Software for Oracle

Use

This section describes how to install the Oracle Fail Safe software, which you need to use the cluster functionality for the Oracle database.

Prerequisites

- You have installed the Oracle database software [page 100] locally on all cluster nodes, using the same `<Oracle_home>`.
- In the *Failover Cluster Manager* make sure that the other cluster node(s) are not set to *Pause*
- Make sure that the *Cluster Server* service is started on all cluster nodes.
- For a **domain user**, you must use the syntax `<domain_name>\<user_name>`. The Oracle Fail Safe software is not able to handle the syntax `<user_name>@<domain>`.
- You have to install the Oracle Fail Safe (OFS) software on **all** cluster nodes.
  Do **not** install the Fail Safe software **in parallel** on all cluster nodes. You must install it on one cluster node at a time.

Procedure

1. Start the *Oracle Universal Installer* from the Oracle RDBMS media.
   - If you use the *Start* menu, double-click the following file:
     <media_drive>:\<OFS_version>\SAP\sapofs.cmd
   - If you use a *PowerShell* script, enter the following command:
     <media_drive>:\<OFS_version>\SAP\sapofs.ps1

   The installer opens and guides you through the installation process.
2. Enter the required information as shown in the following table:

> **i** Note
>
> If the installer aborts and an error is displayed in an *Application Error* window with the text *The exception unknown software exception ...*, check the `TMP` and `TEMP` variables. In the user environment of `<SAPSID>adm`, make sure that these refer to existing files. If not, reset them.

Screen	Entry
Welcome	Choose *Next*.
Select Installation Type	Choose *Typical*, and then *Next*.
Specify Home Details	For *Name*: Enter the name of the Oracle home for the Oracle Fail Safe software. Make sure you use the same Oracle home name on all cluster nodes. The Fail Safe software must be installed in a separate Oracle home directory, for example, **OFS421** For *Path*: Enter the path of the Oracle Home directory for the Oracle Fail Safe software. It must be on a **local** disk and should have the same name on all cluster nodes, for example: **C:\Oracle\OFS421**
Reboot Needed After Installation	Choose *Next*.
Summary	View the information and choose *Install*.
Install	Wait while the software is installed.

Screen	Entry
Configuration Tools	In the dialog box *Oracle Fail Safe Account/Password*, enter the account and password under which the Oracle Fail Safe software is to run. The account has to be a member of the local administrators and the `ora_<dbsid>_dba` or `ora_dba` groups on both cluster nodes. Although the `<SAPSID>adm` user fulfills these requirements, we do not recommend using this user for the following reason: If you choose to use `<SAPSID>adm`, you have to update the account information for the Oracle Services for MSCS Service after every password change of the `<SAPSID>adm` user. You can change the user and password for Oracle Services for MSCS Service as follows: ○ Windows Server 2012 (R2) and higher: To do this, press `Ctrl` + `Esc`, and then `Ctrl` + `Tab`. Choose group *Oracle - <OFS_Home_Name>* > *Set Credentials*. You can also open a PowerShell in elevated mode, and enter the following command: **`<ORACLE_OFS_Home>\FailSafe\Server \Oracle.FailSafe.ServerConfig.exe SetCredentials`** On all cluster nodes
End of Installation	Click *Exit* to leave the installer.

3. Reboot and log on again.

> ⚠ Caution
>
> - Do not reboot a cluster node, if the installation of the OFS software is in progress on another cluster node.
> - 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.

4. Install the latest OFS Patch [page 241].

8.4.1.2 MSCS Only: Installing the Latest Oracle Fail Safe Patch Set

For more information on the latest note Oracle Fail Safe patch set, see SAP Note 1972760.

You have to perform the following procedure on **all** cluster nodes.

Procedure

1. Download the OFS patch set from https://support.sap.com/software/databases.html *OracleDatabase PatchesORACLE PATCHESORACLE PATCHES MISCELLANEOUS*.
2. Install the patch set as described in SAP Note 1865953.

8.4.2 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 238].

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 "Standalone Enqueue Server" versus ASCS instance with new "Standalone Enqueue Server 2":** Software Provisioning Manager 1.0 installs the "Standalone Enqueue Server" by default for all SAP system releases in the ASCS instance. However, if you have installed the ASCS instance for an SAP system based on SAP NetWeaver AS for ABAP 7.52, you can switch to the new "Standalone Enqueue Server **2**" after the installation has completed. For more information, see https://help.sap.com/nw752abap *Application Help* *SAP NetWeaver Library: Function-Oriented View* *SAP NetWeaver Application Server for ABAP* *Components of SAP NetWeaver Application Server for ABAP* *Standalone Enqueue Server 2* *High Availability with Standalone Enqueue Server 2*, and Systems Based on SAP NetWeaver AS for ABAP 7.52 only: Switching to Standalone Enqueue Server 2 and Enqueue Replicator 2 [page 155] .

- 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 "Enqueue Replication Server" versus ERS instance with new "Enqueue Replicator 2":** Software Provisioning Manager 1.0 installs the ERS instance with the classic "Enqueue Replication Server" by default for all SAP system releases. However, if you have installed the ERS instance for an SAP system based on SAP NetWeaver AS for ABAP 7.52, you can switch to " Enqueue Replicator **2**" after the installation has completed. For more information, see https://help.sap.com/nw752abap *Application Help* *SAP NetWeaver Library: Function-Oriented View* *SAP NetWeaver Application Server for ABAP* *Components of SAP NetWeaver Application Server for ABAP* *Standalone Enqueue Server 2*, and Systems Based on SAP NetWeaver AS for ABAP 7.52 only: Switching to Standalone Enqueue Server 2 and Enqueue Replicator 2 [page 155].

- 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 183].
- 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 119] 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 257]

8.4.3 Creating the Oracle Fail Safe Group

You perform the following steps in the Fail Safe Manager on the first cluster node.

Procedure

Creating the OFS Group with OFS Version 4.1 and higher

1. You have installed the PowerShell scripts for Microsoft Failover Clustering.
   For more information, see SAP Note 1976879.
2. Open PowerShell in elevated mode change to the following directory:
   <Oracle_Home>\sap\ora_mscs
3. Run `createoracleclustergroup.ps1`.
4. Enter the required parameters.

   > ⚠ Caution
   >
   > Do **not** use blanks in the Oracle cluster group name.

5. Add the shared database disk to the resource group as follows:
   1. Start the *Failover Cluster Manager* with *Start* > *Administrative Tools* > *Failover Cluster Manager*.
   2. Select group *Storage*.
   3. Right-click the shared database disk, and choose *More Actions* > *Move this resource to another service or application*.

Creating the OFS Group with OFS Version 3.4.2

The following procedure applies for Windows Server 2008 (R2) .

> ℹ Note
>
> OFS 3.4.2 is not supported on Windows Server 2012 (R2):

1. Start the Oracle Fail Safe Manager on Windows Server 2008 (R2) as follows:
   Choose *Start* > *Programs* > *Oracle - <OFSClient_Home>* > *Oracle Fail Safe Manager*.
   The first time, you add the OFSClient, the window *Add Cluster To Tree* appears.
   Perform the following steps:
   1. Insert your virtual cluster name.
   2. Right-click the cluster and choose *Connect to cluster*.

3. Enter the following and then confirm your entries with *OK*:

User name	**<user>** (Oracle Fail Safe account as entered in section Installing the Oracle Fail Safe Software [page 239])
Password	**<password>**
Cluster Alias	**<virtual_cluster_name>** (name of the cluster you are installing)
Domain	**<domain_name>**

4. In the *Welcome* dialog box, choose *Verify Cluster*.

> **i Note**
>
> All cluster nodes must be up and running for this step.

The window *Clusterwide Operation: Verifying Fail Safe Cluster* shows the steps that are executed to verify the cluster. When you are informed that the operation has completed successfully, close the window.

2. In the *Oracle Fail Safe Manager* window, create the *Fail Safe* group `Oracle<DBSID>`.
   Choose *Groups* > *Create*.
   The window *Create Group:..* appears.
3. Enter the *Group Name* **ORACLE<DBSID>**.

> **⚠ Caution**
>
> Do **not** user blanks in the group name.

   In answer to the question *Do you want to allow the group to failback to preferred node?*, select *Prevent failback*.
   The window *Finish Creating the Group* appears and displays information about the group. Choose *OK*.
4. In the window *Add Virtual Address*, select *Yes* to indicate that you want to add a virtual address to the group.
   The *Add Resource to Group: - Virtual Address* appears.
5. Select *Show networks accessible by clients*.
   Under *Network* the entry for your **public** network appears.
   Under *Virtual Address*, for *Host Name*, enter the **<Virtual_Hostname>** of the database host.
   The *IP Address* is automatically recognized.
   Choose *Finish*.
   The window *Add the Virtual Address to the Fail Group* appears.
   Choose *OK*.

> **i Note**
>
> If the *Fail Safe Manager* cannot create the *Fail Safe* group, look at the *Windows Event Logs* on all cluster nodes to find out the reason for the failure.

6. Add the shared database disk to the resource group as follows:
   1. Start the *Failover Cluster Manager* with *Start* > *Administrative Tools* > *Failover Cluster Manager*.

2. Select group *Storage*.
3. Right-click the shared database disk, and choose *More Actions* > *Move this resource to another service or application*.

8.4.4 Installing the Database Instance

Use

This procedure describes how to install the database instance on the first cluster node.

Prerequisites

- The SAP cluster group is *Online* on the first cluster node.
- The Oracle shared disk is *Online* on the first cluster node.
- The Oracle cluster group is *Online* on the first cluster node.

Procedure

Perform the following steps on the **first** cluster node.

1. Run the installer [page 119] and on the *Welcome* screen, choose <Product> > <Database> > *SAP Systems* > <System> > *High-Availability System* > *Database Instance*.

   > ⚠ Caution
   >
   > The following only applies if you use multiple Oracle Homes:
   >
   > - You must have one ORACLE_HOME per database instance on every cluster node on local disks.
   > - All ORACLE_HOMES must use the same disks and directories and ORACLE_HOME names on all DB cluster nodes.
   > - Since each ORACLE_HOME uses its own Oracle Listener, you must specify **unique** Oracle TCP/IP port numbers for every database in the DB failover cluster.
   >   Use 1527 for the first database, 1526 for the second database, 1525 for the third, and so on.

2. Follow the instructions in the installer dialogs and enter the required parameter values.
   1. For the profile directory you have to use the UNC path of the **virtual** ASCS ASCS instance and SCS host name, for example:
      `\\<SAPGLOBALHOST>\sapmnt\<SAPSID>\SYS\profile`.
      In an HA-system, the virtual host name of the ASCS ASCS instance and SCS instance is the same as the SAP global host name.
   2. When the installer prompts you for the database host, make sure that you enter the **virtual** database host name.

> ⚠ Caution
>
> By default, the installer locates the `saparch`, `sapreorg`, `sapcheck`, and `saptrace` directories on the last available drive. If this is a local drive, you must specify that these directories reside on a **shared** disk by using *Advanced Database Options*, which you can find on the screen *Oracle Database Instance*. Continue with *Next* until you can select *Windows Drive Mapping*. Check the box and choose *Next*. Then relocate all folders to a shared disk.

> i Note
>
> For more information about the input parameters, position the cursor on a parameter and press the F1 key in the installer.

8.4.5 Setting Up a Shared Database Directory in Oracle Home

This section describes how to set up a shared database directory in the Oracle home.

The Oracle database uses an `spfile`. With an `spfile` you can set up a central (shared) directory `<Oracle_Home>\database` for Microsoft failover clustering with a junction.

A central directory `<Oracle_Home>\database` has the following advantages:

- You can also use *sqlplus* remotely to make changes to your profile parameters.
- You only have to make the changes in the parameter files once in the shared `<Oracle_Home>\database`-directory.

> i Note
>
> In the past, you had to apply all changes in the parameter file `init<DBSID>.ora` in the `<Oracle_Home>\database`-directories on all cluster nodes.

Procedure

Setting Up a Shared Database Directory in Oracle Home for OFS 4.2.1

1. Stop the Oracle database using *sqlplus*.
2. Stop the Oracle Service OracleService`<DBSID>` and the listener service `Oracle<Oracle Home>TNSListener`.
3. In the sapdata1 directory on the shared disk in the cluster, create the directory database: `<Shared_Disk>:\ORACLE\<DBSID>\sapdata1\database`
4. On the first cluster node, change to the `<Oracle_Home>\database` directory, and enter the following command in the command prompt: **`move * <Shared_Disk>:\ORACLE\<DBSID>\sapdata1\database`**
5. In the local `<oracle_home>`\database directory create a new file `init<SAPSID>.ora` and insert the following line:

spfile = <shared Disk>\oracle\<DBSID>\sapdata1\database\SPFILE<DBSID>.ora
Repeat this step on all additional cluster nodes

6. In the shared database directory, create file `init<DBSID>_OFS.ora` and insert the following line:
spfile = <shared Disk>: \ORACLE\<DBSID>\sapdata1\database\SPFILE<DBSID>.ora

Setting Up a Shared Database Directory in Oracle Home for OFS 4.1

1. Stop the Oracle database using *sqlplus*.
2. Stop the Oracle Service `OracleService<DBSID>` and the listener Service `Oracle<Oracle Home>TNSListener`.
3. In the `sapdata1` directory on the shared disk in the cluster, create the directory `database`:
`<Shared_Disk>:\ORACLE\<DBSID>\sapdata1\database`
4. On the first cluster node, change to the `<Oracle_Home>\database` directory, and enter the following command in the command prompt:
move * <Shared_Disk>:\ORACLE\<DBSID>\sapdata1\database
5. Delete the `<Oracle_Home>\database` directory with the following command:
rd /q /s database

> **i Note**
>
> You can also use the Windows Explorer to delete the directory.

6. Create the junction with the following command:
   - Windows Server 2012 (R2) and higher:
   Open PowerShell in elevated mode, and enter the following command:
   cmd /c mklink /d <Oracle_Home>\database <Shared_Disk>:\ORACLE\<DBSID>\sapdata1\database
   - Windows Server 2008 (R2):
   Create the junction with the following command:
   mklink /d <Oracle_Home>\database <Shared_Disk>:\ORACLE\<DBSID>\sapdata1\database
7. Repeat steps 5 and 6 on the additional cluster node.
8. Create the `init<DBSID>_OFS.ora` file in the database directory, and insert the following line:
spfile = <Path_To_Oracle_Home>\database\SPFILE<DBSID>.ora

Setting Up a Shared Database Directory in Oracle Home for OFS 3.4.2

1. Stop the Oracle database using *sqlplus*.
2. Stop the Oracle Service `OracleService<DBSID>`.
3. In the `sapdata1` directory on the shared disk in the cluster, create the directory `database`:
`<Shared_Disk>:\ORACLE\<DBSID>\sapdata1\database`
4. On the first cluster node, change to the `<Oracle_Home>\database` directory, and enter the following command in the command prompt:
`move * <Shared_Disk>:\ORACLE\<DBSID>\sapdata1\database`
5. Delete the directory `<Oracle_Home>\database` with the command:
rd /q /s database

> **i Note**
>
> You can also use the Windows Explorer to delete the directory.

6. Create the junction with the following command:
   - Windows Server 2008 (R2) and Windows Server 2012 (R2):
     Create the junction with the following command:
     `mklink /j <Oracle_Home>\database <Shared_Disk>:\ORACLE\<DBSID>\sapdata1\database`
7. Select the resource group `Oracle<DBSID>` and move it to the additional cluster node.
8. Repeat steps 5 and 6 on the additional cluster node.
9. Create the `init<DBSID>_OFS.ora` file in the `database` directory, and enter the following line:
   `spfile = <Path_To_Oracle_Home>\database\SPFILE<DBSID>.ora`

8.4.6 Adding the Oracle Database Resource to the Fail Safe Group

This section describes how to add the Oracle Database Resource to the Fail Safe Group.

Adding the Oracle Database Resource to the Fail Safe Group for OFS 4.1 and Higher

1. Copy the `sqlnet.ora` file from the directory `<ORACLE_HOME>\network\admin` on the first cluster node to the same directory on the additional cluster nodes.
2. Save the `<ORACLE_HOME>\network\admin` directory on both cluster nodes.
3. **OFS4.2.1 only:** On the first cluster node, edit the `<ORACLE_HOME>\network\admin\listener.ora` file and exchange the `DBHostname` with the name of the fist cluster node.
4. Change to the directory `<ORACLE_HOME>\sap\ora_mscs`.
5. Right-click the script `AddOracleDbToOracleClusterGroup.ps1` and choose *Run with PowerShell*.
6. Enter the required parameters:
   1. Enter the `<DBSID>` of your Oracle database.
   2. Enter the path and file name of your Oracle parameter file on the shared cluster disk:
      `<Shared_Disk>:\ORACLE\<DBSID>\SAPDATA1\DATABASE\INIT<DBSID>_OFS.ORA`
7. Copy `tnsnames.ora` from `%ORACLE_HOME%\network\admin` to `<sapglobalhost>\sapmnt\<SAPSID>\SYS\profile\oracle`.

Adding the Oracle Database Resource to the Fail Safe Group for OFS 3.4.2

1. Copy the `sqlnet.ora` file from the directory `<ORACLE_HOME>\network\admin` on the first cluster node to the same directory on the additional cluster nodes.
2. Start the Oracle Fail Safe Manager on Windows Server 2008 (R2) and Windows Server 2012 (R2):as follows:
   Choose *Start* > *Programs* > *Oracle* - `<Fail_Safe_Home_Name>` > *Oracle Fail Safe Manager*.

3. If the *Welcome* dialog box appears, choose *Verify Cluster*. Otherwise, right-click the cluster and choose *Verify Cluster*.

> **i Note**
>
> All cluster nodes must be up and running for this step.

   The window *Verifying Cluster* shows the steps that are executed to verify the cluster. When you are informed that the operation has completed successfully, close the window.
4. Add the SAP database to the cluster group `Oracle<DBSID>`:
   1. In the tree on the left, choose *Nodes* > `<First Cluster Node>` > *Standalone Resources*.
   2. Select the database `<DBSID>.world`
   3. Choose *Add to Group*.
5. In the dialog box *Add Resource to Group – Resources:*
   For *Resource Type*, select *Oracle Database*.
   For *Group name*, select *Oracle*`<DBSID>`.
   Choose *Next*.
6. In the dialog box *Add Resource to Group – Database Identity*, enter the following information:

Service Name	**<DBSID>.world**
Instance Name	**<DBSID>**
Database Name	**<DBSID>**
Parameter File	**<Shared_Drive>:\<ORACLE_HOME>\oracle\<DBSID>\sapdata1\database\init<DBSID>_OFS.ora**

7. When you have made all entries, choose *Next*.
8. In the dialog box *Add Resource to Group – Database Authentication:*
   Select *Use SYS account*.
   Enter and confirm the password.
9. Choose *Finish*.
10. In the dialog box *Finish Adding the Database to the Group*, choose *OK* to add the database resource to the group.
11. In the dialog box *Confirm Add database to Group*, choose *Yes*.
    The *Adding resource* `<DBSID>`*.world to group* window, shows the steps that are executed to add the database to the cluster group.
12. Copy `tnsnames.ora` from `%ORACLE_HOME%\network\admin` to `\\<sapglobalhost>\sapmnt\<SAPSID>\SYS\profile\oracle`.

8.4.7 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 183].
- You have already performed the First Cluster Node [page 242] option.

Procedure

1. Run the installer [page 119] and on the *Welcome* screen, choose *<Product>* ▸ *<Database>* ▸ *SAP Systems* ▸ *<System>* ▸ *High-Availability System* ▸ *Additional 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 the parameter and press F1 in the installer.

8.4.8 Additional Steps for the Oracle Fail Safe Configuration

Use

To complete the Oracle Fail Safe configuration, you must perform the following steps:

- Adjusting security settings
  Oracle only allows the use of computer local groups to identify database operators and administrators. Therefore, the local groups that were created on the first cluster node are not known on the other cluster nodes. This means that you have to create these groups manually and grant them access to the database directories.
- Additional steps for a standalone clustered database – see *Additional Steps for Clustered Database Instance Running Separately in One Cluster* at the end of this section

Procedure

1. On the **additional** cluster nodes, check and - if required - create the local groups `ORA_<dbsid>_DBA` and `ORA_<dbsid>_OPER` and add `<sapsid>adm`, and `SAPService<sapsid>` to these groups.

   Example

   ```
   net localgroup ORA_<DBSID>_DBA /add
   net localgroup ORA_<DBSID>_OPER /add
   net localgroup ORA_<DBSID>_DBA <sapsid>adm /add
   net localgroup ORA_<DBSID>_OPER <sapsid>adm /add
   net localgroup ORA_<DBSID>_DBA SAPService<sapsid> /add
   net localgroup ORA_<DBSID>_OPER SAPService<sapsid>/add
   net localgroup ORA_<DBSID>_DBA <Oracle_home_user>/add
   net localgroup ORA_<DBSID>_OPER <Oracle_home_user>/add
   ```

2. Create additional domain groups (only once per database SID), and add the relevant users to these groups.

   Example

   ```
   net group ORA_<DBSID>_DBA /add /domain
   net group ORA_<DBSID>_OPER /add /domain
   net group ORA_<DBSID>_DBA <SAPSID>adm /add /domain
   net group ORA_<DBSID>_OPER <SAPSID>adm /add /domain
   net group ORA_<DBSID>_DBA SAPService<SAPSID>/add /domain
   net group ORA_<DBSID>_OPER SAPService<SAPSID>/add /domain
   net group ORA_<DBSID>_DBA <Oracle_home_user>/add /domain
   ```

```
net group ORA_<DBSID>_OPER <Oracle_home_user>/add /domain
```

3. On **all** cluster nodes, add the domain groups to the local Oracle groups as follows:
   ```
   net localgroup ora_<DBSID>_DBA <domain>\ORA_<DBSID>_DBA /add
   net localgroup ora_<DBSID>_OPER <domain>\ORA_<DBSID>_OPER /add
   ```
4. On all `oracle\<DBSID>` directories on the shared disk drives, adjust the security settings as follows:
   1. Right-click `\oracle\<dbsid>` and select *Properties*.

      > **i Note**
      >
      > You can select multiple directories before you right-click to adjust the security settings.

   2. Select the *Security* tab, add both domain groups `ORA_<dbsid>_DBA` and `ORA_<dbsid>_OPER` to the `Group` or `Users` list and grant these domain groups *Full Control*.
   3. Choose *Advanced* and check *Replace all existing inheritable permissions on all descendants with inheritable permissions from this object* (Windows Server 2008), or *Replace all child object permissions with inheritable permissions from this object* (Windows Server 2008 R2 and higher).

      > **i Note**
      >
      > Entries like *S-1-5-21-3434515990-3720764010-1539101042-1005* represent local groups from other cluster nodes, which cannot be translated to users on the current host. You can safely delete these entries from the list.

Additional Steps for Clustered Database Instance Running Separately in One Cluster

If you have not installed the (A)SCS instance and the database instance together in one cluster, but run the database instance in a separate Microsoft failover cluster, you have to perform the following steps on the database cluster:

1. On each additional cluster node, grant the user rights by adding the `<DBSID>adm` user to the local Administrators group.
2. Copy the user environment of the database user `<DBSID>adm` as follows:
   1. Log on to the first cluster node as the user `<DBSID>adm`.
   2. Run `regedit.exe` and right-click *HKEY_CURRENT_USER\Environment*.
   3. Choose *Export* to export the environment key to a file.
   4. On each additional cluster node, log on as user `<DBSID>adm`.
   5. Import the exported registry key to the registry by executing the `.reg` file.
3. Enable the DB13 support on standalone database servers by setting up a standalone Gateway as described in **SAP Note** 1764650.
   You have to perform this step on all cluster nodes and for each database instance.

8.4.9 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 119] 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.

   > **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 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.
   >
   >   > **i 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.

8.4.10 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 119] 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 Library at:

SAP Release and SAP Library Quick Link	SAP Library Path (Continued)
○ SAP NetWeaver 7.3 http://help.sap.com/nw73 ○ SAP NetWeaver 7.3 including Enhancement Package 1 http://help.sap.com/nw731	*Application Help* > *Function-Oriented View* > *Application Server* > *Application Server Infrastructure* > *Standalone Enqueue Server* > *Installing the Standalone Enqueue Server* > *Replication Server: Check Installation*
○ SAP NetWeaver 7.4 http://help.sap.com/nw74 ○ SAP NetWeaver 7.5 http://help.sap.com/nw75 ○ SAP NetWeaver Application Server for ABAP 7.51 innovation package https://help.sap.com/nw751abap ○ SAP NetWeaver AS for ABAP 7.52 https://help.sap.com/nw752abap	*Application Help* > *Function-Oriented View* > *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 134] 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 257]
- Starting and Stopping the SAP System in a Microsoft Failover Cluster Configuration [page 258].

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, 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
>
> With Oracle, you can also use the *Fail Safe Manager*.

> **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):
  You use the *Failover Cluster Manager* to move services and applications that do not belong to the database groups.

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`

Moving Oracle Groups with the Fail Safe Manager

You use the *Fail Safe Manager* to move the Oracle resources, for example, the Oracle database group.

1. Start the *Fail Safe Manager* as follows.
   - Windows Server 2012 (R2) and higher:
     Press `Ctrl` + `ESC` and `Ctrl` + `TAB`. Choose *Oracle Fail Safe Manager*.
   - Windows Server 2008 (R2):
     Start the *Fail Safe Manager* with *Start* > *All Programs* > *Oracle <Home_Name_fail safe>* > *Oracle Fail Safe Manager*.
2. On the left-hand pane, right-click the group you want to move, and choose *Move to a Different Node* on the context menu.
   The group is now moved to another cluster node.

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 two HA groups: one cluster resource group contains the database resources, the other group contains the SAP ASCS instance.

> **i Note**
>
> When starting a whole SAP system, you first need to start the database instance 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, 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 and Database Instance”.

For more information about *SAP MMC* or *SAPControl*, see Starting and Stopping the SAP System [page 200].

> **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 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 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 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 stop the clustered ASCS instance, open *PowerShell* in elevated mode, and enter the following command:
     ```
     stop-clusterresource "SAP <SAPSID> <Instance_Number> Instance"
     ```

4. 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))
  With the *Failover Cluster Manager* (Windows Server 2008 (R2)), you can only start or stop clustered instances such as the ASCS instance. To start the database instance, you use the *Oracle Fail Safe Manager*. 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*.
  To start or stop the clustered ASCS instance with the *Failover Cluster Manager* do the following:
  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 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*.
- Using the *Oracle Fail Safe Manager*
  With the *Oracle Fail Safe Manager*, you can only start or stop the clustered database instance.
  To start or stop the clustered database instance with the *Oracle Fail Safe Manager* do the following:
  1. Start the Oracle Fail Safe Manager as follows:
     - Windows Server 2012 (R2) and higher:
       Press Ctrl + ESC and Ctrl + TAB. Choose *Oracle Fail Safe Manager*.
     - Windows Server 2008 (R2):
       Choose *Start* > *Programs* > *Oracle - <Fail_Safe_Home_Name>* > *Oracle Fail Safe Manager*.
  2. To start the clustered database instance in the *Oracle Fail Safe Manager*, right-click the database *<DBSID>.world* in the Fail Safe group *ORACLE<DBSID>*, and choose *Place online*.
  3. To stop the clustered database instance in the *Oracle Fail Safe Manager*, right-click the database *<DBSID>.world* in the Fail Safe group *ORACLE<DBSID>*, and choose *Take offline*.

> **i Note**
>
> - Before you stop the database instance, make sure that you have stopped the ASCS instance with the *Failover Cluster Manager* (Windows Server 2008 (R2)).
> - If a dialog box appears, asking you how to take the database offline, choose *Immediate*.

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