



Deployment Strategies for the Kernel of the SAP Application Server ABAP

August 2011



TABLE OF CONTENT

ABSTRACT	3
1. WHAT IS THE KERNEL?	4
2. KERNEL CORRECTIONS	5
3. DELIVERY OF KERNEL CORRECTIONS	6
4. APPLYING KERNEL CORRECTIONS	12

ABSTRACT

The SAP application server ABAP forms the basis of the most critical business applications with highest availability requirements in today's economic world. Thus, updating SAP Software is a delicate and intricate process: selecting the right software version is essential for continuous operation and failure to select the right version may result in increased downtime with significant financial impact.

In this article we point out strategies for finding the correct kernel version of the SAP application server ABAP, thus minimizing the risk of unplanned and unexpected downtime. The most important conclusion of this article is that as long as your system runs stable, there is no reason to update your kernel at all. You should, however, check regularly for SAP security bulletins. Also, in case you encounter problems and you need to upgrade your kernel to a newer patch level, you should select the latest *stack kernel* (see below) if this contains the fix to your problem.

For information about the relevant maintenance procedures please refer to

<http://service.sap.com/sp-stacks>

For information about security issues please refer to

<http://service.sap.com/securitynotes>

1. WHAT IS THE KERNEL?

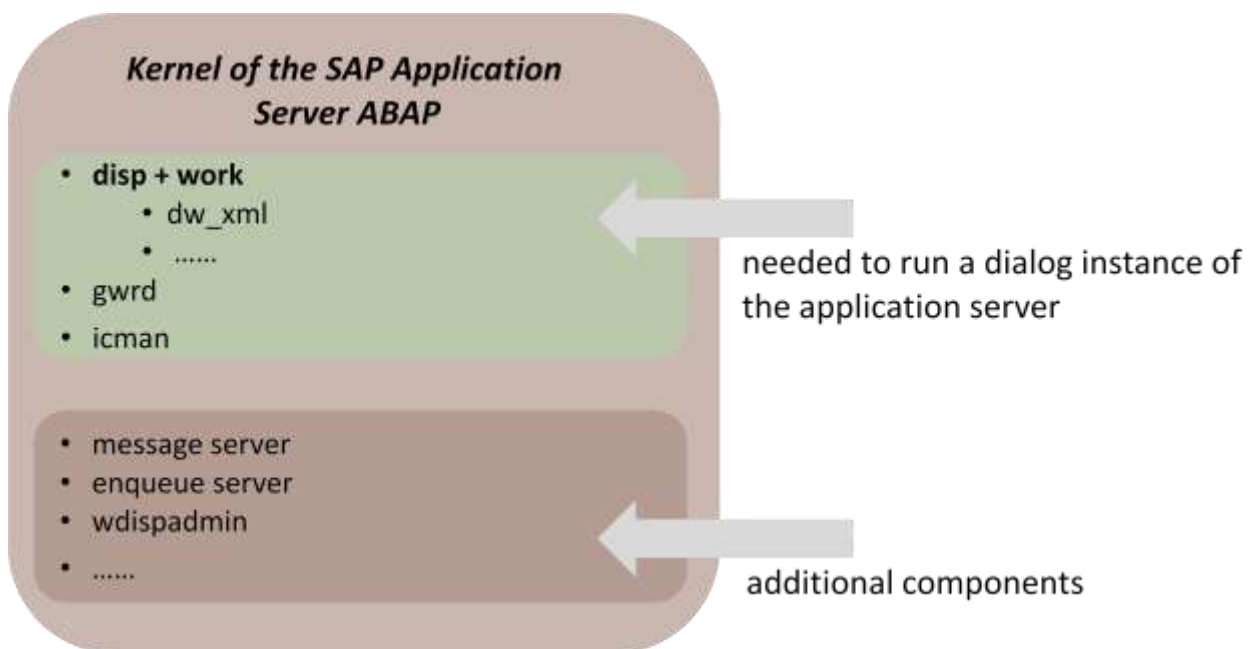
The term *kernel* is used in various meanings. By **kernel of the SAP application server ABAP** (or *kernel* for short) we mean the set of executable files and shared libraries that are necessary to run a dialog instance of the SAP application server ABAP.

As such, the smallest separately installable unit of the kernel consists of the following files together with a set of shared libraries such as `dw_xml.so`:

- **disp+work** A single executable file for both the dispatcher and the work processes of an SAP system.
- **gwr** `gwr` is the gateway reader or SAP gateway for short.
- **icman** The Internet Communication Manager (ICM)

Roughly speaking, the gateway, the ICM, and the dispatcher are communication hubs providing IO services for the work processes, which by themselves run the ABAP processing logic. These three executable files use shared memory for interprocess communication; consequently, they need to be updated as a whole.

Apart from these three executables, many other executable files and OS level shared libraries are part of the kernel. Examples are the SAP message server and the enqueue server, but also monitoring tools such as `dpmon`, `gwmon` etc. The following figure shows the description of the term *kernel*:



2. KERNEL CORRECTIONS

Kernel corrections may become necessary due to one of the following reasons:

1. The kernel software contains a functional error for which no convenient workaround exists. A typical example of this is if an SAP work process crashes as a result of an action by the user that is necessary for the business process. In this case, since a work process should never crash, irrespective of user action, a correction to the disp+work executable will be necessary.
2. A security problem of the kernel that has high impact for customer environments. Obviously if the kernel contains a security weakness that might lead to unauthorized access, disclosure, disruption, modification, or destruction of customer's data, this has to be fixed by a corresponding kernel correction
3. An enhancement improving performance, robustness, or maintainability of the SAP system in question. Although such changes do not add any functionality to the SAP system from a business perspective, such changes may be termed enhancements because they are not based on incorrect behavior. Nonetheless, they are sometimes more than convenient and often they are implemented upon customer request. For example, a change in the implementation of a memory management technology might become necessary because the usage of this technology has changed considerably in the time since the kernel software was originally released, so that today's amount of data used with this technology might lead to unacceptable response times. Note that such corrections are the exception, most corrections are of type 1 or 2.

That leads to the first rule that should be considered when thinking about kernel updates:

Rule 1:

Unless there is explicit demand, either by a kernel error or a known existing or potential security issue, there is absolutely no need to update the kernel of an SAP system. Since there is always the risk of side effects of a kernel correction, if you have no problems with your existing SAP installation, it is a good idea not to update the kernel at all.

Since a kernel correction is a completely new version of a package and the files contained in this package are completely new versions of these files, this bears some peculiarities:

- First of all, it implies that kernel corrections are cumulative: a correction contained in one particular kernel correction will be contained in any later kernel correction as well. This is very useful, since you do not need to know the precise version of the executable that contains the fix for a particular issue. Instead, you may apply the latest available version of the package that is recommended by SAP as described below.
- Secondly, kernel corrections are reversible: applying a kernel correction means replacing the corresponding files by the new versions in the updated archive. You may then simply reverse the kernel correction by reverting back to the old files.

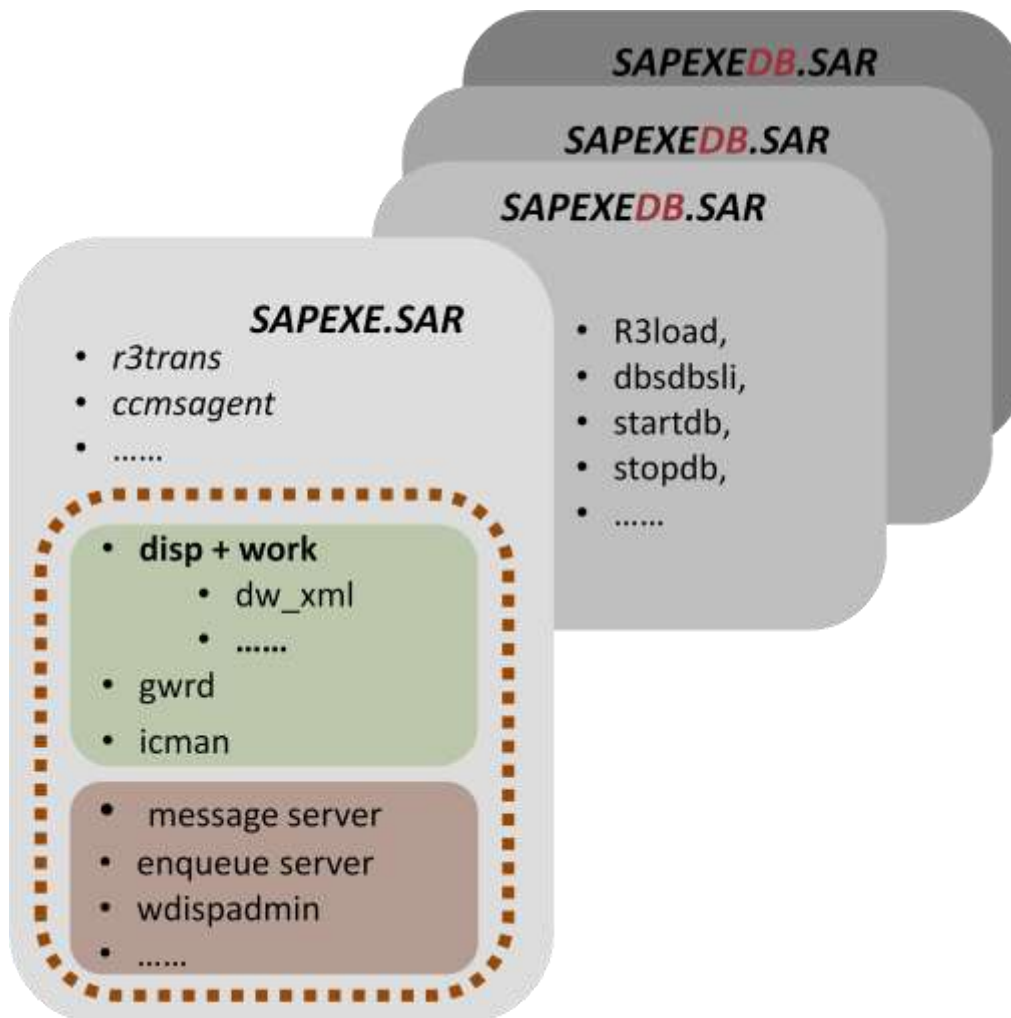
3. DELIVERY OF KERNEL CORRECTIONS

SP Stack Kernel (SAPEXE.SAR and SAPEXEDB.SAR)

Files from the kernel are distributed in different ways. Let us first have a look at the two packages SAPEXE.SAR or SAPEXEDB.SAR. These two archives comprise the complete set of executable files needed in the context of the SAP application server ABAP.

- **SAPEXE.SAR** contains all the files that are independent of the database that is used to run the application server.
Thus, all customers running the application server on a particular operating system platform install the SAPEXE.SAR package belonging to this platform independently of the database they use.
- **SAPEXEDB.SAR** contains all files needed for the application server that depend on the specific database in use.

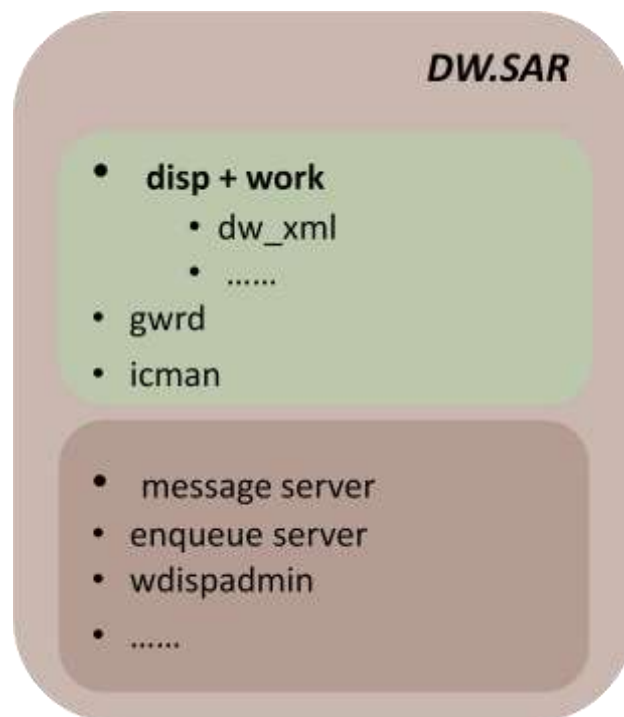
Consequently, in the download section of the SAP support portal there is one SAPEXEDB.SAR package for each combination of OS platform and DB platform. The following picture shows schematically the package collection for one dedicated operating system:



The SAPEXE.SAR matching the used operating system has to be combined with the appropriate SAPEXEDB.SAR matching the used data base. This combination of the SAPEXE.SAR and SAPEXEDB.SAR package is called the **SP stack kernel**. Both packages can typically be installed independently (within one SAP release). Exceptions to this rule are documented in the release notes for the corresponding SAPEXEDB package.

Kernel Patches (DW.SAR and Other Files or Packages)

The archive **DW.SAR** does not contain the complete set of files that are distributed with SAPEXE.SAR/SAPEXEDB.SAR. Roughly speaking, it contains the smallest set of files that have to be replaced when you want to update the *disp+work* executable. So *gwr*d and *icm* are part of the package, as are the corresponding monitoring tools *dpmon*, *gwmon*, and *icmon*. It also contains many shared libraries linked to the executables at runtime and the directories with the JAVA class libraries needed by the VM Container.



The package DW.SAR can be considered as the most important type of a kernel patch.

Some other files from the SAPEXE.SAR package (except all files from the DW.SAR package) will be distributed as single files (or as packages, if two or more files need to be updated simultaneously). This is to allow delivery of hotfixes for these programs to be distributed more frequently than the usual support package schedules for one release. Typical examples are as follows:

- The saprouter executable or
- The transport control program tp.

In summary, by the term *kernel patch* we usually mean one of the packages mentioned above:

- DW.SAR,
- Single files or packages

As the kernel contains binary files only, all corrections to kernel files are distributed as new corrected versions of those files. Nevertheless, we call a new version of one of the packages mentioned above a *kernel patch*.

Schedules for SP Stack Kernel

SAPEXE.SAR and SAPEXEDB.SAR (see above) are published together with ABAP support package stacks (SPS) regularly up to four times a year (depending on the SAP release version). These releases of the kernel can be considered particularly stable versions as they have undergone tests with a much higher coverage than the other kernel patches described below. For example, the SAPEXE.SAR packages published with an SPS have already been used in productive environments inside SAP.

In contrast to SAPEXE.SAR and SAPEXEDB.SAR, the other packages are published on demand and at most with a weekly schedule. Although these packages, including DW.SAR, are also thoroughly tested, SAPEXE.SAR and SAPEXEDB.SAR bear a much lower risk of negative side effects and possible regressions due to their higher test coverage. In fact, they can be safely applied with a minimized risk of creating errors you have not experienced in prior versions of the kernel. This immediately leads to the following rule:

Rule 2:

You can safely apply the latest version of the SP stack kernel available on SAP's download portal. Whenever you run into a kernel issue, it is a good idea to upgrade to the most recent SP stack kernel to see whether it fixes the issue.

Schedules for Kernel Patches (DW.SAR and other Files or Packages)

By far the most corrections within the kernel concern the *disp+work* executable. Since this executable is contained in the DW.SAR package, this implies that the DW.SAR package is usually published on a weekly basis. They run through a hierarchy of tests ranging from unit tests within SAP's development organization to automated regression tests in SAP's production unit. Nevertheless, the test coverage is limited by their weekly schedule and the imminent urgency of their publication. You usually need to apply such a kernel patch only in case you encounter a problem with the kernel for which no workaround solution exists, and the corresponding correction is so new that it is not yet contained in the latest available SP stack kernel.

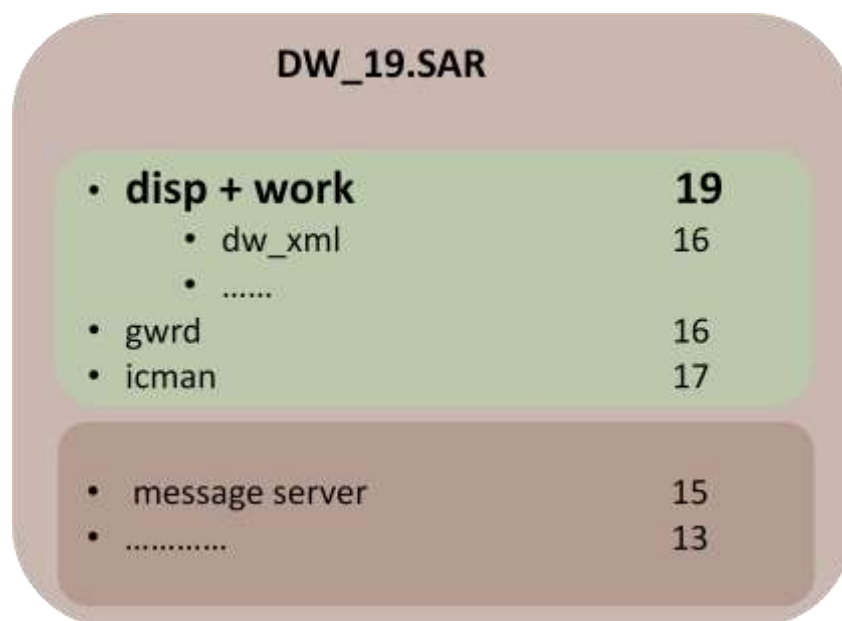
Rule 3:

Apply a kernel patch such as DW.SAR that is newer than the latest available SP stack kernel only if you are experiencing a serious error that is fixed by this kernel patch but not by the latest SP stack kernel.

Labeling of Kernel Corrections

Kernel corrections are labeled by a distinct number, called the **kernel patch level** or **PL** for short. This number is determined as follows:

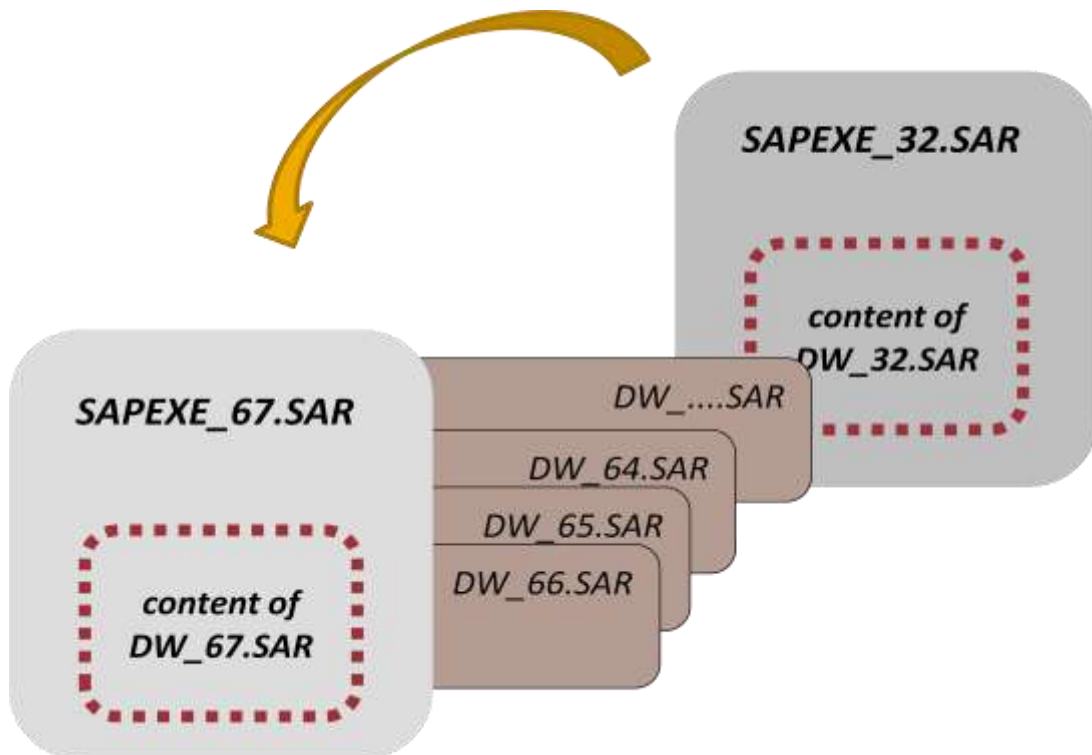
- Labeling of Kernel Patches
Every single executable of a kernel patch has a distinct patch level. The patch level for the *disp+work* executable is typically increased every week¹. Since for each new *disp+work* executable a new DW.SAR archive is built, the DW.SAR patch level increases correspondingly.



The patch levels of the other executables contained in the DW.SAR may be different from the PL of the complete package. For example, it is common that the *gwrn* executable has a smaller patch level than the corresponding *disp+work* executable.

¹ For some releases, kernel patches are produced every other week. Nevertheless, the patch level of the *disp+work* executable changes with higher frequency than every other executable distributed by SAP.

- Labeling of SP Stack Kernels
The patch level of the SP stack kernel is equal to the patch level of the *disp+work* executable contained in the SAPEXE.SAR. It is therefore equal to the DW.SAR archive containing the same *disp+work* executable. The following picture shows schematically the correlation between the numbering of the DW.SAR and the corresponding SAPEXE.SAR:



The numbering of the SP stack kernel (SAPEXE.SAR) is therefore not continuous.

Given a patch level of a kernel correction, the corresponding package in the download section of the SAP support portal has the following name:

<PACKAGE-NAME>_<Patch-Level>-<UID>.SAR

where

- PACKAGE-NAME is the name of the corresponding package such as DW, SAPEXE or SAPEXEDB,
- Patch-Level is the patch level and
- UID is a unique ID which bears no semantics.

Example:

<PACKAGE-NAME>_<Patch-Level>-<UID>.SAR

The SP stack kernel SAPEXE-package of release 7.10 with PL 121 has the name

SAPEXE_121-10004165.SAR



SAR

[SAPEXE_121-10004165.SAR](#)

Kernel Part I (for Basis 7.10)

4. APPLYING KERNEL CORRECTIONS

Applying a kernel correction is currently a manual process. Basically it requires shutting down the system, copying the new executable files to the executable directory, and restarting the system. The following is a description of the installation steps based on the assumption that the system has SAP NetWeaver version 7.10 or higher and that *sapcpe* is used to distribute executable files from a central kernel repository to the local instance specific directories. This is the default procedure for the above mentioned releases. For systems with other releases, or without usage of *sapcpe*, similar procedures apply although the details might be different.

1. The first step in installing a new kernel correction consists of making a backup copy of the current kernel directory. For a UNICODE system with an application server instance running on the 64-Bit version of Linux this would be `/usr/sap/PRD/SYS/exe/uc/linuxx86_64`. This step is important as it provides the option of switching back to exactly the same state of the system if you discover any irregularities during the kernel update.
2. As the next step, you need to extract the given archive, either `DW.SAR` or `SAPEXE.SAR`, into the directory specified above. This step replaces all files that are contained in the archive with the versions from the archive. Note that this may be done while the system is still running with the old kernel version as this only replaces the executables in the central repository. At runtime, the executable is taken from the local `exe` directory such as `/usr/sap/PRD/D01/exe`. However, make sure you do not start a new application server after this step and before shutting down the system.
3. Next, you have to shut down each application server in turn. Once you are done with this, you simply restart all application servers. At startup, the *sapcpe* program is used to copy the new executables from the central repository to the local `exe` directory, thus providing local copies of the newly-updated files.

Of course, all these steps may also be done without copying the executables into the central repository and without using *sapcpe*. In this case, you have to shut down the system prior to extracting the new version of the kernel archives. After shutdown you may extract the archives into the local executable directories of each application server. Be sure, however, that all application server instances are on the same kernel patch level.

Outlook: The Rolling Kernel Switch

Although the kernel correction process may be automated considerably so that the downtime of the system can be reduced drastically, the fact that we need system downtime to apply a new kernel patch can be quite annoying.

The rolling kernel switch will be available for future kernel releases and may then be used to update the kernel of each application server instance of an SAP system in turn, thus eliminating the need for system downtime.

©2011 SAP AG. All rights reserved.

SAP, R/3, SAP NetWeaver, Duet, PartnerEdge, ByDesign, SAP BusinessObjects Explorer, StreamWork, and other SAP products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of SAP AG in Germany and other countries.

Business Objects and the Business Objects logo, BusinessObjects, Crystal Reports, Crystal Decisions, Web Intelligence, Xcelsius, and other Business Objects products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of Business Objects Software Ltd. Business Objects is an SAP company.

Sybase and Adaptive Server, iAnywhere, Sybase 365, SQL Anywhere, and other Sybase products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of Sybase, Inc. Sybase is an SAP company.

All other product and service names mentioned are the trademarks of their respective companies. Data contained in this document serves informational purposes only. National product specifications may vary.

These materials are subject to change without notice. These materials are provided by SAP AG and its affiliated companies ("SAP Group") for informational purposes only, without representation or warranty of any kind, and SAP Group shall not be liable for errors or omissions with respect to the materials. The only warranties for SAP Group products and services are those that are set forth in the express warranty statements accompanying such products and services, if any. Nothing herein should be construed as constituting an additional warranty.

