ADM100

Administration AS ABAP I

SAP NetWeaver Application Server - ABAP

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Participant Handbook

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About This Handbook

This handbook is intended to complement the instructor-led presentation of this course, and serve as a source of reference. It is not suitable for self-study.

Typographic Conventions

American English is the standard used in this handbook. The following typographic conventions are also used.

Type Style	Description
Example text	Words or characters that appear on the screen. These include field names, screen titles, pushbuttons as well as menu names, paths, and options. Also used for cross-references to other documentation both internal and external.
Example text	Emphasized words or phrases in body text, titles of graphics, and tables
EXAMPLE TEXT	Names of elements in the system. These include report names, program names, transaction codes, table names, and individual key words of a programming language, when surrounded by body text, for example SELECT and INCLUDE.
`Example text`	Screen output. This includes file and directory names and their paths, messages, names of variables and parameters, and passages of the source text of a program.
`Example text`	Exact user entry. These are words and characters that you enter in the system exactly as they appear in the documentation.
`<Example text>`	Variable user entry. Pointed brackets indicate that you replace these words and characters with appropriate entries.

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Icons in Body Text

The following icons are used in this handbook.

Icon	Meaning
	For more information, tips, or background
	Note or further explanation of previous point
	Exception or caution
	Procedures
	Indicates that the item is displayed in the instructor's presentation.

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Course Overview

This SAP course provides a broad insight into the many administrative tasks involved with SAP NetWeaver AS ABAP. It provides a solid foundation for the training of SAP system administrators, based on the knowledge acquired in the SAPTEC course (SAP NetWeaver Application Server Fundamentals).

This course is a required prerequisite for attending many advanced courses in the *SAP System Administration* curriculum.

Note: This course deals exclusively with SAP NetWeaver Application Server **ABAP**. For content and instructional reasons, however, the course document refers to SAP NetWeaver Application Server Java at certain points. The ADM200 course (Administration AS Java) provides information about the administration of SAP NetWeaver AS Java.

Target Audience

This course is intended for the following audiences:

- SAP system administrators
- Technology consultants
- People responsible for IT
- People involved in the administration of SAP systems

Course Prerequisites

Required Knowledge

- SAPTEC (SAP NetWeaver Application Server Fundamentals) training course or knowledge of the content delivered on this course.
- Basic operating system and database knowledge

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Course Goals

This course will prepare you to:

- Start and stop SAP systems
- Configure SAP systems
- Perform periodic, automated work with the database
- Perform basic user administration tasks
- Set up remote connections
- Carry out software maintenance
- Define and integrate printers
- Use background processing efficiently
- Set up system monitoring
- Perform structured troubleshooting

Course Objectives

After completing this course, you will be able to:

- Start and stop SAP systems
- Set up profile parameters
- Schedule database backups
- Create and manage users
- Set up remote connections
- Import Support Packages
- Configure printers in the SAP system
- Schedule and monitor background jobs
- Monitor the system
- Perform structured troubleshooting
- Describe the concept of the Work Centers

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Unit 1

Fundamentals

Unit Overview

Basic terms and processes are repeated in this unit, as well as the structure and architecture of an SAP system. As well as refreshing the basics from the prerequisite SAPTEC course, you will learn how to set up SAP Logon and Logon Groups. The last lesson provides a brief overview of central administration with SAP Solution Manager.

Unit Objectives

After completing this unit, you will be able to:

- Outline the structure and the architecture of an SAP system
- List the technical components of the SAP NetWeaver Application Server
- Use the terms system and instance correctly
- Describe the process of a system log on
- Describe the technology of dialog work process multiplexing
- Set up the SAP Logon program
- Explain the benefits of logon groups in AS ABAP
- Set up logon groups in AS ABAP
- Call important administration functions in the system
- Describe the system landscape for central administration
- Explain the term “Work Center”

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Lesson: Architecture of an SAP System

Lesson Overview

In this lesson, you will learn about the structure and architecture of an SAP system, and how to use the terms system and instance correctly.

Lesson Objectives

After completing this lesson, you will be able to:

- Outline the structure and the architecture of an SAP system
- List the technical components of the SAP NetWeaver Application Server
- Use the terms system and instance correctly

Business Example

You want to learn about the architecture of an SAP system.

The Elements of an SAP System

An SAP system consists of the components shown in the graphic: One database and one or more instances. The instance that, together with the database, forms a functional SAP system is also known as the "central instance". There should be a **central instance** configured in every SAP system. A "**central system**" exists if the system contains only a single instance, and this runs together with "its" database on one host.

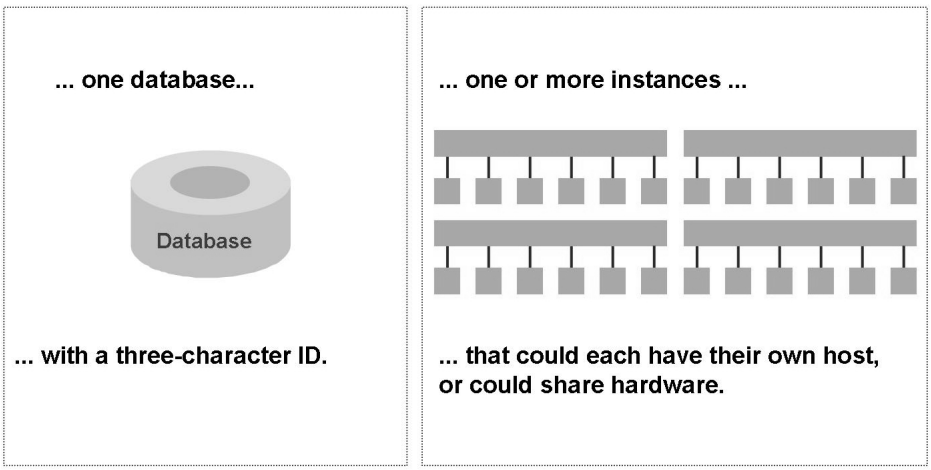

Figure 1: The Elements of an SAP System

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It is certainly possible to install two instances of a system or even of different systems on one host. Before you configure two systems (and their databases) on one host, you should examine the extent to which the chosen hardware is capable of handling the anticipated load. Other aspects to be considered are situations such as upgrades or restore scenarios (for example, one system is to be recreated from a backup whilst the other system should continue to be used without interference).

Within a company, no SAP System IDs (SIDs) should be assigned more than once. You can only exchange data between two systems with the same SID in an effective way by going to a considerable amount of effort (renaming the systems).

What Is an Instance of an SAP System?

An instance of an SAP system is an administrative unit in which components of an SAP system that provide one or more services are combined. **The services offered for an instance can be started or stopped together.** SAP NetWeaver AS-based systems can be installed in three forms.

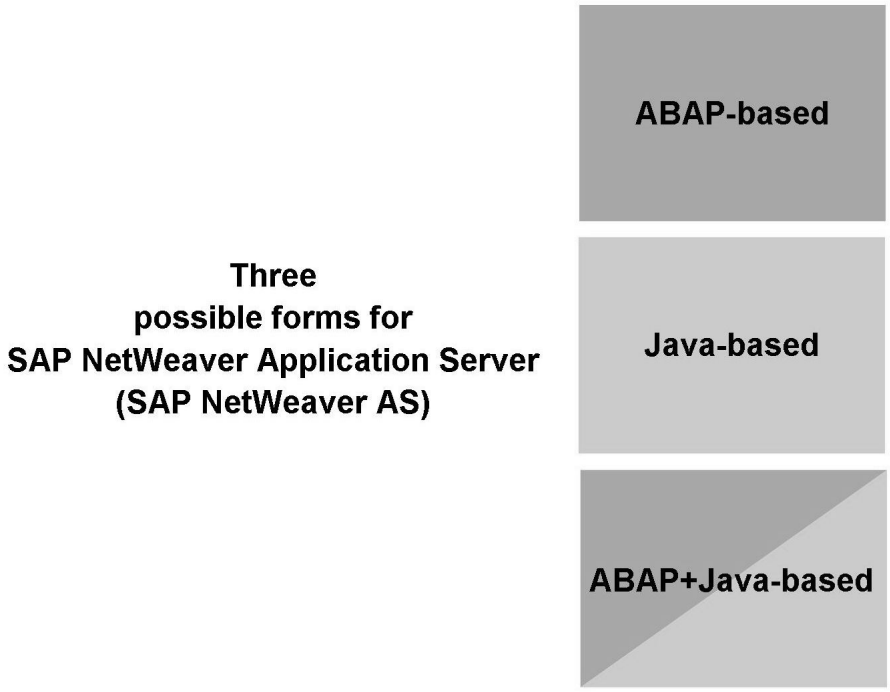

Figure 2: Installation Variants of the SAP NetWeaver AS

1. ABAP-based instances
2. Java-based instances
3. ABAP+Java-based instances (dual-stack)

Caution: These three variants cannot coexist in one SAP system.

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ABAP-Based Instances

First, we will take a look at pure ABAP instances.

The (ABAP) dispatcher is the determining process of an ABAP instance. This process starts other processes that belong to the instance, such as the gateway (abbreviated as GW in the graphic), the Internet Communication Manager (ICM), and a configured number of work processes.

You configure an ABAP instance using an instance profile. The ABAP instance has shared (main) memory areas and its own directory structure in the file system.

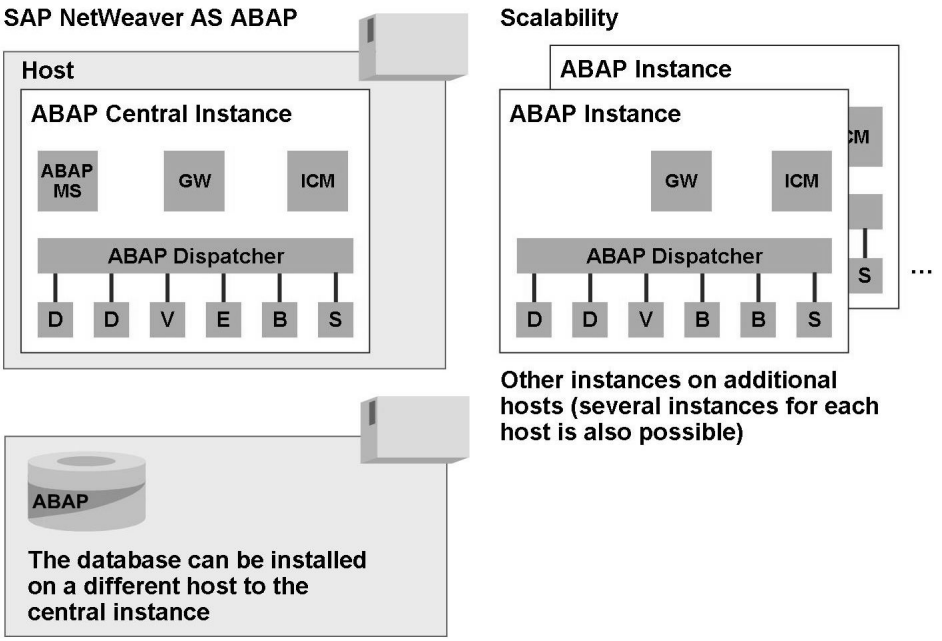

Figure 3: ABAP-Based SAP Systems

An (ABAP) instance only ever has one (ABAP) dispatcher. An instance requires a minimum of two dialog work processes. Otherwise it is not possible to start it. Several instances can be installed on the same host. The instances must then have different **instance numbers**. The instance number is a two-digit number, and is defined at installation. It defines a range of standard communication ports for processes of the instance. The standard port of the dispatcher is 32$$ where $$ denotes the instance number. For example 3200 if the instance number 00 was selected at installation. If several instances are installed on a shared host, these instances use their own, separate, (main) memory areas, and each instance has its own directory structure in the file system.

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An (ABAP or ABAP+Java-based) SAP system can have several instances. A single instance is distinguished from these other instances as the (ABAP) central instance. It includes an additional process – the ABAP Message Server – which only exists once across all systems. Furthermore, the central instance is the only instance that offers one or more enqueue-type work processes.

Hint: Note that this definition of the term central instance cannot be used in the sense described when the ABAP Central Services Instance (ASCS) is deployed. You will find a description of the ASCS concept in the appendix to this lesson.

An instance is also called an **application server** in the software-oriented view of the client-server model. The application server provides the runtime environment for the business applications of SAP systems.

Java-Based Instances

The (Java) dispatcher is the central process of a Java instance. This process distributes the incoming requests to the available server processes.

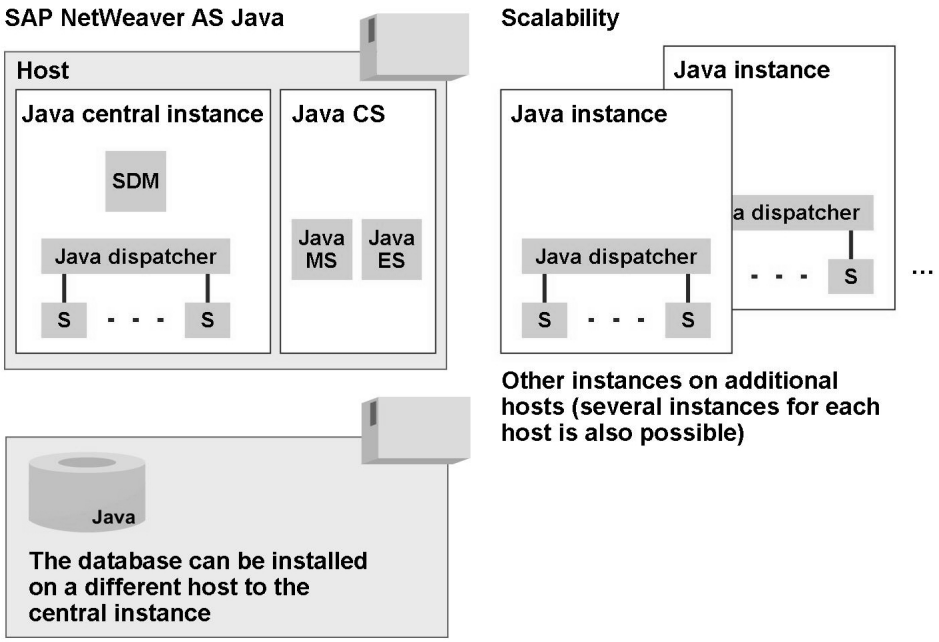

Figure 4: Java-Based SAP Systems

A Java instance only ever has one Java dispatcher. An instance requires a minimum of one server process. Several instances can be installed on the same host (see the section *ABAP-Based Instances*).

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A (Java-based) SAP system can have several instances. A single instance is distinguished from these other instances as the (Java) central instance. It includes an additional process - the Software Deployment Manager (SDM) - which can only be configured once across the whole system. There is also a Java Central Services (CS) instance. This CS instance offers the Java Message Server and the Java Enqueue Server. In the standard installation, the Java central instance and the CS instance are located on one shared host.

You can install additional Java instances on the same host as the central instance or on other separate hosts.

ABAP+Java-Based Instances

ABAP+Java-based instances offer ABAP and Java-based processes. This results in the following definition of a central instance: The central instance of an ABAP+Java-based SAP system offers all the processes of an ABAP central instance and a Java central instance.

Hint: Note the following: If you restart the central instance of an ABAP+Java-based system, for example, the restart affects the following processes. (An instance is distinguished by the fact that all its processes can be started and stopped together)

- All Java server processes
- The Java dispatcher
- The Software Deployment Manager (SDM)
- The Internet Communication Manager (ICM)
- The gateway
- All ABAP work processes
- The ABAP dispatcher
- The ABAP Message Server

The Java Central Services instance does not belong to the ABAP+Java central instance. It is started and stopped separately.

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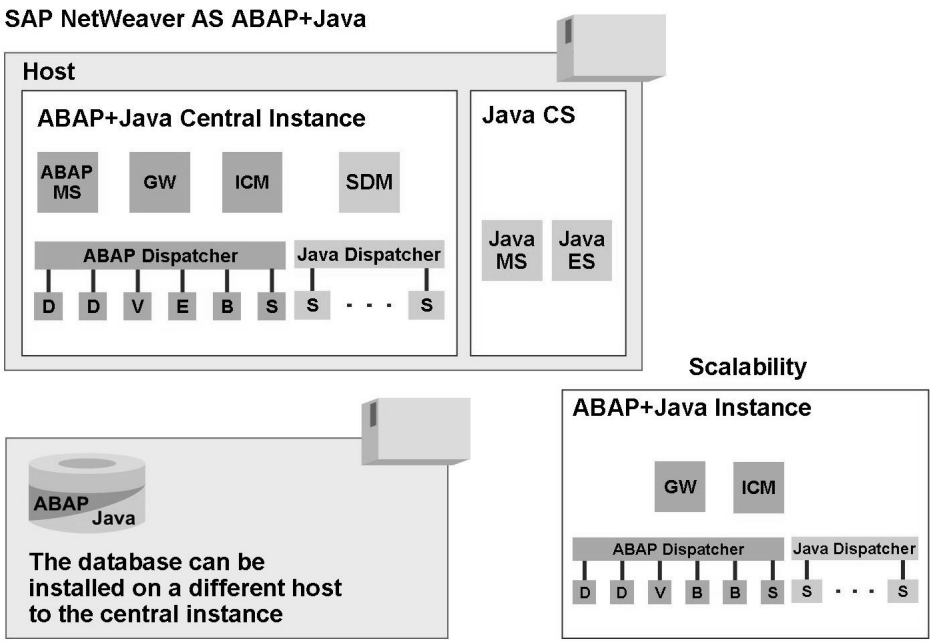

Figure 5: ABAP+Java-Based SAP Systems

An (ABAP+Java-based) SAP system always provides one ABAP+Java-based central instance. Other instances are also ABAP+Java-based.

Appendix: ABAP Central Services (ASCS)

As of SAP NetWeaver 7.0, for high availability ABAP+Java-based SAP systems (such as SAP systems on Windows clusters), you have to set up a separate instance for central services on the ABAP side of an SAP system, namely the ABAP Central Services (ASCS). The ASCS instance enables you to separate the ABAP Message Server and the ABAP Enqueue Service (not implemented as a work process in this case) from the ABAP central instance. This cluster will then contain the ASCS instance and the database. Outside the cluster, you may have any number of **equal** ABAP instances. This means that there is no longer any central instance in your system. The same concept occurs in Java-based SAP systems of

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the installation standard: the (Java) Central Services instance with a Java message server and Java enqueue server. On the Java side, the concept is still referred to as a central instance because the Software Deployment Manager is installed here.

Hint: You will find more information about the ASCS instance here:

SAP Note 1010990 - *Configuring a Standalone Gateway in an HA ASC instance*

SAP Note 1011190 - *MSCS: Splitting the Central Instance After Upgrade to 7.0/7.1*

You will also find further information on installing and configuring ASCS instances in the corresponding installation and upgrade guide for your SAP system.

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Lesson Summary

You should now be able to:

- Outline the structure and the architecture of an SAP system
- List the technical components of the SAP NetWeaver Application Server
- Use the terms system and instance correctly

Related Information

- SAPTEC – SAP NetWeaver Application Server Fundamentals
- SAP Library
- See SAP Notes:
  - 21960 - *Several instances/systems on one UNIX computer* (and SAP Notes linked to from there)

    In principle, this SAP Note also applies to other operating systems.
  - 39412 - *How many work processes to configure*
  - 9942 - *Maximum number of work processes*

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Lesson: Process of a System Logon (ABAP)

Lesson Overview

This lesson revises the process of a system logon, and dialog work process multiplexing.

Lesson Objectives

After completing this lesson, you will be able to:

- Describe the process of a system log on
- Describe the technology of dialog work process multiplexing

Business Example

You want to understand the process of a system logon.

Process of a System Logon (ABAP)

To create a connection between the front end of an end user and an instance of an SAP system, the *sapgui.exe* program requires various information in the form of start parameters. This parameter string is normally created by the *saplogon.exe* program using information about the system selected for logon. This information comes partly from the configuration files of SAP Logon, and partly from a direct request to the message server of the selected system (see steps 1 and 2 in the following figure). SAP Logon then starts the SAP GUI with these specifications.

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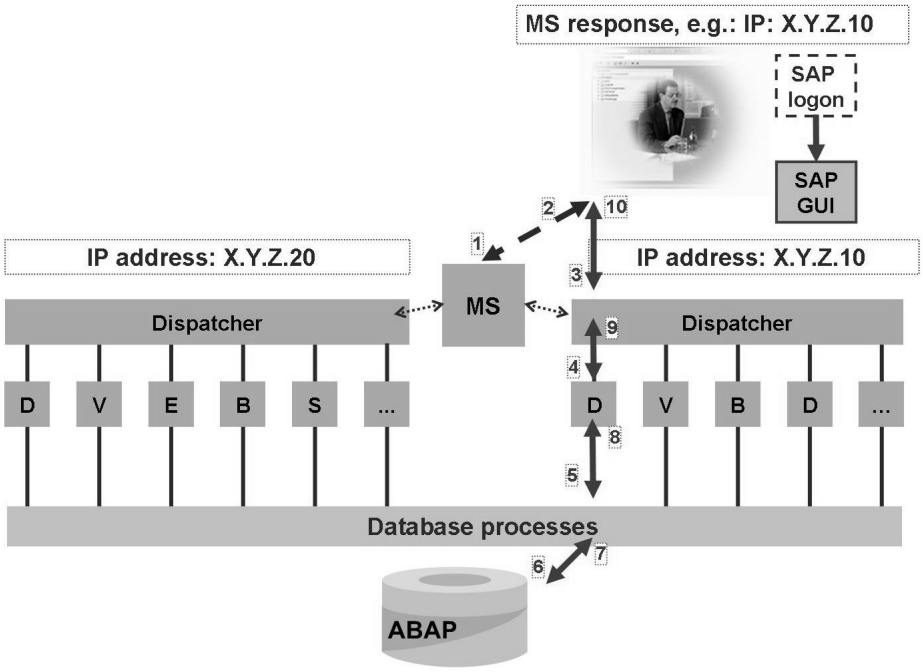

Figure 6: Process of a System Logon

After the transfer of the logon screen from the dispatcher to the front end (not shown in the figure), the SAP GUI sends the user's logon data to the instance (step 3 in the above figure). After the dispatcher has determined a free work process to process the logon, it transfers the logon data to this work process (step 4). The work process, in turn, checks whether the received combination of user ID and password is known to the system using a request to the database (steps 5-8). A positive response from the database prompts the work process to return the initial screen of the system to the front end.

During a logon session, the assignment of the user to the instance is unique. Only during a new logon can the user possibly be assigned to a different instance by the message server.

Dialog Work Process Multiplexing

The processing of a transaction that consists of multiple screens is usually executed using multiple, different dialog work processes. This distribution is called **work process multiplexing**. Work process multiplexing means that a system function whose content is logically connected but consists of multiple substeps can be processed by various dialog work processes. These steps, where the content is connected, are described as transactions. A transaction that consists of multiple screens, such as screens 100 and 200 can also be processed by multiple dialog work processes.

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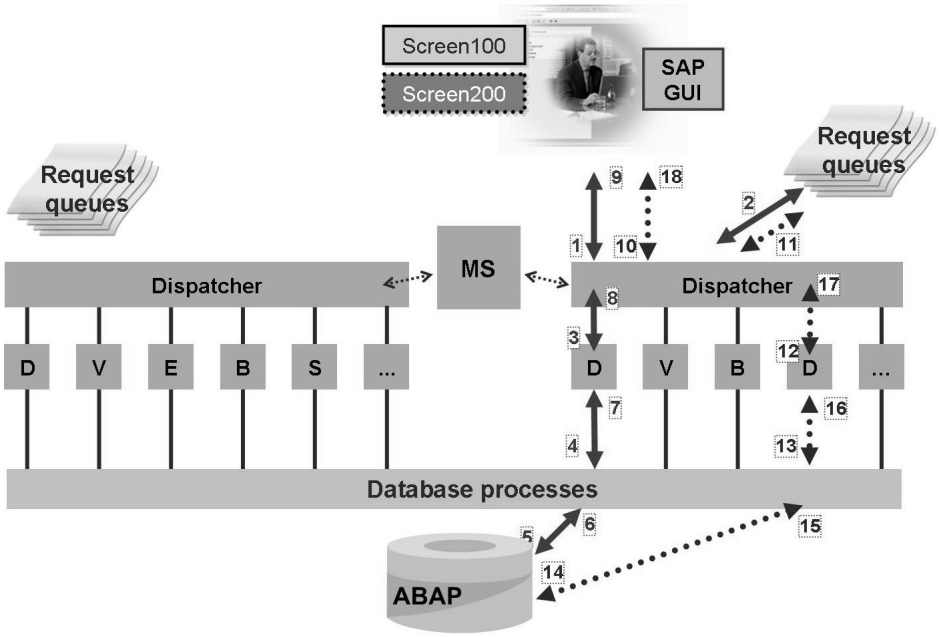

Figure 7: Work Process Multiplexing

The figure shows two screens of a transaction (100 and 200), for which the input is handled by two different dialog work processes. The multiplexing procedure is used exclusively for dialog work processes. All other work process types process entire functions; that is, complete business processes.

As dialog work processes may therefore process only parts of transactions that are connected from a business point of view; the update procedure with the update work process is widely used in SAP systems (see also the course SAPTEC - SAP NetWeaver Application Server Fundamentals).

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Lesson Summary

You should now be able to:

- Describe the process of a system log on
- Describe the technology of dialog work process multiplexing

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Lesson: Configuring SAP Logon

Lesson Overview

In this lesson, you will learn how to configure the SAP Logon program.

Lesson Objectives

After completing this lesson, you will be able to:

- Set up the SAP Logon program

Business Example

You want to enable your end users to log on to the SAP system using the SAP logon.

Setting Up SAP Logon

The SAP Logon program provides users with a convenient logon to an SAP system with the SAP GUI for Windows (from Windows-based front ends). SAP Logon evaluates various configuration files that are stored on the front end. These files can also be processed using SAP Logon.

Fundamentally, SAP Logon simply starts the SAP GUI for a selected SAP system with certain parameters (see the section *SAP GUI Connect String*).

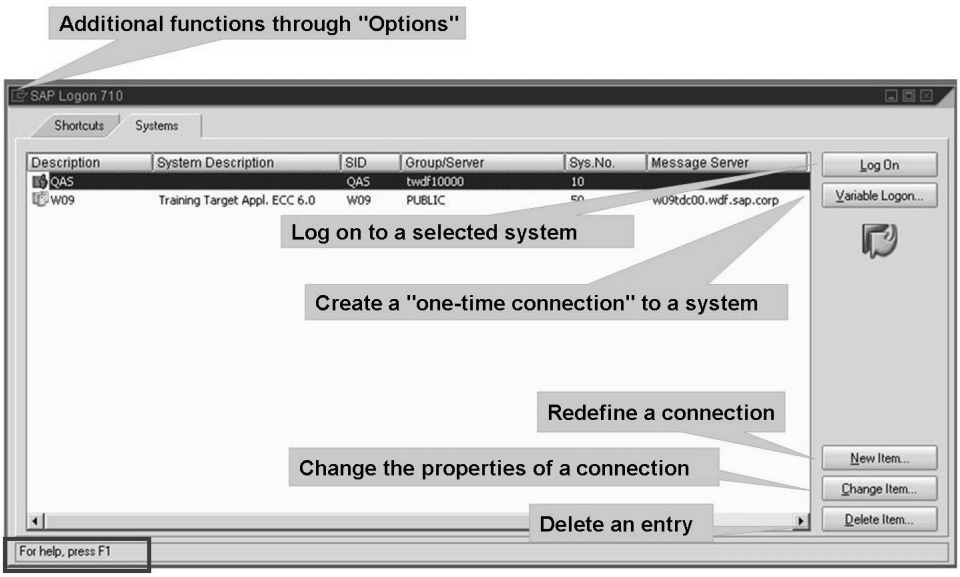

Figure 8: SAP Logon, Systems Tab Page

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You can make various general settings through the SAP Logon *Options* (see figure above). You can, for example, set the trace level for SAP GUI connections in this way. Passwords can also be written to the the trace file generated in this way, so you should use this option only with great care; the trace files should be deleted afterwards.

You can use the *New Item...* pushbutton to create a new connection to a system. A "wizard" takes you through the various options for creating new connections. There are three possible options.

1. The selection of an already known system (from the sapmsg.ini file) followed by selection of the logon principle: Group logon or logon to a specific instance.
2. The definition of a new connection (as a "User Specified System") using the message server ("group or server selection").
3. The definition of a new connection (as a "User Specified System") with explicit specification of all the necessary connection details ("custom application server"), without querying the message server.

Note: In cases 1 and 2, you need connections to the ABAP message server of the SAP system. In case 3, you define a direct connection to a selected dispatcher. No message server query is necessary here.

Hint: If you see the *Groups* and *Server* pushbuttons instead of the *New Entries* pushbutton, the wizard is deactivated. To activate the wizard, choose *Options* from the menu in the upper left corner in SAP Logon. Select the option *With Wizard*, confirm with *OK* and *Yes*, and restart the SAP Logon.

When logging on using a logon group, the ABAP message server is always contacted first in order to identify the instance with the best performance within the selected logon group.

The configuration file *sapmsg.ini* is evaluated to display the systems available for selection. The message server of the selected system is queried to display the available logon groups and application servers. So that the connection to the message server of the system specified in *sapmsg.ini* works, it is necessary for the Microsoft Windows file *services* to specify the correct message server communication port for the selected system ID. A connection is then created to the relevant host and the message server running on it using the information from *sapmsg.ini* and *services*.

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Using SAP Logon and associated files:

- Start SAP logon: Read *saplogon.ini*
- Choose *Logon*: Start logon
- *Variable Logon* pushbutton: No change to *saplogon.ini*, evaluate *sapmsg.ini* and *services*
- *New Item* pushbutton: Edit *saplogon.ini*, evaluate *sapmsg.ini* and *services*
- *Change Item* pushbutton: Edit *saplogon.ini*
- *Delete Item* pushbutton: Edit *saplogon.ini*

Hint: Unlike previous releases, the current status of SAP Logon 7.10 (patch level 2) is such that with a successful connection to a previously unknown SAP system (new SID), the *sapmsg.ini* file is not automatically updated. This means that the file (which contains all known SIDs and their descriptions) may need to be updated manually. The best way to do this is centrally, with the file then distributed to all the relevant hosts (note that the SAP Logon files do not necessarily have to be located on local front ends, but can also be stored centrally).

With *New Item... → User Specified System*, you can create a connection to an SAP system that **need not be** listed in the *sapmsg.ini* or *services* files. You then enter all of the system information that is relevant for a logon yourself. The name of the host where you want to contact an instance, its instance number, the System ID, and a description.

The settings for a connection, such as its SAP Logon description, can be changed using the *Change Item...* pushbutton. On the *Network* tab page for example, you can restrict the amount of data transferred (system to front end), to allow for slow network connections (see also SAP Note 161053: *Using SAPGUI in WAN*).

You can also specify a SAProuter string for SAP GUI connections. A SAProuter is then assigned the task of transferring data for this connection. SAProuter strings can also be specified using aliases. These aliases are processed using the *saproute.ini* file.

Hint: If you do not want to allow users to edit the system entries (in the saplogon.ini file), you can use the SAP Logon Pad program.

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Which files are stored where? The following list shows the files with their possible storage locations; in the case of multiple possible locations, the search sequence is shown:

- *saplogon.ini*, *sapmsg.ini*, *saproute.ini*:
  - SAP GUI directory
  - Windows directory
- *services* (Windows):
  - WINDOWS\system32\drivers\etc\services

Note: You can also go to the ***Shortcuts* tab page to set up "shortcuts"**. With shortcuts, you are prompted to enter a password, after which the system takes you directly to a preassigned transaction in the chosen system. In theory, you can also store the password in the shortcut. However, we advise you not to do this for security purposes. The shortcuts are stored in a file named *sapshortcut.ini* in the Windows directory on the front end.

(SAP) GUI Connect String

The SAP GUI connect string describes a number of call parameters for the SAP GUI program. In its simplest form, a SAP GUI call looks like this:

sapgui <host> <instance number>

If a logon group is to be used, the connection structure has a somewhat more complex structure. Now

/M/<Message Server Host>

is used to specify the host of the message server of the selected system, and then

/S/<Message Server Port>

is used to specify the port of the message server, and

/G/<Logon Group>

is used to specify the name of the logon group to be selected.

sapgui /M/<message server host>/S/<message server port>/G/<logon group>

This would constitute a complete, generic connect string.

sapgui /M/twdf10000/S/3600/G/SPACE

This would constitute a complete, concrete connect string.

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sapgui /M/twdf10000/S/3600/G/SPACE /WAN

You can use the command line switch **/WAN** to declare the connection to be a Low Speed Connection, with the corresponding savings in network traffic.

Note: Note that when you call an SAP GUI using an SAProuter connection, you have to append the SAP GUI connect string shown above to the SAProuter connect string. The SAProuter connect string has a similar syntax, the difference lying in the detail:

/H/ indicates the host name of the SAProuter (note that for technical reasons, the host name has to be at least 2 characters long)

/S/ specifies the service (port). This specification is optional, the default value being 3299

/W/ indicates the password for the connection of the predecessor and the successor on the route and is also optional (the default value is “”, no password)

For example: /H/saprouter/W/pass/H/targetserver

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Exercise 1: SAP Logon

Exercise Objectives

After completing this exercise, you will be able to:

- Set up the SAP Logon program

Business Example

You want to log on to a SAP system using SAP GUI for Windows. First, you need to create an entry for this system in SAP Logon.

Task: Setting up SAP Logon Using the "New Item..." Button

Create a new system entry in SAP Logon.

1. Choose the *New Item...* button and create a new item as a *User Specified System*. Use the data that your instructor gives you for this.

Hint: If you see the *Groups* and *Server* pushbuttons instead of the *New Item* pushbutton, the wizard is deactivated. To activate the wizard, choose *Options* from the menu in the upper left corner in SAP Logon. Select the option *With Wizard*, confirm with *OK* and *Yes*, and restart the SAP Logon.

Result

You have now created a new system entry in SAP Logon. Use this entry to log on to the system.

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Solution 1: SAP Logon

Task: Setting up SAP Logon Using the “New Item...” Button

Create a new system entry in SAP Logon.

1. Choose the *New Item...* button and create a new item as a *User Specified System*. Use the data that your instructor gives you for this.

Hint: If you see the *Groups* and *Server* pushbuttons instead of the *New Item* pushbutton, the wizard is deactivated. To activate the wizard, choose *Options* from the menu in the upper left corner in SAP Logon. Select the option *With Wizard*, confirm with *OK* and *Yes*, and restart the SAP Logon.

a) Start SAP Logon. If necessary, ask the instructor to show you the menu option in the Start menu.

b) Choose *New Item...*.

c) Select *User Specified System* and choose *Next >*.

d) In *Connection Type*, choose *Group/Server Selection*.

e) In the *System ID* input field, enter the system ID of your assigned system, for example **`DEV`**.

Note that an entry can already exist for a system in the *sapmsg.ini* file. However, this entry does not reference the training system that you are using. Therefore, under *Message Server*, enter the name of the host on which “your” SAP system is running (for example **`twdf9999`**).

f) Next, under *Group/Server*, select a logon group or an instance of the system.

g) Choose *Finish*.

Result

You have now created a new system entry in SAP Logon. Use this entry to log on to the system.

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Lesson Summary

You should now be able to:

- Set up the SAP Logon program

Related Information

SAP Note 38119 - *SAP Logon: Administration of functions*

SAP Note 146173 - *SAPshortcut: Saving password in SAPshortcut*

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Lesson: Logon Groups in AS ABAP

Lesson Overview

This lesson introduces the concept of logon groups in AS ABAP.

Lesson Objectives

After completing this lesson, you will be able to:

- Explain the benefits of logon groups in AS ABAP
- Set up logon groups in AS ABAP

Business Example

You want to use logon groups to restrict user logons to certain application servers of your system.

Using Logon Groups

SAP systems sometimes have significantly more than just one or two instances. Each of these instances offers a specific number of work processes of various types and can access the resources of "your" hardware.

Situations are conceivable in which the tasks to be performed on an instance place massive demands on the underlying hardware, thus slowing down all work that is carried out on this instance. Long dialog response times are particularly annoying, since the end users affected by this incur real costs due to poor "system availability". Examples of such situations would be:

- Heavy load due to large numbers of incoming RFC requests
- Heavy load due to complex background work processes
- Heavy load due to numerous update tasks

Use of dialog groups to separate the dialog load from other loads

- Set up a special logon group to receive RFC requests
- Set up a special logon group for background tasks
- Set up update work processes on just a few selected instances
- Set up a special logon group for dialog tasks

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Note that (to use this concept successfully) RFC communication from external systems must reference the specially created logon group. It may be worth setting up a logon group named "RFC" on all your systems, and referencing this logon group for every RFC communication to an SAP system. See also SAP Note 593058: *New RFC load balancing procedure*.

Note: For background tasks, special *job server groups* are created as a logon group in transaction SM61.

Using a logon group to ensure the best possible distribution of dialog load

SAP recommends you set up a single logon group for dialog requests if you want your end users to **have comparable response times**.

This logon group is given the name *PUBLIC* for example. If you think that it is useful, you can decide not to include the central instance of your SAP system in this logon group.

By default, **every instance** of an SAP system (including the central instance) is assigned to the logon group *SPACE*.

Setting Up Logon Groups

Logon groups are set up in transaction SMLG (*Tools → CCMS → Configuration → Logon Groups)*).

Here, you can set up a new logon group and assign the individual instances to this.

You can display the current status of the instances under *Goto → Load distribution*, as well as view which instance the next user is assigned to depending on which logon group is being used.

When logging on using a logon group, the ABAP message server is always contacted first in order to identify the instance with the best performance within the selected logon group. The load information is determined by a report on each instance, which is run automatically every five minutes. This report saves the information in a special memory area in the message server, which the SAP GUI can then use to request the best current instances of a group. To avoid the best current instances of the group becoming overloaded with new logons whenever a large number of users attempt to logon within the five minute period, the load information is updated for each instance after every fifth logon.

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Exercise 2: Setting Up Logon Groups

Exercise Objectives

After completing this exercise, you will be able to:

- Set up logon groups

Business Example

You want to use logon groups to restrict user logons to certain application servers of your system.

Task 1: Setting Up Logon Groups

Create a logon group.

1. Log on to your system using your new item in SAP Logon (with the parameters that your instructor gives you). Call the transaction SMLG (*Tools → CCMS → Configuration → Logon Groups)*.
2. Choose the *Create Assignment* button to create a new logon group with the name *PUBLIC_##*, where ## denotes your group number. Assign at least one of the two instances of your system to your new logon group. *Copy* and *Save* your entries.
3. Set up a logon group with the name *RFC*. Assign the central instance of the system to the logon group. Set the *Ext. RFC-enabled* option.

Task 2: Logon Groups in SAP Logon

Create an entry with the created group *PUBLIC_##* in SAP Logon.

1. In SAP Logon, choose the *New Item...* pushbutton again to add a new entry.

   Create a *User Specified System* again.

   If the logon group that you created previously does not yet appear in the display, the message server has not yet registered the newly created logon group. This is done automatically after five minutes at the latest.

   Hint: If you see the *Groups* and *Server* pushbuttons instead of the *New Item* pushbutton, the wizard is deactivated. To activate the wizard, choose *Options* from the menu in the upper left corner in SAP Logon. Select the option *With Wizard*, confirm with *OK* and *Yes*, and restart the SAP Logon.

2. Log on to your system using the new entry in your SAP Logon.

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Solution 2: Setting Up Logon Groups

Task 1: Setting Up Logon Groups

Create a logon group.

1. Log on to your system using your new item in SAP Logon (with the parameters that your instructor gives you). Call the transaction SMLG (*Tools → CCMS → Configuration → Logon Groups)*.

   a) Follow the instructions for the exercise.

2. Choose the *Create Assignment* button to create a new logon group with the name *PUBLIC_##*, where ## denotes your group number. Assign at least one of the two instances of your system to your new logon group. *Copy* and *Save* your entries.

   a) In transaction SMLG, you can see a list of the logon groups that exist in the system and the instances assigned to them.

   b) To create a new assignment, choose the *Create Assignment* pushbutton. In the following dialog box, enter a name for your new logon group (**`PUBLIC_##`**) in the *Logon Group* field.

      Use the F4 help for the *Instance* input field to select an instance that you want to assign to the new logon group. Then choose *Copy*.

   c) *Save* the list of logon groups.

   d) You can now assign additional instances to your new logon group, or create new logon groups. To do this, choose the *Create Assignment* pushbutton again. Do not forget to *Save* your entries.

3. Set up a logon group with the name *RFC*. Assign the central instance of the system to the logon group. Set the *Ext. RFC-enabled* option.

   a) In transaction SMLG, choose the *Create Assignment* pushbutton. In the following dialog box, enter the name **`RFC`** for your new logon group in the *Logon Group* field.

      In the F4 help for the *Instance* input field, select the central instance.

      Switch to the *Attributes* tab and select the option *Ext. RFC-enabled*.

      Then choose *Copy*.

   b) *Save* the list of logon groups.

Task 2: Logon Groups in SAP Logon

Create an entry with the created group *PUBLIC_##* in SAP Logon.

1. In SAP Logon, choose the *New Item...* pushbutton again to add a new entry.

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Create a *User Specified System* again.

If the logon group that you created previously does not yet appear in the display, the message server has not yet registered the newly created logon group. This is done automatically after five minutes at the latest.

Hint: If you see the *Groups* and *Server* pushbuttons instead of the *New Item* pushbutton, the wizard is deactivated. To activate the wizard, choose *Options* from the menu in the upper left corner in SAP Logon. Select the option *With Wizard*, confirm with *OK* and *Yes*, and restart the SAP Logon.

a) Follow the same procedure as in the *SAP Logon* exercise, and now select the logon group you created *PUBLIC_##*.

To do this, choose *User Specified System* and then, under *Connection Type*, choose the entry *Group/Server Selection*.

Enter a description, and name the system ID for your system, as well as the host on which the (ABAP) message server for your system is running.

You can now use the input help for the Group/Server field. SAP Logon creates a connection to the message server of your system and obtains the logon groups that are currently defined there.

Complete the entry.

2. Log on to your system using the new entry in your SAP Logon.

a) Use the new entry to log on to your system.

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Lesson Summary

You should now be able to:

- Explain the benefits of logon groups in AS ABAP
- Set up logon groups in AS ABAP

Related Information

SAP Notes:

51789 - *Poor user distribution in logon distribution*

64015 - *Description of test program lgtst*

113440 - *Default logon group 'SPACE' for load balancing*

118093 - *Concepts of defining 'limits' in logon load balancing*

888279 - *Regulating / distributing the workflow load*

986373 -*RFC load distribution*

593058 - *New RFC load balancing procedure*

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Lesson: Appendix - Analysis Transactions

Lesson Overview

In this lesson, you will obtain an overview of a number of frequently used analysis transactions for system administration.

Lesson Objectives

After completing this lesson, you will be able to:

- Call important administration functions in the system

Business Example

You want to obtain an overview of the transactions that help you perform your daily work as a system administrator.

Common Administration Tasks

The transactions shown in the following figure help you to deal with daily system administration work. You should already be familiar with the usage and interpretation of most of these transactions.

Figure 9: Common Administration Transactions

You can use transaction SM51 to display the instances of your SAP system. From there, it is possible, among other things, to go to the user list (transaction SM04) or the work process overview (transaction SM50) for a selected instance.

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You can use transactions SM04 and AL08 to obtain an overview of the users logged on to the system, presented in table format for each instance. Note that only those users that are logged on to the **instance** from which you called this transaction display in transaction SM04. Transaction AL08 provides you with an overview of all users logged on to the **system**, arranged according to the instances of your SAP system. Unlike SM04, transaction AL08 provides only display functions.

Transaction SM50 provides an overview of the work processes configured for an instance. There is also a global equivalent to this transaction (SM66), where you can display all of the work processes for the entire SAP system. Like transaction SM50, transaction SM66 provides other functions in addition to purely display functions.

You can use transaction SM37 to obtain an overview of the background jobs in your SAP system.

You can manage lock entries in the lock table of the enqueue work process using transaction SM12.

Use transaction SM21 to analyze the system log.

If you want to send all users in your SAP system a message, you can use transaction SM02 to send a system message. It is also possible to restrict the recipients to users of a certain client, or users that are logged on to a particular instance. A system message is displayed on the screen in the form of a popup the next time a user performs an action.

You can use transaction RZ20 to monitor the SAP system, or to centrally monitor multiple SAP systems.

Digression: ABAP Message Server

The ABAP message server has two main tasks:

1. Distribution of logon load through logon groups
2. Enable certain work process types to be used across all instances

In some situations it can be important to check the (ABAP) message server of an SAP system more precisely. As well as links to message server-related functions in the transactions RZ03 and SMLG, attention should be drawn to the transaction SMMS here.

Initial screen

Status of the instances that are currently active, similar to transaction SM51

Goto → Parameters → Display

Provides comprehensive information about the message server being used

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Goto → Hardware Keys

Shows the hardware key (also *customer key*) of the message server hardware.

Goto → Logon Data → Display

You will find information here about the available communication logs and ports (for example, dialog, RFC, HTTP, SMTP,...)

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Exercise 3: (Optional) Common Administration Transactions

Exercise Objectives

After completing this exercise, you will be able to:

- Call important administration functions in the system

Business Example

You want to obtain an overview of the transactions that help you to perform your daily work as a system administrator.

Task: Basic Administrative Transactions

Determine instances, work processes, and users in the system.

1. Determine the number of instances available to you in your system and their names.
2. How many work processes does your entire SAP system have? Of which types?
3. How many users are currently logged on to the same instance on which you are working?
4. Call your *Own Data* (user defaults). In a new session, check the currently active locks in your system.

   Use another new session to delete the session holding the locks.

   There are two options for doing this. What happens to the locks?

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Solution 3: (Optional) Common Administration Transactions

Task: Basic Administrative Transactions

Determine instances, work processes, and users in the system.

1. Determine the number of instances available to you in your system and their names.

   a) To do this, call transaction SM51 (alternatively, choose: *Tools → Administration → Monitor → System Monitoring → Server*).

   Your system should have two instances, the names of which could be, for example, twdf9999_DEV_00 and twdf9999_DEV_01.

2. How many work processes does your entire SAP system have? Of which types?

   a) If you make the correct settings for the *Process Selection* (ensure that you also display *waiting* processes), transaction SM66 (SAP Easy Access menu path: *Tools → Administration → Monitor → Performance → Exceptions/Users → Active Users → Global Process Overview*) will show you that your system has, for example, 16 dialog work processes, 7 background work processes, and so on.

   The transaction SM66 shows all work processes of a system, unlike transaction SM50.

   Hint: In transaction SM66, you can also show the work process that is currently processing **your** user request, by choosing *Settings* and deselecting the option *Hide own work processes used for analysis*.

3. How many users are currently logged on to the same instance on which you are working?

   a) Transaction SM04 (or *Tools → Administration → Monitor → System Monitoring → User Overview*) displays the number of users that are logged on to the same instance as you.

4. Call your *Own Data* (user defaults). In a new session, check the currently active locks in your system.

   Use another new session to delete the session holding the locks.

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There are two options for doing this. What happens to the locks?

a) Choose *System → User Profile → Own Data*.

You can set user defaults in a new session that opens automatically.

Use the call /OSM12 in the command field to display an overview of currently active locks in your system.

Do not restrict the selection of locks.

There should be an active lock that is connected to changing your user defaults.

You can either end the session that holds the locks using transaction SM04 (Select the user and choose the *Sessions* button) or obtain an overview of your sessions by entering /O, from which you can identify and end the session that holds the locks.

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Lesson Summary

You should now be able to:

- Call important administration functions in the system

Related Information

SAP Library (http://help.sap.com) for SAP NetWeaver 7.0 (2004s) EHP1, *SAP NetWeaver Library → Administrator's Guide → Technical Operations for SAP NetWeaver → General Administration Tasks → Monitoring and Administration of the SAP Message Server*

SAP Notes:

174911 - *Determining the hardware key (customer key)*

396750 - *Enhanced trace options for Message Server*

597939 - *Displaying the patch level for all application servers*, report: RSMONREL_ALV

636938 - *Description of test program msprot*

751873 - *Problem analysis during the HTTP load distribution*

821875 - *Security settings in the message server*

821904 - *Separating SCS instances for ABAP and J2EE*

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Lesson: Central Administration with SAP Solution Manager

Lesson Overview

An increasing number of administrative tasks can be centralized with SAP Solution Manager. This lesson gives a brief overview of such a system landscape from the point of view of administration, and will also introduce the topic of the work center of SAP Solution Manager 7.0.

Lesson Objectives

After completing this lesson, you will be able to:

- Describe the system landscape for central administration
- Explain the term “Work Center”

Business Example

Many administrative functions can be centralized with SAP Solution Manager. Your company wants to use these functions, and you would like to go over the most important terms first.

The SAP Support Infrastructure

The SAP support infrastructure uses SAP Solution Manager as a central component in the customer's system landscape.

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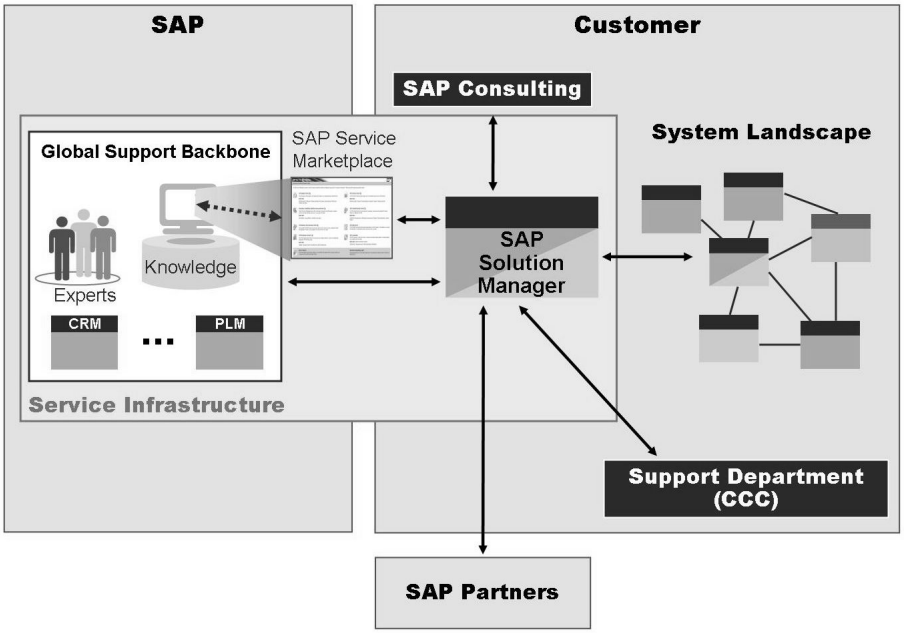

Figure 10: Support Infrastructure

SAP Solution Manager is integrated both in the customer's system landscape, and accessible through SAP Service Marketplace. SAP Service Marketplace allows the Customer Competence Center (CCC) of the customer-specific Support department to access all the basic functions of the SAP Support offerings. SAP Solution Manager provides access to a range of additional functions, for example functions in the areas of Implementation, Monitoring, System Administration, and Service Desk.

The interaction between SAP Solution Manager on the customer side and the SAP Service Marketplace portal of the SAP global support network provides the platform for professional shared service and support processes. These processes then provide the springboard for proactive services tailored to the individual needs and requirements of each CCC. This in turn maximizes the reliability and performance of the software solutions, helps reduce the total cost of ownership, and drives forward return on investment. Through the SAP Global Support Backbone, SAP Solution Manager transfers information to the customer and can also deliver remote support.

The System Landscape from the Point of View of Administration

SAP Solution Manager acts as a central system for the administration of the customer-specific system landscape. Alongside purely administrative functions, it also offers other functions for such areas as Document Administration, Change Request Management, Business Process Monitoring.

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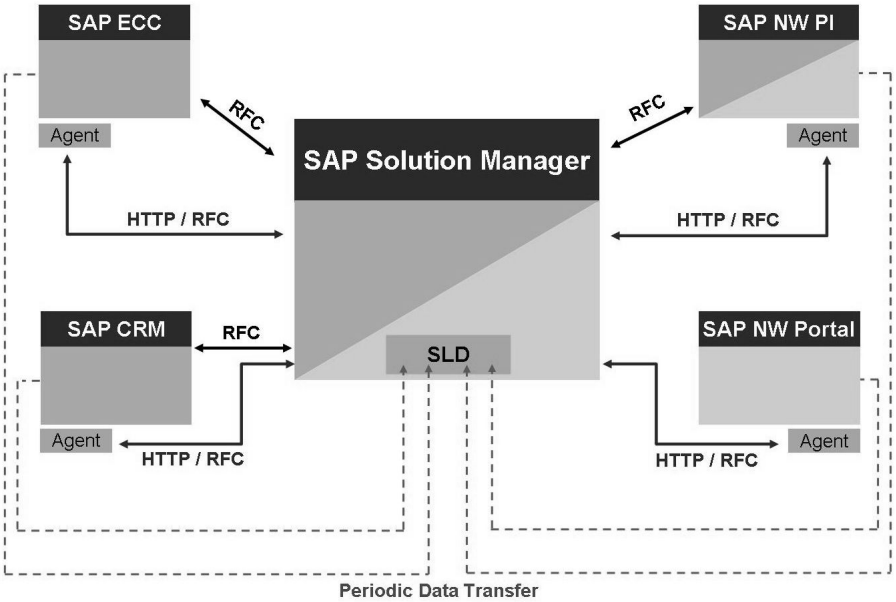

Figure 11: System Landscape from the Point of View of Administration

SAP Solution Manager requires information about the system landscape. This information can be obtained from a System Landscape Directory (SLD).

Note: For more information on the SLD, go to the SAP Developer Network, and search for the quick link /nw-sld (http://www.sdn.sap.com/irj/sdn/nw-sld)

The systems in a landscape periodically send information about themselves to the SLD. The SLD then provides this data to SAP Solution Manager.

Information about all the systems in the landscape or their functions can be accessed from SAP Solution Manager. In AS ABAP-based systems, this is usually done through RFC connections. In AS Java-based systems, HTTP communication and agents are used.

A whole range of central administrative functions can be executed from SAP Solution Manager:

- Central access to the systems you want to manage
- Periodic administration tasks (can be scheduled separately)
- Automatic logging of specific activities
- Documentation of performed actions
- Direct link to expert functions in system administration
- Reporting functions across the entire landscape

Central access to these functions is provided through work centers in SAP Solution Manager.

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Work Centers

Work centers provide a central working environment with access to role-specific functions. A work center is structured based on your role. You are given access to the relevant messages, alerts, evaluations, and documents for which your role has authorization. Depending on your tasks, different numbers of work centers can be assigned to you.

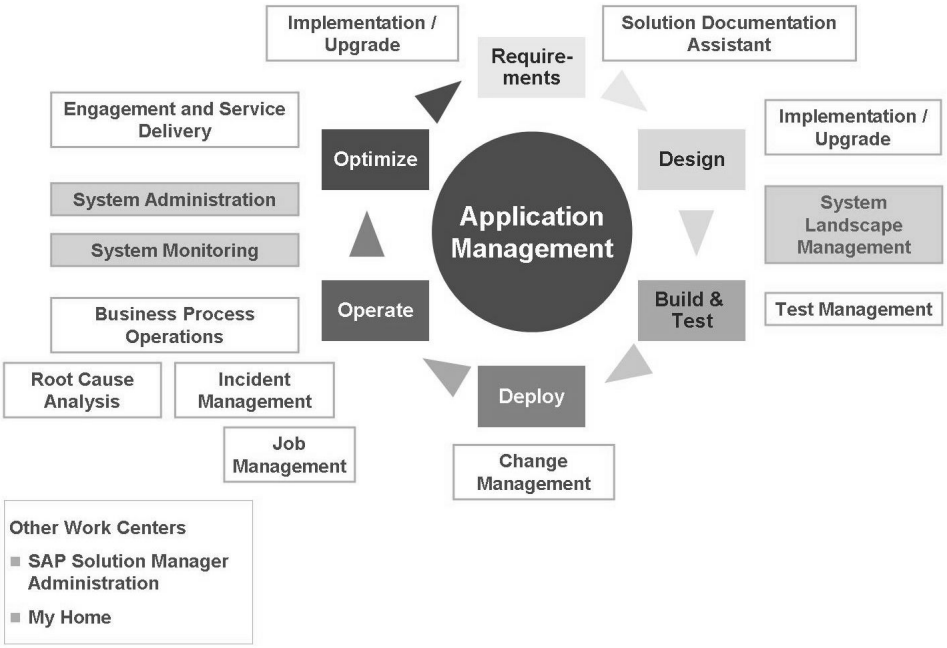

Figure 12: Overview Work Centers

The Work Centers for IT Operations cover “System Administration”, “System Landscape Management” and “System Monitoring”

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System Administration and System Landscape Management describe how all SAP technology must be administered to run a customer solution efficiently.

- The work center System Administration focusses on daily, recurring general administrative tasks.
- The work center contains Task Management, User Management and Administration Tools providing functionalities such as an integrated task scheduler, downtime management and job scheduling management.
- Administration tasks are mainly executed locally, but can be accessed and triggered from a central administration system. This allows a unified access to all SAP technologies.
- The typical tasks of system administration include starting and stopping systems, applying changes to technical configuration, performing imports, and/or applying patches and Support Packages based on the change control workflow.
- Creating or changing users based on a compliance workflow, performing system copies and installing systems, running system diagnostics, managing jobs, and performing backups and recovery.

System Monitoring covers monitoring and reporting of the status of IT systems.

- To provide transparency to customer business, the IT has to report service levels, capacity trends and solution quality on a regular base.
- In order to fulfill the demand of customer business and limited IT budgets, automated monitoring and reporting of the solution is given.
- The work center System Monitoring focusses on realtime monitoring of IT relevant system data of a complete system landscape.

You can start all work centers for which you have access in the following way:

in SAP GUI for Windows using transaction SOLMAN_WORKCENTER

in a web browser using the web dynpro application *AGS_WORKCENTER*

in the SAP NetWeaver Business Client (NWBC)

Note: The web browser URL for calling a web dynpro ABAP application (in the SAP namespace) has the following syntax: *http://<host name>:<ICM-Port>/sap/bc/webdynpro/sap/<application name>*, for example *http://twdf1234.wdf.sap.corp:8000/sap/bc/webdyn-pro/sap/ags_workcenter*.

For more information on the NWBC, see https://www.sdn.sap.com/irj/sdn/nw-businessclient and SAP Note 900000 - *SAP NetWeaver Business Client - FAQ*

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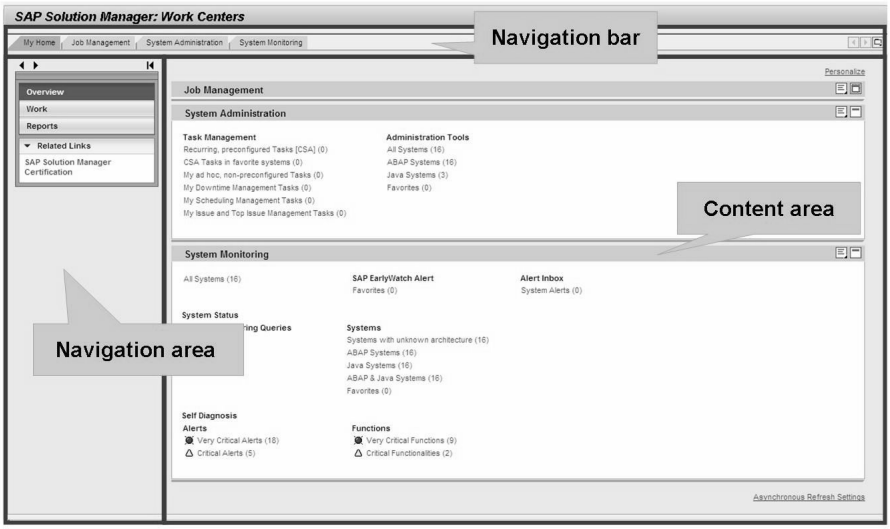

Figure 13: Work Center *myHome*

The above figure shows the work center *myHome* as an example. The role-based work centers use a standardized user interface consisting of navigation bar, navigation area, and content area. In the navigation bar, select the work center. Depending on the work center you select and your role, you can then choose various views and functions in the navigation area. Work centers support task-specific actions, and are designed to offer fast access to important and frequently used functions. A user can be assigned to several work center roles, and one role can have access to more than one work center.

The work center *myHome* offers a central point of access to all important data of almost all SAP Solution Manager work centers linked with the user roles. It shows aggregated information of the linked work centers.

The work center *System Administration* is the central point of access to the functions required to manage your systems. As an example the work center *Administration Tools* and is shown in the following paragraph.

Important and local acting administration functionality for both ABAP and Java is bundled in the work center *Administration Tools*. General administration functionality is located under the Application Server tab. For administration of the AS Java administration functionality of NetWeaver Administrator (NWA) is integrated here.

Additional tools such as ABAP tansactions or ABAP web dynpros could be added by the administrator.

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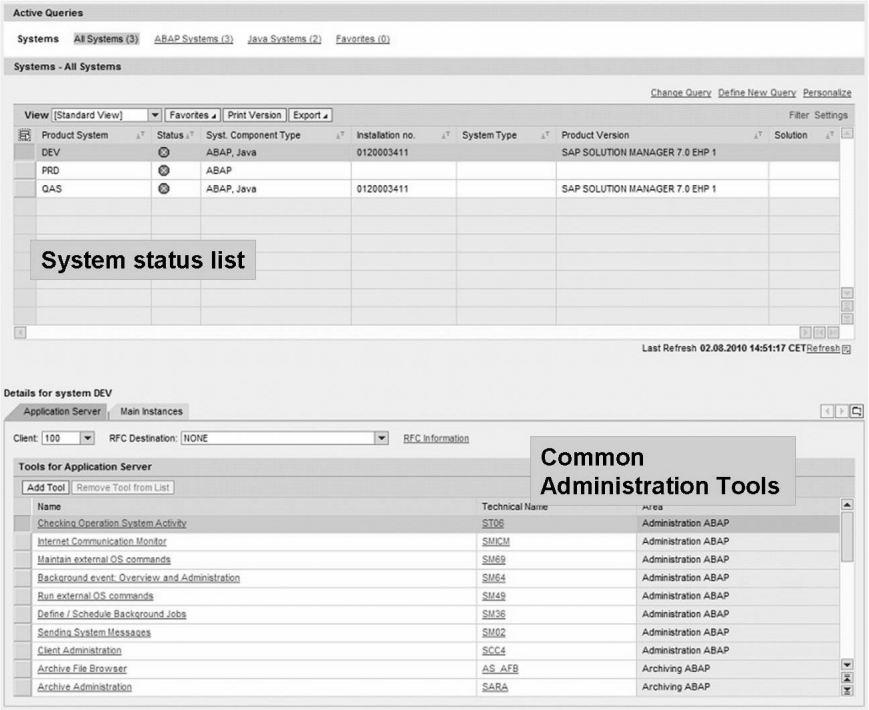

Figure 14: Work Center: Administration Tools

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Exercise 4: Calling a Work Center

Exercise Objectives

After completing this exercise, you will be able to:

- Call a work center

Business Example

Many administrative functions can be centralized with SAP Solution Manager. Your company wants to use these functions.

Task: Call a Work Center

Call a work center in SAP GUI for Windows.

1. Log on to your SAP system with SAP GUI for Windows. Call transaction SOLMAN_WORKCENTER. Navigate to various work centers.

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Solution 4: Calling a Work Center

Task: Call a Work Center

Call a work center in SAP GUI for Windows.

1. Log on to your SAP system with SAP GUI for Windows. Call transaction SOLMAN_WORKCENTER. Navigate to various work centers.

   a) Log on, and call transaction SOLMAN_WORKCENTER.

   b) Navigate to *System Administration* → *Administration Tools* or *System Monitoring* → *System Status* for example.

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Lesson Summary

You should now be able to:

- Describe the system landscape for central administration
- Explain the term “Work Center”

Related Information

SAP Education Course SM100 - *SAP Solution Manager Operation and Configuration*

SAP Library for SAP Solution Manager 7.0 EHP1, *SAP Solution Manager → Using the Work Center*

SAP Developer Network:

SLD: https://www.sdn.sap.com/irj/sdn/nw-businessclient

NWBC: http://www.sdn.sap.com/irj/sdn/nw-sld

SAP Note 900000 - *SAP NetWeaver Business Client - FAQ*

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Unit Summary

You should now be able to:

- Outline the structure and the architecture of an SAP system
- List the technical components of the SAP NetWeaver Application Server
- Use the terms system and instance correctly
- Describe the process of a system log on
- Describe the technology of dialog work process multiplexing
- Set up the SAP Logon program
- Explain the benefits of logon groups in AS ABAP
- Set up logon groups in AS ABAP
- Call important administration functions in the system
- Describe the system landscape for central administration
- Explain the term “Work Center”

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Test Your Knowledge

1. The instance that, together with the database, forms a functional SAP system is also known as the _____.
   Fill in the blanks to complete the sentence.

2. What types of work processes are there in the SAP system?
   Choose the correct answer(s).
   - □ A Update work process
   - □ B Spool work process
   - □ C Dialog work process
   - □ D ICM work process
   - □ E Gateway work process
   - □ F Instance work process

3. ABAP-based SAP systems use _____ technology to process user requests.
   Fill in the blanks to complete the sentence.

4. In what transaction can you obtain an overview of the instances of your SAP system?
   Choose the correct answer(s).
   - □ A SM50
   - □ B SM51
   - □ C SM21
   - □ D SM04

5. You can use transaction _____ to manage the lock entries of the SAP system. Transaction _____ is used to manage the update requests.
   Fill in the blanks to complete the sentence.

6. How can I call the work center in SAP Solution Manager?
   Choose the correct answer(s).
   - □ A With the SAP GUI?
   - □ B With a web browser?
   - □ C With the SAP NetWeaver Business Client?
   - □ D With the SAP NetWeaver Administrator

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Answers

1. The instance that, together with the database, forms a functional SAP system is also known as the central instance.

   Answer: central instance

2. What types of work processes are there in the SAP system?

   Answer: A, B, C

   The ICM (Internet Communication Manager) is not a work process but a service of the SAP NetWeaver Application Server; likewise the gateway. The instance itself is not a work process. In addition to the correct work process types listed above, there are also background work processes and enqueue work processes.

3. ABAP-based SAP systems use work process multiplexing technology to process user requests.

   Answer: work process multiplexing

   Put differently, this means that there is **not** a one-to-one assignment of user to dialog work process for the entire duration of the logon.

4. In what transaction can you obtain an overview of the instances of your SAP system?

   Answer: B

   Transaction SM50 lists the work processes of an instance. You can display the system log in transaction SM21. Transaction SM04 calls the user list of an instance.

5. You can use transaction SM12 to manage the lock entries of the SAP system. Transaction SM13 is used to manage the update requests.

   Answer: SM12, SM13

   Transactions SM12 and SM13 are important tools for the system administrator.

6. How can I call the work center in SAP Solution Manager?

   Answer: A, B, C

   The SAP NetWeaver Administrator is a (local) tool for AS Java.

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Unit 2

Starting and Stopping the AS ABAP

Unit Overview

The topic of this lesson is the starting and stopping of an SAP system. These are two of the basic tasks of system administration. You will also learn about the available log and trace options, to be able to react correctly if an error occurs.

Unit Objectives

After completing this unit, you will be able to:

- Describe the process of the start procedure of an SAP system
- Describe the structure of the file system for SAP instances
- Describe the general start process for an SAP NetWeaver AS ABAP.
- Describe the general start process for an SAP NetWeaver AS ABAP+Java.
- Describe which profiles are analyzed in the start process.
- Operate the tools to start and stop an SAP NetWeaver AS ABAP+Java
- Use the AS ABAP start logs to analyze problems
- plan and schedule downtimes in your SAP Systems using the work center Downtime Management.

Unit Contents

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Lesson: Tools for Starting and Stopping SAP Systems 69
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Lesson: System Start: Process

Lesson Overview

This lesson provides a general overview of how to start and stop SAP systems. It will discuss the areas of the file system that contain the important data for starting instances.

Lesson Objectives

After completing this lesson, you will be able to:

- Describe the process of the start procedure of an SAP system
- Describe the structure of the file system for SAP instances

Business Example

As the administrator of SAP systems, you need to stop the systems for maintenance purposes or after changing system parameters, and then restart them.

Start Process of the SAP System

The starting of an SAP system is the basic prerequisite for being able to work with the system. Restarts of SAP systems are also required after maintenance work on the hardware in use and changes to the SAP system's profile. Starting an SAP system is an initial process with which every administrator should be familiar.

The start process covered in this lesson describes the process for starting an SAP system. Every SAP system has a database and at least one instance. An SAP system with a Java stack also has a Central Services instance. A system with an ABAP stack can contain an ABAP Central Services instance that provides the ABAP enqueue service and the ABAP message server. In this case, the central instance does not have an enqueue work process or a message server. An SAP system with an ABAP and Java stack can therefore have two Central Services instances: one for Java, and one for ABAP.

The figure *Start Process of an SAP System* shows the start process of an SAP system. If the SAP system has an ABAP Central Services instance or a (Java) Central Services instance, these are started first.

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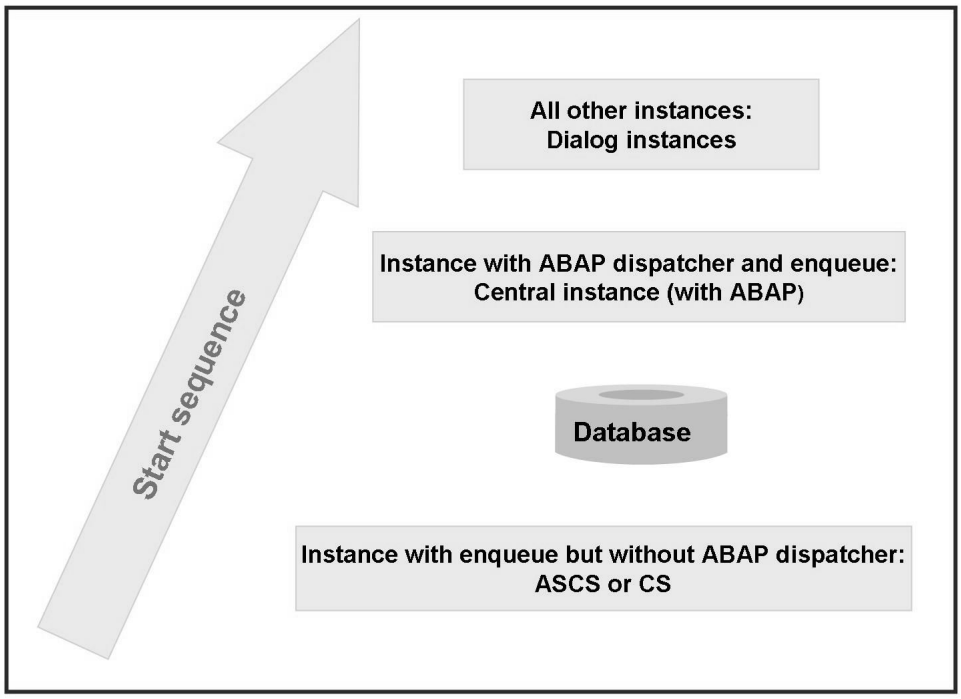

Figure 15: Start Process of an SAP System

Then the central instance is started. The central instance requires a running database (as do the dialog instances). If the database has not yet been started, this is started first during the start process of the central instance. The database can also be started before the actual SAP system is started, for example using database tools.

The start sequence will be explained in more detail below. The instances of SAP systems can be divided into three different categories with different priorities for the start and stop process.

1. Instances with enqueue but without ABAP dispatcher
2. Instances with enqueue and with ABAP dispatcher
3. All other instances

The enqueue process, which occurs on only one instance for each ABAP/Java stack, plays a special role in the start sequence. These instances, which normally also include the message server, must be started before all other instances. The (Java) Central Services instance or an ABAP Central Services instance (priority 1) do not require a running database, which is why the database is not started when either of these instances is started. Central instances with an ABAP dispatcher and an enqueue work process (priority 2) as well as dialog instances (priority 3) require a started database that the ABAP work processes or the Java server processes log

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on to. Therefore, the first step is to start the database when starting this type of instance (unless it is already running). If the SAP system has an ABAP Central Services instance, then this system does not contain a Priority 2 instance.

Fundamentally, the start process is performed in multiple steps. The start process is triggered with the operating system user **<sid>adm**:

- Starting the Central Services instance(s)

  The (Java) Central Services consist of the Java message server and the Java enqueue server, and the ABAP Central Services provide the ABAP message server and the ABAP enqueue server.

- Starting the database

  The underlying element of the entire SAP system is the database. This must be in an operational state before starting SAP instances that provide ABAP work processes or Java server processes. However, it may not run or be started before the Central Services instance is started. When a central or dialog instance is started, the system checks whether the database is running when the start process is triggered, and starts it if necessary.

- Starting the central instance

  In an AS ABAP or ABAP+Java system, the central instance has priority 2 if there is no ABAP Central Services instance and the instance has an enqueue work process; otherwise the central instance has priority 3 just like the dialog instances. A central instance with priority 2 is started before the dialog instances, while a central instance with priority 3 is started at the same time as the dialog instances. In an AS Java system, the central instance always has priority 3, and is always started with the dialog instances.

- Starting the dialog instance(s)

  If the central instance has priority 3, the dialog instances are started at the same time as the central instance. If the central instance has priority 2, the dialog instances are started once the central instance start process has finished.

Stop Process

An SAP system is stopped in the opposite sequence. The instances with enqueue are always stopped last.

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Evaluating the Profiles in the Start Process

Each instance of an SAP system requires data in the file system. This includes data that all instances can access (globally), and data that can only be accessed by an instance individually. In the file system, the data for the instances is contained in the *usr/sap* directory, where it is further organized into subdirectories. The figure *Structure of the File System of an AS ABAP+Java (simplified)* shows this structure.

Hint: The business data and similar data is contained in the database, which has its own structures in the file system depending on the database manufacturer. This data is not contained in the *usr/sap* directory.

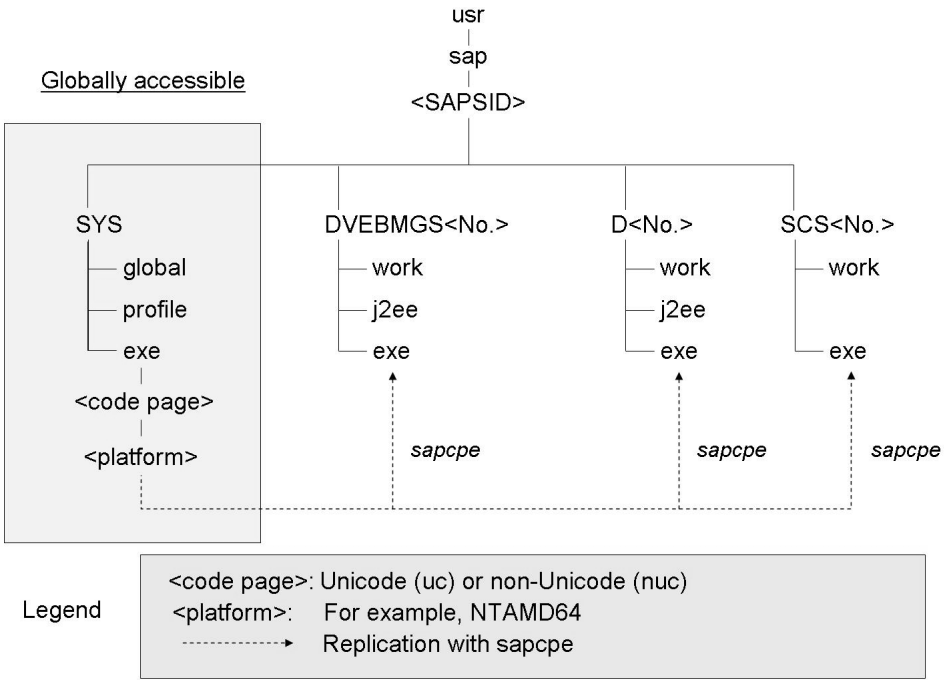

Figure 16: Structure of the File System of an AS ABAP+Java (simplified)

The *<SAPSID>* directory contains all data that must only be accessed by this SAP system. The data for the central instance of an SAP system with an ABAP stack is located in the *DVEBMGS<no>* directory (where *<no>* is the instance number). This directory includes other directories such as *work*, which contains the logs of the start process for example, the *j2ee* directory, which contains data about the Java nodes and other information, and the *exe* directory, which contains the kernel. The kernel directory includes the programs that are started when the system is started. The directories of the dialog instances for a SAP system with an ABAP stack have the name *D<No>* and have the same structure as the central instance. The directory *SCS<No>* is for the Central Services instance of an SAP system with a Java stack. Usually, the central instance and all dialog instances are located on separate hosts. This means each dialog instance also has its own directory. If

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several dialog instances are installed on one host, these have different instance numbers. The *SYS* directory contains data that can be accessed by all instances: On Windows operating systems, it is usually located in the file system in which the central instance is located. On other operating systems, the *SYS* directory is located in its own file system with the name *sapmnt*. On Windows operating systems, "share" is created on the *sap* directory above *SYS* with the name *sapmnt*. This Share allows all instances to access the *SYS* directory. On other operating systems, a *SYS* directory is created in the file system of each instance, which contains links to the subdirectories of the *sapmnt* file system.

The *SYS* directory contains the following subdirectories in particular:

global contains global data

profile contains the default profile and the start and instance profiles

exe contains the kernel.

During the start process of an instance, the kernel of the global *exe* directory is replicated to the local *exe* directory of the respective instance with the *sapcpe* program. On a Windows operating system, the *exe* directory also contains the <*codepage*> subdirectory, which itself contains the <*platform*> subdirectory.

<*codepage*> is *uc* for Unicode, and *nuc* for non-Unicode.

For an AS ABAP+Java system running on a Windows operating system in which the ABAP stack is non-Unicode (the Java stack is always Unicode), this means the *exe* directory contains the two subdirectories *nuc* and *uc*. As of Basis release 7.11, operating systems other than Windows have an identical structure to the Windows operating systems listed above.

For SAP NetWeaver 7.00 systems running on operating systems other than Windows, the kernel is contained in the global *exe* directory. An AS ABAP+Java system with a non-Unicode ABAP stack is an exception. In this case, the non-Unicode kernel is still located in the global *exe* directory. There is also a *uc* subdirectory, in which the Unicode kernel is located in the <*platform*> subdirectory.

The *sapstartsrv* program reads the **start profile** at the beginning. The start profile defines which steps must be performed during the start process or which processes of the instance are started by *sapstartsrv*. First, *sapcpe* (Central Patch Environment) is executed, which replicates, copies or links directories and programs. *sapcpe* is used to replicate the kernel from the global directories to the local *exe* directory of the instance.

For example, the start profile defines that the database should be started if it is not yet running for the central instance and the dialog instances. The IGS watchdog is also started, and on a system with an ABAP stack, the ABAP dispatcher is started and if necessary, the ABAP message server.

Normally, the start profile is not changed. If information for the start process is changed in the start profile despite this, *sapstartsrv* has to be restarted.

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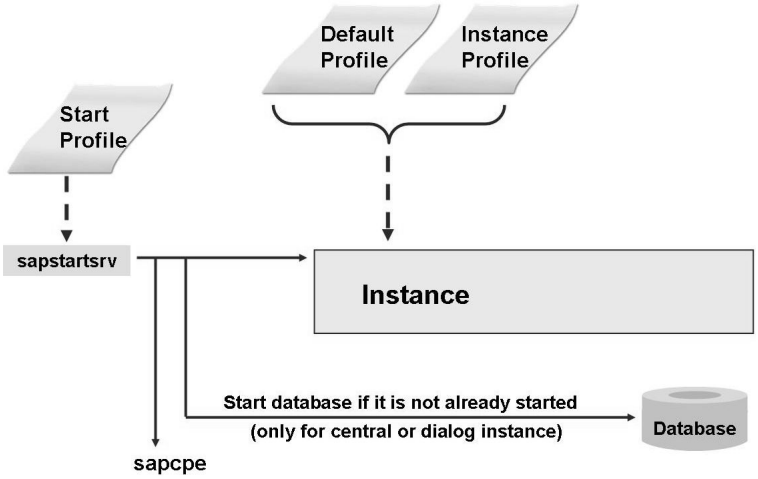

Figure 17: Start and Profile Evaluation of an Instance

If an instance is started, the parameters of the default and instance profile are evaluated, and the instance is started with these parameters. Parameters are defined in the default profile for all instances. For each instance, there is a separate instance profile that defines the parameterization for the respective instance.

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Lesson Summary

You should now be able to:

- Describe the process of the start procedure of an SAP system
- Describe the structure of the file system for SAP instances

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Lesson: System Start: AS ABAP and AS ABAP+Java Process

Lesson Overview

Depending on the installation, the SAP NetWeaver Application Server (AS) may run as an AS ABAP, AS ABAP+Java, or AS Java system. However, the infrastructure for starting and stopping is basically identical, and is introduced in this lesson using an AS ABAP+Java system as an example. On an SAP NetWeaver AS running as an ABAP+Java system, the Java stack is automatically started and stopped by the ABAP dispatcher using the *Startup and Control Framework* (which this lesson does not describe in more detail). The tools used to run the start/stop process are discussed in a later lesson.

Lesson Objectives

After completing this lesson, you will be able to:

- Describe the general start process for an SAP NetWeaver AS ABAP.
- Describe the general start process for an SAP NetWeaver AS ABAP+Java.
- Describe which profiles are analyzed in the start process.

Business Example

As the administrator of SAP systems, you need to stop the systems for maintenance purposes or after changing system parameters, and then restart them.

Starting and Stopping an SAP NetWeaver AS ABAP+Java

The instances are started and stopped using tools such as the SAP Management Console (SAP MC). In an instance of a dual-stack system (ABAP+Java), the Java stack is started by the ABAP dispatcher using the *Startup and Control Framework*, which then starts the Java dispatcher and the server processes.

The Java cluster elements are started using the *Startup and Control Framework*.

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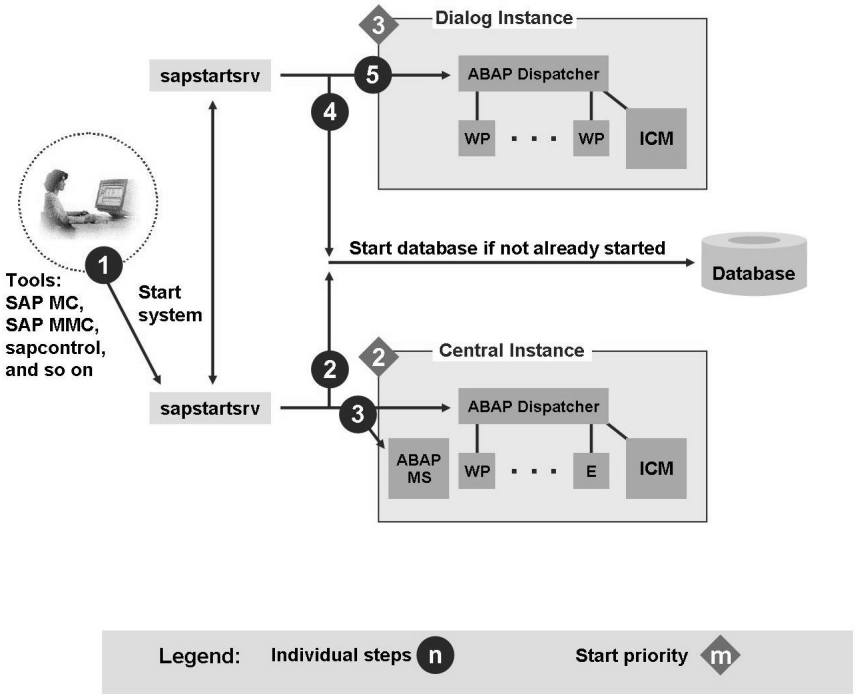

Figure 18: Starting an SAP NetWeaver AS ABAP without an ABAP Central Services Instance

The tools (explained in more detail in a later lesson) can be used to start or stop individual instances or also the entire system. To start and stop individual instances, follow the sequence described above. However, the infrastructure also allows the entire system to be started, stopped, or restarted.

The tools for starting and stopping communicate with the *sapstartsrv* process, which also provides the functions of a Web service. The *sapstartsrv* process is a service in Windows operating systems; in other operating systems, it is scheduled as a daemon. There is a separate *sapstartsrv* process for each instance, which is responsible for starting and stopping the instance. If a *sapstartsrv* process now receives the start command for the system, it must forward this to the other *sapstartsrv* processes, which is done through HTTP(S). The *sapstartsrv* processes write a 1-byte control file to the *$(DIR_GLOBAL)\sapcontrol* directory every minute. The name of the control file indicates the port and host on which the process can be accessed, and the priority of its instance.

Using the control files, the *sapstartsrv* process recognizes which other *sapstartsrv* processes are still active, and starts them according to their priority.

In the above figure, the central instance is started first when the overall SAP system is started (step 1). This is because it has an enqueue work process and is therefore priority 2. It also has no (Java) Central Services or ABAP Central Services instance. At this point, a check is performed to see whether the database is running (step 2). If it is not running, it is started. For the sake of simplicity, the

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sapcpe (Central Patch Environment) step has been omitted. This is run as the first step in the start process of every instance (and, if relevant, before the database is started). The ABAP message server and the ABAP dispatcher are now started (step 3). The ABAP dispatcher starts its work processes and the ICM. The dialog instance is then started since it has priority 3. The start process is similar to the central instance start process, but no ABAP message server is started because there is only one per system. In step 4, the system checks whether the database is running. The database was started when the central instance was started. Although this appears unnecessary, the reason becomes clear in the next example based on an AS ABAP system with an ABAP Central Services instance. In step 5, the ABAP dispatcher is started, which starts its work processes and the ICM.

Hint: The database is only started if it runs on the same host as the instance. In a distributed installation, the database has to be started separately.

In the start process, a *timeout* is specified for starting instances with the next highest priority. This means that all instances with the same priority have to be started within the timeout so that instances with the next highest priority can be started. With a *timeout* of 300 seconds, in our case this means that the dialog instance is not started if the start process of the central instance lasts longer than five minutes. The dialog instance can be started subsequently, or the value for the system start *timeout* can be adjusted.

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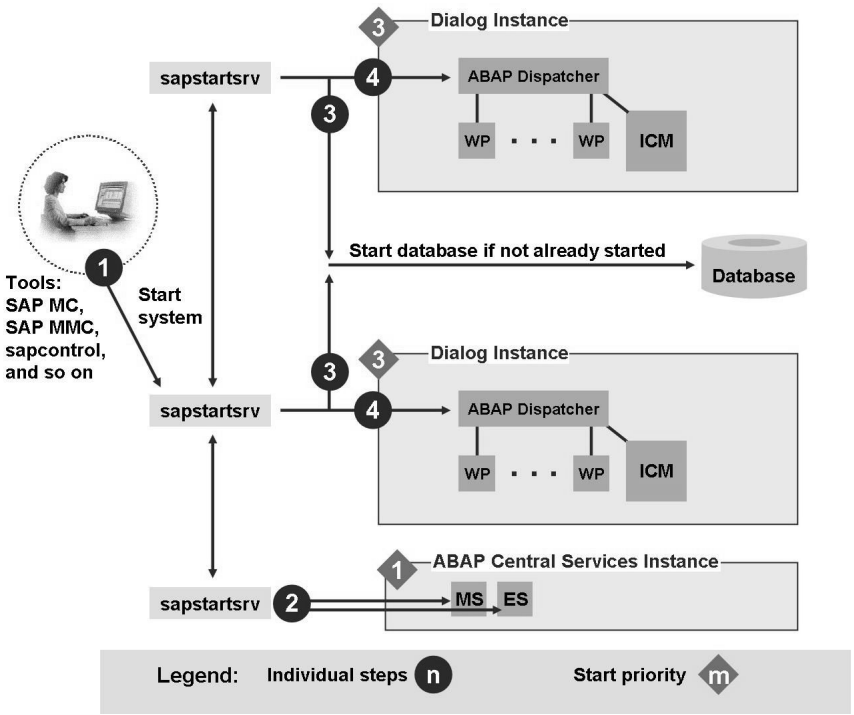

Figure 19: Starting an SAP NetWeaver AS ABAP with an ABAP Central Services Instance

In the above figure, when the overall SAP system is started (step 1), the ABAP Central Services instance is started first (step 2) because it has priority 1.

All dialog instances are then started.

Note: In a system with an ABAP Central Services instance, there is no longer a central instance because the defining processes (enqueue work process and message server) have been relocated. This means that besides the ASCS instance, there are only the dialog instances (with priority 3).

During the start process of the dialog instances, the system first checks whether the database is already running (step 3). If it is not running, it is started. In step 4, all instances are starting the ABAP dispatcher. The ABAP dispatcher starts its work processes and the ICM.

If the instances are started separately, the ABAP Central Services instance must be started first. Each dialog instance can then be started separately and in any order. It is therefore important that each dialog instance checks whether the database is running, and starts it if necessary.

Hint: The database is only started if it runs on the same host as the instance. In a distributed installation, the database has to be started separately.

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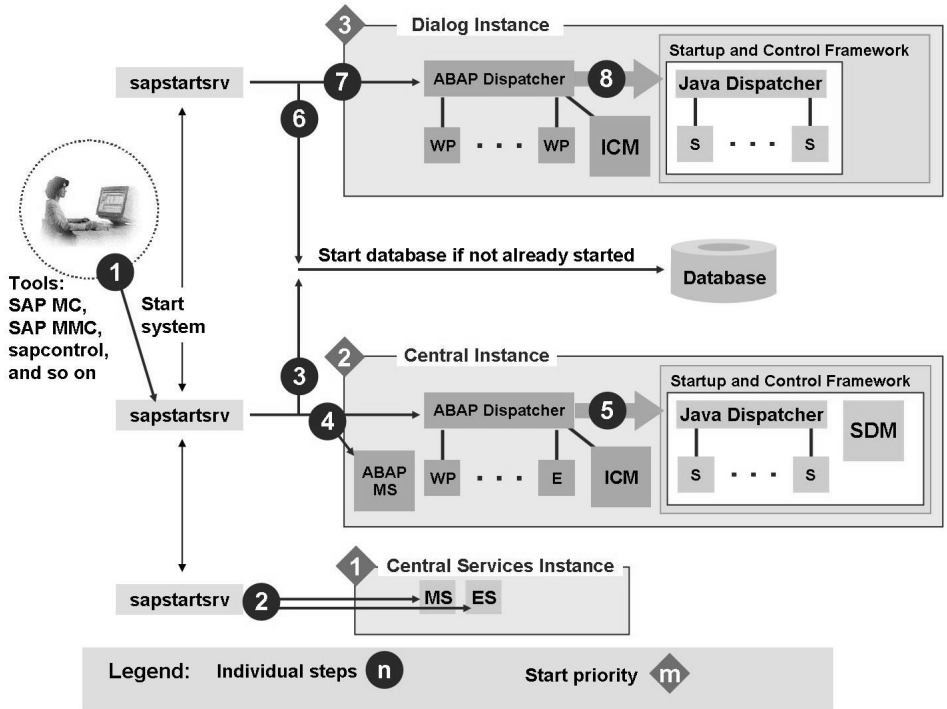

Figure 20: Starting an SAP NetWeaver AS ABAP+Java

In the above figure, when the overall SAP system is started (step 1), the Central Services instance is started first because it has priority 1. The central instance has priority 2 (since no ABAP Central Services instance was installed); therefore, it is the next one to be started. At this point, a check is performed to see whether the database is running (step 3). If it is not running, it is started. The ABAP message server and the ABAP dispatcher are now started (step 4). The ABAP dispatcher starts its work processes, the ICM, and the Startup and Control Framework (step 5), which the Java dispatcher, the SDM (Software Deployment Manager), and the Java server processes belong to. The dialog instance is then started (steps 6, 7 and 8) since it has priority 3. The start process is similar to the central instance start process, but no ABAP message server is started because there is only one per system.

Hint: The database is only started if it runs on the same host as the instance. In a distributed installation, the database has to be started separately.

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Stop Process: Flow

An SAP system is stopped in the opposite sequence. The instances with enqueue are always stopped last. If the ABAP dispatcher receives the stop command (and the system is an AS ABAP+Java system), it transfers this to the *Startup and Control Framework* and the Java dispatcher, and the Java server processes are stopped. The SDM is also stopped in the central instance.

Start Process of an Individual Instance and Evaluation of Profiles

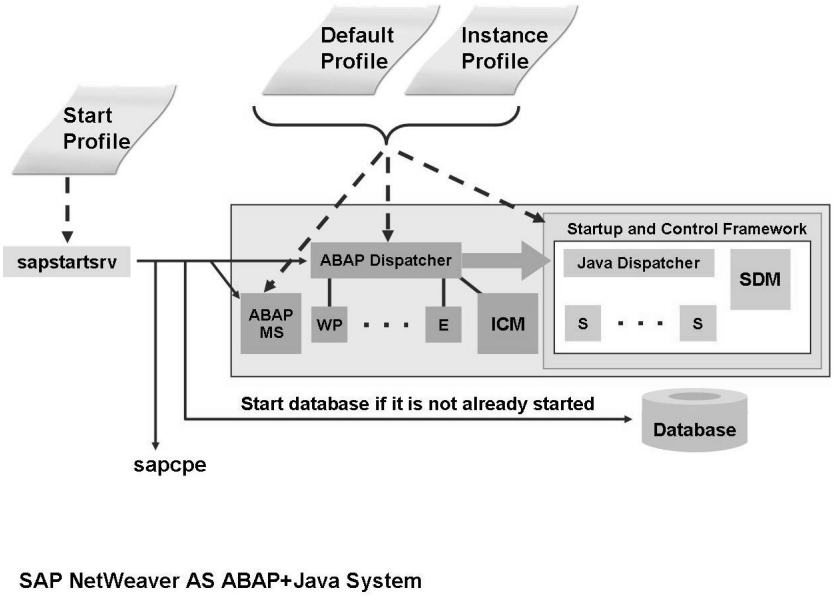

Figure 21: Evaluation of the Start, Default, and Instance Profiles

Using an example of the central instance of a dual-stack system without an ABAP Central Services instance, the start process of an individual instance is shown here, as well as the step in which the particular profiles are evaluated. The *sapstartsrv* process evaluates the start profile when it starts. This defines which programs the process has to start or execute when its instance starts.

First, the *sapcpe* program is executed, which replicates the kernel. After this, the system checks whether the database is already running, and if necessary started (this step is omitted in the case of an ABAP Central Services instance and (Java) Central Services). The start profile for the central instance specifies that the *sapstartsrv* process first starts the ABAP message server. The ABAP message server evaluates the parameters of the default and instance profile, and starts with this parameterization. The *sapstartsrv* process then starts the ABAP dispatcher, which evaluates the default and instance profile, and starts with this parameterization. The profile parameters define several functions including what the ABAP dispatcher should start (for example, work processes, ICM, Java

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Startup and Control Framework, and so on). It passes on the parameterization to the processes that it starts, for example its work processes and the ICM. Furthermore, the ABAP dispatcher starts the Startup and Control Framework, which also evaluates the default and instance profile. If necessary, the *sapstartsrv* process also starts additional programs such as IGS Watchdog or *saposcol* (SAP Operating System Collector) on non-Windows operating systems, which collects the performance data of the operating system.

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Lesson Summary

You should now be able to:

- Describe the general start process for an SAP NetWeaver AS ABAP.
- Describe the general start process for an SAP NetWeaver AS ABAP+Java.
- Describe which profiles are analyzed in the start process.

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Lesson: Tools for Starting and Stopping SAP Systems

Lesson Overview

This lesson presents the tools for a technical implementation of start and stop processes for SAP systems. The SAP Management Console (SAP MC) and the *sapcontrol* program can be used for the start and stop process regardless of the operating system.

Lesson Objectives

After completing this lesson, you will be able to:

- Operate the tools to start and stop an SAP NetWeaver AS ABAP+Java

Business Example

You are using an SAP NetWeaver Application Server with operating system platforms such as Microsoft Windows or UNIX. To start and stop the SAP systems, you require information about the use of the available tools.

The SAP Management Console (SAP MC)

As of SAP NetWeaver Release 2004, a new operating system-independent application is supplied with the SAP Management Console (SAP MC) (see SAP Notes 1014480 and 995116). This allows you to display various monitoring information and perform administration tasks such as start and stop operations in the same interface on different operating systems. The tool is a standalone Java application, which can be started either as an applet or locally. The SAP MC is supplied as standard with the kernel and is ready for use without any additional installation.

The SAP MC is a Java application, which is started as a Java applet by default. All you need is a web browser. To use the applet correctly, you need a JRE (Java Runtime Environment) Version 1.4.2 or higher. The relevant Java plug-in for the browser must also be activated correctly. To start the SAP MC after installing the relevant SAP NetWeaver AS, enter the following URL in your browser:

http://<host name>:5<instance number>13

Or, if you have configured https in sapstartsrv (see SAP Note 1036107):

https://<host name>:5<instance number>14

The *sapstartsrv* process now uses its web service function and sends the Java applet to the browser that is starting the SAP Management Console.

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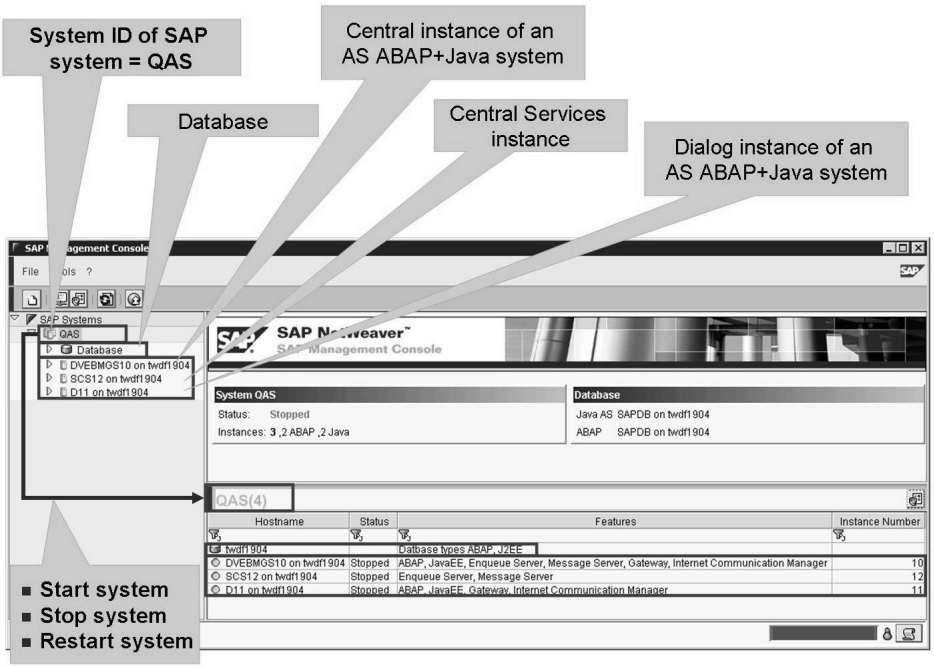

Figure 22: The SAP Management Console

The SAP Management Console (SAP MC) indicates the status of all instances of the system using colors. The colors have the following meaning for the system or an instance:

Gray

Stopped

Yellow

Not fully running

Green

Fully running

Red

Errors

The left section of the SAP MC shows the system as a tree structure in which the individual elements can be expanded to view additional details. When you select the system, the status of the individual instances is shown in the right section of the SAP MC, and the *Features* field shows which services the instances provide.

Starting the SAP System with the SAP Management Console

Once the system is selected, you can use the right mouse button to start, restart, or stop the entire system. The SAP MC works according to the start priorities, and starts or stops the SAP system in the correct sequence. When the SAP MC is reopened, the user is prompted for the user name and password of the <sid>adm

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user at the first *start*, *stop* or *restart* process. This is the user on the operating system where the instance or SAP system is installed. This user is authorized to start or stop an SAP system or instance. The figure *SAP MC: System Start* shows the start process of the entire system where all priority 1 instances are already running (in this case, the Central Services instance), and where the priority 2 instance (in this case, the central instance) is still running through its start process.

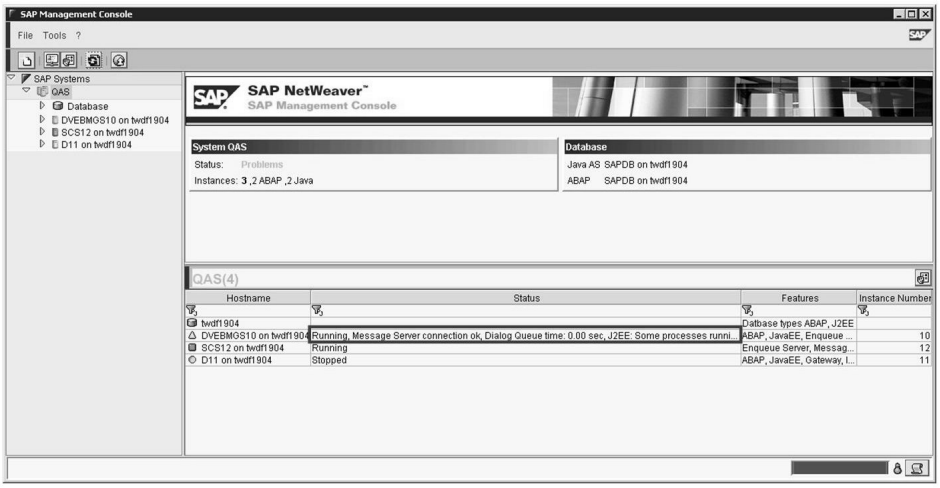

Figure 23: SAP MC: System Start

When an instance is started, the following statuses are shown in this view: “Started”, “Running, Message Server connection ok, ...J2EE...”, “Running”. Since the system shown here is an AS ABAP+Java system, “J2EE....” shows the status of the Java stack. “Running, Message Server connection ok, ...” indicates that the ABAP stack processes have been fully started. If all ABAP and Java processes are running, this view shows the status “Running”. Sometimes, the status “Dialog Queue standstill” is displayed during the start process of an AS ABAP system. This indicates that the start process of the AS ABAP has not fully finished running, and that work processes may not yet be fully initialized. We recommend logging on to the system or instance after the start process to check system availability.

During the start process for the system, a *start timeout* query is sent. If all instances with the same priority do not start within this period, instances with a higher priority cannot be started. The default value is 300 seconds, but this value can be customized in the query dialog box. In the figure *SAP MC: System Start*, the Central Services instance started within the *start timeout* period, which means that instances with the next highest priority (priority 2) have been started: in this case, the central instance. The timeout then starts again. If the start process for the central instance does not end within the *start timeout*, the dialog instance (priority 3) is not started. The start process of the central instance is not terminated, but continues to run.

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Stopping the SAP System with the SAP Management Console

When an SAP system is stopped using the SAP MC, the process follows the opposite sequence to the start process of the system, taking the priorities into account. However, the database is not stopped. After calling the stop process, a *hard* or *soft shutdown* query is sent. A soft shutdown means that no further user requests are received by the instance, and processes are terminated if no process is handling a query. However, this is only implemented as of Basis Release 7.11. On older releases, you should therefore select the hard shutdown.

The *stop timeout* specifies how much time instances with the same priority are given to complete the stop process before instances with the next lowest priority are stopped. If all dialog instances cannot be stopped within 300 seconds, the central instance is stopped once this timeout has expired, and so on.

Starting an Instance with the SAP Management Console

In addition to starting and stopping entire systems, individual instances can also be started, stopped, or restarted with the SAP MC. To do so, select the instance and use the right mouse button to perform the required action. The administrator is responsible for maintaining the correct sequence.

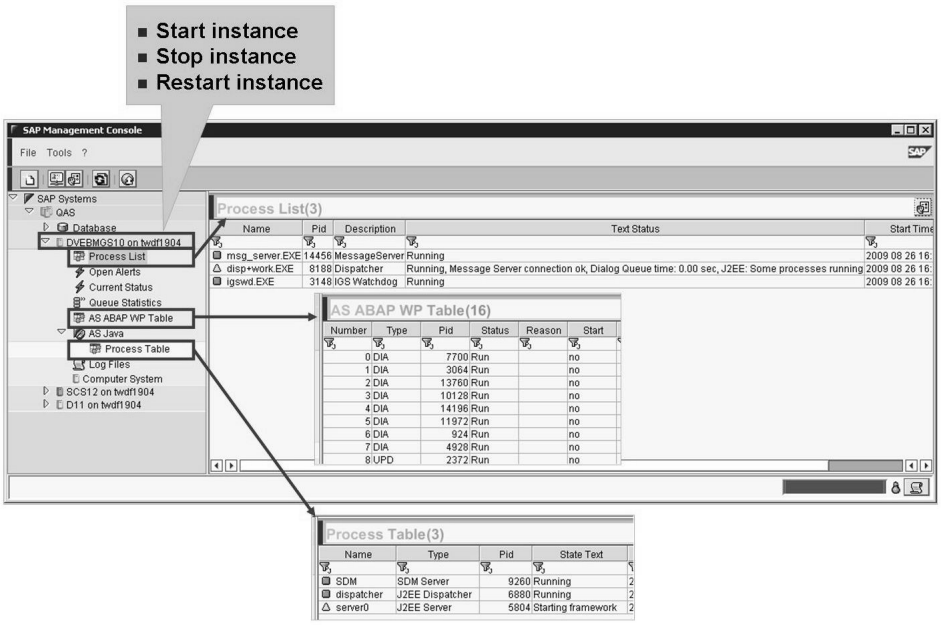

Figure 24: SAP MC: Instance Start

When you expand the instance, other elements are displayed in the SAP MC including the *Process List*, *AS ABAP WP Table*, and the *Process Table* with the processes of the Java stack of this instance. The *Process List* provides information about the start process, and indicates which processes have been started by the *sapstartsrv* process along with their status. At the beginning of the start process,

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you can also use the *Process List* to view the *sapcpe* process, and if relevant, check whether the database has started (*strdbs*). As shown in the figure *SAP MC: Instance Start*, you can also see the ABAP message server, the IGS Watchdog, and the ABAP dispatcher under the central instance. In this example, the ABAP dispatcher also shows the status "Running, Message Server connection ok, ...J2EE..." as discussed above. In the *AS ABAP WP Table*, you can check whether work processes have already been started, and whether they have completed their initialization processes (the *Start* column shows *yes*). The *Process Table* of the Java stack shows the status of the Java processes. In an AS ABAP+Java system, the status of the ABAP dispatcher only changes to green once all Java processes and all ABAP processes are running. This is shown in the figure *SAP MC: Start Process of the Instance is Complete*.

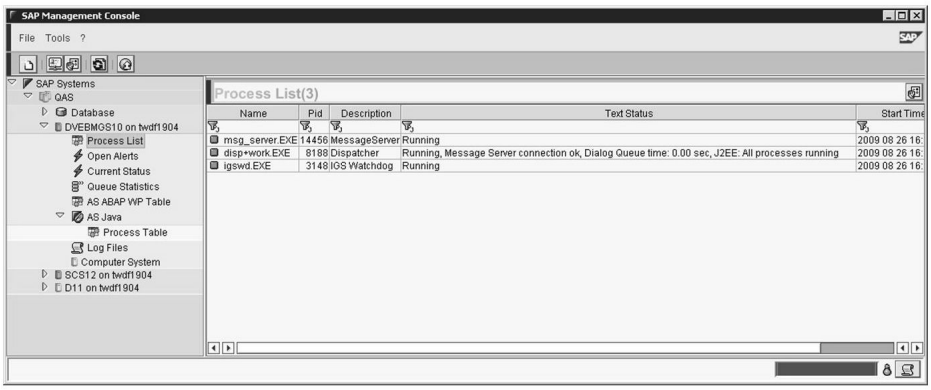

Figure 25: SAP MC: Start Process of the Instance is Complete

Stopping an Instance with the SAP Management Console

The stop process of an instance is the same as the stop process of a system: only the selected instance is stopped. Once any of the processes that belong to an instance are no longer running, or processes are stopping, the instance is colored yellow. As with the start process of an instance, the *Process List* shows the status of the individual processes. In an AS ABAP+Java system, the ABAP dispatcher is only stopped once all ABAP processes and all Java processes have been stopped.

Further Information about the SAP MC and sapstartsrv

You can view the SAP MC version in the menu by selecting *?* → *About*. Very old versions of the SAP MC do not show any version information, and should be replaced with a later version.

The SAP MC allows you to display *Developer Traces*. For example, for work processes or the ABAP dispatcher, this is possible using the right mouse button.

The *sapstartsrv* process contains a web service interface, which provides a number of functions for managing and monitoring an SAP instance, in particular the SAP Management Console (SAP MC). The *sapstartsrv* process also has

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a limited web server function that allows you to download all files under *DIR_EXECUTBALE/servicehttp* using HTTP(S). This can be used, for example, to start the SAP Management Console from a web browser on any host. If no other URL is specified (such as http://<hostname>:5$$13), the system automatically redirects you to http://<hostname>:5$$13)/servicehttp/sapmc/sapmc.html, for example, to start the SAPMC.

The *sapstartsrv* process manages an internal list of protected operations. These can be changed, if necessary, with the start profile parameter *service/protectedwebmethods*. With the start profile parameter *service/hostname*, you can also determine the IP address / host name to which the web service port should be connected (default: all / 0.0.0.0) to limit accessibility in the network. You then have to restart *sapstartsrv*. To do this, refer to SAP Note 927637 - *Web service authentication in sapstartsrv as of release 7.00*.

SAPControl

SAPControl allows the web services of the *sapstartsrv* processes to be addressed. SAPControl is part of the kernel, and is available on all operating systems. Calling *sapcontrol* without any other options provides the syntax description. The figure *SAPControl: Syntax and Examples* shows the basic structure of the syntax with some selected examples.

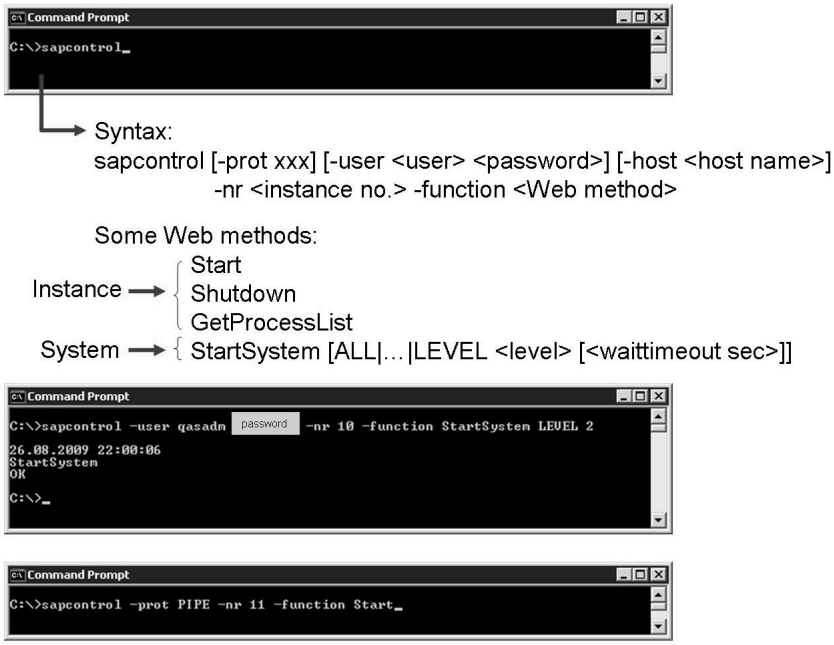

Figure 26: SAPControl: Syntax and Examples

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In the first example “sapcontrol -user qasadm password -nr 10 -function StartSystem LEVEL 2”, the web method *StartSystem* is called with the parameter *LEVEL* and the value 2 for the level. As with the SAP MC, a *sapstartsrv* process that is used to start the instances is addressed. “LEVEL 2” means that all instances with priority 1 are started first (unless they are already running). In our AS ABAP+Java system, this is the Central Services instance. Then the central instance (and if relevant, the database) is started, but no further instances. It is not important whether the instances are running on the same or different hosts. With *StartSystem LEVEL 3* (corresponds to *StartSystem ALL*), all the instances of the system are started according to their priority, unless they are already running. This is the same procedure used to start the system using the SAP MC. *StopSystem LEVEL 2* means that all priority 3 and priority 2 instances are stopped if they are still running. *StopSystem ALL* has the same meaning as *StopSystem LEVEL 1*.

In the second example, “sapcontrol -prot PIPE -nr 11 -function Start”, a *Trusted Connection* is used. No user name or password are specified because the operating system authentication as <sid>adm is sufficient. However, it is only possible to call web methods for the local computer. In the example, the dialog instance (instance number 11) is started. The function *StartSystem LEVEL 3* is not possible because *StartSystem* may have to communicate with systems outside the host, which is not permitted under *Trusted Connections*. This means only functions for instances are possible.

Caution: Trusted Connection for Windows: *-prot PIPE*

Trusted Connection for Unix: *-prot NI_HTTP*; this is the default value.

See also SAP Note 927637 - *Web service authentication in sapstartsrv as of release 7.00*

Special Features when Starting and Stopping Under Microsoft Windows

With the Microsoft Windows operating system, you can use both the SAP Management Console and the Microsoft Management Console with an SAP snap-in (SAP MMC) to start and stop an SAP system.

The SAP MMC allows you to start and stop the instances of the SAP system. For some databases, you can also display administration information and the status of the database. Some database types can also be managed using the SAP MMC.

The information displayed in the SAP MMC, and the start and stop procedures are the same as the browser-based SAP Management Console (SAP MC). This is illustrated by the next two figures.

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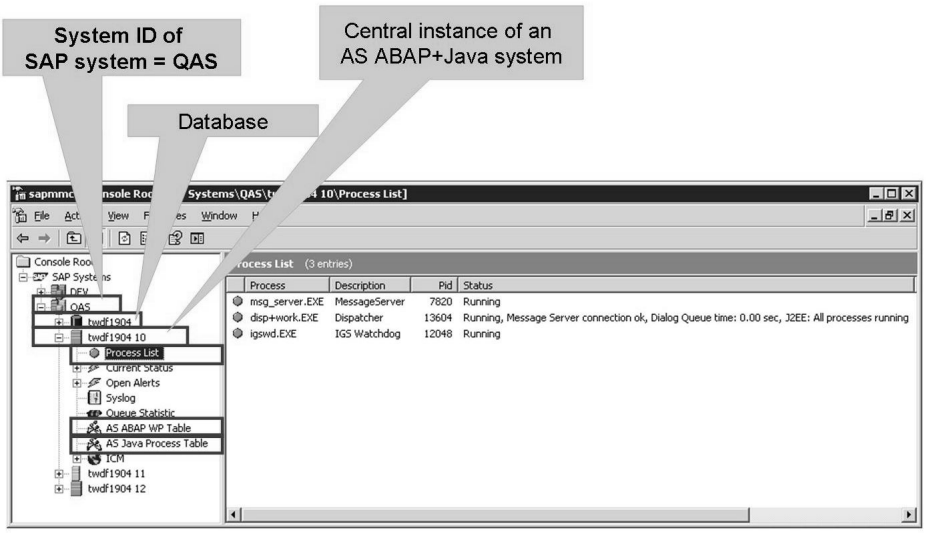

Figure 27: SAP MMC

One small difference to the SAP MC is shown in the figure *SAP MMC*. Here, the instances are not marked with their directory name of the file system, but with the host name and instance number. In exactly the same way as the SAP MC, you can see which instance is the central instance in the *Process List*, and so on. Equally, you can use the SAP MMC to start and stop the entire system according to the priorities of the instances. It is also possible to start and stop individual instances. When you restart the SAP MMC, you must enter the <sid>adm password the first time you start or stop the system or instance.

Hint: In future, the latest versions of the SAP MMC will be available on the *SDN*, and an update link will be integrated into the SAP MMC.

You can find the update link and further information at the bottom of the following page under "More Information and Download" SAP Microsoft Management Console (SAP MMC): http://www.sdn.sap.com/irj/sdn/server-infrastructure

Under Windows, the SAP system can also be started and stopped without a GUI by calling a command using the executable files startsap.exe and stopsap.exe. This can be done using a simple telnet access.

To start an instance of the SAP system, open a telnet connection and enter the following command: **`startsap name=<SID> nr=<instance nr.> SAPDIAHOST=<host name>`**

To stop an instance of the SAP system, open a telnet connection and enter the following command: **`stopsap name=<SID> nr=<instance nr.> SAPDIAHOST=<host name>`**

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For the SAPDIAHOST parameter, enter the name of the host on which the instance is to be started.

Special Features of Starting and Stopping Under UNIX

Previously on SAP systems installed under UNIX, you executed the scripts *startsap* and *stopsap* to initiate the start and stop processes. If multiple SAP instances are installed on one physical server, you add the instance name to the names of the scripts *startsap* and *stopsap*.

The script `startsap` can be called with the following options:

- `DB`: starts the database system;
- `R3`: starts the instances and associated processes for the instance
- `J2EE`: starts the instances and associated processes for the instance
- `ALL`: starts the database system and the instance (default setting, can be omitted).

The `stopsap` script can be called with the following options:

- `DB`: stops the database system using the script `stopdb`;
- `R3`: stops the instances of the SAP system;
- `J2EE`: stops the instances of the SAP system;
- `ALL`: stops the database system and the instance (default setting, can be omitted).

The database and SAP instances can each be started and stopped separately with the options *DB* or *R3*, for example **`startsap R3 DVEBMGS00`**.

Caution: The option *J2EE* can be used in the same way as the option *R3*. In the case of the SAP NetWeaver AS ABAP+Java, both the ABAP stack and the Java stack are started and stopped.

Organizational Information: Stopping the SAP System

It may be necessary to stop an SAP system for a variety of reasons, such as to restart after permanently changing profile parameters, before installing kernel patches, or to allow hardware upgrades to be carried out.

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Check the status of

- **Logged-on users *SM04***
- **Background processing *SM37* and Batch Input *SM35*:**
  - **Are jobs active or planned?**
  - **Are jobs triggered by external systems?**
- **Update *SM13***
- **External connections**

Send a system message *SM02*

Figure 28: Before Stopping the SAP System

Before you stop the system, you should check the status of the system. This includes checks such as:

- Active users:

  Check which users are logged on using the User List (SM04).

- Background processing:

  Check which jobs are active using the Job Overview (SM37). If jobs are terminated by starting the system, these must be rescheduled. Jobs that are scheduled for the time in which the system is stopped run automatically once the system is restarted.

- Batch Input:

  The transaction Batch Input: Session Overview (SM35) displays running batch input jobs.

- Update:

  Use the Update Overview (SM13) to check whether update processes are terminated by the system stop. These update records are rolled back during the stop, and are set to the status “init”. These records are then updated again during the restart.

Before you stop your system, you should inform users using a system message (SM02).

Generally, it is not easy to stop a system or an instance; there are some organizational conditions to note. The “downtime” must be scheduled together with the relevant department, or downtimes must be logged. SAP Solution Manager provides the *Downtime Management* work center to simplify planning

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and execution. Systems and instances can also be started or stopped in *Downtime Management*. Just like the SAP MC and SAPControl, the *Downtime Management* work center also uses the *sapstartsrv* process.

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Exercise 5: Starting and Stopping the SAP System

Exercise Objectives

After completing this exercise, you will be able to:

- Start and stop an SAP system.

Business Example

As the administrator of SAP systems, you need to stop the systems for maintenance purposes or after changing system parameters, and then restart them.

Task 1: Stopping with the SAP Management Console

Stop the SAP system using the SAP Management Console.

1. Before you stop the SAP system, check which users are logged on to your system. Send a system message.
2. Stop the SAP system using the SAP Management Console.

   To do this, log on to the server for your training system with the Terminal Server Client.

Task 2: Starting with the SAP Management Console

Start the SAP system using the SAP Management Console.

1. Start the SAP system using the SAP Management Console. Monitor the start of the processes in your system.

   Your instructor will provide you with the name of the server on which you can start the SAP MC.
2. Which process types are started at operating system level after your system is started up?
3. Check whether your system started correctly. To do this, log on to your SAP system and call the process overview. Compare the list of processes at operating system level with the process overview in the SAP system.

Task 3: (Optional) stopping from the Command Line

Stop the SAP system using a command call.

1. Log on to the server with the user <sid>adm over a telnet connection.
2. Check whether your SAP system is running at operating system level.

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3. Use the *sapcontrol* command in the telnet connection to stop the entire SAP system.

Task 4: (Optional) starting from the Command Line

Start the SAP system using a command call.

1. Check whether your SAP system has stopped at operating system level.
2. Use the *sapcontrol* command in the telnet connection to start the entire SAP system.

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Solution 5: Starting and Stopping the SAP System

Task 1: Stopping with the SAP Management Console

Stop the SAP system using the SAP Management Console.

1. Before you stop the SAP system, check which users are logged on to your system. Send a system message.

   a) You can use the global user overview to display the users logged on to your SAP system: *Tools → Administration → Monitor → Performance → Exceptions/Users → Active Users → Global Users* (transaction AL08). In this transaction, you will find your own user more than once. Transaction AL08 uses RFC connections to collect the user information for all instances. This means that your own user, which initiates the RFC connections, is displayed additionally once per instance.

   To send a system message to the users, choose *Tools → Administration → Administration → System Messages* (transaction SM02). Choose the *Create* pushbutton, enter the system message text, and choose *Save*.

2. Stop the SAP system using the SAP Management Console.

   To do this, log on to the server for your training system with the Terminal Server Client.

   a) Start a Web browser and enter **`http://twd-fxxxx.wdf.sap.corp:5$$13`** in the address bar (where **`xxxx`** stands for the number of the server assigned to your group and **`$$`** represents the instance number) and choose *Start*.

   In the SAP MC, select the required system or individual instance, and choose the *Stop* function from the context menu (right mouse button). The system now requires you to authenticate your ID. To do this, enter the user **`<sid>adm`** with the password assigned for your user. Depending on whether you selected an individual instance or the SAP system, either an individual instance or the entire SAP system is stopped.

Task 2: Starting with the SAP Management Console

Start the SAP system using the SAP Management Console.

1. Start the SAP system using the SAP Management Console. Monitor the start of the processes in your system.

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Your instructor will provide you with the name of the server on which you can start the SAP MC.

a) Start a browser on the host specified by your instructor and enter **`http://twdfxxxx.wdf.sap.corp:5$$13`** in the address bar. Then choose *Start*.

Choose the node for the central instance in the SAP Management Console tree. Select the desired instance and choose the *Start* function from the context menu (right mouse button). Start the dialog instance in the same way.

Hint: You should always start the central instance before the dialog instance.

2. Which process types are started at operating system level after your system is started up?

a) You can monitor the processes at operating system level with the *Process Explorer* (Desktop shortcut).

The following processes are started at operating system level after your system is started up: *saposcol.exe*, *msg_server.exe*, *gwrd.exe*, *icman.exe*, and several *disp+work.exe*. Furthermore, Java processes can belong to your instance (these have the process names: *jlaunch* or *jcontrol*).

3. Check whether your system started correctly. To do this, log on to your SAP system and call the process overview. Compare the list of processes at operating system level with the process overview in the SAP system.

a) Log on to your SAP system. The process overview *Tools → Administration → Monitor → System Monitoring → Process Overview*, transaction SM50) displays a list of work processes for the instance to which you are logged on. The dispatcher and all work processes are visible at operating system level as *disp+work.exe*. An assignment can be made using the process ID.

Task 3: (Optional) stopping from the Command Line

Stop the SAP system using a command call.

1. Log on to the server with the user <sid>adm over a telnet connection.

a) Use the tool specified by the instructor to create a telnet connection to your server. Log on with the user **`<sid>adm`** and the password assigned for your user.

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2. Check whether your SAP system is running at operating system level.
   a) You can do this, for example, by executing the *Process Explorer* program to display an overview of operating system processes.
3. Use the *sapcontrol* command in the telnet connection to stop the entire SAP system.
   a) In the telnet console, enter the command **`sapcontrol -user <sid>adm <password> -nr <instance number> -function StopSystem ALL`** to stop your system. Replace the specifications in the angled brackets with the values for your system. For example, **`sapcontrol -user devadm password -nr 00 -function StopSystem ALL`**.

Task 4: (Optional) starting from the Command Line

Start the SAP system using a command call.

1. Check whether your SAP system has stopped at operating system level.
   a) You can do this, for example, by executing the *Process Explorer* program to display an overview of operating system processes.
2. Use the *sapcontrol* command in the telnet connection to start the entire SAP system.
   a) In the telnet console, enter the command **`sapcontrol -user <sid>adm <password> -nr <instance number> -function StartSystem ALL`** to start your system. Replace the specifications in the angled brackets with the values for your system. For example, **`sapcontrol -user qasadm password -nr 00 -function StartSystem ALL`**.

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Lesson Summary

You should now be able to:

- Operate the tools to start and stop an SAP NetWeaver AS ABAP+Java

Related Information

SAP Help Portal: *help.sap.com → SAP NetWeaver*

http://www.sdn.sap.com/irj/sdn/server-infrastructure to download the SAP Microsoft Management Console (SAP MMC) and *How to use the SAPControl Web Service Interface*

For further information about the SAP Management Console, refer to the following SAP Notes:

936273 - *sapstartsrv for all platforms*

927637 - *Web service authentication in sapstartsrv as of release 7.00*

823941 - *SAP Start Service on Unix*

995116 - *Backward porting of sapstartsrv for earlier releases*

1014480 - *SAP Management Console (SAP MC)*

927637- *Web service authentication in sapstartsrv as of release 7.00*

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Lesson: System Start: AS ABAP Logs

Lesson Overview

In this lesson, you will become familiar with the most important log and trace files, in which the start of an ABAP-based SAP system is logged.

Lesson Objectives

After completing this lesson, you will be able to:

- Use the AS ABAP start logs to analyze problems

Business Example

Problems occurred when starting an SAP system. To correct these problems, the administrator analyzes logs and trace files that were generated during the system start.

Logging the Start Process

The start process is an especially important phase, which is logged by the operating system, the SAP system, and the database. If the SAP system does not start up, you can find the relevant error message in the log files. It may be that there were problems starting the database, meaning that the SAP system could not subsequently be started.

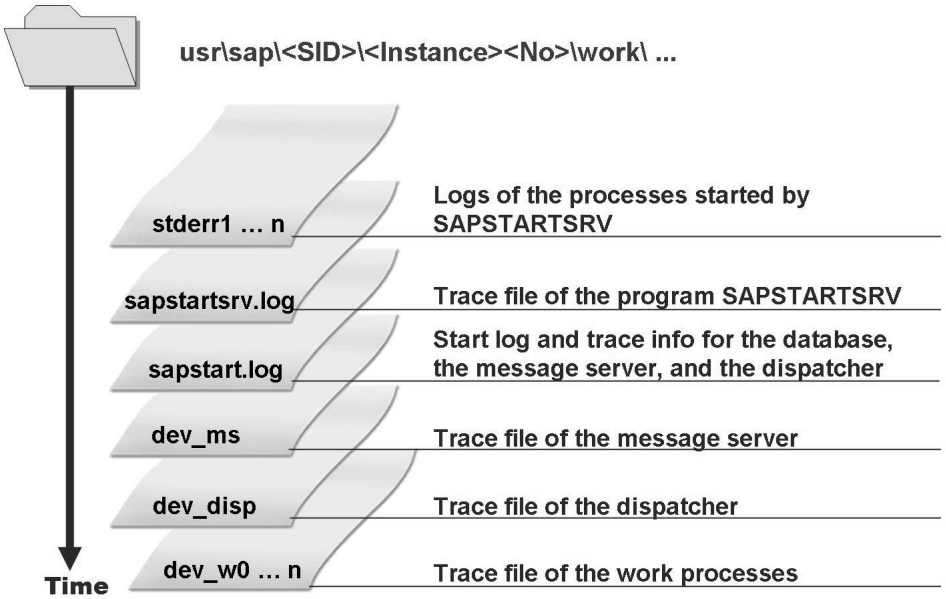

Figure 29: Logging the Start Process in the SAP System

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Logs about the start process of the SAP system are stored in the file system. If there are problems during the start, these logs can provide useful information such as error messages or problem descriptions. These files are stored in the home directory (*DIR_HOME*) of the relevant instance.

The log files *STDERR<n>* are created by *sapstartsrv* during the start process. The starting processes write to the individual files, depending on the sequence in which they are listed in the start profile. The contents of these log files therefore depends on the individual system setup, and could, for example, be as follows:

- STDERR1 Information about the start process of the database system.
- STDERR2 Information about the start process of the message server.
- STDERR3 Information about the start process of the dispatcher.

You can set the granularity of the logged information using the profile parameter *rdisp/TRACE* profile parameter. The possible values for this parameter are:

- 0: No trace
- 1: Error messages
- 2: Full trace. The trace entries depend on the SAP program that is being traced.
- 3: As 2: but data blocks are also traced.

The higher the trace level, the larger the amount of logged information, and therefore the larger the size of the files. You should therefore only increase the default value for short periods for problem analysis.

The trace level can be set separately for individual work processes in the process overview (transaction SM50).

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Problem Analysis

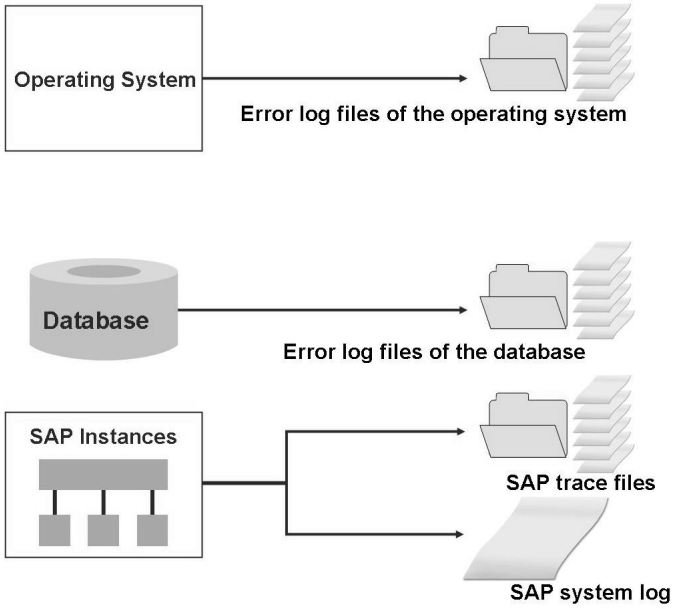

Figure 30: Problem Analysis

If the SAP system does not start correctly, this can be due to a variety of reasons. To analyze the problem, proceed as follows:

- Check the error messages and warnings of the respective operating system with the corresponding operating system tools.
- Check the status of the respective database system using the error log files.
- Check the start logs in the SAP MC. To do this, select the relevant instance, and choose *List Developer Traces* in the context menu.
- Check the error files *stderr<n>* that were created by the sapstartsrv process.
- Check the trace files of the individual SAP work processes:
  - *dev_ms*: Developer trace for the message server
  - *dev_rd*: Developer trace for the gateway
  - *dev_disp*: Developer trace for the dispatcher
  - *dev_w<m>* (m denotes the number of the work process): Developer trace for the work processes

If you can still log on to the SAP system, check the system log of the SAP system using transaction SM21.

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Lesson Summary

You should now be able to:

- Use the AS ABAP start logs to analyze problems

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Lesson: Appendix: Downtime Management

Lesson Overview

This lesson, gives you an overview of different downtimes.

Lesson Objectives

After completing this lesson, you will be able to:

- plan and schedule downtimes in your SAP Systems using the work center Downtime Management.

Business Example

You want to get a general survey about the system downtimes in your system landscape by using the work center Downtime Management.

Introduction

You can schedule and carry out downtimes of product systems, for example for maintenance, and record unexpected downtimes.

Downtime is the period when the system is not available due to activities such as:

- Importing support packages
- Upgrades
- Database, hardware, or operating system maintenance
- Configuration or customization changes
- Migration.

You must plan your downtime and ensure that:

- Downtime does not occur during critical and peak hours of system availability
- Downtime does not have any impact on the Service Level Agreement (SLA) and avoids any penalty

The various types of downtime and uptime are:

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Type	Definition	Occurrence		
		Single	Recurring	
			Weekly	Monthly
Planned Downtime	Downtimes planned, notified and agreed in advance	Yes	Yes	Yes
Unplanned Downtime	Downtimes not planned, notified and agreed in advance because of unexpected events	Yes	N/A	N/A
Crash Downtime	Unexpected downtime because of system failure; can only be documented after the event	Yes	N/A	N/A
Real Downtime	Period of a planned downtime during which the system is technically not available	Yes	Yes	N/A

The System Landscape Management work center comprises all tasks to handle downtime management in your system landscape. These are:

- Downtime Planning
- Notification Management
- Alert Management
- Task Management
- Execution of the Downtime

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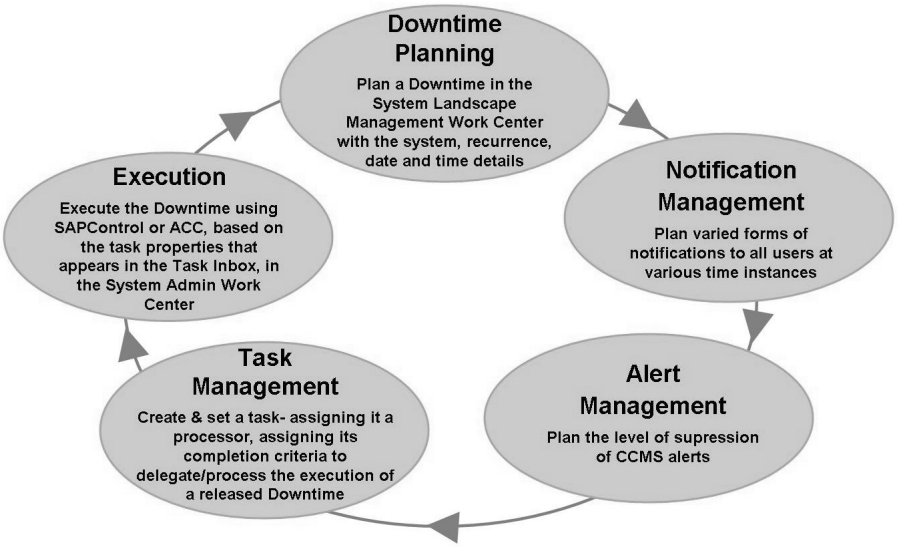

Figure 31: Overview: Downtime Management

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Lesson Summary

You should now be able to:

- plan and schedule downtimes in your SAP Systems using the work center Downtime Management.

Related Information

- SAP Education Course SM100 - *SAP Solution Manager Operation and Configuration*

  SAP Library for SAP Solution Manager 7.0 EHP1, *SAP Solution Manager → Using the Work Center*

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Unit Summary

You should now be able to:

- Describe the process of the start procedure of an SAP system
- Describe the structure of the file system for SAP instances
- Describe the general start process for an SAP NetWeaver AS ABAP.
- Describe the general start process for an SAP NetWeaver AS ABAP+Java.
- Describe which profiles are analyzed in the start process.
- Operate the tools to start and stop an SAP NetWeaver AS ABAP+Java
- Use the AS ABAP start logs to analyze problems
- plan and schedule downtimes in your SAP Systems using the work center Downtime Management.

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Test Your Knowledge

1. Log information for the dispatcher is stored in the file _____. You can control the granularity of the logged information using the profile parameter _____. There are _____ trace levels; error messages and warnings are displayed at level ___ by default.

   Fill in the blanks to complete the sentence.

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Answers

1. Log information for the dispatcher is stored in the file `dev_disp`. You can control the granularity of the logged information using the profile parameter *rdisp/TRACE*. There are four trace levels; error messages and warnings are displayed at level 1 by default.

   Answer: `dev_disp`, *rdisp/TRACE*, four, 1

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Unit 3

Introduction to System Configuration

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Unit Overview

In this unit, you learn how you can use profile parameters to configure an SAP system.

Unit Objectives

After completing this unit, you will be able to:

- Determine the configuration of profile parameters
- Adjust the profile parameters using profiles
- Set up a dynamic switch of work process types using operation modes

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Lesson: How the System Evaluates Its Parameters

Lesson Overview

This lesson explains the order in which the system evaluates profile parameters and where these parameters are stored.

Lesson Objectives

After completing this lesson, you will be able to:

- Determine the configuration of profile parameters

Business Example

You want to determine the profile parameters for your SAP system.

Configuration of Profile Parameters

The individual instances and the SAP system are configured using profile parameters. The default values for these parameters are defined in the program code of the kernel.

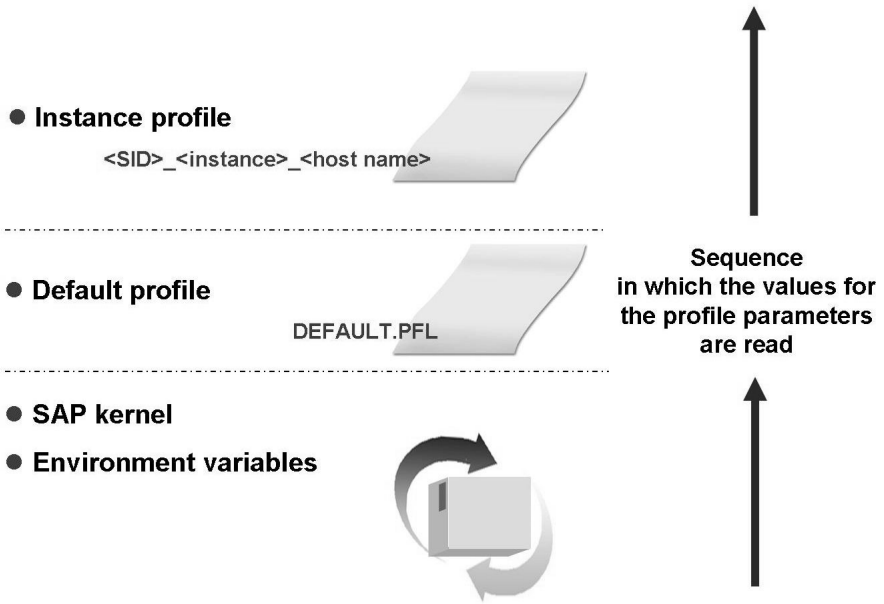

Figure 32: Assigning the Profile Parameters

You can change these default values using the profile files, which are read when an instance is started. These profile files are created during the installation of the system and can also be edited later.

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As the profile files are only read when the system is started, you must restart the instance or the entire system after changing individual parameters.

Dynamic switching while the system is running is only possible for a small number of profile parameters.

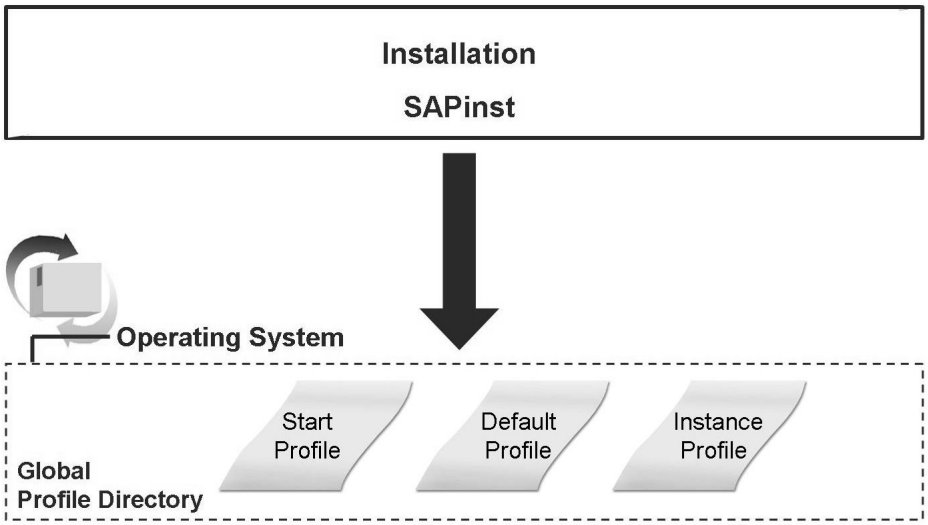

Figure 33: Profile Files at Operating System Level

The profile files are automatically created during installation. After installation is complete, the profile files are stored at operating system level in the directory: *\usr\sap\<SID>\SYS\profile*. This directory can be read by all instances of an SAP system using the share or mount technique.

The SAP system has three types of profiles. These are:

- Start profile
- Default profile
- Instance profile

In principle, you can change these files with operating system tools (editors). In the process, users must themselves ensure that the changes are performed correctly. Parameters that are set incorrectly can lead to the system not starting. It is far more convenient and safer to change the profile parameters using the tools in the SAP system.

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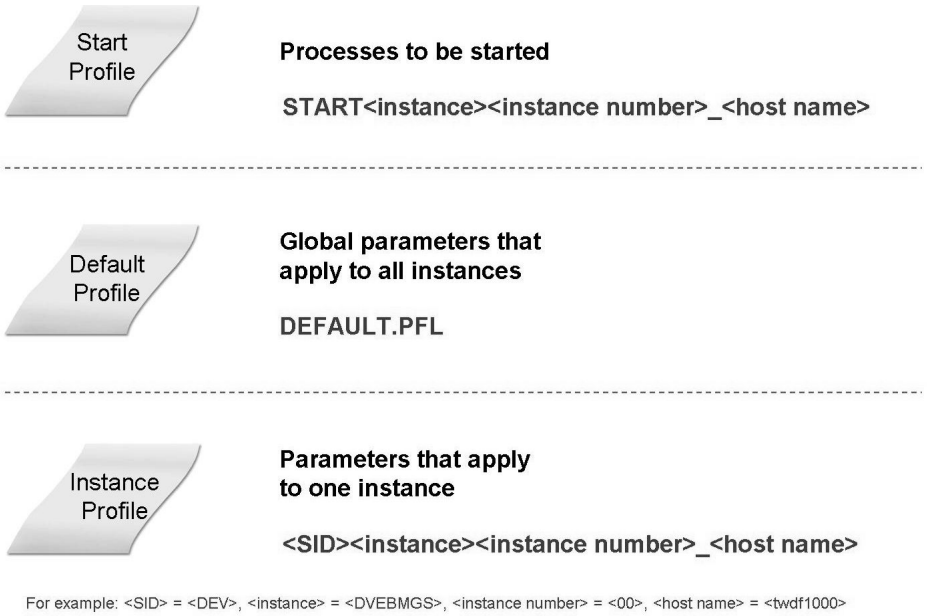

Figure 34: Profile Files: Overview

The instance-specific start profile (*START<instance><instance number>_<host name>*), specifies which processes are to be started for each instance. These are, for example, the message server and the dispatcher.

There is only one default profile (*DEFAULT.PFL*) for each SAP system, and it is read by all instances. It contains system-wide settings such as the system name, the name of the database server, the name of the enqueue server, or also the default logon client.

The instance profile (*<SID>_<instance><instance number>_<host name>*) defines parameters that apply for one instance, such as the number and type of work processes, or the definition of the size and allocation of the main memory area used by the SAP system. The instance profile is therefore instance-specific.

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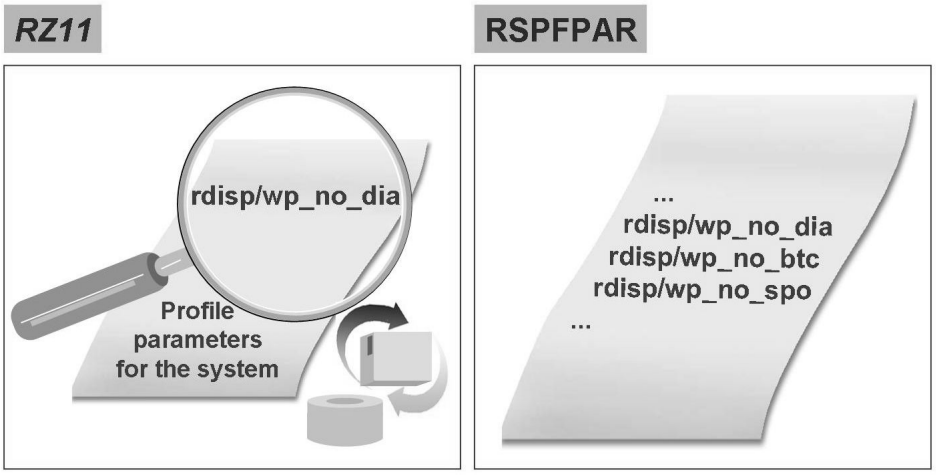

Figure 35: View of the Profile Parameters

The current values of the profile parameters can be displayed in the system. There are two ways to do this: Transaction RSPFPAR (can also be run as a report with the same name) and transaction RZ11. Both functions display the profile parameters for the instance in which the user is currently logged on. Transaction RSPFPAR displays a list of all instance-specific profile parameters, which is updated with the system-wide parameters. You can restrict this list to specific parameters. A table displays the system default value for the individual parameters as defined in the program code of the kernel or in the default profile. If the default value is overridden in the instance profile or dynamically, the table also shows the user-defined value. A short description and, if required, documentation for the parameters can also be displayed. Transaction RZ11 displays information and documentation for individual profile parameters. It also shows whether the parameter can be changed while the system is running with the *DynamicallySwitchable* indicator.

Note: In the *TPFYPROPTY* table, all dynamically switchable profile parameters are identified with the *Dynamic* indicator. You can use transaction SE16, for example, to display this table.

Outside the SAP system, you can display the values of the profile parameters at operating system level using the user <sid>adm and the program **`sappfpar`**. You can display the current value of a parameter with **`sappfpar <parameter name>`**. The command **`sappfpar all`** returns a list of all parameters. You can check the parameters that are set using **`sappfpar check`**. The command **`sappfpar help`** returns a short overview of possible options.

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You can also specify an instance profile, an instance number, or the SAP system name with this command using the options **pf=<instance profile>**, **nr=<instance number>**, or **name=<SID>**.

Hint: Note that to evaluate of profile parameters using the tools described above, some profile parameters are the same system-wide, while others can be set differently for each instance. Transaction RSPFPAR displays the configuration of the instance on which you are running the report.

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Exercise 6: Configuration of Profile Parameters

Exercise Objectives

After completing this exercise, you will be able to:

- Determine the configuration of profile parameters

Business Example

You want to determine the profile parameters for your SAP system.

Task: Determine Values of Profile Parameters

Determine the values of a number of profile parameters.

1. Determine the values of the following profile parameters:

   Name of the application server, number of work processes on the central instance (dialog, batch, enqueue, update, spool), maximum runtime of a program in the dialog.

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Solution 6: Configuration of Profile Parameters

Task: Determine Values of Profile Parameters

Determine the values of a number of profile parameters.

1. Determine the values of the following profile parameters:

   Name of the application server, number of work processes on the central instance (dialog, batch, enqueue, update, spool), maximum runtime of a program in the dialog.

   a) You can determine the values of profile parameters by running the report RSPFPAR (with transaction **SA38** or transaction **RSPFPAR**).

      The parameter names are as follows:

      Name of the local application server: *rdisp/myname*.

      Number of work processes on the central instance:

Dialog:	*rdisp/wp_no_dia*
Batch:	*rdisp/wp_no_btc*
Enqueue:	*rdisp/wp_no_enq*
Update:	*rdisp/wp_no_vb*
Spool:	*rdisp/wp_no_spo*

      This parameter limits the maximum runtime of a process step within a dialog process: *rdisp/max_wprun_time*.

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Lesson Summary

You should now be able to:

- Determine the configuration of profile parameters

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Lesson: How to set Profile Parameters

Lesson Overview

In this lesson, you will learn how you can change the values of profile parameters.

Lesson Objectives

After completing this lesson, you will be able to:

- Adjust the profile parameters using profiles

Business Example

You are an administrator, and want to adjust the configuration of the profile parameters.

Administering and Maintaining Profiles

If you want to change profile parameters, you can make these changes using operating system-specific editors. However, this procedure has certain dangers, as the user must ensure that the changes are performed, and also documented, correctly. Incorrectly set parameters can prevent an instance starting. The SAP system therefore provides integrated profile administration and parameter maintenance.

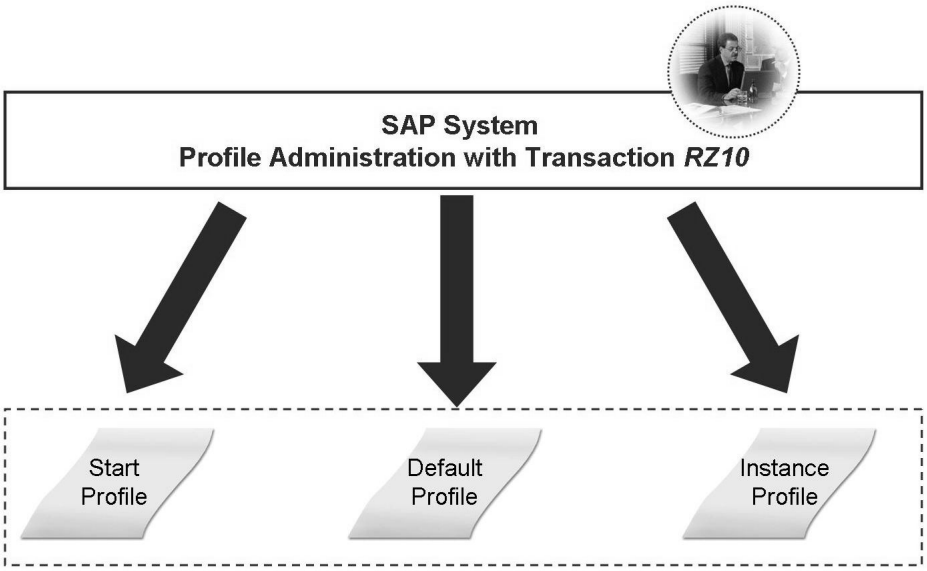

Figure 36: Profile Administration

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Profile administration in the SAP system offers a number of advantages to the user:

- Central administration and maintenance of the instances
- Changes in profiles checked for consistency
- Administration of multiple versions of a profile
- Comparison of the actively used profile and the profile stored in the database
- Immediate activation of selected parameters

Caution: Before you make changes to the profile files, create backups. If an error should occur, you can then start the SAP system with the restored files and perform troubleshooting.

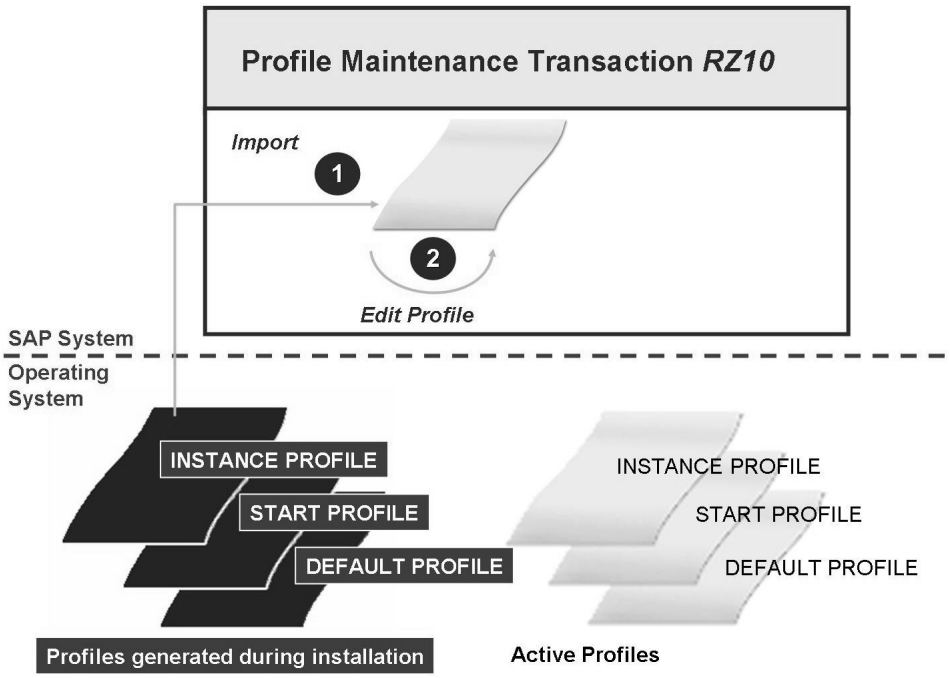

Figure 37: Profile Maintenance 1/2

After installation, the profile parameters are, at first, only present at operating system level. To use the profile administration of the SAP system, the profiles must be imported into the database. During this import, the system performs a consistency check and a check of the way in which the parameters interact. Changes to profile parameters can then be performed in the SAP system, with the previously mentioned advantages. These changes are then stored in the database, and written back to file level. The changes only take effect when they are read by the system; that is, at a restart of the system.

You perform the administration and maintenance of profiles in transaction RZ10. In the first step, you import the profiles into the database by choosing *Utilities → Import Profiles → Of active servers*. After selecting the profile to edit, you

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can change individual profile parameters. There are three different levels for maintaining the profiles. The **administration data** contains the type of profile (start, default, or instance profile), a short description, the path of the file, the name of the instance, and the time of the last activation.

You can perform the maintenance of the parameters of the individual profiles through either **basic maintenance** or **extended maintenance**. Basic maintenance allows you to adjust the most important parameters and supports the user through the use of logical descriptions. Extended maintenance displays the unformatted content of the profile; that is, the technical names of the profile parameters. In extended maintenance, you can not only change the values of individual parameters, but also add new parameters and delete existing parameters.

The changes are stored in two steps. In the first step, the changes are temporarily copied when you choose *Copy*. The values are permanently saved to the database in a second step when you choose *Save*. The changes are therefore successfully saved to the database and must now be written at operating system level. This is done either automatically during saving by confirming the relevant query, or manually from the menu by choosing *Profile → Activate*.

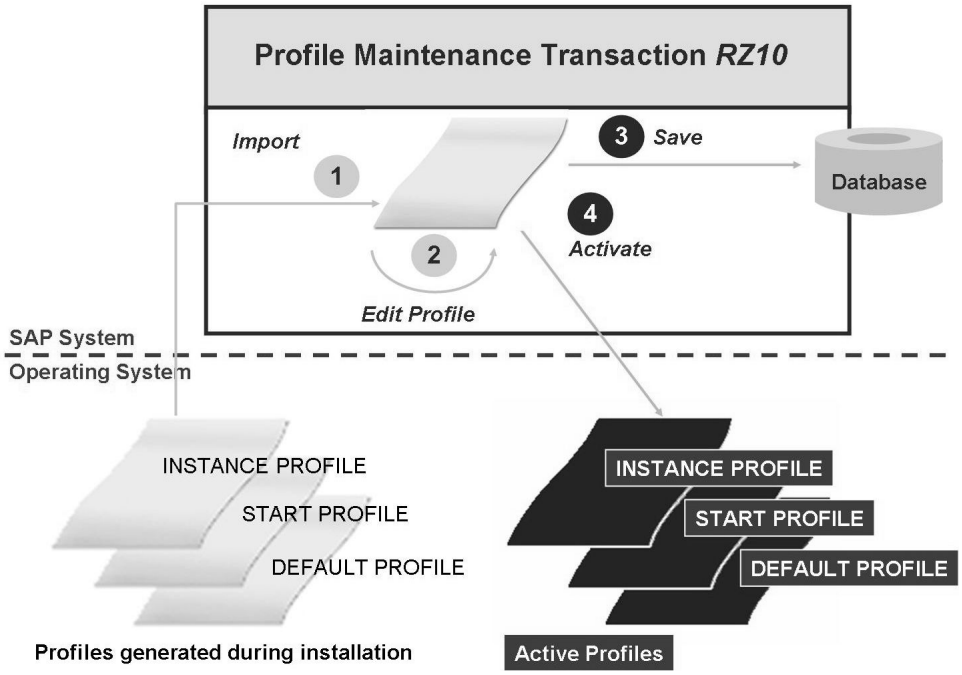

Figure 38: Profile Maintenance 2/2

Changes to instance-specific profiles take effect after a restart of the corresponding instance. Changes to the default profile take effect only after a restart of all instances in the entire system.

Changes to these files are, however, the exception rather than the rule.

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Consistency Check

Additional functions available in transaction RZ10 are the consistency check and the comparison of profiles.

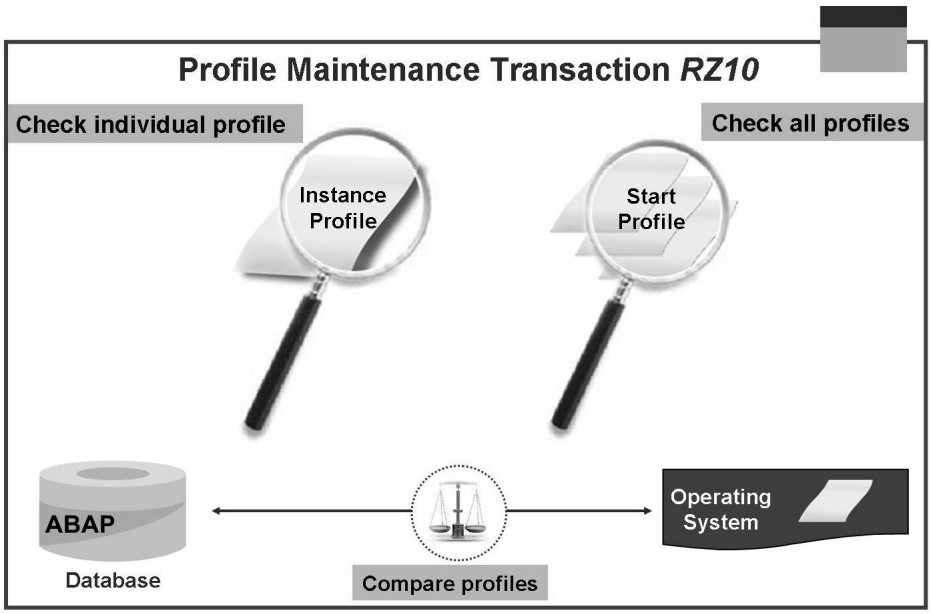

Figure 39: Profile Consistency Checks

During a consistency check, the system checks the syntax and the semantics for individual or for all profiles.

The *Utilities → Check all profiles* option also contains a consistency check between the profiles of a type. This means that, for example, the system checks for the start profile whether only one message server is being started for each system.

During the comparison of profiles, the system compares the profile that is in active use with the profile stored in the database. This comparison is automatically performed when an instance is started. If the system identifies a difference between the active profile and the profile stored in the database, the system displays a message in the Alert Monitor.

You can view a change history of the parameters in transaction TU02 (*Tools → Administration → Monitor → Performance → Setup/Buffers → Parameter Changes*).

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Exercise 7: Maintaining the System Parameters

Exercise Objectives

After completing this exercise, you will be able to:

- Adjust the system parameters using profiles

Business Example

As an administrator, you are to adjust the configuration of the system parameters.

Task 1: Save Profile Files

First back up the profile files.

1. Save your "runnable" profile files in a backup directory. To do this, create a *Backup<SID>* directory under *C:\Temp* and copy all the profile files to this directory. Replace *<SID>* with the system ID of your SAP system.

Task 2: Import and Maintain Profiles

Use transaction RZ10 (*Tools → CCMS → Configuration → System Profile*) to perform the following tasks.

1. Import all the profiles into your SAP system.
2. Change the values of the following parameters:

   Increase the number of dialog work processes for the dialog instance by 2.

   Set the value for the maximum runtime of a process step to 750 seconds. To do this, you may need to add a new parameter to a profile. At the end of the exercise, save and activate your changes.

   Caution: Consider the profiles in which you want to make changes. The solution tells you the relevant parameters, but not which parameters you should enter in which profile.

3. Check the number of work processes in the process overview and the maximum runtime for a process step.
4. Check your changes in the profile files at operating system level.

   What do you still need to do in order that your changes take effect in the system?

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Task 3: Activating the Changed Profile Parameters

Check the changed system parameters after a system restart.

1. Restart the system so that your changes are activated.
2. Check your changes in the system again.

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Solution 7: Maintaining the System Parameters

Task 1: Save Profile Files

First back up the profile files.

1. Save your "runnable" profile files in a backup directory. To do this, create a *Backup<SID>* directory under *C:\Temp* and copy all the profile files to this directory. Replace *<SID>* with the system ID of your SAP system.

   a) Log on to your server. Copy the profile files from the *\usr\sap\<SID>\SYS\profile* directory to the *Backup<SID>* directory.

Task 2: Import and Maintain Profiles

Use transaction RZ10 (*Tools → CCMS → Configuration → System Profile*) to perform the following tasks.

1. Import all the profiles into your SAP system.

   a) You can import all the profile files together by choosing: *Utilities → Import profiles → Of active servers*. A check log displays the result of the import.

   The *Back (F3)* pushbutton takes you back to the *Edit Profiles* entry screen

2. Change the values of the following parameters:

   Increase the number of dialog work processes for the dialog instance by 2.

   Set the value for the maximum runtime of a process step to 750 seconds. To do this, you may need to add a new parameter to a profile. At the end of the exercise, save and activate your changes.

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Caution: Consider the profiles in which you want to make changes. The solution tells you the relevant parameters, but not which parameters you should enter in which profile.

a) To change the values of individual parameters, select the corresponding profile (default or instance profile): In the *Profile* field, choose the corresponding profile (*DEFAULT or <SID>_<instance name><instance number>_<host name>*) using *F4* help. The system automatically fills the *Version* field with the most recent version. Then select the *Extended maintenance* radio button, and change the selected profile by choosing the *Change* icon.

If you can't see a *Change* pushbutton in the next entry screen *Profile '<name of the profile>' Version '<version number of the profile>'*, select the *Display <-> Change* pushbutton (Shift F8) to switch to change mode. Select the desired parameter and choose *Change* or double click the relevant parameter.

To create a new parameter, select the line in which you want to add the parameter in the *Profile '<name of the profile>' Version '<version number of the profile>'* entry screen. Then choose the *Create Parameters (F5)* pushbutton. .

Hint: The parameter is inserted above the line you selected

The required parameters are listed below:

- *rdisp/wp_no_dia*
- *rdisp/max_wprun_time*

After you have made your changes, choose *Copy* and then *Save*. In the list view, choose *Copy* and then *Back*. *Save* the new version of the profile and confirm the activation of the profile in the dialog box.

3. Check the number of work processes in the process overview and the maximum runtime for a process step.

a) Check the number of processes by calling the server overview (*Tools → Administration → Monitor → System Monitoring → Servers*, transaction SM51), selecting the dialog instance, and then choosing *Processes* (Ctrl+Shift+F6).

b) Check the maximum runtime of a process step by displaying the parameter with the transaction RZ11. In the *Parameter Name* field, enter *rdisp/max_wprun_time*, and choose the *Display* pushbutton. The *Current Value* field should still display the previous value `600`.

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4. Check your changes in the profile files at operating system level.

   What do you still need to do in order that your changes take effect in the system?

   a) Open the profile files at operating system level (in the directory *\usr\sap\<SID>\SYS\profile* with an editor, and use this to view the changes that have been made.

   b) Your changes to profile parameters will only take effect after a restart of the affected instance or the entire system.

Task 3: Activating the Changed Profile Parameters

Check the changed system parameters after a system restart.

1. Restart the system so that your changes are activated.

   a) Log on to your server in the same way as you did in the exercises for the Starting and Stopping unit, and restart the system.

2. Check your changes in the system again.

   a) Check the number of processes by calling the server overview (*Tools → Administration → Monitor → System Monitoring → Servers*, transaction SM51), selecting the dialog instance, and then choosing *Processes* (Ctrl+Shift+F6).

   b) Check the maximum runtime of a process step by displaying the parameter with the transaction RZ11. In the *Parameter Name* field, enter *rdisp/max_wprun_time*, and choose the *Display* pushbutton. The *Current Value* field should now display the value `750` that you entered.

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Lesson Summary

You should now be able to:

- Adjust the profile parameters using profiles

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Lesson: Setting up Operation Modes

Lesson Overview

In this lesson, you will learn about the concept of operation modes. You will learn how to set up a dynamic switch of work process types using operation modes.

Lesson Objectives

After completing this lesson, you will be able to:

- Set up a dynamic switch of work process types using operation modes

Business Example

The configuration of the work processes using the profiles usually meets the requirements for day operation. The administrator can use operation modes to optimize the performance of the system for the different requirements during the day and during the night.

Concept of Operation Modes

The demands of users on the SAP system vary during the course of the day. During the day, a large number of dialog users, who want to be served with high performance by the system, are working. Therefore, a large number of dialog work processes should be available for users during the day. During the night, however, only a small number of these dialog work processes are used, and more of the system can be used to process jobs.

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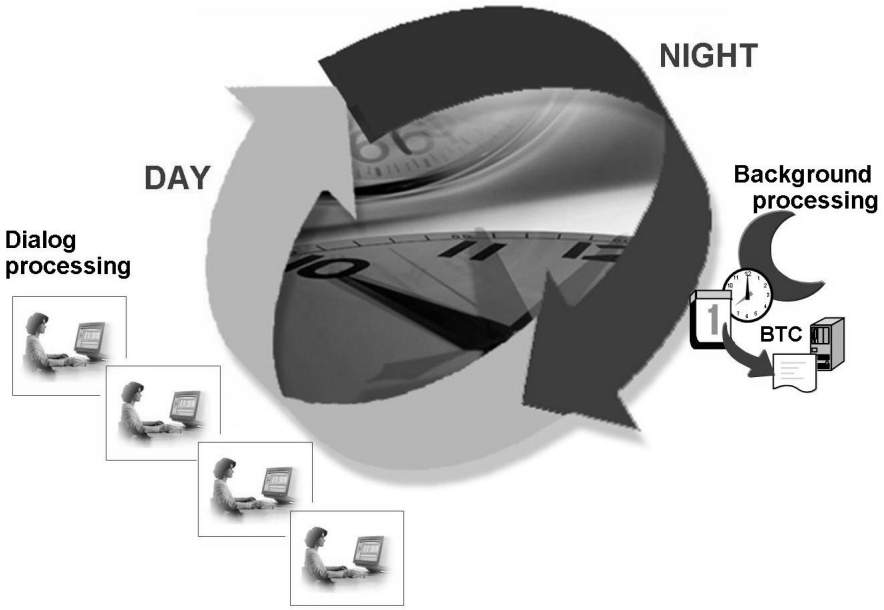

Figure 40: Concept of Operation Modes

The type and number of work processes for each instance is defined in the profiles. The distribution of work processes in the profiles is optimized for fast dialog response times; that is, there are usually lots of dialog work processes and a small number of background work processes. This means that during the night, system resources, such as the main memory, are tied to the dialog work processes, or are not fully utilized by the background processes, such as the CPU. It is therefore practical to define different types and numbers of work processes for these different demands on the SAP system. This is realized through the concept of operation modes.

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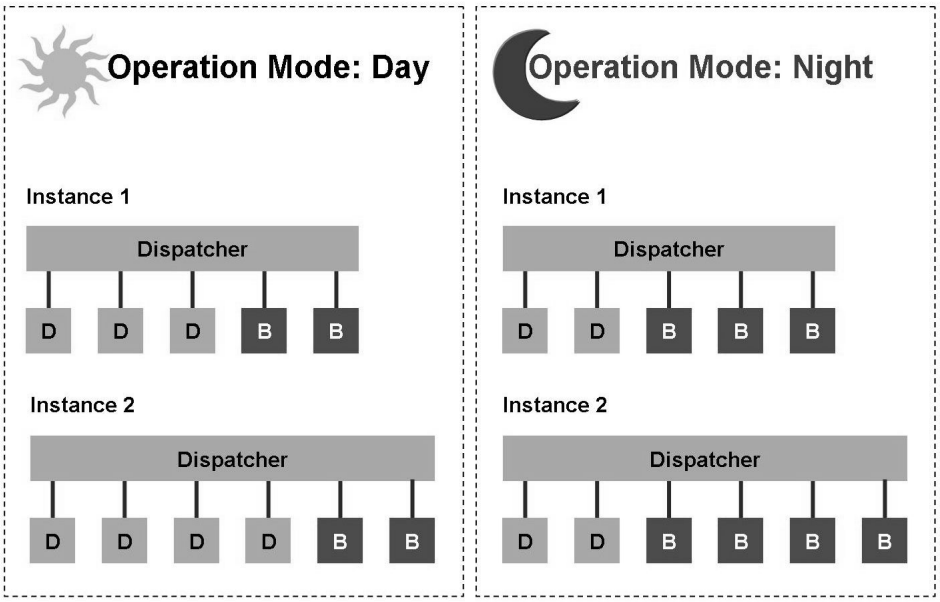

Figure 41: Adjusting Instances to the Load Distribution

Using the operation modes, you can adjust the type and distribution of the work processes to the varying load distribution during the day. You can also adjust the distribution of the work processes to business requirements that only occur once. By defining operation modes, you cannot change the total number of work processes defined in the profiles, but only the type and distribution of the individual work process types within this total number. The switch between the work process types is performed dynamically during the runtime of the SAP system. The switch is triggered using a defined schedule. A reserved work process is not immediately terminated, but marked for switching. This means that certain delays may occur. This type change is logged in the system log.

During the switch of the operation modes, neither the instance nor the affected work processes needs to be restarted. This means that the quality of the buffer of the SAP system is retained during an operation mode switch, and that the request that is currently being processed by a work process is completed. The individual work processes retain their process ID after the switch. You can observe this in the process overview (SM50).

Setting Up Operation Modes

The operation modes are set up in a number of steps.

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Steps to Configure Operation Modes

- First, the operation modes are created as empty containers in transaction RZ04.
- Next, all active instances of the system are detected and the work processes defined in the instance profile are assigned to the operation modes as default values.
- You can now make allocations for the individual operation modes in the total number of work processes taken from the instance profile. The allocation should be made primarily between the dialog and background work processes.
- You then specify the periods for which the operation modes are valid and when the switch between the operation modes should occur in the time table (SM63).

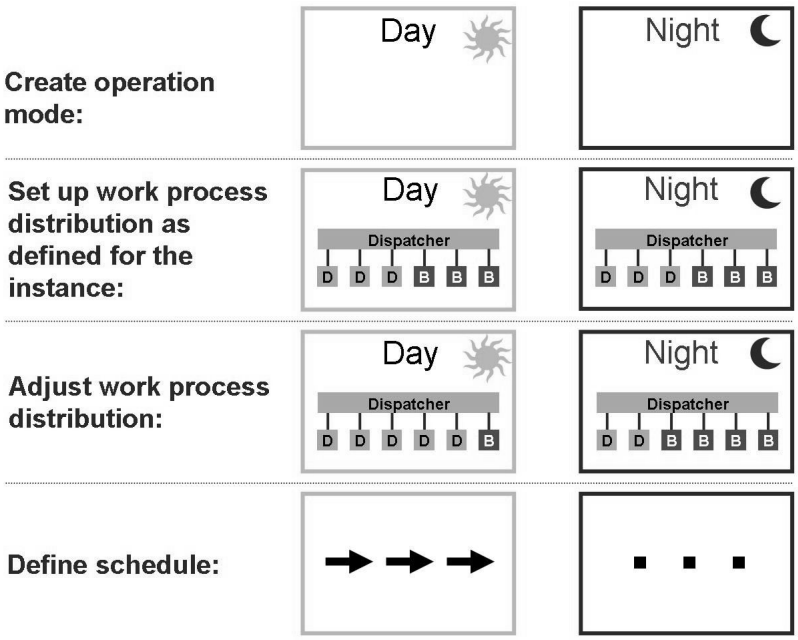

Figure 42: Setting Up Operation Modes

You cannot arbitrarily change the work process distribution.

Work Process Type	Type of Changeability (+ = increase number, – = reduce number)
Dialog	only indirectly changeable
Background	+: possible, reduces number of D-WPs accordingly –: possible, increases number of D-WPs accordingly

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Class A	defines the subset of the B-WPs that only process Class A jobs.
Update	**+**: possible, if there is at least 1 V-WP, reduces the number of D-WPs accordingly **−**: possible, if at least 1 V-WP remains, increases the number of D-WPs accordingly
V2 Update	**+**: possible, if there is at least 1 V2-WP, reduces the number of D-WPs accordingly **−**: possible, if at least 1 V2-WP remains, increases the number of D-WPs accordingly
Enqueue	**+**: possible, if there is at least 1 E-WP, reduces the number of D-WPs accordingly **−**: possible, if at least 1 E-WP remains, increases the number of D-WPs accordingly **You should only increase the number of E-WPs if this procedure is suggested by SAP Support.**
Spool	cannot be changed

Note: Note the following: A change in the allocation should be made primarily between the dialog and background work processes.

The time table (SM63) differentiates between normal operation and exception operation. A general time definition that applies almost all of the time is set using normal operation. In rare cases, in which a special distribution of the work processes for unusual system loads is required, they are defined using exception operation.

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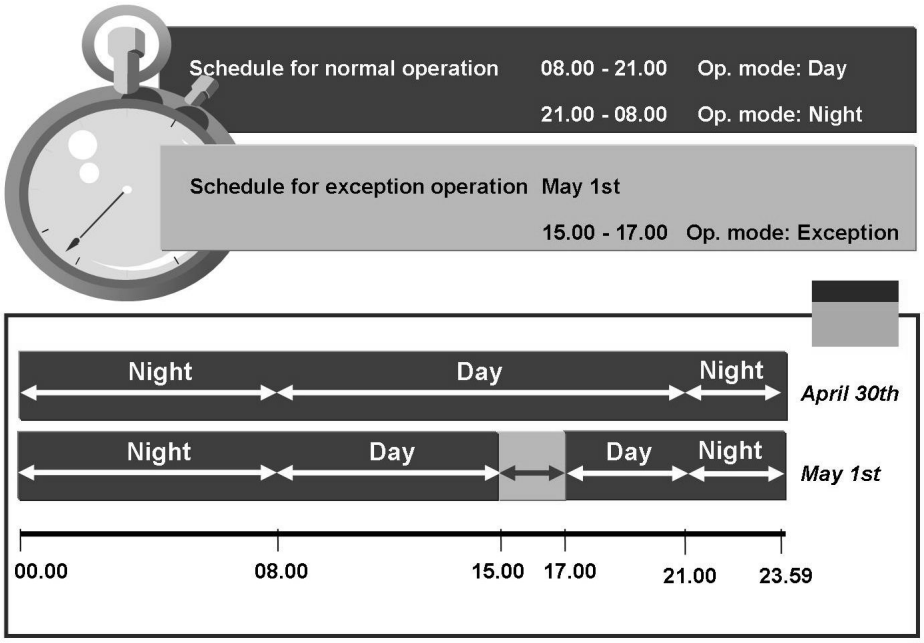

Figure 43: Scheduling Operation Modes

If you do not define a timetable for normal operation, no switch of operation modes is made. The configuration in the instance profile remains active.

The exception operation can only be defined as a unique event.

You can trigger an operation mode switch from a program that you have written yourself using a function module (*RZL_PERFORM_BA_SWITCH*).

Monitoring and Consistency Check

The Control Panel (RZ03) allows you to monitor the instances and the operation modes and provides functions to:

- Check the status of all instances and of the operation modes
- Start and stop the instances
- Manually switch operation mode
- Display an overview of the work processes
- Switch to the Alert Monitor

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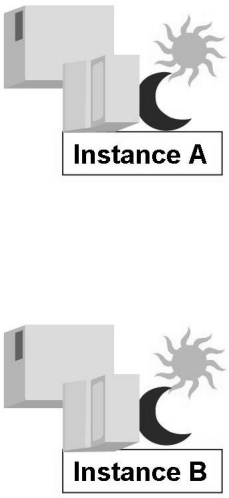

Figure 44: Control Panel (RZ03)

You can switch the operation mode either for all instances (*Control → Switch operation mode → All servers*) or for a selected instance (*Control → Switch operation mode → Selected servers*).

You can first simulate the switch of operation modes (*Control → Switch operation mode → Simulation*). The system checks for which instances a switch can be performed.

You can display a detailed analysis of the status of the individual instances by choosing *Monitoring → Status Details*.

If it is not possible to switch between operation modes, this is usually due to inconsistencies in the SAP system. These inconsistencies can occur if the number of work processes is defined differently in different places in the system. These are the instance profiles at operating system level, the instance profile in the database, and the definition of the operation modes themselves.

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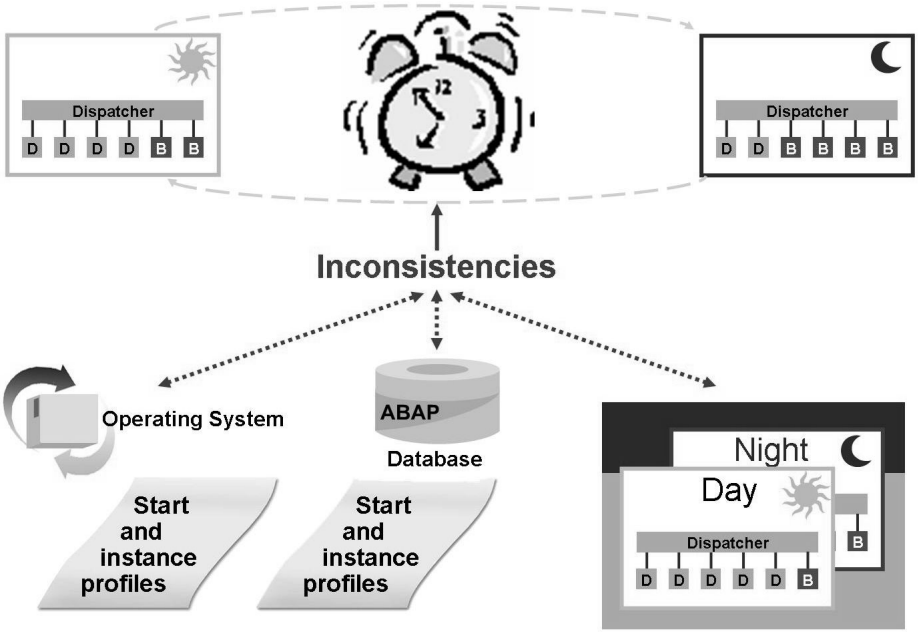

Figure 45: Profile Consistency Checks

If, for example, the number of work processes in the profiles is changed, the system can no longer switch operation modes until after a restart of the instance. You must therefore adjust the configuration of the operation modes after any change to the work process distribution.

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Exercise 8: Setting up Operation Modes

Exercise Objectives

After completing this exercise, you will be able to:

- Set up a dynamic switch of work process types using operation modes

Business Example

The configuration of the work processes using the profiles usually meets the requirements for day operation. The administrator can use operation modes to optimize the performance of the system for the different requirements during the day and during the night.

Task 1: Create Operation Modes

Create operation modes using transaction RZ04 to perform the following steps.

1. Create two operation modes, *Day* and *Night*.
2. Now create a definition for the work process distribution for all instances of your system.
3. Change the distribution of the work processes of your instances for each of the operation modes.

   Note that there should be at least two dialog and two background work processes in all operation modes.

Task 2: Schedule Operation Modes

Schedule the operation modes that you have created.

1. In the timetable, schedule the operation modes that you have created for normal operation.

Task 3: Manual Switch of Operation Modes

1. To observe the change in work process distribution when the operation mode is switched, switch to the *Night* operation mode manually in the Control Panel.
2. How can you observe the change of the work process distribution?

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Solution 8: Setting up Operation Modes

Task 1: Create Operation Modes

Create operation modes using transaction RZ04 to perform the following steps.

1. Create two operation modes, *Day* and *Night*.

   a) You can maintain operation modes in transaction RZ04 (*Tools → CCMS → Configuration → Operation Modes/Instances*).

   You can create operation modes by choosing the *Create operation mode (F5)* pushbutton. Enter the name of the operation mode and a short description and choose *Save*. Repeat the procedure for the second operating mode. When you have finished, you should see two operation modes in the input screen *CCMS: Maintain Operation Modes and Instances*.

2. Now create a definition for the work process distribution for all instances of your system.

   a) Switch to the Instances/Operation Modes view by choosing the *Instances/operation modes (F6)* pushbutton. This is identified by the line *Productive instances and their WP distribution*.

   You define work process distribution for all instances of your system by choosing *Settings → Based on current status → New instances → Generate*. Result: Two additional lines appear at the end of the input screen. Activate your entries by choosing the *Save* pushbutton.

3. Change the distribution of the work processes of your instances for each of the operation modes.

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Note that there should be at least two dialog and two background work processes in all operation modes.

a) To change the distribution of the work processes for the operation modes of the instances, double click the operation modes entries. Start with the operation mode Day. You change and then save the distribution of the work processes in the dialog box: *CCMS: Maintain Work Process Distribution*.

To do this, place the cursor in the column of the work process type that you want to change. You can change the number by choosing + and -. Do not forget to change the operation mode Night as well. The easiest way to do this is by using the pushbutton *Other operation mode*. To the right of the field *for Operation Mode*, press *F4* to select the operation mode Night. Then save the work process distribution for both operation modes by choosing *Save*.

After you have changed the distribution for all operation modes and instances, choose the *Save* pushbutton in the input screen *CCMS: Maintain Operation Modes and Instances* in the system function bar.

Task 2: Schedule Operation Modes

Schedule the operation modes that you have created.

1. In the timetable, schedule the operation modes that you have created for normal operation.

   a) You can schedule operation modes using the operation mode calendar (*Tools → CCMS → Configuration → Operation Mode Calendar*, transaction SM63) or you can use the *Back (F3)* icon to navigate back to the entry screen of transaction *RZ04*. From there, select *Operation mode → Timetable* to navigate to transaction SM63.

   In the input template *Display/Maintain Operation Mode Set*, select the radio button *Normal operation (24 hr)*, and choose the *Change* pushbutton.

   Select the start and end of the time interval for the operation mode Day by double-clicking the relevant line (you can recognize this because the line changes from blue to black). Choose the *Assign* pushbutton, and use F4 help to select the operation mode *Day*. Follow the same procedure to assign the operation mode Night. After you have assigned the entire 24-hour period to your operation modes, choose *Save*.

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Task 3: Manual Switch of Operation Modes

1. To observe the change in work process distribution when the operation mode is switched, switch to the *Night* operation mode manually in the Control Panel.

   a) You can switch the operation modes manually in the Control Panel (*Tools → CCMS → Control/Monitoring → Control Panel*, transaction RZ03).

      As a first step, select the operation mode where you want to switch to, by choosing *Choose operation mode*. Select the operation mode and then *Choose*. In the input screen *CCMS Control Panel: Display Server Statuses and Alerts*, you can check this in the line *Active op. mode: Night*, and in the configuration message informing you that the *operation mode and work processes are different*.

      The switch is performed in a second step, by choosing *Control → Switch Operation Mode → All Servers*. Confirm the dialog box *Switch all servers* with *Yes*. You should then see no more configuration messages. That is, all process have been switched according to the configuration of this operation mode.

2. How can you observe the change of the work process distribution?

   a) Check the changed distribution of the work processes in the process overview (*Tools → Administration → Monitor → System Monitoring → Process Overview*, transaction SM50). This shows you that the number of work processes has remained the same, but individual work process types have changed accordingly.

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Lesson Summary

You should now be able to:

- Set up a dynamic switch of work process types using operation modes

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Unit Summary

You should now be able to:

- Determine the configuration of profile parameters
- Adjust the profile parameters using profiles
- Set up a dynamic switch of work process types using operation modes

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Test Your Knowledge

1. In which sequence are the profile parameters read from the specified locations by the system?

   Choose the correct answer(s).

   - □ A 1. Instance profile 2. Default profile 3. Kernel
   - □ B 1. start.ini 2. Kernel 3. Default profile 4. Instance profile
   - □ C 1. Kernel 2. Default profile 3. Instance profile
   - □ D 1. Kernel 2. start.ini 3. Default profile 4. Instance profile

2. In what profile can you change the number of background work processes?

   Choose the correct answer(s).

   - □ A Start profile
   - □ B Default profile
   - □ C Background profile
   - □ D Instance profile

3. You can use transaction _____ to check the consistency of individual profiles.

   Fill in the blanks to complete the sentence.

4. In what sequence should you perform the listed steps when setting up operation modes?

   Choose the correct answer(s).

   - □ A 1. Create operation modes 2. Assign instances 3. Distribute work processes 4. Maintain time table
   - □ B 1. Create operation modes 2. Maintain time table 3. Distribute work processes 4. Assign instances
   - □ C 1. Create operation modes 2. Distribute work processes 3. Maintain time table 4. Assign instances

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Answers

1. In which sequence are the profile parameters read from the specified locations by the system?

   Answer: C

   There is no file called start.ini involved in this context; it has been made up.

2. In what profile can you change the number of background work processes?

   Answer: D

   The instance profile is the correct profile in this case, as settings in this profile only apply to the affected instance, and the number of work processes for an instance is defined here. The start profile contains information about the processes to be started during the system start. In the default profile, you maintain parameters that apply to all instances or for the entire SAP system. The background profile does not exist.

3. You can use transaction RZ10 to check the consistency of individual profiles.

   Answer: RZ10

   In addition to the consistency of the individual profiles, you can use transaction RZ10 to check *all profiles*. In this case, the system also checks the consistency between the profiles.

4. In what sequence should you perform the listed steps when setting up operation modes?

   Answer: A

   It is especially important that you follow the correct sequence when first setting up the operation modes.

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Unit 4

Fundamentals of Working with the Database

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Unit Overview

This unit provides basic theoretical information about the architecture and functionality of a relational database, and gives you an initial insight into the fundamentals of SAP data archiving.

Building on this knowledge, basic database administrative activities performed using the DBA Cockpit are introduced. The unit also explains how you can securely store application data that is no longer required for day-to-day activities outside the database if your database is constantly expanding.

Unit Objectives

After completing this unit, you will be able to:

- Describe in principle the structure and architecture of database systems
- Back up the contents of the database
- Check whether your database backups have been successfully performed
- Schedule additional periodic checks of the database
- Define the term data archiving
- Explain the need for data archiving
- Outline the technical process of data archiving
- List different options for accessing archived data

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Lesson: Architecture of Database Systems

Lesson Overview

This lesson teaches basic theory about the architecture and functions of a relational database as well as basic backup concepts. These include regular backups of data and log information.

Lesson Objectives

After completing this lesson, you will be able to:

- Describe in principle the structure and architecture of database systems

Business Example

SAP systems store the application data in a relational database. The administrator regularly backs up this data.

Fundamentals of Database Administration

A database management system (DBMS) includes database processes, a buffer in the main memory, data files that contain the data, and log files, in which changes to the data are logged.

At the start of an SAP system, all work processes are linked to a database process. Database queries are passed by SAP work processes to the database processes assigned to them, which execute the queries on the database.

The data is stored in the data files: Access to the data always takes place using the buffer in main memory.

Special database processes are responsible for exchanging data between the buffer and the data files. During this exchange, the data is always read and written in complete pages (which usually contain several data records).

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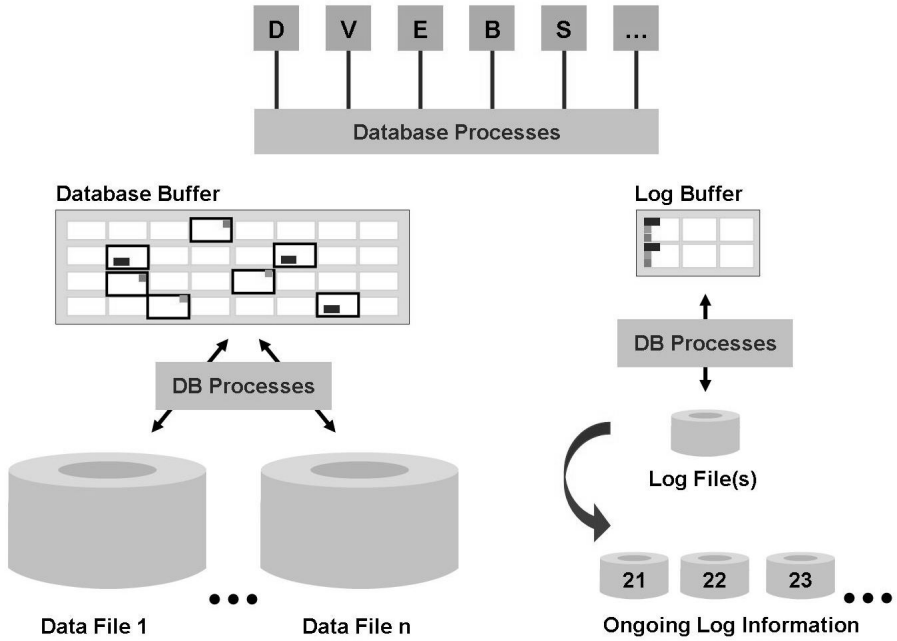

Figure 46: Database: Concepts

If changes are made to the data, these are logged in the log file; that is, the log file contains the status changes of the database. Only the changes, and not the complete pages, are logged in the log buffer. The entries are written from the log buffer to the log file, of which there can be one or more than one, depending on the database. For every database, there is a mechanism that backs up the log information from the log file to other files or directly to a backup medium. This ensures that the log file does not become too large. SAP recommends that you mirror the log file. Some databases provide special software mirrors to allow you to do this.

Caution: This mechanism must not be deactivated; otherwise, the status changes could be lost. This would mean that there was a threat of data loss if a hard disk crash occurred.

A database always also includes structure data that contains essential information for the database, such as the number of data files, and so on.

Backup Concept

A backup concept for the database always includes the regular backup of the data files, the structure data, and also the log information.

The backup of the data files and the log information is performed in different steps. All data files and the structure data are backed up in one step. In another step, the ongoing log information (this may include the structure data) is backed up separately.

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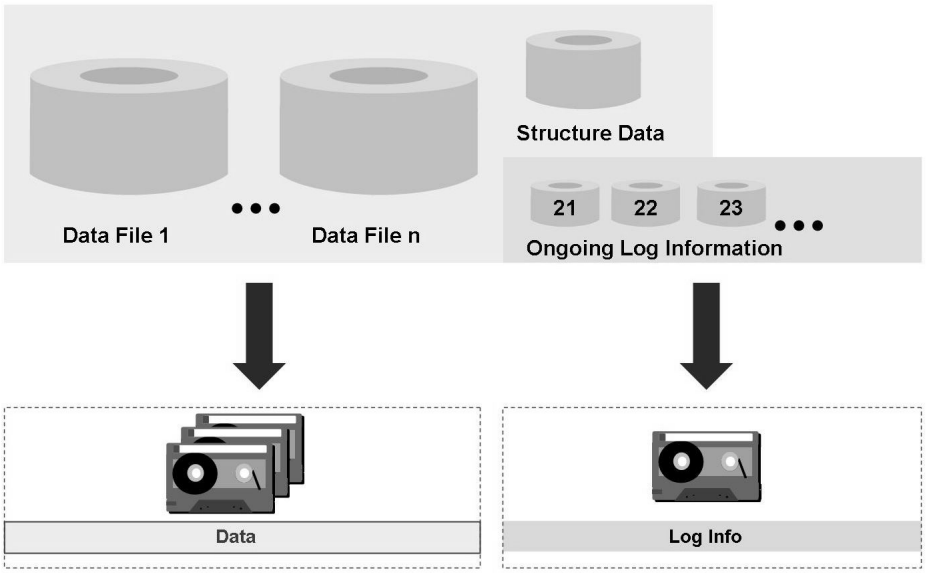

Figure 47: Back Up of the Data and Log Information

Scenarios for Recovering a Database

Resetting the database **(with data loss)**:

If a disk crash occurs at a point between t1 and t2, all data from the data backup t1 is imported. If no further action is taken, all data changes that were made after t1 are lost.

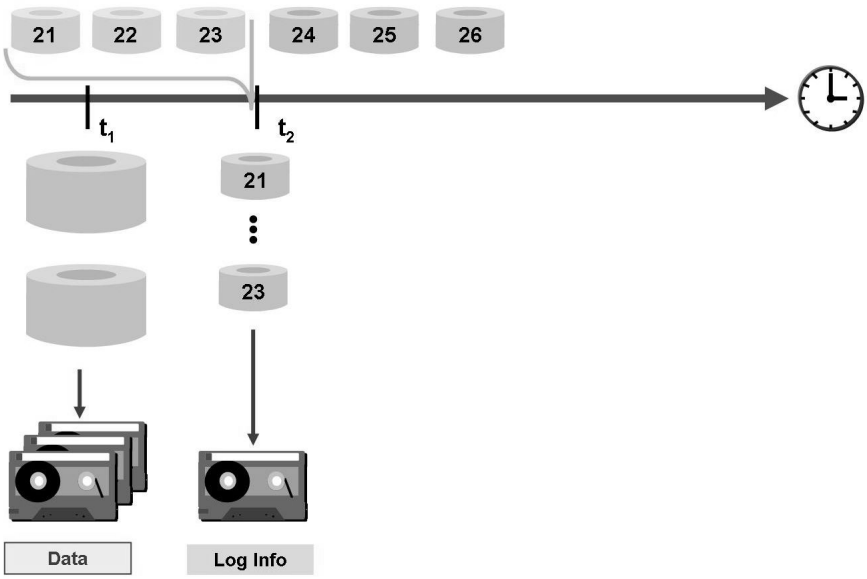

Figure 48: Database Recovery 1/2

Recovering the database **(without data loss)**:

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All data from data backup t1 is imported. Some databases allow you to import only the data files that are missing. The system then applies all the consecutive log information written since t1 (22, 23, ...). In the final step, the current log file is applied. This means that all data is now once again in the same status as at the point when the disk crash occurred. No data will be lost if all log information since the data backup is available with no gaps.

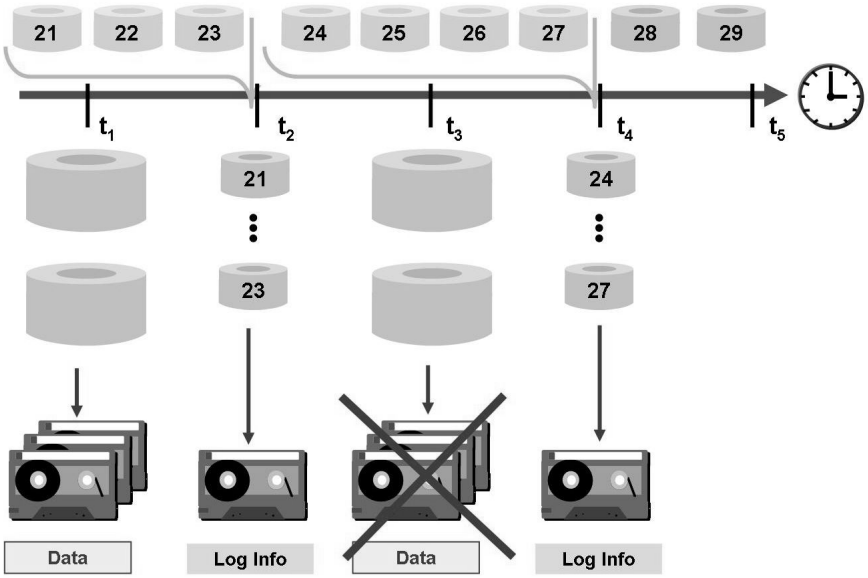

Figure 49: Database Recovery 2/2

Storing the data and log info backups:

The backed-up log information is deleted at operating system level to prevent disk space problems. If a disk crash occurs at the point t5 and a backup medium for the backup t3 is defective, an earlier data backup (in this case, t1) must be used. To recover the database without data loss, you must have **all log info backups** (in this case: t2 and t4) following the data backup t1 and the log information from 28. You must therefore keep older data and log information backups.

Other remarks:

Some databases also require log information to be able to reset the database. You should therefore ensure that you perform **data and log backups** regularly.

Backup Cycle

We recommend that the duration of a backup cycle is 28 days. This means that the backup media for the data and log information backups are not overwritten for at least 28 days.

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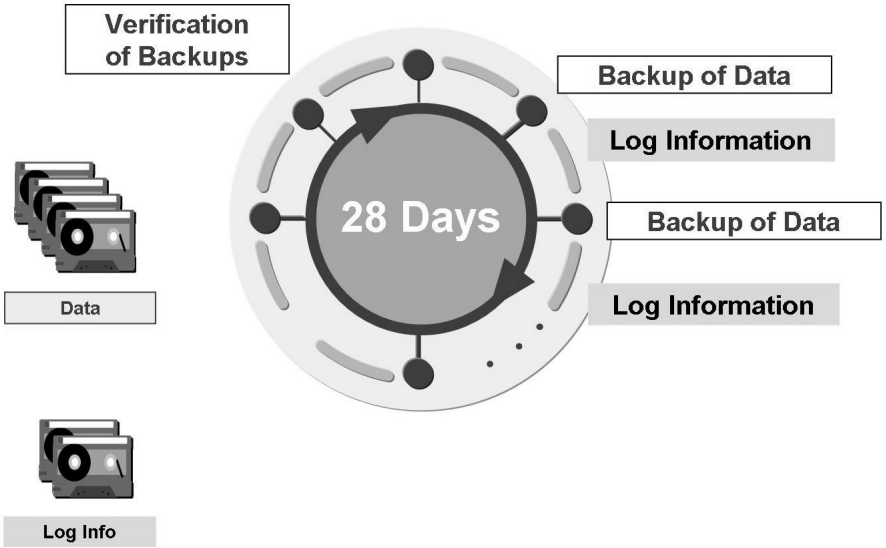

Figure 50: Recommended Backup Cycle

We recommend that you perform complete **data** backups every day.

Some databases offer the option of differential or incremental data backups that do **not** backup the complete data of the database, but only data that has been changed. If you use incremental data backups, you must perform a complete data backup at least once a week. There must be at least four complete data backups contained in the backup cycle.

The log information should be backed up at least once a day. We recommend that you always have two different backup media containing the same information.

Perform a data and log information backup with verification of the backup media at least once in the backup cycle.

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Lesson Summary

You should now be able to:

- Describe in principle the structure and architecture of database systems

Related Information

This introductory course to SAP system administration emphasizes the importance of using the database correctly, and teaches basic theory about the functions of a database, such as how to work with the DBA Cockpit for database management in the SAP system. For more detailed information, attend database-specific courses run by your database vendor, and/or attend training course ADM5##.

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Lesson: Central Database Administration with the DBA Cockpit

Lesson Overview

This lesson presents the DBA Cockpit, the central point for monitoring and administration of databases in the SAP environment.

The DBA Cockpit Planning Calendar is used to schedule regular backups of data and log information.

Lesson Objectives

After completing this lesson, you will be able to:

- Back up the contents of the database
- Check whether your database backups have been successfully performed

Business Example

To protect the SAP system against data loss if an error occurs, the administrator regularly performs backups.

Overview of the DBA Cockpit

To minimize system downtime and improve performance, you must schedule regular administrative jobs such as backups and database checks, and monitor your database daily. The DBA Cockpit is the central point for monitoring and administration of databases in the SAP system. This was first delivered with SAP Basis Release 7.00 Support Package 12 for all databases supported by SAP.

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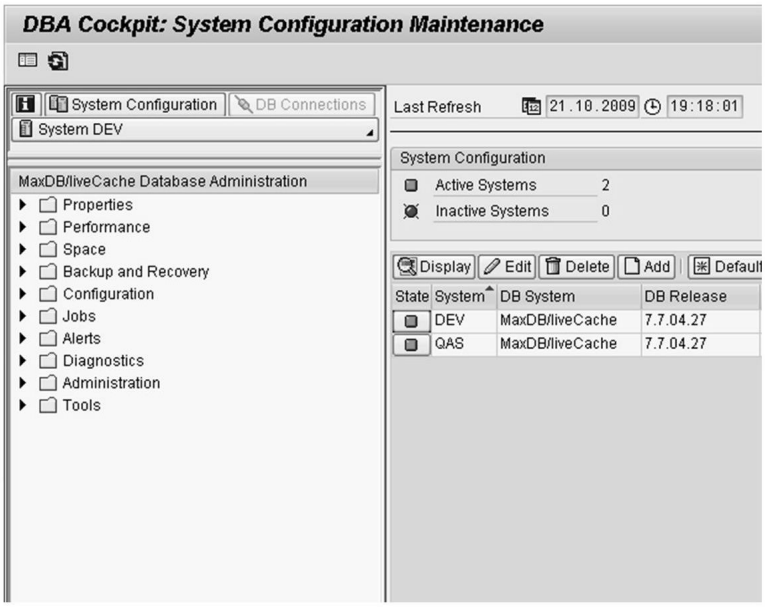

Figure 51: DBA Cockpit: Overview

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The DBA Cockpit (transaction DBACOCKPIT) replaces various transactions that were previously used for monitoring and administration (see SAP Notes 1072066 and 1027146). These include the following transactions that now lead to individual functions in the DBA Cockpit:

- The DBA Planning Calendar and the central DBA Planning Calendar (transactions DB13 and DB13C) are used to schedule backups and other administrative jobs in your database system. You can use this transaction to schedule backups and administrative activities locally or centrally for several SAP systems and databases.
- You can use the Backup Log Overview (transaction DB12) to display the results of your data backups and the status of the archive directory. If all backups are available for a restore and recovery, it also contains a function for checking the restore reports.
- The DBA Operations Monitor (transaction DB14, on MaxDB: DBACOCKPIT→ *Jobs* → *DBA Log* or DB12) checks the status and logs of all database operations, including backup monitoring, updates of the optimizer statistics, and database checks.
- The Database Performance Monitor (transaction ST04 or DB50 on MaxDB) displays the most important indicators for database performance – such as buffer cache quality, statistics of user calls or the configuration of the database management system and the database.
- The Tables and Indexes Monitor (transaction DB02 or DB50 on MaxDB) monitors the storage behavior of the database: For example, space statistics showing the history of the database or size and free space, and the status of the database objects (for example the size of each table in kilobytes and blocks, or indexes that are defined in the ABAP Dictionary, but missing in the database).

The above transactions are still available, but on some databases the transaction codes have been renamed to <previous transaction code>OLD (exception: DB50). This means the transaction codes are now ST04OLD, DB02OLD, DB12OLD, DB13OLD, DB14OLD, and DB13COLD. The DBA Cockpit is called using transaction DBACOCKPIT.

DBA Cockpit - Central Monitoring

The DBA Cockpit has the option of monitoring and managing external databases, including both ABAP and non-ABAP systems. All database systems supported by SAP can be connected as external databases.

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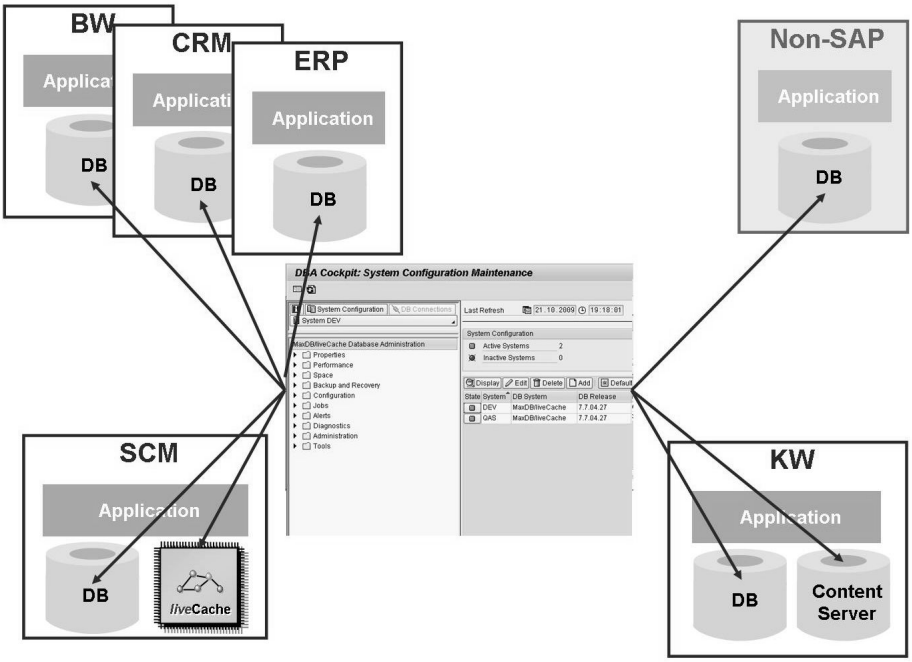

Figure 52: DBA Cockpit: Central Monitoring

A functioning secondary database connection is required to connect external databases. This must be established beforehand.

Scheduling and Monitoring Backups

In the SAP system, you can schedule and monitor regular database backups with the DBA Cockpit Planning Calendar.

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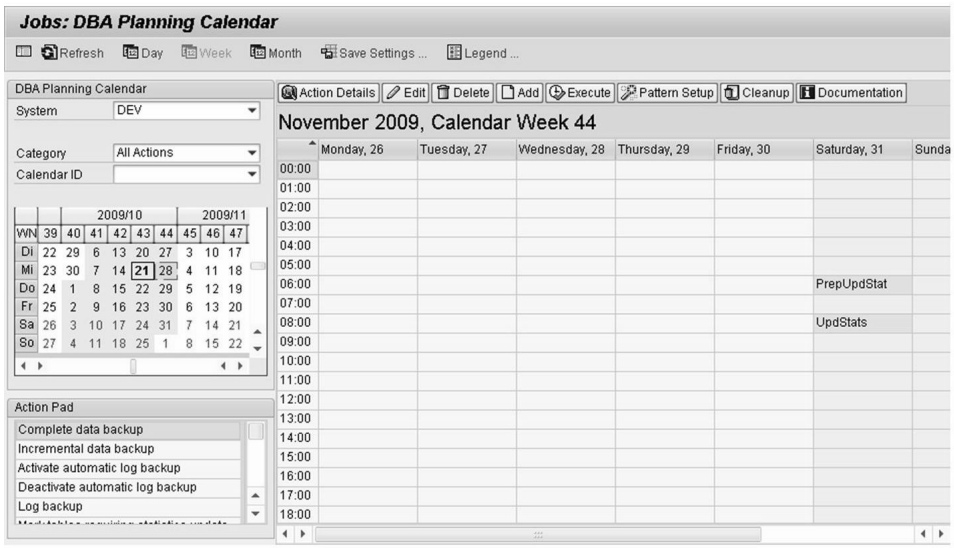

Figure 53: Scheduling and Monitoring DB Backups

Select a suitable data backup procedure for your scenario (recommendation: the complete data backup procedure that is specific to your system), and determine the repeat pattern and interval. Choose the start time or immediate start.

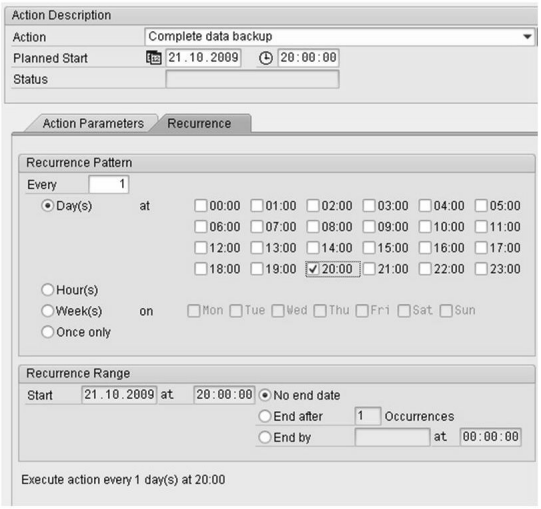

Figure 54: DBA Planning Calendar Action Pattern

If a manual medium swap is required, if you are, for example, using a local tape station, check which medium is required for the next backup every day, and insert this medium before the start of the backup.

Enter the log information backup for every weekday in the same way as the data backup.

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Check every day whether your backups have been successfully completed. In the planning calendar, a successful backup displays with green or yellow (with warnings) labeling. Red labeling indicates an erroneous (and, therefore, unusable) backup. For more information, see *Jobs → DBA Log* in the DBA Cockpit.

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Exercise 9: Back Up the Database Contents

Exercise Objectives

After completing this exercise, you will be able to:

- Perform a number of basic activities in the database backup and database maintenance environment

Business Example

To protect the SAP system against data loss if an error occurs, the administrator regularly performs backups.

Task: Back Up the Contents of the Database

Perform a backup of the data files and a log backup.

1. Display an overview of the utilized backup media. If you have performed a successful backup, what must you then consider before you can start the next backup (Hint: “Can be overwritten”)?
2. Schedule a *Complete data backup* in the DBA Cockpit. Choose a time at night to start the backup (for example 21:00). Use *FORDATA* as the backup template.

   The following morning, check whether the backup has been performed successfully.
3. Schedule a *Log backup* in the DBA Cockpit. Choose a start time after your backup has finished (for example, 2 hours later). Use *FORLOG* as the backup template.

   On the following morning, check whether the log backup has been performed successfully.

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Solution 9: Back Up the Database Contents

Task: Back Up the Contents of the Database

Perform a backup of the data files and a log backup.

1. Display an overview of the utilized backup media. If you have performed a successful backup, what must you then consider before you can start the next backup (Hint: "Can be overwritten")?

   a) Navigate to the DBA Cockpit (transaction DBACOCKPIT, and choose *Backup and Recovery → Backup Templates* from the menu on the left).

   b) You will see an overview of the available backup templates. As the name of the backup file is a fixed assignment, you can only start the next backup once the existing backup file has been renamed or moved to a different location, due to the setting *Can be overwritten = NO*.

2. Schedule a *Complete data backup* in the DBA Cockpit. Choose a time at night to start the backup (for example 21:00). Use *FORDATA* as the backup template.

   The following morning, check whether the backup has been performed successfully.

   a) Call the DBA Cockpit Planning Calendar (in the left menu *Jobs → DBA Planning Calendar*). Select the action *Complete data backup* by clicking the corresponding entry in the *Action Pad*.

   b) Choose the *Define New Backup Templates* pushbutton to obtain an overview of the available backup templates. Since the name of the backup file is fixed, you can only start the next backup once the existing backup file has been renamed or moved to a different location, due to the setting *Can be overwritten = NO*. Choose *Back (F3)* to return to the input screen *Schedule a New Action*.

   c) Now choose the backup template *FORDATA* in F4 help, and set 21:00 as the start time. Then confirm your entries using the *Add* pushbutton. The planned data backup now appears as the blue entry *DataBackup* at the scheduled time in the Planning Calendar.

   d) On the following morning, check the Planning Calendar to see whether the backup has been performed successfully. The entry should be highlighted in green in the Planning Calendar. You should also analyze the logs.

3. Schedule a *Log backup* in the DBA Cockpit. Choose a start time after your backup has finished (for example, 2 hours later). Use *FORLOG* as the backup template.

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On the following morning, check whether the log backup has been performed successfully.

a) If you have not already done so, call the DBA Cockpit Planning Calendar (in the left menu *Jobs → DBA Planning Calendar*). Select the action *Log backup* by double clicking the entry in the *Action Pad*.

b) Now choose the backup template *FORLOG* in F4 help, and set 23:00 as the start time. Then confirm your entries using the *Add* pushbutton. Now this entry also appears as a blue entry in the Planning Calendar. This entry has the name *LogBackup* at the time specified.

c) On the following morning, check the Planning Calendar to see whether the log backup has been performed successfully.

   The log backup terminates immediately. Attempt to determine the cause of this error using the logs.

Hint: The job or action log displays that the database is in a log mode that is invalid for this backup type.

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Lesson Summary

You should now be able to:

- Back up the contents of the database
- Check whether your database backups have been successfully performed

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Lesson: Outlook: Monitoring the Database

Lesson Overview

There may be a large number of periodic checks that need to be performed in addition to making backups, depending on the database that you are using.

Lesson Objectives

After completing this lesson, you will be able to:

- Schedule additional periodic checks of the database

Business Example

To ensure good database performance and, therefore, good SAP system performance, the administrator performs additional checks of the database, which can be regularly scheduled.

Regular Monitoring of the Database

In addition to the daily monitoring of database backups, there are a number of other checks that have to be performed regularly depending on the database. Some of these can be scheduled using the DBA Cockpit Planning Calendar.

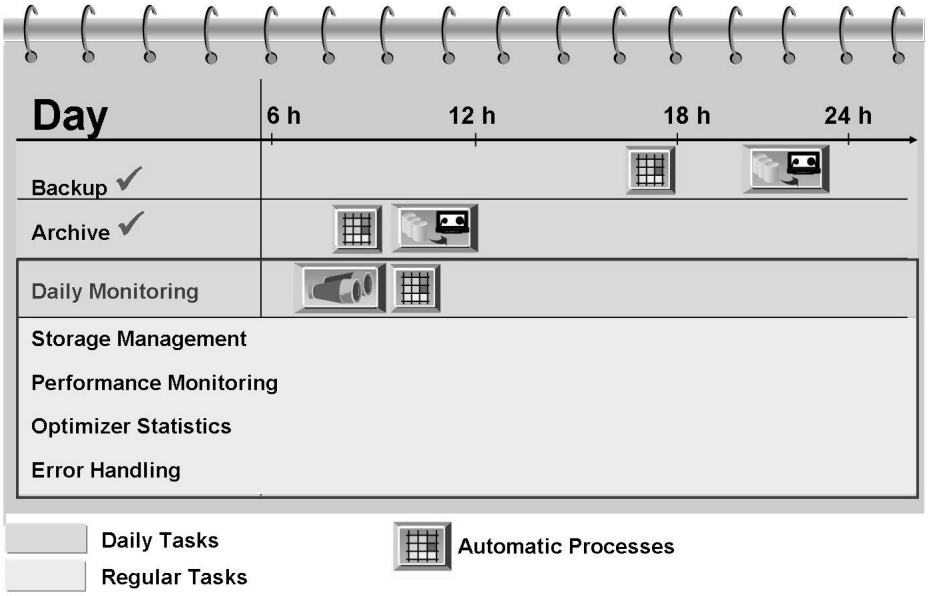

Figure 55: Database Monitoring

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These checks can, for example, be:

- Generation of statistical data to ensure good performance when accessing data records
- Monitor database growth (for example, free space)
- Check for general database problems or errors
- Monitor scheduled periodic actions (for example backups)

The regular generation of statistics is an important prerequisite for efficient access to data records. When the SQL statement is run, the database must select one of the possible access paths to the requested data. In the SQL statement, the WHERE condition specifies the actual number of results. The database now has to find the relevant data records as quickly as possible, in other words, with few read accesses. The database can either read the entire contents of a table (full table scan) or access a table through an index (index scan). Using the statistics, the Cost Based Optimizer of the database calculates the respective number of read accesses for all the possible access paths, and chooses the best (most economical) access path.

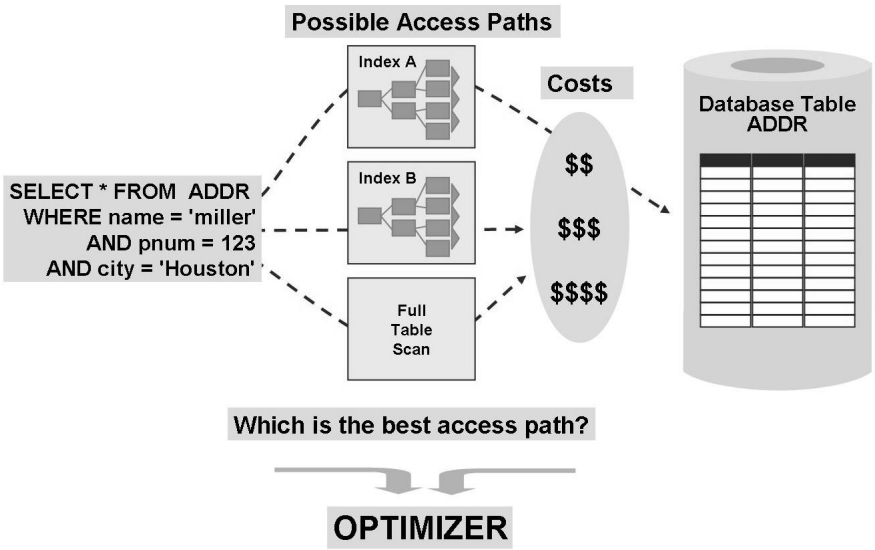

Figure 56: Determining the Best Access Path

The statistics contain information about the number of entries in the table, the number of blocks that are occupied by the table and the indexes, and the selectivity of the values of the individual table fields.

The recommended duration for generating statistics can vary depending on the database or the release you are using. In principle, new statistics only have to be generated when a table has noticeably grown or reduced in size. This is why the statistics are generated over two steps in the SAP environment. In the first step, a check is performed to determine whether statistics need to be generated for the table. To do this, the current number of data records is compared with the

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number of data records that existed the last time that statistics were generated. In the second step, statistics are generated for all tables whose size has changed noticeably. Depending on the database you are using, both of these steps are scheduled in one job or in two separate jobs.

The generation of statistics is extremely important for efficient access to data and should therefore be checked regularly by the administrator.

Another important task of the administrator is to check database growth (in particular, free memory) to ensure database performance remains high. This can be done with the database tools or from the SAP system. There are various database transactions available in the SAP system, as well as CCMS monitoring. The following graphic shows a section of the database monitor that can be used to monitor how full the database is. As the graphic shows, not only can you monitor database growth, but also the performance and scheduled DBA activities such as backups and statistics generation.

DBA Cockpit: Alerts → Alert Monitor (New Version)

Alert Tree	Message	Date	Time
MaxDB (MaxDB Monitoring)			
Properties			
Space Management			
Data Area			
Total Data Space	77000 MB < 1000000000 MB	28.01.2010	09:59:32
Free Data Space	6534 MB > 2048 MB	28.01.2010	09:59:32
Used Data Space	92 % > 90 % - Data area used heavily (92 > 90 3)	28.01.2010	09:59:32
Log Area			
Performance			
Caches			
Data Cache Hitrate - total	10000 % > 9900 %	28.01.2010	09:49:32
Catalog Cache Hitrate	9941 % > 8000 %	28.01.2010	09:49:32
User Tasks			
Monitor			
Optimizer Statistics			
Backup/Recovery			
SAP consistency			
Health			
External Analysis Tools			
Connectivity			

Figure 57: Database: CCMS Monitoring (RZ20)

You should also regularly check the status of your scheduled periodic actions (for example, backups and statistics generation). In the event of problems or warnings, analyze the respective logs either in the Planning Calendar or in the DBA Cockpit log overview.

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DBA Cockpit: Jobs → DBA Log

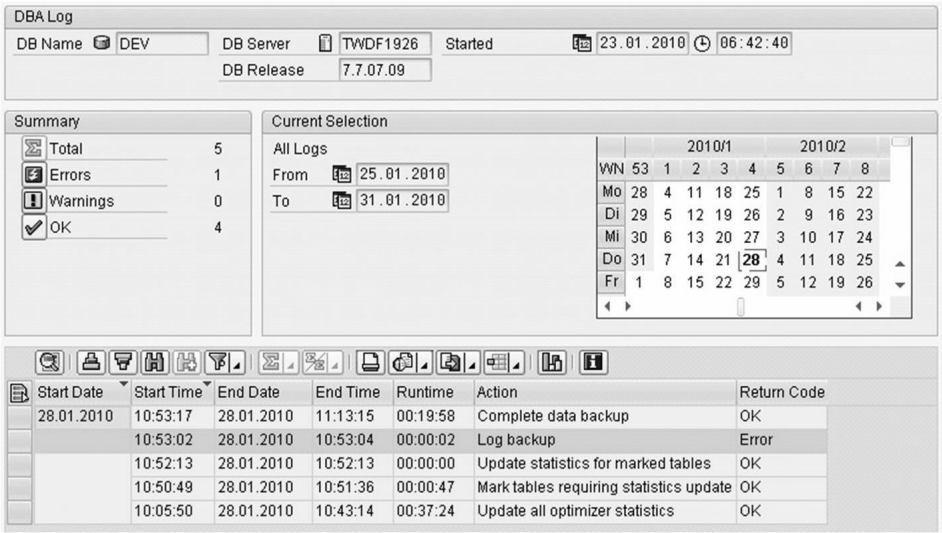

Figure 58: DBA Cockpit: Logs

This lesson merely provides an initial overview of the various checks that the administrator has to perform regularly. For more information about these checks, contact your database vendor, consult the technical documentation, contact an SAP consultant, or attend one of our administration courses for the database that you are using.

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Exercise 10: Outlook: Monitoring the Database

Exercise Objectives

After completing this exercise, you will be able to:

- Schedule additional periodic checks of the database

Business Example

To ensure good database performance and, therefore, good SAP system performance, the administrator performs additional checks of the database, which can be regularly scheduled.

Task: Update the Statistical Data

Schedule the generation of current statistical data in transaction DBACOCKPIT.

1. With the MaxDB, you have the option of generating general statistics for all tables (without prior checks). These actions are usually scheduled after a new installation or after major changes (such as upgrades).

   Schedule the generation of statistics for all tables in the DBA Cockpit. Choose 18:00 as the start time.

2. Normally, updates are scheduled in a two-step process. In the first step, check which tables have been so radically changed since the previous generation of statistics that they need new statistics. In the second step, generate the statistics for these tables.

   Schedule the generation of statistics using the two-step process in the DBA Cockpit. To ensure that some time has passed since statistics were generated, schedule this action for the following morning.

3. On the following morning, check the Planning Calendar to see whether the actions have been performed successfully.

   For example: Check which tables have changed so much between the actions *Update all optimizer statistics* and *Mark tables for statistics update* that they need new statistics. Use the program log for the latter action to do this.

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Solution 10: Outlook: Monitoring the Database

Task: Update the Statistical Data

Schedule the generation of current statistical data in transaction DBACOCKPIT.

1. With the MaxDB, you have the option of generating general statistics for all tables (without prior checks). These actions are usually scheduled after a new installation or after major changes (such as upgrades).

   Schedule the generation of statistics for all tables in the DBA Cockpit. Choose 18:00 as the start time.

   a) Call the DBA Cockpit Planning Calendar (transaction DBACOCKPIT) choosing *Jobs → DBA Planning Calendar* in the left menu. Select the action *Update all optimizer statistics* by double clicking the entry in the *Action Pad*.

      Select 18:00 as the start time, and choose the *Add* pushbutton. The entry *UpdAllStats* appears in the Planning Calendar.

2. Normally, updates are scheduled in a two-step process. In the first step, check which tables have been so radically changed since the previous generation of statistics that they need new statistics. In the second step, generate the statistics for these tables.

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Schedule the generation of statistics using the two-step process in the DBA Cockpit. To ensure that some time has passed since statistics were generated, schedule this action for the following morning.

a) Check which tables require new statistics.

Call the DBA Cockpit Planning Calendar (transaction DBACOCKPIT) choosing *Jobs → DBA Planning Calendar* in the left menu. Select the action *Mark tables requiring statistics update* by double clicking the entry in the *Action Pad*.

Leave the action parameters as their default values, select 06:00 on the following morning as the start time, and confirm the action by choosing the *Add* pushbutton. The entry *PrepUpdStat* appears in the Planning Calendar.

b) Generate the statistics for the selected tables.

Call the DBA Cockpit Planning Calendar (in the left menu *Jobs → DBA Planning Calendar*). Select the action *Update statistics for marked tables* by double clicking the entry in the *Action Pad*.

Select 07:00 on the following morning as the start time, and choose the *Add* pushbutton. This entry now appears as *UpdStats* in the Planning Calendar.

3. On the following morning, check the Planning Calendar to see whether the actions have been performed successfully.

For example: Check which tables have changed so much between the actions *Update all optimizer statistics* and *Mark tables for statistics update* that they need new statistics. Use the program log for the latter action to do this.

a) In the DBA Cockpit, call the Planning Calendar (transaction DBACOCKPIT) by choosing *Jobs → DBA Planning Calendar* in the left menu.

b) Open the details for an action by double-clicking on an action entry in the calendar. The entry for the action *Mark tables for statistics update* is called *PrepUpdStat* in the weekly calendar.

c) In the *Display details for action* window, choose the *Program Log* tab page. You can identify tables that have been marked for the update in the log by the text *set TOBDO*.

Choose *Continue* to close the window.

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Lesson Summary

You should now be able to:

- Schedule additional periodic checks of the database

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Lesson: Fundamentals of SAP Data Archiving

Lesson Overview

Data archiving is used to remove large quantities of data that is no longer required in the system, but which is to be retained in an analyzable format. This lesson defines the term data archiving, and explains the reasons for implementing an archiving project. The process of data archiving will also be outlined.

Lesson Objectives

After completing this lesson, you will be able to:

- Define the term data archiving
- Explain the need for data archiving
- Outline the technical process of data archiving
- List different options for accessing archived data

Business Example

The management team of your company has decided to implement SAP data archiving. As a member of the system administration team, you want to learn about the fundamentals of data archiving.

Introduction

With current database systems, a large data volume can often lead to performance bottlenecks, which cause bad performance on the user side, and increased resource costs on the administration side. Data that is no longer required in the database for applications should therefore be removed from the database. However, it is often not possible simply to delete the data, as read access to the data is still frequently required. The data must therefore be stored outside the database on external storage media so that it can later be read again.

Definition of Data Archiving

Data archiving means the consistent removal of data objects from database tables of the SAP system database, where all table entries that characterize a data object are written to an archive file outside the database. Business consistency is ensured by SAP archiving programs that store all relevant table entries together on the basis of archiving objects.

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The contents of business objects of the SAP system are distributed across multiple tables in the database. Archiving objects bundle logically connected tables of business objects. This ensures, in the context of data archiving, that **all** information for a business object is stored outside the database and therefore deleted from the database.

The following figure clarifies the connection between database tables, business objects, and archiving objects. The application data removed from the SAP system database is compressed and stored in a different location (such as a file system).

The data is archived in online mode; that is, you do not need to shutdown the system during the archiving.

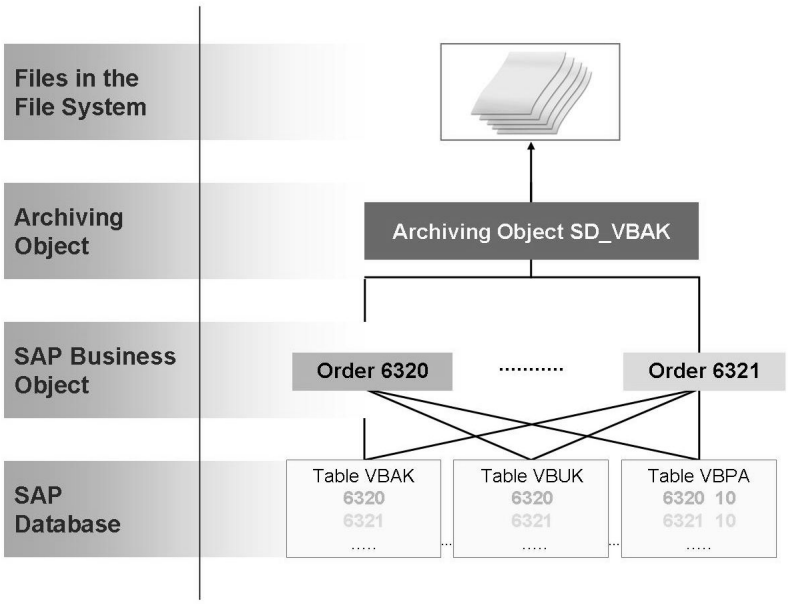

Figure 59: What is Data Archiving?

Since the term archiving is used in an undifferentiated way in the IT world, this section examines a number of other important terms in the data archiving environment in order to create a distinction between these terms and data archiving. In particular, data archiving is **not**

- Reorganization
- Backup / Restore
- Document storage (usually using SAP ArchiveLink)
- Deletion of test data

The term **reorganization** has a double meaning within the SAP world (historically, due to SAP R/2). On one hand, this can mean the physical deletion of application data from the database, on the other - and this is the actual meaning - this term

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means the reorganization of the database. During the reorganization of the database, the data is unloaded from the database and then reloaded, to optimize the physical data distribution on the hard disk.

A **backup** is the backing up of the database contents in case of system breakdowns. The aim is to restore the database status to as close to the status that was current before the breakdown. Backups are usually performed at fixed time intervals and follow a fixed procedure. The process of reloading the backed up data is called a **restore**.

Database backups are independent of the data archiving and should be scheduled and performed at regular intervals.

Document storage means the general electronic storage and management of documents on storage systems outside the SAP system. The documents are transferred to a document storage system. Only a pointer that links to the stored documents and allows access is administered in the SAP system.

SAP ArchiveLink is a data interface integrated into the SAP NetWeaver Application Server that controls communication with storage systems.

Only data from completed business processes can be archived. **Test data** rarely achieves this status.

Reasons for Data Archiving

The larger a database is, the higher the cost for database administration with regard to recovery or backup. Securing the SAP system services requires ever more resources. Upgrades of the system or database also become disproportionately more expensive with an increasing database size.

For end users, an increasing database size means a higher system load for individual database queries; that is, increasing response times for reporting and access to individual database records.

Hint: Full table scans, in particular, are accelerated by data archiving, but access using indexes can also be appreciably accelerated by data archiving. The main effect in this case is that a reduction of the disk requirement for an index improves the quality of the database's data buffer. This effect is especially pronounced for indexes that are likely to be accessed using any of their fields. This includes all indexes that are not created in a chronologically sorted format (such as using the document number).

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The reasons for data archiving are summarized in the following list:

- Improve response times or ensure good response times
- Reduce costs for database administration
- Reduce system downtime for software upgrades, recoveries, and (offline) data backups
- Legal requirements and business requirements must be taken into account here, such as:
  - Country-specific retention rules
  - Data must be available to auditors
  - Potential reusability of data

Data must be archived in a way that they can be called at any time for queries. These queries could, for example, be from tax authorities. There are legal data retention requirements in each country. Also, only data from completed business processes can be archived.

With data archiving, data is archived independent of the hardware and software release statuses (metadata is stored). In this way, it is still possible to call archived data without any problems even after a system upgrade.

Cooperation Between the System Administration and User Departments

You should begin planning the archiving of application data during the implementation of SAP software. The volume of transaction and master data can increase very quickly when live operation is first started.

The system administration's aim is to keep the database as small as possible; that is, to delete as many data objects as possible to reduce the database load. The aim of user departments, on the other hand, is to be able to access as many documents as possible online for queries, lists, and reporting.

The process of data archiving is about finding a compromise between these two positions that satisfies both sides. The long-term aim must certainly be to maintain as constant as possible a volume of data in the database and to archive data proactively instead of reactively.

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Schematic Process of a Data Archiving Run

The actual data archiving is a process in three steps:

1. Creating the archive file(s): In the first step, the write program creates one (or more) archive file(s). The data to be archived is then read from the database and written to the archive file(s).
2. Storing the archive file(s): After the write program has completed the creation of the archive file(s), these can be stored.
3. Deleting the data: the delete program first reads the data in the archive file and then deletes the corresponding records from the database.

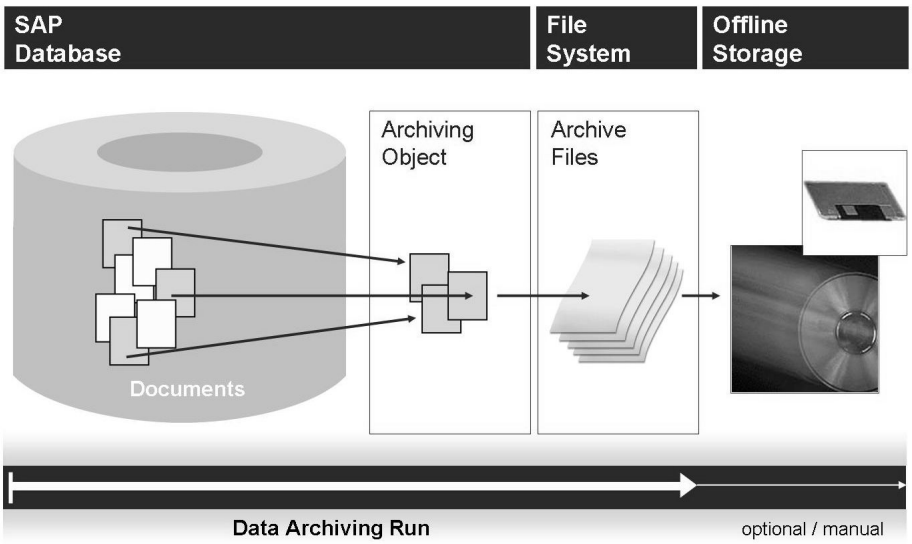

Figure 60: The Archiving Process

You must also consider the fact that it is usually not sufficient to write the data to be archived to archive files and to delete it from the database. The archive files must be stored securely and be managed to ensure that they are accessible later if required.

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There are a number of options for the storage of archive files (see step 2):

- Hierarchical Storage Management (HSM) systems: If an HSM system is used, it is sufficient to maintain the appropriate file path in Customizing (transaction FILE). It is left to the HSM system to store the files on an appropriate storage medium, depending on frequency of access and disk space utilization.
- Optical archiving: This term refers to electronic storage and management of documents on storage systems outside the SAP system landscape. These documents are usually physically stored on optical media, such as CDs. This is where the name originates.
- Manual storage: After the deletion program has processed the relevant archive file, it can be manually placed on tape.

Accessing Archived Data

A significant prerequisite for archiving application data is that this data belongs to completed business processes or periods and is therefore no longer required for current business processes. However, it may be necessary to access this data again even after it has been archived, for example in the case of a complaint, for evaluations, or for an internal or external audit. This section provides an overview of the options for accessing archived data.

Access Options

The Archive Development Kit stores data in such a way that a read access to it is possible at any time. The prerequisite for this is the existence of appropriate read programs, which are made available by the relevant archiving object. They are used to read the archived data objects in accordance with the selection criteria and to display it in a suitable format for the user. In general, two types of access or display are used:

- Sequential access
- Direct access

Sequential (reading) access is the simplest form of access to archived data. With this type of access, the read program first opens the archive files from an archiving run sequentially, reads the contents of all data objects, and lists the data that meets the entered selection criteria sequentially. You can use this method, for example, to list all data objects for a particular posting period or for a particular document number group.

Direct access to individual archived data objects, such as an order or billing document can only be achieved using an index table. The data object to be displayed is first selected in the index table using search terms. If this is successfully achieved, the archive file that contains the data object concerned is localized and opened using the index. The read program can now directly access

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and display the data object for which you have searched. This method of direct access uses a relatively high amount of program resources, and is therefore only offered by a small number of archiving objects.

The SAP Archive Information System provides significantly more extensive and easier to use functions for quick direct access to archived data objects.

The SAP Archive Information System

The SAP Archive Information System (Archive Information System, SAP AS) is a tool for searching in SAP data archives that is fully integrated into the archiving environment. It offers you support when searching for archived data and provides functions for displaying this data.

The SAP Archive Information System is a generic tool; that is, the available functions can be used for all existing archiving objects.

The search for data is always based on archive information structures. These are transparent database tables that are supplied with data from the archive. To search for archived data for an archiving object, there must be at least one archive information structure for this archiving object. An information structure of this type always includes the structure itself, the corresponding transparent database table, and an evaluation program.

Before an archive information structure can be created, that is, filled with data from the archive, it must first be activated. The system generates a transparent database table and the evaluation program in the background. At the start of the delete run for an archiving object, all of the active information structures for this archiving object are filled.

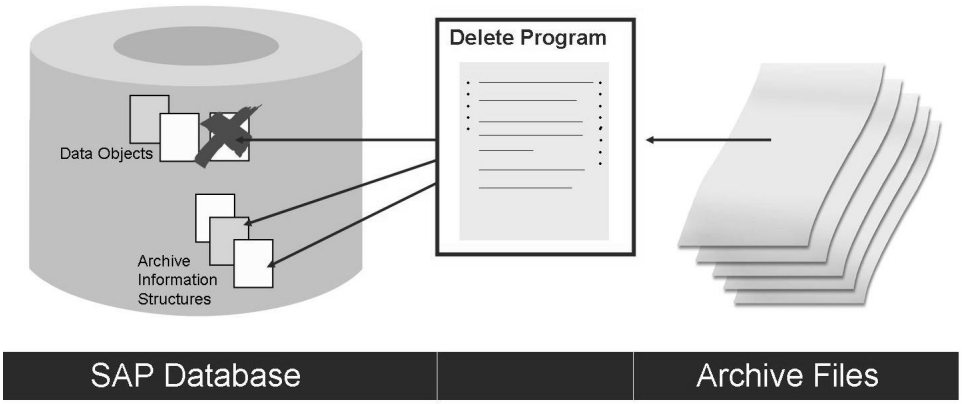

Figure 61: Automatic Filling of an Information Structure by the Delete Program

When displaying archived data, the user can usually choose between a number of views in which the data objects can be displayed. Examples of these views are the technical view and the business view.

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Lesson Summary

You should now be able to:

- Define the term data archiving
- Explain the need for data archiving
- Outline the technical process of data archiving
- List different options for accessing archived data

Related Information

For more information about data archiving, see:

- The online documentation, in the Introduction to Data Archiving section (CA-ARC)
- SAP course BIT660 (Data Archiving)
- SAP Service Marketplace under the Quick Links /data-archiving and /archivelink

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Unit Summary

You should now be able to:

- Describe in principle the structure and architecture of database systems
- Back up the contents of the database
- Check whether your database backups have been successfully performed
- Schedule additional periodic checks of the database
- Define the term data archiving
- Explain the need for data archiving
- Outline the technical process of data archiving
- List different options for accessing archived data

Related Information

- SAP Courses:

  ADM505 - *Database Administration Oracle I*

  ADM506 - *Database Administration Oracle II*

  ADM515 - *Database Administration MaxDB*

  ADM520 - *Database Administration MS SQL Server*

  ADM535 - *Database Administration DB2 LUW*

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Test Your Knowledge

1. Changes to the data are logged by the database in the _____.
   These files also contain the changes in status of the _____.
   Fill in the blanks to complete the sentence.

2. To minimize the risk of data loss, we recommend a _____ complete data backup. If you use incremental data backups as your daily backup, you must perform a complete data backup at least once a _____.
   Fill in the blanks to complete the sentence.

3. Every archiving object in the SAP system is connected 1:1 with the content of a single database table.
   Determine whether this statement is true or false.
   - □ True
   - □ False

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Answers

1. Changes to the data are logged by the database in the log files. These files also contain the changes in status of the database.

   Answer: log files, database

   The log mechanism is essential and must not be deactivated.

2. To minimize the risk of data loss, we recommend a daily complete data backup. If you use incremental data backups as your daily backup, you must perform a complete data backup at least once a week.

   Answer: daily, week

   In addition to a complete data backup, you should also back up the log information at least once a day.

3. Every archiving object in the SAP system is connected 1:1 with the content of a single database table.

   Answer: False

   Different business objects could belong to each archiving object in the SAP system. The data for these business objects could, in turn, be distributed across multiple database tables.

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Unit 5

Fundamentals of User Administration

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Unit Overview

This unit covers the authorization concept for ABAP-based SAP systems. The focus is on explaining important terms and creating roles and authorization profiles. System parameters are used to demonstrate how relevant settings can be made in the system. You are also given an insight into using central services.

Unit Objectives

After completing this unit, you will be able to:

- Create users
- Copy, create, and maintain roles
- Maintain the assignment of roles and users
- Describe the concept of a work center role
- Set system parameters for user logons
- Name standard users in the SAP system
- Locate authorization problems
- Describe the concept of Central User Administration
- Describe connection to directory services

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Lesson: User Administration Concept

Lesson Overview

This lesson explores the administration of user master records. Creating, copying, and maintaining master records of this type will be described in more detail.

Lesson Objectives

After completing this lesson, you will be able to:

- Create users

Business Example

The users of the SAP system require their own user with appropriate authorizations to log on. The administrator sets up a user ID in the system for each user.

Basics of User Administration

The concept of the user master record and the authorization concept are explained in more detail below. Both of these are important to obtain a better understanding of SAP systems.

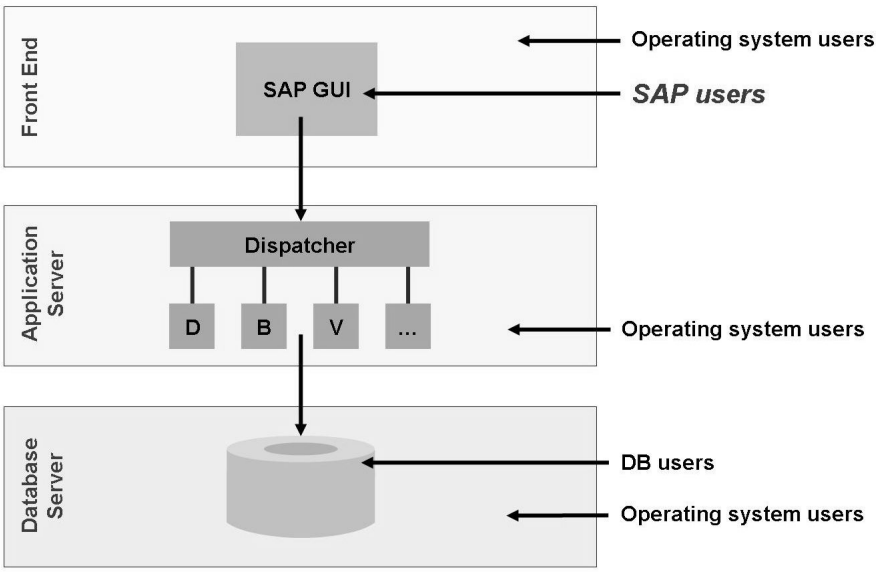

Figure 62: Users in the SAP Environment

The term **user** usually means user ID here. People log on to an operating system, a database, or an SAP system using a user/password combination. Operating systems, databases, and SAP systems usually have different authorization

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concepts. If a user/password combination is created in an SAP system for a person, this does not mean that it is possible to log on to the operating system of a host with the same user/password combination. However, it is possible that identical user/password combinations are created for SAP systems and operating systems.

Note: User requests are processed by SAP work processes. These work processes all use a common user to access the database.

This unit deals exclusively with SAP users that are used to log on to a client of an ABAP-based SAP system. Users and authorization data are client-dependent.

Access to the operating system level of the application server and database server must be protected, otherwise it may not be possible to use the SAP systems or the data could become damaged.

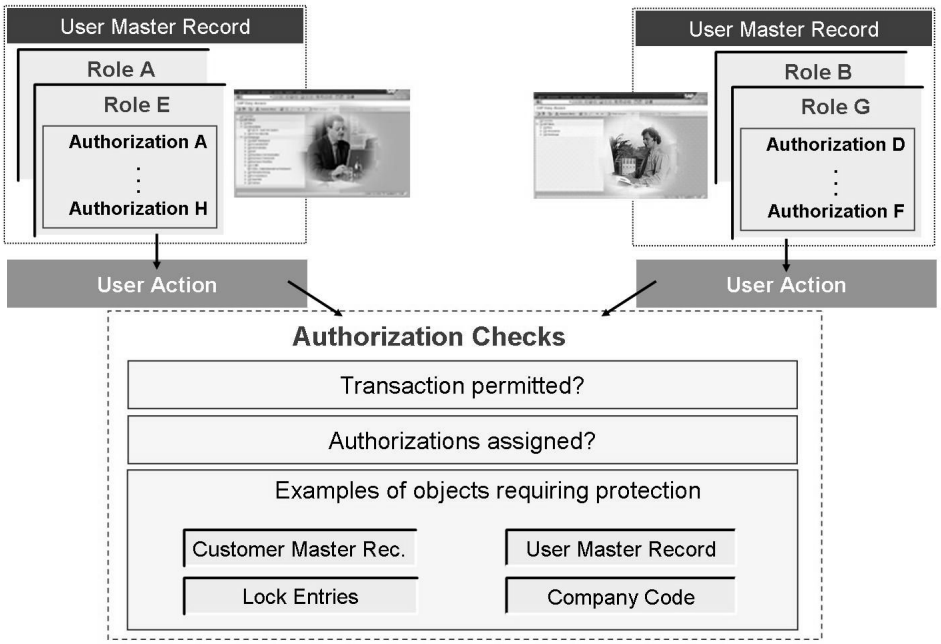

Figure 63: Users and Authorizations

A person can log on to a client of an SAP system if he or she knows the user name and password of a user master record, and if the user type is authorized for the log-on type. For example, it is not possible to log on with a communication or system user in the **dialog process**.

In the SAP system, there is an authorization check every time a transaction is called. If a user attempts to start a transaction for which he or she is not authorized, the system rejects the user with an appropriate error message.

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If the user starts a transaction for which he or she has authorization, the system displays the initial screen of this transaction. Depending on the transaction called, the user enters data and performs actions on this screen. There may be additional authorization checks for the data and actions to be protected.

User authorizations are assigned using roles (and sometimes through *manual* profiles, for example SAP_NEW). The authorizations are combined in roles and the roles are entered in the user master record. This is explained in more detail later in this unit.

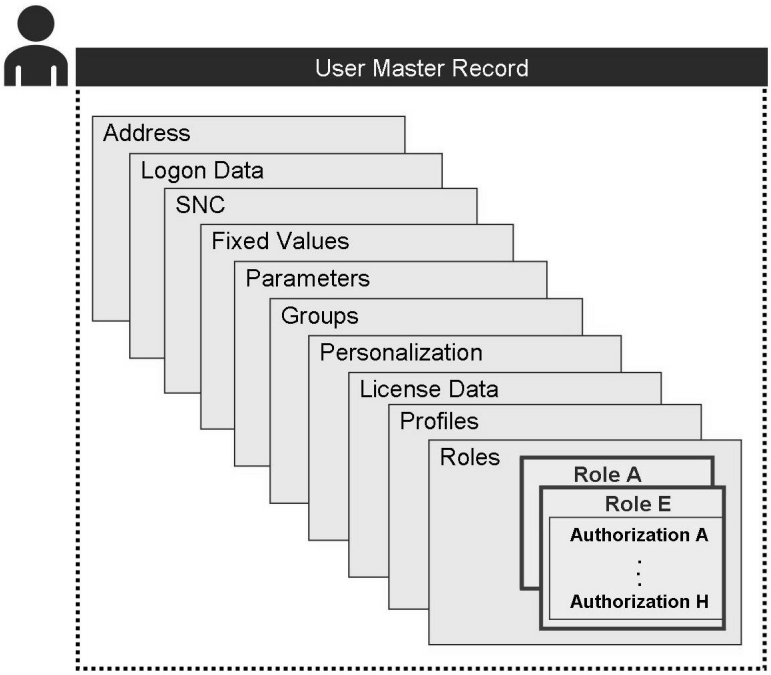

Figure 64: User Master Record

User type

The user type is an important property of a user. Different user types are available for different purposes:

Dialog

A normal *dialog* user is used for all log-on types by just one person. During a dialog logon, the system checks for expired/initial passwords, and the user has the opportunity to change his or her own password. Multiple dialog logons are checked and logged.

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System

Use the *System* user type for dialog-free communication within a system or for background processing within a system, or also for RFC users for various applications, such as ALE, Workflow, Transport Management System, Central User Administration. It is not possible to use this type of user for a dialog logon. Users of this type are excepted from the usual settings for the validity period of a password. Only user administrators can change the password.

Note: See also SAP Note 622464.

Communication

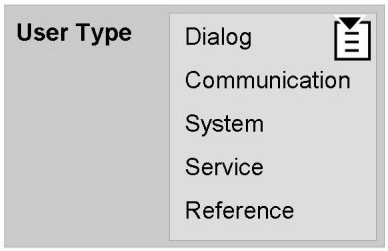
Use the *Communication* user type for dialog-free communication between systems. It is not possible to use this type of user for a dialog logon. The usual settings for the validity period of a password apply to users of this type.

Service

A user of the type *Service* is a dialog user that is available to a larger, anonymous group of users. In general, you should only assign highly restricted authorizations to users of this type. Service users are used, for example, for anonymous system accesses using an ITS or ICF service. The system does not check for expired/initial passwords during logon. Only the user administrator can change the password. Multiple logons are permitted.

Reference

As with the service user, a *Reference* user is a general user, not specific to a particular person. You cannot use a reference user to log on. A reference user is used only to assign additional authorizations. You can specify a reference user for a dialog user for additional authorization on the *Roles* tab page.



	SAP GUI-capable	Not SAP GUI-capable
Password change: Yes	**Dialog**	**Communication**
Password change: No	**Service**	**System**

Figure 65: User Types

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User group

User groups are used to distribute user maintenance among several user administrators or for mass maintenance of user data.

A user group for authorization checks is required if you want to divide user maintenance among several user administrators. Only the administrator that has authorization for this group can maintain users of this group. If you leave the field empty, the user is not assigned to any group. This means that the user can be maintained by any user administrator allowed to maintain any group. This assignment is part of the logon data in the user master record.

For mass maintenance of user data (transaction SU10) users could be assignt to a user group on the tab Groups. Assignments that you make on the Groups tab page are not used for authorization checks that are specified on the Logon Data tab page using the User Group field. This is purely a grouping that is suitable, for mass maintenance.

User groups could be created in transaction *Maintain User Groups* (SUGR).

Creating a new user master record

To start user maintenance (transaction SU01), choose *Tools* → *Administration* → *User Maintenance* → *Users* in the SAP menu [S000].

You can create a new user master record by copying an existing user master record or creating a completely new one. The user master record contains all data and settings that are required to log on to a client of the SAP system. This data is divided into the following tab pages:

- *Address*: Address data
- *Logon data*: Password and validity period of the user, and user type. For further information about the password rules for special users, refer to SAP Note 622464,
- *SNC*: stands for *Secure Network Communications*, and is used for security functions (external product) that are not directly available, but have been prepared in SAP systems. Note the usage regulations for the country in which you want to use this function.
- *Defaults*: Default values for a default printer, the logon language, and so on,
- *Parameters*: User-specific values for standard fields in SAP systems,
- *Roles* and *profiles*: Roles and profiles that are assigned to the user,
- *Groups*: For the grouping of users for mass maintenance.
- *Personalization*: In some transactions, personal settings are required which have some affect on the appearance. These can be stored (prepopulated) using personalization objects.
- *LicenseData*: On this tab page, you specify the contractual user type of the user. Evaluation in the system measurement.

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You must maintain at least the following input fields when creating a user: **Last name** on the *Address* tab page, **initial password** and identical **repetition of password** on the *Logon Data* tab page.

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Exercise 11: Fundamentals of User Administration

Exercise Objectives

After completing this exercise, you will be able to:

- Create users

Business Example

As an administrator, you need to create new users and lock existing users.

Task 1: Creating Users

Create a user in client 100 with the name ADMIN<##>, where <##> is your group number. Follow the steps described below.

1. Log on to client 100 in your SAP system and create a user (master record) with the name ADMIN<##>.
2. Maintain the first and last names of the user.
3. Assign the user an initial password (PW:_____). Make sure you use the correct upper and lower case. Assign it to the *User Group for Authorization Check* **SUPER**.
4. Enter a default value for the logon language for the user (such as EN or DE).
5. Save the user master record.

Task 2: Creating User Groups

Create your own user group.

Hint: ***User group for authorization checks***
A user group isrequired if you want to divide user maintenance among several user administrators. Only the administrator that has authorization for this group can maintain users of this group. If you leave the field empty, the user is not assigned to any group. This means that the user can be maintained by any user administrator allowed to maintain any group.

1. Create your own user group with the name: *ADMINTEAM-##*, and any descriptive text.

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Solution 11: Fundamentals of User Administration

Task 1: Creating Users

Create a user in client 100 with the name ADMIN<##>, where <##> is your group number. Follow the steps described below.

1. Log on to client 100 in your SAP system and create a user (master record) with the name ADMIN<##>.
   a) Start transaction SU01. Enter the name **ADMIN<##>** in the *User* field and choose *Create*.
2. Maintain the first and last names of the user.
   a) Choose the *Address* tab page. Enter the names in the appropriate fields.
3. Assign the user an initial password (PW:_____). Make sure you use the correct upper and lower case. Assign it to the *User Group for Authorization Check* **SUPER**.
   a) Choose the *Logon Data* tab page. In the *Initial Password* field, enter the password and press the tab key to move to the *Repeat Password* field. Enter the password again in this field. Move the cursor to the *User Group* input field, and choose the group **SUPER** from the F4 help by double-clicking on it.
4. Enter a default value for the logon language for the user (such as EN or DE).
   a) Choose the *Defaults* tab page. In the *Logon Language* field, enter **EN** for English, or **DE** for German, for example.
5. Save the user master record.
   a) Choose *Save*.

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Task 2: Creating User Groups

Create your own user group.

Hint: ***User group for authorization checks***
A user group isrequired if you want to divide user maintenance among several user administrators. Only the administrator that has authorization for this group can maintain users of this group. If you leave the field empty, the user is not assigned to any group. This means that the user can be maintained by any user administrator allowed to maintain any group.

1. Create your own user group with the name: *ADMINTEAM-##*, and any descriptive text.

   a) In the SAP menu, choose *Tools* → *Administration* → *User Maintenance* → *Maintain User Groups* (transaction: SUGR).

      Enter **`ADMINTEAM-##`**, and choose *Create User Group (F8)*. Enter additional text, and *Save* your settings.

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Lesson Summary

You should now be able to:

- Create users

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Lesson: Authorization Concept

Lesson Overview

In this lesson, the terms authorization object, authorization profile, authorization check, and role are discussed in a common context. The focus here is on role maintenance; that is, on creating a role.

Lesson Objectives

After completing this lesson, you will be able to:

- Copy, create, and maintain roles
- Maintain the assignment of roles and users
- Describe the concept of a work center role

Business Example

The authorizations for users are created using roles and profiles. Administrators create the roles, and the system supports them in creating the associated authorizations.

Authorization Objects and Authorization Checks

To understand the ABAP authorization concept, you must have some knowledge of roles and authorization profiles in the user master record. This lesson provides you with the necessary knowledge to be able to create your own roles and authorizations.

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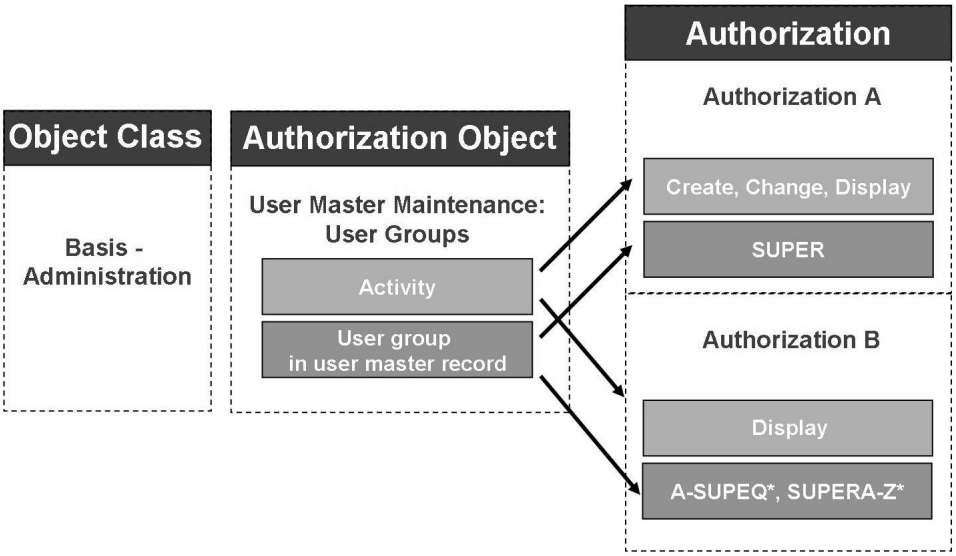

Figure 66: Authorization Objects

In an ABAP-based SAP system, actions and access to data are protected by authorization objects. The authorization objects are delivered by SAP and are in SAP systems. To provide a better overview, authorization objects are divided into various object classes.

Authorization objects allow complex checks that involve multiple conditions that allow a user to perform an action. The conditions are specified in authorization fields for the authorization objects and are AND linked for the check. Authorization objects and their fields have descriptive and technical names. In the example in the figure, the authorization object *User master maintenance: User Groups* (technical name: *S_USER_GRP*) contains the two fields “Activity” (technical name: *ACTVT*) and “User Group in User Master Record” (technical name: *CLASS*). The authorization object *S_USER_GRP* protects the user master record. An authorization object can include up to ten authorization fields.

An authorization is always associated with exactly one authorization object and contains the value for the fields for the authorization object. An authorization is a permission to perform a certain action in the SAP system. The action is defined on the basis of the values for the individual fields of an authorization object. For example: Authorization B in the graphic for the authorization object *S_USER_GRP* allows the display of all user master records that are **not** assigned to the user group *SUPER*. Authorization A, however, allows records for this user group to be displayed.

There can be multiple authorizations for one authorization object. Some authorizations are delivered by SAP, but the majority are created specifically for the customer's requirements.

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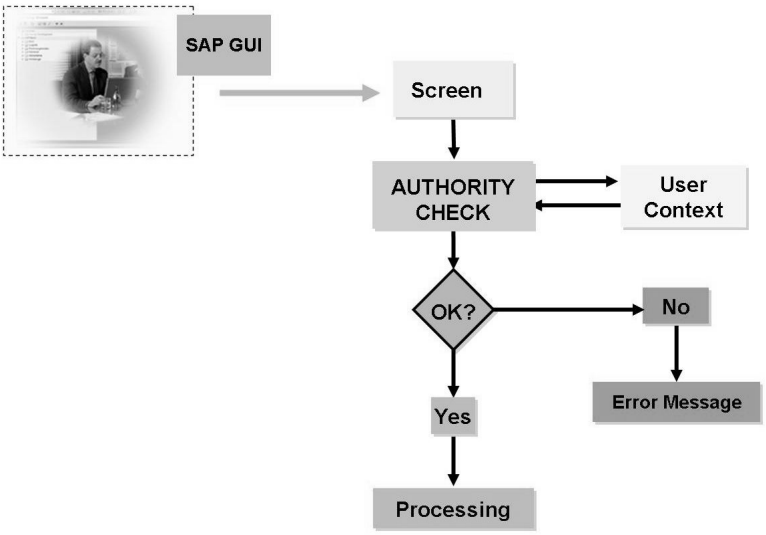

Figure 67: Authorization Check

When a user logs on to a client of an SAP system, his or her authorizations are loaded in the user context. The user context is in the user buffer (in the main memory, query using transaction SU56) of the application server.

When the user calls a transaction, the system checks whether the user has an authorization in the user context that allows him or her to call the selected transaction. Authorization checks use the authorizations in the user context. If you assign new authorizations to the user, it may be necessary for this user to log on to the SAP system again to be able to use these new authorizations (for more information, see SAP Note 452904 and the documentation for the parameter *auth/new_buffering*).

If the authorization check for calling a transaction was successful, the system displays the initial screen of the transaction. Depending on the transaction, the user can create data or select actions. When the user completes his or her dialog step, the data is sent to the dispatcher, which passes it to a dialog work process for processing. Authority checks (*AUTHORITY-CHECK*) that are checked during runtime in the work process are built into the coding by the ABAP developers for data and actions that are to be protected. If the user context contains all required authorizations for the checks (return code = 0), the data and actions are processed, and the next screen is displayed. If one authorization is missing, the data and actions are not processed and the user receives a message that his or her authorizations are insufficient. This is controlled by the evaluation of the return code. In this case, it is not equal to 0.

All authorizations are permissions. There are no authorizations for prohibiting. **Everything that is not explicitly allowed is forbidden.** You could describe this as a “positive authorization concept”.

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Role Maintenance: Menus and Authorizations

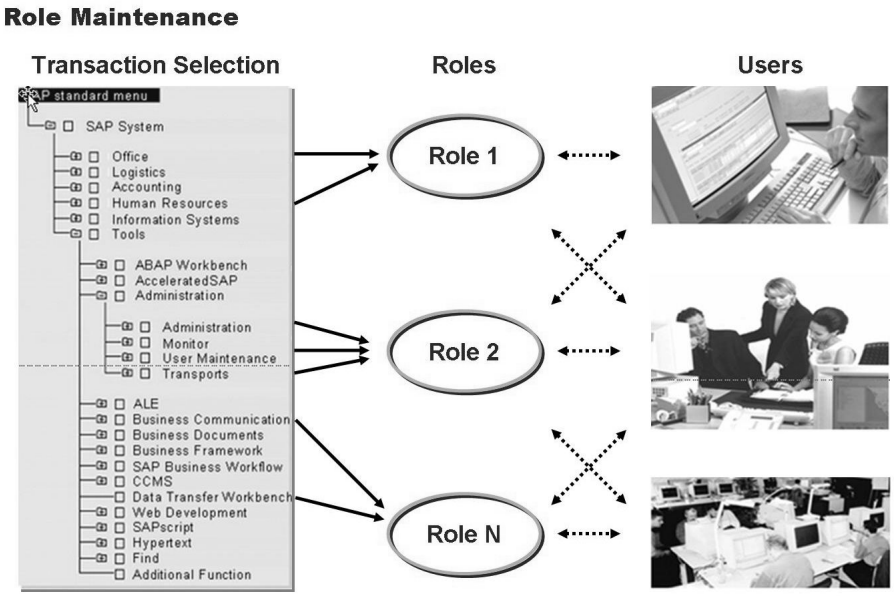

Figure 68: Role Maintenance

Role Maintenance (transaction PFCG, previously also called Profile Generator or activity groups) simplifies the creation of authorizations and their assignment to users. In role maintenance, transactions that belong together from the company's point of view are selected. Role maintenance creates authorizations with the required field values for the authorization objects that are checked in the selected transactions.

A role can be assigned to various users. Changes to a role therefore have an effect on multiple users. Users can be assigned various roles.

The user menu comprises the role menu(s) and contains the entries (transactions, URLs, reports, and so on) that are assigned to the user through the roles.

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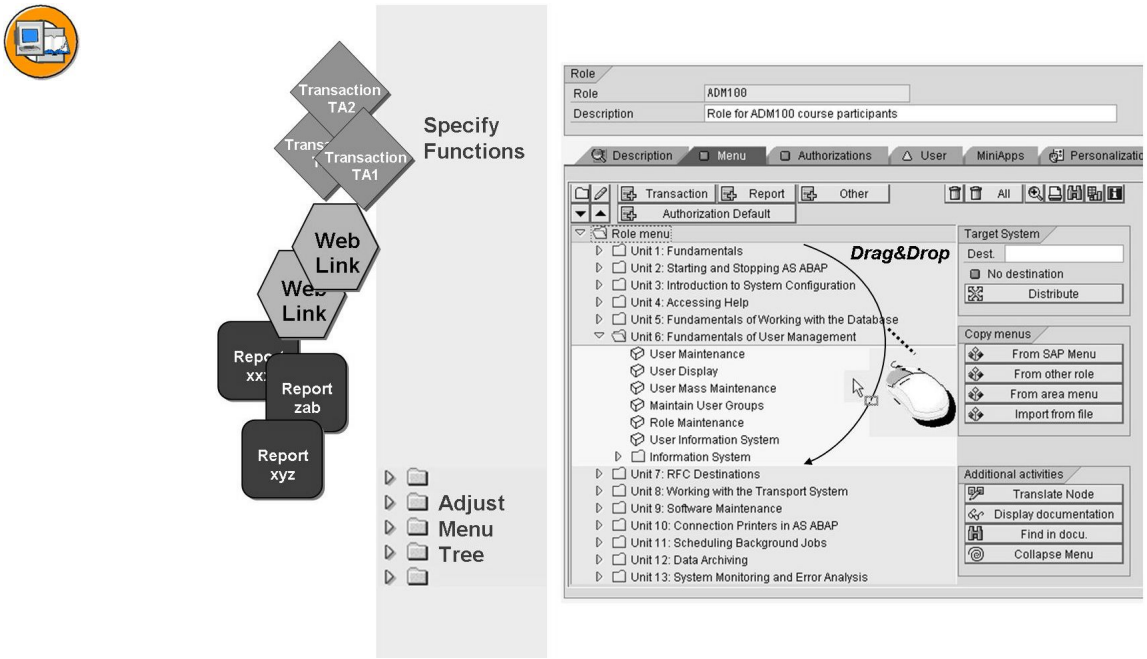

Figure 69: Menu Layout

You can access role maintenance with transaction PFCG or by choosing *Tools → Administration → User Maintenance → Role Administration → Roles*. Enter the name of the role and choose the icon for *Create* or *Change*. Choose the *Menu* tab page.

Select and change functions: The menu tree can be adjusted for the individual roles as required.

You can insert or delete **transactions** into or from the tree structure.

By choosing the *Report* button, you can integrate **Reports**. In this case role maintenance creates transaction codes (if they do not already exist) with which the reports can be called.

By choosing the *Other* button, you can add **Internet addresses** or **links to files** (such as tables or text files). When integrating files, you must use the storage paths instead of URLs. You can also specify BW WebReports, and links to external mail systems and Knowledge Warehouse.

Change menus: You can create, move, delete, and rename directories and subdirectories as required. You can use the Drag&Drop function in role maintenance.

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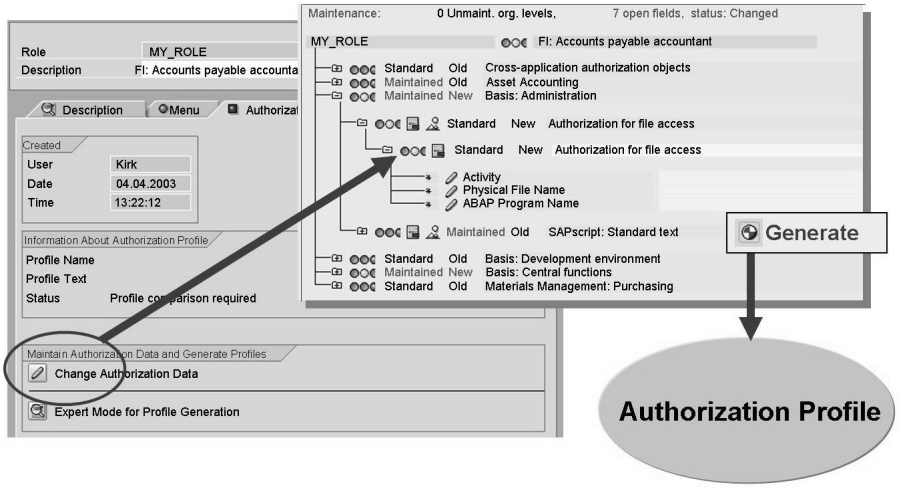

Figure 70: Generating Authorization Profiles

Role maintenance **automatically creates the authorizations** that are associated with the transactions specified in the menu tree. However, all authorization values must be **manually checked and adjusted if required** in accordance with the actual requirements and authorities. The system administrator is responsible for this task, together with the appropriate user department. When using organizational levels, you do not carry out maintenance directly in the field, but by means of the *Org. Levels...* button (Ctrl+F8).

Choose the *Authorizations* tab page and then *Display Authorization Data* or *Change Authorization Data*, depending on the maintenance mode. Check the scope and contents of the authorizations.

If these are proposed by the system, a **green traffic light** in the authorization overview indicates that role maintenance has supplied at least one proposal for each authorization field. A **yellow traffic light** indicates that the authorization must be maintained manually after it has been created. Role maintenance does not provide a default value for the authorization. This example deals with access to files. Role maintenance cannot guess whether data access should only be read access, or should be read and write access.

Some fields appear in many authorizations. A number of important fields were therefore combined into organizational levels, such as the company code. If you maintain an entry for the organizational level using the "*Organizational levels..*" button, you thus maintain **all** the fields that appear there in one go. A **red traffic light** therefore indicates an unmaintained organizational level.

Once all authorizations are maintained as required, the authorization profile can be generated by choosing *Generate*. Important: The second character of the profile name must not be an underscore ("_") (see SAP Note 16466). After creation, this name cannot be changed. The authorizations are combined in profiles. The

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profiles must be entered in the user master record (by the role maintenance) for the authorizations to take effect for the user. This is called *user master record comparison*.

Users and Roles

The assignment of users to roles is performed in the role maintenance transaction (transaction PFCG) or in the user maintenance transaction (transaction SU01). Select the *User* tab page and the user IDs to be maintained there. When selecting user IDs, the system uses the current date as the start of the validity period of the assignment; it sets 31.12.9999 as the end date. You can change both values.

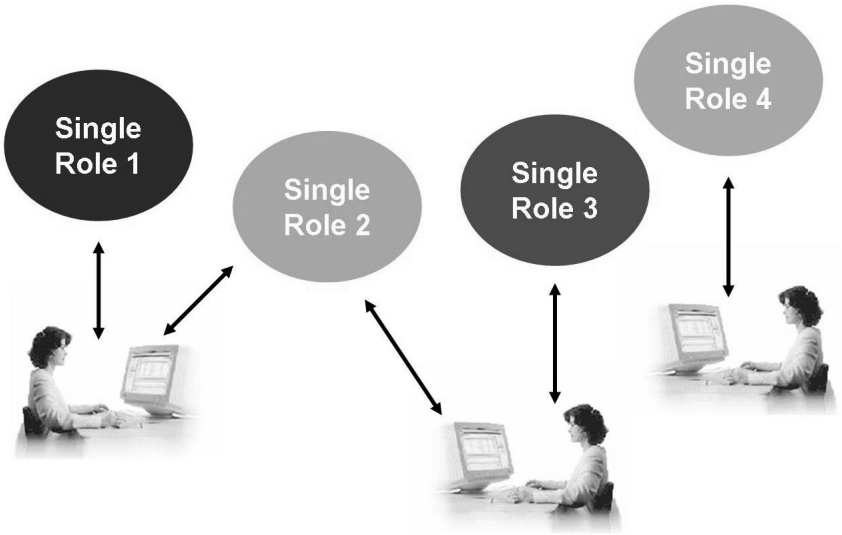

Figure 71: Assigning Roles to Users

Users can be linked to more than one role. This can be useful if some activities (such as printing) are to be permissible across roles.

The assignment of roles to users does not automatically grant the corresponding authorizations to the users. To assign the authorizations, you must first perform a **user master record comparison**, during which the role's profiles are entered in the user master record.

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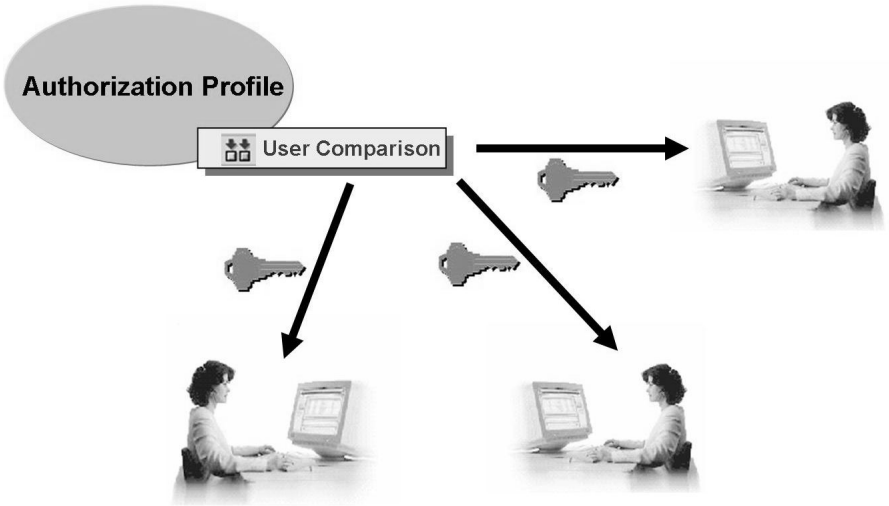

Figure 72: User Master Record Comparison

A user master record comparison determines whether authorization profiles should be added to or removed from the current user on the basis of his or her role assignment. During a comparison, profiles are added to a user master record due to roles that have been added. If role assignments are manually or time-dependently removed, the corresponding authorization profiles are deleted from the user master record.

The comparison can be performed **for every role individually**. Select the role in role maintenance. Choose the *User* tab page and choose *User comparison*. In the dialog box that the system displays, choose *Complete comparison*.

If multiple role assignments are to be updated, you can perform a corresponding comparison in role maintenance by choosing *Utilities → Mass comparison* (transaction PFUD). You can individually specify the desired roles, or update all assignments by entering the asterisk (*) character.

You can also activate the periodic user master record comparison in role maintenance by choosing *Utilities → Mass comparison*. Choose the option *Schedule or check job for full reconciliation*. The system then displays a search window for the background job *PFCG_TIME_DEPENDENCY*. If it does not find a corresponding job, you can create a new one. The default value is that all user master records are compared once every day.

Appendix: Special Roles in the Solution Manager Environment

As explained in the lesson *Central Administration with SAP Solution Manager*, an additional role concept, ***work center roles***, are used in the SAP Solution Manager System. This is shown in the *work center*.

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But what is a *work center role* or the *work center* itself?

- In the previous authorization concept, standard roles were created in transaction PFCG. This was intended to make maintenance easier for the administrator, while also bundling daily tasks for the end user. This means that all the transactions required for a user's warehouse activities for example are already bundled, and have a logical structure. The structure is called the role menu. If the role is assigned to the user, he or she can view the contents in the user menu (bundling of all role menus).
- If we now compare this with *work center roles*, the concept is almost identical. In this case, requirements and subject areas are also bundled for the user. The menu for the *work center roles* can also be viewed in the user menu; but this is not used for navigation. The menu is called through a central application in the web user interface (Web UI), the *work center*. The user interface is called in transaction SOLMAN_WORKCENTER. The contents of the assigned *work center roles* control the display (usually, these are web dynpro applications). Each has a separate tab page in the UI. The contents of the tab page are called simply by clicking the relevant area in the tab page.

Hint: Regardless of the role type, the contents are always maintained in transaction PFCG (role maintenance). The type of authorization check for objects and fields has also been fully retained.

In the SAP Solution Manager system, the *work center* has been offered as a function since SAP NetWeaver Release 7.0 SPS 15. Prior to this Support Package level, the required functions and programs were called through the SAP or user menu directly (not through the web dynpro UI). The roles delivered by SAP for the *work center* are easy to identify with the naming convention "*SAP_SMWORK**".

SAP Note *834534* is a good introduction to the subject. The note includes *annexes*, such as ZIP files, with examples of role definitions and so on. In many cases, the list of *Related Notes* is also very useful.

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Exercise 12: Working with Roles

Exercise Objectives

After completing this exercise, you will be able to:

- Create, copy, and modify roles and assign them to users

Business Example

The authorizations for users are created using roles and profiles. Administrators create the roles, and the system supports them in creating the associated authorizations.

Task 1: Copy a Role Template

Copy a role template and assign it to a user.

1. Select the single role SAP_BC_ENDUSER that was delivered, and copy this completely to your own role BC_ENDUSER<##>.
2. Check the transactions assigned for the user menu with this role.
3. Check the authorizations for the role, and maintain open authorizations if necessary.
4. Assign the role to the user ADMIN<##> and save your settings.
5. Perform a user comparison.

Task 2: (Optional) Create your own role

Create your own role.

1. Assign the name MONITORING<##> to the role.
2. Select the transactions SM50, SM51, and SM04 for the role menu.
3. Check the authorizations for the role, and maintain open authorizations if necessary.
4. Assign the role to the user ADMIN<##>.
5. Perform a user comparison.

Task 3: Assign a Role with Transaction SU01

Assign a role to a user in transaction SU01.

1. Check in the user master record ADMIN<##> which roles and profiles are assigned.

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2. Assign the role *ZPFUD* to the user ADMIN<##> using transaction SU01. You can only do this if you are in change mode in the user master record.
3. In the master record, enter the user group *ADMINTEAM-##* that you created in the lesson *Fundamentals of User Administration*. What effect does this setting have?

Task 4: Check User

Check the user ADMIN<##>.

1. Log on to the SAP System with the user ADMIN<##> and your chosen password and check whether the user can execute the transactions you assigned.

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Solution 12: Working with Roles

Task 1: Copy a Role Template

Copy a role template and assign it to a user.

1. Select the single role SAP_BC_ENDUSER that was delivered, and copy this completely to your own role BC_ENDUSER<##>.

   a) Start transaction PFCG. Place the cursor on the input field for roles. Use the F4 help to select the delivered single role *SAP_BC_ENDUSER*. Choose the *Copy Role* pushbutton. In the dialog box that appears, enter **BC_ENDUSER<##>** in the *to role* field and choose *Copy all*.

2. Check the transactions assigned for the user menu with this role.

   a) In the initial screen of transaction PFCG, choose the *Change* pushbutton or *Role* → *Change* from the menu for the role BC_ENDUSER<##>. Switch to the *Menu* tab page. Display the transaction code (choose the magnifying glass pushbutton, *Switch on technical names*) and open the *Basis Functions* folder.

3. Check the authorizations for the role, and maintain open authorizations if necessary.

   a) Choose the *Authorizations* tab page and then choose *Change Authorization Data*. Check the authorizations for the role and maintain open authorizations if necessary, for example by clicking the yellow traffic light icon at the top and confirming the system query as to whether full authorization should be assigned with *Execute*. Generate and save your profile settings by choosing *Generate*. Accept the proposed profile name in the process. Leave the *Change Roles: Authorizations* screen by choosing *Back*.

   Note: You do not need to *save* again, since this was already performed with the *generate* function.

4. Assign the role to the user ADMIN<##> and save your settings.

   a) Choose the *User* tab page and enter **ADMIN<##>** in the *User ID* field. *Save* your settings. A user master comparison has not yet been performed, however (next subtask).

   If user ADMIN<##> does not exist, create a user with this name in transaction SU01 in a new session.

5. Perform a user comparison.

   a) Choose *User Comparison* and then choose *Complete comparison*. Return to the initial screen for PFCG and save all the data that is still required.

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Task 2: (Optional) Create your own role

Create your own role.

1. Assign the name MONITORING<##> to the role.
   a) Start transaction PFCG. Enter **MONITORING<##>** in the input field for roles and choose *Create Single Role*.
2. Select the transactions SM50, SM51, and SM04 for the role menu.
   a) Choose the *Menu* tab page. Choose the *Transaction* pushbutton and enter the transactions SM50, SM51, and SM04. Then choose *Assign Transactions*.
3. Check the authorizations for the role, and maintain open authorizations if necessary.
   a) Choose the *Authorizations* tab page and then choose *Change Authorization Data*. Check the authorizations for the role and maintain open authorizations if necessary, for example by clicking the yellow traffic light icon at the top and confirming the system query as to whether full authorization should be assigned with *Execute*. Generate the profile in the same way you did in the previous task and accept the proposed profile name here too. Save and exit the *Change Role: Authorizations* screen by choosing *Back* (green arrow icon to the left).
4. Assign the role to the user ADMIN<##>.
   a) Choose the *User* tab page and enter **ADMIN<##>** in the *User ID* field.
5. Perform a user comparison.
   a) Choose *User Comparison* and then choose *Complete comparison*.

Task 3: Assign a Role with Transaction SU01

Assign a role to a user in transaction SU01.

1. Check in the user master record ADMIN<##> which roles and profiles are assigned.
   a) Start transaction SU01. Enter the name **ADMIN<##>** in the *User* field, and choose the *Change* pushbutton. Choose the *Roles* tab page and check whether the role BC_ENDUSER<##> is entered (this was done in task 1 for this exercise). Choose the *Profiles* tab page, and check that the corresponding profile is entered.

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2. Assign the role *ZPFUD* to the user ADMIN<##> using transaction SU01. You can only do this if you are in change mode in the user master record.

   a) Choose the *Roles* tab page and enter **ZPFUD** in the *Role* field and confirm with *ENTER*. Save your entries.

   Hint: By choosing *Enter* and *Save* in transaction SU01 the user master record comparison was performed.

3. In the master record, enter the user group *ADMINTEAM-##* that you created in the lesson *Fundamentals of User Administration*. What effect does this setting have?

   a) *Logon Data* tab page:

      Enter *ADMINTEAM-##* under User Group, and save. This setting means that the master data can only be accessed by users with the necessary authorization for the user group.

Task 4: Check User

Check the user ADMIN<##>.

1. Log on to the SAP System with the user ADMIN<##> and your chosen password and check whether the user can execute the transactions you assigned.

   a) Log on to the SAP system with your ADMIN<##> user. Switch to the user menu and execute some of the assigned transactions.

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Lesson Summary

You should now be able to:

- Copy, create, and maintain roles
- Maintain the assignment of roles and users
- Describe the concept of a work center role

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Lesson: Login Parameters and User Info

Lesson Overview

In this lesson, you learn about system parameters that are important in user administration, for example, for logon behavior. You can use the information system to obtain information about any incorrect logon attempts. Failed authorization checks are analyzed with the system trace. This lesson will also address using central directory services for maintaining user master record, for example, the address data contained in the records.

Lesson Objectives

After completing this lesson, you will be able to:

- Set system parameters for user logons
- Name standard users in the SAP system
- Locate authorization problems

Business Example

Users are having problems due to missing authorizations. The administrator can analyze these using system tools.

Login Parameters

This lesson deals with authorizations in the SAP system from an operational point of view. Among other things, the following questions are considered: Which system settings can be used to influence logon behavior? How can errors and problems be analyzed?

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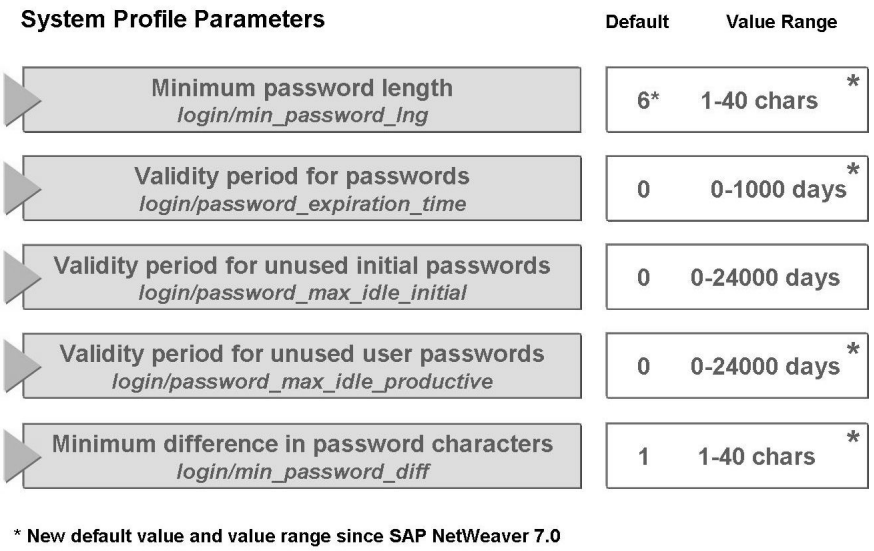

Figure 73: System Parameters for User Logons 1/2

You can set the minimum length for passwords with the parameter ***login/min_password_lng***. The parameters *login/min_password_digits*, *login/min_password_letters*, *login/min_password_lowercase*, *login/min_password_uppercase*, and *login/min_password_specials* specify the minimum number of **digits, letters (number of upper and lower case)** or **special characters** that a password must contain.

The parameter ***login/password_expiration_time*** specifies the number of days after which a user must set a new password. If the parameter is set to 0, the user does not need to change his or her password.

There are general rules for passwords that cannot be deactivated. A password

- Must not begin with “?” or “!”
- Must not be pass

Hint: The setting that determines that users must create a new password that differs from the previous 5 passwords they have entered is no longer mandatory. You can use the *login/password_history_size* parameter to set the history from between 1 and 100. The proposed standard value remains 5.

You can define additional password restrictions in table *USR40*.

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SAP Web Application Server 6.20 and 6.40 offered the parameters *login/password_max_new_valid* and *login/password_max_reset_valid*. They specified for how long an initial password for a newly created user or a password that was reset by an administrator was valid. With SAP NetWeaver AS 7.0, they have been replaced by the parameter ***login/password_max_idle_initial***.

Hint: The parameter *login/password_max_idle_initial* indicates the maximum length of time during which an initial password (a password selected by the user administrator) remains valid if it is not used. Once this period has expired, the password can no longer be used for authentication. The user administrator can reactivate the password logon by assigning a new initial password.

Another new parameter in SAP NetWeaver AS 7.0 is ***login/password_max_idle_productive***. This indicates the maximum length of time a productive password (a password chosen by the user) remains valid when it is not used. Once this period has expired, the password can no longer be used for authentication. The user administrator can reactivate the password logon by assigning a new initial password.

With the parameter ***login/min_password_diff***, the administrator can determine the number of different characters a new password must possess in comparison with the old one when users change their passwords. This parameter does not take effect when a new user is created or passwords are reset (==> initial password).

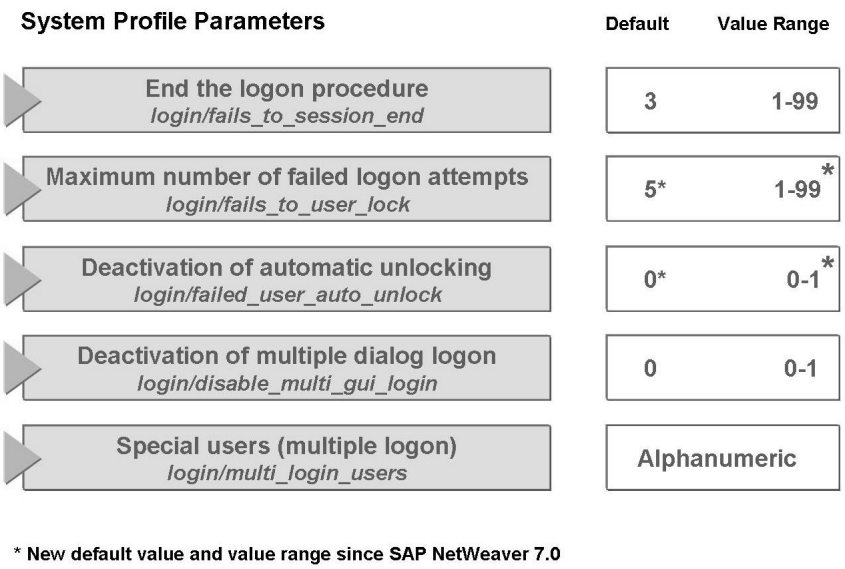

Figure 74: System Parameters for User Logons 2/2

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You can set the number of failed logon attempts after which SAP GUI is terminated using the parameter ***login/fails_to_session_end***. If the user wants to try again, he or she must restart SAP GUI.

You can set the number of failed logon attempts after which a user is locked in the SAP system using the parameter ***login/fails_to_user_lock***. The failed logon counter is reset after a successful logon attempt.

Hint: At midnight (server time), the users that were locked as a result of incorrect logon attempts are **no longer automatically** unlocked by the system (default value since SAP NetWeaver 7.0). You reactivate this automatic unlocking with the parameter ***login/failed_user_auto_unlock*** = 1.

The administrator can unlock, lock, or assign a new password to users in user maintenance (transaction SU01).

If the parameter ***login/disable_multi_gui_login*** is set to 1, a user cannot log on to a client more than once. This can be desirable for system security reasons. If the parameter is set to 1, the user has the following options when he or she logs on again: Continue with this logon and end any other logons in the system or terminate this logon. Users to whom this should not apply should be specified in the parameter ***login/multi_login_users***, separated with commas, and with no spaces.

Initial Passwords for Standard Users

Client	000	001	066	Client (new)
User	SAP*	DDIC	EarlyWatch	SAP*
Initial Password	no longer		support	pass
	06071992	19920706		

Since these users are generally known, they must be protected against unauthorized access.

You are prompted for SAP* and DDIC during the installation in clients 000/001.

Figure 75: Standard Users

Essentially, there are two types of standard users: those created by installing the SAP system and those created when you copy clients.

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During the installation of the SAP system, the clients *000* and *066* are created (the client *001* is not always created during an SAP installation; it is also created, for example, during an SAP ECC installation). Standard users are predefined in the clients. Since there are standard names and standard passwords for these users, which are known to other people, you must protect them against unauthorized access.

The SAP system standard user, SAP*

*SAP** is the only user in the SAP system for which no user master record is required, since it is defined in the system code. *SAP** has, by default, the password "*PASS*", and unrestricted access authorizations for the system.

When you install the SAP system, a user master record is created automatically for *SAP** in client *000* (and in *001* if it exists). At first, this still has the initial password "***06071992***". The administrator is required to reset the password **during** installation. The installation can continue only after the password has been changed correctly. The master record created here deactivates the special properties of *SAP**, so that only the authorizations and password defined in the user master record now apply.

The DDIC user

This user is responsible for maintaining the ABAP Dictionary and the software logistics.

When you install the SAP system, a user master record is automatically created in client *000* [*001*] for the user *DDIC*. With this user too, you are requested to change the standard password of "***19920706***" during the installation (similar to the user SAP*). Certain authorizations are predefined in the system code for the *DDIC* user, meaning that it is, for example, the only user that can log on to the SAP system during the installation of a new release.

Caution:
To protect the system against unauthorized access, SAP recommends that you assign these users to the user group *SUPER* in the client *000* [*001*]. This user group is only assigned to superusers.

The EarlyWatch user

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The EarlyWatch user is delivered in client *066* and is protected with the password "*SUPPORT*". The EarlyWatch experts at SAP work with this user. This user should not be deleted. Change the password. This user should only be used for EarlyWatch functions (monitoring and performance).

Hint:
Special features for the user "*SAP**"

If you copy a client, the user "*SAP**" is always available. This user does not have a user master record, and is programmed into the system code. To protect your system against unauthorized access, you should create a user master record for this standard user. Create a "*superuser*" with full authorization.

If you now delete the user master record "*SAP**", the initial password "*PASS*" with the following properties becomes valid again:

- The user has full authorization since no authorization checks are made.
- The standard password "*PASS*" cannot be changed.

How can you counter this problem to protect the system against misuse?

- You can deactivate the special properties of *SAP**. To do this, you must set the system profile parameter **login/no_automatic_user_sapstar** to a value greater than zero. If the parameter is active, *SAP** no longer has any special properties. If the user master record *SAP** is deleted, the logon with *PASS* no longer works.
- If you want to reinstate the old behavior of *SAP**, you must first reset the parameter and restart the system.

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Determining User Information

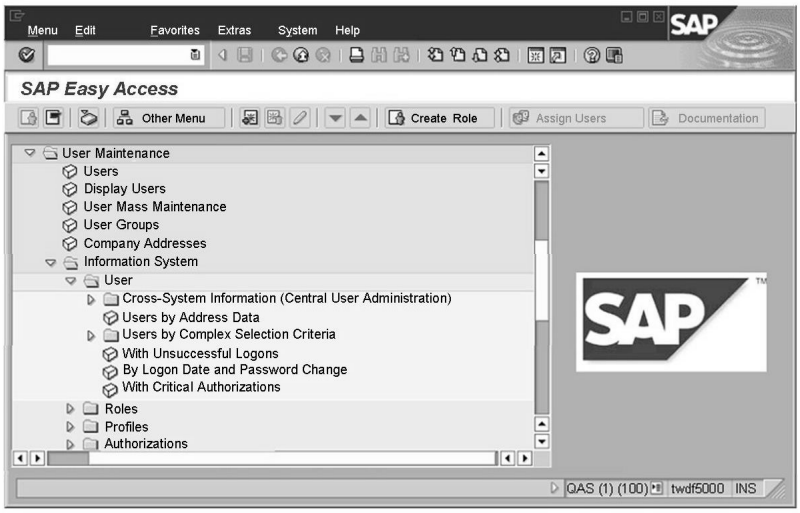

Figure 76: Information System

You can call the Information System (transaction SUIM) in the SAP Menu by choosing *Tools → Administration → User Maintenance → Information System* or in user maintenance (transaction SU01) by choosing *Information → Information System*.

You can obtain an overview of user master records, authorizations, profiles, roles, change dates, and so on using the information system.

You can display lists that answer very varied questions. For example:

- Which users have been locked in the system by administrators or failed logon attempts?
- When did a user last log on to the system?
- What changes were made in the authorization profile of a user?
- In which roles is a certain transaction contained?

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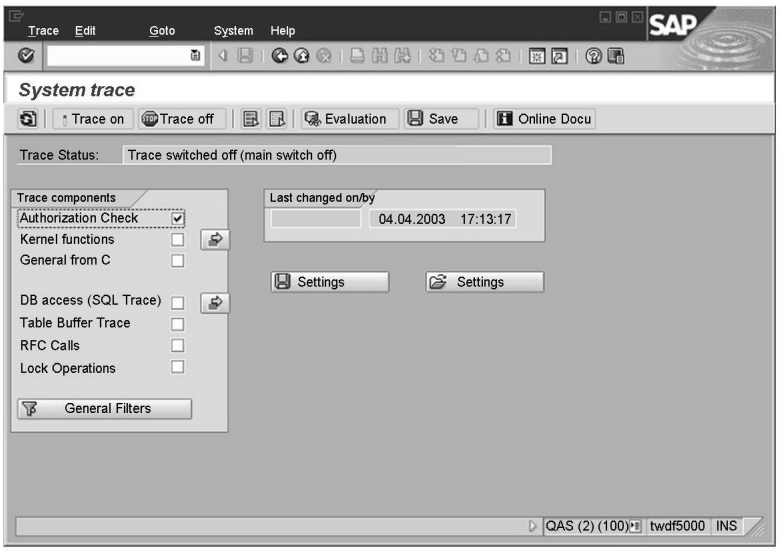

Figure 77: System Trace for Authorizations

You can display the last failed authorization check (transaction SU53) by choosing *System → Utilities → Display Authorization Check*. The system displays the most recently checked authorization object for which the authorization check was unsuccessful with the checked values.

Hint: Users can only display values for the checked object if they have authorizations for the object *S_USER_AUT*. Otherwise, the text: *No authorization to display authorization values* appears.

The system administrator can use transaction SU53 to check which authorizations were missing for a user for the execution of his or her last (unsuccessful) action. If system administrators have authorizations for *S_USER_AUT* too, they can also display the values that the user has for the checked object.

You can record authorization checks in your own and other sessions using the system trace function *Tools → Administration → Monitor → Traces → System Trace* (transaction ST01).

Caution: This only works if the instance (application server) is the same, though.

All checked authorization objects including the checked values are recorded here. The system trace is suited to finding **multiple** missing authorizations. The system trace is activated for the authorization check of a special user who has all required authorizations for the actions to be checked. The actions are performed with this special user. The trace records all authorization checks. These can then be evaluated.

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Lesson Summary

You should now be able to:

- Set system parameters for user logons
- Name standard users in the SAP system
- Locate authorization problems

Related Information

SAP Notes:

2467 - *Password rules & preventing unauthorized logons*

862989 - *New password rules as of SAP NetWeaver 2004s (NW AS ABAP 7.0)*

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Lesson: Appendix: Advanced User Administration Topics

Lesson Overview

In this lesson, you will obtain an overview of Central User Administration and connections to directory services. These topics are dealt with in detail on the SAP training course ADM102 and TZNWIM.

Lesson Objectives

After completing this lesson, you will be able to:

- Describe the concept of Central User Administration
- Describe connection to directory services

Business Example

You want to structure user administration in your company more efficiently through centralization.

Work Center: User Management

The work center User Management offers common local acting user administration functionality for both ABAP and Java. It provides a list of tools for the ABAP and the Java user management. These are for example the ABAP transactions “User Administration” (SU01) and “Role Maintenance” (PFCG). In the case of AS ABAP+Java systems or AS Java systems core administration functionality of SAP NetWeaver Administrator is linked in.

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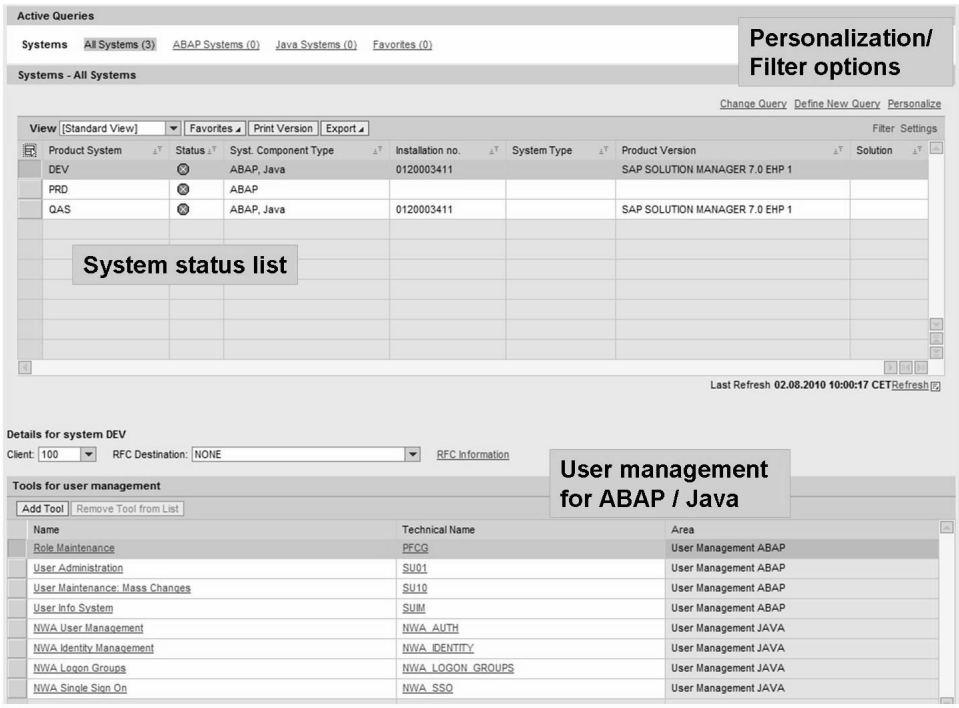

Figure 78: Work Center: User Management

Central User Administration

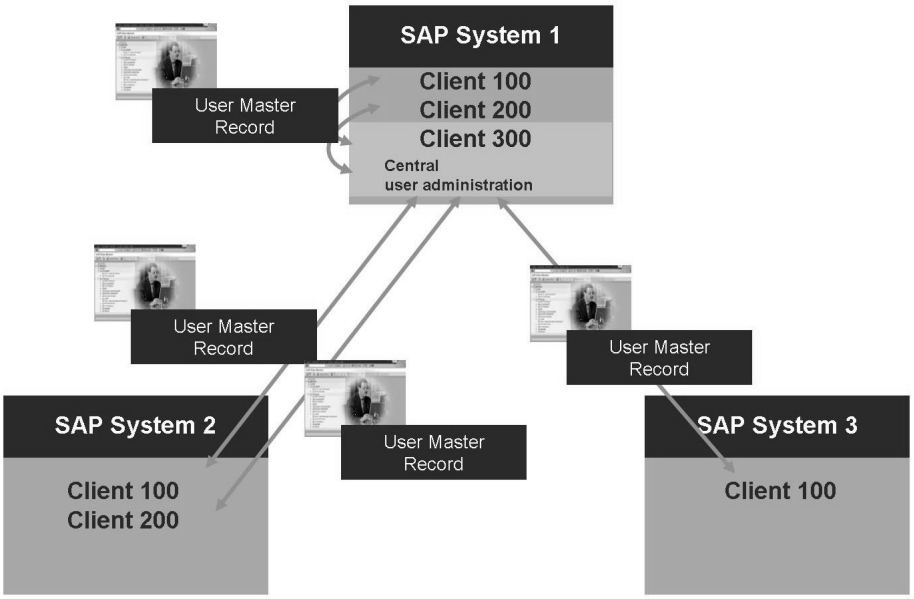

Figure 79: Central User Administration

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If you are operating multiple SAP systems with a number of clients, and identical users are created a number of times in different clients, you can significantly reduce your administrative effort for user administration using Central User Administration (CUA). You can perform user maintenance centrally from one client with CUA. This client is then described as the central system. The clients for which user administration is performed from the central system are called child systems.

You can specify for every user which clients it can log on to. Using CUA does not mean that all users can be used in all clients of the system landscape.

You can also specify which user data can only be maintained centrally and which data can also be maintained locally. It is sometimes useful to allow data to be locally maintained by the users or by an administrator. Local maintenance with distribution to all other clients is also possible (for example, in the case of address data being changed).

The **user master data is exchanged** using **ALE**. ALE stands for Application Link Enabling, and is a technology for setting up and operating distributed SAP applications. ALE allows the process-controlled exchange of business messages between loosely connected SAP systems. Asynchronous processing of the communication ensures that application operation is error-free.

Systems that you want to include in a CUA must have at least SAP Basis 4.5.

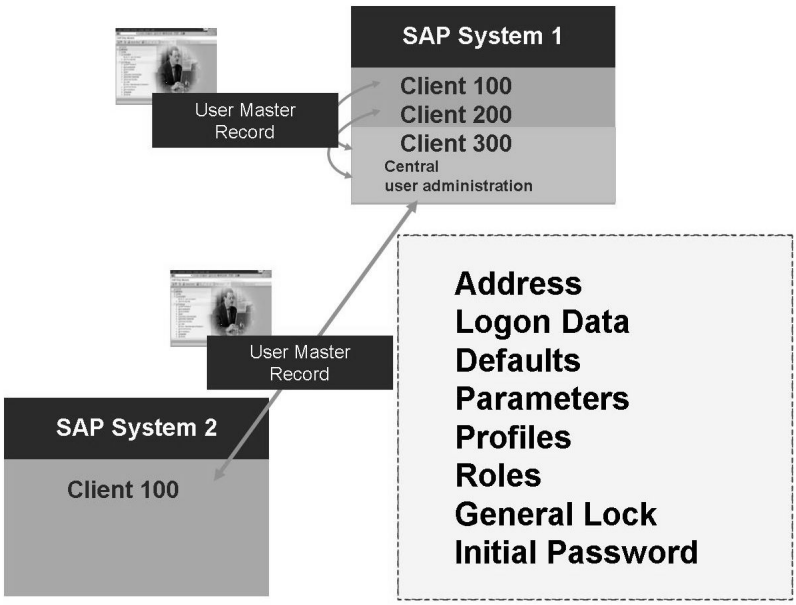

Figure 80: Which Data Can Be Distributed?

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The following data can be distributed using Central User Administration (CUA):

- **User master records**: Addresses, logon data, user defaults, and user parameters
- Users are assigned the associated **single and composite roles** and profiles for all child systems. Using CUA has the advantage that you no longer need to log on to each individual client to maintain these assignments locally.
- **Initial password**: When users are newly created, an initial password is transferred to the child systems. This can be changed in the usual way.
- **Lock status**: In addition to the familiar lock reasons (failed logon attempts or locked by an administrator) there is a new general lock. This takes effect in all child systems in which the affected user is permitted and can be removed either centrally or in an individual child system.

You can **assign single or composite roles** and authorization profiles from the central system. However, the authorization profiles are **maintained locally** rather than centrally, since different system settings and release statuses require local administration of authorization profiles.

Note: With central role maintenance, you can define the menu of a role in an SAP system for a different target system. The authorization profiles are always to be maintained in the target system. You can implement the CUA and central role maintenance concepts together or independently.

Central user administration is discussed in detail in SAP course **ADM102** - *Administration AS ABAP II*.

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Directory Services

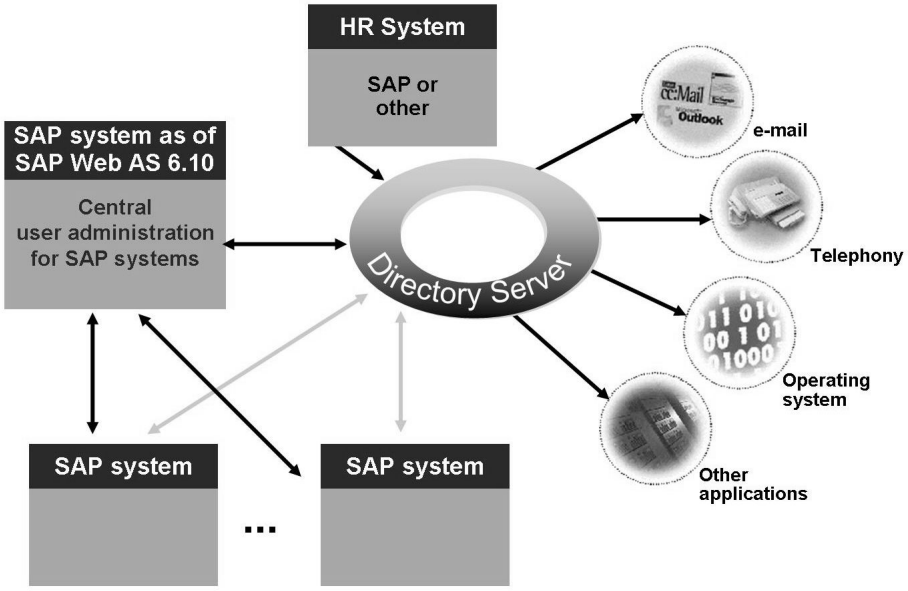

Figure 81: Connection to Directory Services

Directory services allow various applications in an IT landscape to access shared information at a central location. The information is stored on a central directory server that the various systems of your IT landscape can access. In this way, the directory server acts as an "IT address book" for information that is usually used in common, such as personnel data (name, department, organization), user data, and information about system resources and system services. You can use directory services to maintain information in SAP systems for directory-compatible applications (such as user administration or Business Workplace). The standardized Lightweight Directory Access Protocol (LDAP) is usually used as the access protocol. Directory services provide a central information and administration point and therefore simple shared information usage between various applications. Your SAP system can exchange data with directory services using the LDAP protocol. You specify the synchronization direction for each field, that is, whether the SAP system overwrites the data in the directory, or the directory overwrites the data in the SAP system.

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The SAP system can exchange data with directory services from various vendors. The SAP system may require attributes that are not in the standard schemata of the directories. SAP usually provides a schema extension for this purpose.

Note: As of SAP Web AS 6.10, SAP systems can easily connect to a directory service. It was possible to connect to a directory service before SAP Web AS 6.10, although rather more effort was involved.

Hint: A connection to a directory service can extend a Central User Administration. That is, these two concepts are **in no way** mutually exclusive, but rather work together very well.

The topic of central directory services/LDAP is handled in detail on SAP course **ADM102** - *Administration AS ABAP II.*

SAP NetWeaver Identity Management

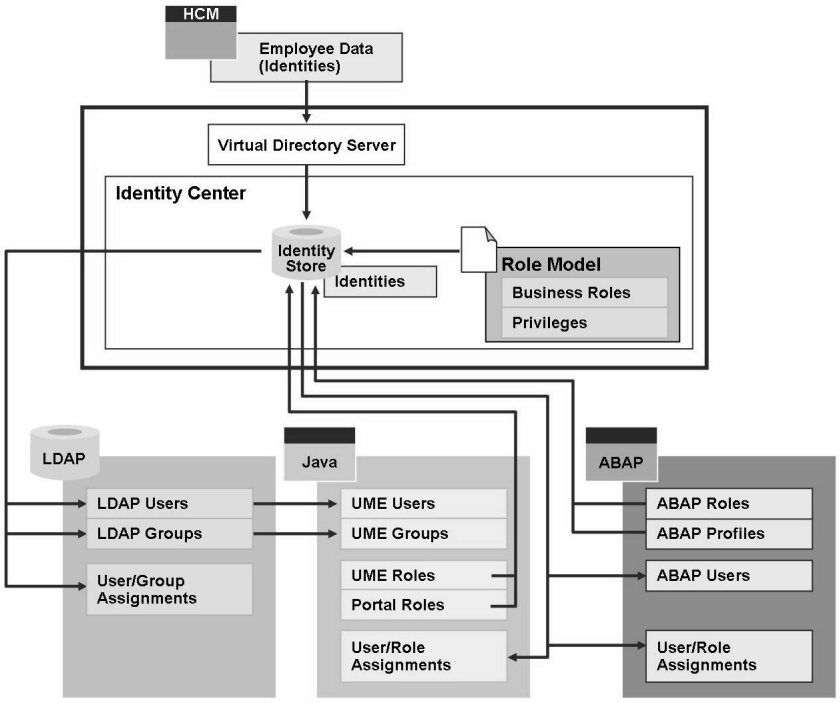

Figure 82: SAP NetWeaver Identity Management

In SAP NetWeaver Identity Management, SAP provides integrated, business process-driven Identity Management functions for a heterogeneous system landscape. SAP NetWeaver Identity Management uses a central identity store to consolidate and save data from various source systems (SAP HCM for example). This information is distributed to connected target systems. User

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accounts and role assignments for SAP and non-SAP applications are distributed. Role assignments can be automated using rule definitions. A very important function of SAP NetWeaver Identity Management is the option of making the authorization assignment workflow-controlled. The integration with HCM as one of the possible source systems for identity information is a key function for business process-driven Identity Management. For more information about SAP NetWeaver Identity Management, go to the SAP Developer Network (https://www.sdn.sap.com/irj/sdn/nw-identitymanagement).

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Lesson Summary

You should now be able to:

- Describe the concept of Central User Administration
- Describe connection to directory services

Related Information

- SAP Courses:

  ADM102 - *Administration AS ABAP II*

  TZNWIM - *SAP NetWeaver Identity Management 7.1*

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Unit Summary

You should now be able to:

- Create users
- Copy, create, and maintain roles
- Maintain the assignment of roles and users
- Describe the concept of a work center role
- Set system parameters for user logons
- Name standard users in the SAP system
- Locate authorization problems
- Describe the concept of Central User Administration
- Describe connection to directory services

Related Information

SAP Courses:

ADM940 - *SAP Authorization Concept*

ADM102 - *Administration AS ABAP II*

TZNWIM - *SAP NetWeaver Identity Management 7.1*

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Test Your Knowledge

1. How are authorizations assigned to a user?

   Choose the correct answer(s).

   - □ A Users are assigned authorizations using profiles.
   - □ B Users are assigned authorizations using roles.
   - □ C Users are assigned authorizations using user names.
   - □ D Users are assigned authorizations using a Certification Authority (CA).

2. The SAP authorization concept is a positive concept because ...

   Choose the correct answer(s).

   - □ A Every user automatically receives all authorizations.
   - □ B Authorizations must be explicitly assigned.
   - □ C The range of features of the authorization check is so large.
   - □ D The developers programmed it efficiently.

3. System parameters for the user logon are in the area _____. To display user's incorrect logon attempts, call the Information System with transaction _____. The system trace function is called using transaction _____.

   Fill in the blanks to complete the sentence.

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Answers

1. How are authorizations assigned to a user?

   Answer: A, B

   Authorizations are combined into profiles. The roles assigned to users contain profiles with appropriate authorizations for the role. Authorizations are not assigned using user names or a CA.

2. The SAP authorization concept is a positive concept because ...

   Answer: B

   SAP uses a positive authorization concept. This means that everything that is not explicitly allowed is automatically forbidden.

3. System parameters for the user logon are in the area login. To display user's incorrect logon attempts, call the Information System with transaction SUIM. The system trace function is called using transaction ST01.

   Answer: login, SUIM, ST01

   User logon settings are implemented using the *login/** parameter. The Information System is called with transaction SUIM, the system trace function with ST01.

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Unit 6

RFC Connections

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Unit Overview

In this unit, you learn about remote connections, also known as Remote Function Calls (RFC). As well as the various options for using the RFC, you will learn about the technical setup for connections of this type.

Unit Objectives

After completing this unit, you will be able to:

- Explain the principle of the Remote Function Call
- List the different types of Remote Function Call
- Set up an RFC connection

Unit Contents

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Lesson: Setting Up RFC Connections 234
Exercise 14: Setting Up Remote Connections 237

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Lesson: Fundamentals and Variants for Using RFC

Lesson Overview

This lesson will provide you with an overview of Remote Function Calls.

Lesson Objectives

After completing this lesson, you will be able to:

- Explain the principle of the Remote Function Call
- List the different types of Remote Function Call

Business Example

SAP systems can communicate with each other using Remote Function Calls. A prerequisite for this is that the administrator has set up the relevant interface system.

RFC Fundamentals

Remote Function Calls have been used for many years as the technical interface with which SAP and non-SAP systems are usually connected. It is irrelevant whether data exchange is synchronous or asynchronous, periodic or aperiodic, or transactional. Many conceivable variants are supported.

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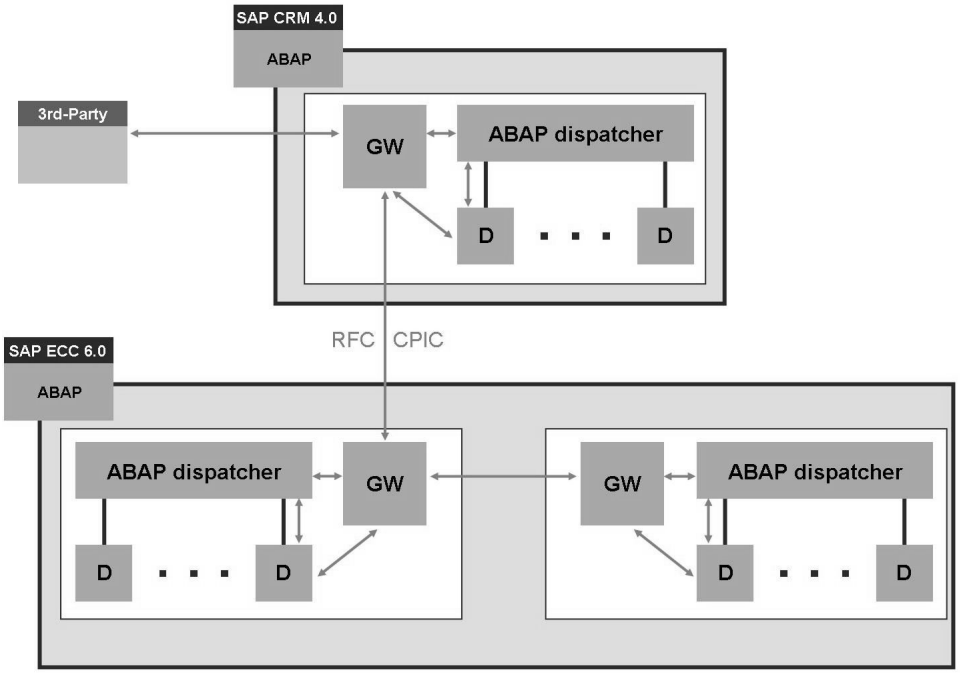

Figure 83: RFC Communication

A “Remote Function Call” (RFC) is the call of a function module that is running in a different system to the calling program. You can call a function module in the same system as an RFC too. However, RFCs are normally used when the calling and called function modules are running in different systems.

When Remote Function Call (RFC) or CPIC is used to communicate between instances of a system or between systems themselves, the gateway is always involved. If a dialog work process has to establish an RFC connection to a remote system in the context of a request (for example, to retrieve customer data), it uses a gateway to communicate with the remote system. The gateway forwards the request to the gateway of the remote system. The remote gateway then transfers the request to the dispatcher, which, in turn, forwards the request to one of its work processes, which then communicates directly with “its” gateway.

Inbound RFC connections are therefore always received by the gateway while outbound connections are initiated by the work process.

In the SAP system, the RFC interface system provides this function. The RFC interface system allows function calls between two SAP systems or between an SAP system and an external (non-SAP) system.

RFC is an SAP interface protocol that is based on the Common Programming Interface for Communication (CPI-C) and allows cross-host communication between programs. This enables external applications to call ABAP functions and SAP systems to contact (RFC-enabled) external applications.

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RFC means that ABAP programmers do not have to write their own communication routines. For an RFC call, the RFC interface

- converts all parameter data to the format required in the remote system
- calls the communication routines that are required to communicate with the remote system
- handles errors that occur during the communication

The RFC interface is easy for the ABAP programmer to use. The processing steps for calling external programs are integrated into the CALL FUNCTION statement.

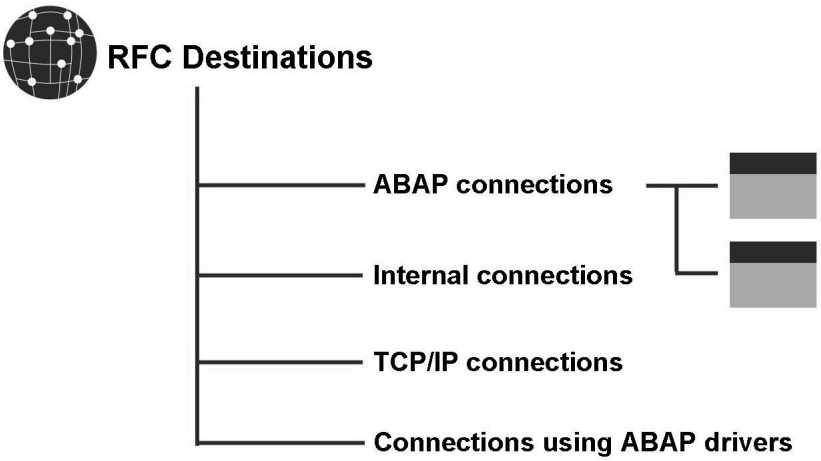

Figure 84: RFC Connections

To be able to call a function module on a remote system, you must define the remote system as a destination in your calling system. You also require access authorization for the remote system.

You can manage these remote connections in the calling system. To do this, switch to the *Display and Maintain RFC Destinations* screen, either by choosing the menu path *Tools → Administration → Administration → Network → RFC Destinations* or by calling transaction SM59 directly. The connection types and all existing destinations are displayed in a tree structure on the initial screen. For details about all available connection types, see the documentation.

There is a search function for destinations that have already been set up. To search for a destination, choose *Search* and enter your selection. The system displays a list of all matching entries. You can display all available information for each entry.

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To change an existing RFC destination, select the relevant RFC destination in the menu tree and then choose *Change*.

Hint: To copy an existing RFC connection you first have to call the change screen for the RFC connection you want to copy. Then choose *Connection → Copy*.

Outlook: RFC Usage Variants

Synchronous RFC (sRFC)

For direct communication between different systems and between SAP NetWeaver AS and SAP GUI.

Asynchronous RFC (aRFC)

For direct communication between different systems and for parallel processing of selected tasks.

Transactional RFC (tRFC)

For genuine asynchronous communication. Transactional RFC ensures "transaction-like" processing of processing steps that were originally autonomous.

queue(d) RFC (qRFC)

Queued RFC is an extension of tRFC. It also ensures that individual steps are processed in sequence.

Background RFC (bgRFC)

bgRFC is the successor to tRFC and qRFC.

"RFC" is a superordinate term for various implementation variants. **sRFC** is the synchronous call of function modules. This means that the client waits until the server has completed its processing. **The two systems involved must be accessible at the time of the call.**

Despite its name, **aRFC** is not really an asynchronous communication type because it does not fully satisfy the conditions for this type of communication. Consequently, the called system must be available during the call (similar to sRFC, for example). Directly after the call, however, function control returns to the calling program. aRFC is always recommended if real-time communication is established with a remote system, where processing in the calling program should not be interrupted until the results of the called function module have been obtained (the term asynchronous is used in this sense here).

Unlike aRFC, transactional RFC (**tRFC**, also previously known as asynchronous RFC) is a **genuine asynchronous communication method** that executes the called function module just once in the RFC server. **The remote system does not have to be available** when the RFC client program executes a tRFC. The tRFC

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component stores the called RFC function, together with the corresponding data, in the SAP database under a unique transaction ID (TID). If a call is sent while the receiving system is unavailable, the call remains in the local queue. The calling dialog program can proceed without waiting to see whether or not the function module was successful. If the receiving system does not become active within a certain amount of time, the call is scheduled as a background job. **tRFC is always used if a function is to be executed as a Logical Unit of Work (LUW).** Within a LUW, all calls

- are executed in the sequence in which they are called
- are executed in the same program context in the target system
- are executed in a single transaction, that is, they are either fully written to the database (known as a COMMIT) or fully reset (known as a ROLLBACK).

tRFC is always recommended if you want to ensure the transactional sequence of the calls.

Disadvantages of tRFC:

- tRFC processes all LUWs independently of one another. Due to the number of activated tRFC processes, this procedure can significantly reduce performance in both the sending system and target system.
- In addition, the sequence of LUWs defined in the application cannot be retained. Consequently, there is no guarantee that the transactions will be executed in the sequence specified by the application program. The only guarantee is that all LUWs are transferred sooner or later.

To guarantee that multiple LUWs are processed in the sequence specified by the application, tRFC can be serialized using (inbound or outbound) queues. This type of RFC is known as queued RFC (**qRFC**), which is an **extension of tRFC**. It transfers an LUW (transaction) only if it has no predecessors in the participating queues (this is based on the sequence defined in different application programs). qRFC is always recommended if you want to **ensure that various transactions are processed in a specified sequence**.

bgRFC is the **successor to tRFC and qRFC**, with significant improvements in terms of performance and functional capability. Consequently, SAP urgently recommends using bgRFC instead of tRFC and qRFC.

Configuring System Resources for RFC

To ensure optimum RFC functional capability, you must maintain various system parameters that, for example, specify the maximum number of work processes that can be occupied by RFC.

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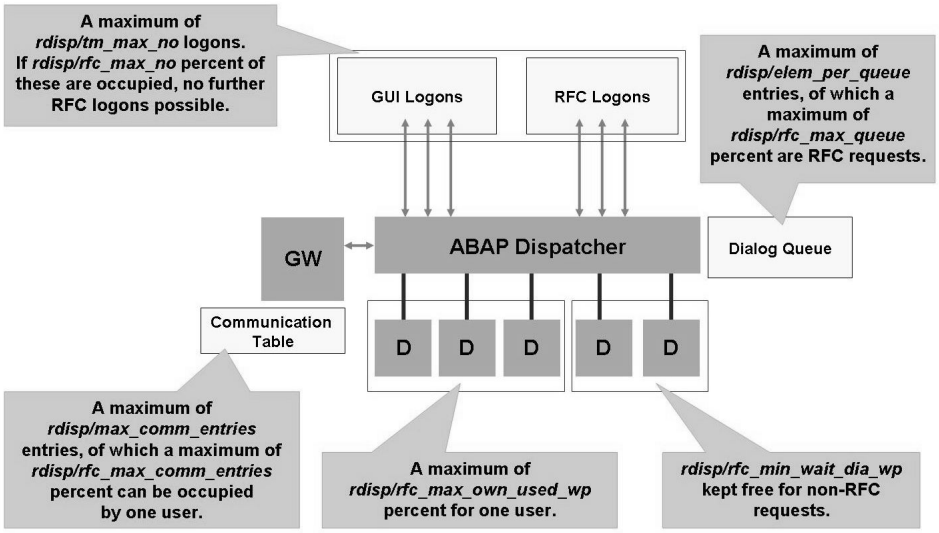

Figure 85: Configuration of RFC Resources

A prerequisite for the resource check is that the parameter *rdisp/rfc_use_quotas* must be set to the value *1*.

Resources can be assigned from the following areas:

Logons to the SAP System

A total of *rdisp/tm_max_no* users can be logged on to the server simultaneously (using the GUI or RFC). If *rdisp/rfc_max_login* percent of the maximum number of possible users are logged on, no more RFC logons can be accepted. An RFC user can occupy a maximum of *rdisp/rfc_max_own_login* percent of the login slots (*rdisp/tm_max_no*).

RFC Requests in the Dialog Queue

The dialog queue of the dispatcher contains *rdisp/elem_per_queue* entries, of which a maximum of *rdisp/rfc_max_queue* percent can be filled by RFC requests.

Entries in the Communication Table

The communication table contains one entry for every occurrence of CPIC communication for all parties involved. The table can contain a maximum of *rdisp/max_comm_entries* entries, of which *rdisp/rfc_max_comm_entries* percent can be occupied by one user.

Dialog Work Processes

When you start the server, it has *rdisp/wp_no_dia* dialog work processes. However, you can change this number while the server is running. One way to do this is to use operation mode switching. The dispatcher keeps *rdisp/rfc_min_wait_dia_wp*

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of the dialog work processes free for “genuine” dialog requests (not RFC). In addition, a user can occupy a maximum of *rdisp/rfc_max_own_used_wp* percent of the dialog work processes.

Server-Side Dispatcher Check

The dispatcher checks whether it has free resources for each RFC request it receives. If it has, it assigns the request to a dialog work process. Otherwise, it places the request in the dispatcher queue. You can use the parameter *rdisp/rfc_check* to control the level of detail for this check.

Overview of All RFC Resources in the SAP System

You can use transaction SARFC to monitor the resources on all servers in the SAP system.

Monitoring RFC Activities

We will now briefly discuss some of various monitoring and troubleshooting tools available for RFC communication:

Server Resources (SARFC)

Displays the RFC resources currently available to all application servers. You can also dynamically change RFC parameters here.

Transactional RFC (SM58)

Tools → Administration → Monitor → Transactional RFC. This tool lists those transactional RFCs that could not be carried out successfully or had to be scheduled as background jobs. The list contains the LUW ID and the corresponding error message from the target system.

qRFC Monitor for the Outbound Queue (SMQ1)

Here, you can monitor the status of your LUWs in the outbound queue and manually start any queues that hang.

qRFC Monitor for the Inbound Queue (SMQ2)

Here, you can monitor the status of your LUWs in the inbound queue.

Gateway Monitor (SMGW)

The Gateway Monitor is used to analyze and manage the gateway in the SAP system.

bgRFC Monitor (SBGRFCMON)

You can use the bgRFC Monitor to display the units recorded for the bgRFC. One unit comprises one or more function modules that need to be processed as an indivisible unit.

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RFC Server Groups and Parallel Processing with aRFC

aRFC can be used in application development, for example, to simultaneously process background tasks in more than one work process, thus considerably reducing the application's runtime. To achieve an even load balancing in the target system, you can define a group of application servers as an RFC server group. For each RFC server group, you can also maintain separate values for RFC resource parameters. RFC server groups are created in a similar way to logon groups. To do this, choose *Extras → RFC Groups* in transaction SM59.

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Exercise 13: Checking RFC Parameters

Exercise Objectives

After completing this exercise, you will be able to:

- Display the parameters for RFC communication

Business Example

SAP systems can communicate with each other using Remote Function Calls. A prerequisite for this is that the administrator has set up the relevant interface system.

Task: Display RFC Parameters

Display the current RFC parameter values.

1. Log on to the SAP system and use transaction SARFC to determine the current RFC parameter values for all instances.

   Alternatively, call transaction RSPFPAR.

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Solution 13: Checking RFC Parameters

Task: Display RFC Parameters

Display the current RFC parameter values.

1. Log on to the SAP system and use transaction SARFC to determine the current RFC parameter values for all instances.

   Alternatively, call transaction RSPFPAR.

   a) Call transaction SARFC.

   b) Double-click an instance. You can view the current parameter values in the dialog box.

   c) In transaction RSPFPAR, enter the value **`rdisp/rfc*`** in the *Profile Parameters* field and choose *Execute (F8)*.

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Lesson Summary

You should now be able to:

- Explain the principle of the Remote Function Call
- List the different types of Remote Function Call

Related Information

SAP Library for SAP NetWeaver 7.0 EHP1, *Administrator's Guide → Technical Operations for SAP NetWeaver → Administration of SAP NetWeaver Systems → AS ABAP (Application Server for ABAP) → Administration → Connectivity → RFC Administration*

SAP Notes:

74141 - *Resource Management for tRFC and aRFC*

593058 - *New RFC load balancing procedure*

597583 - *Performance improvement using RFC parallel processing*

986373 - *RFC load distribution*

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Lesson: Setting Up RFC Connections

Lesson Overview

In this lesson, you will learn how to set up a remote connection.

Lesson Objectives

After completing this lesson, you will be able to:

- Set up an RFC connection

Business Example

As part of an e-commerce scenario, functions from different SAP systems must be linked with each other. Order data, for example, is to be further processed in another system.

Remote Connections

To create a new RFC destination, choose the *Create* pushbutton in transaction SM59 (*Tools → Administration → Administration → Network → RFC Destinations*). The system displays a new screen with empty fields that you must fill out.

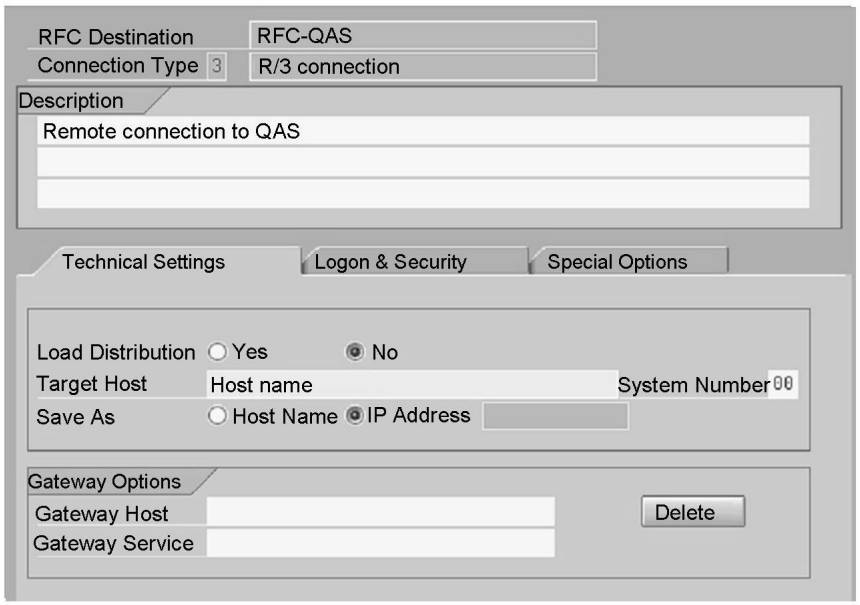

Figure 86: Setting Up an RFC Connection

The system opens the dialog for creating a new RFC destination.

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Enter a destination name, the connection type **3**, and a short description.

Choose *Save*. The system saves all your entries and switches to the technical settings screen. Alternatively, you can also choose **Return** here, but your entries will not be saved if you do so.

Enter the target host and the system number (instance number) of the system in the relevant fields and choose *Save* (*CTRL+S*).

Hint: The instance number is used to obtain the relevant *sapgw$$* service for communication with the target system gateway. This service is contained in the *services* file in the operating system and the communication port is defined there. Example: If the instance number is *11*, the service is *sapgw11* and the port is *3311*.

For a faster logon, you can specify a client, user name, and password for logging on to the target system on the *Logon & Security* tab page. Do not use your own user data here, but rather general user data, as every user (with the appropriate RFC authorizations) can use the RFC destination that you create.

Caution: Make sure you make an entry in the Client field for two reasons in particular:

1. Without specifying a target client, it may be the case that your defined RFC connection cannot be used as you expect, in spite of the connection having been tested successfully. If this is the case, it is fairly difficult to find the cause of the error, since the error messages do not point to the missing entry in the *Client* field.
2. As you can see, RFC connections between ABAP-based SAP systems always target a certain client. Thus, they do not communicate “with a particular system”, but rather “with a selected client in a particular system”.

Hint: RFC connections can always be used across the entire system. This means that an RFC connection you have defined in client 000 can also be used from client 100 (without any difference).

For security reasons, you should leave the *User* and *Password* fields empty or you should enter a *communication* user or *system* user with very restrictive authorizations (in other words, adjusted to your requirements). In the first case, the system displays an input prompt for logon when you later open a connection; in the second case, dialog logons to the system are not possible, although programs can use the connection to communicate.

Note: The *PW Status* field informs you whether you have already stored a password in the masked *Password* field or not.

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Information concerning the target system code page is stored on the *MDMP & Unicode* tab page. Perform a *Unicode test* to check whether the target system is a Unicode system. For the calling system, you can check this under *System → Status*. If the target system is a Unicode system, you must select the *Unicode* option for the destination. Otherwise, errors may occur when exchanging data or during other means of communication.

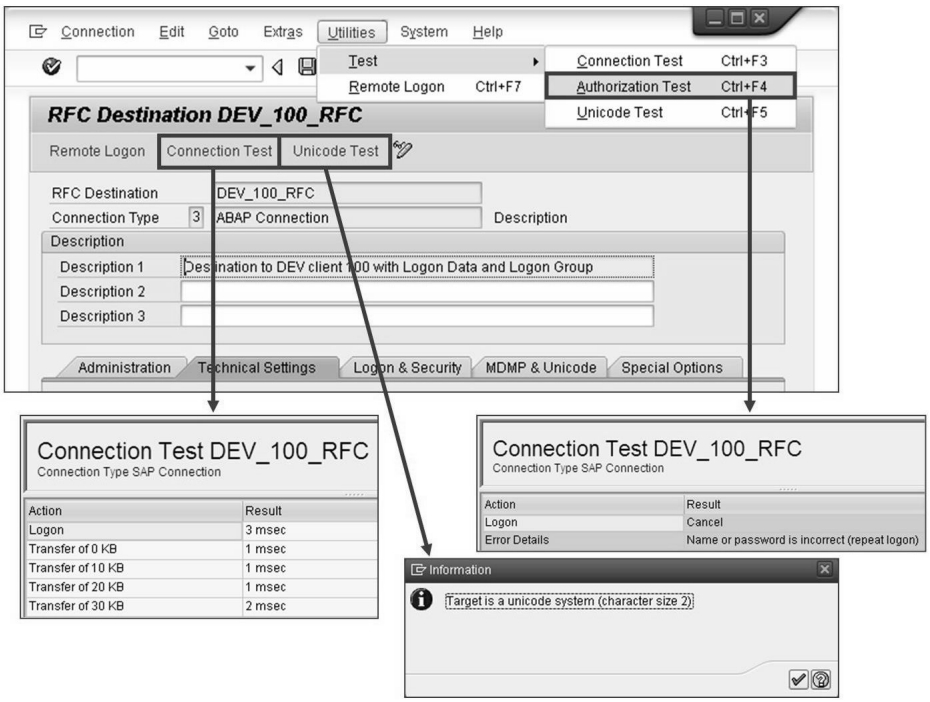

Figure 87: Testing RFC Connections

You have two options for testing a destination:

- You can attempt to log on to the remote system. To do this, choose *Remote Login*. A new session opens for the remote system. Enter the client, your user name, and your password. If you have stored a dialog user with password in the connection, a dialog logon is performed.

  If you have defined a communication user or system user, you can check that the specified password is correct under *Utilities → Test → Authorization Test*.

- With a connection test (*Test Connection* button or the menu path *Utilities → Test → Connection Test*), the system tries to establish a connection with the target system and then displays a table with response times. If an error message appears, check your settings. This test is a pure "technical" connection test, and only checks whether a partner system can be reached with the specifications you have made.

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Exercise 14: Setting Up Remote Connections

Exercise Objectives

After completing this exercise, you will be able to:

- Create a remote connection

Business Example

As an administrator, you are to set up remote connections to other systems, which are then to be used, for example, in the context of an ALE integrated system.

Task 1: Create and Test a Remote Connection

Set up a remote connection.

1. You are to create a remote connection to the central instance of the second system on your host. Use the following naming convention: **<SID of target system>_<client>_CI** (for example, **QAS_100_CI**).

   The group that is using the DEV system sets up a connection to the QAS system. The group that is using the QAS system sets up a connection to the DEV system.

   Do not specify any user data. Then perform a remote logon.

Result

You have now created an RFC connection to the central instance of your partner system.

Task 2: Create and Test a Remote Connection with Logon Data

Set up another remote connection, this time with a logon group and logon data.

1. Create a remote connection to a logon group in the second system on your host. Use the following naming convention: **<SID of target system>_<client>_<logon group>**.

   The group that is using the DEV system sets up a connection to the QAS system. The group that is using the QAS system sets up a connection to the DEV system.

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In addition, specify user data for logging on to the target system. If possible, use a *system* user for this purpose (possibly one already created in an earlier lesson in this course). Otherwise, you can now create a user of this type in the target system (in consultation with your partner group).

For the logon group for load balancing, you can use the ***RFC*** logon group (possibly created in the target system in an earlier exercise in this course). Once again, do this in consultation with your partner group.

Test whether the logon data you have defined is correct.

Result

You have now created an RFC connection with logon data.

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Solution 14: Setting Up Remote Connections

Task 1: Create and Test a Remote Connection

Set up a remote connection.

1. You are to create a remote connection to the central instance of the second system on your host. Use the following naming convention: **<SID of target system>_<client>_CI** (for example, **QAS_100_CI**).

   The group that is using the DEV system sets up a connection to the QAS system. The group that is using the QAS system sets up a connection to the DEV system.

   Do not specify any user data. Then perform a remote logon.

   a) To set up a remote connection, switch to the window *Display and Maintain RFC Destinations*. To do this, choose *Tools* → *Administration* → *Administration* → *Network* → *RFC Destinations* (transaction SM59) and then *Create*.

   The system opens the dialog for creating a new RFC destination. Enter the following:

Field	Input
RFC Destination	**`<SID of target system>_<client>_CI`**, whereby you use the SID of your partner system
Connection Type	**`3`**
Description 1	**`Connection to the central instance`**

   Choose *Save*. The system saves your entries and the technical settings screen appears.

   b) Make the following entries:

Field	Input
Target Host	**`<host name>`**: Here, name the host on which your partner system is running (for example, **`twdf1234.wdf.sap.corp`**).
System Number	**`00`** or **`10`**, depending on the partner system SID

   Choose *Save* (*CTRL+S*).

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c) Switch to the *MDMP & Unicode* tab and choose the *Unicode* option. Confirm the information dialog box and choose *Save*. Choose *Unicode Test*.

d) Choose *Remote Logon*. The logon screen for the target system should open in a new session. Log on to the system, for example, as user **`<CourseID>-##`**. Once you have successfully logged on, log off again.

Result

You have now created an RFC connection to the central instance of your partner system.

Task 2: Create and Test a Remote Connection with Logon Data

Set up another remote connection, this time with a logon group and logon data.

1. Create a remote connection to a logon group in the second system on your host. Use the following naming convention: **<SID of target system>_<client>_<logon group>**.

   The group that is using the DEV system sets up a connection to the QAS system. The group that is using the QAS system sets up a connection to the DEV system.

   In addition, specify user data for logging on to the target system. If possible, use a *system* user for this purpose (possibly one already created in an earlier lesson in this course). Otherwise, you can now create a user of this type in the target system (in consultation with your partner group).

   For the logon group for load balancing, you can use the ***RFC*** logon group (possibly created in the target system in an earlier exercise in this course). Once again, do this in consultation with your partner group.

   Test whether the logon data you have defined is correct.

   a) To set up a remote connection, switch to the *Display and Maintain RFC Destinations* window. To do this, choose *Tools* → *Administration* → *Administration* → *Network* → *RFC Destinations* (transaction SM59) and then choose *Create*.

      The system opens the dialog box for creating a new RFC destination. Enter the following:

Field	Input

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Field	Input
RFC Destination	**<SID of target system>_<client>_<logon group>**, whereby you use the SID of your partner system (for example **QAS_100_RFC or DEV_100_RFC**).
Connection Type	**3**
Description 1	**Load-balanced connection to the partner system with logon data**

Choose *Save*. The system saves your entries and the technical settings screen appears.

b) Now enter the following data:

Field	Input
Load Balancing	*Yes*
Target System	**<SID of target system>**, for example, **DEV**
Msg. Server	**<host name>** on which the message server for the partner system is running (for example, **twdf1234.wdf.sap.corp**)
Group	**<logon group in target system>**, for example, **RFC**

Choose *Save* (*CTRL+S*).

Choose *Test connection* to check whether the logon group you have entered also exists in the target system.

c) Specify the following data on the *Logon & Security* tab page.

Field	Input
Client	for example, **100**
User	**<system user>**, for example, **SYS-07**
Password	The password for the user entered.

Choose *Save* to save your entries. Confirm the information dialog box.

Note: If you have not yet created a *system* user, proceed as follows:

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Log on to the target system using, for example, the connection from Task 1 in this exercise. Call transaction SU01. Enter a user name, for example, **SYS-##** and choose *Create*. Enter a *Last name*. Switch to the *Logon data* tab and assign an *initial password*. Select *System* as the *User type*. Switch to the *Profiles* tab. Enter **SAP_ALL** under *Profile*. Press *Enter* to check whether the profile exists. *Save* the user.

d) Switch to the *MDMP & Unicode* tab and choose the *Unicode* option. Confirm the information dialog box and choose *Save*. Choose *Unicode Test*.

e) Choose *Remote Logon*. Nothing should happen because the user you defined earlier is a non-dialog user.

f) Choose *Utilities* → *Test* → *Authorization Test* to check whether the logon data you have defined is correct.

Result

You have now created an RFC connection with logon data.

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Lesson Summary

You should now be able to:

- Set up an RFC connection

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Unit Summary

You should now be able to:

- Explain the principle of the Remote Function Call
- List the different types of Remote Function Call
- Set up an RFC connection

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Test Your Knowledge

1. Which Remote Function Call procedures does an SAP system provide?

   Choose the correct answer(s).

   - ☐ A Synchronous RFC
   - ☐ B Reflexive RFC
   - ☐ C Looped RFC
   - ☐ D Transactional RFC
   - ☐ E Direct RFC
   - ☐ F Queued RFC

2. Which RFC variant can you use to process work steps in parallel?

   _____

   _____

   _____

   _____

3. To connect two SAP systems by RFC, you require an _____ in each system (this automatically exists) and an explicitly defined _____ from one system to the other.

   Fill in the blanks to complete the sentence.

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Answers

1. Which Remote Function Call procedures does an SAP system provide?

   Answer: A, D, F

   In addition to the three correct answers (synchronous, transactional, and queued RFC), the system also provides asynchronous RFC and background RFC.

2. Which RFC variant can you use to process work steps in parallel?

   Answer: You can use asynchronous RFC to process program steps in parallel, as long as there are work processes available in the system.

3. To connect two SAP systems by RFC, you require an RFC interface in each system (this automatically exists) and an explicitly defined RFC connection from one system to the other.

   Answer: RFC interface, RFC connection

   The basic requirement is the RFC interface, which is in the protocol stack of every SAP system. You must also set up a connection from the calling system to the called system (transaction SM59).

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Unit 7

Software Maintenance

Unit Overview

This unit explains how to maintain the SAP software using Support Packages. It also provides a brief description of how to import SAP Notes using the Note Assistant, and introduces the concept of SAP enhancement packages. A valid maintenance certificate may be required to import Support Packages. To select the Support Packages you want to import, you need to define a maintenance transaction. This unit focuses mainly on importing Support Packages. Practical exercises enable you to consolidate the knowledge that you have acquired.

Unit Objectives

After completing this unit, you will be able to:

- Describe the concept of SAP Notes and Support Packages
- Explain the concept of maintenance certificates
- Describe a maintenance transaction
- Explain the use of the Support Package Manager and import a SPAM/SAINT update.
- Import Support Packages with transaction SPAM
- Provide a general explanation of the import process for Support Packages
- Understand the idea of SAP enhancement packages

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Lesson: SAP Notes and Support Packages

Lesson Overview

This lesson provides an introduction to the subject of SAP Notes and Support Packages.

Lesson Objectives

After completing this lesson, you will be able to:

- Describe the concept of SAP Notes and Support Packages

Business Example

You want to import adjustments (made in response to changes in legal requirements) into your SAP system. You also want to correct bugs that may be in the SAP software. SAP provides SAP Notes and Support Packages for this purpose.

SAP Notes and Support Packages

An SAP system comprises various software components. These software components receive regular updates through SAP Notes and Support Packages. SAP Notes and Support Packages are used to import adjustments based on changes in legal requirements. They are also used to correct errors in the standard SAP software and to enhance existing functions or make minor new functions available.

The SAP system should always have the most recent Support Package level, to comply with legal requirements and to eliminate errors.

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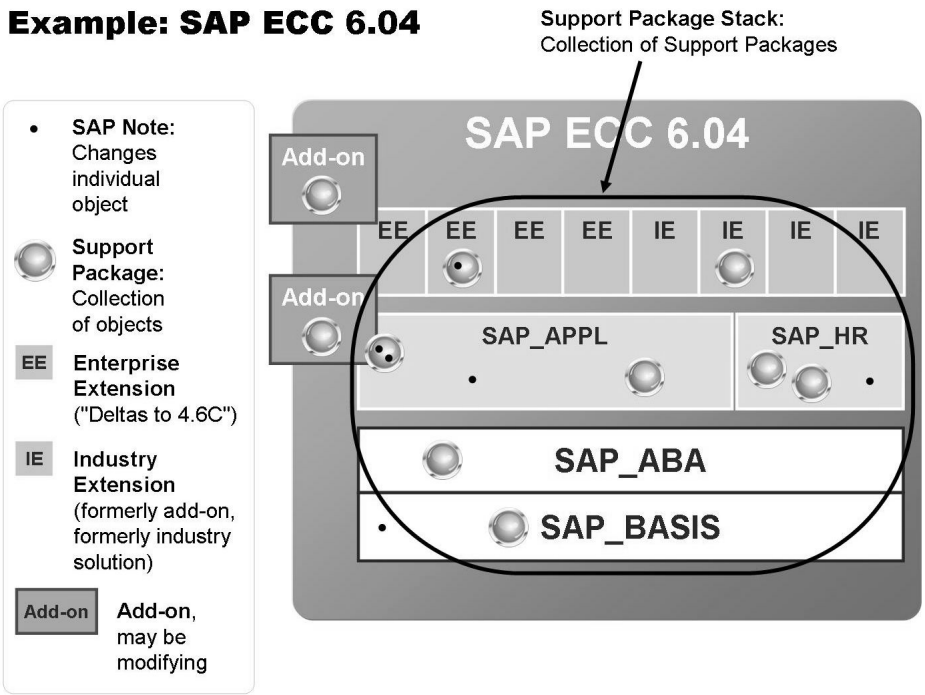

Figure 88: SAP Notes and Support Packages

SAP Notes can contain general information, hints and tips, or recommendations from SAP. They can also describe a problem and the solution to errors in standard functions of the SAP software. This type of SAP Note contains the solution to an individual problem, which is often the solution to a programming error, in the form of corrected lines of source code.

Support Packages are bundles of repository objects and Customizing. In principle, each software component and each release level has its own Support Packages. In the case of software components that intersect (with modified add-ons, for example), there is an additional type of Support Package, the Conflict Resolution Transport (CRT). Technically speaking, Support Packages are a kind of transport request that cannot be imported as a normal transport request, however. A Support Package contains all known, relevant SAP Notes that have been created since the last Support Package for the corresponding software component. It can also contain new Customizing and Customizing that has been corrected since the last Support Package. Support Packages are not cumulative, but are based on their predecessors.

In principle, importing Support Packages for one particular software component is independent of the level of Support Packages of other software components. The individual components are in general independent of one another. However, there can be cases where the importing of individual Support Packages leads to side-effects. Importing an SAP_HR Support Package can require the previous

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import of a SAP_BASIS Support Package, or an SAP_APPL Support Package, for example. As soon as they have been identified, these side-effects are documented in a composite SAP Note that is referenced when importing Support Packages.

Hint: If a maintenance transaction in SAP Solution Manager - Maintenance Optimizer is used to determine the Support Packages, known dependencies are also highlighted there.

To enable patches to be implemented consistently in different software components, SAP recommends you import Support Packages using Support Package Stacks. Support Package Stacks are recommended combinations of Support Packages of different software components. Support Package Stacks are not alternative, special patches, but recommended combinations of normal Support Packages. Support Package Stacks are available for the various SAP systems. In addition to Support Packages, they mostly contain recommendations for patching other components, such as kernel patches for patching the ABAP runtime environment.

The problem of how to patch a complex landscape frequently arises, as well as the question of how to actually use the Support Package Stack for orderly, documented patching. What is the current patch status of my system landscape? Where can I find the necessary Support Packages and the Support Package Stack information? The Maintenance Optimizer (MOpz) as part of SAP Solution Manager provides the solution to these questions. With the Maintenance Optimizer, you can request the Support Package Stacks required for the systems of your landscapes defined in SAP Solution Manager in a controlled and manageable way.

Note: The Maintenance Optimizer is mandatory for some Support Packages, such as the Support Packages for SAP ECC 6.0 and above, which have been available since April 2007.

Note Assistant

Support Packages are imported with the Support Package Manager (transaction SPAM). SAP Notes are implemented with the Note Assistant (transaction SNOTE).

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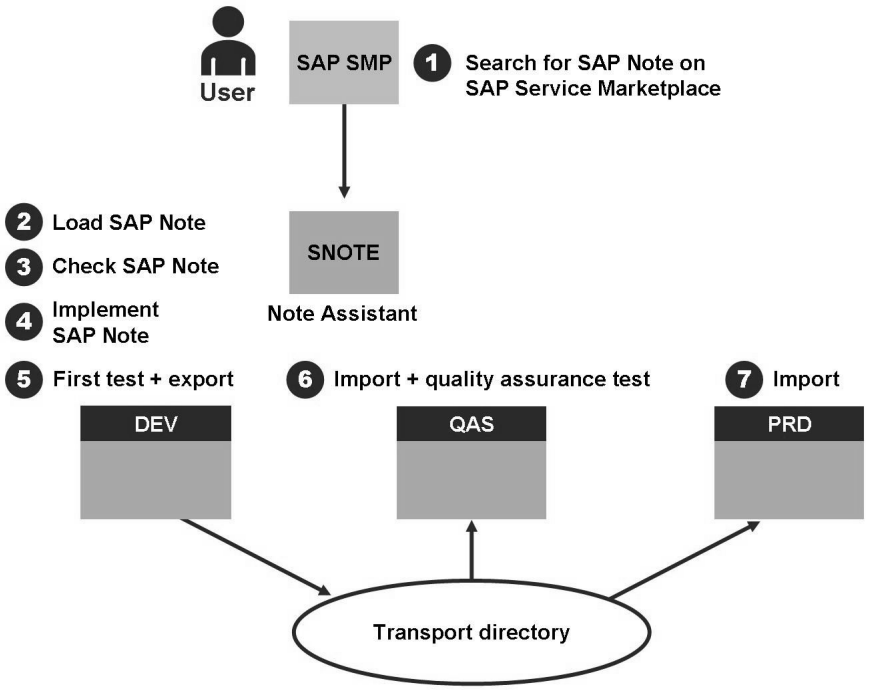

Figure 89: Note Assistant

The Note Assistant is called with the transaction SNOTE. It has been part of the standard system since Basis release 6.10. In earlier releases, you can make it available by importing it as an additional software component, as an add-on.

The current version of the Note Assistant can implement various types of SAP Notes: Changes to SAP programs, the creation of new SAP programs, changes to SAP function modules and several other types of repository objects can be handled. It cannot, however, change Dictionary objects, for example. Furthermore, the Note Assistant can only change repository objects, not Customizing, for example.

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The Note Assistant implements SAP Notes as follows:

1. You have to localize the required SAP Notes on the SAP Service Marketplace, for example, by searching for keywords or selecting the unique SAP Note number, if you know it.
2. You can then load these SAP Notes to the development system with the Note Assistant (transaction SNOTE).
3. The SAP Notes are checked by the Note Assistant here. It checks whether the release named in the SAP Note and the Support Package level are correct, whether the SAP Note requires other SAP Notes as predecessors, whether it can be implemented due to other modifications that may exist for the affected repository object, and so on.
4. The SAP Note is implemented by choosing the *Implement SAP Note* button. This creates a transport request.
5. The result of implementing the SAP Note is roughly tested in the development system.
6. If this test is successful, the resulting transport request is imported into the quality assurance system. The quality assurance test is performed here.
7. If this is also successful, the transport request is imported into the production system.

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Exercise 15: Implementing an SAP Note with the Note Assistant

Exercise Objectives

After completing this exercise, you will be able to:

- Implement an SAP Note with the Note Assistant

Business Example

To correct the coding of an SAP object, you want to implement an SAP Note.

Caution: The SAP Note is implemented into the DEV system with the Note Assistant. Later on it could be imported into the QAS system with the Transport Management System (TMS).

So the QAS groups work together with their partner DEV groups in the corresponding DEV system.

Task 1: Download and check an SAP Note

Download the SAP Note given by the instructor with the Note Assistant from SAP Service Marketplace. Afterwards check, if the SAP Note can be implemented.

1. Download the SAP Note.
2. Check the downloaded SAP Note.

Task 2: Implement the downloaded SAP Note

Implement the downloaded SAP Note with the Note Assistant.

1. Implement the SAP Note.
2. Complete the SAP Note implementation.

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Solution 15: Implementing an SAP Note with the Note Assistant

Task 1: Download and check an SAP Note

Download the SAP Note given by the instructor with the Note Assistant from SAP Service Marketplace. Afterwards check, if the SAP Note can be implemented.

1. Download the SAP Note.
   a) Log on to your DEV system, client 100 and start transaction SNOTE.
   b) Download the SAP Note by choosing *Goto -> Download SAP Note*. Enter the SAP Note number and choose *Execute*.
2. Check the downloaded SAP Note.
   a) Select the SAP Note and choose the *Check SAP Note* button. You can find the SAP Note in the *New* folder. Confirm the popup with *Continue*.

Task 2: Implement the downloaded SAP Note

Implement the downloaded SAP Note with the Note Assistant.

1. Implement the SAP Note.
   a) Select the SAP Note and use the *Set Processing Status* button to set the processing status to *In Processing*.
   b) Select the SAP Note and choose the *Implement SAP Note* button. You can find the SAP Note in the *In Processing* folder. Confirm that you have read the SAP Note with *Yes*.
   c) Confirm the popup about the repairs with *Continue*. Press the *Create Request* button in the *Prompt for transportable Workbench request* popup. Enter a short description for the transport request and create the transport request by choosing the *Save* button. Press *Continue* to confirm the *Prompt for transportable Workbench request* popup.
   d) Confirm the *Confirm Changes* popup with *Continue*. Activate any inactive items by confirming the *Inactive Objects for ...* popup with *Continue*.

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2. Complete the SAP Note implementation.

   a) The SAP Note is implemented now. If you are satisfied with the result in the DEV system, select the SAP Note and use the *Set Processing Status* button to set the processing status to *Completed*.

   b) The next steps would be to release the corresponding transport request via transaction SE09 in the DEV system and to import the transport request into the QAS system. Here it would be tested. After a positive test result the transport request can be imported into the PRD system. Imports are done via transaction STMS. But transporting and testing is not part of this exercise.

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Lesson Summary

You should now be able to:

- Describe the concept of SAP Notes and Support Packages

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Lesson: Preparation for Software Maintenance

Lesson Overview

This lesson discusses the use of the SAP Solution Manager - Maintenance Optimizer (MOpz) to request Support Packages within a maintenance transaction.

Lesson Objectives

After completing this lesson, you will be able to:

- Explain the concept of maintenance certificates
- Describe a maintenance transaction

Business Example

You want to import Support Packages into your SAP system. You want to request these with the help of your Solution Manager

Maintenance Certificates

A maintenance certificate enables the SAP software logistics tools (for example, SPAM, SAINT, and JSPM) to identify the system to be maintained and to determine the extent of maintenance required. It is also used to ensure that only customers with a valid maintenance contract can perform the relevant maintenance transactions.

Hint: As of January 2009, the software logistics tools can only maintain a system if a valid maintenance certificate is available.

As of SPAM/SAINT Version 7.00/0034, a valid maintenance certificate is a prerequisite for importing Support Packages. In the near future, Java Support Packages (imported using the tool JSPM) will also require a maintenance certificate. At the moment (late 2010), only a warning is displayed.

Hint: All SAP products based on SAP NetWeaver AS ABAP 7.0 and higher require a maintenance certificate.

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Maintenance certificates are valid for a period of three months, after which time they must be renewed. To keep costs to a minimum, a SAP Solution Manager system can be used to automate the process of generating maintenance certificates. For this purpose, a SAP Solution Manager system must have release 7.0 and Support Package Stack level 16 or higher (recommended: 18).

Hint: The SAP Solution Manager system requires a connection to SAP Service Marketplace and to the SAP system to be patched.

If these connections are not possible (for example, for security reasons), the maintenance certificates can also be requested manually from SAP Service Marketplace.

When performing a release upgrade or importing SAP enhancement packages, Support Packages are incorporated into the update process. A maintenance certificate is **not** required here.

You can use transaction SLICENSE to check whether your system has a valid maintenance certificate. Choose *New Licenses* (to switch to the *Digitally-Signed License Keys* view). You can now check the following:

- Software Product: *Maintenance* in the *Sware Prod* column
- Valid From: Date on which the maintenance certificate was requested
- Valid To: Date on which the maintenance certificate was requested + approximately three months

Hint: See also SAP Note 1280664 - *Distribution of maintenance certificates: Troubleshooting*

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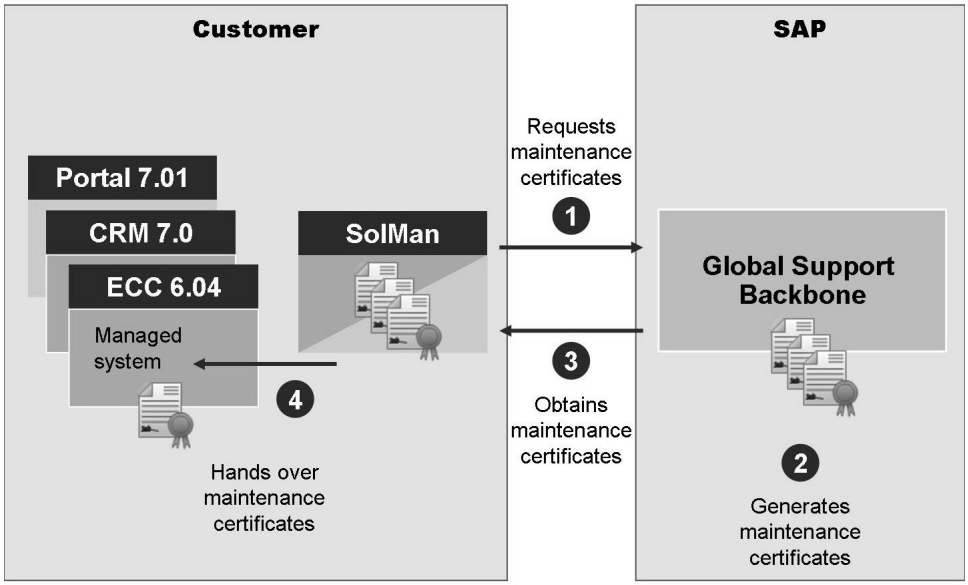

Figure 90: Maintenance Certificate

1. The SAP Solution Manager system requests a maintenance certificate for all managed systems, where the maintenance certificate is expiring.
2. The maintenance certificates are generated in the SAP Global Support Backbone.
3. The SAP Solution Manager system contains the maintenance certificates the next time a connection is established (every 24 hours).
4. The managed systems receive the maintenance certificates from the SAP Solution Manager system.

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The following is a more detailed description of the process:

1. If automatic distribution is active for maintenance certificates, SAP Solution Manager passes the system numbers of all satellite systems to the SAP Global Support Backbone.
2. The SAP Global Support Backbone automatically checks each system for a valid maintenance contract.
3. If there is no valid maintenance contract, the process in the SAP Global Support Backbone automatically ends, and the customer's SAP Solution Manager system is informed.

   If there is a valid maintenance contract, the SAP Global Support Backbone automatically checks whether there is a maintenance certificate, and returns it to SAP Solution Manager.
4. If there is no maintenance certificate, the SAP Global Support Backbone automatically generates one for this system. The next time it runs (every 24 hours), SAP Solution Manager can get this maintenance certificate from the SAP Global Support Backbone.
5. The maintenance certificates are automatically given to SAP Solution Manager, where they are saved and made available.
6. The *Maintenance Package* task, which runs daily in the satellite systems (in the Service Data Control Center, transaction SDCCN), uses an RFC connection to request the relevant maintenance certificate from SAP Solution Manager.
7. If a maintenance certificate is successfully retrieved, it is automatically saved locally in SAP License Management (transaction SLICENSE).
8. If the tools SPAM or SAINT are used to import Support Packages, an automatic check is performed to check whether there is a valid maintenance certificate for the system.

SAP Note 1280664 - *Distribution of maintenance certificates: Troubleshooting* provides detailed information about troubleshooting.

Maintenance Transaction

All SAP systems that are part of the customer's system landscape are registered in SAP Solution Manager. The Maintenance Optimizer (MOpz), as part of SAP Solution Manager, can then work with this information.

To import Support Packages, among other things, SAP recommends that you create a maintenance transaction with the Maintenance Optimizer. On the one hand, this maintenance transaction is used to calculate a consistent combination

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of Support Packages for a systems in the system landscape. On the other hand, the Support Packages to be imported must be approved before they can be downloaded. The approval is performed as part of the maintenance transaction.

Hint: All Support Packages for systems based on SAP NetWeaver 7.0 (and higher) require the Maintenance Optimizer for approval.

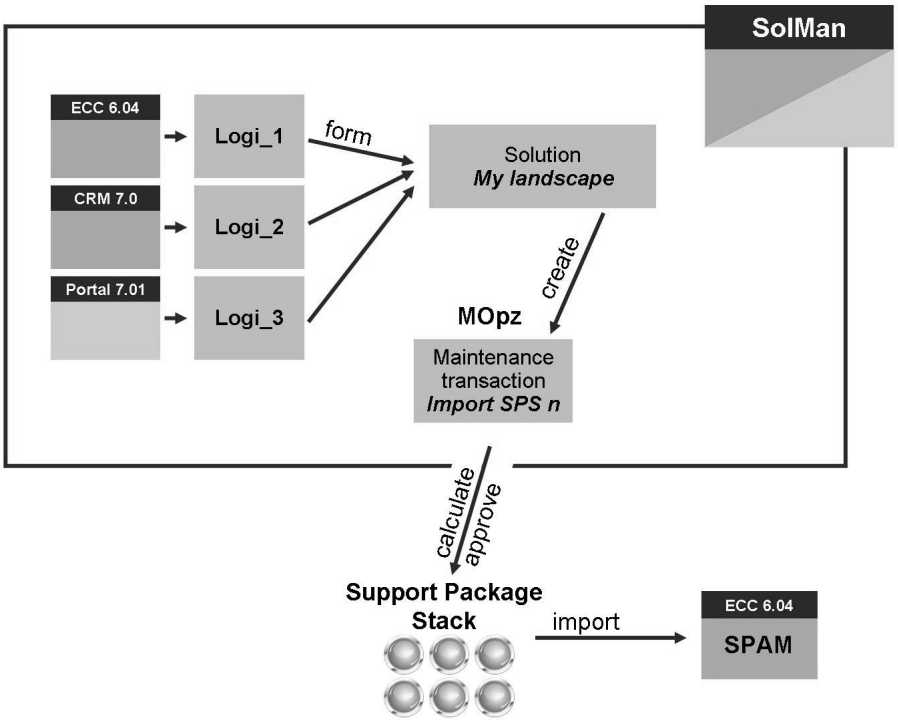

Figure 91: Maintenance Transaction

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The following steps are necessary to perform a maintenance transaction and using it to select Support Packages:

1. In the SAP Solution Manager system, the basic configuration needs to have been performed with transaction SOLMAN_SETUP.
2. The SAP systems to be maintained need to have been registered in SAP Solution Manager with transaction SMSY.
3. As part of this registration process, the systems are assigned to a logical component.
4. The logical component needs to be assigned to a solution in the *SAP Solution Manager Administration* work center.
5. In the *Change Management* work center you can create a maintenance transaction using the Maintenance Optimizer (MOpz) by choosing *Common Tasks → New Maintenance Transaction*.
6. The required Support Packages can be selected within this maintenance transaction.
7. The selected Support Packages can be placed in the download basket. They are then approved within the maintenance transaction so the Download Manager can be used to download them from the SAP Service Marketplace. (Alternatively, the Software Lifecycle Manager functions (SLM) can be used for the download.)
8. The downloaded Support Packages can now be imported using the Support Package Manager (transaction SPAM in the AS ABAP based system to be maintained). In AS Java based systems Support Packages are imported with the tool JSPM.

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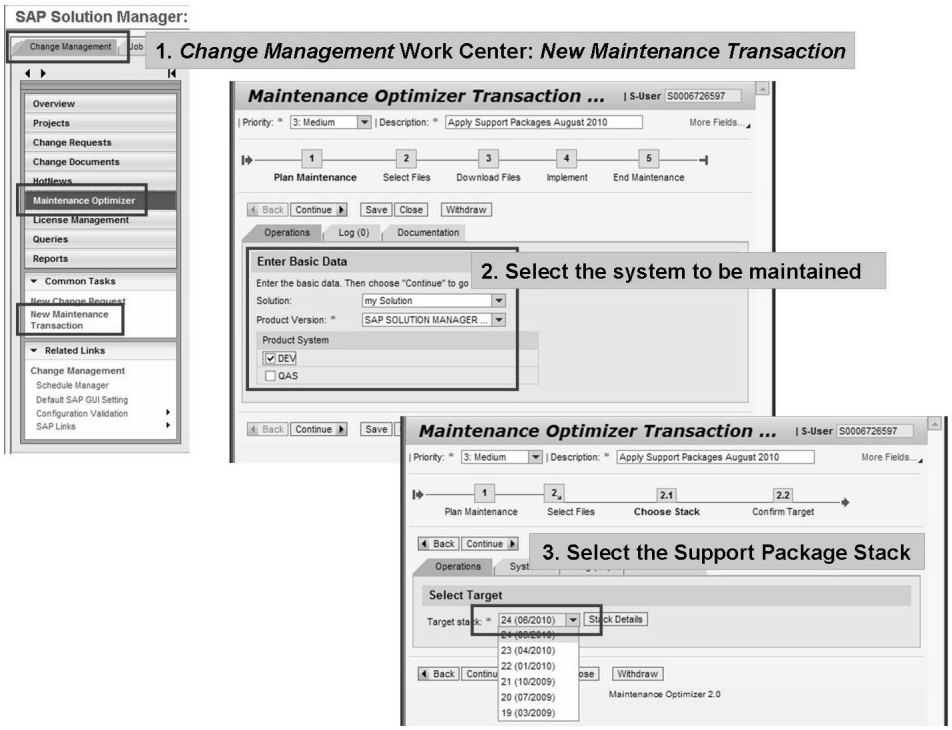

Figure 92: Support Package Stacks and Maintenance Optimizer

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Exercise 16: Execute a Maintenance Transaction

Exercise Objectives

After completing this exercise, you will be able to:

- Create and execute a maintenance transaction for Support Packages in the SAP Solution Manager system.

Business Example

You want to update the SAP systems in your company to the latest Support Package level. You want to use a maintenance transaction in the SAP Solution Manager system to determine the Support Packages.

Caution: The DEV groups log on to the partner QAS system and define a maintenance transaction for their own DEV system. The QAS groups log on to the partner DEV system and define a maintenance transaction for their own QAS system.

The partner system is assumed to be the Solution Manager system, the own system is assumed to be the system to be updated.

Caution: The maintenance transaction exercise requires certain system configurations to be made. The systems for this course are prepared accordingly. However, you may still need to create a solution and assign logical components. The first task is used for this.

Task 1: Create a Solution

Create a solution your partner SAP Solution Manager system that has a logical component assigned to it with your own system included.

1. Create a solution and assign your logical component to it. Use the *SAP Solution Manager Administration* work center.

Task 2: Execute a Maintenance Transaction

Use your partner SAP Solution Manager system to execute a maintenance transaction for your own system for importing a Support Package Stack into your system.

1. Create a maintenance transaction for importing a Support Package Stack.
2. Select the Support Package Stack you require for your maintenance transaction.

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3. Complete the maintenance transaction.

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Solution 16: Execute a Maintenance Transaction

Task 1: Create a Solution

Create a solution your partner SAP Solution Manager system that has a logical component assigned to it with your own system included.

1. Create a solution and assign your logical component to it. Use the *SAP Solution Manager Administration* work center.
   a) Log on to your SAP Solution Manager system.
   b) Call the *SAP Solution Manager Administration* work center using the SOLMAN_WORKCENTER transaction, for example.
   c) Choose *Solutions* and select the *New* button.
   d) Enter user and password and log on. You are now in the screen to create a new Solution.
   e) In the field *Solution*, enter the name of your solution, for example **`Solution ##`** and choose a language.
   f) Choose *Development System* as the *Leading System Role* and then *Save Solution*.
   g) Switch to the *Solution Landscape* tab.
   h) Choose *Add Existing Logical Component*.
   i) In the popup choose as *Product Version* **`SAP SOLUTION MANAGER 7.0 EHP1`**, as *Product Instance* **`Solution Manager ABAP Stack`**, as *Product System* **`<SID of your system>`**, and as *Logical Component* **`Z_SOLMAN_ABAP`**. Confirm this selection with *OK*. You can just as well directly select the *Logical Component*.
   j) Repeat the last step for the AS Java part of your system with *Logical Component* **`Z_SOLMAN_JAVA`**.
   k) Save your changes with *Save Solution*.

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Task 2: Execute a Maintenance Transaction

Use your partner SAP Solution Manager system to execute a maintenance transaction for your own system for importing a Support Package Stack into your system.

1. Create a maintenance transaction for importing a Support Package Stack.
   a) Log on to your partner SAP Solution Manager system.
   b) Call the *Change Management* work center using the SOLMAN_WORKCENTER transaction, for example.
   c) Choose *Common Tasks* → *New Maintenance Transaction*.
   d) Choose a *Priority* and enter a *Description*. Choose the *Solution* you created in the previous task.
   e) Choose *SAP SOLUTION MANAGER 7.0 EHP 1* as the product version and select the row with your own SAP system.
   f) Choose *Continue*.

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2. Select the Support Package Stack you require for your maintenance transaction.

   a) Select *Calculate Files Automatically - Recommended* and choose *Continue*.

   b) *Maintenance* is already selected in your maintenance transaction. Choose *Continue*.

   c) Accept the *Target stack* currently proposed, for example, *24 (06/2010)* and choose *Continue*. (This may take several minutes.)

   d) You now see a selection of operation system- and database-dependent files. For the operating system *Windows Server on x64 64bit*, select the **`#Database independent`** and **`MaxDB`** files. Choose *Continue*.

   e) You now see a selection of stack-independent files. Leave the selection unchanged and choose *Continue*.

   f) You now see the files that belong to your stack. Leave the selection unchanged and choose *Continue*.

   g) As the download tool choose *Download Basket*. The files will be added to the download basket. Choose *Continue*.

   h) The files are automatically confirmed in your S-user's download basket. You could now start the Download Manager by choosing *Download Files from Download Basket*. In the context of this course this step is not necessary, because the relevant files are already downloaded to your server.

   i) Choose *Continue*. The *Status of Implementation* is **`New`**. You may want to set it to **`In Process`**.

   j) At this point, you would use the Download Manager to download the files and, for example, use transaction SPAM to import the Support Packages into your own AS ABAP based system. For an AS Java based system, the tool JSPM is used. However, this is not part of this exercise. Imagine that you have already successfully imported all of the files contained in your maintenance transaction.

3. Complete the maintenance transaction.

   a) Set the *Status of Implementation* to **`Completed`**.

   b) Choose *Continue*.

   c) Recognize the information about the changed entries and choose *Save*.

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Lesson Summary

You should now be able to:

- Explain the concept of maintenance certificates
- Describe a maintenance transaction

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Lesson: Support Package Manager (SPAM)

Lesson Overview

In this lesson you will be introduced to the Support Package Manager. You will learn what a SPAM/SAINT update is and how to import it. A SPAM/SAINT update may be required before you can import new Support Packages.

Lesson Objectives

After completing this lesson, you will be able to:

- Explain the use of the Support Package Manager and import a SPAM/SAINT update.

Business Example

Functional enhancements to a system can affect not only the applications, but also the actual tools that you use to import the Support Packages.

SPAM/SAINT Update

Most standard software components of an SAP system are installed during the initial installation process. Additional software components can be imported afterwards, if required. These are referred to as add-ons. Examples of add-ons are plug-ins or industry-specific components (industry solutions) that are not part of the standard installation. These add-ons are imported with the help of the Add-On Installation Tool (transaction SAINT). The Add-On Installation Tool and add-ons themselves will not be dealt with in detail in this lesson.

The tool for importing Support Packages is the Support Package Manager. You can call it using the transaction SPAM.

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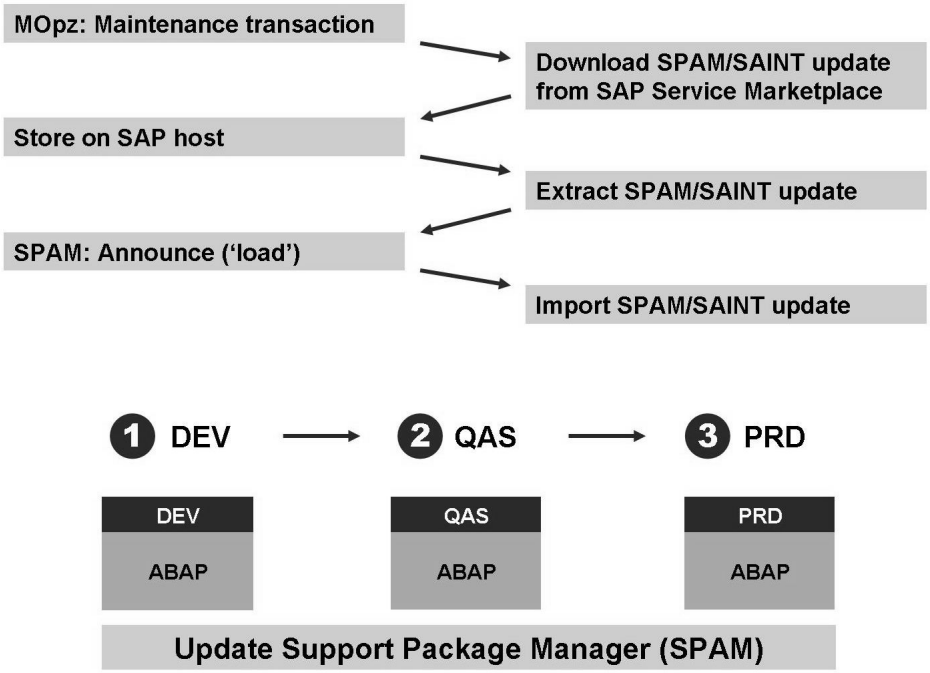

Figure 93: Support Package Manager: SPAM/SAINT Update

The Support Package Manager offers the following functions:

You can use the Support Package Manager (transaction SPAM) to import individual Support Packages for individual components. You can also import several consecutive Support Packages for a software component. Furthermore, you can import several Support Packages for various software components (a vector). If you want to import such a vector of Support Packages, you can either switch to *All Components* in the selection dialog box for the queue or you can choose *Extras* → *Settings* → *Define Queue* to switch to the vector selection view.

When the Support Package Manager imports a Support Package into the system, it follows a fixed sequence of steps. If the process of implementing the Support Package terminates, processing can be restarted at the break-off point. The process restarts at the point at which it was terminated.

A special import procedure keeps downtime to a minimum. (*Extras* → *Settings* → *Import Queue* → *Import Mode: Downtime-minimized*) The individual phases of the Support Package Manager are grouped into four modules. You can determine the start times of the modules individually. The individual modules can also be scheduled for background processing.

The Support Package Manager can recognize dependencies between Support Packages and take account of these (but not the side-effects, however). To remain up-to-date and to be able to use the new functions of the Support Package Manager too, you should update the Support Package Manager itself before you import Support Packages. Since transactions SPAM and SAINT are closely related from

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a technical point of view, a shared patch, the SPAM/SAINT update, is supplied at unregular intervals to upgrade the tools. You can find out the version from the short description of transaction SPAM (for example, *SPAM/SAINT update - Version 7.01/0040*).

Hint: The update for the Support Package Manager (SPAM/SAINT update) is only delivered in German and English. You are therefore recommended to log on in English or German when working with the Support Package Manager.

The SPAM/SAINT update is imported using the transaction SPAM.

You can only import a SPAM/SAINT update if there are no aborted Support Packages in the system. If there are aborted Support Packages, a dialog box informs you of this. You then have two options:

- You first import the complete queue of Support Packages and then the SPAM/SAINT update.
- You reset the status of the queue, import the SPAM/SAINT update first and then the Support Package queue. You can reset the status of the queue by choosing *Extras → Reset status → Queue*.

Procedure for importing a SPAM/SAINT update:

1. Check whether the SPAM/SAINT update currently offered on SAP Service Marketplace is newer than the one imported into the SAP system (the SPAM/SAINT version of the SAP system is displayed in the title bar of the Support Package Manager).
2. Download the latest SPAM/SAINT update from SAP Service Marketplace. As part of a maintenance transaction, the Maintenance Optimizer can be used for this purpose.
3. Extract the downloaded file to the transport directory of the relevant SAP system, subdirectory *EPS*, subdirectory *in*.
4. Log on to client *000* in the SAP system and call transaction SPAM.
5. Communicate the patch (the SPAM/SAINT update) to the Support Package Manager: *Support Package → Load packages → From Application Server*. This is simply a notification for the Support Package Manager and does not import the SPAM/SAINT update. No packages are loaded. And they are not searched for on the application server, but rather on the host, the application server run on.
6. To import the SPAM/SAINT update, choose *Support Package → Import SPAM/SAINT Update*.

In a multi-system landscape you have to carry out this import procedure in each system. In a three system landscape, the most practical sequence is development system, quality assurance system, and then production system.

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Since the SPAM/SAINT update is a full delivery of transactions SPAM and SAINT, you can import the latest available SPAM/SAINT update immediately. For example, for an existing version 0035, you can directly import version 0040.

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Exercise 17: Support Package Manager (SPAM)

Exercise Objectives

After completing this exercise, you will be able to:

- Import a SPAM/SAINT update

Business Example

To import Support Packages, you often need to first update the tool that you are using for the import. This may be necessary in order to read current attributes from the new Support Package, for example.

Task: Importing a SPAM/SAINT Update

Import a SPAM/SAINT update.

Caution: This exercise must be performed by the DEV group first and then by the QAS group.

In the first step, a SPAM/SAINT update is imported into the SAP system DEV. After it has been imported successfully, the SPAM/SAINT update is imported into the SAP system QAS.

Your instructor will show you the downloaded file you require for the SPAM/SAINT update.

1. Check the current SPAM version in your system.
2. Extract the file that contains the SPAM/SAINT update at operating system level.

   Hint: Remember that this step only needs to be performed once for each transport directory.

3. Log on to the correct client.
4. Load the SPAM/SAINT update using transaction SPAM; that is, declare the file to the SAP system.
5. Import the SPAM/SAINT update into your SAP system. Note any possible errors.
6. Check the import process log for errors.

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Solution 17: Support Package Manager (SPAM)

Task: Importing a SPAM/SAINT Update

Import a SPAM/SAINT update.

Caution: This exercise must be performed by the DEV group first and then by the QAS group.

In the first step, a SPAM/SAINT update is imported into the SAP system DEV. After it has been imported successfully, the SPAM/SAINT update is imported into the SAP system QAS.

Your instructor will show you the downloaded file you require for the SPAM/SAINT update.

1. Check the current SPAM version in your system.

   a) Call transaction SPAM. The SPAM version is displayed in the title bar (for example, "Support Package Manager - Version 7.01/0039)."

   To see whether SPAM/SAINT updates have already been imported, select the *Imported Support Packages* radio button and choose *Display*. The system displays an overview of the previously imported SPAM/SAINT updates, called *SAP_OCS* (SAP Online Correction System) here.

   Note: You can also skip individual SPAM/SAINT updates, which means that you can switch directly from version 7.01/0039 to the newest version corresponding to SAP_BASIS release 7.01.

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2. Extract the file that contains the SPAM/SAINT update at operating system level.

   Hint: Remember that this step only needs to be performed once for each transport directory.

   a) Go to operating system level. Copy the file *KD701<nn>.CAR* to the transport directory (for example, *G:\usr\sap\trans*). *<nn>* stands for the (latest) version of the SPAM/SAINT update.

      At operating system level, open a command prompt in the transport directory and use the command **`sapcar -xvf KD701<nn>.CAR`** to extract the file you have just copied. This extracts the file to the directory *\EPS\in*. It should now be in *G:\usr\sap\trans\EPS\in*, for example.

3. Log on to the correct client.

   a) Log on to client 000. You can only import a SPAM/SAINT update from client 000.

4. Load the SPAM/SAINT update using transaction SPAM; that is, declare the file to the SAP system.

   a) Transaction SPAM: *Support Package → Load packages → From Application Server*. Confirm the dialog box for the "upload". See that the SPAM/SAINT update was recognized. Go back to the initial screen of SPAM

      Hint: Remember that - although the menu path may suggest it - no package is uploaded or imported here, and it is not searched for on the application server, but rather on the host, the application server is running on.

5. Import the SPAM/SAINT update into your SAP system. Note any possible errors.

   a) In transaction SPAM, choose *Support Package → Import SPAM/SAINT Update*. Confirm the dialog box to import. In case the import process terminates due to an error, just restart it with transaction SPAM. A termination is not unusual, because you are patching the tool with itself.

   b) Then call transaction SPAM again. This takes some time, since the system must regenerate the underlying programs and so on, due to the SPAM/SAINT update.

6. Check the import process log for errors.

   a) Call transaction SPAM and choose *Goto → Import Logs → SPAM/SAINT Update*. No errors should be displayed.

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Lesson Summary

You should now be able to:

- Explain the use of the Support Package Manager and import a SPAM/SAINT update.

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Lesson: Importing Support Packages

Lesson Overview

In this lesson you will learn how Support Packages are imported into your systems.

Lesson Objectives

After completing this lesson, you will be able to:

- Import Support Packages with transaction SPAM
- Provide a general explanation of the import process for Support Packages

Business Example

Importing Support Packages is a task for the SAP system administrator. The new versions of SAP objects in the Support Packages stabilize and extend the functional scope of the SAP system. They are also needed in regard of legal changes.

Importing Support Packages

The **Support Package Stacks** represent combinations of Support Packages recommended by SAP for the respective product version, and you are advised to import these regularly.

When importing Support Packages you should observe the instructions for the Support Package Stack and import all the Support Packages in the Support Package Stack, if possible. A kernel patch often is part of the Support Package Stack, too. This should be implemented before you import the Support Packages (not covered in this lesson).

If you have installed an enhancement package in your SAP system, you must use the Maintenance Optimizer, as part of SAP Solution Manager, to calculate a Support Package Stack. In any case you should use the Maintenance Optimizer.

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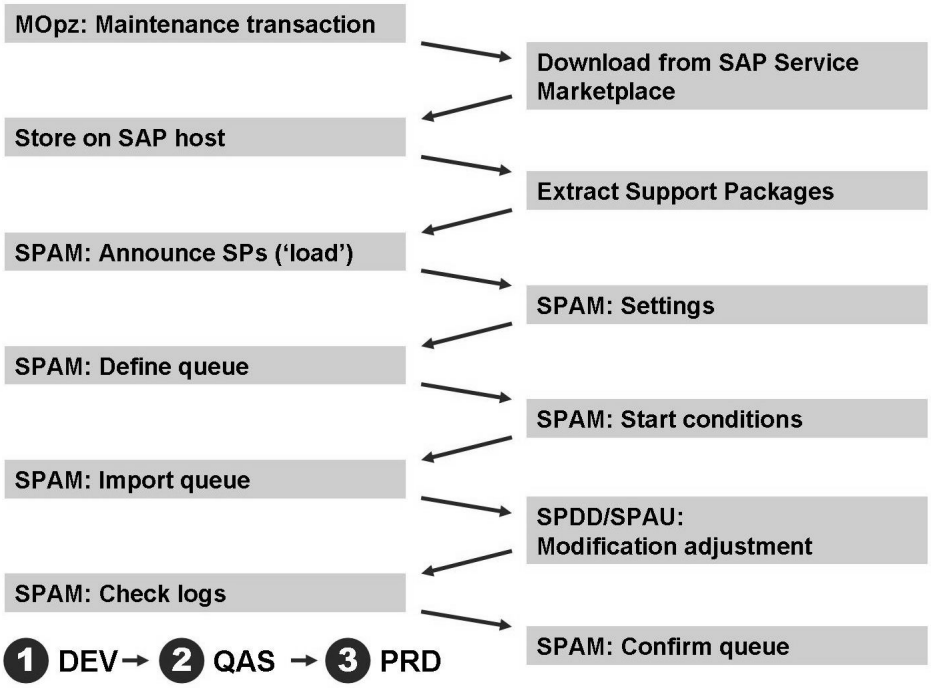

Figure 94: Importing Support Packages

The procedure for importing Support Packages should be as follows:

1. Create a maintenance transaction in the Maintenance Optimizer. The Maintenance Optimizer calculates the necessary combination of Support Packages (Support Package Stack) for the system you want to patch. You should also make sure you have the latest SPAM/SAINT update. The Maintenance Optimizer approves the selected Support Packages for the download, and place them in the download basket for the Download Manager.
2. You can download the required Support Packages from SAP Service Marketplace using the Download Manager.
3. The downloaded files need to be unpacked to the transport directory of the relevant SAP system, subdirectory *\EPS\in*.
4. Log on to client *000* in the SAP system and call transaction SPAM.
5. The new Support Packages are announced to the Support Package Manager: *Support Package → Load Packages → From Application Server*. This is simply a notification for the Support Package Manager and does not import the Support Packages. If the compressed files are on the front-end servers host and are smaller than around 10 MB, you can also transfer these files to the application servers host and decompress them directly from the Support Package Manager. With files that are larger than approximately 10 MB in size, this method is inefficient, since it is too slow.
6. Make settings for the import procedure (see below).

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7. You define the queue for the Support Packages to be imported. This can choose Support Packages for one single software component as well as Support Packages for several components. The Support Package Manager checks the consistency of the queue. The Support Package Manager ensures that only Support Packages that match the system are displayed in the queue. Support Packages that are intended for a different release or a software component that is not installed, or whose predecessor relationships are not fulfilled, do not appear in the queue, even if these have been specified in the SAP system.
8. To import the Support Package queue, choose *Support Package → Import Queue*.
9. Choose the start conditions for the four import modules (see below).
10. Start the import process. One or two modification adjustments may arise during the import (see below). These must be executed at the specified point.
11. Once the Support Packages have been imported successfully, check the logs: *Goto → Import Logs → Queue*
12. After the Support Packages have been imported to the development system, the developers can check the objects. After the Support Packages have been imported to the quality assurance system, an acceptance test should be carried out by subject matter specialists. You can then import the Support Packages to the production system.
13. If the import has been completed successfully, the imported queue has to be confirmed in the relevant system: *Support Package → Confirm*

There are a number of possible settings for the import procedure (*Extras → Settings*). Under *Import Queue → Scenario*, you can define the actions to be carried out during the import:

- Standard: The standard scenario is used to import Support Packages completely; all steps are performed. The import mode *Downtime-minimized* can be used here (see below).
- Test: You can use the test scenario to observe whether a modification adjustment is required before you import the Support Package, or to check whether conflicts occur that must be resolved before the import. No data or objects are imported to the SAP system during the test scenario.

  There is no test scenario for SPAM/SAINT updates. The selection you make here is ignored when importing a SPAM/SAINT update.

There are many steps (phases) to the import procedure. These are subdivided into four modules.

- The modules can be executed individually in the correct sequence.
- The modules can be started in a background process.
- The start time of the module can be controlled flexibly.

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The four modules execute the following steps:

1. **Preparation** module: All the preparatory steps and check steps (such as the test import, add-on conflict check) are performed in this module. The module can run during production operation. Once the preparation module has been completed, you still have the option of resetting or deleting the queue. If you continue with the Import 1 module, data is changed on the database and the queue can no longer be reset or deleted.
2. **Import 1** module: In this module, the objects of the Support Packages are imported. If the import procedure is carried out in **Downtime-minimized** mode, programs are inactively imported. The runtime system cannot "see" these changes yet. Dictionary objects are inactive when imported, independent of the import mode. The manual modification adjustment of the Dictionary objects is performed at the end of this module, if required (SPDD modification adjustment). Now the dictionary objects are activated. If you can guarantee that no manual changes are required for the SAP system and no transports are imported into the SAP system during this time, up to here this module can run with the **Downtime-minimized** import mode during production operation. These conditions are normally given in the production system. Nevertheless, in this case this module runs longer.
3. **Import 2** module: The remaining import steps are carried out in this module. If you use the **Downtime-minimized** import mode, inactive programs are activated in this module as well. During this module **production operation is not permitted** to avoid inconsistencies and data loss. As a result, this module always means system **downtime**.
4. **Clean Up** module: In this module, all the clean-up steps are processed. The modification adjustment of the non-Dictionary repository objects is performed in this module (SPAU modification adjustment). When all modifications have been adjusted, production operation can continue.

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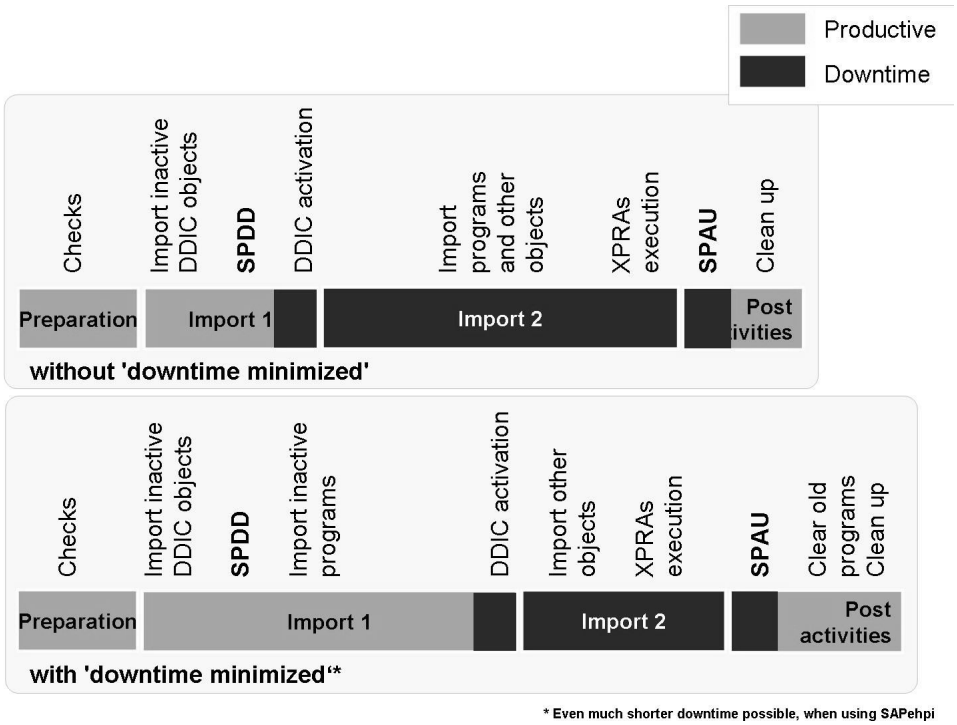

Figure 95: Import Mode Downtime-minimized

Caution: The SAP system administrator must manage the downtime manually! This means, that the administrator is responsible for locking the system, logging out the users, stopping batch processing, invalidating RFC connections and so on.

With the **Downtime-minimized** import mode, the ABAP programs in the *Import 1* module are inactive when imported.

Advantages of the Downtime-minimized import mode: Since you can stop the import of Support Packages after each module, you can run the *Preparation* and *Import 1* modules up to the first modification adjustment during production operation. After the scheduled switch to non-production operation, you can run the *Import 2* module and the modification adjustments, if required. After that, production operation can resume.

Note: You can considerably reduce system downtime by selecting Downtime-minimized. However, this makes the overall import procedure longer because you still need to activate the ABAP programs in module *Import 2*. Additionally, module *Import 1* will take longer to run because the imported objects must be kept in addition to the previous versions of the objects using the version administration tools.

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The setting for the Downtime-minimized import mode also influences the default setting for the start conditions of the four import modules.

If you selected the conventional import procedure (Downtime-minimized import mode not activated), the following settings appear by default:

1. Preparation: Start in dialog immediately
2. Import 1: Continue in dialog immediately
3. Import 2: Continue in dialog immediately
4. Clean Up: Continue in dialog immediately

If you selected the Downtime-minimized import mode, the following settings appear by default:

1. Preparation: Start in dialog immediately
2. Import 1: Continue in dialog immediately
3. Import 2: Continue manually
4. Clean Up: Continue manually

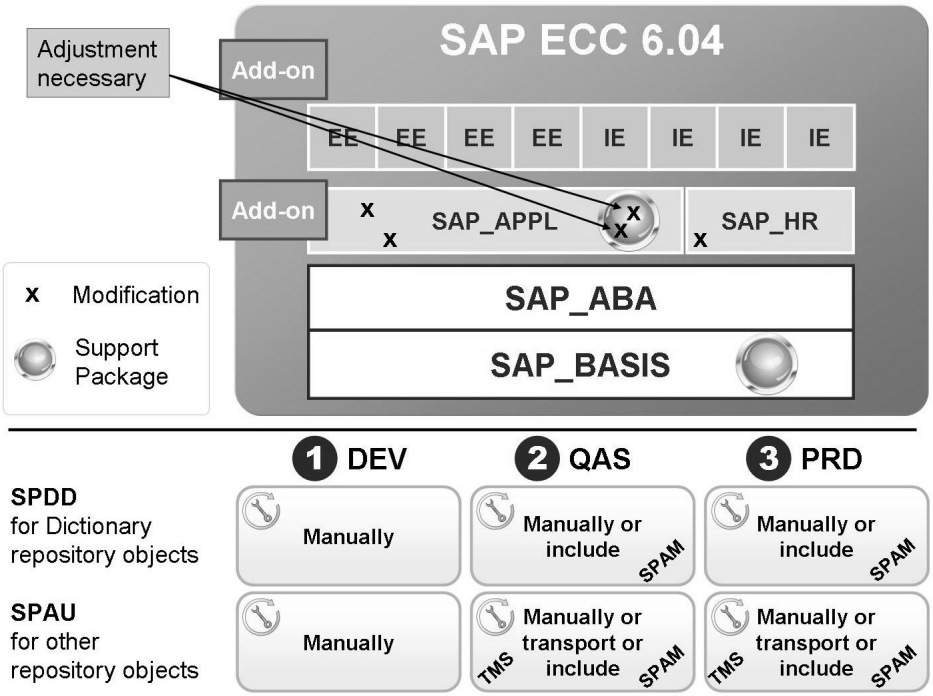

Figure 96: Modification adjustment when importing Support Packages

If SAP objects were modified by the customer and then imported with a Support Package, the objects have to be adjusted when they are imported. If these objects are not adjusted, the customer's modifications that have been made to the SAP

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objects are reset to the SAP delivery status. Use transaction SPDD to adjust Dictionary repository objects, and transaction SPAU to adjust non-Dictionary repository objects.

The modification adjustment for Dictionary repository objects is performed using transaction SPDD. This modification adjustment must be carried out completely before you can continue with the import. Otherwise, the modifications to the Dictionary repository objects are lost. This can then lead to data loss.

Caution: The SPDD adjustment should be performed manually in each system in the landscape and not be replaced by importing a transport request. Importing a transport request can lead to inconsistencies and is not recommended.

Note: As of SPAM/SAINT Version 7.00/0024, you can bind transport requests that contain the modification adjustments from the development system into the Support Package queue for the subsequent SAP systems. This means that the modification adjustments only need to be carried out once in the development system, and are then implemented automatically in the quality assurance and production systems by the modification adjustment transports. This is a similar procedure as in a release upgrade.

The modification adjustment for non-Dictionary repository objects is performed using transaction SPAU.

You can perform the SPAU adjustment in each system of a multi-system landscape manually. Or this modification adjustment can be performed once in the development system and imported to the following systems using the resulting transport request (which is not possible in transaction SPDD). To do this, however, you should compare the modification status of the individual systems in the landscape beforehand. You can check these at any time with the Modification Browser (transaction SE95).

Note: As of SPAM/SAINT Version 7.00/0024, you can bind transport requests that contain the modification adjustments from the development system into the Support Package queue for the subsequent SAP systems.

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To perform an SPDD or an SPAU modification adjustment, proceed as follows:

1. To enable developers to perform the modification adjustment, create a transport request in the Transport Organizer, and under the transport requests, create tasks for the developers. You are advised to create only one transport request for the adjustment of Dictionary repository objects (SPDD) and one second transport request for the adjustment of non-Dictionary repository objects (SPAU).
2. The developers can now perform the modification adjustment. They can use transactions SPDD and SPAU to do this. After the adjustment is complete, the developers must release the tasks and transport requests.
3. If you are using a SPAM/SAINT version 7.00/0024 or above, you can flag the adjustment transport requests (select *Select for Transport* in the transactions SPDD and SPAU). This is possible as of Basis Release 7.00. This enables you to perform the modification adjustments manually in the development system only. When you import the Support Packages to the subsequent SAP systems of the landscape, these adjustment transports can be included in the Support Package queue. This means manual modification adjustments are no longer required in the subsequent SAP systems.
4. Now choose *Confirm Adjustment* and confirm the prompt.
5. To continue the import process, choose *Support Package → Import Queue*.

The Support Package Manager continues the processing and displays the status.

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The downtime must be managed manually by the SAP system administrator!

It is also possible to import Support Packages with the current version of the SAP enhancement package installer (SAPehpi).

For some SAP systems, for example SAP CRM, an advanced version of SPAM is used: The *Support Package Manager for EBP/CRM*.

Figure 97: Additional Hints

Hint: It is also possible to import Support Packages with the current version of the SAP enhancement package installer (SAPehpi) (without importing an SAP enhancement package). Importing Support Packages with SAPehpi is by far more difficult and complex for the SAP system administrator, but leads to a shorter downtime! This method of importing Support Packages is not covered in this lesson.

Hint: For some SAP systems, for example SAP CRM, an advanced version of SPAM is used: The in Transaction SPAM choose *Environment →Support Package Manager for EBP/CRM*. It is more interactively and - besides others - helps the administrator to control the downtime.

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Exercise 18: Import Support Packages

Exercise Objectives

After completing this exercise, you will be able to:

- Import Support Packages with transaction SPAM

Business Example

You need to import the most recent Support Packages to update the SAP system.

Task: Import Support Packages

Caution: This exercise must be performed first by the *DEV* group and then by the *QAS* group. It must not be performed by both groups at the same time.

Import the SAP_BASIS Support Packages named by your instructor.

In the first step, all the available Support Packages are imported in a queue into the SAP system *DEV*. After this import is successfully completed, the Support Packages are imported into the SAP system *QAS*.

The files required for the SAP_BASIS Support Packages have already been requested. The instructor will show you where to find them.

1. Check whether Support Packages have already been imported into your system. Have these been confirmed?
2. Extract the files that contain the new Support Packages at operating system level.

   Note that this step only needs to be performed once for each transport directory.
3. Log on to the correct client.
4. Load the Support Packages, that is, inform the SAP system about the files.
5. Check the settings for the import of the Support Packages in transaction SPAM.
6. Define the queue for importing the Support Packages in transaction SPAM.
7. Import the Support Package queue to your system. Note any possible errors.
8. Check the log for the import process for errors.
9. Confirm the imported Support Packages after successful import.

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Solution 18: Import Support Packages

Task: Import Support Packages

Caution: This exercise must be performed first by the *DEV* group and then by the *QAS* group. It must not be performed by both groups at the same time.

Import the SAP_BASIS Support Packages named by your instructor.

In the first step, all the available Support Packages are imported in a queue into the SAP system *DEV*. After this import is successfully completed, the Support Packages are imported into the SAP system *QAS*.

The files required for the SAP_BASIS Support Packages have already been requested. The instructor will show you where to find them.

1. Check whether Support Packages have already been imported into your system. Have these been confirmed?

   a) Transaction SPAM: Select the *Imported Support Packages* radio button and choose *Display*.

      Result: Support Packages have already been imported. They have also already been confirmed. You can tell this, for example, from the green traffic light on the initial screen of transaction SPAM.

2. Extract the files that contain the new Support Packages at operating system level.

   Note that this step only needs to be performed once for each transport directory.

   a) Go to file system level. Copy the relevant files to the transport directory (for example *G:\usr\sap\trans*).

      At operating system level, open a *Command Prompt* in the transport directory (for example *G:\usr\sap\trans*). Extract the files you have just copied there using the command **`sapcar -xvf <name of file>`**. This extracts the files to the relative directory *\EPS\in* (for example *G:\usr\sap\trans\EPS\in*).

3. Log on to the correct client.

   a) Log on to client 000. It is only possible to import Support Packages from client 000.

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4. Load the Support Packages, that is, inform the SAP system about the files.

   a) Transaction SPAM: *Support Package → Load packages → From Application Server.*

      Smile about the misleading named menu path and confirm the dialog box to "upload". See that both SAP_BASIS Support Packages were recognized. Go back to the initial screen of SPAM.

5. Check the settings for the import of the Support Packages in transaction SPAM.

   a) Transaction SPAM: *Extras → Settings*

      Leave the settings at their default values.

6. Define the queue for importing the Support Packages in transaction SPAM.

   a) Transaction SPAM: Choose the *Display/define* button. Choose the required software component (SAP_BASIS) and the required Support Packages (all available).

      You can confirm the queue with *Enter*.

      There are no adjustment transports that could be included: You should therefore confirm the system prompt *Do you want to add Modification Adjustment Transports to the queue now?* with *No*

7. Import the Support Package queue to your system. Note any possible errors.

   a) In transaction SPAM, import the queue by choosing *Support Package → Import Queue*. Retain the default values for the start conditions of the four modules. Confirm the dialog box to start the import.

      Follow the individual steps of the import process, as far as possible, in the status line.

      If errors occur, check these by opening the error log. In this case, repeat the import the Support Packages. The import process can be repeated beginning with the step it failed.

      Confirm the dialog box informing you that the import was successful.

8. Check the log for the import process for errors.

   a) Check the import logs in transaction SPAM by choosing *Goto → Import Logs → Queue*.

      No return code values of 8 or higher should be displayed.

9. Confirm the imported Support Packages after successful import.

   a) Finally, confirm the queue in transaction SPAM by choosing *Support Package → Confirm*

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Lesson Summary

You should now be able to:

- Import Support Packages with transaction SPAM
- Provide a general explanation of the import process for Support Packages

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Lesson: Enhancement Packages

Lesson Overview

In this lesson you will learn what SAP enhancement packages are.

Lesson Objectives

After completing this lesson, you will be able to:

- Understand the idea of SAP enhancement packages

Business Example

New functions are required for an existing SAP system. There are no plans for a complete system upgrade. New functions are delivered in SAP enhancement packages.

SAP Enhancement Package

In the past, new functions for an existing release were “hidden” in Support Packages. This meant that Support Packages did not just consist of legal changes and error corrections, but also imported new functions. However, not all new functions were delivered by Support Package. The really “large” new functions were only available with a new release. Therefore, a system upgrade was necessary every few years.

A system upgrade (for example, from SAP R/3 4.6C to SAP ECC 6.0) is a complete delivery of all software components in the new release. After the upgrade, the system behaves like the new release. Before it can be used in production operation you therefore need to make numerous adjustments. These include modification adjustments, delta Customizing, delta developments for customer developments, and enhancements. The functional acceptance test is also very time-consuming. You normally need to allow a period of several months for an upgrade project of a system landscape. A system upgrade is thus relatively expensive.

To reduce the cost and effort involved, SAP is delivering SAP enhancement packages for all applications. This began with SAP ERP 6.0 in 2007. The current SAP ERP Enhancement Package in 2010 is Enhancement Package 4 for SAP ERP 6.0. SAP enhancement packages are complete deliveries of several software components of one ore more SAP systems. In other words, they are a partial upgrade of several SAP systems.

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The Switch Framework is used to deliver the new functions in a “hidden” way. The Switch Framework allows changes to be made to repository objects without these changes becoming effective immediately. If you need to use the new functions, you have to activate these changes first. It is even possible to make various changes to a single repository object and activate the one individual changes required.

Hint: The switch framework is only available in some AS ABAP-based systems, AS ABAP 7.00 and higher, not in AS Java-based systems.

In some AS ABAP-based systems, it is therefore possible to import parts of an SAP enhancement package without any immediate functional change. This means no further actions are necessary after the import, unlike a complete system upgrade. In a second step you can activate the needed functions by activating Business Function sets (BC sets). As a result, the time needed for implementation and testing is kept to a minimum.

Caution: In real live you always have to bind Support Packages to the SAP enhancement package installation process. Support Packages are not switchable. So you need to perform a complete regression test even if you do not activate any Business Function sets! Just as if you would import Support Packages only.

Hint: Therefor SAP recommends to import about once a year the newest SAP enhancement package together with its corresponding Support Packages instead of applying Support Packages only.

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Example:

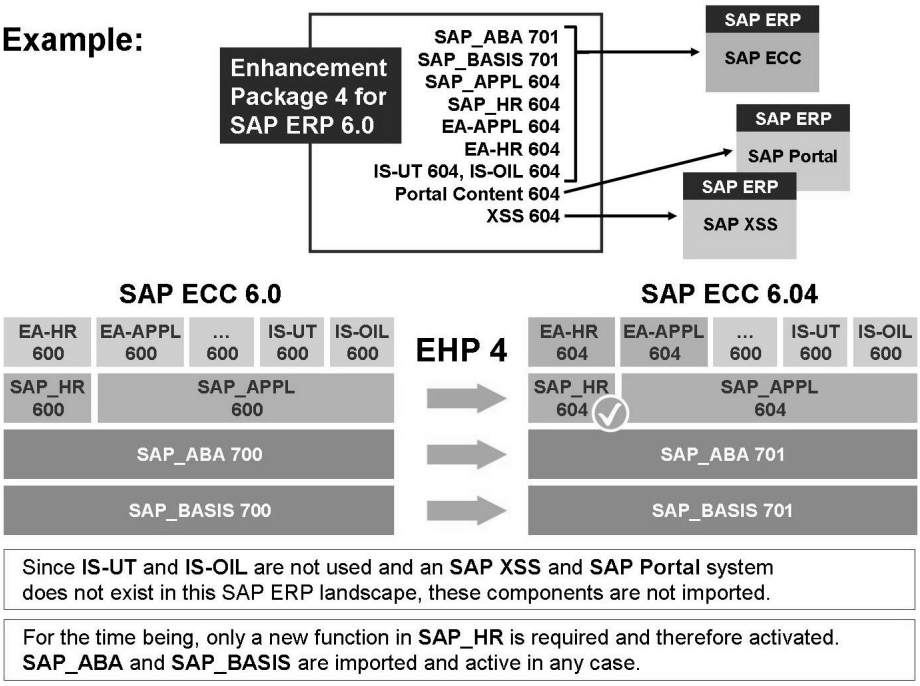

Figure 98: SAP Enhancement Packages and Software Components

SAP enhancement packages are therefore an upgrade of individual software components with the advantage that the new functions can be activated when required.

Note: Selective activation of business functions of an SAP enhancement package is only possible in certain AS ABAP-based SAP systems!

The advantages of SAP enhancement packages are:

- Simple adaptation to legal requirements
- Easier to maintain and plan
- Fewer complete system upgrades necessary
- The new function can be activated as and when required (only possible in some AS ABAP-based systems)

Note: An SAP enhancement package not only delivers software components of an SAP system, but also different SAP systems of an application, for example SAP ERP.

As such, an SAP ERP 6.0 enhancement package might contain some software components of an SAP ECC 6.0 system, and additional software components or content of an SAP NetWeaver Portal 7.0 system, and components of an SAP XSS 600 system. An SAP enhancement package can therefore include elements for various components in an application (in this example: SAP ERP 6.0).

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Since SAP enhancement packages are complete deliveries of the software components they contain, they are cumulative. This means that Enhancement Package 4 for SAP ERP 6.0, for example, contains Enhancement Package 3 for SAP ERP 6.0. SAP enhancement packages therefore do not need to be imported in a specific sequence (as is the case with Support Packages). You can implement the latest SAP enhancement package directly (as is the case with a system upgrade).

The selected elements of an SAP enhancement package are imported with the SAP Enhancement Package Installer (SAPehpi).

Note: Importing elements of an SAP enhancement package causes a technical downtime comparable to the downtime of a complete system upgrade. The project length and project costs are much lower, however, due to less testing effort.

Hint: Support Packages should always be selected corresponding to the release level of their software component. For example, if SAP_APPL is of release 604, and SAP_HR is of release 600, then you need to import release 604 SAP_APPL Support Packages and release 600 SAP_HR Support Packages.

Hint: With the current release the SAP Enhancement Package Installer (SAPehpi) can also be used to import Support Packages only! The effort and complexity is higher compared to importing Support Packages with transaction SPAM. But the downtime is much shorter!

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Lesson Summary

You should now be able to:

- Understand the idea of SAP enhancement packages

Related Information

SAP course ADM327 - *Importing Enhancement Packages*

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Unit Summary

You should now be able to:

- Describe the concept of SAP Notes and Support Packages
- Explain the concept of maintenance certificates
- Describe a maintenance transaction
- Explain the use of the Support Package Manager and import a SPAM/SAINT update.
- Import Support Packages with transaction SPAM
- Provide a general explanation of the import process for Support Packages
- Understand the idea of SAP enhancement packages

Related Information

SAP Courses:

ADM325 - *Software Logistics AS ABAP*

ADM326 - *SAP ECC Upgrade*

ADM327 - *Importing Enhancement Packages*

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Test Your Knowledge

1. For what are Support Packages used?

   Choose the correct answer(s).

   - □ A To enter user data.
   - □ B To import SAP objects to keep the system at the current maintenance level.
   - □ C To implement adjustments in the system due to changes in legal requirements.
   - □ D To transport programs developed by the customer.
   - □ E To import all the transport requests that SAP makes available on the SAP Service Marketplace.

2. What can be done with a maintenance transaction?

   Choose the correct answer(s).

   - □ A Import Support Packages.
   - □ B Calculate Support Package Stacks for your SAP systems.
   - □ C Approve objects in your download basket.
   - □ D Import SAP Notes.
   - □ E Import SAP enhancement packages

3. You always have to import all available SPAM/SAINT updates in order, since they build on one another.

   Determine whether this statement is true or false.

   - □ True
   - □ False

4. The queue for importing the SPAM update must be confirmed manually.

   Determine whether this statement is true or false.

   - □ True
   - □ False

5. A prerequisite for importing a SPAM/SAINT update is that the system must not have any terminated import procedures for Support Packages.

   Determine whether this statement is true or false.

   - □ True
   - □ False

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6. Support Packages can be imported in any order.

   Determine whether this statement is true or false.

   □ True

   □ False

7. SAP enhancement packages are imported in order to implement new functions. For these new functions to be effective in an AS ABAP-based system, they must be _____.

   Fill in the blanks to complete the sentence.

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Answers

1. For what are Support Packages used?

   Answer: B, C

   Support Packages are not used to enter user data. Customer developments are transported to other systems using transport requests. Transport requests from SAP are imported with the Transport Management System (TMS).

2. What can be done with a maintenance transaction?

   Answer: B, C

   A maintenance transaction can not import SAP Notes, Support Packages and SAP enhancement packages. SAP Notes are imported via the Note Assistant, Support Packages for AS ABAP based systems via transaction SPAM, Support Packages for AS Java based systems via tool *JSPM*, SAP enhancement packages via the tool *SAPehpi*.

3. You always have to import all available SPAM/SAINT updates in order, since they build on one another.

   Answer: False

   All repository objects that belong to the tools are always upgraded during the SPAM/SAINT update. It is therefore not necessary to follow any particular order.

4. The queue for importing the SPAM update must be confirmed manually.

   Answer: False

   It is neither necessary to define a special queue, nor to confirm this non-existent queue.

5. A prerequisite for importing a SPAM/SAINT update is that the system must not have any terminated import procedures for Support Packages.

   Answer: True

   This is true, the system must not have any terminated import procedures for Support Packages.

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6. Support Packages can be imported in any order.

   Answer: False

   Support Packages must be imported in ascending order, without any gaps.

7. SAP enhancement packages are imported in order to implement new functions. For these new functions to be effective in an AS ABAP-based system, they must be activated.

   Answer: activated

   Importing elements of an SAP enhancement package in AS ABAP-based systems does not change the existing function until activation.

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Unit 8

Printer Connection in AS ABAP

Unit Overview

In this unit, you learn about the output processing architecture in the SAP system. You learn how to define printers and spool servers in the system and how to manage spool and output requests. You also learn how to set up central printer administration.

Unit Objectives

After completing this unit, you will be able to:

- Describe the architecture and data flow of output processing in ABAP-based SAP systems
- Create printers and spool servers in the SAP system
- List important access methods
- Manage spool requests
- Describe the concept of logical spool servers
- Set up logical spool servers
- Manage spool and output requests
- Name the prerequisites for using the Printing Assistant for Landscapes (PAL)
- Explain the terms in the PAL environment
- Set up and use a PAL landscape

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Lesson: Configuring Printers in the AS ABAP

Lesson Overview

In this lesson, you will learn about the output processing architecture. You will learn how to set up printers in the SAP system.

Lesson Objectives

After completing this lesson, you will be able to:

- Describe the architecture and data flow of output processing in ABAP-based SAP systems
- Create printers and spool servers in the SAP system
- List important access methods
- Manage spool requests

Business Example

The administrator sets up printers in the SAP system and monitors the output of spool requests.

Printing from SAP Systems

There are various document classes in the SAP system (such as report lists, SAPscript or SAP Smart Forms documents). Although the way in which documents are created may be completely different, the output on paper is always performed using the same mechanism in two steps: First a **spool request** is created. The spool request contains device-independent print data and includes administrative information (such as author, date, number of copies) and the actual print data. Only when the spool request is to be output on a particular device is an **output request** created. The device-independent print data from the spool request is converted to the printer language that the selected output device understands.

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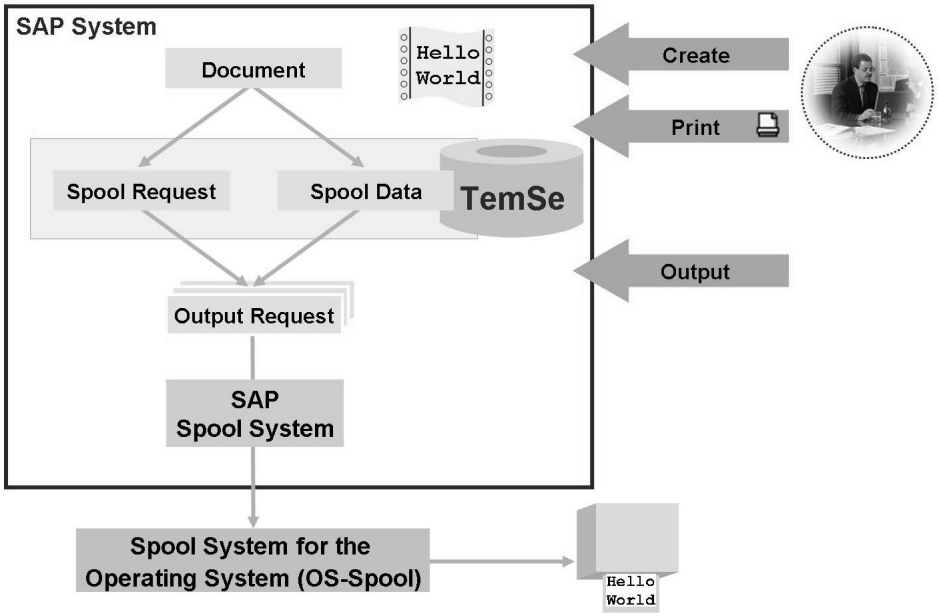

Figure 99: Data Flow During Printing

This procedure allows the user to display a spool request before output. There can also be several output requests for one spool request. This can avoid the user having to recreate (possibly with a great deal of effort) a spool request, if, for example, the toner in a printer is exhausted, or the wrong paper was in the tray. The user can of course create a spool request and an output request at the same time (immediate print) by choosing the *Print out immediately* option.

The actual document content of a spool request is stored in **TemSe** (for temporary sequential objects), for which you define the storage location with the profile parameter *rspo/store_location*.

- Value *db* (the default value): Spool requests are stored in database table *TST03* (Advantage: backup as part of the database).
- Value *G*: Storage at operating system level in the (global) directory */usr/sap/<SID>/sys/global* (advantage: performance).

SAP Note 20176 contains additional possible values for *rspo/store_location*.

Note: You can also specify the storage location individually for each output device in transaction SPAD (menu path *Edit → Data Storage*).

Creating an output request prompts the SAP spool system to send a (usually) printer-dependent, completely formatted data stream to a printer through an operating system spooler (OS spool). This means that the addressed printer model must be known to the SAP system. Definitions of this type are described as **device types**.

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If a printer cannot be controlled at operating system level, it cannot be used from the SAP system, either. There are several ways in which a spool work process can reach an operating system spooler. The most important of these connections, described as **access methods**, are introduced in the following sections.

Local Printing

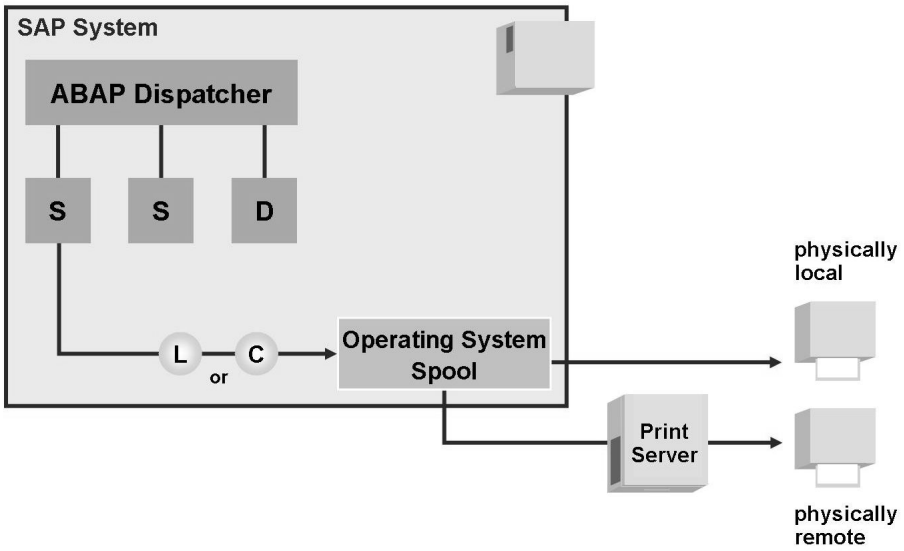

Figure 100: Local Printing

In **local printing**, the **spool work process and operating system spool run on the same host**. It is irrelevant whether the printer is directly connected to this host, or is reached over a network (and possibly another print server). The spool work process passes on its data locally, that is on the same host.

- On **UNIX** systems, the print data with **access method L** is output using operating system methods (for example, with the commands *lp* or *lpr*). The specific syntax is stored in profile parameters.
- Under **Microsoft Windows**, the data with **access method C** is passed directly to the operating system print API.

Local printing is the fastest and most reliable connection from the SAP system to the operating system. As soon as the spool work process has transferred its data, it can deal with new output requests, even if the operating system spooler is still occupied.

You can configure multiple spool work processes for an SAP instance. Regardless of the access method, this affects the **output sequence**. Different spool requests for the same printer may be printed in a different order to that in which they were created. If you require output in sequence, you can specify this for individual printers. However, a setting of this type reduces the ability to process printouts in parallel. For more information about this topic, see SAP Note 108799.

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Remote Printing

With remote printing, the spool work process and operating system spooler run on different hosts. In exactly the same way as with local printing, it is irrelevant from the SAP system's point of view whether the printer is directly connected to the remote host, or is reached using another network connection.

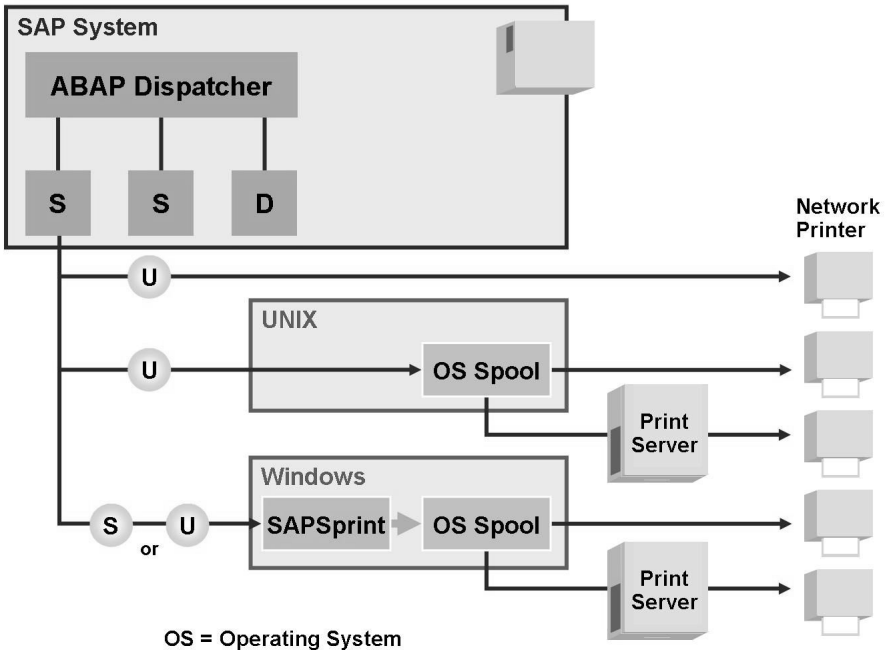

Figure 101: Remote Printing

Typical scenarios for remote printing are:

- Network printers provide their own operating system spoolers, and are directly connected to a computer network. Printers of this type are directly addressed from the SAP system using their names (**access method U**).
- Access method U is also used if the remote host is a UNIX system. SAP Note 39405 describes how access method U can be used for the various UNIX versions.
- SAP provides the *SAPSprint* program for all hosts running on Microsoft Windows operating systems. SAPSprint is a Windows service capable of multi-threading. Each output request is processed in a separate, isolated thread. The output requests that SAPSprint receives from the SAP system can thus be transferred to a particular printer individually. If the printer is not working, this does not disturb the printing of other output requests on the other printers.

  Access method S is usually used here (SAP protocol), but **access method U** (UNIX Berkeley protocol) is also supported.

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For performance reasons, you should only use remote printing in a LAN environment (not WAN), and ensure that the operating system spoolers are available.

Front-end Printing

SAP users can output documents on their **local printers** using **front-end printing**. These local printers do not need to be individually defined in the SAP system. Rather the system administrator only needs to create a representative output device for each operating system platform.

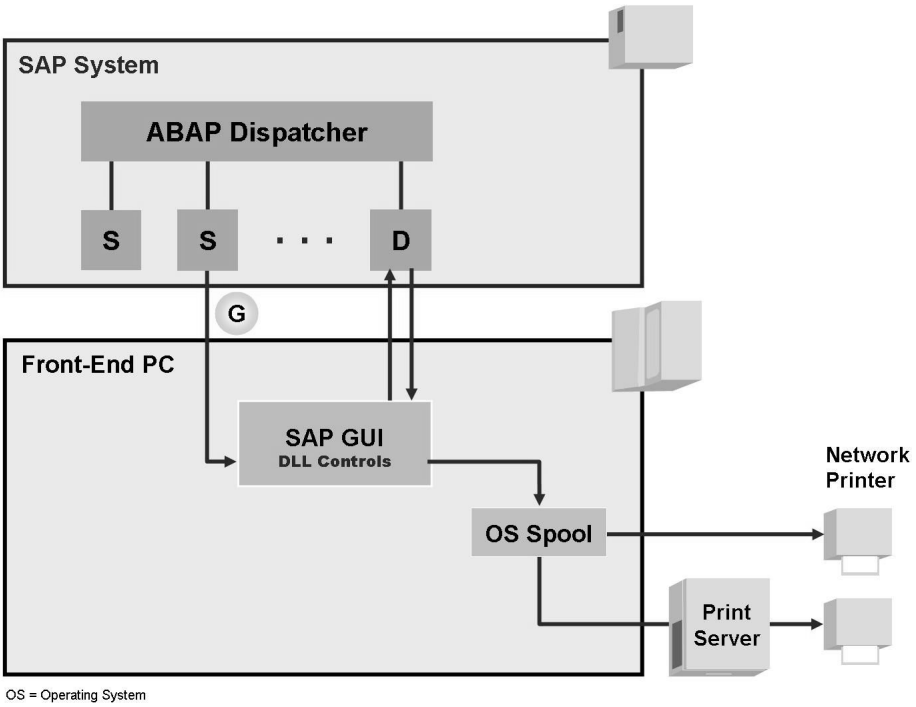

Figure 102: Front-end Printing with Control Technology (Access Method G)

As of SAP Basis Release 4.6C, a new procedure is available for front-end printing: front-end printing using control technology with **access method G**. Controls are DLLs that run in the process context of the SAP GUI. The new print control receives the print data and transfers it to the printing system for the operating system. In contrast to previous front-end printing with access method F, front-end printing with control technology and access method G offers the advantage that front-end printing using SAP GUI for Java can be set up irrespective of the platform. Printing using the Windows Terminal Server is also made easier with front-end printing using control technology.

SAP Note 821519 contains useful information about front-end printing using control technology including the exact system requirements.

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The processing of front-end printing is also performed, as with the other output methods, using a spool work process. There can, therefore, be conflicts between regular and front-end print requests. The profile parameter *rdisp/wp_no_spo_Fro_max* allows you to define the maximum number of spool work process for front-end printing for each SAP instance (the standard value is 1).

Front-end printing is suitable for output on local printers; however, it is not for production or mass printing.

Front-end printing requires a connection to the front-end PC. However, this method cannot be used for background processing.

For more information, see SAP Composite Note 128105. SAP Note 771683 describes front-end printing with the integrated ITS (for SAP systems as of AS ABAP 6.40) when using the SAP GUI for HTML. SAP Note 150533 contains information about front-end printing when using Windows Terminal Server.

If you are using the SAP GUI for HTML and want to print on your front end, this is also possible through access method G. The print data is sent to the browser and displayed using this print method. You can then print the document on your front end.

SAP recommends that you configure at least one spool work process on each application server that (end) users log onto. If no work process is running on the application server that a user wants to use for front-end printing, the system selects one of the available spool servers with the least load to process the print request. You can define a spool server **specifically for front-end printing** by setting the profile parameter *rspo/local_print/server* to the required server name.

Creating Output Devices

The configuration of the spool system is a system administration task. The central tool for this is transaction SPAD (menu path *Tools → CCMS → Print → Spool Administration*).

Creating Output Devices

		Local	Remote	Front end (Microsoft Windows)
Device Attributes	*Device Type*	Select the appropriate type in each case		*SWIN*
	Spool Server			–

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		Local	Remote	Front end (Microsoft Windows)
Host Spool Access	*Access Method*	*L* (Unix) *C* (Windows)	*S* or *U*	*G*
	Host Printer	OS Printer Name		`_ _DEFAULT`
	Host	fix	–	–
	Destination Host	–	specify	–

With front-end printing with control technology (access method G), the printer is given a generic name in the SAP system, and is assigned to the physical device `_ _DEFAULT` (for Microsoft Windows front ends). Since the models used as front-end printers can vary considerably, the device type *SWIN* is often assigned for Microsoft Windows front ends. When printing with SAP GUI for Java on other operating systems, you have to use a corresponding device type, such as *PostScript* or *PDF1*.

If you are using SAP GUI for HTML for front-end printing, the device type *PDF1* is selected. The print data is then transferred to the front-end browser as a PDF document, and can be printed locally.

Output Devices for Front-end Printing

	SAP GUI for Windows	SAP GUI for Java	SAP GUI for HTML
Device Type	*SWIN*	Select the appropriate type in each case	*PDF1*
Access Method	*G*	*G*	*G*
Host Printer	`_ _DEFAULT`	specify	Any

To create an output device, call transaction SPAD and choose *Output Devices* on the *Devices / Servers* tab page. If there are a large number of devices in your system already, you can restrict the output list in the field next to the button (for example “PR*”). Important information for an output device:

Output device

Name, maximum of 30 characters long (case-sensitive).

Short name

For internal system purposes (can be automatically generated).

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Device type

Printer model/family (more information about this below). The device type *SWIN* transfers the spool data from the SAP system to the Microsoft Windows printer driver. This is useful, for example, if various printers are used for front-end printing in a Microsoft Windows environment.

Spool server

SAP application server with spool work processes or logical server.

Location

For example, building and room number (so that users can find their output).

Message

Used to temporarily override the location (such as "Is currently in maintenance").

Lock printer in SAP system

Output requests for printers for which this indicator is selected are created but not transferred to the printer. The user receives the message *...no immediate printing*.

Host spool access method

How does a spool work process contact the operating system spooler?

Host printer

Name of the printer at operating system level. Note that this name is case-sensitive. Under Microsoft Windows, there must not be a space in the printer name, and network printers are addressed using their UNC names (in the format *\\R12345\P42*). The entry **_ _DEFAULT** controls the Windows default printer (for front-end printing using SAP GUI for Windows).

Host name

Only for local printing, is calculated automatically from the spool server.

Destination host

Only for remote printing. Name of the host on which the operating system spooler is running.

Device Types

The SAP system uses a device type to format the output device-specific print output.

Hint: When reference is made to an output device in the SAP environment, it does not necessarily mean a printer. An output device can also be, for example, an Output Management System or an archiving system.

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When the spool work process generates an output request, it uses the specifications of the device type. That is, the device type describes how print data should be formatted for a particular output device.

The following figure illustrates how a device type is created.

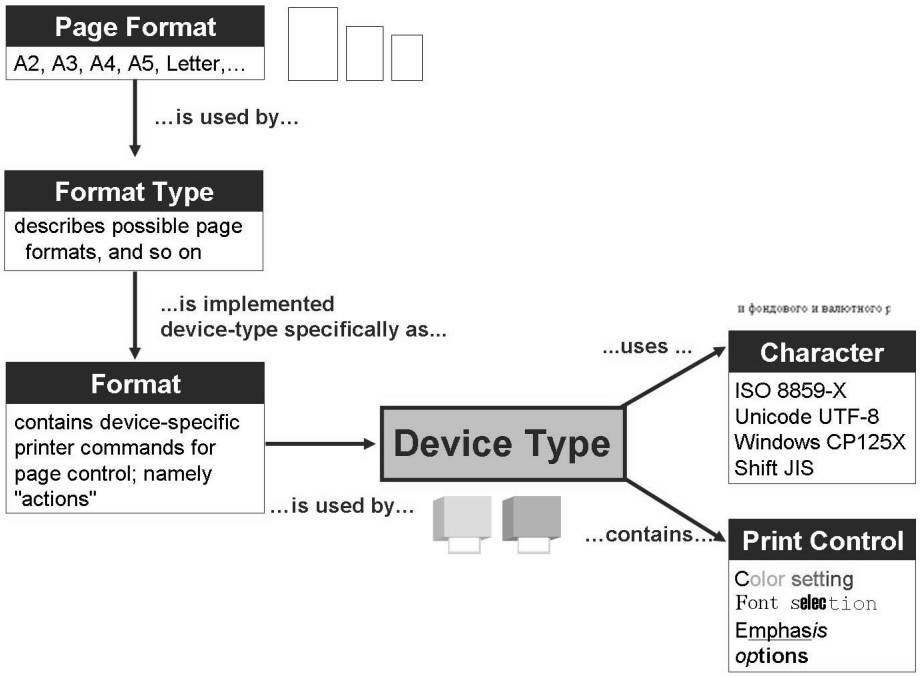

Figure 103: What Is a Device Type?

The following list explains the terms from the above graphic:

Page format

A page format describes the format of a printable page in the SAP system. A large number of standard page formats are predefined in the system. If a device is to support additional format that are not delivered, you can define new formats. Consider when doing so that your output device must, of course, be able to use the new format.

Format type

A format type describes how output should appear on paper. It primarily contains the formatting of the page format.

Format

A format is a device-specific implementation of a format type. That is, the SAP system can use the description in a format to control a device correctly to, for example, perform an output on a page with the Letter format. A format type is therefore not device-specific; the format, on the other hand, is a device-specific implementation of a format type.

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Character set

A character set contains the characters that can be output by a particular output device. That is, to be able to use a particular character set for a selected printer model in the SAP environment, the device type assigned to this printer model must contain this character set.

Print control

Print controls allow the control of particular display options of output devices, such as boldface, changing the font size, changing the font, and so on. Print controls use device-specific control character sequences. That is, to create a new device type, the display options offered in the SAP system must be stored with the control character sequences that the selected printer model supports. The control character sequences to be used can be found in the device vendor's documentation.

You can see that using devices for which no suitable device type exists in the SAP system may mean a significant effort.

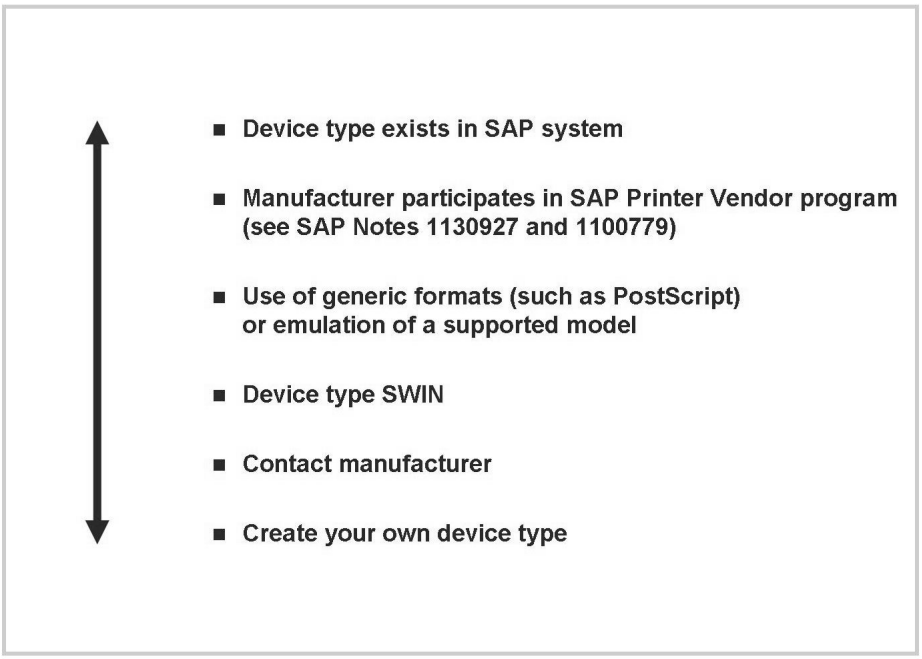

Figure 104: Selecting an Appropriate Device Type

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How do you assign the correct **device type** to your printer?

- In the ideal situation, there is already a device type in your SAP system. Note that a separate device type is not required for every printer model of a vendor, but just for each model family.
- Several printer manufacturers participate in the SAP Printer Vendor Program. It is easy to import the corresponding device types for the supported printer models using the Wizard (available in transaction SPAD for output devices).
- For many printers, you can use a generic format (such as PostScript) for which device types exist. It is also possible that your printer can be addressed in the same way as another model that is supported by SAP (compatibility mode).
- There are drivers for the Microsoft Windows operating systems for practically all printers on the market. You can use these printers as output devices with device type *SWIN*. The conversion to a print data stream is performed by the Microsoft Windows driver in this case.
- The SAP system contains all of the tools required to create your own device types or to adjust copies of existing device types. Detailed knowledge of the SAP spool system and the printer control are required to do this. You should weigh up the expense against the purchase of supported printers.

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Exercise 19: Configure Printers

Exercise Objectives

After completing this exercise, you will be able to:

- Create printers and spool servers in the SAP system

Business Example

The administrator sets up printers in the SAP system.

Task 1: Check the Print Environment

First check the print environment of your SAP system.

1. How many spool work processes are set up for the application server to which you are currently logged on?
2. How many spool work processes are configured in your entire SAP system?
3. How many spool servers are available in your SAP system?
4. As the default setting for your SAP user, change the settings so that an output request is not created immediately for a spool request.
5. Which printers are defined at operating system level of your server? Where do they print?
6. (If possible) Which printers are defined at operating system level of your front-end PC in the training room? Where do they print?

Task 2: Local Printing

Create an output device with a local host spool access method.

1. In your SAP system, create a local printer **Local##** with the short name **LO##** (where ## denotes your group number) that controls one of the previously defined printers.
2. Output any list (Suggestion: All profile parameters that begin with “rspo”) without immediate printing on the printer Local##.
3. Check your output.
4. **Optional:** Display the generated print data. Instead of checking at operating system level, you can view the file from the SAP system using transaction AL11 (SAP directory *DIR_C_TEMP*).

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Task 3: Remote Printing

Install SAPSprint, and create an output device with a remote host spool access method.

1. Install and start SAPSprint on your server.

   Caution: This exercise section should only be performed once for each host: Decide whether the DEV group or OAS group should perform this exercise.

2. In the SAP system, create a remote printer **Remote##** with the short name **RE##** that controls a printer on a remote server.

   Note: These exercise sections should be performed by both groups again.

3. As the default setting for your SAP user, change the settings so that an output request is created immediately for a spool request.
4. Output any list with immediate printing on the printer *Remote##*.
5. Check your output.

Task 4: Front-End Printing

Create an output device for front-end printing with the SAP GUI for Windows.

1. In the SAP system, create a front-end printer **front end##** with the short name **FR##** that controls the default printer of a Microsoft Windows front-end PC.
2. Send any list for immediate printing on the *front end##* printer, and check the output.

Task 5: Optional: Web Printing

Create an output device for front-end printing with the SAP GUI for HTML.

1. Create a copy of the output device *front end##* you created and name this device **`Web Print##`** with the short name **`WP##`**. Change the *device type* to *PDF1*.
2. Log on to the SAP GUI for HTML with your course user **`<CourseID>-##`**.

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Solution 19: Configure Printers

Task 1: Check the Print Environment

First check the print environment of your SAP system.

1. How many spool work processes are set up for the application server to which you are currently logged on?

   a) Call transaction SM50, and count the number of work processes of type *SPO*.

2. How many spool work processes are configured in your entire SAP system?

   a) This information is provided by transaction SM66. If you do not see any work processes at first, check the status *wait* under *Select process*.

   Hint: The number of spool work processes cannot be changed by operation mode switches.

3. How many spool servers are available in your SAP system?

   a) A (real) spool server is an SAP application server with at least one spool work process. You can display this information with transaction SM51 more easily than with transaction SM66: All application servers that provide the service *Spool* are spool servers.

4. As the default setting for your SAP user, change the settings so that an output request is not created immediately for a spool request.

   a) To do this, choose *System* → *User Profile* → *Own Data* (transaction SU3) and the *Defaults* tab page there. Ensure that *Output Immediately* is **not** checked and save your changes, if necessary.

   Hint: This default setting can be overridden with the direct setting when printing at any time.

5. Which printers are defined at operating system level of your server? Where do they print?

   a) Choose *Start* → *Settings* → *Printers and Faxes* at the operating system level of your server. There should be printers (such as *Printer1* for the group working on the DEV system, and *Printer2* for the group working on the QAS system) that each print to a file.

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6. (If possible) Which printers are defined at operating system level of your front-end PC in the training room? Where do they print?

   a) If possible, choose *Start → Settings → Printers and Faxes* on your front-end PC.

Task 2: Local Printing

Create an output device with a local host spool access method.

1. In your SAP system, create a local printer **Local##** with the short name **LO##** (where ## denotes your group number) that controls one of the previously defined printers.

   a) In the SAP system, choose *Tools → CCMS → Print → Spool Administration* (transaction SPAD).

   b) On the *Devices/Servers* tab page, choose the *Output Devices* pushbutton (leave the field to the left empty).

   c) If you cannot see a *Create* pushbutton, choose *Change* to switch to change mode. Now create the printer **`Local##`** with the following specifications:

      - *Short name*: **`LO##`**
      - *Device Attributes* tab page:
        - *Device Type*: Should match the previously determined printer (*HPLJ4*)
        - *Spool Server*: Any spool server from your system (use F4 help)
        - *Location*: Any text
      - *Host Spool Access Method* tab page:
        - *Access Method*: *C* for Windows
        - *Host Printer*: Name of the previously determined printer (**`Printer1`** or **`Printer2`**)

      Accept the default values for the other values and save.

2. Output any list (Suggestion: All profile parameters that begin with “rspo”) without immediate printing on the printer Local##.

   a) To create the proposed list, call transaction RSPFPAR. Enter the parameter **`rspo*`** and choose *Execute* again.

      Select the pushbutton to print. Choose **Local##** as the output device (select it using the F4 help). Choose *Continue* without making any additional entries.

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3. Check your output.
   a) Call transaction SP01. Choose *Execute*, and view your spool requests.
4. **Optional:** Display the generated print data. Instead of checking at operating system level, you can view the file from the SAP system using transaction AL11 (SAP directory *DIR_C_TEMP*).
   a) Both solutions are described here:
      - At operating system level, you can use *Notepad* for example (*Start* → *Run* and then enter **`notepad`**) to view the file *C:\temp\Print1.prn*/*C:\temp\Print2.prn*. Note that Notepad cannot display all printer-specific control characters.
      - In the SAP system, call transaction AL11 and double-click the entry *DIR_C_TEMP* at the end of the list. Double click the file name (*Print1.prn* or *Print2.prn*) displays the file contents.

Task 3: Remote Printing

Install SAPSprint, and create an output device with a remote host spool access method.

1. Install and start SAPSprint on your server.

Caution: This exercise section should only be performed once for each host: Decide whether the DEV group or OAS group should perform this exercise.

   a) On your server, navigate to the directory *M:\ADM100_71\SAPSprint*.
   b) Start the most recent installation program listed (naming convention *xSPrint_<PatchLevel-xxxx>.exe*).
   c) Run through the installation (and be sure to choose SAPSprint for installation). Retain the default values for each prompt.
   d) Optional: You can use the Windows Service Manager to verify that a *SAPSprint* has been created and started as a Windows service.

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2. In the SAP system, create a remote printer **Remote##** with the short name **RE##** that controls a printer on a remote server.

   Note: These exercise sections should be performed by both groups again.

   a) In the SAP system, choose *Tools* → *CCMS* → *Print* → *Spool Administration* (transaction SPAD).

   b) On the *Devices/Servers* tab page, choose the *Output Devices* pushbutton (leave the field to the left empty).

   c) If you cannot see a *Create* pushbutton, choose *Change* to switch to change mode. Now create the printer **`Remote##`** with the following specifications:

      - *Short name*: **`RE##`**
      - *Device Attributes* tab page:
        - *Device Type*: Should match the previously determined printer (*HPLJ4*)
        - *Spool Server*: Any spool server from your system (use F4 help)
        - *Location*: Any text
      - *Host Spool Access Method* tab page:
        - *Access Method*: *S* for the SAP printing protocol
        - *Host Printer*: Name of the previously determined printer (**`Printer1`** or **`Printer2`**)
        - *Destination Host:* **`twdf****.wdf.sap.corp`** (where **`twdf****`** should be replaced with the host on which SAPSprint was installed)

      Accept the default values for the other values and save.

3. As the default setting for your SAP user, change the settings so that an output request is created immediately for a spool request.

   a) To do this, choose *System* → *User Profile* → *Own Data* (transaction SU3), and choose the tab page *Defaults*. Ensure that *output immediately* is checked and save your changes.

   Hint: This default setting can be overridden with the direct setting when printing at any time.

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4. Output any list with immediate printing on the printer *Remote##*.
   a) Follow the same procedure as for local printing. For a list, you could output the list of work processes in transaction SM50, for example.
5. Check your output.
   a) With the settings in Step 3, the print time *Output Immediately* is now the default value. The user can make this (and other) settings in the print dialog box by choosing *Properties*.

   Hint: By choosing *Show selected print parameters on initial screen* in the *Properties* window, you can maintain some parameters directly on the print dialog box in future.

   b) Call transaction SP01. Choose *Execute*, and view the spool requests and the corresponding output requests.

Task 4: Front-End Printing

Create an output device for front-end printing with the SAP GUI for Windows.

1. In the SAP system, create a front-end printer **front end##** with the short name **FR##** that controls the default printer of a Microsoft Windows front-end PC.
   a) In the SAP system, choose *Tools* → *CCMS* → *Print* → *Spool Administration* (transaction SPAD).
   b) On the *Devices/Servers* tab page, choose the *Output Devices* pushbutton (leave the field to the left empty).
   c) If you cannot find the *Create* pushbutton, choose Change to switch to change mode. Now create the printer **`front end##`** with the following specifications:
      - *Short name*: **`FR##`**
      - *Device Attributes* tab page:
        - *Device Type*: *SWIN*
        - *Location*: **`here`**
      - *Host Spool Access Method* tab page:
        - *Access Method*: **`G`**
        - *Host Printer*: **`_ _DEFAULT`** (without spaces between the two underscores)

      Accept the default values for the other values and save.

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2. Send any list for immediate printing on the *front end##* printer, and check the output.

   a) The procedure is the same as for the previous task.

Task 5: Optional: Web Printing

Create an output device for front-end printing with the SAP GUI for HTML.

1. Create a copy of the output device *front end##* you created and name this device **`Web Print##`** with the short name **`WP##`**. Change the *device type* to *PDF1*.

   a) In the SAP system, choose *Tools* → *CCMS* → *Print* → *Spool Administration* (transaction SPAD).

   b) On the *Devices/Servers* tab page, choose the *Output Devices* pushbutton (leave the field to the left empty).

   c) If you cannot find the *Create* pushbutton, choose Change to switch to change mode.

   d) Select the line for the output device *front end##*, and choose the pushbutton *Create with Template*.

   e) Enter **`Web Print##`** as the name of the new output device. Change the *short name* to **`WP##`**. In the *Device Attributes* tab page, change the field *Device Type* to *PDF1*. *Save* the output device without further changes.

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2. Log on to the SAP GUI for HTML with your course user **`<CourseID>-##`**.

   a) **Either** start the transaction SICF (in SAP GUI for Windows). Enter the value **`webgui`** in the search field under *Service Name*, and choose *Execute (F8)*. Select the service */sap/bc/gui/sap/its/webgui* with the right mouse button, and choose *Test service*.

      Or enter the following URL in your web browser: **`http://twdf####.wdf.sap.corp:<ICM-HTTP-Port>/sap/bc/gui/sap/its/webgui`**. You can determine the ICM HTTP port (of the ICM of the instance to which you are currently connected) in transaction SMICM – the standard value is 80$$, where $$ denotes the instance number.

   b) Log on to the SAP GUI for HTML with your course user **`<CourseID>-##`**.

   c) Send any list to the output device *Web Print##* **for immediate printing**.

      Hint: You can view the print dialog box in *Menu → System → List → Print*.

      Wait a few seconds until the generated PDF document is displayed in a new browser window.

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Lesson Summary

You should now be able to:

- Describe the architecture and data flow of output processing in ABAP-based SAP systems
- Create printers and spool servers in the SAP system
- List important access methods
- Manage spool requests

Related Information

- Online documentation for SAP NetWeaver 7.0 EhP 1: *SAP NetWeaver Library → SAP NetWeaver by Key Capability → Solution Life Cycle Management by Key Capability → System Management → SAP Printing Guide (BC-CCM-PRN)*
- SAP Notes:

  118057 - *Flexible Configuration of the Spool Service*

  19706 -*Tuning the Spooler*

  128105 -*Frontend printing (collective note)*

  150533 -*Printing in Windows Terminal Server (WTS)*

  1130927 - *SAP Printer Vendor Program*

  1100779 - *Participants in the SAP Printer Vendor Program*

  1097990 - *List of Printer Vendor Wizard Notes*
- SDN website https://www.sdn.sap.com/irj/sdn/printing

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Lesson: Concept of Logical Spool Servers

Lesson Overview

In this lesson, you will learn about the concept of logical spool servers, and how to set them up.

Lesson Objectives

After completing this lesson, you will be able to:

- Describe the concept of logical spool servers
- Set up logical spool servers

Business Example

Concept of Logical Spool Servers

The printing concept introduced up to now envisages a fixed assignment of an output device to a spool server. A spool server, on the other hand, can be assigned multiple output devices, which raises the risk of this server becoming overloaded. It would therefore be desirable to have a mechanisms for load balancing across multiple servers. It is also advisable to set up groups of spool servers to ensure reliability. Both aspects are considered in this introduction to logical spool servers.

Include logical spool servers from the outset when planning your printer landscape. When scaling your SAP system later (additional instances with spool work processes), logical spool servers make it easier to adapt the printer landscape.

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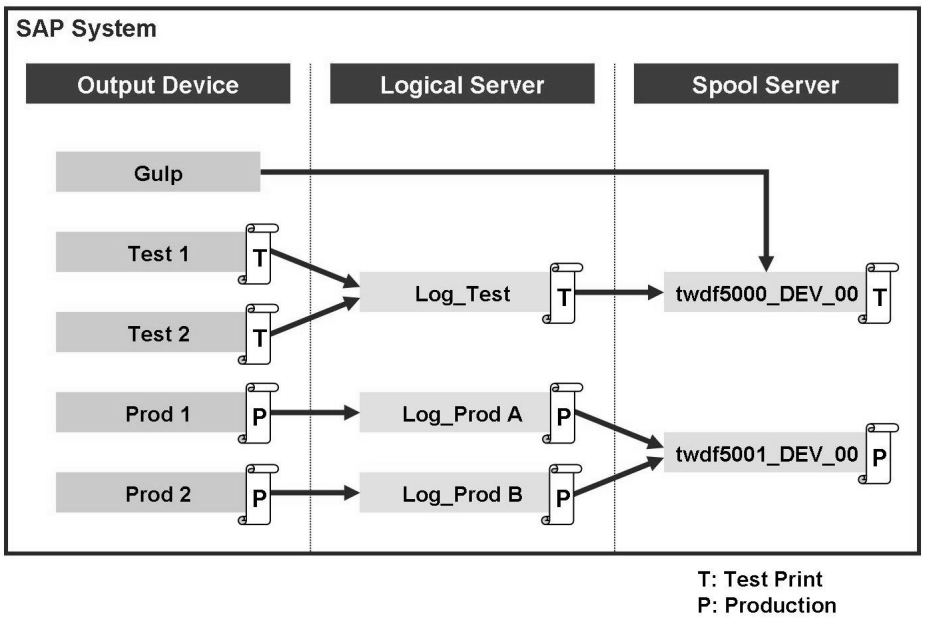

Figure 105: Spool Server

A **spool server** is an SAP application server with at least one spool work process. Every output request is processed on a "real" spool server of this type.

An output device created in the SAP system can be assigned a spool server directly. However, there are many advantages associated with an additional logical layer between the output device and the spool server. You can use **logical (spool) servers** for this purpose. These stand for a hierarchy of other logical servers and/or "real" spool servers.

You can classify output devices and spool servers, for example, for test printing or production printing.

The SAP system checks the classifications when saving, and displays a warning message if there are deviations. For example, the system warns you if you attempt to assign a high volume printer to a production print server.

Creating a Logical Spool Server

You can maintain the spool server in transaction SPAD by choosing *Spool Servers* on the *Devices / Servers* tab page. Important information for a spool server:

Server Name

Name of the spool server, maximum of 20 characters (case-sensitive). The field below is intended for a short description.

Server Class

Classify the spool server here (for example, for mass printing).

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Logical Server

Select this field when you create a logical server.

Mapping

Name of a real or logical server to which this logical server refers.

Additional information is presented below.

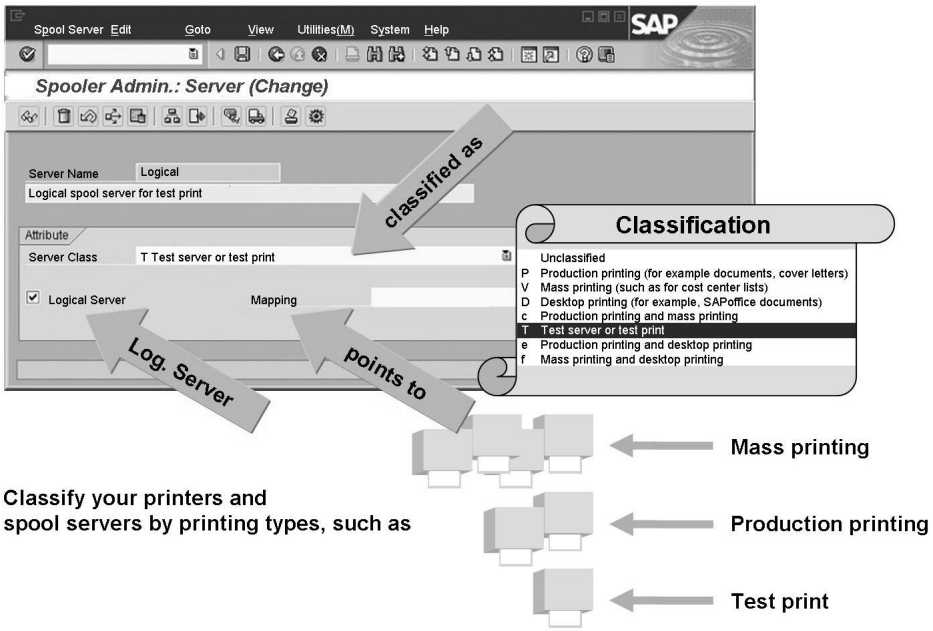

Figure 106: Creating a Logical Server

If you expect a significant workload due to front-end printing, you should configure at least one additional spool work process for each front-end printing spool server for other tasks.

As already mentioned, you can classify output devices and spool servers. To classify an output device, select it (in transaction SPAD under *Output Devices*) and choose the menu path *Edit → Classification*.

Advantages of Logical Spool Servers

Downtime Security

When creating a spool server (either a logical server or a spool server), you can specify an **alternative server**. If the normal server is not available, the SAP system attempts to use this alternative.

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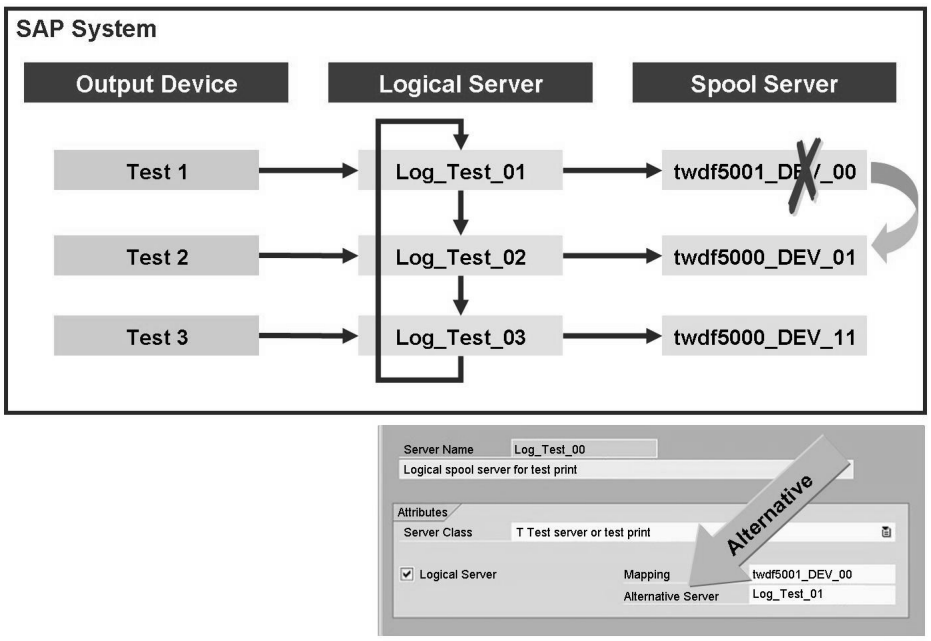

Figure 107: Breakdown Alternatives

You must ensure that all printers that may be used by a different spool server can be controlled in the same way by every spool server. For example, if the output device *Test 1* in the above example points at operating system level to a printer *P42* that is controlled locally, an operating system printer *P42* must be available on servers *twdf5000* and *twdf5001*.

You cannot define more than two spool servers for a logical server. Since a logical server can itself reference logical servers, **extensive spool server hierarchies** are also possible.

Load Balancing

You can allow **load balancing** for every spool server with an alternative server (to do this, select the field *Allow Load Balancing*). The load of a spool server is calculated from the number of spool work processes, output requests, and printed pages.

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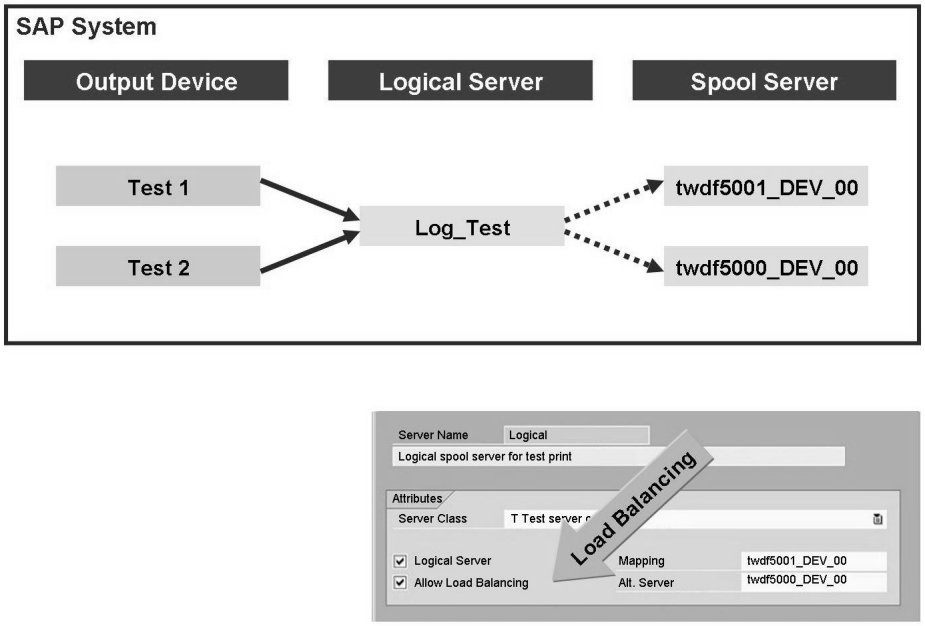

Figure 108: Load Balancing

For an output request for a spool server with load balancing (the setting can be made for logical servers and spool servers), the system determines the server with the smallest load. The algorithm is recursive: The same selection criteria are used on the mapping and the alternative server (both could be logical servers themselves).

Sequential request processing (property of an output device) has priority over the load balancing shown here (property of a spool server). This means that output requests for an output device with sequential request processing would not be distributed in accordance with the current load, although assigned to a spool server with load balancing.

Transporting the Print Landscape

The concept of logical servers supports you when defining a **consistent, transportable print landscape**. Unlike real spool servers, logical servers can have the same name in various SAP systems. In this way, you can define a consistent SAP print architecture in the development system and then transport it to other systems. After the transport, all you need to do is adjust the mapping of the logical servers to the spool servers of the new system.

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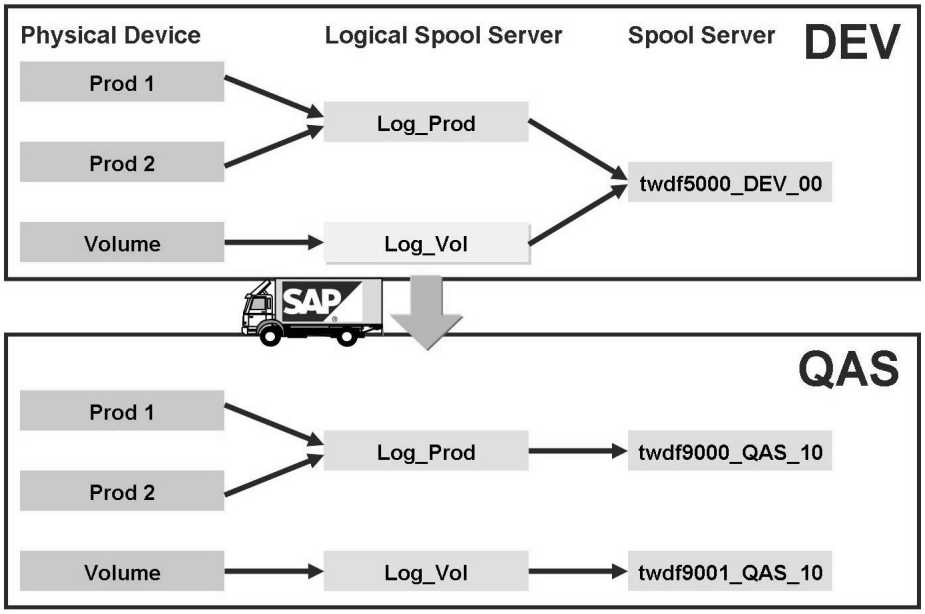

Figure 109: Transporting the Print Landscape

There are functions for the manual transport of output devices and spool servers in transaction SPAD.

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Exercise 20: Logical Spool Servers

Exercise Objectives

After completing this exercise, you will be able to:

- Set up logical spool servers and assign output devices.

Business Example

You want to set up logical spool servers in your ABAP-based SAP system to ensure load balancing and reliability.

Task: Create a Logical Spool Server

1. Create a logical server **Logical##**. If possible, enter two different spool servers as mapping and alternative servers and activate load balancing. Classify *Logical##* as a test server.
2. Change the output device *Local##* so that the logical server *Logical##* is used as the spool server in future. Classify *Local##* as a test printer.
3. Send any list to the printer *Local##* for immediate printing (suggestion: all profile parameters that begin with *rspo*).
4. Check your output. Which real spool server was used?

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Solution 20: Logical Spool Servers

Task: Create a Logical Spool Server

1. Create a logical server **Logical##**. If possible, enter two different spool servers as mapping and alternative servers and activate load balancing. Classify *Logical##* as a test server.

   a) In the SAP system, choose *Tools* → *CCMS* → *Print* → *Spool Administration* (transaction SPAD).

   b) On the *Devices/servers* tab page, choose *Spool Servers* (leave the field to the left empty).

   c) If you cannot see a *Create* pushbutton, choose *Change* to switch to change mode. Now create a logical server **`Logical##`**.

   Choose *Logical server* and enter at least one spool server under *Mapping* (use the F4 help). Enter the other details as described in the exercise and choose save.

2. Change the output device *Local##* so that the logical server *Logical##* is used as the spool server in future. Classify *Local##* as a test printer.

   a) From transaction SPAD, choose the *Output Devices* pushbutton on the *Devices / Servers* tab page. By double-clicking *Local##*, you can edit your printer (switch to change mode if necessary). On the Device Attributes tab page, enter the logical spool server **`Logical##`** as the spool server. To classify the output device, choose *Edit* → *Classification* → *Test Print*. Save your entries.

3. Send any list to the printer *Local##* for immediate printing (suggestion: all profile parameters that begin with *rspo*).

   a) Settings from previous exercises may mean that *Output Immediately* is proposed as the time of printing. The user can make this (and other) settings in the print dialog box by choosing *Properties*.

   Hint: By choosing *Show selected print parameters on initial screen* on the *Properties* window, you can maintain some parameters directly on the print dialog box in future.

   To create the proposed list, call transaction RSPFPAR. Enter the parameter **`rspo*`** and choose *Execute* again.

   To print, choose the appropriate pushbutton. Alternatively, you can choose *System* → *List* → *Print*. Choose *Local##* as the output device (select it using the F4 help). Choose *Continue* without making any additional entries.

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4. Check your output. Which real spool server was used?

   a) This time, an output request is created immediately. Transaction SP01 displays its status. For the spool server, select your output request (not the spool request) and choose *Choose Detail*. The server name is at the bottom of the list.

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Lesson Summary

You should now be able to:

- Describe the concept of logical spool servers
- Set up logical spool servers

Related Information

- Online documentation for SAP NetWeaver 7.0 EhP 1: *SAP NetWeaver Library → SAP NetWeaver by Key Capability → Solution Life Cycle Management by Key Capability → System Management → SAP Printing Guide (BC-CCM-PRN) → Spool Server*
- SAP Note 118057 - *Flexible Configuration of the Spool Service*

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Lesson: Managing Spool Requests

Lesson Overview

In this lesson, you will learn about managing spool and output requests.

Lesson Objectives

After completing this lesson, you will be able to:

- Manage spool and output requests

Business Example

As a spool administrator, you maintain the spool and output requests in your SAP system.

Managing Spool and Output Requests

To **maintain spool and output requests**, call the Output Controller (transaction SP01 or choose *System → Services → Output Controller*). If you only want to check the status of your own spool requests, choose *System → Own Spool Requests* (transaction SP02).

Transaction SP01 provides many **selection criteria** for selecting particular spool or output requests. The *Further selection criteria...* function is simple to use and allows each user to define their own selection criteria.

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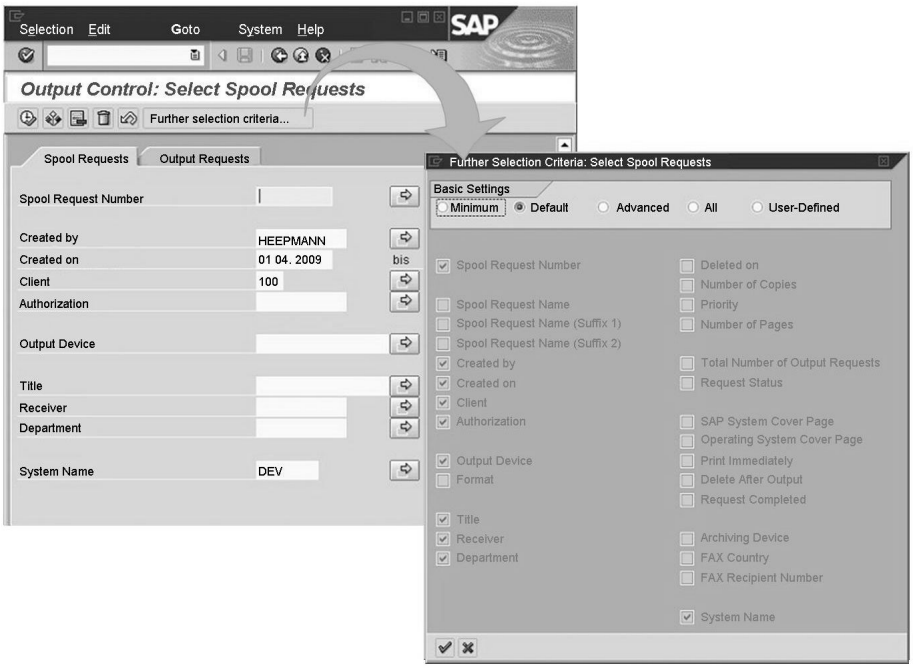

Figure 110: Selecting Spool or Output Requests

It is even possible to monitor spool and output requests on other SAP systems. To do this, enter a valid RFC connection in the *System Name* field. If this field remains empty, all systems are addressed that were selected for remote monitoring using transaction RZ20 (table *ALCONSEG*).

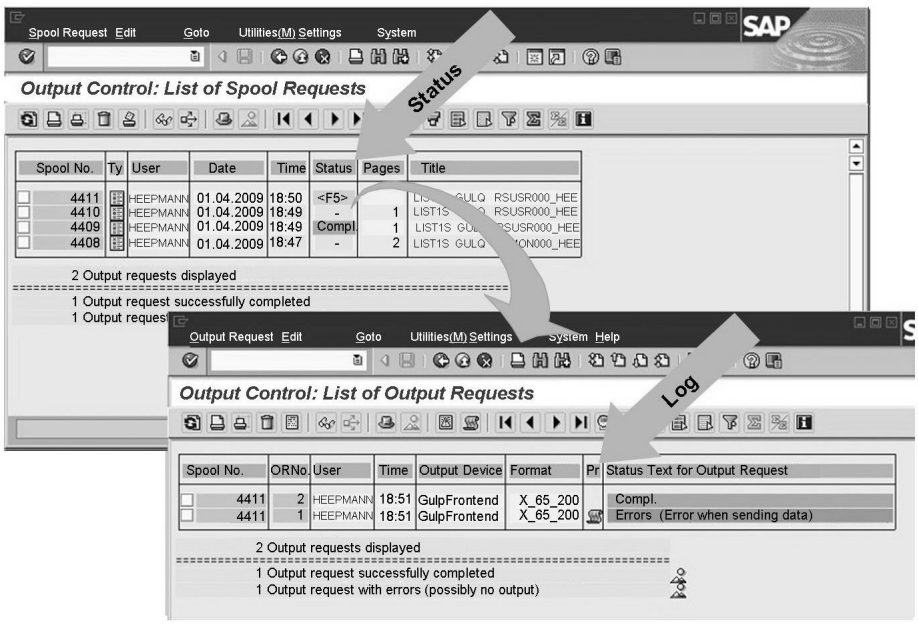

Figure 111: Monitoring Spool and Output Requests

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The displayed list shows all spool or output requests that match your selection criteria. The list is created using the SAP List Viewer (ALV). This allows you to change the appearance of the list as you desire. This means that you can show and hide columns, sort columns, or create variants.

The following indicators specify the **status** of a spool request:

-

Not yet sent to the operating system (no output request exists).

+

Spool request is still being created (stored in spool system).

Waiting

The output request has not yet been processed by the spool system.

Proc.

A spool work process is formatting the output request for printing.

Print.

The output request is printed by the operating system spooler. If the query at the host spooler is not activated, this status is shown for around a minute.

Compl.

The output request has been printed. If the query at the host spooler is not activated, the status changes to *Compl.* as soon as the output request is transferred to the host spooler.

<F5>

There are (at least two) output requests with various statuses.

Problem

Indicates an error not of a serious nature (such as incomplete character set). This request was still printed.

Error

Indicates a serious error (such as a network error).

Time

A particular time was specified for the output of the request by the request creator.

If you double click the status of a spool request, the system displays the associated output requests. To view the output requests of multiple spool requests, select these and choose *Output Requests* (or choose *F5*).

For every unsuccessful output request, a log is written that you can use for error analysis.

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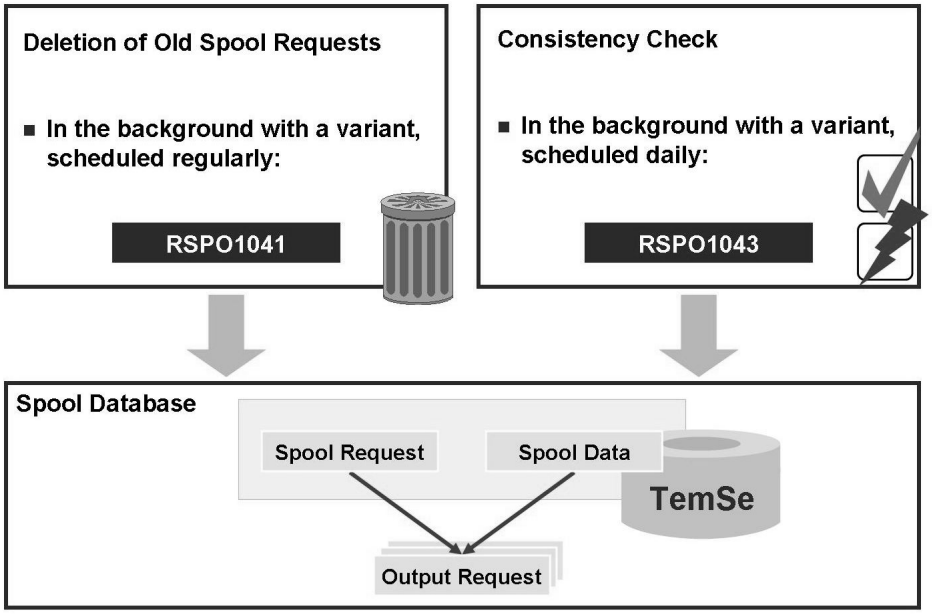

Figure 112: Maintaining the Spool Database

The system administrator is responsible for regularly deleting old spool requests and monitoring the consistency of the spool database.

To **delete old spool requests**, schedule the ABAP program *RSPO1041* with an appropriate variant as a **periodic** job. For more information about the *RSPO1041* program, see SAP Note 130978.

To **check the consistency of the spool database**, schedule the ABAP program *RSPO1043* with an appropriate variant as a **daily** job. For more information about the *RSPO1043* program, see SAP Note 98065.

You can also start spool administration tools (in the dialog) in transaction SPAD in the *Admin.* tab page. However, the functions provided in transaction SPAD for deleting spool requests and running consistency checks are limited compared to the other programs available.

For information about the reorganization of TemSe and spool, see also SAP Note 48400.

Appendix: Other Print Scenarios

Here is an overview of other print scenarios:

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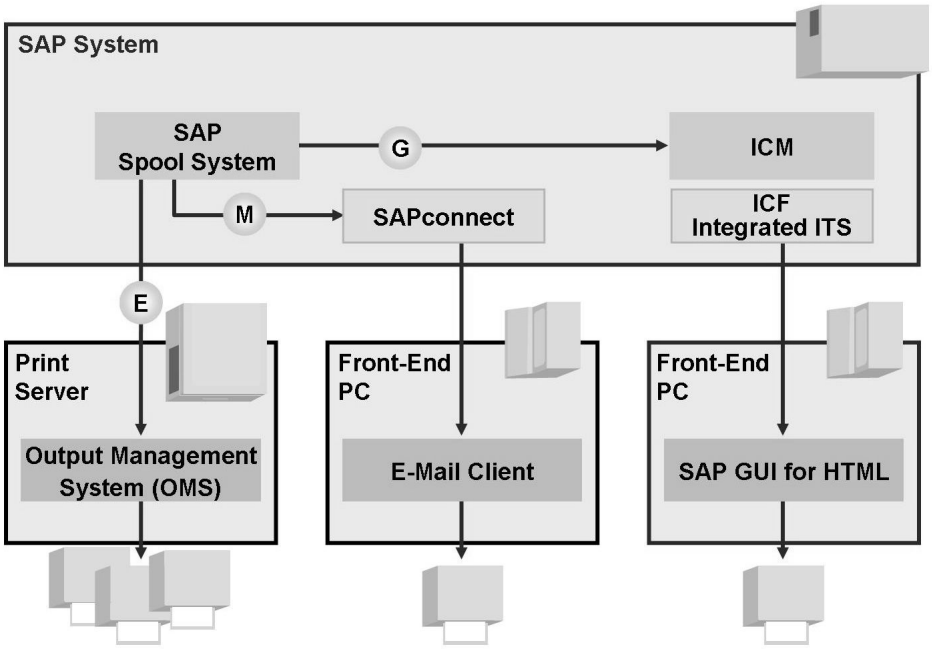

Figure 113: Appendix: Other Print Scenarios

External Output Management Systems (OMS) can be addressed from the SAP system using a defined interface (BC-XOM) (access method E). This method is of particular interest if you have a very large volume, or the output of multiple systems (SAP systems and others) is to be centrally controlled and monitored.

As of SAP Basis Release 4.0B (with a specific kernel and Support Package status), you can **send print output by e-mail** to a user (access method M). The e-mail is sent using SAPconnect. For more information, see SAP Notes 311037 and 513352.

A user can also be connected to an SAP system from a web browser using SAP GUI for HTML. This type of connection can be set up in the SAP system with the integrated ITS as of AS ABAP 6.40. What options does this user have for print output? One option is the previously described output by e-mail. **Web printing** on the other hand does not require an e-mail client. You can use web printing as of SAP Basis Release 4.6B. To do this, the system administrator must set up a printer with device type *PDF1* and the access method G. If the user selects this printer, a PDF document appears in a new browser window. The user can then print this PDF document locally. SAP Note 351230 describes the exact prerequisites and contains additional information about Web printing.

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Exercise 21: Managing Spool Requests

Exercise Objectives

After completing this exercise, you will be able to:

- Manage spool and output requests

Business Example

You want to delete unwanted spool requests from TemSe.

Task: Deleting spool requests

Evaluate and delete spool requests.

1. Display all the spool requests **you have created today**.
2. Run the report *RSPO1041* (in the dialog) to delete all of **your** spool requests with **successful** output requests.

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Solution 21: Managing Spool Requests

Task: Deleting spool requests

Evaluate and delete spool requests.

1. Display all the spool requests **you have created today**.
   a) Choose *System* → *Services* → *Output Control* (transaction SP01).
   b) Restrict the output to **your spool requests from today** (this is the default selection (restricted to the current client)).
   c) Choose *Execute (F8)*.

   Hint: To view the output requests for a spool request:
   - Double click the *Status* field, or
   - Select a spool request, and press *F5*.

2. Run the report *RSPO1041* (in the dialog) to delete all of **your** spool requests with **successful** output requests.
   a) Call transaction SA38.
   b) In the *Program* field, enter **`RSPO1041`**, and choose *Execute (F8)*.
   c) Uncheck the fields *Without output request*, *In processing*, and *Incorrect*. In the *Completed* section, only check the *Completed* field, and in the *older than ... days* field, enter **`0`**. Further down, in the *Creator* field, enter your course user **`<CourseID>-##`**, and choose *Execute (F8)*.
   d) You can see which spool requests were deleted in the log.

   Note: In practice, you will schedule the *RSPO1041* report as a periodic background job with an appropriate variant.

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Lesson Summary

You should now be able to:

- Manage spool and output requests

Related Information

- Online documentation for SAP NetWeaver 7.0 EhP 1: *SAP NetWeaver Library → SAP NetWeaver by Key Capability → Solution Life Cycle Management by Key Capability → System Management → SAP Printing Guide (BC-CCM-PRN) → Maintaining the Spool Database*
- SAP Notes:

  130978 - *RSPO1041 - Deleting old spool requests*

  98065 - *Spool Consistency Check with RSPO1043 as of 4.0A*

  48400 - *Reorganization of TemSe and Spool*

  48284 - *System can no longer create spool requests*

  311037 -*Printing via e-mail*

  771683 - *Front-end printing for SAP GUI for HTML (as of Release 6.40)*

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Lesson: Printing Assistant for Landscapes (PAL)

Lesson Overview

In this lesson, you will learn about the **Printing Assistant for Landscapes (PAL)**. After learning the concepts and terms, you will learn about administrative tasks in transaction PAL.

Lesson Objectives

After completing this lesson, you will be able to:

- Name the prerequisites for using the Printing Assistant for Landscapes (PAL)
- Explain the terms in the PAL environment
- Set up and use a PAL landscape

Business Example

Your company uses several ABAP-based SAP systems, each with several output devices. To keep administration tasks to a minimum in the event of changes, you want to use the Printing Assistant for Landscapes.

Prerequisites for Using PAL

You can use the **Printing Assistant for Landscapes** to simplify the administration of output devices in ABAP-based SAP systems. To do this, output devices are maintained in one system (normally the central system), and their definition is then distributed across any number of additional systems (target systems) over RFC.

SAP recommends using PAL if at least one of the following criteria applies:

- You manage several output devices in a few SAP systems.
- You manage a few output devices in several SAP systems.
- You manage several output devices in several SAP systems.

The following diagram is based on a small PAL landscape, and shows the release requirements of the systems involved:

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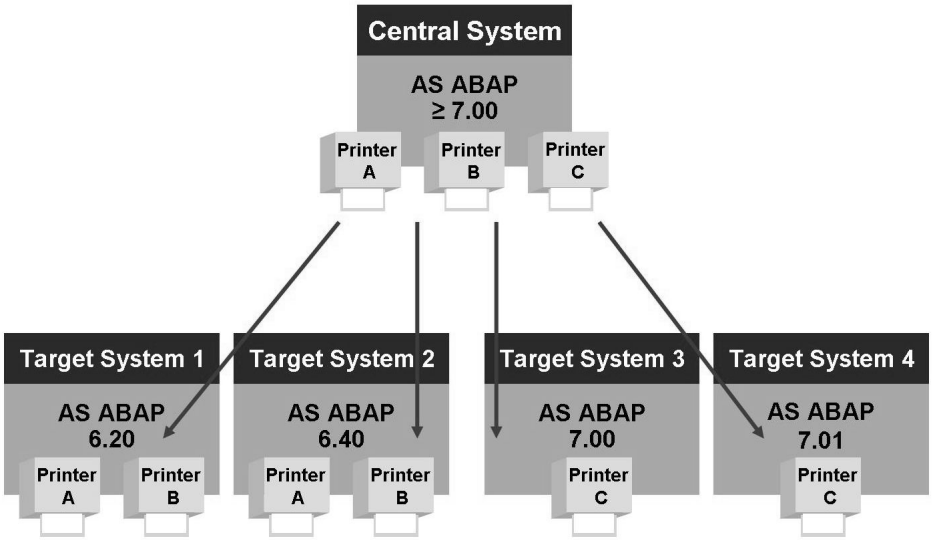

Figure 114: PAL Landscape

The central system must be based on an **AS ABAP 7.00** (or higher) with an up-to-date patch level. Since SAP Solution Manager also allows you to manage other functions centrally, SAP Solution Manager 7.0 suggests itself as the central system for PAL. The target systems must have a minimum release level of **AS ABAP 6.20** with certain Support Package levels.

Hint: See SAP Note 964501 for the precise system requirements.

PAL currently supports the following access methods:

- L and C: Local printing
- U and S: Remote printing
- F and G: Front-end printing
- M: E-mail based printing
- E: External output management systems

Restrictions exist for some of these access methods: See the SAP online documentation for SAP NetWeaver 7.0 Enhancement Package **2** (or higher) for details.

Setting Up and Using PAL

Before introducing the configuration steps, some terms need to be explained first:

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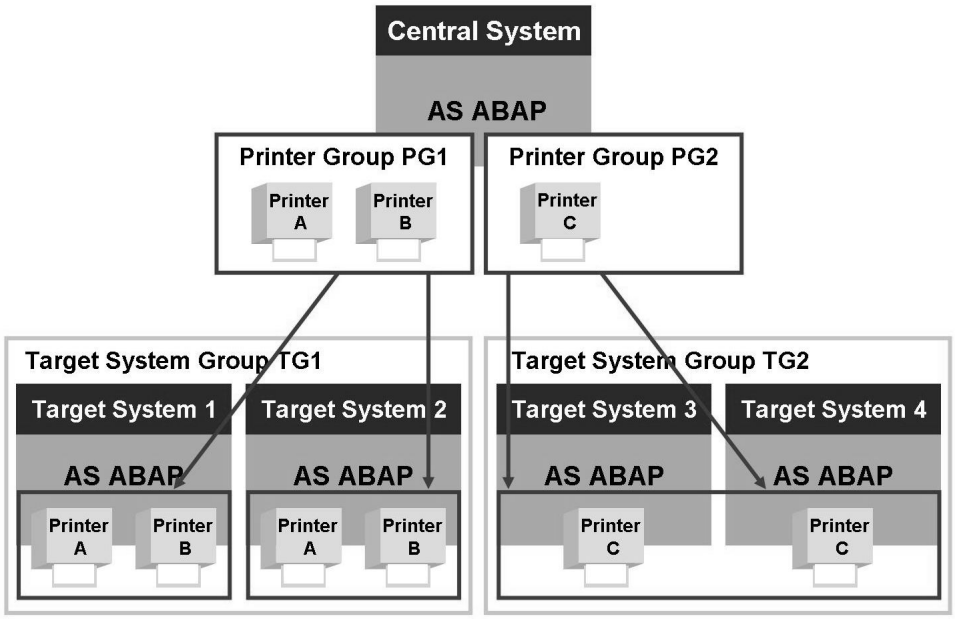

Figure 115: PAL Terminology

(PAL) Printer

The first step in the Printing Assistant for Landscapes is to create an output device (using transaction SPAD). This output device must then be designated as a PAL printer (often simply referred to as a “printer” below).

Printer Group

A printer group normally comprises several printers that are jointly distributed later.

Target System

A target system in a PAL environment refers to an RFC connection (maintained in the central system). This RFC connection contains connection and log on data for a suitable ABAP-based SAP system in the PAL landscape.

Target System Group

Printer groups are always distributed in a target system group, which usually consists of several target systems.

The following diagram shows the steps for defining and using a PAL printer landscape:

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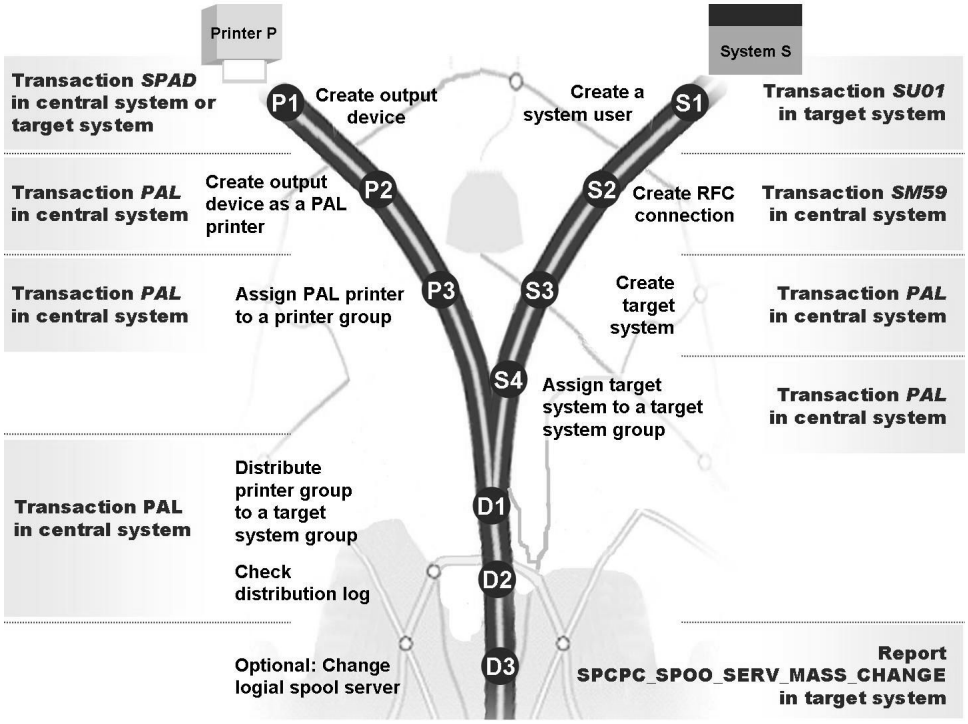

Figure 116: Roadmap for PAL

The following sections explain the individual steps in more detail.

Maintaining a PAL System Landscape

Printer definitions are distributed from the central system to the target systems across RFC. You therefore need an RFC connection in your central system to each target system . SAP recommends setting up a dedicated **system user** for spool administration in every target system. This user has authorization to the following authorization objects

Authorization Object	Values
S_TCODE	SPAD, PAL
S_ADMI_FCD	SP01, SPOR, SPAA, SPAB, SPAC, SPAD

To ensure a **target system** is recognized by PAL, it must be created with transaction PAL (to start it in the central system). Printers are then always distributed using **target system groups** that define a logical collection of target systems. A target system group could consist of all production systems for example.

Note: A target system cannot belong to multiple target system groups.

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Key steps of the initial set up:

1. Create an RFC connection in the central system for each target system.
2. Call transaction PAL in the central system.
3. Under *Show*, choose the option *Target System*, and choose *Create*. Select a PAL target system name and the corresponding RFC destination.
4. Under *Show*, choose the option *Target System Group*, and choose *Create*. Select a PAL target system group name. You can define the target systems you want to include now or later.

Create and Distribute PAL Printers

PAL allows you to manage and distribute **Printers** ("PAL printers") that you defined in the central system or a target system as a output device earlier (in transaction SPAD). You can then subsume these PAL printers in **printer groups**. A printer group could incorporate all test printers for example. You can then distribute **printer groups** across **target system groups**.

Note: A PAL printer cannot belong to multiple printer groups.

Key steps during set up:

1. Call transaction PAL in the central system.
2. Under *Show*, choose the option *Printers*, and choose *Create*. The Wizard will ask you whether you want to specify output devices from the central system or a target system as a printer.
3. Under *Show*, choose the option *Printer Group*, and choose *Create*. Select a PAL printer group name. You can define the printers you want to include now or later.
4. In the view *Printer Group*, select a printer group, and choose *Distribute*. Select one (or several) target system group(s).
5. After you have distributed the printer group, check the *Distribution Status*.

PAL printers in the target system can only be displayed in transaction SPAD, not changed.

When a printer is distributed to a target system for the first time, an arbitrary (physical) spool server is assigned to the output device. Using the report *SPCPC_SPOO_SERV_MASS_CHANGE* in the target system, you can assign a (logical or physical) spool server to some or all PAL printers. The only mandatory input field is *New Spool Server*. The checkbox *Confirm before change* is selected as a default. If you use the default setting, a list of affected PAL Printers will be displayed. You can check first if the new spool servers are correct before you execute the report.

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Deleting PAL Objects

You can also delete objects from the PAL landscape. There are some points to consider.

To delete an (existing) **printer**, proceed as follows:

1. Call transaction PAL in the central system.
2. Delete the relevant printer from the printer group.
3. Call the distribution status: changes that have not yet been distributed are displayed. Distribute the relevant printer group across the listed target system group(s). The deleted printer no longer appears in transaction SPAD for the target systems.
4. Delete the (PAL) printer.
5. If required, delete the output device using transaction SPAD in the central system.

To delete a **target system**, proceed as follows:

1. Call transaction PAL in the central system.
2. Delete the required target system from the target system group.
3. Call the distribution status: changes that have not yet been distributed are displayed. Distribute the relevant printer group across the listed target system group(s).
4. Delete the target system.
5. If required, delete the RFC destination using transaction SM59 in the central system.
6. If required, delete the relevant system user using transaction SU01 in the target system.

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Exercise 22: Central Administration of Output Devices (PAL)

Exercise Objectives

After completing this exercise, you will be able to:

- Set up a PAL system landscape
- Distribute the definition of output devices

Business Example

Your company uses several ABAP-based SAP systems, each with several output devices. To keep administration tasks to a minimum in the event of changes, you want to use the Printing Assistant for Landscapes (PAL).

Caution: The DEV and QAS groups must work together on this exercise. The **DEV system** will assume the role of the **central system**, and the **QAS system** (on the same server) will assume the role of a **target system**. The following steps should therefore be completed together.

The aim of the exercise is to distribute the output devices created in the DEV system to the QAS system so that they can be used there.

Task 1: PAL System Landscape

Checking the prerequisites and defining the PAL landscape.

1. Verify that in the central system (the DEV system) there is an RFC connection of the type *<SID of the target system>_<client>_<log on group>* defined to the target system (the QAS system), for example *QAS_100_RFC*.

   This RFC connection should provide the logon credentials of a (dialog or system) user with spool administration rights.

   Hint: If you have not yet created an RFC connection of the type *<SID of the target system>_<client>_<log on group>*, you can use the prepared RFC connection *PARTNER* instead.

2. In the DEV system, configure the QAS system as a PAL target system.
3. In the DEV system, create a target system group **`TestSystems`**, and add the QAS system to this group.

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Result

You have created a target system group *TestSystems*, and assigned the *QAS* system to it. In practice, you would manage multiple target system groups and/or define more systems for each target system group.

Task 2: Distribute Local Printer

Defining a local printer as the PAL printer, and distributing it.

Note: This section assumes that a local printer *Local##* has been created in the DEV system.

1. Define the local printer *Local##* as a PAL printer in the DEV system.
2. In the DEV system, create a printer group **`TestPrinters`**, and add the printer *Local##*. Then distribute the printer group *TestPrinters* to the system group *TestSystems*.
3. In the target system, check whether the output device *Local##* is recognized.

Result

You have successfully distributed a local printer using PAL.

Task 3: Distribute Remote Printer

Defining a remote printer as the PAL printer, and distributing it.

Note: This section assumes that a remote printer *Remote##* has been created in the DEV system.

1. Define the remote printer *Remote##* as a PAL printer in the DEV system.
2. Add the PAL printer *Remote##* to the printer group *TestPrinters* that you created earlier. Then distribute the printer group *TestPrinters* to the system group *TestSystems*.
3. In the target system, check whether the output device *Remote##* is recognized.

Result

You have successfully distributed a remote printer using PAL.

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Task 4: Optional: Mass Change of Spool Server(s)

Changing the spool servers of all distributed PAL printers.

Note: This section assumes that a logical spool server *Logical##* has been created in the QAS system.

1. Using report *SPCPC_SPOO_SERV_MASS_CHANGE*, assing the logical spool server *Logical##* to all PAL printers in the target system QAS.
2. Check the spool server of all PAL printers in the target system QAS.

Result

You have adjusted the spool server of the distributed PAL printers.

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Solution 22: Central Administration of Output Devices (PAL)

Task 1: PAL System Landscape

Checking the prerequisites and defining the PAL landscape.

1. Verify that in the central system (the DEV system) there is an RFC connection of the type *<SID of the target system>_<client>_<log on group>* defined to the target system (the QAS system), for example *QAS_100_RFC*.

   This RFC connection should provide the logon credentials of a (dialog or system) user with spool administration rights.

   Hint: If you have not yet created an RFC connection of the type *<SID of the target system>_<client>_<log on group>*, you can use the prepared RFC connection *PARTNER* instead.

   a) In the DEV system, start transaction SM59.

   b) Under *ABAP Connections* (Type 3), you should see the RFC connection of the type *<SID of the target system>_<client>_<log on group>* (or *PARTNER*) that corresponds to the QAS system, and which contains a user with the profile *SAP_ALL* in the target system.

2. In the DEV system, configure the QAS system as a PAL target system.

   a) In the DEV system, start transaction PAL.

   b) Under *Show*, choose the option *Target System*, and choose *Create*.

   c) Populate the *Create Target System* window as follows:

Field	Input
Target System Name	`QAS`
Description	Any
RFC destination	use F4 help to select *<SID of the target system>_<client>_<log on group>* (for example *QAS_100_RFC*) or *PARTNER*

   Then use the *Check* pushbutton to verify that the target system can be accessed. Then choose *OK*.

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3. In the DEV system, create a target system group **`TestSystems`**, and add the QAS system to this group.

   a) You have opened transaction PAL in the DEV system.

   b) Under *Show*, choose the option *Target System Group*, and choose *Create*.

   c) Populate the *Create Target System Group* window as follows:

Field	Input
Target System Group Name	**`TestSystems`**
Description	Any

   Select the line for the target system *QAS*, and choose *OK*.

Result

You have created a target system group *TestSystems*, and assigned the *QAS* system to it. In practice, you would manage multiple target system groups and/or define more systems for each target system group.

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Task 2: Distribute Local Printer

Defining a local printer as the PAL printer, and distributing it.

Note: This section assumes that a local printer *Local##* has been created in the DEV system.

1. Define the local printer *Local##* as a PAL printer in the DEV system.
   a) You have opened transaction PAL in the DEV system.
   b) Under *Show*, choose the option *Printer*, and choose *Create*.
   c) In the window *Select - Source of Output Devices*, select the option *Central System*, and choose *Next*.
   d) In the window *Select - Output Devices in Central System*, select the device *Local##*, and choose *Next*.
   e) Confirm the prompt (with information about the access method) asking you if you want to continue with *Yes*.

      Note: An error message "Lock failed. Foreign lock." indicates that the selected output device is currently processed in change mode. To release the lock, leave transaction SPAD (or switch to the *Display* mode).

   f) The printer assistant issues a log detailing the (hopefully successful) creation of the PAL printer, which you can *Close*.

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2. In the DEV system, create a printer group **`TestPrinters`**, and add the printer *Local##.* Then distribute the printer group *TestPrinters* to the system group *TestSystems*.

   a) You have opened transaction PAL in the DEV system.

   b) Under *Show*, choose the option *Printer Group*, and choose *Create*.

   c) Populate the *Create Printer Group* window as follows:

Field	Input
Printer Group Name	**`TestPrinters`**
Description	Any

   Select the line for the PAL printer *Local##*, and choose *OK*.

   d) In transaction PAL, select the printer group *TestPrinters*, and choose *Distribute*.

   e) If the system displays a prompt on the access method of the selected printer(s), confirm it by pressing *OK*.

   f) In the window *Select - PAL Target System Group*, select the target system group *TestSystems* you just created, and choose *Next*.

   g) View the result of the *Device Type Check in Target System* – if this was successful, choose *Next*.

   h) The printer assistant issues a log about the distribution, which you can *Close* now.

3. In the target system, check whether the output device *Local##* is recognized.

   a) In the QAS system, start transaction SPAD.

   b) Make sure that the definition of the output device *Local##* is correctly recognized in the QAS system.

   Note

   - that you can not change the definition in the target system.
   - the description “Centrally-Administered Device”.
   - the spool server of the device.

Result

You have successfully distributed a local printer using PAL.

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Task 3: Distribute Remote Printer

Defining a remote printer as the PAL printer, and distributing it.

Note: This section assumes that a remote printer *Remote##* has been created in the DEV system.

1. Define the remote printer *Remote##* as a PAL printer in the DEV system.
   a) You have opened transaction PAL in the DEV system.
   b) Under *Show*, choose the option *Printer*, and choose *Create*.
   c) In the window *Select - Source of Output Devices*, select the option *Central System*, and choose *Next*.
   d) In the window *Select - Output Devices in Central System*, select the device *Remote##*, and choose *Next*.
   e) Confirm the prompt asking you if you want to proceed with *Yes*.
   f) The printer assistant issues a log detailing the creation of the PAL printer, which you can *Close* now.
2. Add the PAL printer *Remote##* to the printer group *TestPrinters* that you created earlier. Then distribute the printer group *TestPrinters* to the system group *TestSystems*.
   a) You have opened transaction PAL in the DEV system.
   b) Under *Show*, choose the option *Printer Group*, and select the line *TestPrinters*.
   c) In the section shown below, switch to the *Members* tab. Choose the *Add* pushbutton. Select the line for the printer *Remote##*, and choose *OK*.
   d) In transaction PAL, select the printer group *TestPrinters*, and choose *Distribute*.
   e) If the system displays a prompt on the access method of the selected printer(s), confirm it by pressing *OK*.
   f) In the window *Select - PAL Target System Group*, select the target system group *TestSystems*, and choose *Next*.
   g) View the result of the *Device Type Check in Target System* – if this was successful, choose *Next*.
   h) Confirm the system message about the distribution of the printer group(s) with *Yes*.
   i) The printer assistant issues a log about the distribution, which you can *Close* now.

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3. In the target system, check whether the output device *Remote##* is recognized.
   a) In the QAS system, start transaction SPAD.
   b) Make sure that the definition of the output device *Remote##* is correctly recognized in the QAS system.

      Note

      - that you can not change the definition in the target system.
      - the description “Centrally-Administered Device”.
      - the spool server of the device.

Result

You have successfully distributed a remote printer using PAL.

Task 4: Optional: Mass Change of Spool Server(s)

Changing the spool servers of all distributed PAL printers.

Note: This section assumes that a logical spool server *Logical##* has been created in the QAS system.

1. Using report *SPCPC_SPOO_SERV_MASS_CHANGE*, assing the logical spool server *Logical##* to all PAL printers in the target system QAS.
   a) You are logged on to the QAS system.
   b) Start transaction SA38.
   c) Enter *Program SPCPC_SPOO_SERV_MASS_CHANGE* (you may enter **`spcpc*`** and use the F4 help), and press *Execute* (F8).
   d) For *New Spool Server*, choose *Logical##* (you may use the F4 help).
   e) Keep all other fields with their default value, and press *Execute* (F8).
   f) Check the window *Confirm Spool Server Change*, and press *Change Spool Server*. A log with detailed information regarding the spool server change is displayed.

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2. Check the spool server of all PAL printers in the target system QAS.
   a) You are logged on to the QAS system.
   b) Start transaction SPAD.
   c) On the tab *Devices / severs*, press *Display* besides *Output Devices* (without any search pattern).
   d) In the overview of output devices, note the column *Spool servers*. For the output devices created by PAL, you should see the value *Logical##*.

Result

You have adjusted the spool server of the distributed PAL printers.

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Lesson Summary

You should now be able to:

- Name the prerequisites for using the Printing Assistant for Landscapes (PAL)
- Explain the terms in the PAL environment
- Set up and use a PAL landscape

Related Information

- SAP NetWeaver 7.02 online documentation, path *SAP NetWeaver Library → SAP NetWeaver by Key Capability → Solution Life Cycle Management by Key Capability → System Management → SAP Printing Guide (BC-CCM-PRN) → Printing Assistant for Landscapes (PAL)*
- SAP Developer Network, Quick Link /irj/sdn/printing.
- SAP Note 964501: Printing Assistant for Landscape (PAL)

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Unit Summary

You should now be able to:

- Describe the architecture and data flow of output processing in ABAP-based SAP systems
- Create printers and spool servers in the SAP system
- List important access methods
- Manage spool requests
- Describe the concept of logical spool servers
- Set up logical spool servers
- Manage spool and output requests
- Name the prerequisites for using the Printing Assistant for Landscapes (PAL)
- Explain the terms in the PAL environment
- Set up and use a PAL landscape

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Test Your Knowledge

1. Which of the following access methods exist in the SAP system?

   Choose the correct answer(s).

   - □ A Remote printing
   - □ B Front-end printing
   - □ C Instance printing
   - □ D Local printing

2. Which of the listed states can a spool request have?

   Choose the correct answer(s).

   - □ A Compl.
   - □ B Canceled
   - □ C Error
   - □ D Waiting
   - □ E Active
   - □ F Print.

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Answers

1. Which of the following access methods exist in the SAP system?

   Answer: A, B, D

   Instance printing does not exist.

2. Which of the listed states can a spool request have?

   Answer: A, C, D, F

   The incorrect options *canceled* and *active* are possible status messages from job monitoring. Other possible statuses of a spool request are -, +, *Proc.*, *<F5>*, *Problem*, and *Time*.

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Unit 9

Scheduling Background Tasks

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Unit Overview

This unit deals with the basics of background processing, and the scheduling and monitoring of jobs. You also learn about special functions and extension options of background processing.

Unit Objectives

After completing this unit, you will be able to:

- Describe the uses of background processing
- Schedule and monitor jobs
- Schedule time-dependent jobs
- Schedule standard jobs
- Schedule event-dependent jobs
- Define and trigger events
- Use additional, special functions of background processing
- Explain how to use SAP Central Process Scheduling by Redwood
- Name the most important features of SAP CPS
- Use the Work Center Job Managemant to schedule and monitor background jobs

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Lesson: Fundamentals of Background Processing

Lesson Overview

In this lesson, you will learn about the basics of background processing.

Lesson Objectives

After completing this lesson, you will be able to:

- Describe the uses of background processing
- Schedule and monitor jobs

Business Example

Reports that are to run on a regular basis and long-running programs are scheduled as jobs in the SAP system. The administrator schedules jobs and monitors the system's background processing to ensure that it is running correctly.

Basics

The following questions are answered in the course of this lesson:

- Why do you need background processing?
- What is a job?
- What can be performed in the background?
- What start criteria are there?
- How are jobs scheduled and monitored?
- What status can a job have?

Dialog work processes should be able to respond to end users' requests quickly. Dialog resources should therefore not be burdened with long-running programs. This can lead to bottlenecks in the dialog response time. The system profile parameter *rdisp/max_wprun_time* exists for this reason. It limits the maximum runtime of a dialog step within a dialog work process. This should ensure that dialog work processes are not blocked by long-running programs, interfering with online operation. After the maximum runtime has elapsed, the program is terminated.

Note: The way in which the parameter *rdisp/max_wprun_time* works is described in detail in SAP Note 25528.

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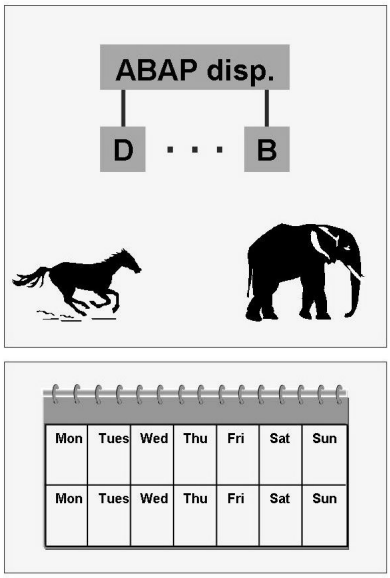

- Reduce the load on dialog resources
- Schedule regular tasks

Figure 117: Why Background Processing?

You can use the background work processes for long-running tasks. These are sometimes also called **batch work processes**.

Normally, background processing is used not only for long-running, but also for recurrent tasks. Examples of this type of task are the daily database backup or the month-end work for financial accounting.

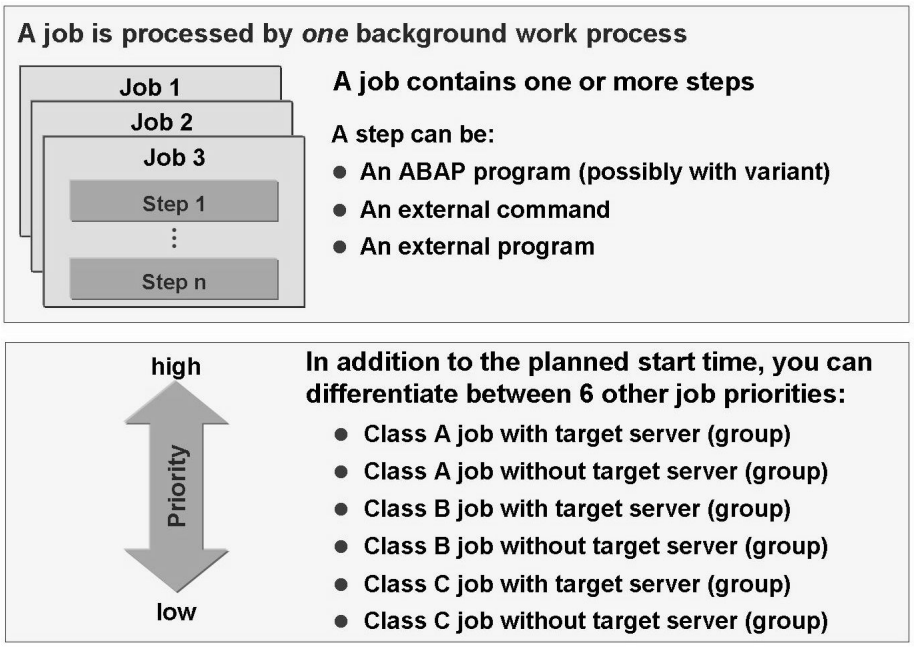

Figure 118: What Is a Job?

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A job comprises one or more steps (known as job steps). A step can be:

- An ABAP program
- An external command
- An external program

Every job is processed without interruption by one single background work process.

Background jobs can be scheduled with different priorities:

- Class A (highest priority)
- Class B (medium priority)
- Class C (normal priority)

If a job should be executed on a particular server or server group, it is handled preferentially compared to other jobs with the same class. This preference only applies if multiple jobs of various priorities request background processing at the same time, for example, because they are scheduled for the same time.

Hint: You should ensure that a large share of all background tasks are normally scheduled as class C without target server specification. This share can include 90% (or more) of all tasks. System background tasks are also executed in this way, such as the tasks that you schedule with transaction DB13.

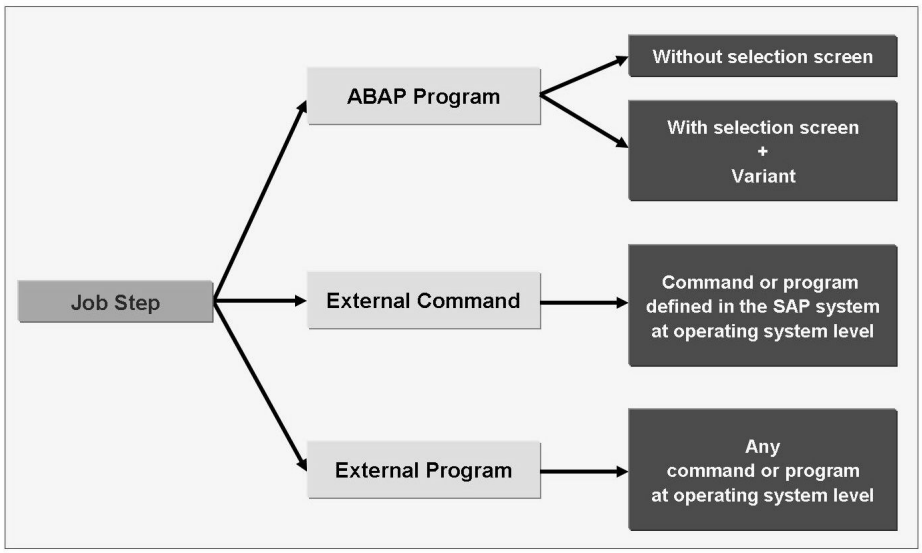

Figure 119: What Can Be Performed in the Background?

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A step within a job can call one of three actions:

- Every **ABAP program** can be scheduled as a step of a job. If the ABAP program has one or more selection screens, you must create the input required there in advance in the form of a **variant**. A variant makes it possible to run an ABAP program in the background although the program requires input. The values stored in the variant are then used during the execution of the program. If an ABAP program has a screen output as its result, this is directed to a spool list. You can specify an (e-mail) recipient for this spool list when defining the job. This recipient then receives the job output by e-mail after the job has been executed. You must also specify a printer for the creation of spool lists even though, as a result of background processing, there is not necessarily any direct output to a printer (this depends on the printer's access method). This may have to be explicitly started later.
- An **external command** is a call of a predefined script, a command, or a program at operating system level. With external commands, you can mask operating system calls and store them in the SAP system under a name. You can also use the SAP authorization concept to protect the execution of an external command. This enables you to determine which users are allowed to execute which external commands (on which target hosts and/or operating systems).
- An **external program** is any operating system command. The SAP authorization concept only specifies whether a user can call external programs or not. A more detailed authorization assignment, for example at the level of program names, is not provided; use external commands for this.

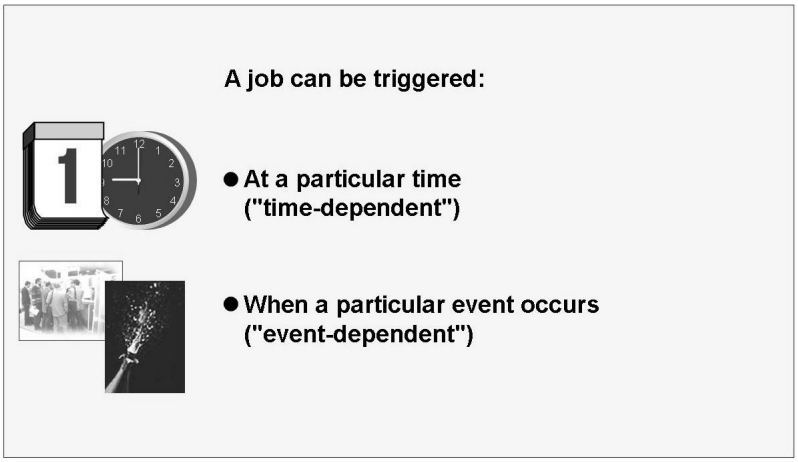

Figure 120: Start Criteria for a Job

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A job can be triggered:

- By scheduling it on a particular date at a particular time (this includes the start time “immediately”, if there are no free background work processes available when the job is scheduled).
- By the occurrence of a particular event defined in the SAP system (this includes jobs that are to start after other jobs or at operation mode changes, or jobs with immediate start if there are free background work processes available when the job is scheduled).

Scheduling and Monitoring

Use transaction SM36 to define new jobs. You can also call the Job Wizard (transaction SM36WIZ) from transaction SM36.

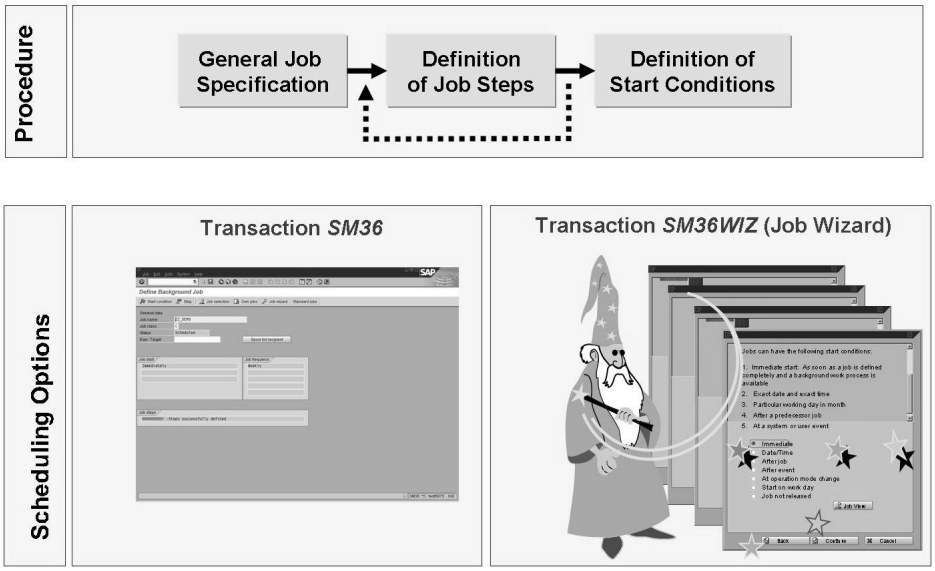

Figure 121: Job Scheduling

Required specifications when defining a job are:

- General specifications such as job name, job priority (Default: C) and (optionally) target server (group)
- Definition of one or more job steps
- Definition of start conditions (time-dependent or event-dependent)

The Job Wizard supports you when defining jobs, by guiding you easily through the creation process.

The way in which a job is created (“classic” or using the Job Wizard) has no bearing on the result. Some functions (specifying an SAP user for each step, swapping steps) are not available with the Job Wizard, however.

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Use transaction SM37 to monitor jobs.

You can select jobs using a diverse range of criteria on the initial screen of this transaction. In this way, you can display all jobs that contain a particular job step, that have a particular status, or that react to a defined event (for this, you must select a particular event or "*").

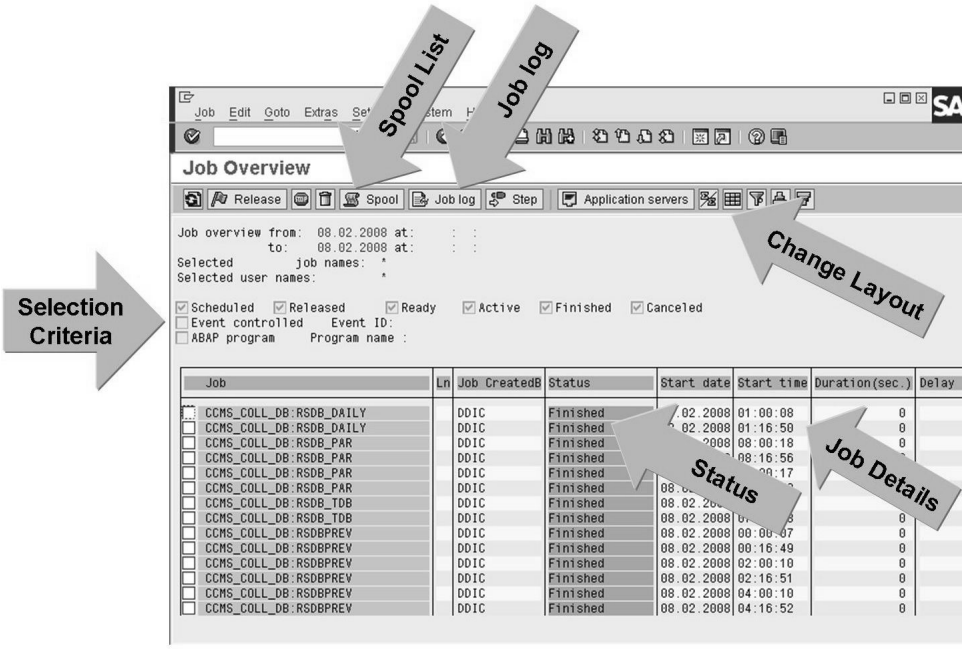

Figure 122: Job Monitoring

After you have chosen *Execute*, a **job overview** appears that is realized by the SAP List Viewer (ALV). By choosing *Settings* from the menu you can determine the columns that are displayed and the sort order, amongst other things. You can set this layout as the standard layout (for the current user or for all users).

Hint: The transaction SM37 offers the following two ALV-based display types:

- *LIST:* offers a quick list structure (standard setting)
- *GRID:* enables you to change the layout easily (required for accessibility)

Using the program *BTC_SWITCH_LIST_GRID*, a batch administrator can determine the display type for individual users or all users.

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You can navigate to other job-specific views from the job overview shown above:

- The **spool list** contains the output lists for ABAP programs (if they exist).
- The **job details** contain, among other information, the job definition, duration of the processing of the job, and the start time of the job.
- All messages output by a background program are stored in the **job log**. You can display this log to obtain information about a program that terminated with errors or to perform a detailed investigation about a background processing run.

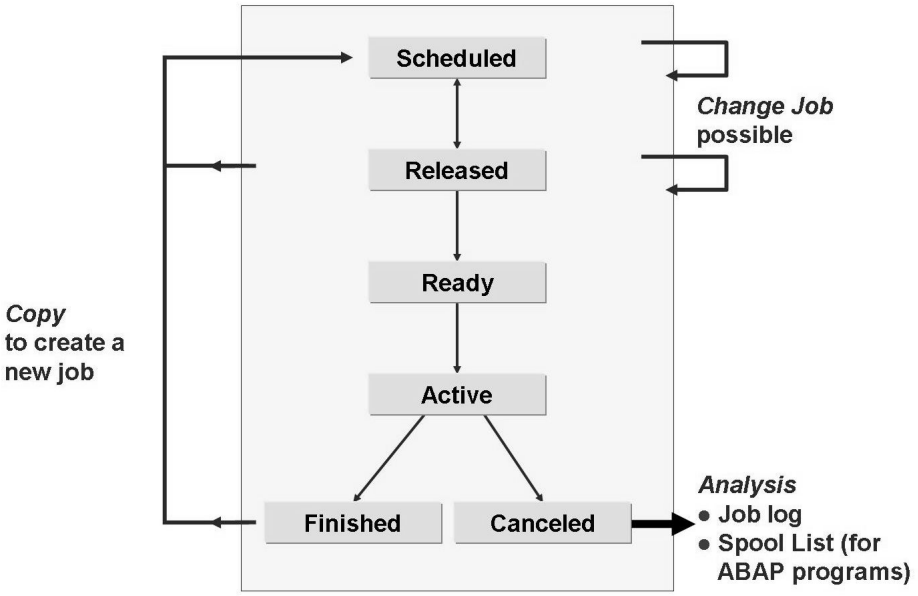

Figure 123: Status of a Job

A job can have the following statuses:

Scheduled

The steps that make up the job have already been defined, however the start condition still needs defining.

Released

The job has been completely defined, including its start condition. A job cannot be released without a start condition. Only an administrator or a user with the relevant authorizations for background processing can release a job. This ensures that unauthorized users cannot execute jobs without approval.

Ready

The start condition of a released job has been fulfilled. A job scheduler has placed the job in the wait queue for a free background work process.

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Active

The job is currently being executed and cannot be deleted or changed.

If an active job does not seem to be running correctly (for example, it is running for an unusually long time), you can terminate it in a background work process in debugging mode, analyze it, and then either release it again or terminate it completely. To do this, call transaction SM37 and choose *Job → Capture: active job*.

Hint: To capture a job, you must be logged on to the instance on which the job is running.

Finished

All steps of this job were successfully completed.

Canceled

The job aborted. This can happen in two ways:

- An administrator deliberately terminates the job in transaction SM37 by choosing *Job → Cancel active job*.
- A job step is terminated with an error.

You can still change a job as long as the job still has the status Scheduled or Released.

If the execution of the job has already begun, you can monitor the processing in the job log. If the job contains ABAP programs that create output lists, these are stored in spool lists.

You can create a new job by copying an existing job. From the menu, choose *Job → Copy*.

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Exercise 23: Fundamentals of Background Processing

Exercise Objectives

After completing this exercise, you will be able to:

- Determine the configuration of your SAP system with regard to background processing.

Business Example

Reports that are to run on a regular basis and long-running programs are scheduled as jobs in the SAP system. The administrator schedules jobs and monitors the system's background processing to ensure that it is running correctly.

Task: Checking the Configuration

Check the way that background processing is configured in your SAP system. The following steps will make you familiar with the SAP system settings that are relevant for background processing.

1. How many background processes are currently configured in your SAP system?
2. What determines the number of available background work processes?
3. How many jobs can be processed simultaneously?
4. Assume that all background work processes in your system are currently processing and there are, therefore, no free resources for other jobs. Can you set up additional background work processes without restarting the SAP system?

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Solution 23: Fundamentals of Background Processing

Task: Checking the Configuration

Check the way that background processing is configured in your SAP system. The following steps will make you familiar with the SAP system settings that are relevant for background processing.

1. How many background processes are currently configured in your SAP system?

   a) Start transaction SM66.

   b) Choose the *Select Process* pushbutton to make the following selections:

      - *Type: Background* only
      - *Status:* choose *Wait* in addition

      Choose *Continue* and count the number of work processes displayed.

2. What determines the number of available background work processes?

   a) The parameter *rdisp/wp_no_btc* initially specifies the number of available background work processes on the current instance. You can check the value of the parameter with transaction RZ11 or the report RSPFPAR.

      If you have defined operation modes (transaction RZ04), this value can be overwritten. In this case, use the CCMS Control Panel (transaction RZ03) to specify the current operation mode.

3. How many jobs can be processed simultaneously?

   a) The SAP system process as many jobs concurrently as there are background work processes available.

4. Assume that all background work processes in your system are currently processing and there are, therefore, no free resources for other jobs. Can you set up additional background work processes without restarting the SAP system?

   a) Using the concept of operation modes, you can define an operation mode with additional background work processes in transaction RZ04. You can then perform a manual operation mode switch using transaction RZ03. You do not need to restart your system when doing this.

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Lesson Summary

You should now be able to:

- Describe the uses of background processing
- Schedule and monitor jobs

Related Information

SAP Notes:

25528 - *Parameter rdisp/max_wprun_time*

519059 - *FAQ: Background Processing System*

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Lesson: Time-Based Scheduling of Jobs

Lesson Overview

In this lesson, you will learn about time-based scheduling of jobs.

Lesson Objectives

After completing this lesson, you will be able to:

- Schedule time-dependent jobs
- Schedule standard jobs

Business Example

The administrator schedules jobs and monitors the system's background processing to ensure that it is running correctly.

Time-Based Scheduling

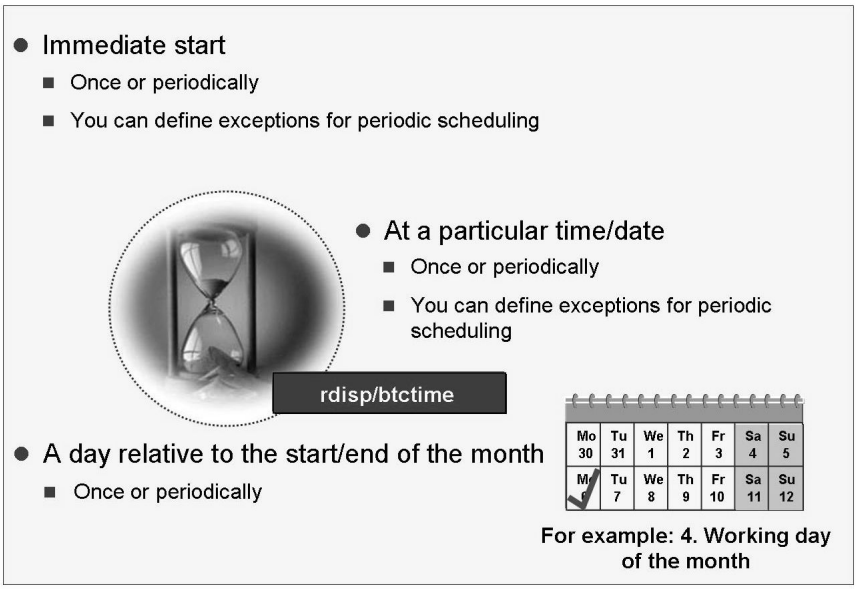

Figure 124: Time-Dependent Start of a Job

A job can be started in a time- or event-dependent manner. In the case of a time-dependent start of a job, you can choose between the following options:

- The job should be executed immediately
- The job should be executed at a particular date/time
- The job should be executed on a particular work day

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You can choose to make all time-based start conditions for jobs recurrent. This means that the job is executed again after a defined period of time has elapsed. You can specify exceptions (such as postponement to the following work day in the case of holidays in the factory calendar).

The job is started at the specified date and time, in accordance with the job priority and availability of background work processes.

You can also specify a time period during which the job should be executed. To do this, you specify a time after which the job should no longer be executed. With this function, you prevent periodic jobs being executed at an undesirable time, among other things. For example, a reorganization job that should only be executed at night is delayed. With a start time window, you can avoid this job being executed during the day, when the dialog users are active and there are fewer system resources available.

Load Balancing

The profile parameter *rdisp/bctime* specifies the time period in which the time-dependent job scheduler is active (see the next figure). Executing jobs with the start condition *immediate* usually avoids the time-dependent scheduler. In this case, the dialog work process of the scheduling user performs the job scheduling. Only if no free resources are found, is the job concerned scheduled in a time-based way. The scheduled start time then corresponds to the time point at which it should have started.

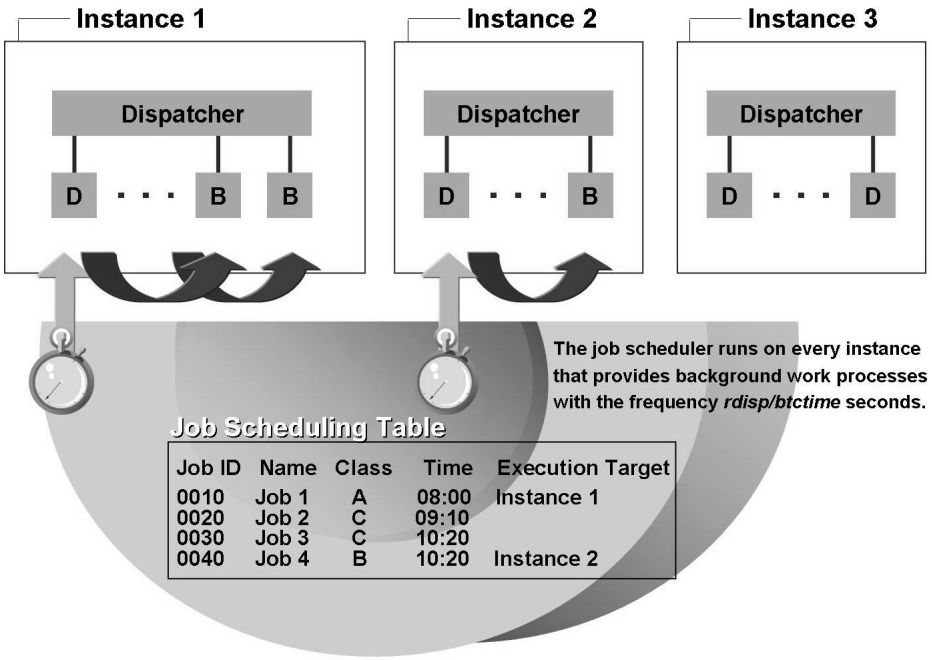

Figure 125: Scheduling Jobs and Load Balancing

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Background work processes can be configured on every instance of the SAP system using the profile parameter *rdisp/wp_no_btc*.

The number of background work processes required in the SAP system depends on the number of tasks to be performed in the background. If the transport system is used, there must be at least two background work processes in the system.

The combination of job ID and job name define the job uniquely in the system.

On every SAP instance on which background work processes are defined, the time-dependent job scheduler runs every *rdisp/btctime* seconds (default value: 60 seconds). This is an ABAP program (*SAPMSSY2* - an auto ABAP) that runs automatically in a dialog work process.

Hint: Since SAP NetWeaver 7.0, the job scheduler also starts after a job has finished. This increases the throughput for background processing considerably (depending on how many jobs there are).

SAP Note 923228 describes how you can activate this for SAP systems with Basis release 4.6C and above.

The time-dependent job scheduler checks the job scheduling table in the database for jobs that are waiting for processing. These jobs are transferred to free background work processes in the SAP instance, in accordance with their priority and execution target.

- Jobs that are not assigned any particular execution target can be executed with any free background work process. This means that the workload is automatically distributed between the SAP instances.
- If a job is explicitly assigned an execution target (such as a selected instance or a group of instances), the special properties of the execution target can be used (for example, you can ensure that a job is performed on a particular operating system, or that the job is executed by a background work process that is running on the same host as the database). This means, however, that you do not have the advantages of automatic load balancing.

Standard Jobs

Standard jobs are background jobs that should run regularly in a production SAP system. These jobs mainly perform certain clean up tasks in the system, such as the deletion of obsolete spool requests.

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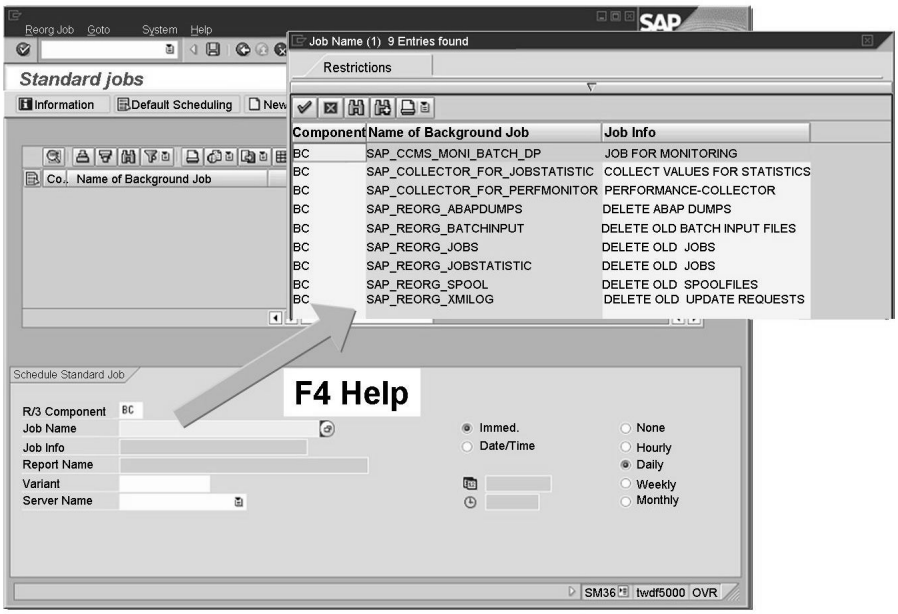

Figure 126: Scheduling Standard Jobs

In the job definition transaction (SM36), you can access a selection of important standard jobs that you can schedule, monitor, and edit by choosing *Standard Jobs* (see figure).

- If you want to schedule all standard jobs, choose *Default Scheduling*. All standard jobs that are defined in table REORGJOBS are scheduled with the specified variant and period. If other jobs exist that execute one of the programs of the standard jobs, the system informs you of this.
- To schedule individual jobs, choose the selected job with the input help and specify an execution period.
- To define an additional standard job that is not yet available in the selection (table *REORGJOBS*), choose *Predefine new job*.

Note: For information about standard jobs, see also SAP Note 16083 - *Standard jobs, reorganization jobs* and SAP Note 1034532 - *Changes for standard jobs*.

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Exercise 24: Time-Based Jobs

Exercise Objectives

After completing this exercise, you will be able to:

- Schedule and monitor time-dependent jobs

Business Example

The administrator schedules jobs and monitors the system's background processing to ensure that it is running correctly.

Task 1: Check Profile Parameter

Check the setting for the time-dependent Job Scheduler.

1. What is the time interval for the time-dependent Job Scheduler in your system?

Result

You now know every how many seconds the time-dependent Job Scheduler is started.

Task 2: Optional: Variants

Create a variant for an ABAP program.

1. Create a variant **`DISP_##`** for the program *RSPFPAR* (## stands for your group number) which only issues parameters for the ABAP dispatcher.

Result

You have created a variant for an ABAP program.

Task 3: Schedule Jobs

Use various tools to create jobs.

1. **(Optional)** Use transaction SA38 to run the report *RSPFPAR* in the background (start time: *Execute immediately*). For the *Variant*, select the name *DISPATCHER* or (if you have carried out the previous task) *DISP_##*.
2. **(Optional)** Use transaction SM36WIZ to create a job with the following properties:

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Job Name	**`TIME-WIZ-##`**, ## = group number.
Job Class	*C*
Target Server	Leave empty
1. step	Program *RSUSR000*
Start Condition	*Immediate*
Period	Hourly

3. Use the transaction SM36 (without the wizard) to create a job with the following characteristics:

Job Name	**`TIME-##`**, ## = group number.
Job Class	*C*
Target Server	Leave empty
1. step	Program *RSPFPAR* with variant *DISPATCHER* or *DISP_##*
Start Condition	<System time + 3 minutes>
Period	Daily

Hint: Bear in mind that the system time (*System* → *Status*) is the determining factor for jobs.

Result

You can schedule time-dependent jobs with different tools.

Task 4: Monitor Jobs

Use the job overview to monitor jobs.

1. Display all your jobs for today.
2. Find out details for the job *RSPFPAR* such as the priority, client, job ID, user who scheduled and released the job, and the work process that executed the job.
3. Take a look at the spool list for the job *TIME-WIZ-##*.
4. Determine whether the job *TIME-##* was delayed, and if so, the length of the delay.
5. In SM37, why do you see the next job *TIME-WIZ-##*, but not the next job *TIME-##*?

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Solution 24: Time-Based Jobs

Task 1: Check Profile Parameter

Check the setting for the time-dependent Job Scheduler.

1. What is the time interval for the time-dependent Job Scheduler in your system?

   a) Determine the value of the profile parameter *rdisp/btctime* (with either the transaction RZ11 or the report *RSPFPAR*).

Result

You now know every how many seconds the time-dependent Job Scheduler is started.

Task 2: Optional: Variants

Create a variant for an ABAP program.

1. Create a variant **`DISP_##`** for the program *RSPFPAR* (## stands for your group number) which only issues parameters for the ABAP dispatcher.

   a) Start the transaction SA38 and enter **`RSPFPAR`** as the *Program*. Choose *Execute*.

   b) Under *Profile Parameters*, enter **`rdisp/*`** and choose *Save as Variant* ( ).

   c) Under *Variant Name* enter **`DISP_##`**, and under *Meaning* enter any text.

   d) Leave the other fields unchanged and *Save* the new variant.

Result

You have created a variant for an ABAP program.

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Task 3: Schedule Jobs

Use various tools to create jobs.

1. **(Optional)** Use transaction SA38 to run the report *RSPFPAR* in the background (start time: *Execute immediately*). For the *Variant*, select the name *DISPATCHER* or (if you have carried out the previous task) *DISP_##*.

   a) Start the transaction SA38 and enter **`RSPFPAR`** as the *Program*.

   b) Choose *Background*.

   c) Select the variant *DISPATCHER* or *DISP_##* (using the F4 help).

   d) Choose *Execute Immed*. Use the *Job Overview* pushbutton to go to the transaction SM37, where you can display the results of your job (*Execute* pushbutton).

2. **(Optional)** Use transaction SM36WIZ to create a job with the following properties:

Job Name	**`TIME-WIZ-##`**, ## = group number.
Job Class	*C*
Target Server	Leave empty
1. step	Program *RSUSR000*
Start Condition	*Immediate*
Period	Hourly

   a) Start the transaction SM36WIZ and choose *Continue*.

   b) Fill the screens as specified in the task. Use the F4 Help wherever possible. Where no values have been specified, use the default values.

   c) To finish, choose *Complete*.

3. Use the transaction SM36 (without the wizard) to create a job with the following characteristics:

Job Name	**`TIME-##`**, ## = group number.
Job Class	*C*
Target Server	Leave empty

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1. step	Program *RSPFPAR* with variant *DISPATCHER* or *DISP_##*
Start Condition	<System time + 3 minutes>
Period	Daily

Hint: Bear in mind that the system time (*System* → *Status*) is the determining factor for jobs.

a) Start transaction SM36.

b) Under *Job Name*, enter **`TIME-##`** .

c) Choose *Step*. Enter the specifications for the step that are listed in the task and choose *Save*. Then choose *Back* ( ).

d) Choose *Start Condition*. Choose *Date/Time* and enter a time <system time + 3 minutes>. Select the *Periodic Job* checkbox and under *Period Values*, select *Daily*. Then choose *Save*.

e) Finally, on the initial screen of transaction SM36, choose *Save* **once**.

Result

You can schedule time-dependent jobs with different tools.

Task 4: Monitor Jobs

Use the job overview to monitor jobs.

1. Display all your jobs for today.

   a) Start transaction SM37. Include *scheduled* jobs in the selection too. Then choose *Execute*.

2. Find out details for the job *RSPFPAR* such as the priority, client, job ID, user who scheduled and released the job, and the work process that executed the job.

   a) In transaction SM37, double-click the job *RSPFPAR*.

   b) Choose *Job Details* to display a dialog box that contains all the information you require.

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3. Take a look at the spool list for the job *TIME-WIZ-##*.

   a) In transaction SM37, select the job *TIME-WIZ-##*.

   b) Use the *Spool* pushbutton to go to the spool request that was generated.

   c) Select the spool request and choose *Display Contents* (). You should see a user overview similar to the output of transaction AL08.

      Spool lists are only created for job steps that contain ABAP programs with output. They are only printed immediately if you have made the corresponding setting in the printer settings during the definition of the job step or in your user defaults.

4. Determine whether the job *TIME-##* was delayed, and if so, the length of the delay.

   a) Depending on the setting, you will already see a column headed *Delay* in SM37. After you have selected the job *TIME-##*, you can choose *Job Log* to display the job's progress over time.

      Delays could be due to busy background work processes or the fact that the time-dependent Job Scheduler runs periodically.

5. In SM37, why do you see the next job *TIME-WIZ-##*, but not the next job *TIME-##*?

   a) With the default values, the job monitor SM37 displays **today's** jobs. If you adjust the selection accordingly, the next job *TIME-##* (released for the following day) is displayed too.

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Lesson Summary

You should now be able to:

- Schedule time-dependent jobs
- Schedule standard jobs

Related Information

SAP Notes:

- 16083 - *Standard jobs, reorganization jobs*
- 923228 - *Background job sched.: using processes that have become free*
- 1034532 - *Changes for standard jobs*

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Lesson: Event-Based Scheduling of Jobs

Lesson Overview

In this lesson, you learn about event-based scheduling of jobs.

Lesson Objectives

After completing this lesson, you will be able to:

- Schedule event-dependent jobs
- Define and trigger events

Business Example

The administrator schedules background jobs and monitors the correct process of the system's background processing.

Event-Based Scheduling

An event is a signal to the background processing system that a particular status has been achieved in the SAP system. The background processing system receives events and then starts all jobs that are linked to this event.

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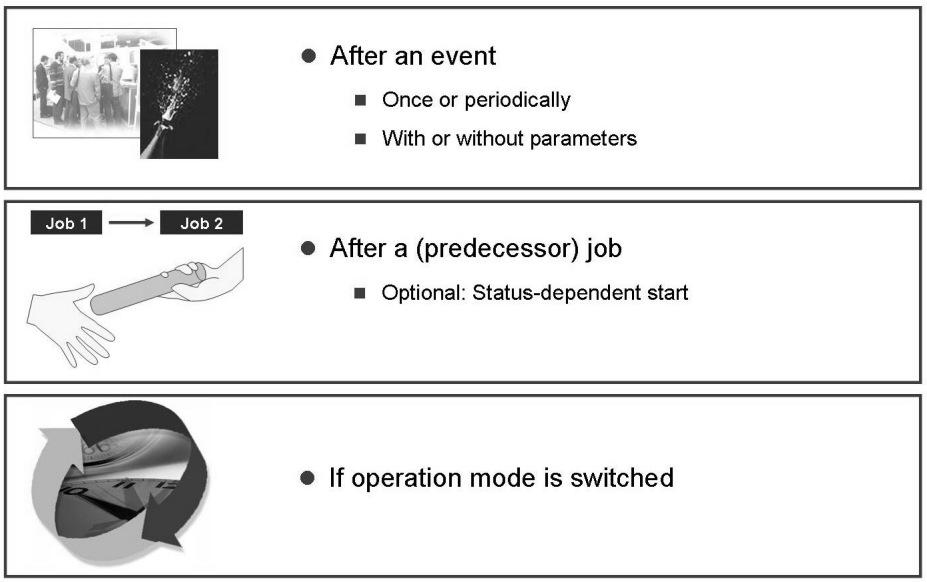

Figure 127: Event-Dependent Start of a Job

Hint: In older releases, the parameter *rdisp/btcname* was very significant for event-dependent scheduling. Since the following kernel patches:

Basis Release 640: patch 220

Basis Release 700: patch 147

this parameter is no longer evaluated (the parameter value is usually empty). For more information, see SAP Notes **1038669** and **104574** .

Event-dependent jobs can be scheduled with one of the following three start conditions:

After event

The job starts after a defined event is received by the SAP system.

At operation mode

With this option, you can link a job to the activation of an operation mode when scheduling the job.

After job

In this way, you can create simple job chains where the execution of the successor job can be made dependent on the status of the predecessor job.

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Events

New events are defined by the system administrator in CCMS (transaction SM64). When doing so, the administrator differentiates between system events and user events. System events are events predefined by SAP that you should not or cannot modify or trigger.

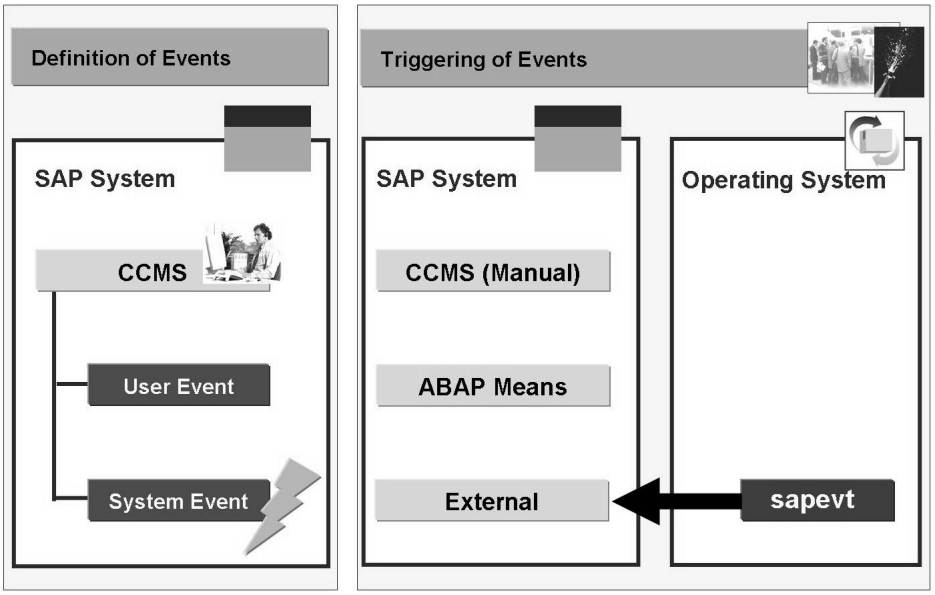

Figure 128: Definition and Triggering of Events

Events can be triggered in various ways:

- Manually in CCMS for test purposes (transaction SM64)
- With the ABAP program *BTC_EVENT_RAISE* or within an ABAP program (by using the function module *BP_EVENT_RAISE* or the RAISE method for the *CL_BATCH_EVENT* class)
- Outside the SAP system at operating system level using the program *sapevt*.

A parameter can also be transferred when an event is triggered. In this way, you can define jobs that wait for the occurrence of the event together with the specified parameter. You can access a history of events by way of the Event History (transaction SM62).

The syntax for the program *sapevt* is:

```
sapevt <parameters>
<Parameters> are several single switches from the following:
{<EventID> | event=<EventID>} [{-p <EventParam>} | param=<EventParam<>]
[-t[0|1|2][a]]
[-v]
{[name=<SystemName>] [msserv=<MsServ>]
```

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```
  [mshost=<MsHost>] [pf=<Profile>]}
{[timeout=<TimeOut>]}
[-? | /? | -help | /help]
```

Note: SAP Note 802172 explains the individual parameters in detail.

For example: **`sapevt event=MYEVENT name=DEV mshost=twdf5000.wdf.sap.corp`**. *sapevt* is output in a trace file *dev_evt* in the directory in which *sapevt* was called.

To be able to react to external events, the SAP system must be active. Otherwise an event triggered by an external program is lost.

Hint: If the name of the event contains a blank character, you must specify it in quotation marks when you call sapevt, for example, **`sapevt "MY EVENT" name=QAS mshost=twdf9999.wdf.sap.corp`**.

Note: If you want to call sapevt from a remote host, read **SAP Note 374379**: *Triggering SAPEVT from a remote host*.

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Exercise 25: Event-Dependent Jobs

Exercise Objectives

After completing this exercise, you will be able to:

- Schedule event-dependent jobs
- Define and trigger events

Business Example

The administrator schedules background jobs and monitors the correct process of the system's background processing.

Task: Events and Event-Dependent Jobs

Create events and jobs that await the triggering of the respective event.

1. Create a customer event **`EVENT_##`**.
2. Copy the job *TIME-##* that you created in a previous exercise to **`EVENT-##`**.

   Note: If there is no job *TIME-##* in your system, you can also copy a different job or create a new one.

3. Schedule the job *EVENT-##* periodically to the event *EVENT_##*.
4. Trigger the event *EVENT_##* in a new session using CCMS tools and refresh the job overview.
5. **(Optional)** Trigger the event *EVENT_##* at operating system level in your SAP system and refresh the job overview.

   Hint: If the name of the event you defined contains a blank character, you must specify the event in quotation marks when you call *sapevt*.

Result

Congratulations! You can now create and trigger events to start scheduled jobs at them.

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Solution 25: Event-Dependent Jobs

Task: Events and Event-Dependent Jobs

Create events and jobs that await the triggering of the respective event.

1. Create a customer event **`EVENT_##`**.
   a) Start transaction SM64.

   Caution: Do not change any system events.

   b) Choose *Create*.
   c) Under *Event* enter **`EVENT_##`**, and under *Description* enter any text. Do not select the *System* checkbox and *save* the event.
2. Copy the job *TIME-##* that you created in a previous exercise to **`EVENT-##`**.

   Note: If there is no job *TIME-##* in your system, you can also copy a different job or create a new one.

   a) Call transaction SM37 and enter the relevant data to view the job *TIME-##*.
   b) Select the job *TIME-##* and choose *Job* → *Copy*.
   c) Enter **`EVENT-##`** as the *new job name* and choose *Copy*.
3. Schedule the job *EVENT-##* periodically to the event *EVENT_##*.
   a) Call transaction SM37 and enter the relevant data to view the job *EVENT-##* (display jobs with the status *Sched.*).
   b) Select the job *EVENT-##* and choose *Release*.
   c) Choose the *After Event* pushbutton and select the *event EVENT_##*. Leave the *Parameter* field empty and select the *Periodic Job* checkbox. *Save* the release.
   d) If the system does not display the job *EVENT-##* in the job overview after its release, you must change the entries on the initial screen of transaction SM37: In the Job Start Condition area under *or after event*, select *EVENT_##* (or also*).

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4. Trigger the event *EVENT_##* in a new session using CCMS tools and refresh the job overview.
   a) Start the transaction SM64 and select your event *EVENT_##*.
   b) Choose *Trigger*, leave the *Parameter* field empty, and choose *Trigger* again.
   c) After you have *refreshed* the job overview, the job *EVENT-##* should have run successfully and been rescheduled.
5. **(Optional)** Trigger the event *EVENT_##* at operating system level in your SAP system and refresh the job overview.

   Hint: If the name of the event you defined contains a blank character, you must specify the event in quotation marks when you call *sapevt*.

   a) If you have not already done so, log on to your SAP system at operating system level.
   b) Open a *Command Prompt* ("DOS box").
   c) Execute the following command: **`sapevt event=EVENT_## name=<SID> mshost=twdfXXXX.wdf.sap.corp`**, where ## stands for your group number, <*SID*> for your system name (DEV or QAS), and *XXXX* for the server number (for example: **`sapevt event=EVENT_00 name=DEV mshost=twdf0042.wdf.sap.corp`**).
   d) Take a look at the trace file *dev_evt* that was created in the current directory (either with *SAPpad* or the command **`more dev_evt`**). You will find the last (newest) entries at the end of this file.
   e) After you have *refreshed* the job overview, the job *EVENT-##* should have run successfully and been rescheduled.

Result

Congratulations! You can now create and trigger events to start scheduled jobs at them.

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Lesson Summary

You should now be able to:

- Schedule event-dependent jobs
- Define and trigger events

Related Information

SAP Notes:

- 104574 - *Error when starting server: rdisp/btcname is not defined*
- 802172 - *sapevt (Version 4): Release-independent version*
- 1021079 - *Event history*
- 1038669 - *Background jobs with start condition 'Event' do not start*

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Lesson: Background Processing: Further Topics

Lesson Overview

In this lesson, you learn about further, special functions for background processing.

Lesson Objectives

After completing this lesson, you will be able to:

- Use additional, special functions of background processing

Business Example

You want to use the background processing resources more efficiently.

Reservation for Class A Jobs

In normal operation, every background work process processes jobs of every priority.

You can, however, reserve as many of the configured background work processes as desired for high priority jobs, that is, class A jobs. The reservation of work processes for class A jobs does not reserve any particular work processes. Rather it ensures that a particular number of work processes is always kept free. Jobs in job classes B and C can only be started if the defined number of work processes for possible class A jobs remains free.

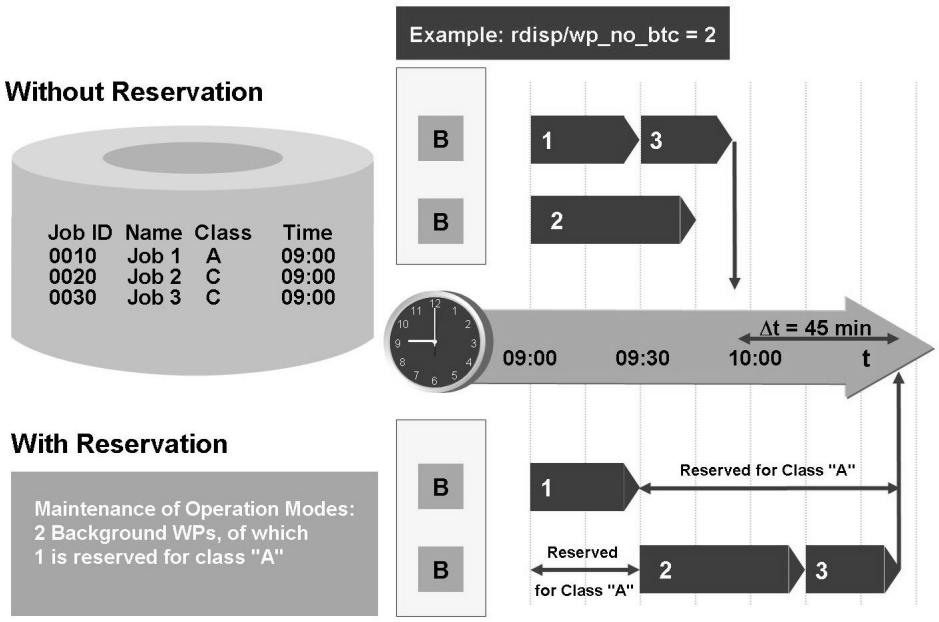

Figure 129: Reservation for Class A Jobs

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To set the number of reserved background work processes for class A, you can define an operation mode in transaction RZ04 (maintenance of operation modes and instances) and maintain the work process distribution for this operation mode.When doing so, you have the option of reserving work processes.

If the class A workload is small, or bottlenecks rarely occur in background processing - in other words, at least one background work process is usually free - there are probably no advantages to reserving a work process for class A jobs. In this case, reservation will simply mean that a work process is seldom used.

We recommend that you do not reserve more than one background work process for processing class A jobs for each instance. For each system, it is usually sufficient to reserve one background work process for processing class A jobs.

Execution Targets

Only instances with background work processes or a **job server group** can be used to specifically schedule a background task.

A job server group contains one or more instances with available background work processes. Groups of this type can be used in the same way as logon groups for dialog users. It is also possible to process background tasks from different applications on selected instances.

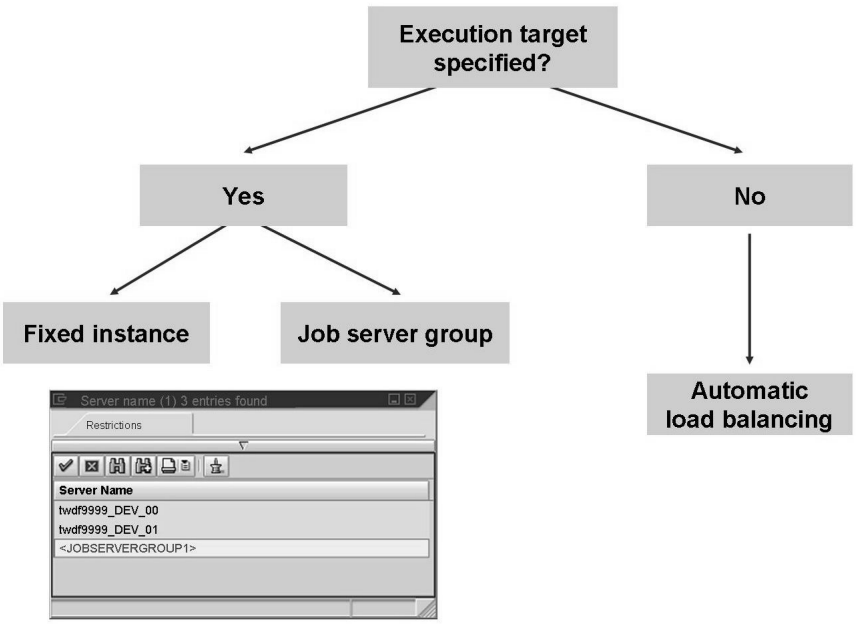

Figure 130: Execution Targets and Job Server Groups

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You can set up a job server group in transaction SM61 (menu path: *Tools → CCMS → Background Processing → Background Objects*). To do this, call the transaction and then choose the *Job Server Groups*. You can then define your job server group and assign your instances.

Background Users

With the classic definition of jobs using transaction SM36, you can assign each step of the job to a user (see the figure). The specified user is used for the authorization checks during the execution of the step. By default, the name of the logged-on user appears in this field, and your job is performed using your authorizations. Enter a different user name, if your job should not be performed using your own authorizations. To be able to do this, you must, however, have the appropriate authorization (authorization object *S_BTCH_NAM*) to enter names other than your own in the *User* field.

Figure 131: Background Users

It is useful to set up background users for various work areas that have the necessary authorizations for the required activities, and that can be used by users with the same authorizations to schedule background tasks in this work area (such as for system administration). Background users have user master records that are specifically intended for background processing authorizations.

Use the *System* user type when creating background users. A dialog logon with a user of this type is not possible. In the same way, users of this type are exempt from the usual settings for the validity period of a password. The password can only be changed by user administrators using transaction SU01 (*Users → Change Password*).

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When using the Job Wizard to define a job, the name of the user who is logged on is included in the authorization check for each step.

Using External Programs

The background processing system differentiates between external commands for normal users and external programs for system administrators. The purpose of this differentiation is to give system administrators the ability to run any required external program, while normal users are restricted to external commands for which there are authorization checks. In both cases, the program *sapxpg* is called at operating system level. sapxpg then starts the relevant program at operating system level.

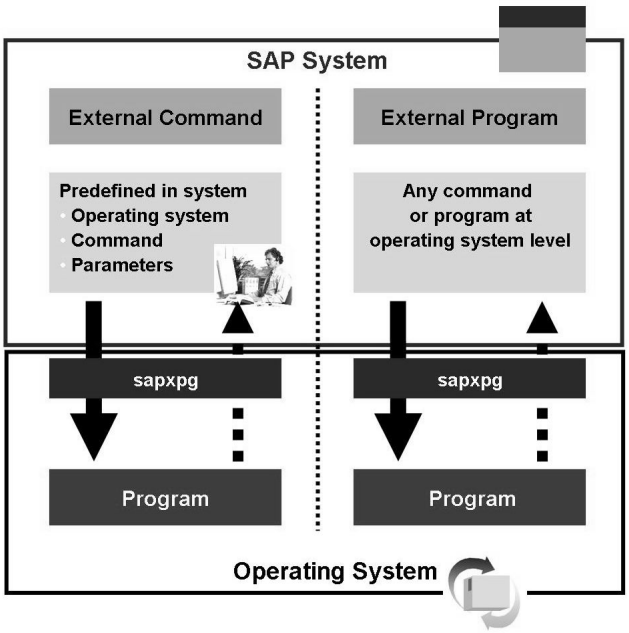

Figure 132: Using External Programs

External commands are host system commands or programs predefined in the SAP system by an administrator. They are protected by authorizations so that normal users can only schedule the commands for which the system administrator has assigned them the authorization. You can, therefore, provide functions outside the SAP system, at operating system level, for users of the SAP system.

External programs are unrestricted commands that are neither predefined nor restricted by authorizations. A user with administration authorization can enter any external program in a job step. No SAP authorization check is performed before the execution of the command. External programs provide an administrator (user with administration authorization for external commands (authorization

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object *S_RZL_ADM*: Background Processing: Background Administrator)) the flexibility to run any required host system command in the SAP system without administrative preparation.

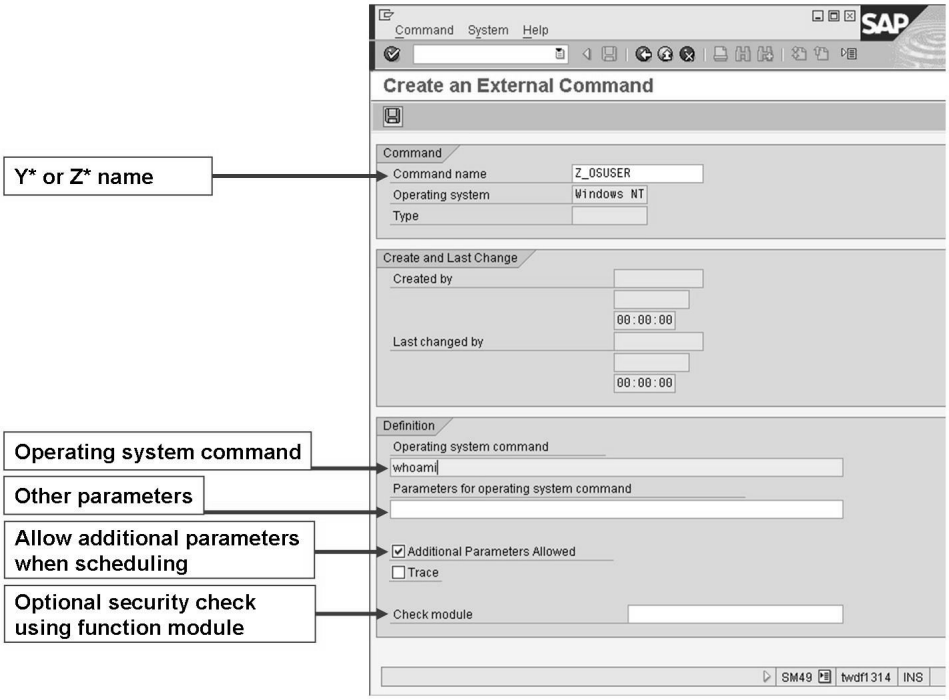

Figure 133: Definition and Use of External Commands

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The creation of external commands requires the following steps:

1. Call the transaction SM69 (*Tools → CCMS → Configuration → Display/Change External Commands)*.
2. Choose *Create*.
3. Make entries for the new command.
   - External commands are uniquely identified with a name (beginning with Y or Z) and an operating system type. The *Type* field fills automatically.
   - Specify an executable operating system command (if required with the complete path) and specify any additional required or optional parameters.
   - Select the *Additional Parameters Allowed* checkbox if users are allowed to specify additional parameters when they execute the external command later or schedule it in a job. The additional parameters are added to parameter strings that may already be specified under *Parameters for Operating System Command*.
   - The *Trace* field should usually be left blank. To follow the execution of an external command, use the trace parameter for the function module *SXPG_COMMAND_EXECUTE*.
   - If you have defined an additional authorization check, enter the name of the function module that performs the check in the *Check Module* field. This is usually a customer copy of the function module *SXPG_DUMMY_COMMAND_CHECK*. The system calls the function module automatically if a user tries to execute the external command or schedule it in a job.
4. Choose *Save*. To return to the command overview, choose *Back* ( ).

Control Flags

You can make specifications about the task and other runtime options using control flags. You do not normally need to change the default values.

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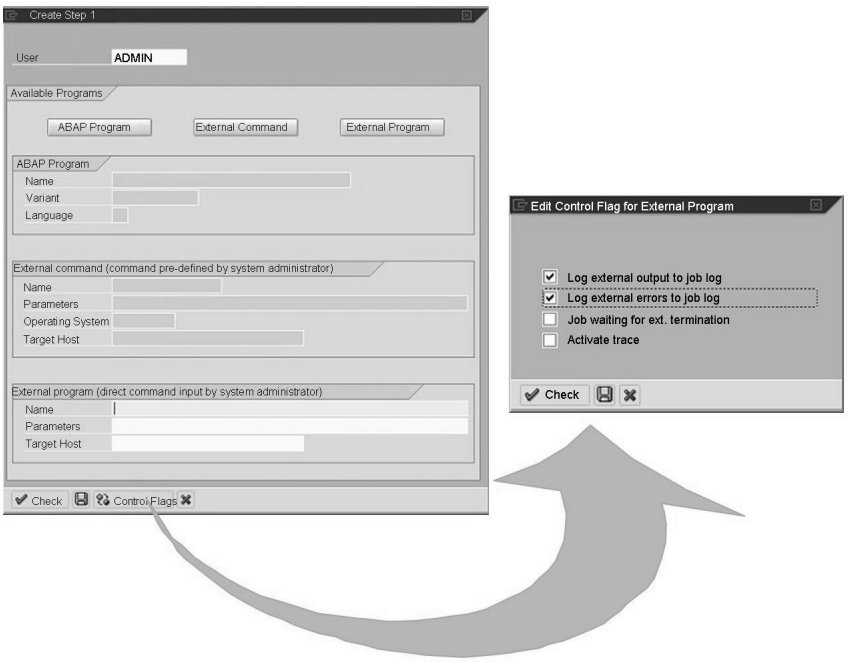

Figure 134: Control Flags for External Programs/Commands

You can, for example, specify:

- Whether the process is to be logged. The output data is written to the log as it is output by the external program. The language can differ here from your logon language. You can also call additional information about the data of an external program in the job log.
- How the SAP control program should end and whether the external program triggers an event. After you have started service programs with the background processing system (such as daemons in UNIX systems), they remain active after the start. They are not ended and do not return to the SAP background processing system, as is the case with other programs. If you start a service program, you should not use the control flag setting *Job waiting for ext. termination* when scheduling the job.

You can use the F1 help to display additional information about the meaning of the control flags on the *Edit Control Flags for External Programs* screen.

Extending the Standard

The job scheduling options described in the previous lessons do not cover all possible requirements. You can implement more complex scenarios in the following ways:

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The SAP system has various internal function modules that support you when defining your own job processes. These function modules are in the function groups *BTCH* and *BTC2*. You can define any complex scenarios with the help of these function modules.

SAP provides a set of interfaces that enable other system management environments to be connected to the SAP Computing Center Management System (CCMS):

- The eXternal Monitoring Interface API (XMI-API) interface logs the activities of external users and programs.
- The eXternal interface for Background Processing (XBP-API) interface allows the use of external job scheduling programs.

With these tools, you can schedule background jobs beyond the boundaries of the SAP system and include non-SAP systems.

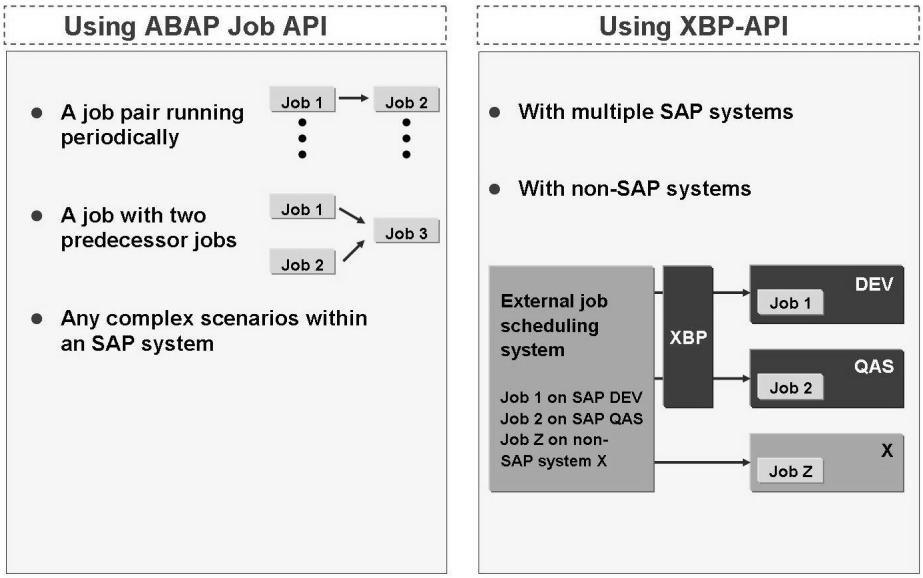

Figure 135: Extending the Standard

For a list of certified solutions, see the software category *Job Scheduling* in the Software Partner Directory.

In addition to conventional, local SAP background processing (transactions SM36/SM37), you can use a job scheduler for cross-landscape background processing as of SAP NetWeaver 2004. Information about this cross-landscape job scheduler is available in the SAP Developer Network under the quick link /nw-scheduling https://www.sdn.sap.com/irj/sdn/nw-scheduling.

Furthermore, SAP Solution Manager 7.0 provides some central functions for job scheduling in the *Job Management* work center.

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Exercise 26: (Optional) Other Topics in the Area of Background Processing

Exercise Objectives

After completing this exercise, you will be able to:

- Check whether background work processes for class A jobs have been reserved
- Create external commands
- Schedule external commands and external programs as jobs

Business Example

The administrator schedules jobs and monitors the system's background processing to ensure that it is running correctly.

Task 1: Reservation for Class “A” Jobs

Check the current setting for reserving background work processes for class “A” jobs.

1. Find out if background work processes are reserved for class “A” jobs in your system.

Task 2: External Programs and External Commands

Create a job chain, external programs and external commands as a job step.

1. Use the transaction SM36 (without the wizard) to create a job with the following characteristics:

Job Name	**`EXT-PROG-##`**
Job Class	*A*
Target Server	<central instance>
1. step	Program **`whoami`**
Start Condition	Event *EVENT_##*
Period	None

2. **(Optional)** Create an external command **`Z_OSUSER_##`** that executes the operating system command **`whoami`**.
3. Use the transaction SM36 (without the wizard) to create a job with the following characteristics:

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Job Name	**EXT-CMD-##**
Job Class	*C*
Target Server	Leave empty
1. step	Command *Z_OSUSER_##* or *ZKERNEL*
Start Condition	After Job *EXT-PROG-##*
Period	none

4. Trigger the event *EVENT_##* in a new session using CCMS tools and refresh the job overview.

Result

Congratulations! You can now create external commands and schedule external programs as job steps.

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Solution 26: (Optional) Other Topics in the Area of Background Processing

Task 1: Reservation for Class “A” Jobs

Check the current setting for reserving background work processes for class “A” jobs.

1. Find out if background work processes are reserved for class “A” jobs in your system.

   a) You can only check whether you have defined background work processes for jobs of job class A using transaction RZ04 (Maintain Operation Modes and Instances). Choose *Instances/Operation Modes* there and check column *BPA*.

Task 2: External Programs and External Commands

Create a job chain, external programs and external commands as a job step.

1. Use the transaction SM36 (without the wizard) to create a job with the following characteristics:

Job Name	**`EXT-PROG-##`**
Job Class	*A*
Target Server	<central instance>

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1. step	Program **whoami**
Start Condition	Event *EVENT_##*
Period	None

a) Start transaction SM36.

b) Under *Job Name*, enter **EXT-PROG-##**.

c) For the *Job Class*, select *A*.

d) Choose *Step*. Choose *External Program*. Enter the specifications for the step that are listed in the task and choose *Save*.

Note: You can analyze the *control flags* here – retain the default values.

Then choose *Back* ( ).

e) Choose *Start Condition*. Choose *After Event* and select *EVENT_##*. Leave the *Parameter* field empty, do not select the *Periodic Job* checkbox, and choose *Save*.

f) Finally, on the initial screen of transaction SM36, choose *Save* **once**.

2. **(Optional)** Create an external command **Z_OSUSER_##** that executes the operating system command **whoami**.

a) Start transaction SM69.

b) Choose *Create*.

c) Under *Command Name*, enter **Z_OSUSER_##**, and under *Operating System Command*, enter **whoami**. Do not change the other default values and *save* the command.

You could also go *back* to the overview and *execute* your command to test it.

3. Use the transaction SM36 (without the wizard) to create a job with the following characteristics:

Job Name	**EXT-CMD-##**
Job Class	*C*
Target Server	Leave empty

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1. step	Command *Z_OSUSER_##* or *ZKERNEL*
Start Condition	After Job *EXT-PROG-##*
Period	none

a) Call transaction SM36.

b) Under *Job Name*, enter **`EXT-CMD-##`**.

c) Choose *Step*. Select *External Command*. Make the entries for the step that are specified in the task. Under *Operating System*, select *Windows NT* and choose *Save*.

Note: You can analyze the *control flags* here – retain the default values.

Then choose *Back* ( ).

d) Choose *Start Condition*. Choose *After Job* and under *Name*, enter **`EXT-PROG-##`**. Then choose *Save*.

e) Finally, on the initial screen of transaction SM36, choose *Save* **once**.

4. Trigger the event *EVENT_##* in a new session using CCMS tools and refresh the job overview.

a) Start the transaction SM64 and select your event *EVENT_##*.

b) Choose *Trigger*, leave the *Parameter* field empty, and choose *Trigger* again.

c) After you have *refreshed* the job overview, the jobs *EXT-PROG-##* and *EXT-CMD-##* should each have run once successfully.

Result

Congratulations! You can now create external commands and schedule external programs as job steps.

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Lesson Summary

You should now be able to:

- Use additional, special functions of background processing

Related Information

SAP Notes:

24092 - *Distribution of background jobs on application server*

101146 - *Batch: Authorization object S_BTCH_JOB, S_BTCH_NAM*

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Lesson: Job Scheduling with SAP Central Process Scheduling by Redwood

Lesson Overview

In this lesson the new event-based job scheduling capability of SAP NetWeaver is introduced. You will learn which advantages SAP CPS offers in comparison to the job scheduling functionality in CCMS.

Lesson Objectives

After completing this lesson, you will be able to:

- Explain how to use SAP Central Process Scheduling by Redwood
- Name the most important features of SAP CPS

Business Example

In every system landscape you have the need to run and monitor background processes. SAP Central Process Scheduling by Redwood is the new central scheduling tool that is integrated in SAP NetWeaver as of SAP NetWeaver 7.0.

SAP Central Process Scheduling by Redwood

The SAP Central Process Scheduling application by Redwood (SAP CPS) is a solution that centrally manages and orchestrates the underlying processes that need to take place across multiple applications and organizations. It supports event-driven and dynamic processes by automatically monitoring your environment and starting or managing processes and process chains. It offers complete, centralized management of all business processes, including scheduled or batch processes. It is seamlessly integrated with the native SAP management tools SAP NetWeaver and SAP Solution Manager and provides integration with SAP- and non-SAP applications.

In the graphic below you see the features SAP CPS offers in the free-of-charge version on the one hand and in the full version (at cost) on the other hand. Main differentiators between the basic and the full version are event-driven job scheduling, the job handling on OS level and the ability to run jobs or job chains across systems.

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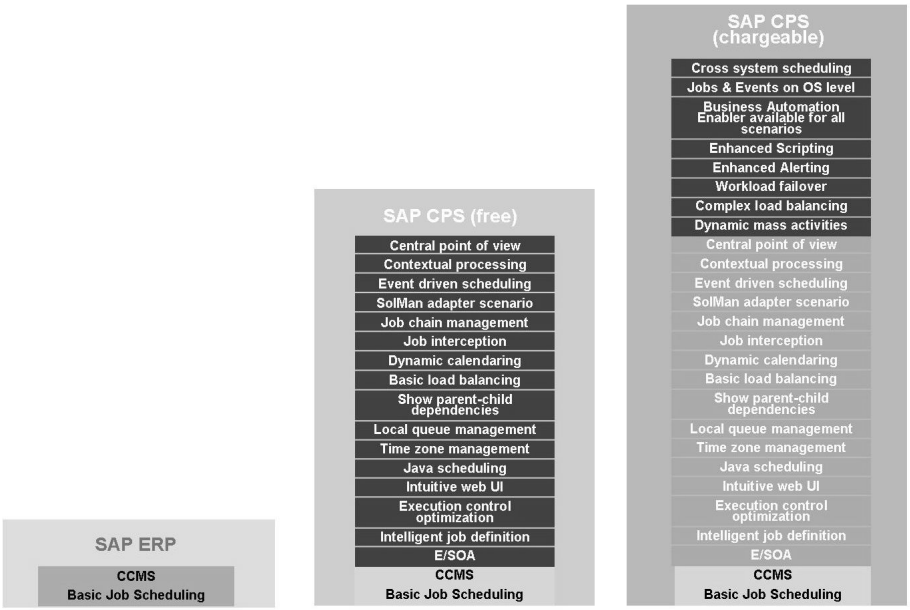

Figure 136: Features of SAP CPS - Comparison of Basic and full Version

In the figure below the technical architecture of SAP CPS is shown. SAP CPS is a Java application that runs on top of an SAP NetWeaver 7.0 AS Java and saves all its configuration data in the Java schema of the database (1). All SAP CPS related tables have the prefix “JCS_” in their name.

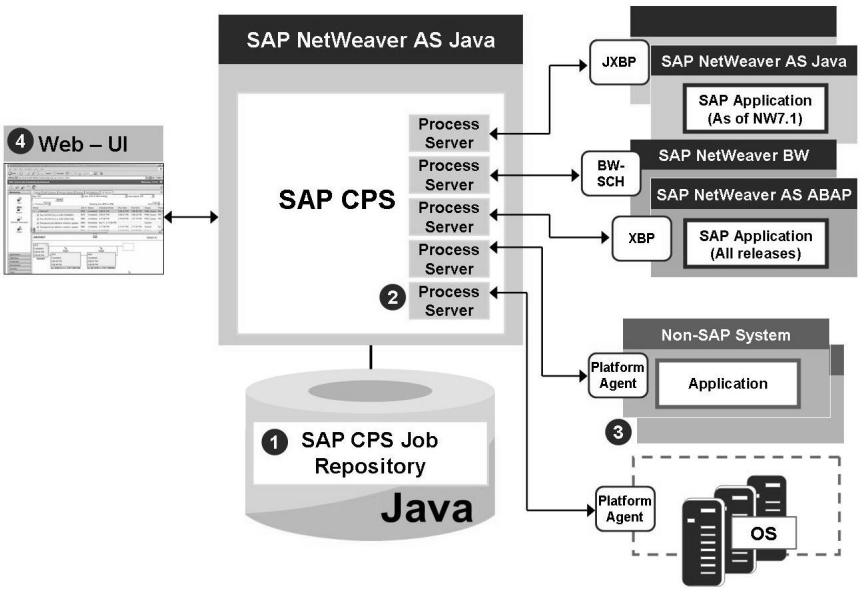

Figure 137: SAP CPS - Architecture

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The so called Process Servers (2) are RFC-Clients running within SAP CPS. Each Process Server can connect to exactly one RFC server. The appropriate interfaces XBP, BW-SCH, and JXBP are their counterparts on the connected remote systems.

If a non-SAP system has to be connected, an RFC server is required on that remote host. On these systems the so called Platform Agent (3) has to be installed to enable SAP CPS to connect to them.

To access SAP CPS a Web UI (4) is used, which can be opened in a browser.

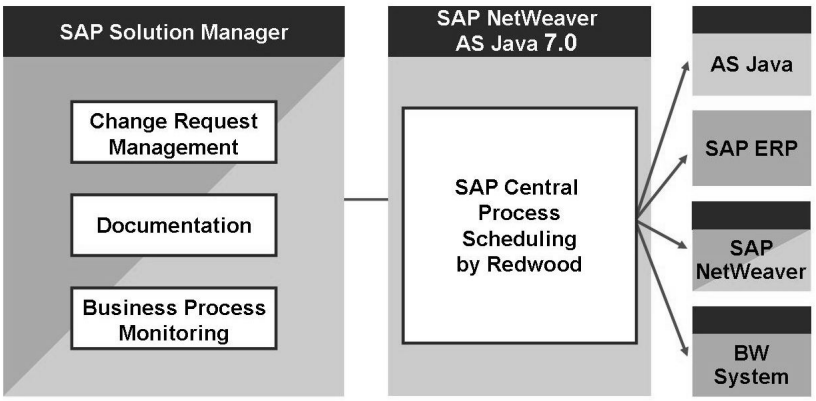

Figure 138: Central Process Scheduling by Redwood Integration with SAP Solution Manager

SAP Solution Manager and SAP CPS interact by using the Application Scheduling API. The request of a job can be managed by SAP Solution Managers Change Request Management process. Job descriptions can be kept centrally in SAP Solution Manager. Job status results can be analyzed and presented in SAP Solution Managers Business Process Monitoring.

For details on how to install and customize the Process Scheduling Adapter see *http://service.sap.com/rkt → SAP Solution Manager → SAP Solution Manager Extensions → Process Scheduling Adapter for SAP Solution Manager*.

Working with SAP CPS

SAP CPS is an application, which has to be deployed with the Software Deployment Manager. With the deployment, the three actions

- Redwood.com/Scheduler/AccessScheduler
- Redwood.com/Scheduler/ManageScheduler
- Redwood.com/Scheduler/ManageSchedulerIsolation

are available in UME. To grant administration access to the scheduler, you need to define a UME role with both actions or assign those actions to an existing role. With a user having the assigned actions you can start the scheduler in a Web Browser with the URL http://<host>:<http port>/scheduler.

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Working with the basic version of SAP CPS, you can only deal with one system per logon. Every system of the system landscape needs a so called isolation group with assigned users. This means, as a first step you have to create the isolation groups and assign the users that are allowed to schedule jobs on this system.

Hint: You have to add your own user to the isolation group, too, if you want to schedule jobs on this system.

After you have created the isolation group you have to log off and log on again to get into the isolation group. Now create the SAP system in the isolation group.

1. From the navigation bar, choose *Environment → SAP Systems*
2. From the context menu, choose *New*.
3. Make the following settings:
   - RFC Connect String **`ASHOST=<full hostname, e.g. twdfxxxx.sap.corp> SYSNR=<instance_number> TRACE=0`**
   - J2EE URL: http://<j2ee host:http port>
   - Default timezone: Europe/Berlin (enter eu and wait for the system to give a preselection)
4. Test the connection.
5. Switch to the XBP tab and click *New*.
6. Make the following settings:
   - Client of connected system
   - RFC user
   - password
   - Mark the *Enabled* checkbox
   - Mark the *Default Client* checkbox
7. Check the Connection Settings. Select *Save and Close*.

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Once the system is created, CPS automatically creates a process server for the system and a job queue. For the process server you have to enter additional parameters.

1. From the navigation bar, choose *Environment → Process Servers*
2. A process server has been created with name >system>_ProcessServer. Select it and choose *Edit* from the context menu.
3. On the *Parameters* tab, click *New* and select **`SAP_EnableRfcServer`**. As a value, enter **`true`**.
4. Save and close.
5. Start the process server: Select the process server, and from the context menu choose start. As soon as the Process Server is running, a connection to the system is established. You can have a look in TA SM59, TCP/IP connections: cronacle-<ID>@SAP:<SID>-<instance_nr.>, created by user CPSCOMM.

Now you can start to run jobs with SAP CPS.

Create and Schedule a Job

You have several options to create jobs in SAP CPS:

- Start from the *Submit Job* button in the top level navigation and select a job definition (template) there or manually script a job
- Start from the navigation bar *Definitions → Job Definitions*, choose a job definition and select *Submit* from the context menu
- Create a job chain (with help of a graphical display) and choose *Definitions → Job Chains*

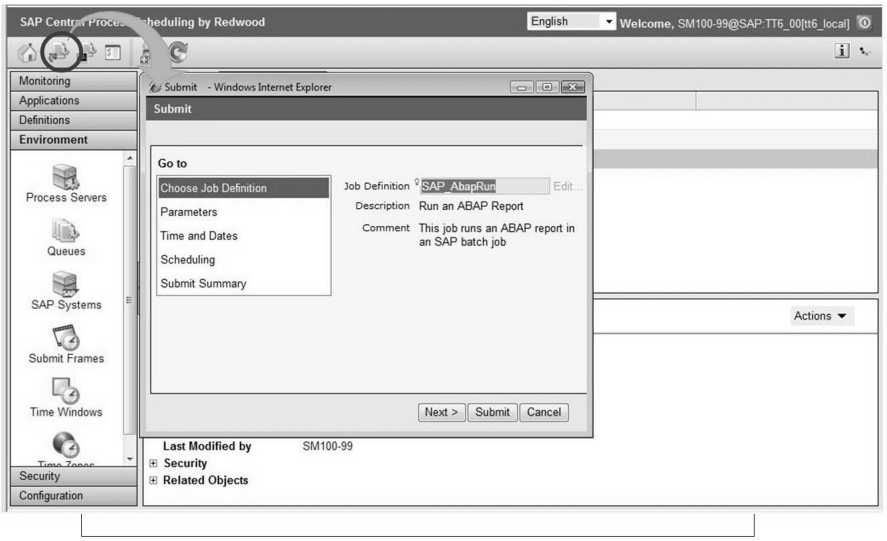

Figure 139: Create and Schedule a Job

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You can observe the job in the job monitor under *Monitoring → Jobs*. From the detailed view of each job you can open the logs and output file, if applicable. You can even reschedule the job from the monitoring view, selecting *Schedule → Resubmit* from the context menu.

For a complete overview of the functionality and features of SAP CPS refer to the **Administration Guide** you can open with a click on the info button in the top level navigation.

Create and run Job Chains

A job chain executes one or more job definitions (job definition jobs) in parallel or sequentially. The job definition jobs are grouped into steps. All jobs in a step are executed simultaneously (parallel processing). The process server waits until all jobs in a step get a final job status before proceeding with the next step (sequential processing).

The main advantage over the core CCMS functionality is that steps can be skipped or restarted based on the final status of a step using Status Handlers. Job chains have two levels of status handlers, on the step level and on the job chain level: When no status handler is found on the step level, the status handler on the job chain level is used. When there is none on the job chain level either, then the default behavior is used.

The default behavior is the following:

- When a step has reached status completed the following step is started or, when this is the final step, the chain status is set to completed.
- When a step has reached status error the job chain status is set to error.
- When a step has been canceled the job chain status is set to error.

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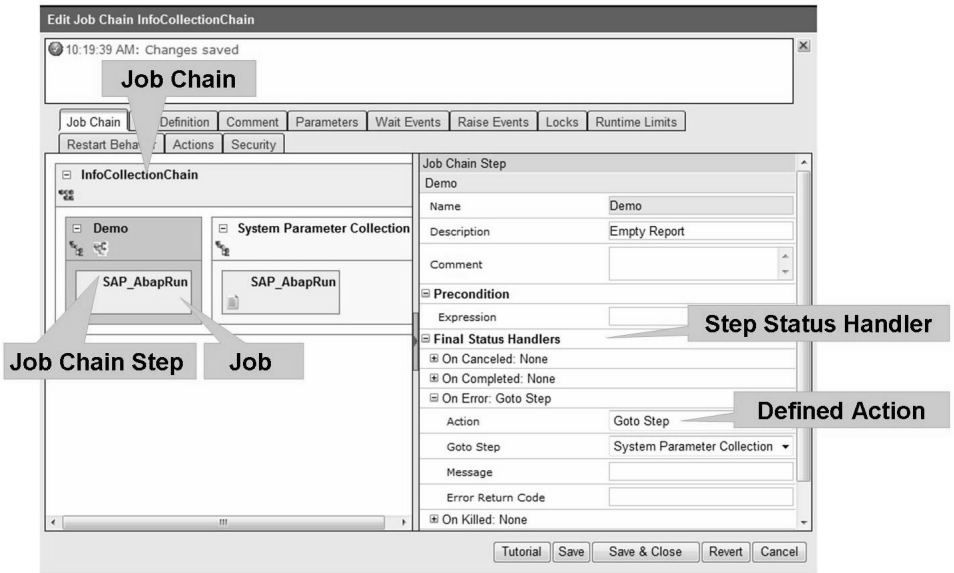

Figure 140: Create a Job Chain with Step Status Handler

Status handlers overrule the default and set the step or chain to a preselected status or take distinct actions if a certain status is reached. The following actions are available:

- Goto Step - to go to another step within the job chain
- Raise Error - To raise an error by returning the Return Code
- Mark Completed - To change the status of the step to completed (independent from the actual result)
- Restart Step - To restart the current step
- Restart Chain - To restart the chain
- Request Restart - Creates an Operator Message in case of an error and asks for a manual restart of the job chain
- Continue - To continue with the processing of the chain

Event based Scheduling

In SAP CPS, jobs and job chains cannot only be triggered by entering a start time and a period. It is a lot more effective to start jobs based on their dependencies to other jobs, for example as soon as data has been transferred by a predecessor job. This can be done by events:

- A Raise Event that is added to a job/job chain starts a new job/job chain under the status you have defined
- A Wait Event that is added to job/job chain makes this job waiting for the event to be raised (by the assigned job or manually)

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Events allow the creation of complex dependencies, as they can be raised and cleared by completed jobs. As long as one or more events are not raised a job waiting on those events will not start. This guaranties that a job will not start unless all conditions are met for it to start.

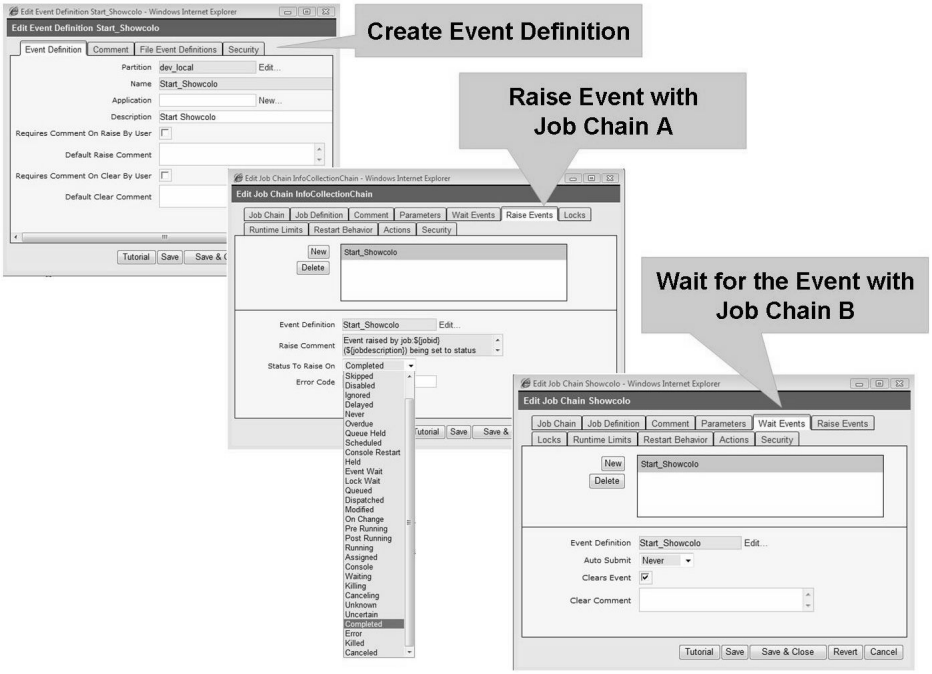

Figure 141: Create a Dependency between to job chains with an Event

If you want to work with events, you first have to create event definitions.

1. Choose *Definitions* → *Event Definitions* from the navigation bar.
2. From the context menu choose *create* and enter an event definition and a description. Save and close.
3. Assign the event to job chains. You do this by editing the job chain.
4. Edit the job chain and go to the tab Raise Event if you want to add an event that starts another job chain.
5. Select the event from the dropdown list and select the status in which the event shall be raised. Save and close.
6. Add the same event as a wait event to the job chain you want to make dependent from the first one.
7. Submit the job chain with the wait event. The job now waits for the event to be raised.

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Import Jobs from the ABAP System

If you want to run and control background jobs you have previously submitted in your SAP system via transaction SM36 now by SAP CPS, you can use the function **ImportCCMSJobs**. You can import CCMS job steps as separate job definitions or just make the job chains use the SAP_AbapRun job definition; the latter keeps the number of job definitions in SAP CPS low and allows you have a better overview. The downside is that you cannot easily schedule a step on its own without filling in the parameters yourself or submitting the job chain with steps disabled.

To import your CCMS jobs from an SAP System:

1. Choose *Definitions* → *Job Definitions* and locate the job definition SAP_ImportCCMSjobs.
2. From the context menu, choose Submit.
3. Fill in the corresponding information in the tabs *Parameters* and *Generation Settings*.

   The following fields are mandatory on the *Parameters* tab:

   - SAP System
   - SAP Client
   - SAP Job Name

   The following fields are mandatory on the *Generation Settings* tab:

   - Name for the generated job definition
   - Overwrite existing job definitions?
   - Application
   - Create a job definition for each step?
   - Add step numbers to SAP job names?
   - Retrieve joblog?
   - Retrieve spoollist?
   - Delete job when finished?
4. Choose scheduling on the left-hand side and choose the queue belonging to the SAP System.
5. Choose Submit.

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Exercise 27: Job Scheduling with SAP CPS

Exercise Objectives

After completing this exercise, you will be able to:

- Create an isolation group for your user and assign the SAP system.
- Create and submit a job chain with Status Handler.

Business Example

To use the basic version of SAP CPS you have to create an isolation group for each system you want to schedule jobs in.

Hint: In this exercise you use your system as central job scheduling system to schedule a job in the system of your partner group. That means the DEV group is using their SAP CPS to schedule a job in System QAS and vice versa.

Task 1: Isolation Group and System Connection

Create an isolation group in SAP CPS and assign your user and your system to it.

1. Open the SAP CPS browser with the URL http://twd-fxxxx.wdf.sap.corp:<Java_CI_http_port>/scheduler, for example http://twdf9999.wdf.sap.corp:50000, and log on with your user <CourseID>-##. Create an isolation group and add your user to the isolation group.
2. In the new isolation group create the SAP system entry for a remote system.

Result

You successfully connected an SAP system to SAP CPS.

Task 2: Job Chain

Create and submit a Job Chain with Status Handler

1. Create a Job Chain with name JobChain##.
2. Assign a Step Status Handler to Step 1.
3. Submit the Job Chain and monitor the processing of the Job Chain.

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Solution 27: Job Scheduling with SAP CPS

Task 1: Isolation Group and System Connection

Create an isolation group in SAP CPS and assign your user and your system to it.

1. Open the SAP CPS browser with the URL http://twd-fxxxx.wdf.sap.corp:<Java_CI_http_port>/scheduler, for example http://twdf9999.wdf.sap.corp:50000, and log on with your user <CourseID>-##. Create an isolation group and add your user to the isolation group.

   a) After logging on you may need to first create a license. To do this enter **SAP AG** as *Company Name* and choose *Activate Free of Charge License*.

   b) As you work with a basic version of SAP CPS, you have to create an isolation group (scheduling can only be set up and administered in one system per logon). In the navigation bar, select *Security → Isolation Group*. From the context menu, choose *New*. Create the isolation group **<SID>_##**, for example **DEV_06**. Save and close.

   c) Select the isolation group and choose *Import Users* from the context menu. Search for your user <CourseID>-## and import the user.

2. In the new isolation group create the SAP system entry for a remote system.

   a) Log off from the scheduler and log on again. You are directed to the newly created isolation group. (If you create more than one isolation group, you can select the isolation group from a list of all groups your user is assigned to.)

   b) From the navigation bar, choose *Environment → SAP Systems*

      From the context menu, choose *New*.

      Make the following settings:

      - *Name*: **<SID>##_<host_name>**, for example **QAS03_twdf9999**.
      - *RFC Connect String*: **ASHOST=<full_host_name> SYSNR=<central_instance_nr.> TRACE=0**, for example **ASHOST=twdf9999 SYSNR=10 TRACE=0**
      - *J2EE URL*: **http://<full_host_name>:<CI_Java_http_port>**, for example **http://twdf9999.wdf.sap.corp:51000**
      - *Default Job Time Zone*: *Europe/Berlin* (enter **eu** and wait for the system to give a preselection)

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Test the connection.

Switch to the *XBP* tab and click on *New*.

Make the following settings:

- *Client Number*: **100**
- *Username*: <provided by instructor>
- *Password*: <provided by instructor>
- Mark the *Enabled* checkbox
- Mark the *Default Client* checkbox

Check the Connection Settings. Select *Save and Close*.

Once the system is created, CPS automatically creates a process server for the system and a job queue. For the process server you have to enter additional parameters:

From the navigation bar, select *Environment* → *Process Servers*

A process server has been created with name <SystemName>_ProcessServer. Select it and choose *Edit* from the context menu.

On the *Parameters* tab, click on *New* and select **SAP_EnableRfcServer**. As a value, enter **true**.

Save and close.

Result

You successfully connected an SAP system to SAP CPS.

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Task 2: Job Chain

Create and submit a Job Chain with Status Handler

1. Create a Job Chain with name JobChain##.

   a) From the navigation bar, choose *Definitions → Job Chains*. From the context menu choose *New*. In the new window click on the rectangle with the job chain symbol. This leads to a display of the job chain details. Enter the name for the job chain **`JobChain##`** and select the queue <SystemName>_Queue.

   b) Click on the rectangle and select *Add Step* from the context menu. Add a name, e.g. Step 1, and description for the step. Click on the step rectangle and select *Add Job* from the context menu. Click in the *Job Definition* field and select *SAPAbapRun* from the list. Make the following entries:

      - Scheduling - Queue: <SystemName>_Queue
      - Input Parameters:
        - SAP System - Expression: <IsolationGroup>.<System-Name>
        - SAP Client - Expression: 100
        - SAP Job Name - Expression: DEMOJOB##_1
        - ABAP Program - Expression: RSDEMO03

   c) Click on the Job Chain rectangle and select *Add Step* from the context menu. Add a name, e.g. Step 2, and description for the second step. Click on the step rectangle and select *Add Job* from the context menu. Click in the *Job Definition* field and select *SAP_AbapRun* from the list. Make the following entries:

      - Scheduling - Queue: <SystemName>_Queue
      - Input Parameters:
        - SAP System - Expression: <IsolationGroup>.<System-Name>
        - SAP Client - Expression: 100
        - SAP Job Name - Expression: DEMOJOB##_2
        - ABAP Program - Expression: RSPFPAR
        - ABAP Variant - Expression: SAP&SPOOL

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2. Assign a Step Status Handler to Step 1.

   a) Go back to Step 1. Under *Final Status Handlers* open *On Error* and make the following entries:

      - Action: Go to Step
      - Go to Step: Step 2

      Save and Close.

3. Submit the Job Chain and monitor the processing of the Job Chain.

   a) In the Job Chain Definitions view, click on your new job chain and select *Submit* from the context menu. Leave the default settings and choose *Submit*. Open the Job Monitor and refresh the list. Now you see your job chain running.

Result

Although one of the jobs in the job chain has failed, the whole job chain is processed and end with status Completed. The status handler allows for overwriting statuses on step level and sets rules how to proceed within the job chain if certain conditions are met.

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Lesson Summary

You should now be able to:

- Explain how to use SAP Central Process Scheduling by Redwood
- Name the most important features of SAP CPS

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Lesson: Appendix: Job Management

Lesson Overview

This lesson gives you an overview of the Work Center Job Management.

Lesson Objectives

After completing this lesson, you will be able to:

- Use the Work Center Job Managemant to schedule and monitor background jobs

Business Example

You want to get a general survey about the jobs in your system landscape by using the work center Job Management.

Work Center: Job Management

The work center Job Management is the central access to all functions for documenting, scheduling, and monitoring background jobs. It comprises views to display and edit job requests, job documentation, scheduled jobs, and job alerts. You can perform typical tasks in job scheduling.

As a prerequesite to use this work center, a business partner is assigned to your system user.

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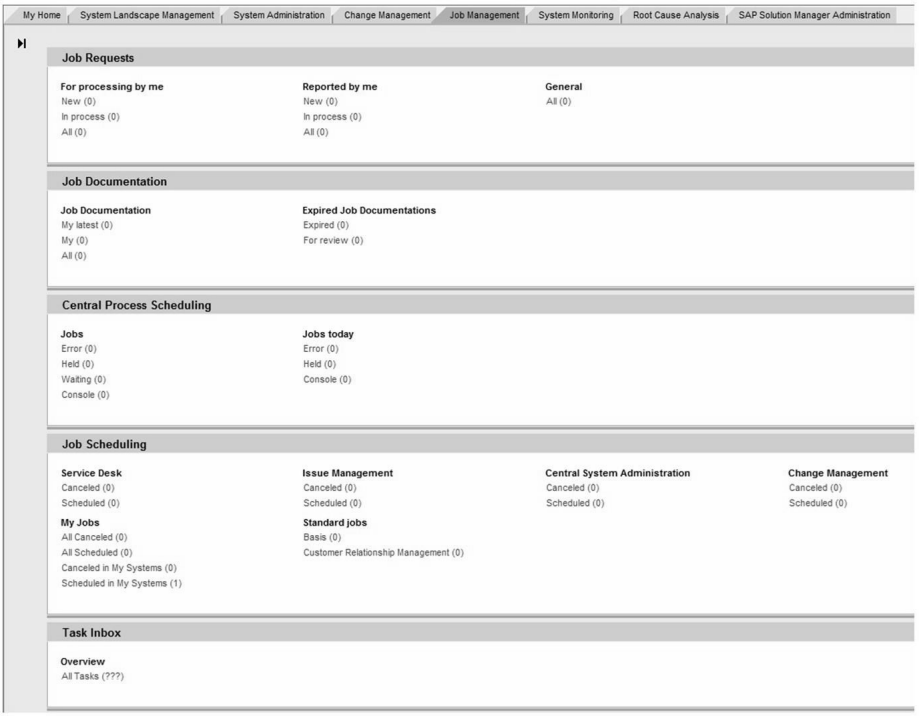

Figure 142: Work Center Job Management

The work center Job Management offers the following features;

Overview information

Overview information is available for the following views:

- Job requests
- Job Documentation
- Central process scheduling
- Job Scheduling
- Task Inbox

Job Requests

Job Requests are listed. You see:

- All job requests you created
- All job requests you are assigned to as processor
- All Service Desk messages from Job Monitoring that the system reports in the context of Business Process Monitoring

Job Documentation

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You get a list of job documentation. You can define queries and set filters to select data. When you select job documentation from the list, the system displays details of the job documentation below the list, for example, further information about the steps. To reach job documentation, select the job documentation and choose Display. If authorized, you can edit job documentation.

Job Monitoring

- Gives an overview about background jobs.
- Provides Job Analysis, Job Scheduling, Display of Job Logs, and the Job Documentation Overview
- SAP Central Process Scheduling by Redwood is integrated here as well.

Common Tasks

The following functions could be performed from any view in the work center:

- Create a Job Request for a new job.
- Create Job Documentation
- Call a template
- Analyze jobs
- Scheduling Jobs Directly
- Importing Jobs into Job Documentation

Job Scheduling Management

The Job Scheduling Management component enables you to do the following:

- Central and complete job documentation
- Management of jobs using, for example, the following standardized workflow:
- Scheduling of jobs (according to authorizations with or without release) centrally from the SAP Solution Manager system to connected SAP systems.
- You can import jobs from systems connected using SAP Solution Manager into job documentation.
- You can import jobs from job documentation into systems connected using SAP Solution Manager.
- You can monitor jobs and see in the analyses to which business processes and business process steps the job belongs.

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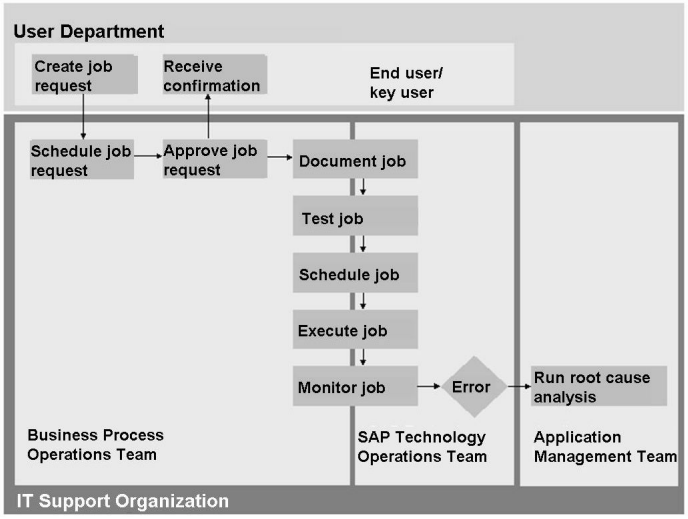

Figure 143: Workflow for Managing Jobs

Note: Additional information about the Job Scheduling Management standard is available under http://service.sap.com/supportofferings *SAP Support Offerings → Support Standards → Media Library → Job Scheduling Management* .

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Lesson Summary

You should now be able to:

- Use the Work Center Job Managemant to schedule and monitor background jobs

Related Information

- SAP Education Course SM100 - *SAP Solution Manager Operation and Configuration*

  SAP Library for SAP Solution Manager 7.0 EHP1, *SAP Solution Manager → Using the Work Center*

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Unit Summary

You should now be able to:

- Describe the uses of background processing
- Schedule and monitor jobs
- Schedule time-dependent jobs
- Schedule standard jobs
- Schedule event-dependent jobs
- Define and trigger events
- Use additional, special functions of background processing
- Explain how to use SAP Central Process Scheduling by Redwood
- Name the most important features of SAP CPS
- Use the Work Center Job Managemant to schedule and monitor background jobs

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Test Your Knowledge

1. A job contains one or more _____. An ABAP program or an _____ command or program can be executed in such a _____. A job can be triggered at a particular _____ or when a defined _____ occurs.
   Fill in the blanks to complete the sentence.

2. What status can a job have?
   Choose the correct answer(s).
   - □ A Running
   - □ B Released
   - □ C Waiting
   - □ D Finished
   - □ E Error
   - □ F Active

3. Which of the listed options for time-dependent scheduling of a job can be implemented with the standard resources of the SAP system?
   Choose the correct answer(s).
   - □ A Daily at 1500
   - □ B The second-last working day of every month
   - □ C Every nine days, but not on Sundays
   - □ D Only tomorrow at 2355
   - □ E Every year on April 1 at 0800

4. Which of the listed options for event-dependent scheduling of a job can be implemented with the standard resources of the SAP system?
   Choose the correct answer(s).
   - □ A Whenever the system switches to the *Night* operation mode
   - □ B After the job *Job1* has run successfully
   - □ C Whenever a particular event has been triggered
   - □ D Whenever the periodic job *Job2* has run successfully

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5. If one of the system's ten background work processes is reserved for class A jobs, and jobs are being processed in the other nine work processes, the reserved work process remains free even if a class A job is waiting for execution.

   Determine whether this statement is true or false.

   □ True

   □ False

6. If a user has authorization to schedule an external program as a step of a background job, he or she can run any operating system command.

   Determine whether this statement is true or false.

   □ True

   □ False

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Answers

1. A job contains one or more steps. An ABAP program or an external command or program can be executed in such a step. A job can be triggered at a particular time or when a defined event occurs.

   Answer: steps, external, step, time, event

   After the job is triggered, it is processed without interruption by a single background work process.

2. What status can a job have?

   Answer: B, D, F

   In addition to the three correct answers, a job could have the status *Scheduled*, *Ready*, or *Canceled*.

3. Which of the listed options for time-dependent scheduling of a job can be implemented with the standard resources of the SAP system?

   Answer: A, B, C, D, E

   You can implement all the options mentioned with standard AS ABAP tools.

4. Which of the listed options for event-dependent scheduling of a job can be implemented with the standard resources of the SAP system?

   Answer: A, B, C

   Option D cannot be implemented directly in the standard system. However, you can implement it as one of many additional possibilities (for example, by using function modules to enhance the standard).

5. If one of the system's ten background work processes is reserved for class A jobs, and jobs are being processed in the other nine work processes, the reserved work process remains free even if a class A job is waiting for execution.

   Answer: False

   The work processes that are reserved for class A jobs process class A jobs. The option to reserve work processes for class A jobs should only prevent all work processes being occupied with class B or C jobs.

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6. If a user has authorization to schedule an external program as a step of a background job, he or she can run any operating system command.

   Answer: True

   If you do not want, as an administrator, to assign this critical authorization, but want to enable your users to run a specific operating system command, you can define an external command in the SAP system.

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Unit 10

System Monitoring and Troubleshooting

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Unit Overview

This unit provides an introduction to system monitoring. You first learn about the basics of the monitoring architecture, and how to use the CCMS Alert Monitor. Later in the unit, you learn how to set up your own monitors, connect remote systems, and maintain threshold values. At the end of the *System Monitoring* section, two separate lessons introduce additional log and trace options in AS ABAP as well as a general troubleshooting method.

All of the content in this unit refers to the functions of ABAP-based SAP systems. You can find an introduction to monitoring Java-based SAP systems in the *ADM200 - Administration AS Java* training course. Other specialized training courses deal with this topic in more detail.

This unit presents the system monitoring functions exactly as they occur in all general AS ABAP-based SAP systems. SAP Solution Manager offers too many different system monitoring configurations to be covered in this training course alone. You can find this information (and much more) in the *SM100 - SAP Solution Manager Configuration for Operations* training course.

Unit Objectives

After completing this unit, you will be able to:

- Explain the concepts of the CCMS Alert Monitor infrastructure
- Use the CCMS Alert Monitor to monitor your system
- Integrate remote systems into the CCMS Alert Monitor
- Design and create your own monitors
- Set threshold values
- Name different trace options
- Perform simple traces in the SAP system
- Develop procedures for structured troubleshooting

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Lesson: Monitoring Architecture

Lesson Overview

This lesson provides an introduction to monitoring as a significant component of the Computing Center Management System (CCMS). Terms such as monitoring tree element (MTE), monitoring object, and monitoring attribute will be discussed in detail.

Lesson Objectives

After completing this lesson, you will be able to:

- Explain the concepts of the CCMS Alert Monitor infrastructure
- Use the CCMS Alert Monitor to monitor your system

Business Example

You want to ensure good performance for the processing of business processes. You therefore regularly monitor the SAP systems, and take preventative action if required.

Fundamentals

Initial questions about monitoring:

- Why?
  - To ensure the efficient processing of business processes
  - To ensure system security and stability
- How?
  - Central and cross-system
  - With an alert if an error occurs
  - With help that provides cross-system detailed information if an error occurs
- With which tool?
  - With the help of the CCMS Alert Monitoring Infrastructure and the special transactions connected to it

Nowadays, many components are usually involved in a business process. These components (whether produced by SAP or not) must be monitored, as both a gradual reduction in performance or a sudden breakdown of a component could affect overall productivity. It is a task of the administrator to monitor the system landscape regularly, and not only in the case of errors, but to take preventative action.

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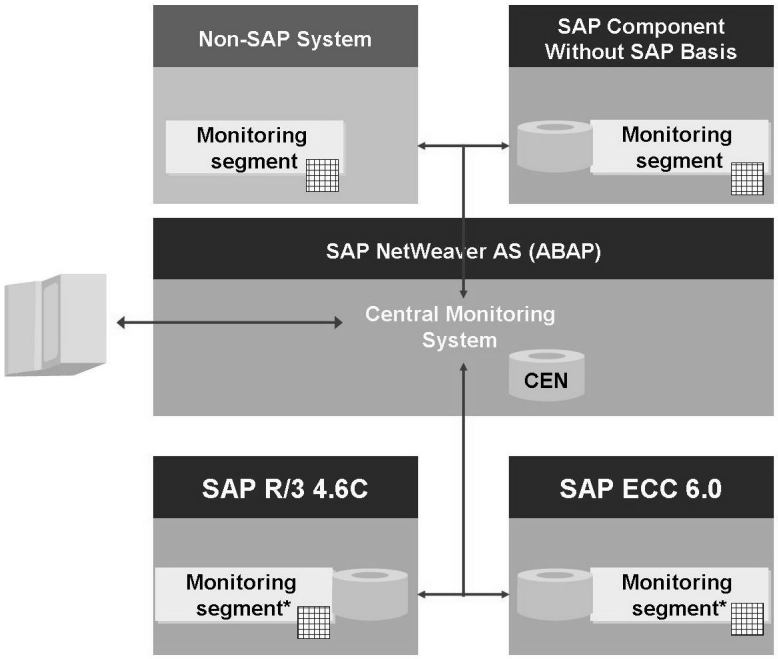
For example:

A file system where files of the SAP database are stored is 100% full. The database can no longer extend the tables in the files. A user performs a business transaction in the context of which a data record should be asynchronously added to one of these tables. The insert fails due to the space problem in the file system. The database error is seen as so serious that the entire asynchronous update process is automatically deactivated. All user sessions hang with the display of the hour glass. The SAP system hangs. If the fill level of the file system had been monitored regularly, the administrator could have taken action at the right time and system downtime could have been avoided.

Monitoring should be organized as efficiently as possible. There is not enough time for an administrator to log on to each host component to check its status. An efficient monitoring structure should be able to display the entire system landscape centrally at a glance. If an error occurs, the person responsible is automatically notified. Tools should be provided for the analysis of errors that provide cross-system detailed information about the problem.



* Within an AS ABAP-based SAP system, each instance has its own monitoring segment.

Figure 144: Central Monitoring

The CCMS Alert Monitor infrastructure gives you the option of central and efficient monitoring for SAP systems.

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This infrastructure must exist on every component that is to be centrally monitored. This is automatically the case for SAP systems with software component SAP_BASIS 4.0 or above. CCMS agents are used to connect components for which an SAP Basis system is not active.

Each component collects its own monitoring data using the infrastructure and stores it locally in the main memory. This part of the main memory is called the **monitoring segment**. Its size can be configured.

One SAP system is selected as the central monitoring system It should have as high a release level as possible and also be highly available. In large system landscapes, we recommend that you include a separate system that is used only for special tasks such as central monitoring, Central User Administration, and the transport domain controller. From a performance point of view, the workload of the central monitoring system increases only insignificantly, as the collection of monitoring data is usually decentralized.

The central monitoring system collects the monitoring data for the components and displays it in various views. In this way, the administrator has a central view of the entire system landscape. If errors occur, the administrator can jump directly from the central monitoring system (by RFC) to the relevant component to correct a problem in a detailed analysis.

Note: SAP recommends that you set up your central system monitoring on the **SAP Solution Manager** system.

Details

The CCMS Alert Monitoring Infrastructure consists of three parts: Data collection, data storage, and administration.

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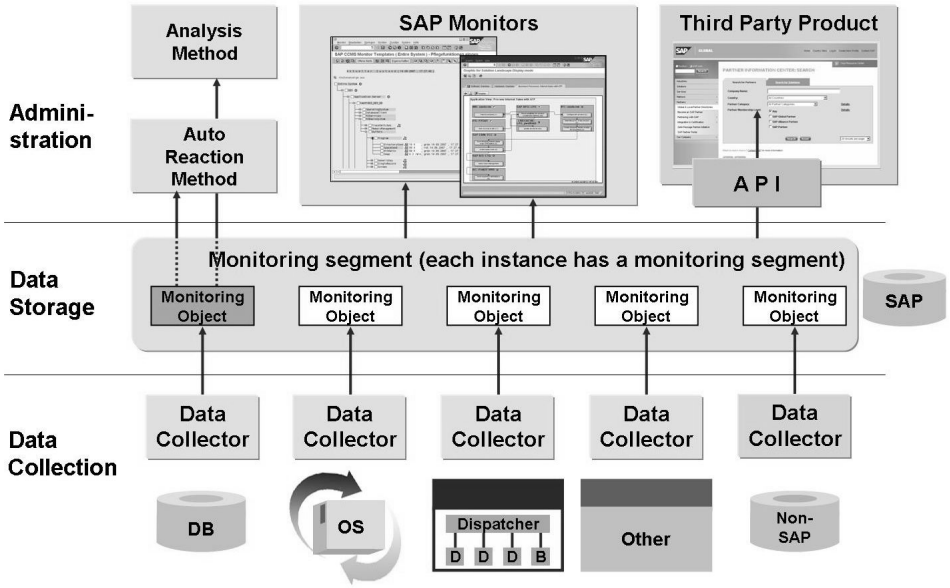

Figure 145: CCMS Alert Monitoring Infrastructure in Detail

At the **data collection** level, small subareas of an SAP system are monitored by special programs called data collectors. Data collectors can be ABAP, C, or Java programs. There are several hundred data collectors in ABAP alone. Each data collector checks its subcomponent at regular intervals and stores the collected monitoring data in the main memory of its host.

At the **data storage** level, the area of the main memory that contains the monitoring data from the data collector is called the monitoring segment. As the main memory data is always overwritten, it can be permanently copied to database tables. You can then analyze the data later. The data collection and storage elements must be present on every component that is to be centrally monitored.

Caution: Note that every instance of an SAP system (with the software component SAP_BASIS) has its own monitoring segment in the shared memory. This means that for an SAP system with eight instances, there are eight different monitoring segments. The number of instances determine the number of monitoring segments. Whether or not several instances run on the same hardware is of no significance here.

The Central Services instances (ABAP or Java) do not have a monitoring segment.

The **administration level** allows the data from the monitoring segment to be displayed and evaluated. SAP provides an expert tool, the CCMS Alert Monitor (transaction RZ20), as a display transaction. SAP Solution Manager can also show

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the data in a business process-oriented context. If the system identifies a problem, it can execute a prepared automatic reaction, such as informing the responsible person. The analysis method then helps you to investigate the problem.

The CCMS Alert Monitoring Infrastructure can be extended. You can integrate your own components using data collectors that you have written yourself. Third-party vendors and partners can use various interfaces to export the monitoring data from the monitoring segment.

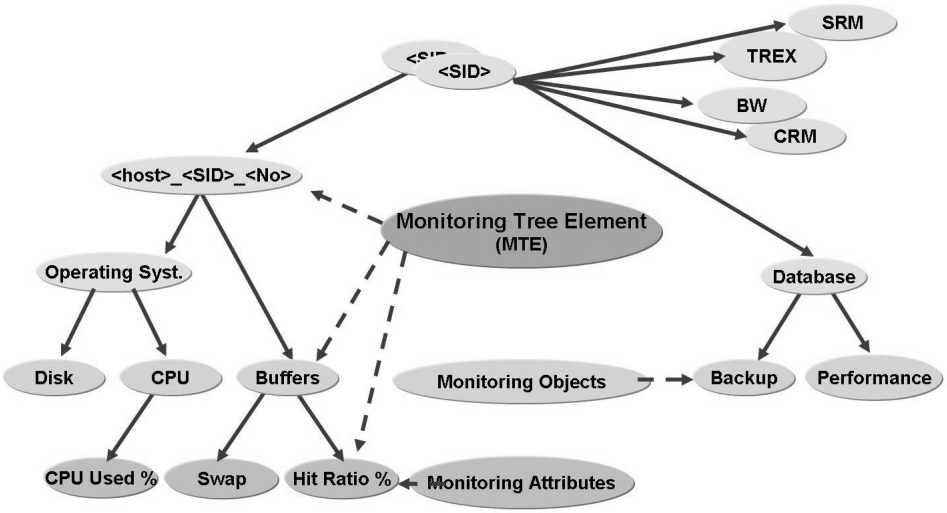

Figure 146: Monitor Structure

The CCMS Alert Monitor (transaction RZ20) displays the monitoring data from the monitoring segment in a tree structure. The tree structure allows a clear display when you are displaying a large number of measured values.

Any node in the tree is called a Monitoring Tree Element (MTE).

The measured values that are collected by the data collectors are displayed at the lowest level in the leaves of the tree. The leaves are known as monitoring attributes.

Threshold values can be stored for a monitoring attribute. SAP delivers default threshold values. However, in order to customize the monitor as well as possible for your system environment, you should check these threshold values, and adjust them if required.

Monitoring attributes are grouped at the second lowest level using monitoring objects. For example, the monitoring object *program buffer* contains, among others, the attributes *hit rate* and *swap*.

All other nodes in the tree serve to structure the monitoring objects in a logical and clear way, so that you can easily find the monitoring attribute that you require.

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A CCMS monitor displays different subareas of the monitoring data. A monitor can contain data from multiple SAP systems.

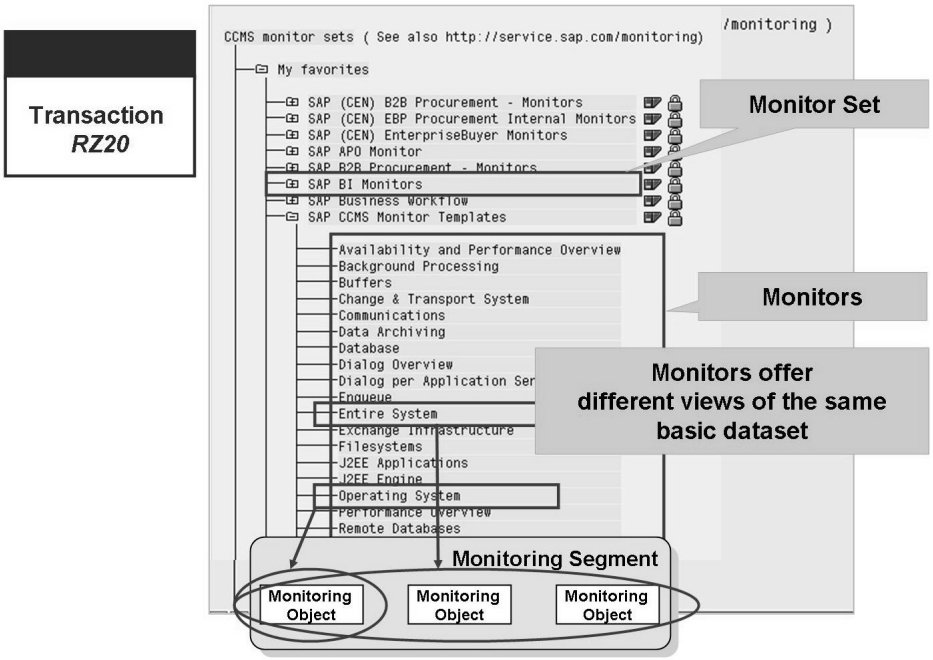

Figure 147: The CCMS Alert Monitor

You can access the monitor sets in the system by calling the transaction RZ20. Alternatively, in the SAP Easy Access menu, choose *Tools → CCMS → Control/Monitoring → CCMS Monitor Sets*.

SAP delivers preconfigured monitor sets that you can use immediately. Every monitor set bundles monitors that display various parts of the entire monitoring architecture, by topic area. It is therefore easier, for example, to find the database area.

The delivered monitor sets can be different for each system. For example, an SAP CRM system contains a special set for monitoring CRM scenarios. Of course, this also includes special data collectors that are preconfigured and delivered with an SAP CRM system.

The monitoring data that monitors display can overlap. This means that the monitoring attribute *hit rate* of the program buffer can appear in several monitors. If you change, for example, the threshold value for this attribute in one of these monitors, it is changed in all monitors.

Some monitors, such as the monitor *Availability and Performance Overview* in the monitor set *SAP CCMS Monitor Templates*, do not display any data at first. This can be due to the fact that special settings are required to start the underlying data collectors.

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To begin with, you will use the preconfigured monitors. Later, you can also create your own monitors that display exactly the data that you require for your daily monitoring work.

You can open a monitor by selecting its name.

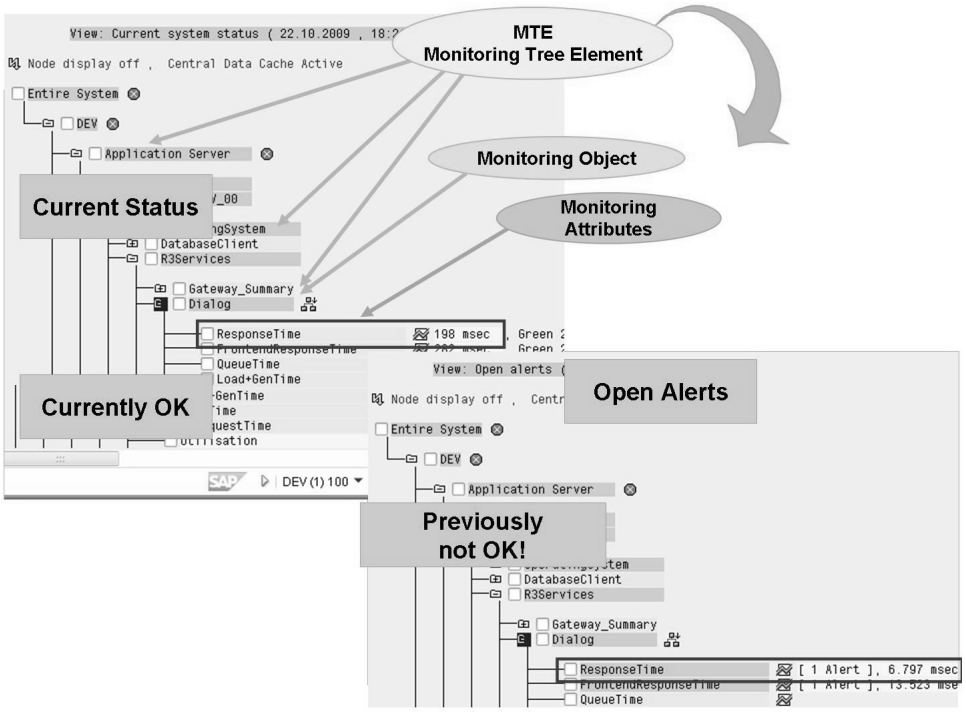

Figure 148: Layout of a Monitor

After you have opened a monitor, the corresponding monitoring data displays in the form of a tree. By clicking the "+" sign beside an MTE, you can expand the tree down to its leaves; the monitoring attributes.

Alert threshold values for triggering yellow and red alerts are assigned to monitoring attributes. If the threshold value condition is fulfilled, first a yellow, and then, if there is further deterioration, a red alert is triggered. The color of the monitoring attribute is propagated to its higher-level node in the tree, where the most severe alert is forwarded (red is more severe than yellow). This means that you can determine whether there is an alert in the tree from the root of the tree.

Views

The monitor should support you in your daily work. After you have opened the monitor, the following two views are available to you, among others:

- The *Current Status* view displays the monitor with the newest reported data.
- The *Open Alerts* view displays a monitor with alerts that have not been completed.

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For example, there may have been problems during the previous night that no longer occur now. In the *Current Status* view, the monitoring attribute is green, while it is displayed as red in the *Open Alerts* view. After you have ensured that there are currently no problems, you can then investigate problems that have previously occurred. You can see the selected view in the upper part of the monitor. You can switch views by choosing the *Current Status* or *Open Alerts* buttons.

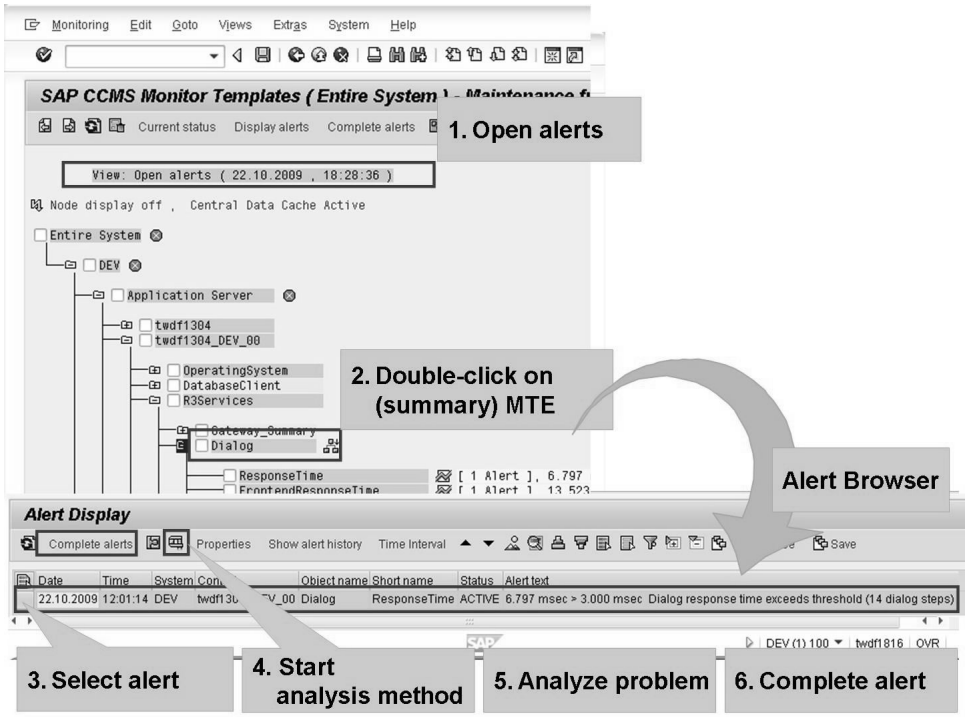

Figure 149: The Alert Browser

You can easily process the alerts that occurred in the past in the *Open Alerts* view. By double-clicking an MTE in the tree, you open the Alert Browser, which displays a list of all alerts for the selected MTEs and all alerts below it in the tree. This means that if you double-click the root of the tree, the system displays a list of all alerts in the tree, sorted by red and yellow alerts.

Select an alert that you want to process. Then choose the *Start Analysis Method* button. This starts the analysis method that is assigned to the MTE. The analysis method is a special tool that supports you when investigating problems. It can be transactions, or specially programmed function modules, or URL calls. You, therefore, do not need to remember all of the special tools, but simply use the CCMS Alert Monitor as a central point of entry.

After you have clarified the problem situation, choose *F3* to return to the Alert Browser. Then choose *Complete Alerts*. The processed alert is removed from the list and is stored in a database table.

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Proceed in the same way with the remaining alerts, until the list is empty. When you next use your monitor, only the newly-occurred alerts display.

If you want to display completed alerts again, choose *Show Alert History* in the Alert Browser. Completed alerts display with the status *Done*.

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Exercise 28: System Monitoring

Exercise Objectives

After completing this exercise, you will be able to:

- Evaluate and process alerts in the Alert Monitor

Business Example

You want to ensure good performance for business processes. You therefore regularly monitor the SAP systems, and take preventative action if required.

Task: The CCMS Alert Monitor

1. Start the CCMS Alert Monitor (transaction RZ20).
2. Open the *Entire System* monitor from the *SAP CCMS Monitor Templates* monitor set.
3. What is the current average dialog response time?
4. Switch to the *Open Alerts* view.
5. Select all alerts that have occurred in the *Dialog* area.
6. Process an alert from this list:

   Start the analysis method for an alert.

   Note: Analysis tools are not assigned to all attributes. If you know of any suitable analysis functions yourself, you can assign them to the attributes. This option is not dealt with as part of this course, however.

   Return to the Alert Browser and complete the alert.

   Does the alert still appear in the list?

   How can you display the completed alert again?

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Solution 28: System Monitoring

Task: The CCMS Alert Monitor

1. Start the CCMS Alert Monitor (transaction RZ20).

   a) Call the CCMS Alert Monitor (*Tools* → *CCMS* → *Control/Monitoring* → *CCMS Monitor Sets*, transaction RZ20).

2. Open the *Entire System* monitor from the *SAP CCMS Monitor Templates* monitor set.

   a) Expand the *SAP CCMS Monitor Templates* set by choosing the "+" sign beside the set.

      Double click the *Entire System* set.

3. What is the current average dialog response time?

   a) You can find the monitoring attribute for the average dialog response time by expanding, for example, the branch *<SID>* → *R/3 Services* → *Dialog* → *<Instance>*.

      Make sure that the monitor is in the *Current Status* view.

4. Switch to the *Open Alerts* view.

   a) Choose *Open Alerts*.

5. Select all alerts that have occurred in the *Dialog* area.

   a) Double click the *Dialog* MTE.

      All alerts in this area are displayed in the Alert Browser.

6. Process an alert from this list:

   Start the analysis method for an alert.

   Note: Analysis tools are not assigned to all attributes. If you know of any suitable analysis functions yourself, you can assign them to the attributes. This option is not dealt with as part of this course, however.

   Return to the Alert Browser and complete the alert.

   Does the alert still appear in the list?

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How can you display the completed alert again?

a) Select an alert in the list.

Then choose the *Start Analysis Method* button.

The system jumps from the monitor to a function that provides you with detailed data about the alert.

Return to the monitor.

Choose *Complete Alerts*.

The alert is removed from the list.

To display the alert again, choose *Show Alert History*.

Your completed alert has the status *DONE*.

Hint: It is possible that the system displays other alerts with the status *AUTO_COMPLETE*.

These alerts were completed automatically by the system to keep the alert area free for new alerts.

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Lesson Summary

You should now be able to:

- Explain the concepts of the CCMS Alert Monitor infrastructure
- Use the CCMS Alert Monitor to monitor your system

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Lesson: Configuring System Monitoring in CCMS

Lesson Overview

In this lesson, you will learn how to integrate remote systems into the Alert Monitor and what to bear in mind when designing and creating your own monitors. To get the best from the monitors that you create yourself, you should adjust the threshold values for the monitoring objects or monitoring attributes displayed to your system landscape.

Lesson Objectives

After completing this lesson, you will be able to:

- Integrate remote systems into the CCMS Alert Monitor
- Design and create your own monitors
- Set threshold values

Business Example

As a system administrator, you integrate remote systems into system monitoring in CCMS. You also create monitors that have been adjusted to your own particular requirements. Monitors can only be used in a meaningful way if the selected threshold values for the individual monitoring attributes are set to “suitable” values. Usually, there are no generally recommended values because different values make sense depending on the type of system, operation mode, usage type of the system (development/production), and your own expectations and requirements.

Integrating Remote Systems

The monitors delivered by SAP display more detailed monitoring data for the local SAP system. Central system monitoring, on the other hand, has the advantage that you can monitor the entire system landscape at **one** glance, and not just your local system.

You can centrally monitor all components that have a CCMS monitoring infrastructure. SAP has delivered this infrastructure since SAP Basis 4.0. To be able to include components that do not have an infrastructure, you can use the CCMS agent programs *SAPCM3X* for SAP R/3 3.x and *SAPCCMSR* for non-SAP components. This agent technology will be revised in future releases of SAP software.

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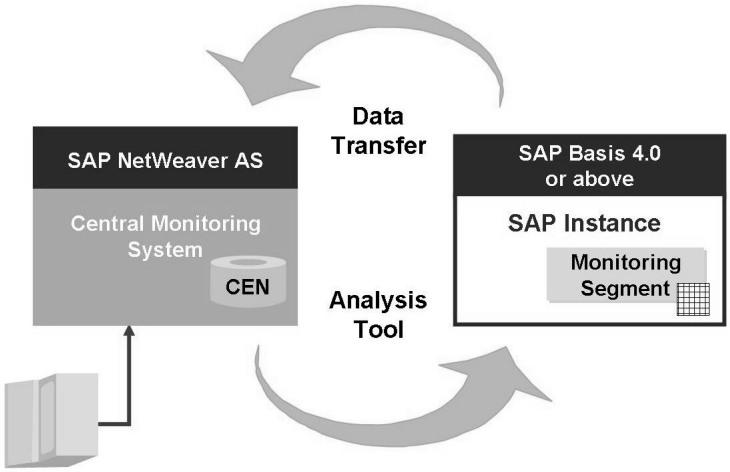

Figure 150: Integrating Remote Systems

To integrate an SAP system into a central monitoring architecture, you require two RFC connections as follows: one for transferring the monitoring data from the remote SAP system to the central monitoring system and one for executing the analysis functions in the remote system. The data collection is performed independently by the CCMS monitoring infrastructure on the remote system.

Note: You can also create the RFC connection for starting analysis methods as a "trusted RFC" connection, which provides greater usability and security when using this RFC connection. SAP Solution Manager can easily generate these RFC connections (once the basic configuration has been completed).

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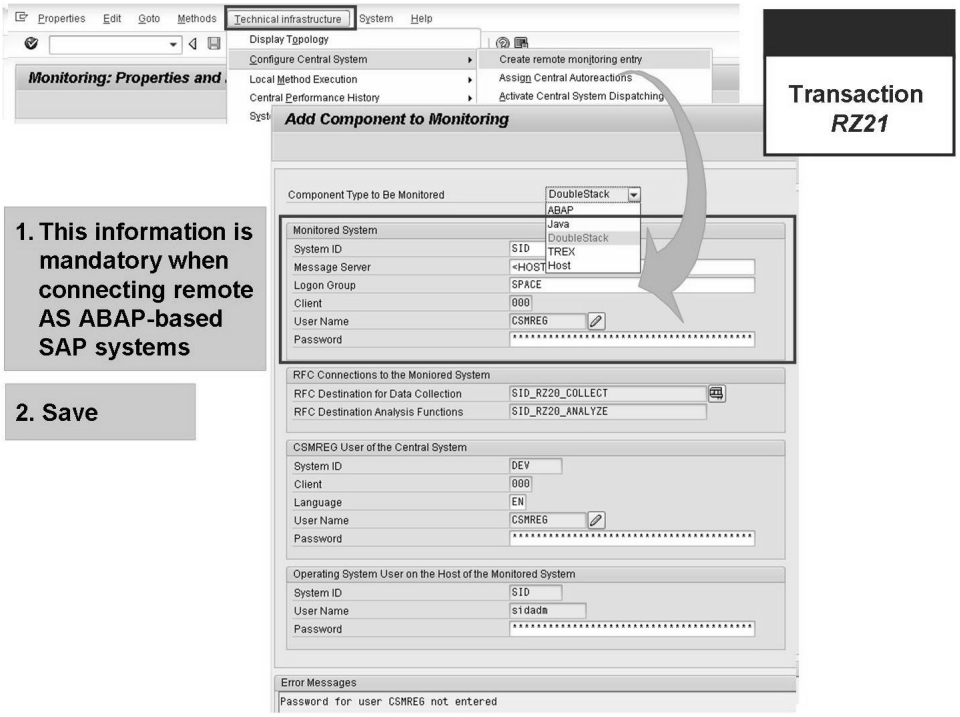

Figure 151: Integrating Remote Systems: Transaction RZ21

SAP systems are integrated in the central monitoring system in transaction RZ21.

In RZ21, choose *Technical Infrastructure → Configure Central System → Create Remote Monitoring Entry*.

First, use the input help (F4) to select the component type of the remote system to be monitored, for example, **`ABAP`** if you want to monitor an SAP ECC 6.0 system without an AS Java component.

In the *System ID* field, enter the SID of the SAP system to be monitored and name the message server host and an existing logon group for the system to be monitored.

Then enter the password for the user CSMREG in client 000 of the remote system.

Hint: You should use a function in transaction RZ21 to create the user CSMREG in client **000** of both the **remote system and central system**. To do this, use the path *Technical Infrastructure → Configure Central System → Create CSMREG User*.

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No user data is specified in the RFC connection used to start the analysis methods. If you want to call an analysis method (in the remote system being monitored) from the central system, you access a logon screen.

Hint: If your CEN has a release of less than SAP NetWeaver 7.0, you are required to create the relevant RFC connections manually, using transaction SM59. It makes sense to use the same naming convention for all of the RFC connections that you create for system monitoring. The following naming conventions are used by the system for generated RFC connections in RZ21:

`<SID>_RZ20_COLLECT` for the name of the RFC connection used to read data from the remote system

`<SID>_RZ20_ANALYZE` for the name of the "analysis RFC connection".

You should always use the RFC connection for reading data from the remote system with client 000. You can use any client for the analysis RFC connection. **`<SID>`** stands for the SID of the remote SAP system.

Designing Your Own Monitors

Initial Questions About Designing Your Own Monitors:

- Why should you build your own monitors?
  - To see exactly what is important for your daily work
  - To facilitate cross-system monitoring.
- How can you build your own monitors?
  - Consider what information you require.
  - Create your own monitor set.
  - Create some **static** monitors.
  - Create some **rule-based** monitors (ADM106).
- Hints:
  - Design monitor definitions to deal with specific problems.
  - Transfer as little data by RFC as possible.
  - Note that you can transport monitor sets.

We recommend that, for your regular work, you create your own monitors, which display precisely the cross-system or local data that you require for your work.

The sets and monitors delivered by SAP cannot be changed. You should therefore first create your own monitor set. You can then create your own static monitors, which display the required data.

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The second technique for creating your own monitors, rule-based monitors, is described in detail in the follow-on course ADM106.

Before you create your own monitor, you should clarify the purpose of the monitor. The monitor should display as little data as possible in as clear a way as possible. You must make a selection that meets your requirements from the many hundreds of monitoring attributes that exist. A system overview monitor, for example, should contain the status of the last database backup or terminated updates as core indicators, but not details about the distribution of the dialog response time. You can create another monitor to display the response time in detail.

Note also, especially if data from the monitored SAP systems is also to be displayed, the quantities of data to be transferred quickly become very large. A monitor that displays all monitoring data for multiple remote systems is unusable because the data transfer can take too long, especially if the remote systems have a heavy load. As an approximate guideline, we recommend 5-10 monitoring attributes for each monitored instance in the central monitor.

Creating a Monitor Set

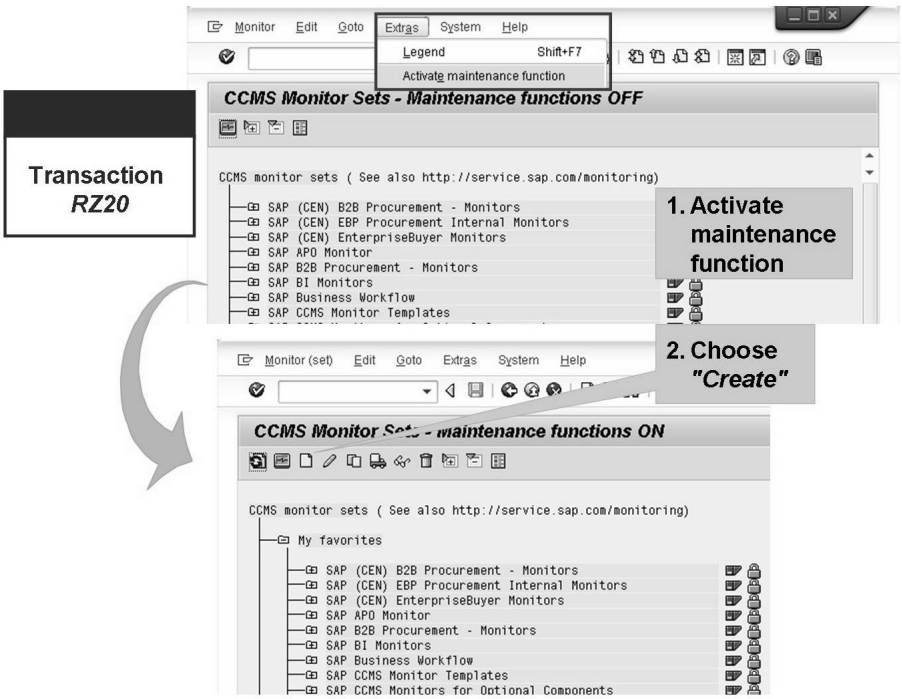

Figure 152: Creating a Monitor Set

The monitor sets (transaction RZ20) are usually in display mode, so you can open monitors, but cannot create or change them. To activate change mode, choose *Extras → Activate maintenance function* in transaction RZ20.

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Maintenance functions ON appears in the transaction heading. The system displays new pushbuttons for creating and changing monitors and sets. Choose *Create*.

The system asks whether you want to create a monitor set or a monitor. Select *Monitor Set* and choose *Copy*. On the next screen, assign a name to your monitor set.

Make sure that the name of your monitor set does not begin with “SAP”.

You can choose whether your set can be changed by other users or not. You can also choose whether the set is displayed directly for other employees in the monitor set overview.

After you have specified these attributes, choose *Enter*.

You have now created your own monitor set in which you can either create new monitors or copy existing monitors.

The monitor sets and monitors delivered by SAP cannot be changed. However, you can use them as stable templates. You can set whether or not an SAP monitor set should appear in the display mode of the CCMS Alert Monitor.

If you want to hide an SAP monitor set, position the cursor (in *change mode*) on the name of the monitor set to be hidden (with a single click) and then choose *Change* (Shift + F1). Remove the selection for *public*. The set can now no longer be seen in display mode. You can change your selection in change mode.

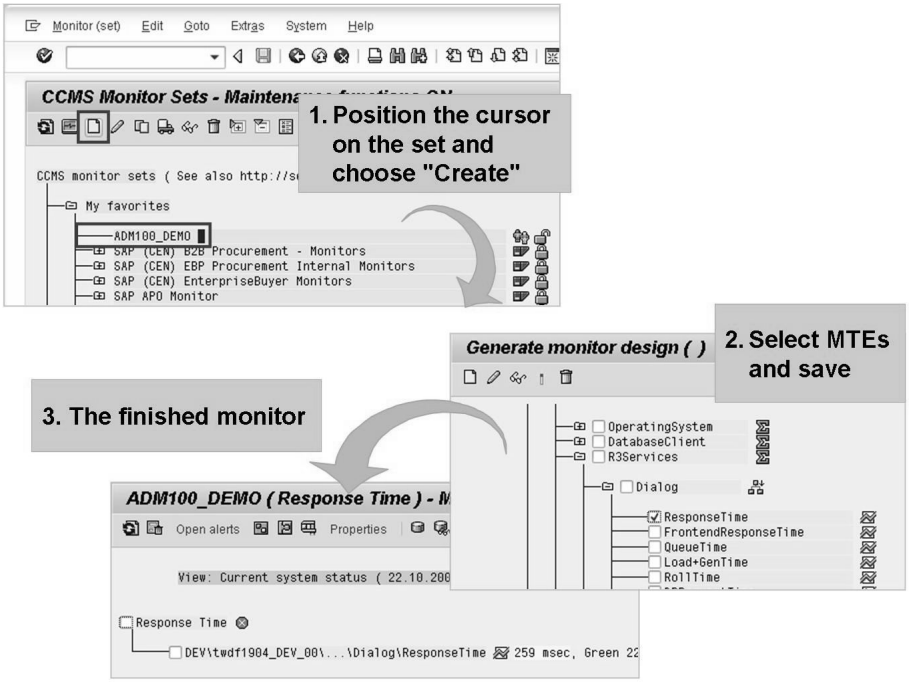

Figure 153: Static Monitors

Now create new monitors or copy existing monitors into your monitor set.

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To create new monitors in your set, select the set and choose *Create*.

The system displays a selection screen in which all MTEs for all registered systems are displayed.

Expand the tree structure and choose the MTEs that you want to display in your monitor by checking them. If an MTE is checked, all MTEs underneath it are automatically copied to the monitor. Take into account considerations about the number of MTEs.

Choose *Save*. The system prompts you for a name for the new monitor, which you can then start by double-clicking it.

You can organize your monitor more clearly by using virtual nodes when selecting the MTEs. Virtual nodes allow you to structure your monitor. During the MTE selection, choose *Create* and then *Virtual Node*. You can choose any text for the virtual node. It should be as descriptive as possible. Complete your entry by choosing *Enter*. Your virtual node is inserted. You can now select any MTEs for inclusion in the monitor under this node. In the final monitor, these MTEs appear under the virtual node.

Threshold Values and Properties Variants

Properties Variants and Threshold Values: Why?

- Why?
  - So that alerts are not constantly or never triggered by the system
  - So that system monitoring is adapted in the best possible way to meet your requirements
- How?
  - In the central monitoring system in transaction RZ20
  - Transport from there to the monitored SAP systems
- Hints:
  - First create and activate a container for threshold values (properties variants).
  - Then maintain threshold values for the MTEs in your own monitors.

Threshold values can be stored for a monitoring attribute. Threshold values determine when the monitoring attribute should trigger a yellow or a red alert, and when it should become green or yellow again. The CCMS monitor infrastructure is delivered preconfigured with threshold values recommended by SAP. You should, however, check the threshold values, at least for the monitoring attributes that you consider to be important and that you have included in your own monitors. In this way, you adapt system monitoring to your system environment in the best possible way. Otherwise, alerts can be constantly or never triggered, depending on whether the threshold value is too low or too high for your system environment.

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Caution: Threshold values must be stored locally in every system.

However, instead of maintaining the same threshold values in every system, we recommend that you maintain the values in the central monitoring system and then distribute them to the monitored SAP systems using the transport system.

The prerequisite for transporting the threshold values to other SAP systems is that you have stored them in properties variants.

- What are properties variants?
  - Containers in which system monitoring settings can be saved. Example: Threshold values for an MTE
- What are properties variants used for?
  - Monitoring behavior can be switched dynamically
  - Monitoring behavior can be coupled to operation modes
  - Copying settings to other systems
  - Additional information is available in training course ADM106.

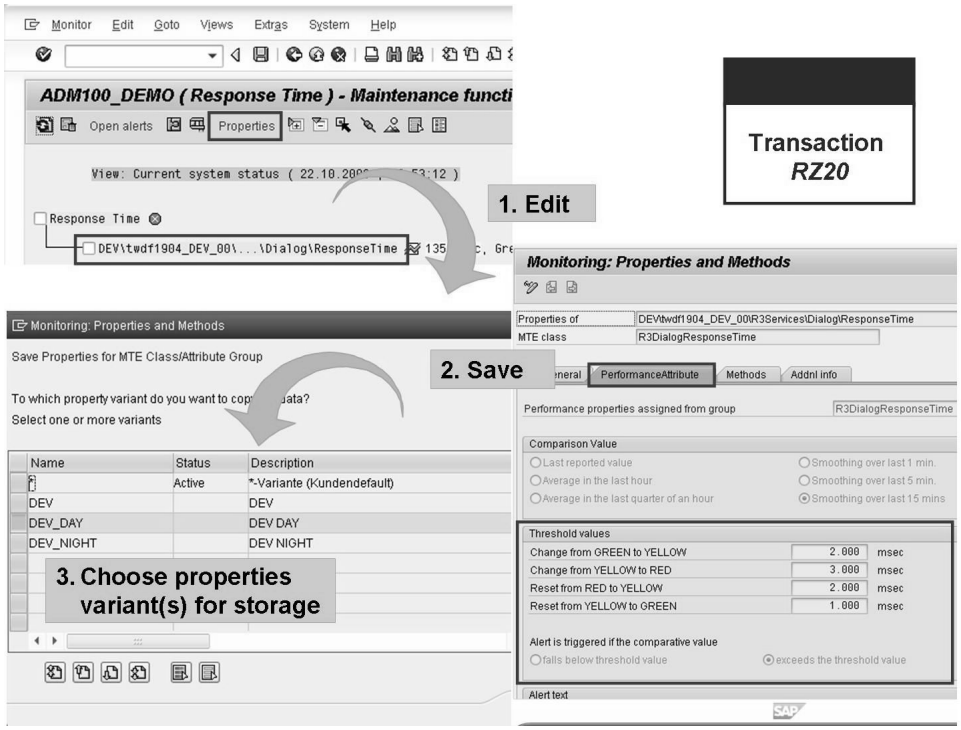

Figure 154: Maintaining Threshold Values

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After you have activated your properties variant, you can check the threshold values for the monitoring attributes you consider important and have included in your own monitors.

To do this, open your monitor. Select a monitoring attribute and choose *Properties*. The current tab page displays the valid threshold value definition.

The thresholds for *Change from GREEN to YELLOW* and *Change from YELLOW to GREEN* are defined to change sooner than the thresholds for *Change from RED to YELLOW* and *Change from YELLOW to GREEN*. In this way, you can avoid your monitor "flickering", if the measured value is wavering around the threshold value. It is useful to give an "all clear" only once the situation has markedly improved.

Choose *Display* → *Change*. You can now adjust the threshold values to your requirements. Save your settings.

If several changeable properties variants are defined in your system, you can select (in a dialog box) the properties variants in which you want to save your changed threshold values. Note that the currently active variant is preselected. You can change the selection as desired.

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Exercise 29: Integrating Remote Systems and Creating Your Own Monitors

Exercise Objectives

After completing this exercise, you will be able to:

- Integrate a remote system into central system monitoring
- Create your own monitors
- Create a monitoring properties variant and maintain threshold values

Business Example

As an administrator, you integrate remote systems into central system monitoring and then create your own monitor, which is specifically adjusted to your systems.

Monitors can only be used in a meaningful way if the selected threshold values for the individual monitoring attributes are set to sensible values. For this reason, you will assign new threshold values to your own monitors.

Task 1: Integrate Remote SAP Systems

Integrate another SAP system into the central monitoring architecture.

1. Your SAP system is the central monitoring system.

   Choose a valid user (for client 000 in **YOUR OWN** training system) with a password from your instructor.

   Use this user to create the **CSMREG** user in transaction RZ21 (*Technical infrastructure → Configure Central System → Create CSMREG User*).

   Assign the password **`monitor`** (within this training course only).

2. Register the SAP system of your partner group in your system in transaction RZ21.

   Coordinate with your partner group. Registration can only be successful if both you (in your system) and your partner group (in their system) have created the CSMREG user with the password **monitor**.

   Both groups require CSMREG user **created by their partner group**.

   The procedure proposed here enables both groups to learn about the function for creating the CSMREG user without causing any additional confusion.

3. Where can you see data from your partner group's SAP system?

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Task 2: Creating a Monitor Set

Create your own new monitor set.

1. Create your own monitor set, **`<CourseID> System Monitoring##`**.

Task 3: Create a Monitor

Create your own cross-system monitor, *Core information##*, that displays the most important system monitoring data.

1. First **consider** which information is important for monitoring, from your point of view. Remember that you should not display too many values for each SAP system. For this task, you don't need to change or create something in the training system.
2. Now **create** the monitor *Core information##*.

   The monitor should, as far as possible, display the desired data for your system and your partner group's system.

Task 4: Process Alerts in the Remote System

Analyze an alert in the partner system and complete it.

1. Open your *Core information##* monitor.

   Display all alerts for the entire monitor.

   Process an alert from your partner group's system.

   i) Start the analysis method for an alert.

   ii) Return to the Alert Browser and complete the alert. Does the alert still appear in the list?

   iii) How can you display the completed alert again?

Result

You have just worked on a cross-system basis with the Alert Monitor.

Task 5: Create a Properties Variant

Create one (or two) properties variants and activate one of them.

1. Create your own properties variant, **`TEST##`** (or **`DAY##`** and **`NIGHT##`**), in your SAP system.

   Activate your monitoring properties variants (or one of the two variants).

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Task 6: Maintain Threshold Values

Change a set of delivered threshold values and assign them to a newly created and active monitoring properties variant.

1. Maintain the threshold values for a monitoring attribute in your monitor. To do this, find a monitoring attribute from your SAP system, for which you can maintain the thresholds for:

   Green to yellow

   Green to red

   Red to yellow

   Yellow to green

   Change these threshold values and save them.

   For example, you can use the "**Dialog response time**" monitoring attribute for this purpose.

   Hint: These threshold values can only be defined for performance monitoring attributes. There are two other monitoring attribute types for which threshold values are specified in a different way.

Result

The threshold values are successfully adjusted and are stored in your monitoring properties variant.

We recommend that you perform this check for all monitoring attributes in your system that are important for you and that you use in your own monitors. To activate the threshold values in other systems, you can transport your monitoring properties variant to these systems.

Task 7: Switch Monitoring Properties Variants Manually

Manually switch from one monitoring properties variant to another and then observe the changed, valid threshold values.

1. Activate the "*" monitoring properties variant in transaction RZ21.

   What has happened to the threshold values for the MTE that you set in the previous task?

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Solution 29: Integrating Remote Systems and Creating Your Own Monitors

Task 1: Integrate Remote SAP Systems

Integrate another SAP system into the central monitoring architecture.

1. Your SAP system is the central monitoring system.

   Choose a valid user (for client 000 in **YOUR OWN** training system) with a password from your instructor.

   Use this user to create the **CSMREG** user in transaction RZ21 (*Technical infrastructure → Configure Central System → Create CSMREG User*).

   Assign the password **`monitor`** (within this training course only).

   a) Call the configuration transaction for the CCMS Alert Monitor (*Tools → CCMS → Configuration → Attributes and Methods*, transaction RZ21).

   b) Choose *Technical Infrastructure → Configure Central System → Create CSMREG User*.

   c) Enter the password **`monitor`** twice and confirm your entries with **`Enter`**.

   d) Confirm the success message by choosing *Continue*.

2. Register the SAP system of your partner group in your system in transaction RZ21.

   Coordinate with your partner group. Registration can only be successful if both you (in your system) and your partner group (in their system) have created the CSMREG user with the password **monitor**.

   Both groups require CSMREG user **created by their partner group**.

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The procedure proposed here enables both groups to learn about the function for creating the CSMREG user without causing any additional confusion.

a) Call the configuration transaction for the CCMS Alert Monitor

(*Tools → CCMS → Configuration → Attributes and Methods*, transaction RZ21).

Choose *Technical infrastructure → Configure Central System → Create remote monitoring entry*.

Under *Component Type to Be Monitored*, select the **`DoubleStack`** entry.

Then, on the changed input screen, enter the SID of your partner system as well as the following additional values:

- *Message Server*: Name your training server here (for example, **`twdf1000`**)
- *Logon Group*: **`SPACE`**
- *Password* Here, name the password of the CSMREG user in client 000 **of your partner system**.

  Note: The password should be **"monitor"** (see above). Of course, in real life, you should choose a different secure password.

- **Leave all other fields on default. You don't need entries there.**
- Choose *Save*.

A success message in the status bar tells you that the SAP system has been registered correctly.

3. Where can you see data from your partner group's SAP system?

a) You cannot yet see any data for the system of your partner group, as all monitors delivered by SAP display only local data.

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Task 2: Creating a Monitor Set

Create your own new monitor set.

1. Create your own monitor set, **`<CourseID> System Monitoring##`**.

   a) Call the CCMS Alert Monitor

   (*Tools → CCMS → Control/Monitoring → CCMS Monitor Sets*, transaction RZ20).

   Activate the maintenance function by choosing *Extras → Activate maintenance function*.

   Choose *Create*.

   On the following screen *New Monitor Set* is already selected. Choose *Apply*.

   Enter the name **`<CourseID> System Monitoring##`** for your monitor set.

   Maintain the attributes of your monitor set as you wish.

   Choose *Apply*.

   Your monitor set is displayed under *My Favorites*.

   You can now create new monitors in this set.

Task 3: Create a Monitor

Create your own cross-system monitor, *Core information##*, that displays the most important system monitoring data.

1. First **consider** which information is important for monitoring, from your point of view. Remember that you should not display too many values for each SAP system. For this task, you don't need to change or create something in the training system.

   a) Your new monitor, *Core information##*, should contain the most important monitoring data for your system landscape.

   It could contain the following data, **for example**:

   - Terminated updates
   - Terminated ABAP programs
   - System log messages
   - Average dialog response time

2. Now **create** the monitor *Core information##*.

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The monitor should, as far as possible, display the desired data for your system and your partner group's system.

a) In maintenance mode for transaction RZ20, place the cursor on your monitor set and choose *Create*.

The system displays the currently registered SAP systems.

Expand the tree and search for monitoring attributes that correspond to the data that you require.

For the proposed monitor from task 1:

- Terminated updates: Take a look in the branch

  <SID> → <instance> → R3Services → Update → Update → AbapErrorInUpdate.

- Terminated ABAP programs: Take a look in the branch

  <SID> → <instance> → R3Abap → Shortdumps.

- System log messages: Take a look in the branch

  <SID> → <instance> → R3Syslog

- Average dialog response time: Take a look in the branch

  <SID> → <instance> → R3Services → Dialog → ResponseTime.

Select the MTEs you require for all instances of both monitored SAP systems.

Choose *Save*.

Enter **`Core information##`** as the name of your monitor.

Open your monitor by double-clicking it.

Task 4: Process Alerts in the Remote System

Analyze an alert in the partner system and complete it.

1. Open your *Core information##* monitor.

   Display all alerts for the entire monitor.

   Process an alert from your partner group's system.

   i) Start the analysis method for an alert.

   ii) Return to the Alert Browser and complete the alert. Does the alert still appear in the list?

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iii) How can you display the completed alert again?

a) Open your *Core information##* monitor by double-clicking it.

Switch to the *Open Alerts* view.

Double-click an MTE for your partner system. All alerts in this area for your partner system are displayed in the Alert Browser.

Select an alert in the list.

Then choose the *Start Analysis Method* button.

The logon screen of the partner system appears, as *Current User* is selected for the user data in the RFC connection for starting analysis methods.

Log on to your partner system.

To do this, use a user (and password) provided by your partner group or instructor.

In the partner system, you jump to an action that provides you with detailed data about the alert.

Return to the monitor.

Choose *Complete Alerts*.

The alert is removed from the list.

To display the alert again, choose *Show Alert History*.

Your completed alert has the status *DONE*.

Result

You have just worked on a cross-system basis with the Alert Monitor.

Task 5: Create a Properties Variant

Create one (or two) properties variants and activate one of them.

1. Create your own properties variant, **`TEST##`** (or **`DAY##`** and **`NIGHT##`**), in your SAP system.

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Activate your monitoring properties variants (or one of the two variants).

a) Call the configuration transaction for the CCMS Alert Monitor (*Tools → CCMS → Configuration → Attributes and Methods*, transaction RZ21).

Choose *Properties → Variants → Create*.

Enter **TEST##** as the variant name and enter a short description.

Choose *Save*.

Choose *Properties → Variants → Activate*.

Select your variant *TEST##* and choose *Enter*.

The *TEST##* variant is displayed as the active variant in the initial screen of transaction RZ21.

Task 6: Maintain Threshold Values

Change a set of delivered threshold values and assign them to a newly created and active monitoring properties variant.

1. Maintain the threshold values for a monitoring attribute in your monitor. To do this, find a monitoring attribute from your SAP system, for which you can maintain the thresholds for:

   Green to yellow

   Green to red

   Red to yellow

   Yellow to green

   Change these threshold values and save them.

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For example, you can use the "**Dialog response time**" monitoring attribute for this purpose.

Hint: These threshold values can only be defined for performance monitoring attributes. There are two other monitoring attribute types for which threshold values are specified in a different way.

a) To do this, call transaction RZ20 and double-click your monitor.

Show a description of the symbols that are used in the monitor by choosing *Extras → Legend*.

The icon for performance attributes is a graph.

Search for a performance attribute for **your** SAP system in your monitor (such as the average dialog response time).

Place the cursor on a monitoring attribute and choose *Properties*.

The **current** threshold values are displayed on the *Performance Attribute* tab page.

Do you consider the threshold values to be appropriate?

Choose *Display <-> Change* and change the threshold values.

Choose *Save*.

In the *Monitoring: Properties and Methods* window, select your monitoring properties variant **`TEST##`** and confirm this by choosing *Continue*.

Result

The threshold values are successfully adjusted and are stored in your monitoring properties variant.

We recommend that you perform this check for all monitoring attributes in your system that are important for you and that you use in your own monitors. To activate the threshold values in other systems, you can transport your monitoring properties variant to these systems.

Task 7: Switch Monitoring Properties Variants Manually

Manually switch from one monitoring properties variant to another and then observe the changed, valid threshold values.

1. Activate the "*" monitoring properties variant in transaction RZ21.

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What has happened to the threshold values for the MTE that you set in the previous task?

a) Call the configuration transaction for the CCMS Alert Monitor

(*Tools → CCMS → Configuration → Attributes and Methods*, transaction *RZ21*).

Choose *Properties → Variants → Activate*.

Select the variant "*" and choose *Enter*.

The "*" variant is displayed as the active variant in the initial screen of transaction RZ21.

Now open the *Core information##* monitor in transaction RZ20 by double-clicking it.

Find the monitoring attribute whose threshold values you maintained previously.

The threshold values have returned to their original values, which are stored in the active monitoring properties variant or its parent variant.

If you were to reactivate your monitoring properties variant *TEST##* in transaction RZ21, the changed settings would become active again.

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Lesson Summary

You should now be able to:

- Integrate remote systems into the CCMS Alert Monitor
- Design and create your own monitors
- Set threshold values

Related Information

You can find further information about system monitoring:

- On SAP Developer Network, SDN - https://www.sdn.sap.com go to Monitoring on SDN: https://www.sdn.sap.com/irj/sdn/monitoring
- In the training course *ADM106 - SAP System Monitoring Using CCMS I*. This course focuses, in particular, on the configuration of methods (analysis and auto-reaction) and the use of rule-based monitors.
- In the training course *ADM107 - SAP System Monitoring Using CCMS II*

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Lesson: Traces

Lesson Overview

In this lesson, you will learn about the different trace options available in the SAP system. You will perform and evaluate a trace yourself.

Lesson Objectives

After completing this lesson, you will be able to:

- Name different trace options
- Perform simple traces in the SAP system

Business Example

An unexpected, reproducible error situation is occurring in your SAP system. As a system administrator, it is your task to find the cause of the error.

Introduction

You can follow the process of various operations in your SAP system with trace functions. This allows you to monitor the system and isolate problems that occur.

There are many trace options in SAP systems. The main ones are listed below.

- System Log (SM21)
- Dump Analysis (ST22)
- System Trace (ST01)
- Performance Trace (ST05)
- Developer Trace (ST11)

You can use the **System Log** (transaction: SM21) to determine and correct errors that occur in your system and its environment. SAP application servers record events and problems in system logs. Every SAP application server has a local log that contains the messages output by this server.

If unpredictable errors occur at runtime when you call an ABAP program, a runtime error that generates a **short dump** occurs (transaction ST22).

If you want to record the internal SAP system activities, such as authorization checks, database accesses, kernel functions, and RFC calls, use the **System Trace** function (transaction: ST01). ST01).

The **Performance Trace** (transaction: ST05) allows you to record database calls, lock management calls and remote calls of reports and transactions in a trace file, and to display the logged measurement results as lists. The performance trace also offers extensive support for a detailed analysis of individual trace records. You

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can find all the functions of the performance trace in the system trace too. The performance trace is a more suitable analysis tool for certain problems, since the reduced scope of functions makes it is easier to handle.

Technical information about internal SAP problems is logged in the **developer traces**.

System Log

Events and problems are recorded locally on each application server and displayed in the system log (syslog) in the SAP system.

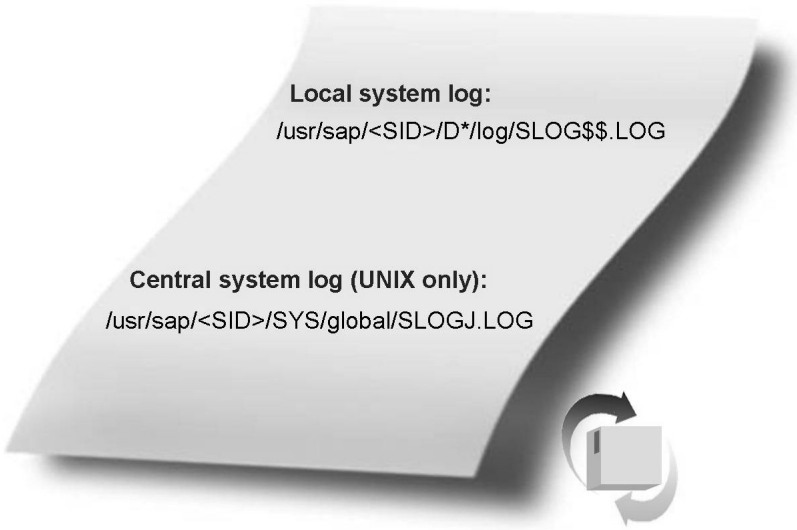

Figure 155: System Log (SM21)

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If you are using the UNIX operating system, you can also work with central logging. In this case, each application server copies its local logs periodically to a central log. Central logging is not possible on Microsoft Windows and iSeries hosts. Technically, the system log is written to a ring buffer. If this log file reaches the maximum permitted size, the system begins to overwrite the oldest data.

Note: Also read the following SAP Notes, which concern the system log:

SAP Note 712706 - Program RSLGVIEW - reading the SAP system log without system

SAP Note 28665 - Central syslog under NT. This notes provides a solution that uses CCMS monitoring functions as well as a feature for viewing the logs for all instances of a system.

You can also use the **SAP Microsoft Management Console** and the **SAP Management Console** to view the syslog, irrespective of whether or not the instances in question have started successfully.

Hint: The system does not display a message when an old log file is replaced.

To display a log, choose *Tools → Administration → Monitor → System Log* or call transaction SM21. By default, the system reads the log for the last one to two hours. As well as the local system log, you can display system logs for other application servers in transaction SM21. To do this, choose the menu path *System Log → Choose → All Remote System Logs* or *System Log → Choose → Central System Log*.

In expert mode (menu path *Edit → Expert Mode*), you can extend the selection criteria so that it is possible to search for entries for a particular terminal. To do this, choose the *Attributes* button.

In UNIX systems, you can display the status of the send process in the SAP system in transaction SM21 or by choosing *Environment → Process Status*.

You can define the path and file names for local and central log files with the following system profile parameters:

- *rslg/local/file*: File name for the local log (standard: SLOG<SAPSYSTEM-NUMBER>)
- *rslg/central/file*: File name for the active central log (standard: SLOGJ); not valid for Microsoft Windows NT and AS/400 platforms.

By default, the log files for the local system log are stored in the following directory: */usr/sap/<SID>/<instance_directory>/log*. The central system log is stored in */usr/sap/<SID>/SYS/global*

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You can also schedule system logging as a job. There are two ABAP programs provided to do this:

- *RSLG0000*: To create the local system log
- *RSLG0001*: To create the central system log (not on Microsoft Windows NT and AS/400 platforms)

Dump Analysis

ABAP programs are checked statically when they are created and dynamically when they are running. Errors that are not statically predictable and only occur at runtime are dynamically identified by the ABAP runtime environment. States of this type lead to exceptions. If an exception is not handled or cannot be handled, a runtime error occurs. If a runtime error occurs, the ABAP runtime environment terminates the execution of the program, generates a short dump and branches to a special screen for analyzing the short dump. You can also find short dumps in transaction **ST22** or by choosing the menu path *Tools → ABAP Workbench → Test → Dump Analysis*.

A short dump is divided into different sections that document the error. The overview shows what other information is output in the short dump, such as contents of data objects, active calls, control structures, and so on. You can branch to the ABAP Debugger at the termination point from the short dump view. The following different error situations exist:

- Internal Error

  The kernel identifies an error state. In this case, send a message to notify SAP.

- Installation and Environment/Resource Error

  In this case, an error occurred that was caused by incorrect system installation or missing resources (such as the database being shutdown).

- Error in Application Program

  Typical causes of errors are:

  – Content of a numerical field not in the correct format
  – Arithmetic overrun
  – An external procedure is not available
  – Type conflict when transferring parameters to an external procedure

By default, short dumps are stored in the system for 28 days. The transaction for managing short dumps is ST22. You can delete short dumps in accordance with a time specification using the *Reorganize* function, which you can call by choosing *Goto → Reorganize*. You can save a short dump without a time limit using the *Keep* function, which you can choose from the Detail View under *Short Dump → Keep/Release*.

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If problems that you cannot solve yourself occur with ABAP programs, you can send an extract of the short dump to SAP. A short dump is an important basis on which the SAP Hotline and remote consulting solve problems.

Important Features of Dump Analysis

- If a runtime error occurs, a short dump is generated. You can use transaction ST22 to analyze this short dump.
- Dump data is stored in the database.
- Dump data can be reorganized.
- Individual short dumps can be flagged for retention.

(SAP) System Trace

You can use the (SAP) system trace ("system trace" for short) to record internal system activities. The system trace is primarily used if an authorization trace is to be executed. We recommend that you use the system log or the developer trace for system monitoring and problem analysis. You can call the system trace in transaction ST01 or by choosing the menu path *Tools → Administration → Monitor → Traces → SAP System Trace*. You can also use transaction ST01 to display the inactive trace file.

The system trace is used for analyzing:

- Authorization checks
- Kernel functions
- Kernel modules
- DB accesses (SQL trace)
- Accesses to table buffers
- Lock operations (client-side)

You select the components to be logged on the initial screen. If the trace is activated for the authorization check, all authorization checks performed by the system are recorded. During the evaluation, you can identify which authorizations the system checked at which times. The following detail information is also provided: Date, time, work process number, user, authorization object, program, line, number of authorization values, and authorization values.

You can use the SQL trace to follow how the Open SQL commands in reports and transactions are converted to standard SQL commands and the parameters with which the SQL commands are transferred to the database system in use. The results of the SQL command are also logged, such as the return code and the number of records found, inserted, or deleted by the database. Logging the execution time and the callpoint in the application program allows you to perform more advanced evaluations.

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With the enqueue trace, you can follow which lock instructions the SAP system performs on which lock objects, and which parameters the system uses for these locks. The program that triggered the lock, the owner of the lock, and the time that the enqueue server required to release the lock again are all also logged in the trace file.

You can use the RFC trace to follow which remote calls the SAP system executes, and the instance on which these calls are executed. From the trace recording, you can see which function modules were called remotely by the program to be analyzed, and whether the RFC was successfully executed. The total time required for the execution of the remote call and the number of bytes sent and received during the RFC are also logged in the trace file.

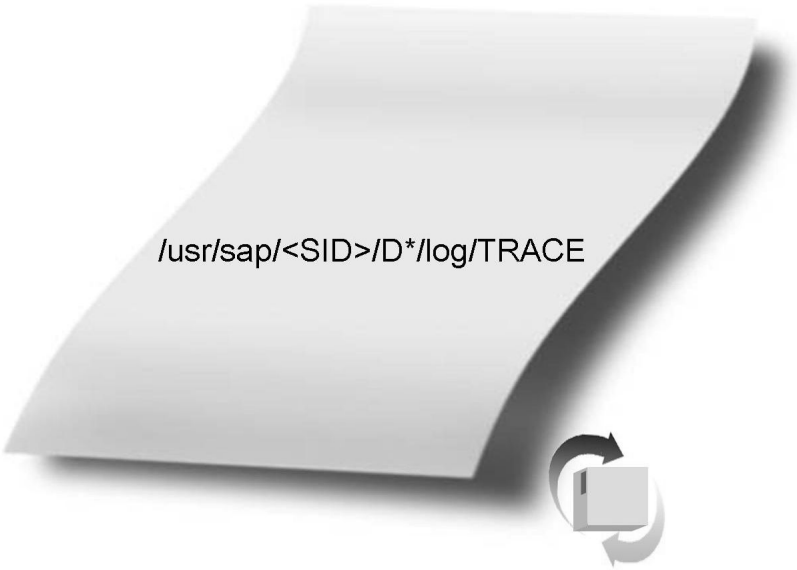

Figure 156: System Trace (ST01) and Performance Trace (ST05)

Performance Trace

The performance trace is used for analyzing:

- Database calls
- Lock management calls
- Accesses to table buffers
- Remote calls of reports and transactions
- Individual trace records
- SQL statements

The performance trace provides similar trace options to the system trace. It allows you to record database calls, calls to lock management, calls to table buffers, and remote calls of reports and transactions from the SAP system itself in a trace file.

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You can call the performance trace using transaction ST05 or by choosing the menu path *Tools → Administration → Monitor → Traces → Performance Trace*. On the initial screen of transaction ST05, you can choose the *Explain SQL* button to analyze an SQL statement without branching to a specific trace file.

The performance trace is integrated into the ABAP Workbench as a test tool and can therefore be called from there.

Configuring the Trace File

You can use system profile parameters to restrict the size of the trace files and to specify an appropriate path.

The SAP system trace writes the trace data to trace files. For performance reasons, this is not done directly, but rather using a process-internal buffer. The profile parameter *rstr/buffer_size_kB* determines the size of this buffer. Since SAP Web AS 6.10, the SAP trace stores the data in multiple files, which are written in turn. The parameter *rstr/filename* defines the base name of these files. There is always a file with exactly this name. If the file is full (parameter *rstr/max_filesize_MB*), the file is renamed and a new file is created with the base name. When the file is renamed, a number between 00 and 99 is added to the file name. The parameter *rstr/max_files* determines the maximum number of files. If this value is exceeded, the files are overwritten.

Developer Trace

Developer traces are recordings that contain technical information and that are used if errors occur. This type of process trace is especially useful to investigate host and internal SAP problems that are affecting your SAP system. Developer traces **`dev_*`** are written to files in the directory */usr/sap/<SID>/<instance directory>/work* of the SAP application server that generated the trace.

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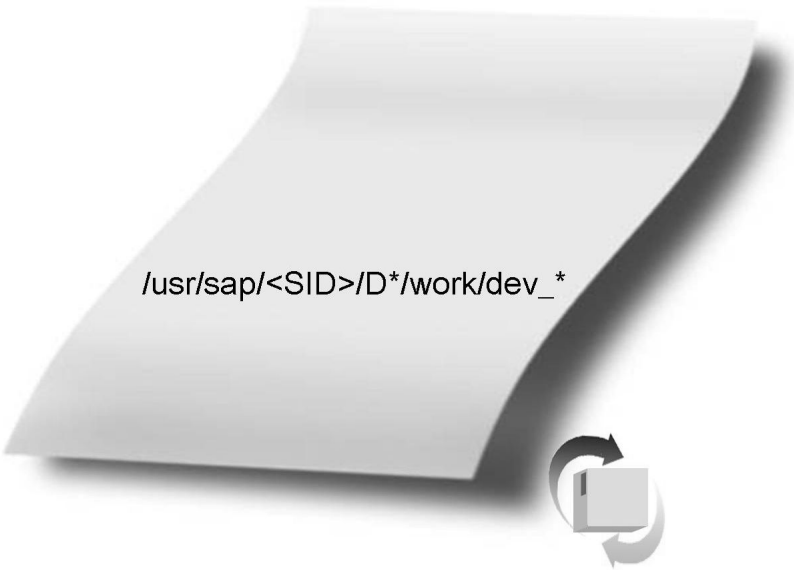

Figure 157: Developer Traces

You can access the developer traces in the operating system, in transaction AL11, transaction ST11 or transaction SM50 (Work Process Overview). In transaction SM50, you can switch to the individual dev_* traces by choosing *Process → Trace → Display File*. You can display additional details in the displayed traces by expanding individual entries.

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Exercise 30: Trace Options

Exercise Objectives

After completing this exercise, you will be able to:

- Use trace options in the SAP system to analyze a problem if errors occur
- Use the transactions for the various trace functions

Business Example

You want to use trace functions to correct errors in the SAP system.

Task: Traces

Activate traces in the SAP system and evaluate them.

1. In transaction ST01, activate the trace for authorization checks, RFC calls, and for lock operations for your user. Start the transaction for user maintenance SU01 and change the title for your own user.
2. Deactivate the trace again and evaluate the trace file.
3. In transaction ST05, activate the SQL trace for your user.

   Start transaction SA38 and execute the program **RSUSR000**.

   Deactivate the trace again and evaluate it.

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Solution 30: Trace Options

Task: Traces

Activate traces in the SAP system and evaluate them.

1. In transaction ST01, activate the trace for authorization checks, RFC calls, and for lock operations for your user. Start the transaction for user maintenance SU01 and change the title for your own user.

   a) Call transaction ST01 and select authorization check, RFC calls, and lock operations.

      In addition, you can choose the *General Filters* button to restrict the trace to your own user.

      Start the trace by choosing the *Trace on* button.

   b) Call transaction SU01.

      Select your user and choose the menu entry *Users* → *Change*.

      On the *Address* tab page, change the title, and save your change.

2. Deactivate the trace again and evaluate the trace file.

   a) Call transaction ST01 and choose the *Trace off* button.

   b) To evaluate the generated trace file from transaction ST01, choose *Goto* → *Analysis* and select Authorization Check, RFC Calls, and Lock Operations.

      Start the analysis by choosing *Start Reporting*.

      You can now jump directly to the program code by double-clicking a data record and then choosing *Go to ABAP Position*.

3. In transaction ST05, activate the SQL trace for your user.

   Start transaction SA38 and execute the program **`RSUSR000`**.

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Deactivate the trace again and evaluate it.

a) Call transaction ST05 and select SQL Trace.

   Start the trace by choosing the *Activate Trace with Filter* button, and enter your user as the selection criterion.

b) Start the program **RSUSR000** in transaction SA38 and stop the trace in transaction ST05 by choosing *Deactivate Trace*.

c) To evaluate the generated trace file, call transaction ST05, choose the *Display Trace* button, and select SQL Trace.

   You can now display the SQL commands in plain text by using the operation “Open” or “Reopen” to select a data record and choosing *Explain*.

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Lesson Summary

You should now be able to:

- Name different trace options
- Perform simple traces in the SAP system

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Lesson: Troubleshooting Procedure

Lesson Overview

This lesson describes a general procedure for troubleshooting.

Lesson Objectives

After completing this lesson, you will be able to:

- Develop procedures for structured troubleshooting

Business Example

Unexpected problems are occurring while your SAP systems are running. As a system administrator, you want to learn about the procedure for structured troubleshooting.

General Approach

Errors, by their very nature, always occur in places where they should not occur. Consequently, we can only present a general approach here.

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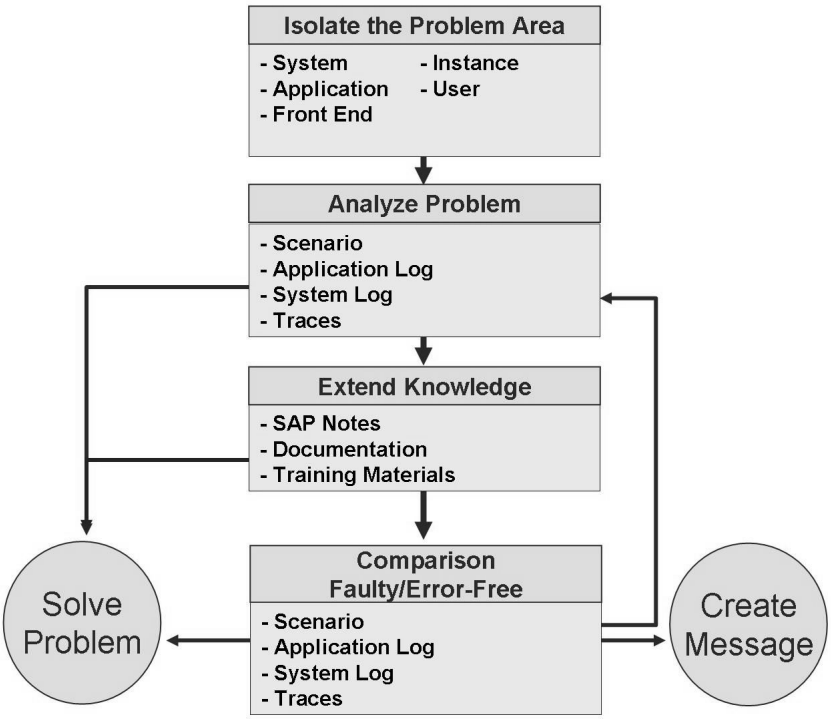

Figure 158: Troubleshooting: Approach

Isolate the problem area: First, attempt to isolate the error. Where does it occur, when does it occur, and in what context does it occur? “It doesn't print” would be too imprecise here. “Front-end printing on front end xyz does not work with any SAP system” is more exact. If you also know that front-end printing works on other front ends, you have already isolated the problem.

Problem analysis: Check the scenario to find out whether all required settings, and so on, are correct. Check the application logs, the system log, and the traces (the developer traces will usually be helpful here) to see whether they provide any clues for correcting the error.

Gain additional knowledge: To interpret the results from the first problem analysis, it is, of course, necessary that you are familiar with the processes and functions of the area in which the error is occurring. If your experience and your previous knowledge are insufficient, you can start to search SAP Notes and SAP Service Marketplace with the keywords from the system log or the trace files. You may find a problem solution here, or additional information that helps you find and correct the error. If you have not found any suitable SAP Notes or suitable search terms, search for composite SAP Notes for the topic area (for example, with the terms *front-end printing* and *composite SAP Note*). For additional background information about the topic area, see the online documentation and course materials. If you still cannot solve the problem with this information, compare the process with errors against an error-free process.

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Compare error-free and erroneous processes: You can use this to determine where there are differences between an erroneous and an error-free process. This information helps you to further isolate the problem area and may help you to solve the problem or to perform new, more targeted problem analyses. If it is not possible to perform another problem analysis, create a message for SAP on SAP Service Marketplace. Enter the information from your troubleshooting (such as a trace and/or system log information) when doing so.

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Lesson Summary

You should now be able to:

- Develop procedures for structured troubleshooting

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Unit Summary

You should now be able to:

- Explain the concepts of the CCMS Alert Monitor infrastructure
- Use the CCMS Alert Monitor to monitor your system
- Integrate remote systems into the CCMS Alert Monitor
- Design and create your own monitors
- Set threshold values
- Name different trace options
- Perform simple traces in the SAP system
- Develop procedures for structured troubleshooting

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Test Your Knowledge

1. What can transaction RZ20 be used for?
   Choose the correct answer(s).
   - □ A Database backup
   - □ B Updating data
   - □ C Monitoring the database and the SAP system
   - □ D Configuring and monitoring the firewall

2. Why do you integrate remote systems into central system monitoring?
   Choose the correct answer(s).
   - □ A To transport program code from system to system
   - □ B To create a local connection to a database backup of remote systems
   - □ C To be able to monitor these remote systems centrally
   - □ D To allow file sharing
   - □ E To connect an LDAP server

3. What types of monitors are there in the SAP system?
   Choose the correct answer(s).
   - □ A Ruled monitors
   - □ B Statistical monitors
   - □ C Rule-based monitors
   - □ D Static monitors
   - □ E Self-repairing monitors

4. With which of the following transactions can you activate a trace for SQL statements in the SAP system?
   Choose the correct answer(s).
   - □ A Performance trace
   - □ B System log
   - □ C (SAP) system trace
   - □ D Database performance analysis

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Answers

1. What can transaction RZ20 be used for?

   Answer: C

   You can use system monitoring in transaction RZ20 to monitor SAP systems and their databases.

2. Why do you integrate remote systems into central system monitoring?

   Answer: C

   Integrating remote systems should facilitate the central monitoring of systems.

3. What types of monitors are there in the SAP system?

   Answer: C, D

   There are static and rule-based monitors.

4. With which of the following transactions can you activate a trace for SQL statements in the SAP system?

   Answer: A, C

   You can analyze SQL statements by activating the trace in transaction ST01 (System Trace) or ST05 (Performance Trace). Transaction SM21 (System Log) is the system log and ST04 (Database Performance Analysis) is used to analyze database statistics.

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Course Summary

You should now be able to:

- Start and stop SAP systems
- Set up profile parameters
- Schedule database backups
- Create and manage users
- Set up remote connections
- Import Support Packages
- Configure printers in the SAP system
- Schedule and monitor background jobs
- Monitor the system
- Perform structured troubleshooting
- Describe the concept of the Work Centers

Related Information

- SAP Courses:

  ADM102 - *Administration AS ABAP II*
  ADM106 - *SAP System Monitoring Using CCMS I*
  ADM107 - *SAP System Monitoring Using CCMS II*
  ADM110 - *SAP ECC 6.0 Installation*
  ADM200 - *Administration AS Java*
  ADM315 - *Workload Analysis AS ABAP*
  ADM325 - *Software Logistics AS ABAP*
  ADM326 - *SAP ECC Upgrade*
  ADM327 - *Importing Enhancement Packages*
  ADM940 - *SAP Authorization Concept*
  ADM950 - *Secure SAP System Management*
  ADM960 - *Security in SAP System Environments*
  SM100 - *SAP Solution Manager Configuration for Operations*

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Glossary

ABAP
Advanced **B**usiness **A**pplication **P**rogramming. SAP's programming language.

activation
Procedure that makes an object available to the runtime environment. During activation, runtime objects are generated, which the application programs and screen templates access.

ALE
Application Link Enabling technology to create and operate distributed applications.

archive information structure
A central element in the SAP Archive Information System (AS). Using data fields, it enables you to find and display archived data.

archiving object
Logical object of related business data in the database that can be read from the database using a write program and then deleted from the database by the associated delete program after successful archiving.

Buffer
Area in the main memory of an instance in which data frequently used by applications can be temporarily stored.

business object
Representation of a business object in the real world, such as an order. SAP business objects describe entire business processes. This type of encapsulation reduces the complexity, since the internal structure of the business object remains hidden.

central system
A central SAP system consists of a single instance that provides all required SAP services and the associated database. In the case of a central system, these are usually on the same computer.

client
A client usually corresponds to the mapping of a company in an SAP system. That is, multiple companies can be mapped and active in parallel in an SAP system with multiple clients. A key field in the business tables of the database associated with the SAP system corresponds to the client. From a particular client, you can only access the data for that client. In this way, clients correspond to separate business entities.

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Software component that uses a server's service (software-oriented view) or a workstation that is provided with resources by the server (hardware-oriented view).

CPI-C

The Common Programming Interface for Communication describes data exchange between different programs. CPI-C can be used to transfer "packaged" data with various technical protocols, such as TCP/IP or LU6.2.

data archiving

Reading data from the database that is no longer required for online operation, and storing this data in an archive file. Archived data is usually deleted from the system. Archiving removes load from the system, meaning that programs, database accesses, and database backups have shorter runtimes due to the lower quantity of data in the database.

dispatcher (ABAP)

Central process of an ABAP instance. It is responsible, amongst other things, for starting work processes and, if necessary, the SAP NetWeaver AS Java, as well as distributing the transaction load across work processes.

dispatcher (Java)

Central process of a Java instance. It is, amongst other things, responsible for distributing the transaction load across server processes.

front end

Work center computer

instance

Administrative unit in which components of an SAP system that provide one or more services are grouped together. These services are started and stopped at the same time.

Instance Number

Two-digit number that identifies the instance. Each instance of the SAP application server requires its own instance number, as do other components such as the enqueue server, Central Services for AS Java, the SAP Web Dispatcher, and so on. Two instances with the same number must never be started on one machine.

Internet Communication Manager

The Internet Communication Manager (ICM) is the component in the SAP architecture that allows the SAP system to communicate directly with the Internet. It is started by the dispatcher of an instance.

Job

A job describes work processes (steps) to be executed in the system without user interaction (in the background). Jobs are processed by background work processes.

LDAP

Lightweight Directory Access Protocol. A protocol for accessing address directories, defined in IETF RFC 1777.

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lock table
The lock table is a table in the main memory of the enqueue server that contains information about the locks that currently exist. For each existing lock, it shows the owner, the lock mode, the name, and the fields of the locked table.

maintenance certificate
A maintenance certificate enables the SAP software logistics tools (for example, SPAM, SAINT, and JSPM) to identify the system to be maintained and to determine the extent of maintenance required. It is also used to ensure that only customers with a valid maintenance contract can perform the relevant maintenance transactions.

maintenance transaction
To import Support Packages, among other things, SAP recommends that you create a maintenance transaction with the Maintenance Optimizer. This maintenance transaction is used to calculate a consistent combination of Support Packages for a specific system or a combination of systems in the landscape and to approve this combination for download.

message server (ABAP)
Standalone program that contains a list of all instances that are part of the SAP system. In the case of a logon using logon groups, the message server determines the instance that a user logs on to, and organizes the communication between the instances.

Modification Adjustment
If SAP objects were modified by the customer, and these objects are imported with a Support Package, enhancement package, or a release upgrade, the objects have to be adjusted when they are imported. If these objects are not adjusted, the customer's modifications that have been made to the SAP objects are reset to the SAP delivery status.

output request
An output request contains the data from a spool request in a format for a particular printer model.

PAL
Printing Assistant for Landscapes (PAL): PAL allows output devices to be maintained in a (central) system, and then distributed across additional (target) systems.

RFC
Remote Function Call (RFC) is an SAP interface protocol based on CPI-C. It simplifies the programming of communication processes between systems.

role
A role is a collection of activities that a person executes to participate in one or more business scenarios of an organization. User menus are used to access the transactions, reports, Web-based applications, and so on, in the roles.

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SAP Archive Information System
Generic tool fully integrated in data archiving for searching SAP data archives. The search and display of data is based on archive information structures that the user can define and fill with data from the archive.

SAP ArchiveLink
A service integrated into the SAP system technology that creates a connection between stored documents and related application documents (business objects) in the SAP system.

SAP Business Suite
The SAP Business Suite is a complete package of open integrated solutions for the entire value chain. Customers, employees, vendors, and partners are brought together using the functions of the SAP Business Suite. Information, orders, and service requests can be efficiently and directly accessed and processed by the appropriate person.

SAP Easy Access
SAP Easy Access is the standard initial screen in SAP systems. The system displays the menu available to you in a tree structure on the left of the screen. You can display your own logo on the right of the screen.

SAP enhancement package
An SAP system consists of various software components with a particular release level. Importing parts of an SAP enhancement package updates some of these software components to a higher release level.

SAP GUI
SAP Graphical User Interface; software component with which the user can exchange information with the computer. With the user interface, you can select commands, start programs, display files, and choose other options by pressing function keys or pushbuttons or selecting menu options.

SAP GUI for Java
Platform-independent SAP GUI, requires a Java environment.

SAP GUI for Windows
Implementation of SAP GUI in a Microsoft Windows environment.

SAP Logon
When it is started, the SAP Logon program (only available for Microsoft Windows) provides a list of SAP systems for which the logon process can be started. This list is taken from the information in a file on the front end: *saplogon.ini*. This file is usually preconfigured centrally and provided to end users. The SAP Logon program also allows logon load balancing across the resources available for the selected system at logon.

SAP NetWeaver™
SAP NetWeaver provides an open integration and application platform that enables you to implement Enterprise Services Oriented Architecture (ESOA). You can standardize business processes irrespective of technological boundaries, integrate applications for your employees as required, and access and process information in a simple and structured way.

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SAP NetWeaver Application Server

The SAP NetWeaver Application Server offers complete support for platform-independent Web services, business Web applications and developments based on key technologies such as J2EE-compliant Java and ABAP. The SAP NetWeaver Application Server provides the infrastructure for many solutions and components of the SAP Business Suite, such as SAP ERP, SAP CRM or SAP NetWeaver BW.

SAP Note

An SAP Note is a text containing information for a particular question, problem situation, or system message, that can occur in connection to your work in the system. All SAP notes are available in an online database, and can be called by customers from there. A possible question could be, for example: "Which database versions of database XY are released in combination with my SAP system release?"
SAP Notes enable you to make adjustments on the basis of changes in legal requirements, correct errors in the standard SAP software and enhance existing functions, or make new functions available. An SAP Note mainly affects changes to an individual object. Compare also "Support Packages".

SAP system

An SAP system can be, for example, an SAP ECC, SAP SCM, or SAP CRM system. SAP systems are the central components of the SAP applications that form the SAP Business Suite.

server

Software component that provides a service (software-oriented view) or a central host in a network that provides resources to local computers (hardware-oriented view).

server process

Process that uses its services to work through requests to the AS Java. In contrast to ABAP work processes, Java server processes are multi-threaded, and can therefore process a number of requests at the same time.

SPAM/SAINT update

100% patch for the Support Package Manager (transaction SPAM) and the Add-On Installation Tool (transaction SAINT). The SPAM/SAINT update is used to update these two tools.

spool request

A spool request contains information about data to be output, its formatting, and the printer model used.

Support Package

A Support Package enables you to make adjustments on the basis of changes in legal requirements, correct errors in the standard SAP software and enhance existing functions, or make new functions available. A Support Package contains a number of changed objects. Compare also "SAP Note" and "Support Package Stack".

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Support Package Manager (SPAM)
Tool (transaction SPAM) for importing Support Packages. With the Support Package Manager, the tool itself is patched too. See also “SPAM/SAINT update”.

Support Package Stack
A Support Package Stack is a recommended combination of Support Packages and other patches for an SAP system. Compare also “Support Package”.

System Landscape Directory (SLD)
The System Landscape Directory (of SAP NetWeaver) is the central source for information about the system landscape.

system log
Analysis option for errors in the system and its environment.

Table
Tabular array of data in the ABAP Dictionary. A table consists of columns (data values of the same type) and rows (data records). Each record can be identified uniquely by one or more fields.

TemSe
Abbreviation for Temporary Sequential file; file that temporarily includes information such as spool request data and background processing job logs.

user context
Data that is assigned specifically to one user. If a user starts a transaction in the ABAP-based SAP system, the work process that is processing the request requires the user context. The user context contains a user-specific area that contains user and authorization data.

User Master Record
The user master record contains the definition of a user in the client. Some fields are, for example: Name, first name, initial password, telephone number, and so on. The user master record is used to create a user context (see this entry) when a user logs on to the system.

variant
Preassignment of the input fields of a selection screen for reports, for example to enable the execution of the report in the background.

work process
Process that handles requests in an SAP system. The following work process types exist: Dialog (for executing dialog programs), update (for changing database entries), background (for executing background jobs), spool (for print formatting) and enqueue (for executing lock operations).

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