SAP NetWeaver Library: Function-Oriented View

Generated on: 2020-02-07

SAP NetWeaver Application Server for ABAP 7.52 | SP05

PUBLIC

Original content: https://help.sap.com/viewer/ff18034f08af4d7bb33894c2047c3b71/7.52.5/en-US

Warning

SAP NetWeaver Library: Function-Oriented View

Use

This part of the SAP NetWeaver Library contains documentation on the functional areas of SAP NetWeaver. Information for all target audiences is available for each of the functional areas:

- *Application Server*

  This area includes information on the following:

  - Application Server Infrastructure
  - Application Server ABAP

- UI Technologies in SAP NetWeaver

  This area includes information on the following:

  - UI Technologies in ABAP
  - UI Frameworks based on HTML5, JavaScript, and CSS
  - Theming and Branding
  - User Interface Clients

- Solution Life Cycle Management

  Solution Life Cycle Management (SLCM) provides you with the technology required for the entire life cycle of your solution, from its implementation, through running a live system, to continuous modifications and upgrades.

- Search and Operational Analytics

  This area includes information on the following:

  - Embedded Search
  - Operational Data Provisioning
  - Other Search technologies:
    - SAP NetWeaver Enterprise Search
    - Search Engine Services
    - Search and Classification TREX

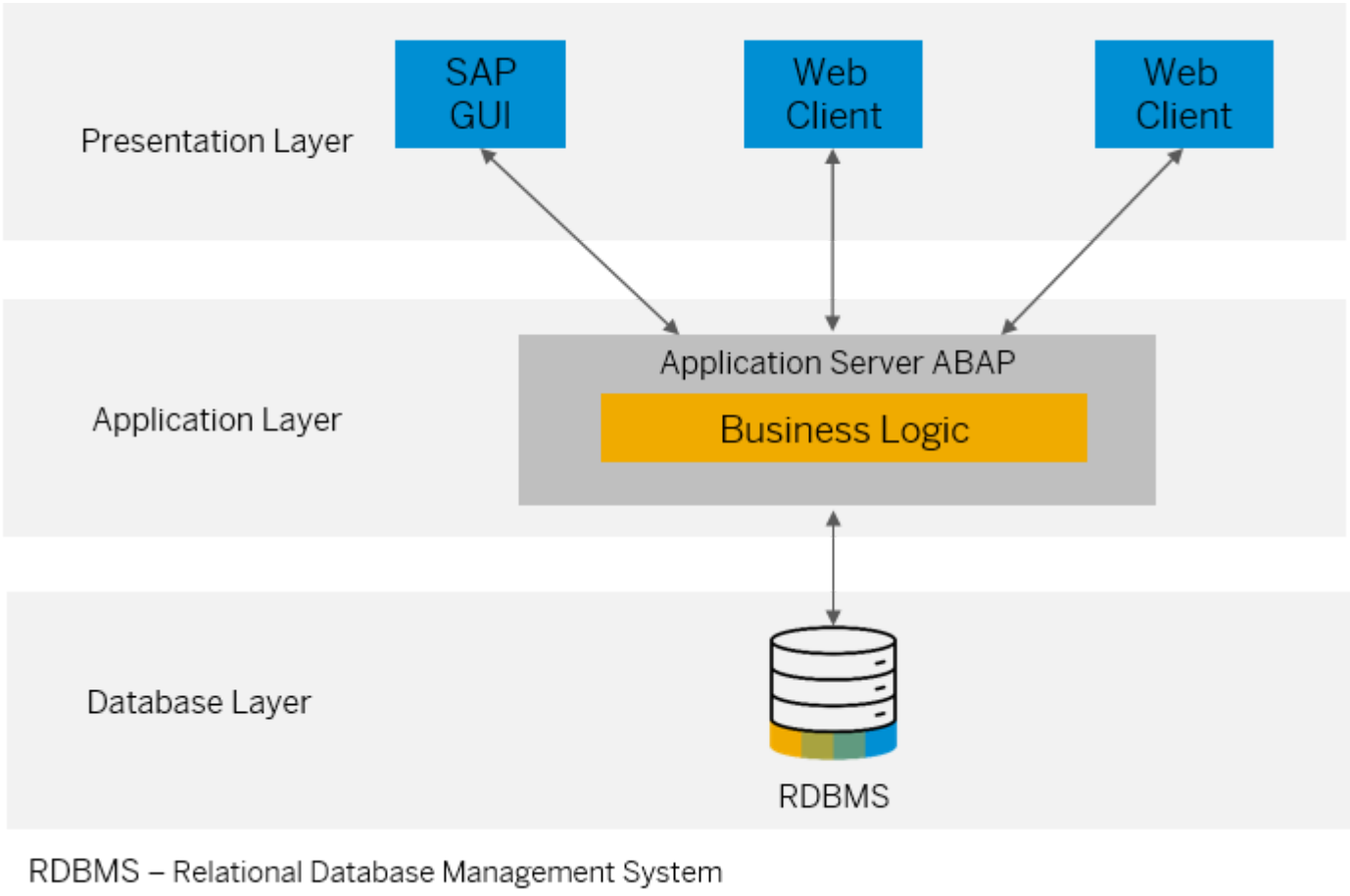
- Database Administration for SAP HANA
- Database Administration
- Security
- Accessibility

SAP NetWeaver Application Server for ABAP Infrastructure

SAP NetWeaver Application Server for ABAP (AS ABAP) is a platform on which important business processes run. It provides a complete development and runtime environment for ABAP-based applications.

The purpose of AS ABAP is to provide programmers with an efficient means of expressing business logic and relieve them from the necessity of platform-related and purely technical coding. AS ABAP is therefore a basis for all ABAP systems.

AS ABAP is part of a three tier architecture, which consists of a database, application and presentation layer, and provides greater scalability, robustness and extensibility. A classical ABAP system includes the database and the application layer, and contains a database schema and AS ABAP.



Three Tier Architecture

AS ABAP is located on the application level, upon which the entire business logic runs. It provides a complete runtime and development environment for ABAP programs. This environment is optimized for the development of highly scalable business applications.

On the one hand, AS ABAP provides interfaces to the presentation level (SAP GUI, browser, Business Client) by supporting different protocols (HTTP, HTTPS, RFC, and so on). On the other hand, supports AS ABAP different operating systems and databases.

As the development environment, AS ABAP enables SAP customers and partners to enhance and modify SAP standard applications, as well as to build their own applications. The entire, powerful infrastructure of the AS ABAP can be used, which even supports the creation of the most complex applications by large groups of developers.

AS ABAP is made up of different components, which are described in this documentation.

Systems and Instances

An AS ABAP comprises specific entities known as system and instance. The following explains these two terms in greater detail:

- **ABAP system** – installed software system that provides a defined set of functionalities that are part of an SAP solution. These functions are implemented in a set of software components. An ABAP system is installed and configured as a unit. It comprises one or more application server instances (AS instances), a central services instance (ASCS instance), and a database schema. An ABAP system is identified by its SAP system ID (SID), which consists of 3 letters or digits (e.g. PRD).
- **Application server instance (AS instance)** – administrative unit that combines components of an SAP system running on one physical host. An application server instance provides the actual data processing functions of a system and provides the corresponding services. Instances are started, stopped, and monitored as one unit. There can be multiple instances (belonging to the same system or to different systems) running on one host. However, several instances of a system can also be running on different hosts. An AS instance is uniquely identified by the host name, the SID),and a two-digit instance number.

ℹ Note

The terms application server instance and application server are often used synonymously.

The following instance types exist:

- Primary application server (PAS) - the first AS instance of an ABAP system installed.
- Additional application server (LOA) – all other AS instances of an ABAP system.
- ABAP system central services instance (ASCS instance) - every ABAP system has an ASCS instance, which comprises a message server and an enqueue server. The ASCS instance is usually used for reasons of high availability.
- There are other instance types, in addition to those mentioned here, such as Enqueue Replication Server (ERS) and SAP Web Dispatcher.

Related Information

Application Server ABAP
Architecture of SAP NetWeaver Application Server for ABAP
Administration of Application Server ABAP
Components of SAP NetWeaver Application Server for ABAP
Connectivity

Architecture of SAP NetWeaver Application Server for ABAP

The SAP NetWeaver Application Server for ABAP (AS ABAP) provides the complete infrastructure for developing and running ABAP-based applications. The design of AS ABAP is aimed at providing an exceptionally high level of robustness and supportability for the applications running on it.

The architecture of AS ABAP and basic terminology are explained below. For detailed information about the individual settings, read the field help.

Instances of the SAP NetWeaver Application Server for ABAP

An ABAP system has several application server instances (AS instances). An instance is an administrative unit containing various components of an SAP system. The components of an instance are parameterized in a shared instance profile. Each instance is identified by a system ID and an instance number. An ABAP system consists of AS instances and an ABAP central services instance (ASCS instance).

There can be any number of AS instances in a system. The AS instances process incoming user requests. An AS instance contains exactly one SAP start service, one ABAP dispatcher, Internet Communication Manager (ICM), one gateway, and any number of work processes (dialog, background, update task, spool).

As well as multiple AS instances, there is one ASCS instance that contains the Message Server, the Enqueue Server, and a separate SAP start service. The ASCS instance cannot process any dialog requests - it is used to manage locks, exchange messages, and balance workload in the SAP system. ASCS instance has an ABAP system using not include the Enqeueue-Workprozess and the message server to the AS instance.

Overview of the Components of SAP NW AS ABAP

The AS ABAP is made up of the following components:

- ABAP Dispatcher
- Internet Communication Manager (ICM)
- RFC Gateway
- SAP Start Service
- SAP Message Server
- Standalone Enqueue Server or Standalone Enqueue Server 2

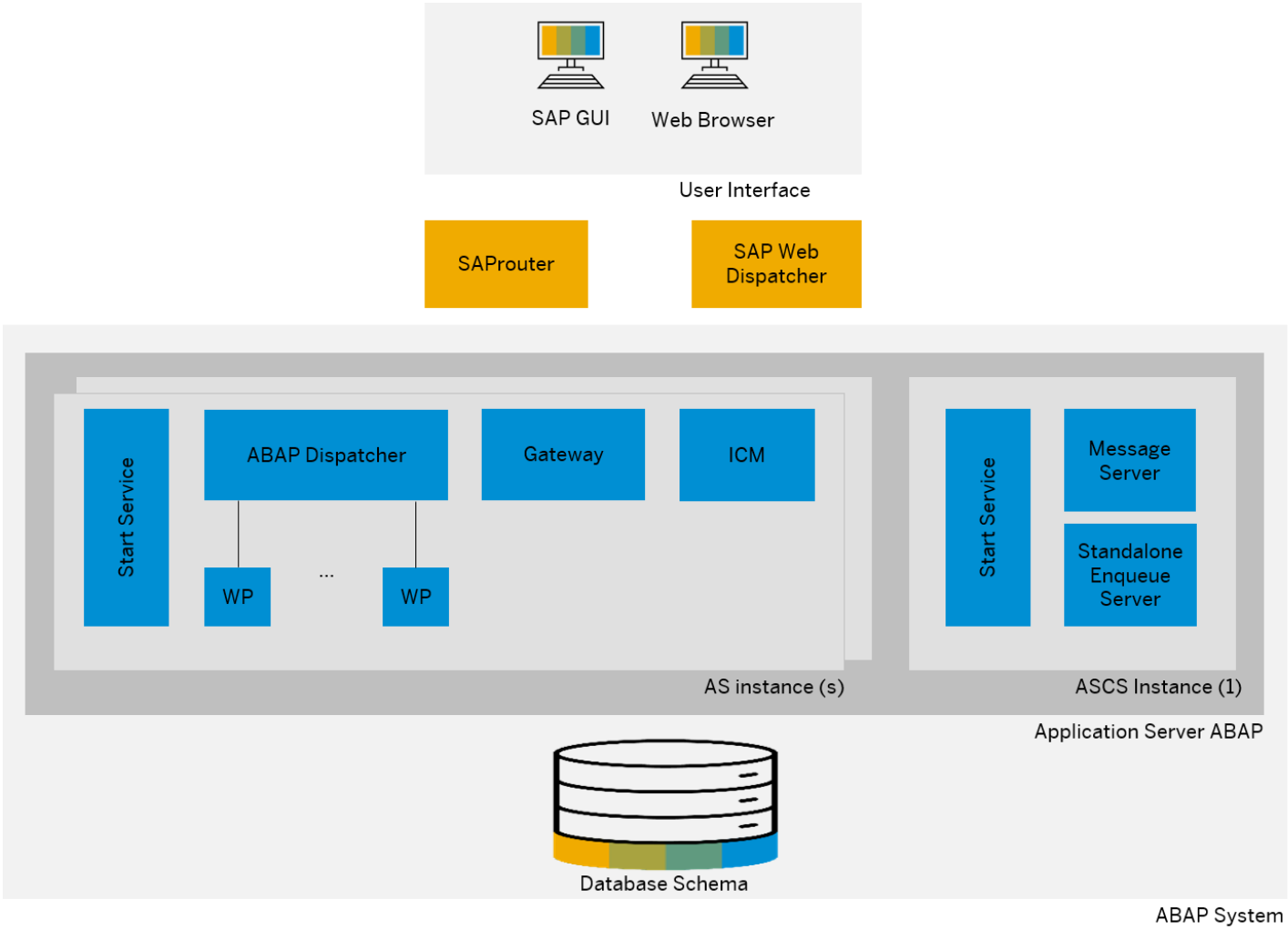
In addition, the following optional components are installed that are not part of the ABAP system:

- SAP Web Dispatcher
- SAProuter

The processes in AS ABAP include:

- Dialog: Deals with all requests triggered by an active user (person or program), plus all non-specialized requests that, for example, are received from RFC and HTTP connections. For each AS instance, you need to configure at least two dialog work processes.
- Update: Executes update requests. The update makes consistent changes to the database. You need at least one update work process in the whole ABAP system. However, you can also have more than one configured for each ABAP instance.
- Print (spool) Forwards sequential data streams to output devices (printers). You need at least one spool work process in the entire ABAP system. However, you can also have more than one configured for each ABAP instance.
- Background Processing (batch) Processes programs that can be executed without user interaction. You need at least two background work processes in the entire ABAP system. However, you can also have more than one configured for each AS instance.
- Enqueue: Locks and releases lock objects. You need the enqueue work process only if no central instance (ASCS instance) in your ABAP system.

The following figure shows the components of an AS ABAP within an ABAP-only system. For a better overview, series lines have not been used. Depending on the request type, inbound requests are handled either by the ABAP Dispatcher, the Internet Communication Manager or SAP Web Dispatcher, or directly by Gateway. There is one database for each ABAP system.



Component Overview of Application Server ABAP

Related Information

Components of SAP NetWeaver Application Server for ABAP

Components of SAP NetWeaver Application Server for ABAP

Use

The following are the components of SAP NetWeaver Application Server for ABAP (AS ABAP). In the list, the standard components as well as optional components, such as SAP Web Dispatcher or SAProuter, listed. It displays the work processes (WkP) of the AS ABAP are listed.

Overview of the Components of SAP NW AS ABAP

Component	Description
ABAP Dispatcher	The ABAP dispatcher distributes the requests to the work processes.
Task handler	The task handler controls the work process and manages its resources if the work process was instructed by the Dispatcher to process a specific ABAP program.

Component	Description
SAP Start Service	The SAP start service provides the following functions for monitoring SAP systems, instances, and processes. • Starting and stopping • Monitoring the runtime state • Reading logs, traces, and configuration files • Technical information, such as network ports, active sessions, thread lists, etc.
SAP Message Server	There is only one SAP Message Server in every SAP system. It is a part of the ABAP Server Central Services instance (ASCS instance) and performs the following tasks in the SAP system: • Central communication channel between the individual application servers (instances) of the system • Load distribution of logons using SAP GUI and RFC with logon groups • Information point for the SAP Web Dispatcher and the application servers (each application server of the system firsts logs on to the message server)
Standalone Enqueue Server	The standalone enqueue server is part of the ABAP Server central services instance (ASCS instance), which manages SAP locks. Together with the enqueue replication server, the standalone enqueue server as the single point of failure offers for your SAP system a high availability (HA) solution.
Standalone Enqueue Server 2	The new Standalone Enqueue Server 2 is also responsible for managing locks and together with the Enqueue Replicator 2 offers a new high availability (HA) solution for an SAP system.
Internet Communication Manager (ICM)	Component of Application Server ABAP that receives and sends Web requests (HTTP(S), SMTP,...). ICM evaluates the URL and forwards requests to AS ABAP.
SAP Web Dispatcher	Standalone program that you install in the demilitarized zone (DMZ). It is the entry point for Web requests. SAP Web Dispatcher balances the load across the application servers (instances) and can also perform other monitoring tasks.
RFC Gateway	Gateway implements within an SAP system the RFC services based on TCP/IP. These services enable SAP systems and external programs to communicate with one another. RFC services can be used either in the ABAP program or for the external programs using the interfaces. RFC can be used between the individual processes of an instance, a system, or between several systems.
SAProuter	The SAProuter is a tool that protects the network against attacks

Work Processes of AS ABAP

Work Process:	Description
ABAP work process: Dialog	The work process is responsible for the execution of dialog steps that are triggered by an active user.

Work Process:	Description
ABAP Work Prozess: Print (Spool)	The following are among the main tasks of the SAP spool system: • Processing and managing print requests • Administering output devices • Technical mapping of the output devices in the SAP system
ABAP Work Prozess: Update	The update system is used to lighten the workload of the SAP transactions when time-consuming changes are made to the database. These are then carried out asynchronously in special updating work processes. The update system also avoids rollback problems that occur as a result of the differences between the logical units of work (LUW) in an SAP transaction and in the database.
ABAP Work Process: Background Processing	This work process enables background jobs to be processed with the Computing Center Management System (CCMS). CCMS provides extensive support with scheduling and managing background jobs.

SAP Start Service

Use

The SAP start service runs on every computer where an instance of an SAP system is started. It is implemented as a service on Windows, and as a daemon on UNIX. The process is called `sapstartsrv.exe` on Windows, and `sapstartsrv` on UNIX platforms.

The SAP start service provides the following functions for monitoring SAP systems, instances, and processes.

- Starting and stopping
- Monitoring the runtime state
- Reading logs, traces, and configuration files
- Technical information, such as network ports, active sessions, thread lists, etc.

These services are provided on SAPControl SOAP Web Service, and used by SAP monitoring tools (SAP Management Console, SAP NetWeaver Administrator, etc.).

Features

Ports

The start service connects the following ports:

- HTTP port 5<xx>13 (or `sapctrl <xx>` in `/etc/services`), where<*xx*> is the number of the instance
- HTTPS port 5<xx>14 (or `sapctrls <xx>`) in `/etc/services`), where <*xx*> is the number of the instance

Example

The start service uses HTTP port 50013 and HTTPS port 50014 for an instance with number 00.

Security

The standard SAP setup is used for secure SSL communication.

If critical functions (“protected methods”, such as restarting an instance) are not called using a trusted connection, they require authentication with operating system user and password. On UNIX platforms trusted connections go through UNIX domain sockets (`/tmp/.sapstream<port-no>`), and on Windows they go through “Windows named pipe” (`\\<host>\pipe\sapcontrol_<xx>`)

Integration

The start service is registered automatically in LDAP (Lightweight Directory Access Protocol) if `ldap/autoregister = 1` is set in the profile.

The start service is registered automatically in SAP SLD (System Landscape Directory). File `slddest.cfg` is required in directory `DIR_GLOBAL` for the registration.

The Web service interface is compatible with the following SOAP implementations: SAP ABAP, SAP JEE, Java Axis, Microsoft .NET.

Process

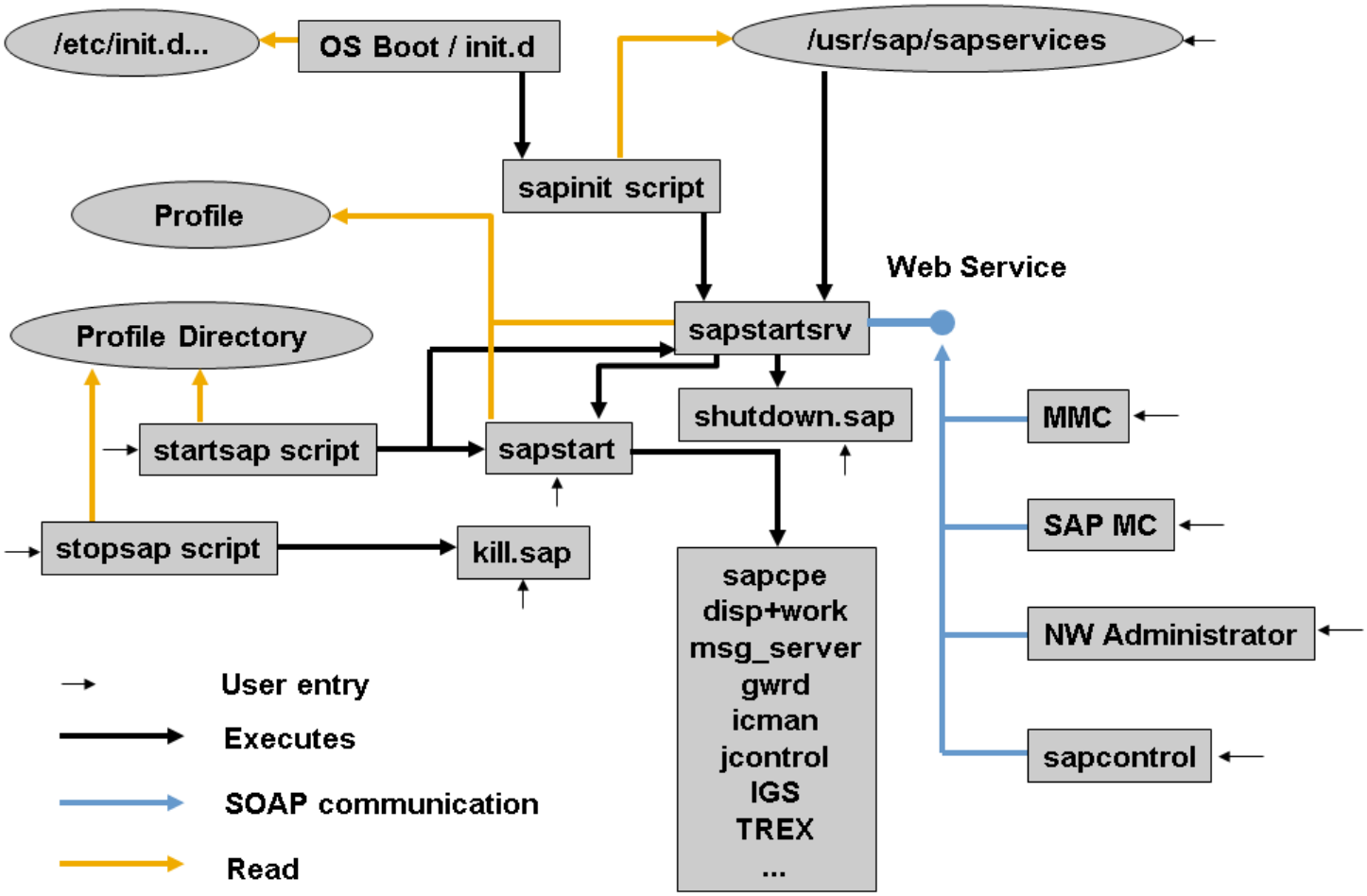
An SAP instance is started differently on Windows and UNIX platforms.

> ⚠ **Caution**
> For both operating systems, the start service requires the SAP profile. If this is not found, the service cannot start. You can find the related error message in file `sapstartsrv.log`.

UNIX

The instance is started by the `sapstartsrv` process, and not directly by the start service `sapstart`. The process is started by the start service, which ideally is started by the `sapinit` script when the operating system is booted.

The following figure shows how these processes fit together:



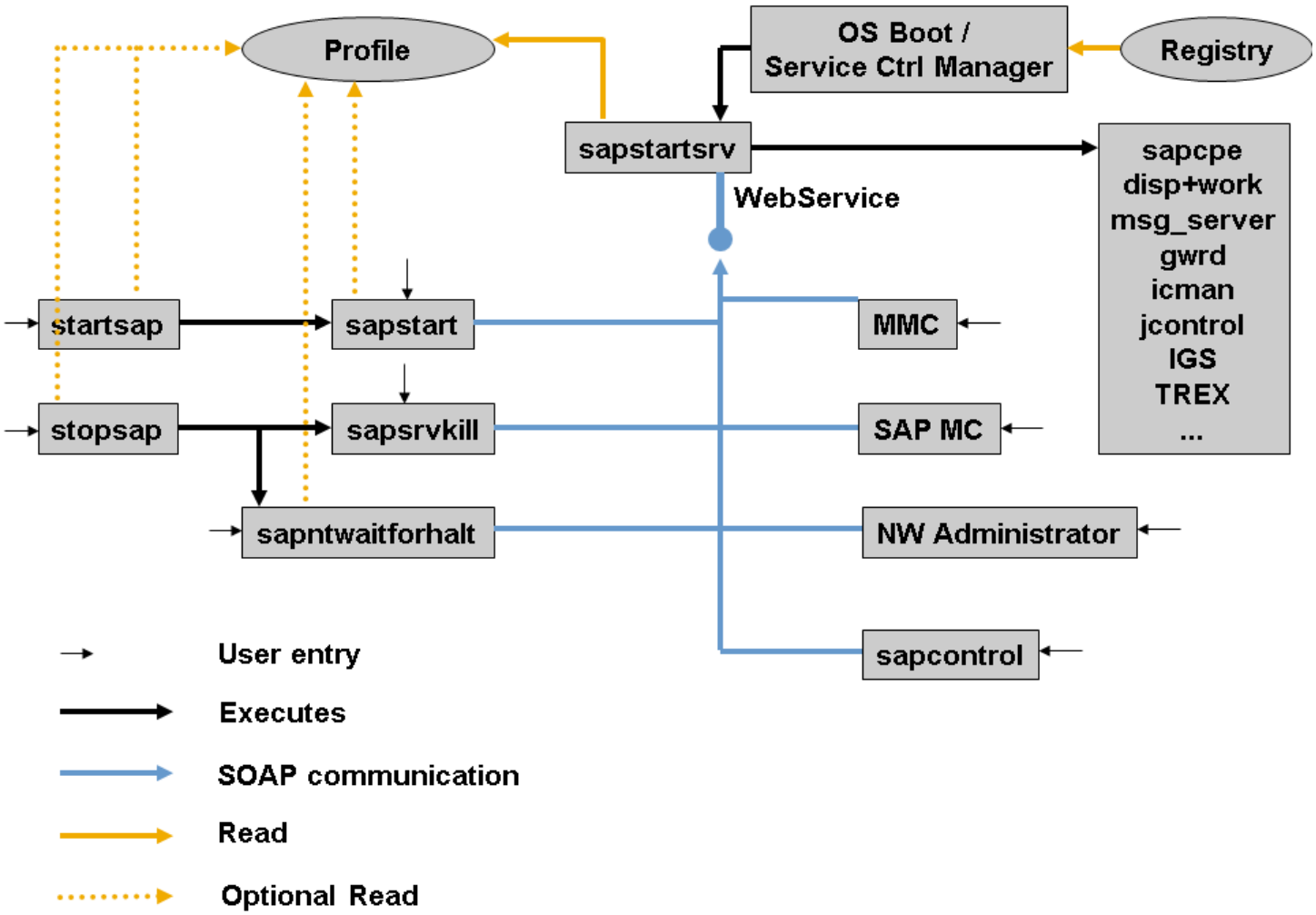
Startup on UNIX Platforms

You can also still use the `startsap` and `stopsap` scripts to start and stop the instance (standard procedure in older releases).

Windows

On Windows the instance is started directly by the start service (process `sapstartsrv.exe`). The start service is started automatically when the operating system is booted.

The start service reads the instance profile and executes all commands in the instance profile that contain an `Execute_` statement. It then starts the processes of the SAP instance in the order in which the `Start_Program_` statements are listed in the profile.



Startup on Windows Platforms

More Information

Systems and Instances

An SAP NetWeaver Application Server comprises specific entities called “system” and “instance”. The two terms are often used incorrectly and this can cause confusion. Below is a definition of the most important entities contained in ABAP systems and Java systems. Their relationship to each other is also described.

- **SAP system** – installed software system that provides a defined set of functionalities that are part of an SAP solution. These functionalities are implemented in a set of software components. An SAP system is installed and configured as a unit. It consists of a logical database, one or more application server instances (ABAP or Java), central services (such as a message server and enqueue server), and optional components (such as TREX and liveCache). The system is identified by its SAP system ID, which consists of 3 letters or digits (e.g. PRD).
- **Application server instance** – administrative unit that puts together components of an SAP system running on one physical host. Application server instances provide the actual data processing functions of a system and offer the corresponding services. Instances are started, stopped, and monitored as one unit. There can be multiple instances (belonging to the same system or to different systems) on one host. An instance can be uniquely identified by the host name and a two-digit instance number.

There are two types of systems: ABAP system, Java system. The system types consist of the corresponding instance types in a homogeneous way, meaning only one type is permitted in the system: ABAP instances or Java instances.

The instance types in turn consist of different processes.

The main instance types are the following:

- **ABAP server instances** are often called “dialog instances”. This term is however incorrect because ABAP server instances and client requests also work as background jobs. They consist of common components such as ICM (Internet Communication Manager), IGS (Internet Graphics Server), and ABAP work processes of different types: dialog (for mostly interactive use), batch (for background processing), update (for update processing, which plays an important role in the ABAP transaction model), and spool (for printing) depending on the purpose of the instance and the work load characteristics.
- **Java server instances** consist of common components such as ICM, IGS, and Java server processes, each running on one Java Virtual Machine (JVM).
- **Central Services Instance (SCS)** - Every ABAP or Java system has one SCS consisting of a Message Server for communication between instances and an Enqueue Server for lock management.
- In addition to the instance types described here there are others, such as TREX, Web Dispatcher, and enqueue replication server.

Monitoring Tools:

The following monitoring tools use the Web service interface:

- SAP Microsoft Management Console: Windows
- SAP Management Console
- SAP NetWeaver Administrator
- `sapcontrol`: with `sapcontrol` (process name on Windows `sapcontrol.exe`) you can call the functions of the Web service interface from the command field. `sapcontrol -h` shows the syntax and the available options.

  You can find information for developers about using SAPControl Web services in SDN at http://www.sdn.sap.com/irj/scn/index?rid=/library/uuid/60e24f7b-1ba1-2b10-c0a0-e514b855624b&overridelayout=true

Application Server ABAP

Use

The SAP Web Application Server provides a complete development and runtime environment for ABAP-based applications. It is optimized for the development of highly scalable business applications.

The ABAP development environment is used both for developing completely new applications and extending and modifying SAP standard applications for customers. The entire, powerful infrastructure of the Web AS can be used, which even supports the creation of the most complex applications by large groups of developers.

The ABAP technology can be used to implement complete applications including user interfaces. However, it is also possible to implement only the core components of an application, such as the business logic and persistence in ABAP and to use defined interfaces (RFC, BAPIs, Web Services and so on) so that a Java-based interface can be used, or to make other applications available.

Prerequisites

To be able to understand the documentation, users should be familiar with:

1. Basic programming knowledge

2. Database programming in SQL

3. Principles of object-oriented programming

Features

The ABAP development and runtime environment makes it possible to develop complex business applications, without having to worry explicitly about technical details such as process or memory administration, multi-user capability, database connections or similar issues. These are provided in the basis services or are integrated directly in the ABAP runtime. The application development is similarly independent of the underlying platform. The Web AS decouples the application coding completely from the operating system and database that are used.

ABAP Workbench

In addition to the pure ABAP Editor for creating ABAP source code, the development environment, which is completely integrated in the server, also provides support for developing extensive projects in the form of:

- Versioning support
- Structuring the development object in packets
- Interface editors for SAP GUI-based interfaces
- Development tools for Web interfaces
- Support for multi-lingual text elements and messages
- Connection to the Transport Organizer
- Direct access to all data definitions in the ABAP Dictionary
- Debugger
- Tools for runtime analyses
- Test tools
- Modification assistant to compare user-defined extensions

ABAP development projects are managed directly in the system; metadata and source code are located in the database.

ABAP Objects

The ABAP programming language unifies the advantages of an object-oriented language with those of an integrated 4GL language. The typical OO language constructions such as classes, interfaces, inheritance and so on are available. Furthermore, many of the server's services, which are integrated in other languages in the form of libraries and have to be addressed using APIs, are integrated directly in the language. This includes amongst other things the direct possible use of all data types that are managed in the central ABAP Dictionary, in particular the integration of database access.

Persistence and Transactions

A central feature of the ABAP development is the direct integration of database access. The runtime environment ensures that every ABAP program automatically receives an open connection to the central database in the system, so that an application programmer does not need to worry about opening and closing database connections. ABAP Objects contain Open SQL, a platform-independent SQL dialect as a direct component of the language. It can be used to execute database accesses directly without having to use an API or a class library. Buffer mechanisms on the application server-side ensure that highly-scalable, complex database accesses are possible.

In addition to Open SQL, object services are offered that enable persistent objects to be defined, whose persistence is completely taken over by the runtime.

The runtime system provides its own lock mechanism for synchronizing accesses to data in the database. This prevents two parallel transactions from being able to change the same data in the database. The update enables business processes to be mapped in transactions, which ensure the integrity of the data.

UI Technologies

With Web Dynpro ABAP, Application Server ABAP provides a programming model based on the Model View Controller principle. The architecture of this model is identical to that of Web AS ABAP and Web AS Java. Applications that were created using Web Dynpro for ABAP are displayed using a standard browser on the user's PC.

In the past, the interfaces of classic SAP applications were based on the SAP GUI. In addition to the list-based display of data, the dynpro technology gives you the option of programming dialogs, which are displayed at runtime using a proprietary protocol in the SAP GUI. This type of UI programming is still possible, and additional UI programming technologies have been created.

The ITS was introduced so that you can use existing interfaces in the Web whilst keeping the work required to migrate them as low as possible. In addition to the pure conversion of the GUI interface into the Web protocol at runtime, it is also possible to create special, HTML-based interfaces, which are mixed at runtime with the data belonging to screens that were developed especially for this.

The Business Server Pages model follows the server-side scripting approach. Similar to JSPs, this model makes it possible to create an HTML-based Web application with integrated ABAP. The Business Server Page model is based on the underlying Internet Communication Framework, which enables it to implement ABAP-based services, which respond to HTTP or HTTPS requests.

Documentation and Translation Tools

The integrated documentation and translation tools are used to create documentation and multilingual applications. New applications and changes to SAP standard applications can be documented directly. The documentation texts are managed similarly to the development objects. Multilingual texts can be created separately from the actual program development using the translation tools. Connection to the transport system means that even complex documentation and translation landscapes can be created and managed.

More Information

For more information about the Application Server ABAP, see the following sections of the documentation:

- Application Development on AS ABAP
- Administration of Application Server ABAP
- Other Services

Solution Life Cycle Management

Solution life cycle management provides you with the technology required for the entire life cycle of your solution, from its implementation, through running a live system, to continuous modifications and upgrades.

The following table lists the capabilities for solution life cycle management:

Area	Description

Area	Description
SAP Licenses	This section gives you an overview of the tools that manage your SAP licenses.
SAP Business Continuity	The term "Business Continuity" describes the efforts to ensure that business-critical functions are continually available to customers, vendors, and companies. The aim is to reduce both unplanned and planned downtimes of an SAP system to a minimum. For information about Business Continuity in SAP environments, see the SAP Business Continuity Guide in SCN at http://scn.sap.com/community/business-continuity.
SAP NetWeaver Configuration	Here you can find notes on technical configuration steps which may be necessary in your SAP NetWeaver system.
Security and User Administration	Describes the tools and tasks for maintaining the security configuration and user master data in your system.
Starting and Stopping SAP NetWeaver AS	Describes how SAP NetWeaver AS is started and stopped. The procedures assume a central system that consists of a database and a central instance (ABAP, Java) on a single host.
Connecting a Technical System to SAP Solution Manager	SAP Solution Manager gives you central access to tools, methods, and preconfigured content that you can use to evaluate and implement your solutions. When your implementation is running, you can use SAP Solution Manager to manage and monitor systems and business processes in your solution landscape, and also to set up and operate your own solution support.
Solution Monitoring	The monitoring features in IT landscapes monitor IT components and processes that run across multiple components. The monitoring results are displayed in a central system. Any problems are displayed as alerts. You can use the relevant analysis methods to go to an appropriate transaction or tool to evaluate the problem.
SAP Host Agent	The SAP Host Agent contains all required elements for central provisioning, monitoring, and controlling of any host, instance, database, or SAP system.
SAP Management Console	With SAP Management Console, you can start, stop and monitor SAP systems and their instances centrally. Unlike SAP MMC, SAP Management Console is a Java applet, which means that you can manage remote systems regardless of platforms with your browser without a local installation.

Area	Description
SAP Microsoft Management Console: Windows	The SAP Microsoft Management Console (SAP MMC) provides a common framework for system management. You can use this to start, stop and monitor SAP systems centrally with Microsoft Windows platforms.
Database Administration Database Administration for SAP HANA	Here you can find more information about routine administration of the databases that are supported by SAP. You can find further information about routine administration of the SAP HANA database here.
SAP Printing Guide (BC-CCM-PRN)	The SAP Printing Guide describes the functions of the SAP spool system. This system was designed for use on different platforms. To save users from having to deal with operating-system-specific issues, SAP provides its own spool service and a spool database.
System Copy	If you want to change your operating system, your database, or both, you must perform a system copy. We also recommend that you perform a system copy if you are planning to set up a test system, demo system, or training system.
Backup and Recovery	You need to regularly back up your operating system and database to restore the SAP system, if required.
Software Logistics	You can use the tools and processes in Software Logistics to implement new functions, to copy or migrate existing systems and to support the creation and distribution of changes in your system landscape. You can also update your system landscape in order to ensure smooth operation and upgrade existing scenarios in your landscape to new releases.
Statistics	Statistics give you an overview of system performance and system load.
Data Archiving	You can use the data archiving functions to archive any completed business transactions that are no longer relevant for your daily operations, and so significantly reduce the load on the database.
ILM Database Store (BC-ILM-STO)	You can use the ILM Database Store to store archive files in a database if you are using the WebDAV interface standard BC-ILM 3.0.
Data Aging (BC-CCM-DAG)	Data Aging allows you to move the data within a database from the hot area to the cold area, to gain working memory. You move the data by specifying a data temperature for this data, which is defined by the application. This affects the visibility during data accesses by the application server (SAP NetWeaver AS for ABAP).

Area	Description
Information Retrieval Framework (IRF)	The Information Retrieval Framework (IRF) allows you to search for and retrieve all personal data of a specified data subject. The search results are displayed in a comprehensive and structured list containing all personal data of the data subject specified, subdivided according to the purpose for which the data was collected and processed.
Application Log (BC-SRV-BAL)	The application log is a tool that collects messages, exceptions, and errors. This information is organized and displayed in a log.
Troubleshooting	For information about troubleshooting (problem analysis scenarios) for particular installable software units, see the relevant sections of the documentation. The SAP Technology Troubleshooting Guide provides a central starting point for all problems and can be found at http://wiki.sdn.sap.com/wiki/display/TechTSG.
Testing	SAP NetWeaver provides you with a full environment for all test phases of ABAP applications and Web Dynpro Java applications: From creating and running tests using eCATT through to test administration using Test Workbench.
Remote Support Setup	If you want to use SAP remote services (for example, SAP EarlyWatch or Remote Consulting), or if you would like to permit an SAP support consultant to work directly in your system to make a more precise problem diagnosis, then you need to set up a remote service connection.
Audit Information System	SAP NetWeaver AS for ABAP provides you with a simple audit function and the Audit Information System.

SAP Licenses

Use

For managing the SAP licenses, the following tools are available as standard.

SAP License Keys

To use your SAP systems successfully, they must be assigned with lasting SAP license keys, as described in SAP License Keys .

More information is available on the SAP Service Marketplace under the Quick Link `licensekeys` .

http://service.sap.com/licensekeys

Licensing the AS Java

Documents how you request and import a license key for AS Java.

More information is available under *Licensing AS Java* and on the SAP Service Marketplace under the Quick Link `licensekeys`

http://service.sap.com/licensekeys

SAP System Measurement

With the measurement program (transaction USMM), you can ascertain the number of users and used engines of the SAP software for each system. You can then pass the measurement results to SAP.

Additional information is available in System Measurement , and in the SAP Service Marketplace under the alias `licenseauditing` .

http://service.sap.com/licenseauditing

License Administration Workbench (LAW)

Using the License Administration Workbench, you can consolidate the measurement results of one or more systems, as described in License Administration Workbench . You can then pass the consolidated measurement results to SAP.

More information is available on the SAP Service Marketplace under the Quick Link `licenseauditing` .

http://service.sap.com/licenseauditing

BPO Usage Measurement

Documents licensing for customers that sell services to other companies.

SAP NetWeaver Configuration

SAP NetWeaver offers tools to help automate configuration.

Configuration using ABAP Task Manager for Lifecycle Management Automation

Perform configuration tasks in an automated way by using the ABAP task manager. The ABAP task manager guides you through extensive configuration processes by means of predefined task lists and offers the possibility to customize them according to your needs.

Related Information

Configuration Information
Configuration using ABAP Task Manager for Lifecycle Management Automation

Configuration using ABAP Task Manager for Lifecycle Management Automation

Perform configuration tasks in an automated way by using the ABAP task manager for lifecycle management automation (ABAP task manager).

The ABAP task manager guides you through extensive configuration processes with predefined task lists and offers the possibility to customize them according to your needs.

SAP offers predefined task lists for the following use cases:

- ABAP Initial Setup

  After you have installed a new SAP system, you have to perform an initial setup and configuration of the system to enable its usage. For example, you have to install an SAP license, create logon groups, and configure the Transport Management System and security settings.

  For more information, see the Technical Configuration Automation Configuration Guide on SAP Support Portal at http://support.sap.com/sltoolset.

- ABAP Post-Copy Automation

  > **Note**
  > **Disclaimer:**
  >
  > Predefined task lists for ABAP post-copy automation are only available if you own an SAP Landscape Management enterprise edition license. Contact your SAP representative to obtain a license to make this function available.

  For more information about using the predefined task lists with the enterprise edition of SAP Landscape Management, see the ABAP Post-Copy Automation Installation and Configuration Guides on SAP Help Portal at https://help.sap.com/viewer/p/ABAP_POST-COPY_AUTOMATION.

- SAP Fiori Setup

  You perform system configuration tasks for Gateway or SAP Fiori Launchpad. For example, you perform basic configuration steps for Gateway or activate launchpad OData and HTTP services on a Gateway system.

  For more information, see SAP Fiori Implementation Information on SAP Help Portal at https://help.sap.com/viewer/p/FIORI_IMPLEMENTATION.

- Security Checks

  You perform security system smoke tests, such as checking the Secure Sockets Layer (SSL) configuration or the basis system configuration.

  For more information, see the Technical Configuration Automation Configuration Guide on SAP Service Marketplace at http://support.sap.com/sltoolset.

- Embedded Search

  You perform configuration tasks to automate Embedded Search configuration and administration.

  For more information, see Automatic Configuration Using Task Manager Task Lists.

For more information about using the ABAP task manager, call one of the following transactions and choose the Online Help pushbutton:

Transaction	Description
STC01	ABAP task manager for lifecycle management automation
STC02	Task list run monitor

Related Information

ABAP Technical Configuration
Automated Initial Setup of ABAP-Based Systems
Standard Roles and Permissions

Assigning Roles
Executing Task Lists with the ABAP Task Manager for Lifecycle Management Automation
Displaying Task List Documentation
Displaying Log Information for Task List Runs

Standard Roles and Permissions

The table below shows the standard roles and permissions that are used for automated technical configuration activities.

Role	Description	Permissions
SAP_BC_STC_DISPLAY	Role for displaying task lists. This role allows task lists and corresponding objects (task list runs and task list variants) used for technical configuration to be displayed.	• Display task lists (transaction STC01) • Display task list variants (transaction STC01) • Display task list runs (transaction STC02)
SAP_BC_STC_USER	Role for a configuration user. This role reflects the typical usage of the ABAP task manager for lifecycle management automation.	• Display task lists (transaction STC01) • Execute task lists (transaction STC01) • Define task list variants (transaction STC01) • Display task list variants (transaction STC01) • Display task list runs (transaction STC02)
SAP_BC_STC_AUTHOR	Role for authoring task lists. This role allows task lists used for technical configuration to be authored.	• Create task lists (transaction STC01) • Copy task lists (transaction STC01) • Change existing task lists (transaction STC01) • Delete task lists (transaction STC01) • Display task lists (transaction STC01) • Display task list variants (transaction STC01) • Display task list runs (transaction STC02)

Role	Description	Permissions
SAP_BC_STC_REORG	Role for cleaning up runtime data. This role allows task list runs executed during technical configuration to be cleaned up.	• Display task lists (transaction STC01) • Display task list variants (transaction STC01) • Display task list runs (transaction STC02) • Delete task list runs (transaction STC02)
SAP_BC_STC_REMOTE	Role for remote access. This role contains the authorizations which are necessary to operate on technical configuration task lists remotely.	To perform particular actions, further authorizations are necessary. See other SAP_BC_STC_* roles.
SAP_BC_STC_CUST	Role for customizing task lists or task list variants. This role contains the authorization for transporting task list variants between systems.	• Display task lists (transaction STC01) • Display task list runs (transaction STC02) • Create task list variants (transaction STC01 • Define task list variants (transaction STC01) • Transport task list variants (transaction STC01)

Role	Description	Permissions
SAP_BC_STC_ADMIN	Role contains all permissions of the following roles: • SAP_BC_STC_DISPLAY • SAP_BC_STC_USER • SAP_BC_STC_AUTHOR • SAP_BC_STC_REORG • SAP_BC_STC_REMOTE • SAP_BC_STC_CUST	• Display task lists (transaction STC01) • Display task list variants (transaction STC01) • Display task list runs (transaction STC02) • Execute task lists (transaction STC01) • Define task list variants (transaction STC01) • Create task lists (transaction STC01) • Create task list variants (transaction STC01 • Copy task lists (transaction STC01) • Change existing task lists (transaction STC01) • Delete task lists (transaction STC01) • Delete task list runs (transaction STC02)

Related Information

Assigning Roles
Configuration using ABAP Task Manager for Lifecycle Management Automation

Assigning Roles

To execute automated technical configuration activities, you must assign the corresponding SAP_BC_STC roles to the administrator (dialog user) responsible for ABAP technical configuration activities and to the technical users that are using remote access.

Procedure

1. Log on to your ABAP system.
2. Call transaction *PFCG*.
3. Assign the role SAP_BC_STC_USER to the dialog user and the technical user.
4. Assign the role SAP_BC_STC_REMOTE to the technical user.

Related Information

Standard Roles and Permissions
Configuration using ABAP Task Manager for Lifecycle Management Automation

Executing Task Lists with the ABAP Task Manager for Lifecycle Management Automation

This section describes how to execute task lists with the ABAP task manager for lifecycle management automation.

Prerequisites

You have the required permissions to execute task lists.

For more information, see Standard Roles and Permissions.

Procedure

1. Log on to your ABAP system with logon language English.
2. Call transaction `STC01`.
3. Enter *<Task list name>* in the **Task List** field.
4. Choose or **With Variant**.

   The ABAP task manager for lifecycle management automation assigns a name to the task list run automatically and displays a list of the tasks that are defined for the configuration scenario in the order of their execution. Mandatory and necessary tasks are preselected for execution.
5. Some tasks require your input. Choose or in the **Parameter** column of each task, if applicable. If you do not define mandatory parameters, the ABAP task manager for lifecycle management automation uses default settings, if any, or stops and prompts you for your input. After you have made your settings, save them and go back to the task list.
6. Choose .

   i Note
   For the following task lists, choose **Start/Resume Task List Run in Dialog**:

   - `SAP_ABAP2ABAP_SSO_CONFIG`
   - `SAP_ABAP2ABAP_TRUST_SERVER_CFG`
   - `SAP_SAP2GATEWAY_TRUSTED_CONFIG`

7. To get the current status of the task list run, choose .

Next Steps

Displaying Log Information for Task List Runs

Related Information

Configuration using ABAP Task Manager for Lifecycle Management Automation

Displaying Task List Documentation

This section describes how to display the complete documentation of a task list with a detailed task description.

Procedure

1. Log on to your ABAP system with logon language English.
2. Call transaction `STC01`.
3. Enter the name of the task list.
4. Choose  .
5. Choose **Goto Documentation Display with Task Docu** .

Results

The system displays the documentation of the task list with a detailed task description.

Related Information

Configuration using ABAP Task Manager for Lifecycle Management Automation

Displaying Log Information for Task List Runs

You view detailed log information about a task list run.

Prerequisites

You have executed a task list or task list variant.

Procedure

1. Log on to your ABAP system with logon language English.
2. Call transaction `STC02`.
3. Search for the task list run you want to view.
4. Choose **Task List Run Display Log** .

Results

The system displays the following:

- Task list run header information
- Task list information
- Task overview
- Task details

Next Steps

To download a ZIP file with the log information, choose  .

Related Information

Configuration using ABAP Task Manager for Lifecycle Management Automation

Customizing

Use

With Customizing settings enable you to adapt the non-company specific and industry-specific functions shipped to the specific business requirements of your enterprise.

Customizing supports you in the following situations:

- Implementing the SAP System
- Enhancing the SAP System
- in release and system upgrades

Integration

Customizing controls the behavior of SAP applications. You only work with many SAP applications once you have made the necessary settings in Customizing, for example, setting the currencies and purchasing groups in Customizing that are used in your company.

To be able to transport the Customizing settings to other systems, for example, your test system, you need the transport system.

Features

- Tools for System Settings and their documentation (Logging Customizing Changes)
- Recommendations for system settings
- Customizing projects as a means for controlling the management, editing and analysis processes of the implementation and upgrade projects
- Support for transferring the system settings from the test system into the production system
- Support when transporting system settings between different systems using Business Configuration Sets , for example for a business rollout.
- Comparison of Customizing Between Different Systems
- Tools for system upgrades and release upgrades

Constraints

Customizing does not help you to modify the standard SAP functions.

Starting and Stopping SAP Systems

When you start an SAP system, you start the system database, the application servers, and the respective processes of which the system consists.

ℹ Note

In general, the database starts first, and then the instance. When you start the central instance, the database starts automatically. However, the database does not stop when you stop the primary application server instance.

The following sections describe how you start and stop SAP systems and instances.

Related Information

Starting Systems and Instances with the SAP Management Console
Stopping Systems and Instances with the SAP Management Console
Starting and Stopping SAP Systems and Instances with the SAP MMC (Windows)
Starting and Stopping SAP Systems Using SAPControl
Starting and Stopping SAP Systems and Instances on IBM i

Starting Systems and Instances with the SAP Management Console

You can use the SAP Management Console (SAP MC) to start and restart systems and instances.

Prerequisites

- **UNIX only:** Make sure that the host names defined in the DNS server match the names of the SAP system instance hosts. In particular, keep in mind that host names are case-sensitive. For example, if the names of the SAP system instance hosts are in upper case, but the same host names are defined in the DNS server in lower case, starting and stopping the system does not work.
- If you want to start or restart remote systems or instances, make sure that you have registered them in the SAP Management Console (SAP MC).

  You do not need to register SAP systems or instances installed on the local host, because the SAP MC displays them automatically.
- You have started the SAP MC.

Context

As of SAP MC version 7200, 313, 20, 42101 you can also start databases of SAP systems on all operating system platforms using the SAP MC.

Procedure

1. In the navigation pane of the SAP MC, open the tree structure and navigate to the system node that you want to start.
2. Select the system node and then choose **Start** from the context menu.

   The **Start SAP System(s)** dialog box displays.
3. In the **Start SAP System(s)** dialog box, select the SAP system instances to be started and choose **OK**.
4. The SAP MC prompts you for user credentials that are required to start the SAP system or instances.

   ### ℹ Note

   If the database of the SAP system is not yet running, you might be also prompted for additional credentials of a user that is authorized to start the database.

Results

The SAP MC starts the requested SAP system or instances.

Next Steps

- The SAP MC automatically displays the instances installed on the local host. If you need to monitor and administer remote systems or instances, you have to register them in the SAP MC. For more information, see *Registering Systems and Instances*.
- The nodes for instances are displayed in different colors depending on their state. For more information, see *Layout of the SAP Management Console*.

Related Information

Starting the SAP Management Console

Registering Systems and Instances in the SAP Management Console

Layout of the SAP Management Console

SAP Management Console

Stopping Systems and Instances with the SAP Management Console

You can use the SAP Management Console (SAP MC) to stop systems and instances.

Prerequisites

- **UNIX only:** Make sure that the host names defined in the DNS server match the names of the SAP system instance hosts. In particular, keep in mind that host names are case-sensitive. For example, if the names of the SAP system instance hosts are in upper case, but the same host names are defined in the DNS server in lower case, starting and stopping the system does not work.
- If you want to stop remote systems or instances, make sure that you have registered them in the SAP MC.

  You do not need to register SAP systems or instances installed on the local host, because the SAP MC displays them automatically.
- You have started the SAP MC.

Procedure

1. In the navigation pane of the SAP MC, open the tree structure and navigate to the system node that you want to stop.
2. In the navigation pane of the SAP MC, select the system you want to stop and choose **Stop** from the context menu.
3. In the **Stop SAP System(s)** dialog box, select the SAP system instances to be stopped and choose **OK**.

   ### ℹ Note
   If you also want to stop the database, mark the **Include Database** checkbox.

4. The SAP MC prompts you for user credentials that are required to stop the SAP system or instances.

   ### ℹ Note
   You might be also prompted for additional credentials of a user that is authorized to stop the database.

Results

The SAP MC stops the requested SAP system or instances.

Related Information

Starting Systems and Instances with the SAP Management Console
SAP Management Console

Starting and Stopping SAP Systems and Instances with the SAP MMC (Windows)

Prerequisites

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

Context

You can start and stop an SAP system or installed SAP instances locally on the host that you are logged on to with the SAP Microsoft Management Console (MMC). If the SAP MMC is configured for central system administration, you can start or stop the entire system from a single host.

Procedure

1. Start the SAP MMC on the SAP system host.
2. Right-click the SAP system node and choose **Start** or **Stop**.

   All instances listed under the system node start or stop in the correct order.

   > **Note**
   > The database is not stopped automatically when you stop your SAP system. To stop the database, see your database-specific documentation.

3. If the SAP system is installed on multiple hosts (distributed or high-availability system), you have the following options to start or stop your system:
   - You start or stop the SAP instances using the SAP MMC on each host.
   - You add the remote instances to the SAP MMC configuration to start or stop all instances from a single SAP MMC. For more information, see the SAP MMC documentation.

Starting and Stopping SAP Systems Using SAPControl

You can use *SAPControl* to start or stop an SAP system from the command line.

Prerequisites

You are logged on to the SAP system host as user `<sapsid>adm`.

Context

ℹ Note

The `startsap` and `stopsap` commands are deprecated. SAP recommends that you do not use them any longer. For more information, see SAP Notes 1763593 and 809477.

This section only lists the basic commands how to start or stop an SAP system. You can find a detailed list of all *SAPControl* options and features in the command line help, which you can call as follows:

UNIX:	`/usr/sap/hostctrl/exe/sapcontrol --help`
Windows:	`%ProgramFiles%\SAP\hostctrl\exe\sapcontrol.exe --help`

Procedure

- **Starting an SAP System or Instance**
  - Starting an SAP System:

    You can start an SAP system by executing the following commands from the command line (`<Instance_Number>` can be the number of any instance of the SAP system):

UNIX	`/usr/sap/hostctrl/exe/sapcontrol -nr <instance_number> -function StartSystem`
Windows	`%ProgramFiles%\SAP\hostctrl\exe\sapcontrol.exe -nr <instance_number> -function StartSystem`

  - Starting an SAP System Instance

    You can start an SAP system instance by executing the following commands from the command line:

UNIX	`/usr/sap/hostctrl/exe/sapcontrol -nr <instance_number> -function Start`
Windows	`%ProgramFiles%\SAP\hostctrl\exe\sapcontrol.exe -nr <instance_number> -function Start`

    For remote instances, the syntax is slightly different, because you also have to apply the `-host` and `-user` parameters:

UNIX	`/usr/sap/hostctrl/exe/sapcontrol –nr <instance_number> -host <remote host> –user <sapsid>adm <password> -function Start`
Windows	`%ProgramFiles%\SAP\hostctrl\exe\sapcontrol.exe –nr <instance_number> -host <remote host> –user <sapsid>adm <password> -function Start`

- **Stopping an SAP System or Instance**
  - Stopping an SAP System

    You can stop an SAP system by executing the following commands from the command line (`<Instance_Number>` can be the number of any instance of the SAP system):

UNIX	`/usr/sap/hostctrl/exe/sapcontrol -nr <instance_number> -function StopSystem`

Windows	`%ProgramFiles%\Program Files\SAP\hostctrl\exe\sapcontrol.exe -nr <instance_number> -function StopSystem`

- Stopping an SAP System Instance

  You can stop an SAP system instance by executing the following commands from the command line:

UNIX	`/usr/sap/hostctrl/exe/sapcontrol -nr <instance_number> -function Stop`
Windows	`%ProgramFiles%\SAP\hostctrl\exe\sapcontrol.exe -nr <instance_number> -function Stop`

  For remote instances, the syntax is slightly different, because you also have to apply the `-host` and `-user` parameters:

UNIX	`/usr/sap/hostctrl/exe/sapcontrol –nr <instance_number> -host <remote host> –user <sapsid>adm <password> -function Stop`
Windows	`%ProgramFiles%:\Program Files\SAP\hostctrl\exe\sapcontrol.exe –nr <instance_number> -host <remote host> –user <sapsid>adm <password> -function Stop`

  i Note

  The database is not stopped by these commands. You have to stop the database using database-specific tools or commands.

- **Checking System Instance and Processes**
  - With the following command you get a list of system instances, their status, and the ports used by them (`<Instance_Number>` can be the number of any instance of the SAP system):

UNIX	`/usr/sap/hostctrl/exe/sapcontrol –nr <instance_number> -host <remote host> –user <sapsid>adm <password> -function GetSystemInstanceList`
Windows	`%ProgramFiles%\SAP\hostctrl\exe\sapcontrol.exe –nr <instance_number> -host <remote host> –user <sapsid>adm <password> -function GetSystemInstanceList`

  - With the following command you get a list of instance processes and their status:

UNIX	`/usr/sap/hostctrl/exe/sapcontrol –nr <instance_number> -host <remote host> –user <sapsid>adm <password> -function GetProcessList`
Windows	`%ProgramFiles%\SAP\hostctrl\exe\sapcontrol.exe –nr <instance_number> -host <remote host> –user <sapsid>adm <password> -function GetProcessList`

- **Troubleshooting**

  If you get an error like `"FAIL: NIECONN_REFUSED"`, execute `sapcontrol -nr <Instance_Number> -function StartService <SAPSID>` to ensure that `sapstartsrv` is running. Then execute again the start or stop command.

Related Information

Starting and Stopping SAP Systems and Instances on IBM i

Procedure

To start and stop an SAP system or instance on IBM i, proceed as follows:

Starting

1. Log on to the host of your central system as <SID>ADM.
2. To start an SAP system or instance, enter the command `STARTSAP INSTANCE(*ALL)`.

   The instances and all other processes for your system are started on this host.

Stopping

1. Log on to the host of your central system as <SID>ADM.
2. To stop an SAP system or instance, enter the command `STOPSAP INSTANCE(*ALL)`.

> **Note**
>
> To start or stop SAP instances, you can also log on as QSECOFR or another user with sufficient authority to operate on the SAP system. To set up the library list and environment variables, enter `CALL PGM(R3<SID>400/R3INLPGM)` before using the commands STARTSAP or STOPSAP.

Connecting a Technical System to SAP Solution Manager

SAP Solution Manager gives you central access to tools, methods, and preconfigured content that you can use to evaluate and implement your solutions.When your implementation is running, you can use SAP Solution Manager to manage, monitor, and update systems and business processes in your solution landscape, and also to set up and operate your own solution support.

Procedure

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

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

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

   - If your SAP Solution Manager release is 7.1:

     http://help.sap.com/solutionmanager Version 7.1 SPS *<No>* Application Help SAP Solution Manager Operations Managing System Landscape Information Managing Technical System Information Register Technical Systems Automatically by Data Suppliers

   - If your SAP Solution Manager release is 7.2:

http://help.sap.com/solutionmanager Version 7.2 SPS <No> Application Help (English) Technical Infrastructures Landscape Management Database (LMDB) Managing Technical System Information Registering Technical Systems Automatically by Data Suppliers

2. The data suppliers send information about the hardware and installed software to a central **System Landscape Directory (SLD)**. Updates are sent to the SLD as well.

   For more information, see the **Planning Guide - System Landscape Directory** in the SAP Community Network at . System Landscape Directory (SLD) - Overview

3. From the SLD, this information is regularly synchronized with **SAP Solution Manager** where it is managed in the Landscape Management Database (LMDB).

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

   - If your SAP Solution Manager release is 7.1:

     http://help.sap.com/solutionmanager Version 7.1 SPS <No> Application Help SAP Solution Manager Operations Managing System Landscape Information Setting Up the Landscape Management Infrastructure Connecting LMDB to System Landscape Directory (SLD)

   - If your SAP Solution Manager release is 7.2:

     http://help.sap.com/solutionmanager http://help.sap.com/solutionmanager Version 7.2 SPS <No> Application Help (English) Technical Infrastructures Landscape Management Database (LMDB) Setting Up the Landscape Management Infrastructure Connecting LMDB to System Landscape Directory (SLD)

4. In the LMDB, you complete the information from the SLD manually.

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

   - If your SAP Solution Manager release is 7.1:

     Managing Technical System Information and Managing Product System Information at http://help.sap.com/solutionmanager Version 7.1 SPS <No> Application Help SAP Solution Manager Operations Managing System Landscape Information

   - If your SAP Solution Manager release is 7.2:

     http://help.sap.com/solutionmanager Version 7.2 SPS <No> Application Help (English) Technical Infrastructures Landscape Management Database (LMDB) Managing Technical System Information

Next Steps

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

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

Solution Monitoring

Use

The monitoring features in IT landscapes monitor IT components and processes that run across multiple components. The monitoring results are displayed in a central system. Any problems are displayed as alerts. You can use the relevant analysis methods to go to an appropriate transaction or tool to evaluate the problem.

The following monitoring types are available:

- System Monitoring with CCMS

  This system monitor enables you to check the status and performance of the various system components. For example, you can monitor the availability of a system.

- Process Monitoring with PMI (Process Monitoring Infrastructure)

  The PMI monitors the whole of a process that involves multiple components. Here, the individual steps of the process are important, not the status of the components. You can see the process flow of the steps across multiple systems, even for asynchronous processes with several transactions. In this way, you can detect any errors and drops in performance at an early stage.

SAP Microsoft Management Console: Windows

Use

Windows comes with a system and application management framework, the Microsoft Management Console (MMC). The actual management functionality is implemented in so called snap-ins.

SAP provides a snap-in for the MMC — that is called "SAP Management Console" (SAP MMC) — to administer, monitor, and troubleshoot SAP systems. It also can be used to collect system information in a snapshot, which could easily be attached to support tickets in order to simplify the ticket processing.

Installation and Configuration

SAP MMC is automatically installed during SAP installation on Windows. You can open default SAP MMC configuration by choosing the desktop icon or from the Start menu. Additional configurations can be created by starting the executable file `mmc.exe` and adding the `SAP Systems Manager` snap-in via the menu path **File Add/Remove Snap-In... SAP System Manager** .

SAP MMC utilizes the SAPControl web-service interface of the SAP Start Service to access the instances of SAP systems running on any operating system supported by SAP (Windows, Unix, Linux and others). You can use it to administer individual systems as well as huge system landscape (e.g., optionally registered in Lightweight Directory Access Protocol (LDAP) or System Landscape Directory (SLD)). SAP MMC can also be installed separately (for example, on an Administrator's Windows machine) using the SAP MMC MSI installation package.

SAP MMC comes with an integrated `F1` context sensitive help that provides detailed information on the offered functionality.

Related Information

You can find latest information and download links to **SAP ONE Support Launchpad** are available on the SAP MMC homepage.

System Copy

Use

In different situations during the life-cycle of your SAP solution, it may be appropriate for you to perform a system copy or a migration.

If you want to change your operating system, your database, or both, you must perform a system copy. We also recommend that you perform a system copy if you are planning to set up a test system, demo system, or training system.

As of SAP NetWeaver 7.0, you can copy a mixed ABAP Stack and Java Stack system in a single operation, not just standalone ABAP or Java systems.

i Note

When you perform a system copy, all usage types in the source system are copied to the target system. This means that you cannot leave out any usage types in the source system or copy selectively to a target system.

Definition of Terms

- You perform a **homogeneous system copy** if your target system is on the same operating system and database system as your source system. The database contents are copied from the source system to the target system.
- You perform a **heterogeneous system copy** if you want to change the operating system or database system. Migration is another term for a heterogeneous system copy.

More Information

- For more information about the system copy, see SAP Service Marketplace at http://service.sap.com/systemcopy.
- For a detailed description of the system copy procedure, see the current system copy guide on SAP Service Marketplace at **http://service.sap.com/instguides SAP NetWeaver <your release> Installation**.

Backup and Recovery

You need to regularly back up your operating system and database to restore the SAP system, if required.

To use an appropriate back up and restore method is one of the most important tasks of the system and database administrator. However, there is no general recommendation for such a method, since it depends on several factors, such as:

- Disaster recovery concept
- Maximum permissable downtime during restore
- Amount of data loss that is tolerable
- Available budget

Operating System-specific Backup and Recovery Procedures

For information on operating system-specific backup and recovery procedures, see one of the following sections:

- Backing Up and Restoring your SAP System on Windows
- Backing Up and Restoring your SAP System on UNIX
- Backing Up and Restoring your SAP System on IBM i

Database-specific Backup and Recovery Procedures

For information on database-specific backup and recovery procedures, see the information available in the *Database Administration* section.

Backing Up and Restoring Your SAP System on Windows

Prerequisites

You are logged on as user `<sapsid>adm`.

Context

This procedure describes how to back up and restore an SAP system on Windows Server 2008 (R2) and higher.

On Windows, a lot of information created during the SAP system installation and operation is stored in databases like the Windows system registry, the user registry, or the Active Directory, when installing in a Windows domain.

Therefore, we recommend that you always back up and restore the complete computer, including the operating system to avoid data or system inconsistency. In addition, the overhead of a full backup of the computer (backup of operating system disk, non-operating system disks, database data files) compared to a database online backup is negligible. During backup, the SAP system can be online.

To be able to back up and restore your SAP system properly in case of emergency, we strongly recommend that you test the backup and restore procedure on a regular basis, to avoid system downtime and data loss.

Procedure

- Backing Up your SAP system

  1. Back up the operating system disk.
  2. Back up non-operating system disks (excluding disks that contain database data files only).
  3. Back up the database data files.

     For more information, see your database-specific documentation.

  The Microsoft tool available for creating a backup on Windows Server 2008 (R2) and higher, is called **Windows Server Backup (WSB)**, which replaces the former backup tool **NTBackup** of Windows Server 2003. You have to activate the WSB feature before you can use it. With WSB you can no longer back up single files or directories, but only complete disk volumes. There is an **NTBackup** version available, which is running on Windows Server 2008 (R2 and higher, and which you can download from the Microsoft web page. This version, however, only allows you to restore files that were backed up on Windows Server 2003. You cannot use this version to create backup savesets.

  After you have activated the WSB feature, you can invoke it with **Start** ▸ **Administrative Tools** ▸ **Windows Server Backup**.

  For more information about the Windows Server 2008 (R2) and higher backup and recovery procedures, see the F1 help or the **Help and Support** documentation, which you find in the Windows **Start** menu under **Start** ▸ **Help and Support** / **Server Fundamentals** / **Backup and Recovery**.

- Restoring Your SAP system

  Since the SAP system is very complex, we strongly recommend that you restore complete system backups only.

  Restoring partial backups might lead to configuration inconsistencies and is only possible on the computer where the backup was created, and which has the same (unique) **Computer Security Identifier (SID)**, which is generated during the installation of the Windows operating system.

  Restoring the directory structure `\usr\sap` including the database data files on another computer leads to a complete loss of the system- and computer-specific environment on the target computer. You cannot start the system or the database on this computer for the following reasons:

  - Configuration information is also stored in the Windows system registry and this cannot be restored on a different computer.

- Security settings on **Directory and Files** use unique SIDs, which cannot be translated on a different computer.

If, for any reason, you must restore a backup on a different computer, you have to perform a homogeneous system copy with the backup/restore procedure. For more information, see the **System Copy Guide** for your SAP product.

To restore your SAP system, proceed as follows:

1. Restore the operating system disk.

   For more information, see the Windows **Help and Support** documentation, which you can find in the Windows **Start** menu under **Start Help and Support / Server Fundamentals / Backup and Recovery / Windows Recovery Environment Overview** .

   As of Windows Server 2008 R2, you can also use PowerShell commands for the backup. For more information, start Windows PowerShell and enter the following command: `get-help Start-WBBackup -online`

2. If not already done in the previous step, restore the non-operating system disks with WSB.
3. Restore the database.

   For more information, see your database-specific documentation.

Backing Up and Restoring your SAP System on UNIX

This procedure describes how to perform a **full offline backup** of an SAP system and how to use the backup data for a restore.

Prerequisites

The SAP system and database are stopped. For more information, see *Starting and Stopping SAP Systems*.

Procedure

- Backing Up Your SAP System
  1. Perform a full database backup.
  2. Back up the home directories of the following operating system users:
     - `<sapsid> adm`
     - Database-specific operating system user(s)
  3. Back up the following file systems of your SAP system:
     - `/usr/sap/ <SAPSID>`
     - `/usr/sap/trans`
     - `/ <sapmnt>/ <SAPSID>`

     Note

     For more information about the SAP system directories available under these file systems, see SAP System Directories on UNIX.

  4. Proceed as follows to perform the backup:

     Note

The UNIX commands used in this procedure work on all hardware platforms. For more information about operating system-specific backup tools, see your operating system documentation.

a. Log on as user `root`.

b. Manually create a compressed `tar` archive that contains all installed files:

- Saving to tape:

  `tar -cf - <file_system | compress -c> <tape_device>`

- Saving to the file system:

  `tar -cf - <file_system | compress -c> ARCHIVENAME.tar.Z`

ⓘ Note

On Linux, you can also execute the following command to manually create a compressed `GNU tar` archive that contains all installed files and save it to the file system:

`tar -czf <ARCHIVENAME>.tgz <file_system>`

5. Back up the operating system using operating system tools.

   This saves the structure of the system and all configuration files, such as file system size, configuration of the logical volume manager, and database configuration data.

- Restoring the Backup

If required, you can restore the data that you previously backed up.

⚠ Caution

Check for modifications in the existing parameter files before you overwrite them when restoring the backup.

1. Log on as user `root`.
2. Go to the location in your file system where you want to restore the backup image.
3. Proceed as follows to restore the backup:

ⓘ Note

The UNIX commands used in this procedure work on all hardware platforms. For more information about operating system-specific backup tools, see your operating system documentation.

- Execute the following command to restore the data from tape:

  `cat <tape_device>| compress -cd | tar -xf -`

- Execute the following command to restore the data from the file system:

  `cat ARCHIVENAME.tar.Z | compress -cd | tar -xf -`

ⓘ Note

If you want to restore the data from a `GNU tar` archive on Linux, you have to execute the following command:

`tar -xzf <ARCHIVENAME>.tgz`

4. Restore your database backup.

   For more information, see the database backup documentation for your database in the *Database Administration* section of this documentation.

Related Information

SAP System Directories on UNIX

SAP System Directories on UNIX

Here you can find information about the directory structure of an SAP system.

SAP System Directory Types

An SAP system contains the following types of directories:

- Physically shared directories, which reside on the global host and are shared by Network File System (NFS)
- Logically shared directories, which reside on the local host with symbolic links to the global host
- Local directories, which reside on the local host

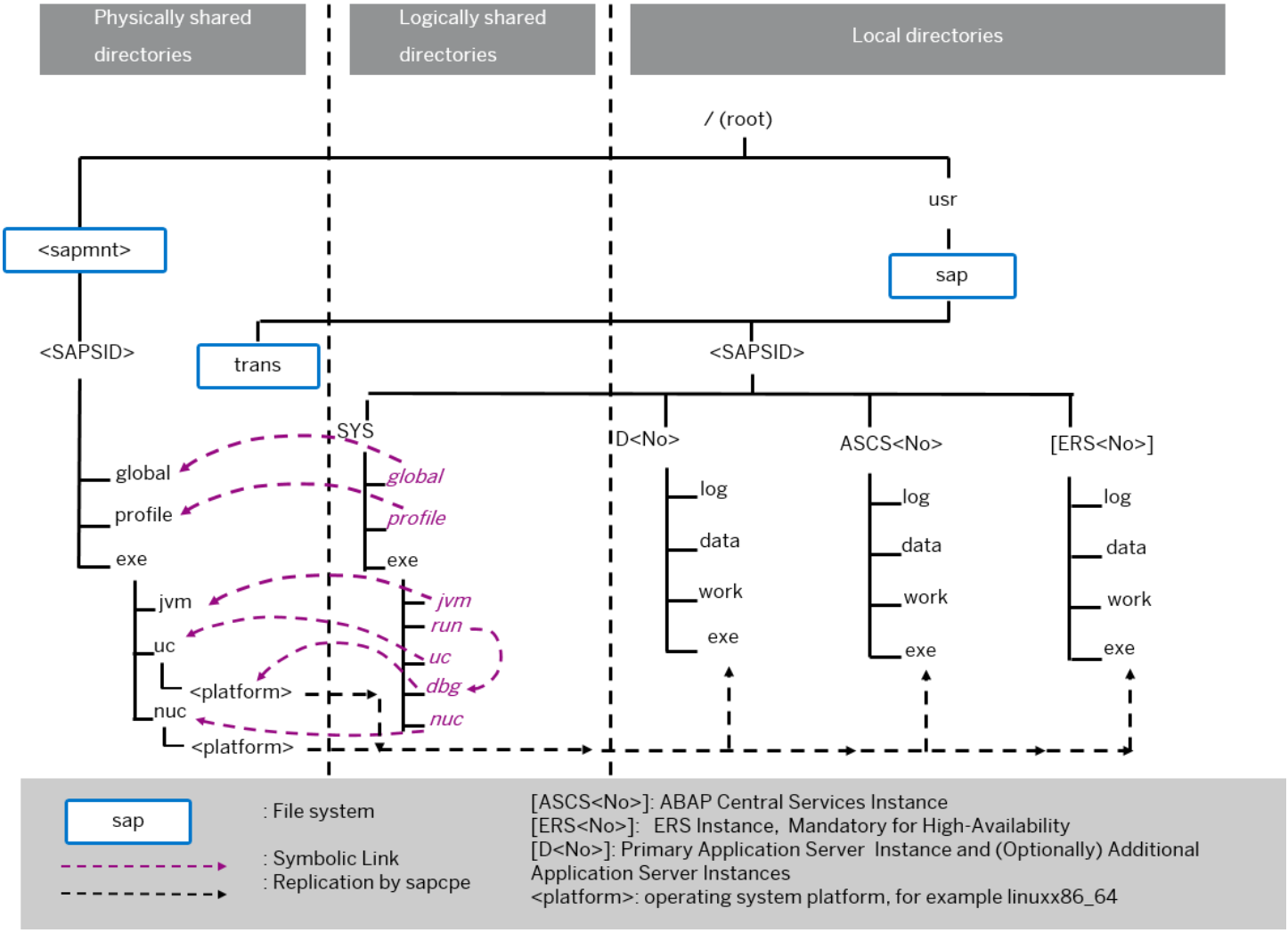
The figures below assume that you have set up one file system for the SAP system mount directory `/<sapmnt>` and one file system for the `/usr/sap` directory.

Standard System Directories for an SAP ABAP System

An ABAP system can be Unicode or non-Unicode.

SAP ABAP System (Unicode) based on SAP NetWeaver 7.5 to 7.52

> **Note**
> SAP ABAP systems based on SAP NetWeaver 7.5 to 7.52 are Unicode only.



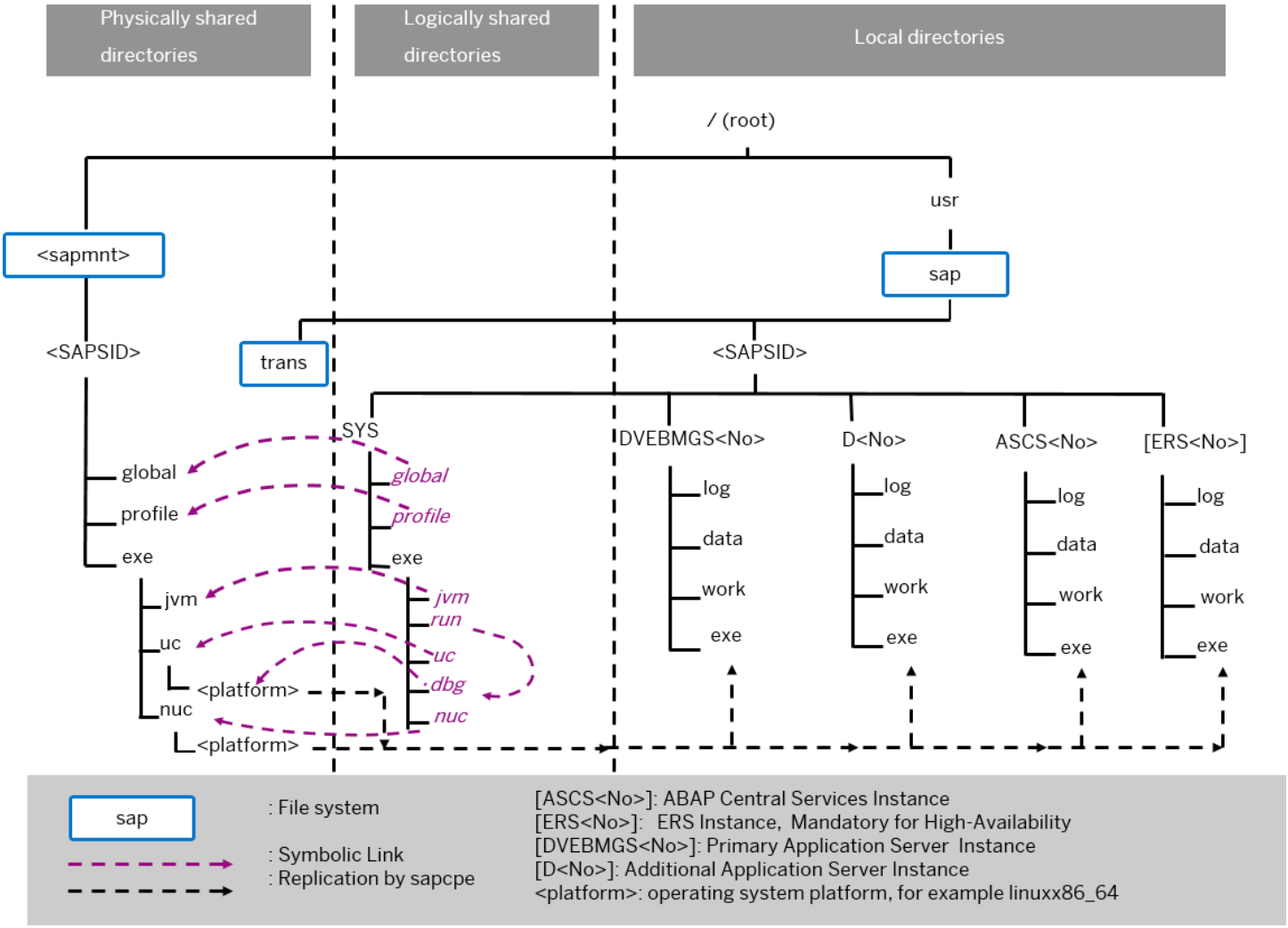
SAP ABAP System (Unicode) based on SAP NetWeaver 7.5 to 7.52

SAP ABAP System (Unicode or Non-Unicode) based on SAP NetWeaver 7.1 to 7.4

SAP ABAP System (Unicode or Non-Unicode) based on SAP NetWeaver 7.1 to 7.4

ℹ Note

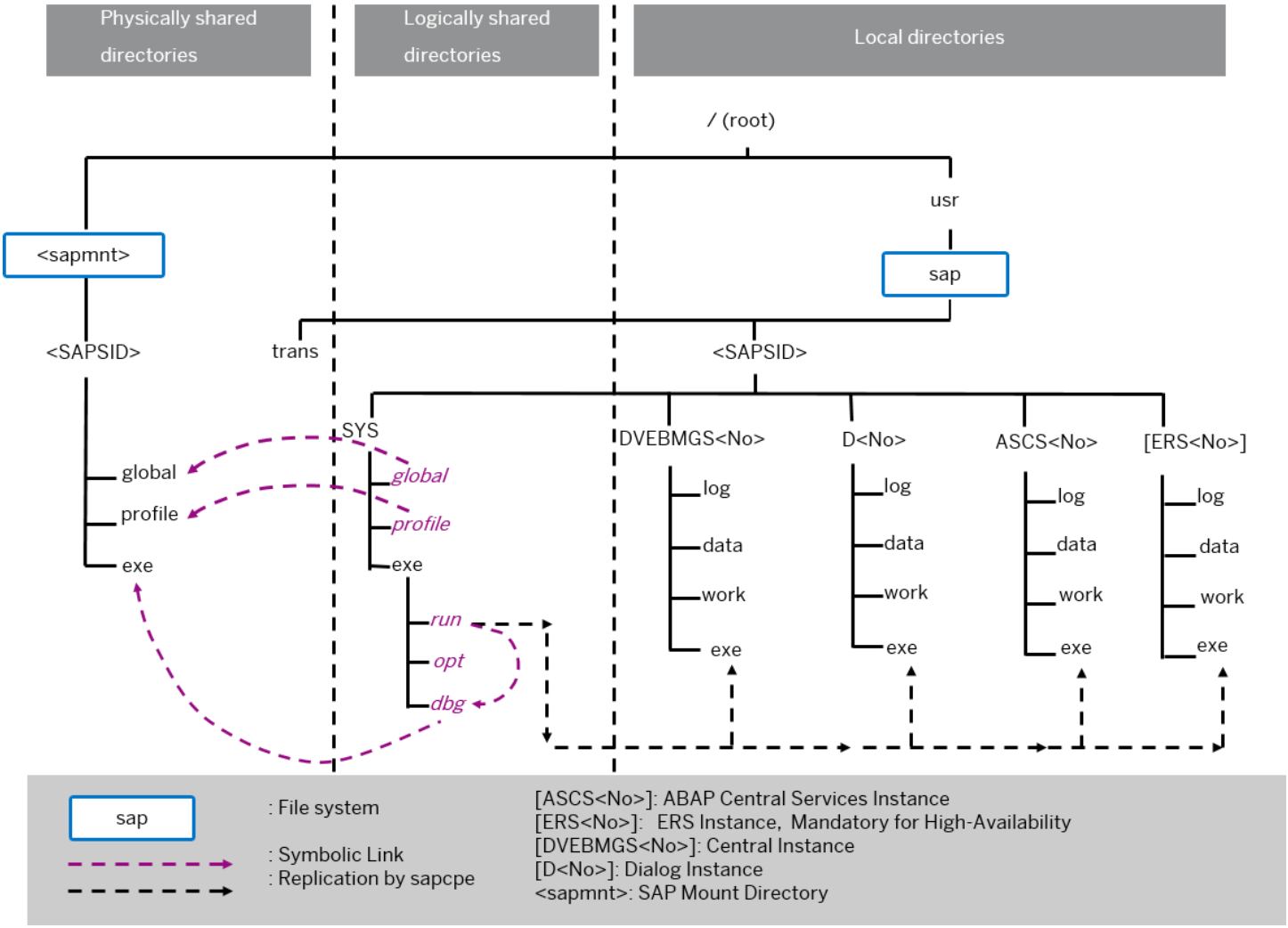
SAP ABAP systems based on SAP NetWeaver 7.5 and higher are only Unicode systems.



SAP ABAP System (Unicode or Non-Unicode) based on SAP NetWeaver 7.1 to 7.4

SAP ABAP System (Unicode or Non-Unicode) based on SAP NetWeaver 7.0

SAP ABAP System (Unicode or Non-Unicode) based on SAP NetWeaver 7.0:



SAP ABAP System (Unicode or Non-Unicode) based on SAP NetWeaver 7.0. For more information, see section *SAP System Directories in Detail*

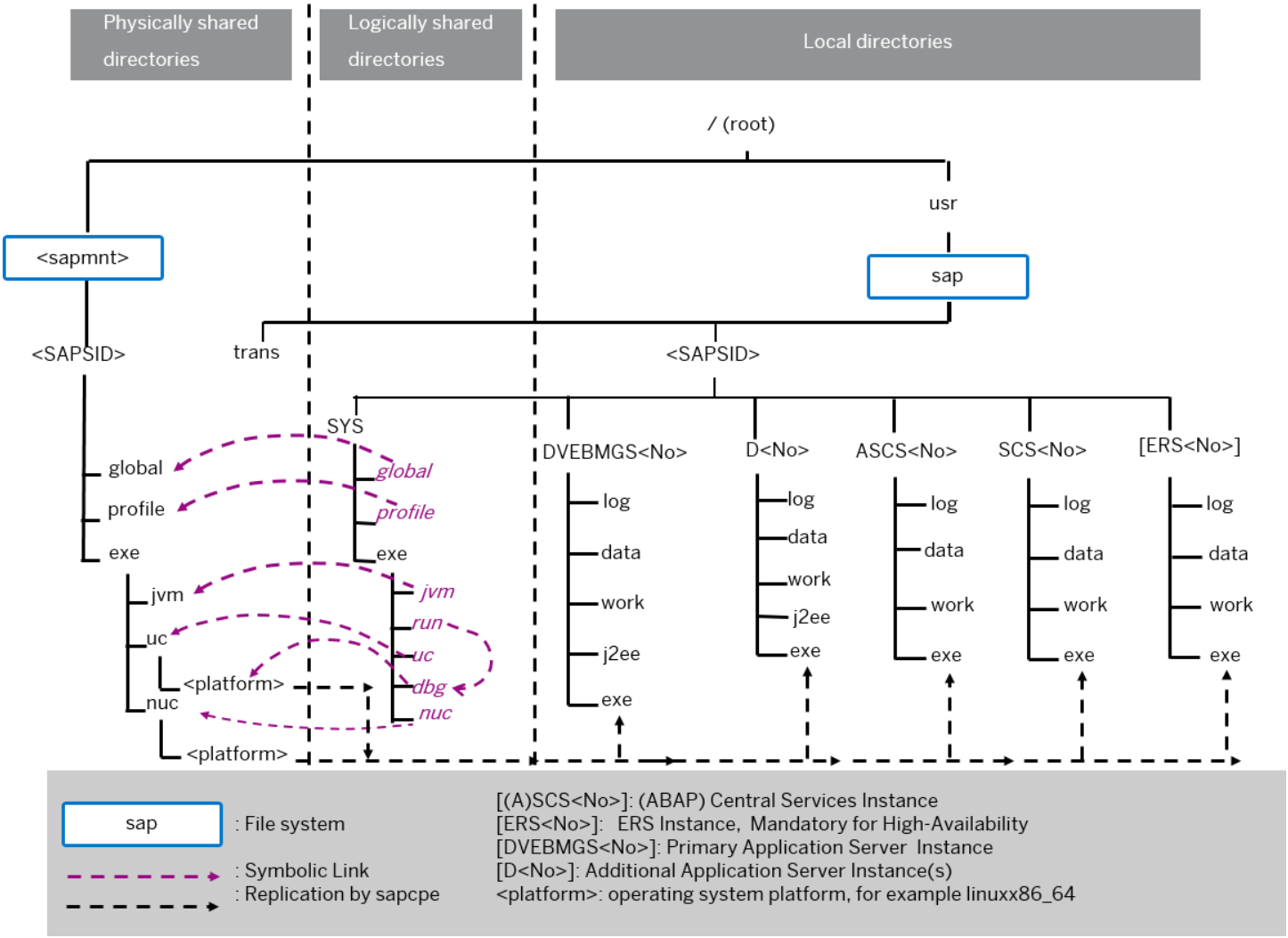
Standard System Directories for an SAP Dual-Stack (ABAP+Java) System

A dual-stack system can be Unicode or non-Unicode. That is, the ABAP system can be Unicode or non-Unicode, whereas the Java system can only be Unicode.

Standard SAP Directories for a Dual-Stack (ABAP+Java) System based on SAP NetWeaver 7.1 to SAP NetWeaver 7.4

ⓘ Note

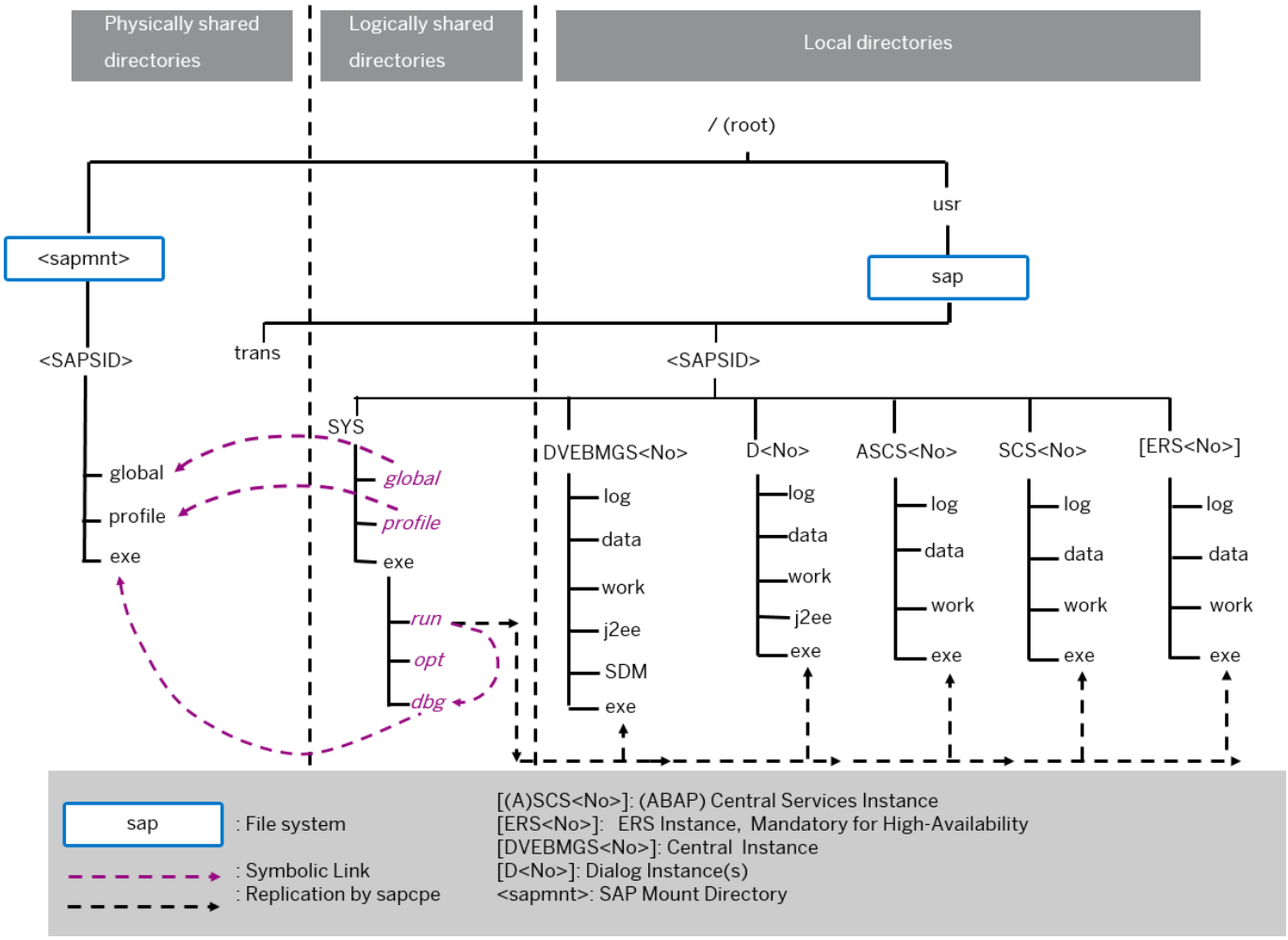
In SAP systems based on SAP NetWeaver 7.5 or higher, dual stack (ABAP+Java) is no longer supported.



Standard SAP Directories for a Dual-Stack (ABAP+Java) System based on SAP NetWeaver 7.1 to SAP NetWeaver 7.4

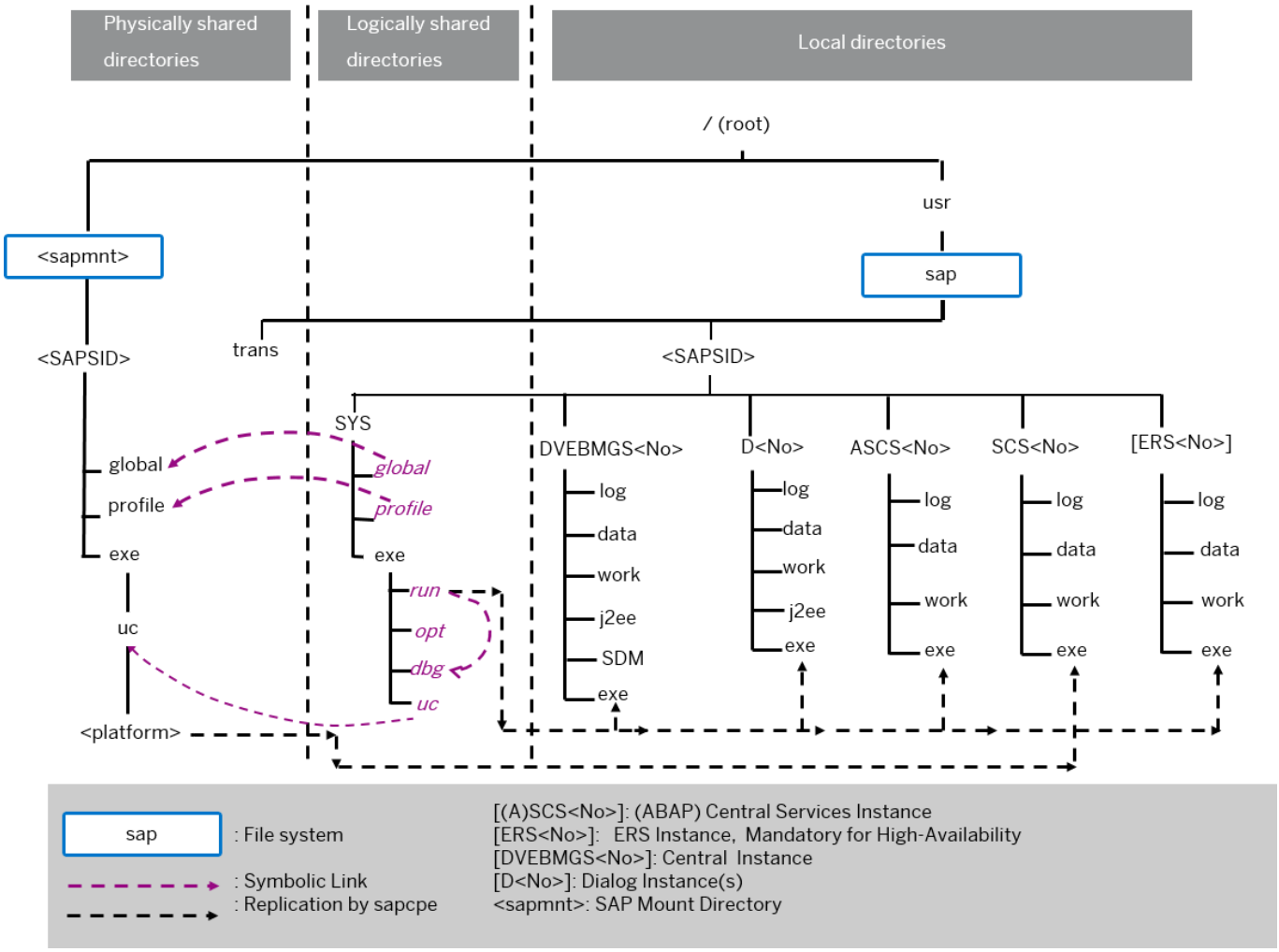
Standard SAP Directories for a Dual-Stack (ABAP+Java) System based on SAP NetWeaver 7.0

- SAP Directories for a Dual-Stack (ABAP+Java) System (ABAP Unicode) based on SAP NetWeaver 7.0:



Standard SAP Directories for a Dual-Stack (ABAP+Java) System (ABAP Unicode) based on SAP NetWeaver 7.0

- SAP Directories for a Dual-Stack (ABAP+Java) System (ABAP non-Unicode) based on SAP NetWeaver 7.0:

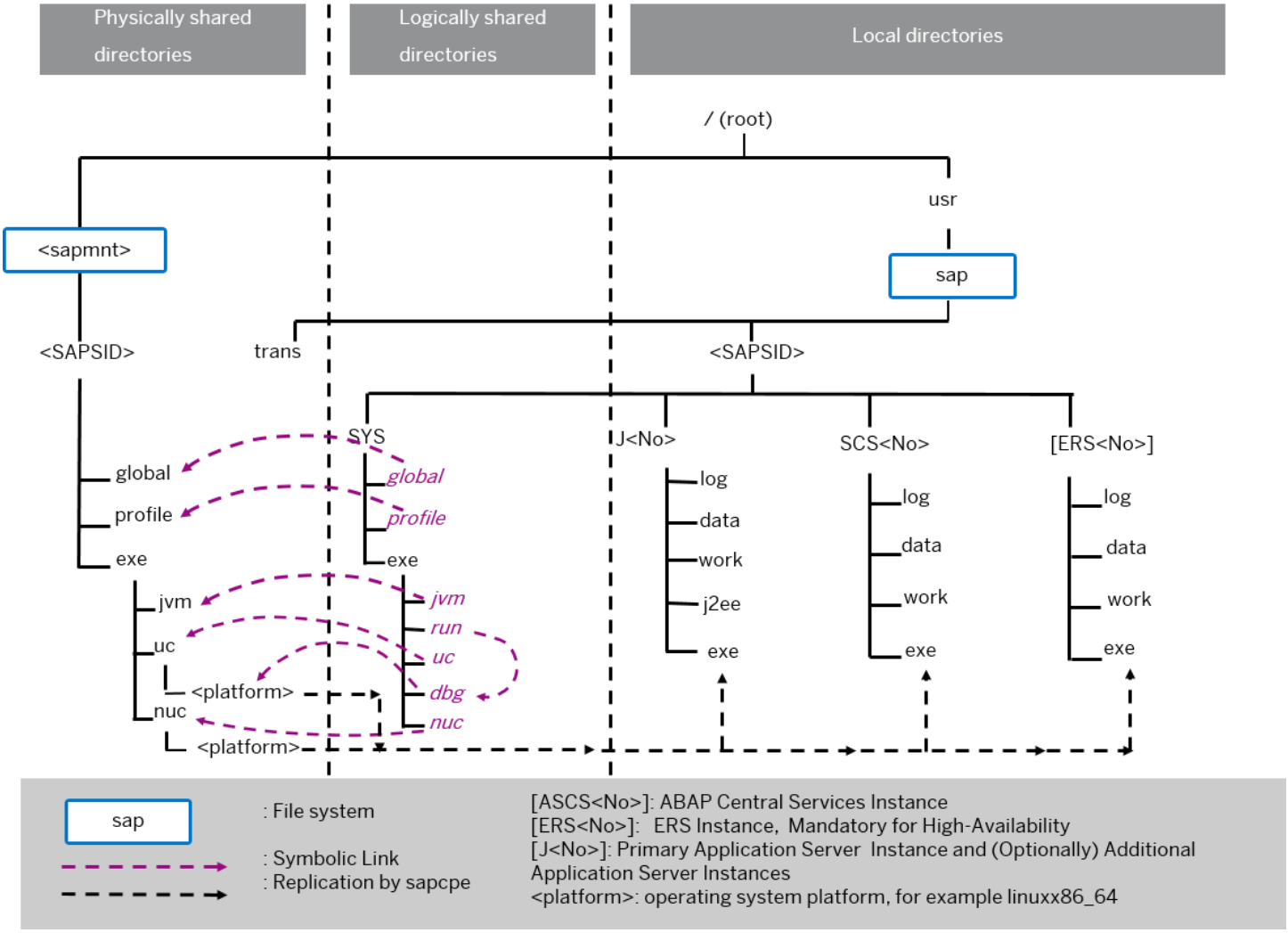


Standard SAP Directories for a Dual-Stack (ABAP+Java) System (ABAP non-Unicode) based on SAP NetWeaver 7.0

Standard System Directories for an SAP Java System (Unicode)

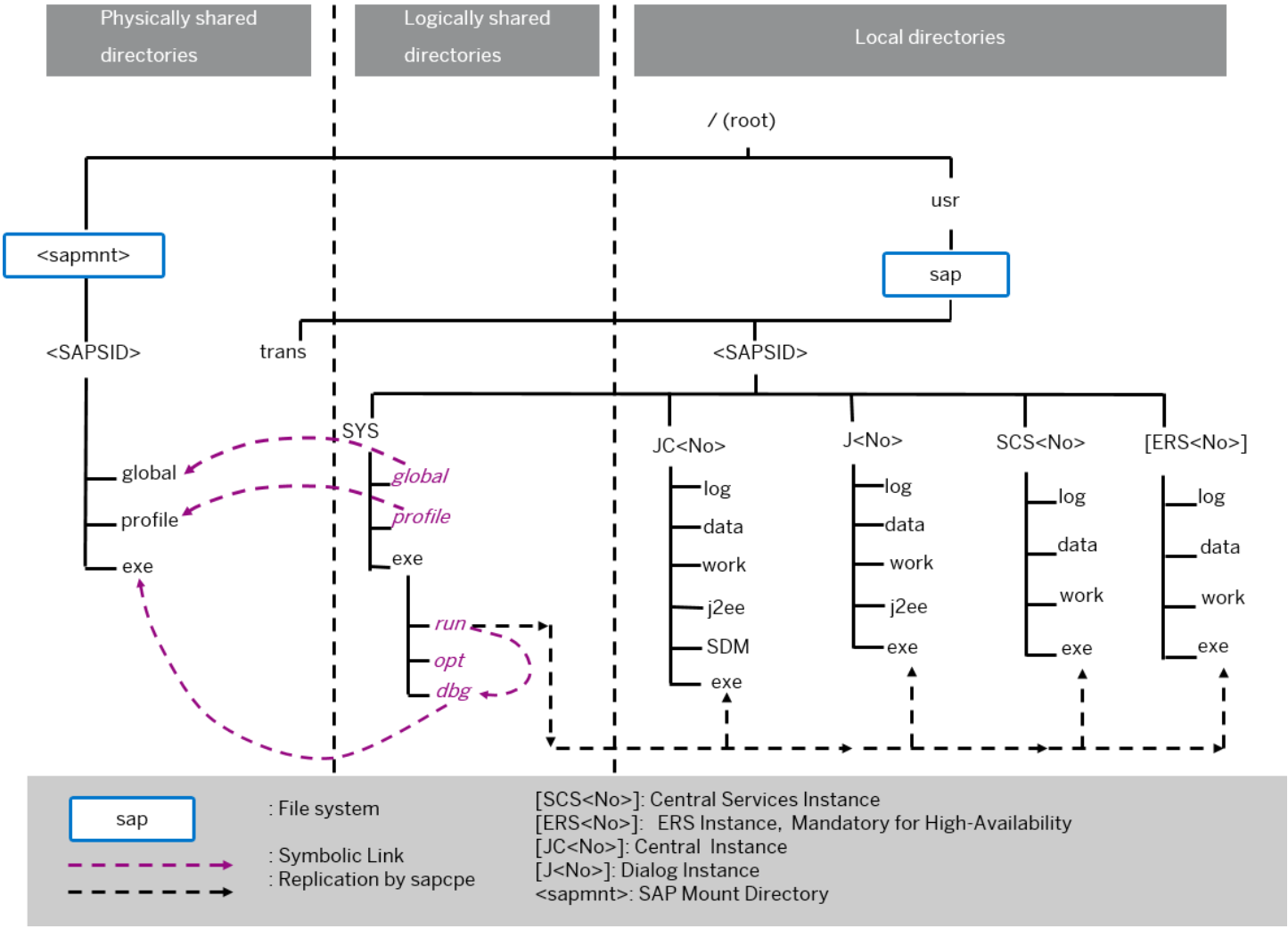
A Java system can only be a Unicode system.

Standard SAP Directories for a Java System (Unicode) based on SAP NetWeaver 7.1 to 7.5



Standard SAP Directories for a Java System (Unicode) based on SAP NetWeaver 7.1 to 7.5

Standard SAP Directories for a Java System (Unicode) based on SAP NetWeaver 7.0



Standard SAP Directories for a Java System (Unicode) based on SAP NetWeaver 7.0

SAP System Directories in Detail

System Directories of an SAP System based on SAP NetWeaver 7.5 to 7.52

i Note

In SAP systems based on to SAP NetWeaver 7.5 to 7.52, dual stack (ABAP+Java) is no longer supported.

Directory	Description

Directory	Description
`/<sapmnt>/<SAPSID>`	Software and data for one SAP system This directory and its subdirectories need to be physically shared using Network File System (NFS) and mounted for all hosts belonging to the same SAP system. It contains the following subdirectories: • `exe` This directory contains executable kernel programs. In an SAP system with distributed instances, this directory must be shared for all hosts with the same operating system. • `global` This directory contains log files. In an SAP system with distributed instances, this directory must be shared for all hosts with the same operating system. • `profile` This directory contains the start and operations profiles of all instances. In an SAP system with distributed instances, this directory must be shared for all hosts with the same operating system.
`/usr/sap/<SAPSID>`	Instance-specific data, symbolic links to the data for one system This directory contains files for the operation of a local instance. • There is a subdirectory for each instance. Each instance directory has the name of the related instance: ◦ The instance names (instance IDs) of an ABAP system are as follows: ▪ Primary application server instance: `D<Instance_Number>` ▪ Additional application server instance: `D<Instance_Number>` ▪ ABAP Central Services instance (ASCS instance): `ASCS<Instance_Number>` ▪ Enqueue replication server instance (ERS instance): `ERS<Instance_Number>` ▪ The enqueue replication server instance is only mandatory in a high-availability system. **Example** For an SAP ABAP system with SAP system ID C11, the instances might look as follows: ▪ Primary application server instance: `D00` ▪ Additional application server instance: `D01` ▪ ABAP Central Services instance (ASCS instance): `ASCS02` ▪ Enqueue replication server instance (ERS instance): `ERS03` ◦ The instance names (instance IDs) of a Java system are as follows: ▪ Application server instance: `J<Instance_Number>` ▪ Central services instance for Java (SCS): `SCS<Instance_Number>` ▪ Enqueue replication server instance: `ERS<Instance_Number>` ▪ The enqueue replication server instance is only mandatory in a high-availability system.

Directory	Description
	Example For an SAP Java system with SAP system ID C11, the instances might look as follows: ▪ (Primary) application server instance: `J00` (the Java EE Engine is installed in `/usr/sap/C11/J00/j2ee`) ▪ (Additional) application server instance: `J01` (the Java EE Engine is installed in `/usr/sap/C11/J01/j2ee`) ▪ Central services instance for Java (SCS): `SCS02` ▪ Enqueue replication server instance (ERS) for the SCS: `ERS03`. • The directory `/usr/sap/<SAPSID>/SYS` contains soft links to appropriate directories in `/<sapmnt>/<SAPSID>/` for storing data used by several instances. SYS is logically shared and available on each host of the SAP system. Its subdirectories contain symbolic links to the corresponding subdirectories of `/<sapmnt>/<SAPSID>` on the SAP global host, as shown in the figures above. Whenever a local instance is started, the sapcpe program checks the executables against those in the logically shared directories and, if necessary, replicates them to the local instance. For more information about sapcpe, see *The sapcpe Program* documentation. Executables located in `/usr/sap/<SAPSID>/SYS/exe/run` are replicated by `sapcpe` to the exe subdirectory of the instance directories.
`/usr/sap/trans`	Global transport directory for all SAP systems The global transport directory is used by the Change and Transport System (CTS). The CTS helps you to organize development projects in the ABAP Workbench and in Customizing, and then transport the changes between the SAP systems in your system landscape. For more information, see the Change and Transport System documentation.

System Directories of an SAP System based on SAP NetWeaver 7.1 to 7.4

Directory	Description

Directory	Description
/<*sapmnt*>/<*SAPSID*>	Software and data for one SAP system This directory and its subdirectories need to be physically shared using Network File System (NFS) and mounted for all hosts belonging to the same SAP system. It contains the following subdirectories: • exe This directory contains executable kernel programs. In an SAP system with distributed instances, this directory must be shared for all hosts with the same operating system. **Note** **Dual-stack (ABAP+Java) system only:** exe contains a folder uc and a folder nuc, each with a platform-specific sub folder: /<*sapmnt*>/<*SAPSID*>/exe/uc/<*platform*> is used in Unicode systems. Executable kernel programs are replicated from this directory to the exe directories of each Unicode system instance. /<*sapmnt*>/<*SAPSID*>/exe/nuc/<*platform*> is used in non-Unicode systems (see below). Executable kernel programs are replicated from this directory to the exe directories of each non-Unicode system instance (see below). • global This directory contains log files. In an SAP system with distributed instances, this directory must be shared for all hosts with the same operating system. • profile This directory contains the start and operations profiles of all instances. In an SAP system with distributed instances, this directory must be shared for all hosts with the same operating system.

/usr/sap/<*SAPSID*>	Instance-specific data, symbolic links to the data for one system
	
	This directory contains files for the operation of a local instance.
	
	• There is a subdirectory for each instance. Each instance directory has the name of the related instance:
	  ◦ The instance names (instance IDs) of an ABAP system are as follows:
	  ▪ Primary application server instance: DVEBMGS<*Instance_Number*>
	  ▪ Additional application server instance: D<*Instance_Number*>
	  ▪ ABAP Central Services instance (ASCS instance): ASCS<*Instance_Number*>
	  ▪ Enqueue replication server instance (ERS instance): ERS<*Instance_Number*>
	  ▪ The enqueue replication server instance is only mandatory in a high-availability system.
	
	Example
	For an SAP ABAP system based on SAP NetWeaver 7.1 to SAP NetWeaver 7.4 with SAP system ID C11, the instances might look as follows:
	  ▪ Primary application server instance: DVEBMGS00
	  ▪ Additional application server instance: D01
	  ▪ ABAP Central Services instance (ASCS instance): ASCS02
	  ▪ Enqueue replication server instance (ERS instance): ERS03

Directory	Description
	○ The instance names (instance IDs) of a dual stack (ABAP+Java) system are as follows: ■ Primary application server instance: DVEBMGS<*Instance_Number*> ■ Additional application server instance: D<*Instance_Number*> ■ ABAP Central Services instance (ASCS instance): ASCS<*Instance_Number*> ■ Central Services instance (SCS instance): SCS<*Instance_Number*> ■ Enqueue replication server instances (one for the ASCS and one for the SCS instance): ERS<*Instance_Number*> The enqueue replication server instances are only mandatory in a high-availability system. **Example** For an SAP ABAP+Java system with SAP system ID C11, the instances might look as follows: ■ Primary application server instance: DVEBMGS00 (the Java EE Engine is installed in `/usr/sap/C11/DVEBMGS00/j2ee`) ■ Additional application server instance: D01 (the Java EE Engine is installed in `/usr/sap/C11/D01/j2ee`) ■ ABAP Central Services instance (ASCS instance): `ASCS02` ■ Enqueue replication server instance (ERS instance) for the ASCS instance: `ERS03` ■ Central services instance for Java (SCS): `SCS04` ■ Enqueue replication server instance (ERS) for the SCS: `ERS05` ■ On a primary application server instance with SAP system ID C11 and instance name `DVEBMGS00`, the Java EE Engine is installed in `/usr/sap/C11/DVEBMGS00/j2ee`. ○ The instance names (instance IDs) of a Java system are as follows: ■ Application server instance: `J`<*Instance_Number*> ■ Central services instance for Java (SCS): SCS<*Instance_Number*> ■ Enqueue replication server instance: ERS<*Instance_Number*> ■ The enqueue replication server instance is only mandatory in a high-availability system. **Example** For an SAP Java system with SAP system ID C11, the instances might look as follows: ■ (Primary) application server instance: `J00` (the Java EE Engine is installed in `/usr/sap/C11/J00/j2ee`) ■ (Additional) application server instance: `J01` (the Java EE Engine is installed in `/usr/sap/C11/J01/j2ee`) ■ Central services instance for Java (SCS): `SCS02` ■ Enqueue replication server instance (ERS) for the SCS: `ERS03`.

Directory	Description
	• The directory /usr/sap/<*SAPSID*>/SYS contains soft links to appropriate directories in /<*sapmnt*>/<*SAPSID*>/ for storing data used by several instances. SYS is logically shared and available on each host of the SAP system. Its subdirectories contain symbolic links to the corresponding subdirectories of /<*sapmnt*>/<*SAPSID*> on the SAP global host, as shown in the figures above. Whenever a local instance is started, the sapcpe program checks the executables against those in the logically shared directories and, if necessary, replicates them to the local instance. For more information about sapcpe, see *The sapcpe Program* documentation. Executables located in /usr/sap/<*SAPSID*>/SYS/exe/run are replicated by sapcpe to the exe subdirectory of the instance directories.
/usr/sap/trans	Global transport directory for all SAP systems The global transport directory is used by the Change and Transport System (CTS). The CTS helps you to organize development projects in the ABAP Workbench and in Customizing, and then transport the changes between the SAP systems in your system landscape. For more information, see the Change and Transport System documentation.

System Directories of an SAP System based on SAP NetWeaver 7.0

Directory	Description
/<*sapmnt*>/<*SAPSID*>	Software and data for one SAP system This directory and its subdirectories need to be physically shared using Network File System (NFS) and mounted for all hosts belonging to the same SAP system. It contains the following subdirectories: 1. exe This directory contains executable kernel programs. In an SAP system with distributed instances, this directory must be shared for all hosts with the same operating system. **Note** **dual-stack (ABAP (Non-Unicode) + Java) system only:** exe contains a folder uc with a platform-specific subfolder: <*sapmnt*>/<*SAPSID*>/exe/uc/<*platform*>. 2. global This directory contains log files. In an SAP system with distributed instances, this directory must be shared for all hosts with the same operating system. 3. profile This directory contains the start and operations profiles of all instances. In an SAP system with distributed instances, this directory must be shared for all hosts with the same operating system.
/usr/sap/<*SAPSID*>	Instance-specific data, symbolic links to the data for one system This directory contains files for the operation of a local instance. Whenever a local instance is started, the sapcpe program checks the executables against those in the logically shared directories and, if necessary, replicates them to the local instance. • There is a subdirectory for each instance. Each instance directory has the name of the related instance. ◦ The instance name (instance ID) of the ABAP central instance is DVEBMGS<*Instance_Number*>, and the instance name of an ABAP dialog

Directory	Description
	instance is D<*Instance_Number*>. In a high-availability system, there is also an ABAP Central Services instance called ASCS<*Instance_Number*>. **Example** The file system structure might look as follows: On a central instance with SAP system ID C11 and instance name DVEBMGS00, the ABAP dialog instance has the instance name D01. ◦ The instance name (instance ID) of the dual-stack (ABAP+Java) central instance is DVEBMGS<*Instance_Number*>, the instance name of the Java central services instance is SCS<*Instance_Number*>, and the instance name of a dual-stack (ABAP+Java) dialog instance is D<*Instance_Number*>. In a high-availability system, there is also an ABAP Central Services instance called ASCS<*Instance_Number*> **Example** The file system structure might look as follows: On a central instance with SAP system ID C11 and instance name DVEBMGS00, the J2EE Engine is installed in /usr/sap/C11/DVEBMGS00/j2ee, and the corresponding Software Delivery Manager (SDM) is installed in /usr/sap/C11/JC00/SDM On a dialog instance with instance name D01, the J2EE Engine is installed in /usr/sap/C11/D01/j2ee. No SDM is installed. ◦ The instance name (instance ID) of the Java central instance is JC<*Instance_Number*>, the instance name of a Java dialog instance is J<*Instance_Number*>, and the instance name of the Java central services instance is SCS<*Instance_Number*>. The instance name (instance ID) of the central instance is JC<*Instance_Number*>, the instance name of a Java dialog instance is J<*Instance_Number*>, and the instance name of the Java central services instance is SCS<*Instance_Number*>. **Example** The file system structure might look as follows: On a central instance with SAP system ID C11 and instance name JC00, the J2EE Engine is installed in /usr/sap/C11/JC00/j2ee, and the corresponding SDM is installed in /usr/sap/C11/JC00/SDM. On a dialog instance with instance name J01, the J2EE Engine is installed in /usr/sap/C11/J01/j2ee. No SDM is installed. • The directory /usr/sap/<*SAPSID*>/SYS contains soft links to appropriate directories in /<*sapmnt*>/<*SAPSID*>/ for storing data used by several instances. SYS is logically shared and available on each host of the SAP system. Its subdirectories contain symbolic links to the corresponding subdirectories of /<*sapmnt*>/<*SAPSID*> on the SAP global host, as shown in the figures above. For more information about sapcpe, see *The sapcpe Program* documentation. Executables located in /usr/sap/<*SAPSID*>/SYS/exe/run are replicated by sapcpe to the exe subdirectory of the instance directories.

Directory	Description
/usr/sap/trans	Global transport directory for all SAP systems The global transport directory is used by the Change and Transport System (CTS). The CTS helps you to organize development projects in the ABAP Workbench and in Customizing, and then transport the changes between the SAP systems in your system landscape. For more information, see the Change and Transport System documentation.

Backing Up and Restoring your SAP System on IBM i

Use

This procedure describes how to perform a full system backup including all SAP instances in offline mode and how to restore the data. For information about backing up partial data, see section *Backup and Recovery* in the *SAP Database Guide: IBM Db2 for i*.

Prerequisites

Backing Up the Entire System

- All users have logged off and all SAP systems have been stopped.

  This is important because the IBM i shuts down all subsystems before starting this type of backup.

- You are working at the console, and you are logged on as QSECOFR or as a user with *SAVSYS rights and authorization to start and end subsystems.

- You have enough storage media (that is tapes) available and initialized to contain the complete backup of your system.

Restoring the Entire System

- A console screen is available and connected to your IBM i server.
- Backup media with SAVSYS information, IBM libraries and user data from the most recent backup is available.
- A CD-ROM with the licensed internal code (LIC) is available. It is required if you are restoring the licensed internal code from a device that is not connected to the system bus (bus 1).
- You are aware of your disk configuration, that is you know which auxiliary storage pools (ASPs) were configured before the start of the recovery.

Procedure

Backing Up the Entire System

1. Enter command GO SAVE.

   The Save menu appears.

2. Select option 21 (Entire system).

   ### ℹ Note

   This ends all active subsystems, saves all system and user data, and starts the controlling subsystem. When starting the controlling subsystem, the automatic startup program that is specified in system value QSTRUPPGM is executed

automatically and all other subsystems are started again.

3. To verify that the backup is complete, enter command `DSPJOBLOG` to look for error messages that might have occurred during the backup.

> **Note**
>
> If errors occurred, your backup might not be complete. Therefore, it might be unusable for recovery.

4. If your SAP systems are not started automatically by the system startup program, start your SAP systems now.

Restoring the Entire System

1. If your system is **partitioned**, shut down the partition using the command `PWRDWNSYS`, the Dedicated Service Toole (DST), or the Hardware Management Console (HMC). If the system is **not partitioned**, shut down the system.
2. Place the system or partition in manual mode and choose IPL source D (IPL from tape or optical media). It depends on your system configuration whether you perform these steps through the control panel, the option **Work with system partitions** in the System Service Tools (SST), the Dedicated Service Tools (DST), or the Hardware Management Console (HMC).
3. Load the SAVSYS media to the alternate IPL device (usually a tape unit) and the LIC CD to your CD drive.
4. Start the system or partition.
5. After a while, the **Install Licensed Internal Code (LIC) screen** appears with the following options:

   1. Restore Licensed Internal Code

   2. Install Licensed Internal Code and Initialize System

   3. Install Licensed Internal Code and Recover Configuration

   4. Install Licensed Internal Code and Restore Disk Unit Data

   5. Install Licensed Internal Code and Upgrade Load Source

   Choose option **3 Install Licensed Internal Code and Recover Configuration**.
6. Enter `F10` on the **Install LIC and Initialize System - Confirmation** screen.
7. If you are installing the licensed internal code on the primary partition of a partitioned system, you receive the following error report after the LIC has been loaded:

   ```
   Unit has incorrect logical partition configuration
   ```
8. To recover your LPAR configuration, start the Dedicated Service Tools (DST) and choose option **11 Work with system partitions**, and then option **4 Recover partition data** and option **1 Recover primary partition configuration data**.

> **Note**
>
> You also receive the following error report after the LIC has been loaded:
>
> ```
> Missing disk configuration
> ```

9. To recover your disk configuration and the journal receivers in your user ASP, start the Dedicated Service Tools (DST).
10. Choose option **4 Work with disk units**, and then option **2 Work with disk unit recovery** and option **5 Recover disk configuration**.

> **Note**
>
> The system displays a **Problem Report** with two problems:

`Load source has been re-built` and `ASPs will be cleared`.

You can ignore these reports.

11. To continue, enter `F10`.

> **i Note**
> You must verify your disk configuration at the end of the procedure.

12. Return to the menu **IPL or Install the System** and choose option **2 Install the operating system**.
13. Confirm the installation of the operating system when requested to do so.
14. Complete the requested information during the installation as needed, such as the language feature selection or install option.
15. Choose **1 Take defaults for the install option**.
16. When the installation is completed, the system automatically performs an IPL and displays an **IPL Sign On** screen.
17. Sign on with user profile `QSECOFR`.

> **i Note**
> The system requires no password at this time. The system displays the **Change Password** display. The system sets the `QSECOFR` user profile to `*EXPIRED`, and the password to `QSECOFR`. When the IPL completes, the `QSECOFR` password is the password associated with the SAVSYS media you used.

18. Enter command `GO RESTORE`.

    The **Restore** menu appears.

19. Select option `21` (**System and user data**).

> **i Note**
> This ends all active subsystems, restores user profiles, configuration data, libraries, documents, folders, objects in directories and authorities, and starts the controlling subsystem. When starting the controlling subsystem, the automatic startup program that is specified in system value `QSTRUPPGM` is executed automatically and all other subsystems are started again.

20. To verify that the restore is complete, enter command `DSPJOBLOG` to look for error messages that might have occurred during the restore. If errors occurred during the restore, your system might not be complete. Therefore, the system might be unusable.
21. If the restore was started as a result of an unplanned system outage, or if your backup contains partial transactions, you must perform data recovery. Recover all changes since the last backup until the time shortly before the error as described in section *Recovering Changes to the SAP System Since the Last Backup* in *SAP Database Guide: IBM Db2 for i*.
22. If your SAP systems are not started automatically by the system startup program, start your SAP systems now.

More Information

For more information about system backup and restore, see the IBM documentation *iSeries Backup and Recovery* (document number SC41-5304).

Statistics

Use

Statistics give you an overview of the performance of your system. You can use the statistics to display the workload. There are the following important statistics displays:

- Workload Monitor

  The workload monitor displays statistical data from the local ABAP system. The workload overview enables you to analyze the performance of a system. You can also display the total values for all instances, and compare the performance of particular instances over a period of time. A wide range of analysis views and data helps you to find the source of performance problems quickly and easily.

- Global Workload Monitor

  The global workload monitor displays statistics for entire landscapes, including statistics for the non-ABAP components J2EE Engine, BC, and ITS. For example, in this monitor you can display the load data created when external components are started.

- Analyzing Individual ABAP Statistics Records

  Use ABAP statistics records to find out which activities are running in your system. This is a log of system activities that is implemented in the ABAP kernel. Every dialog step is logged and recorded with technical information, such as response time, transaction code, or CPU time. Unlike the workload monitor, the individual records, not the aggregates, are displayed.

- Functional Trace

  Whereas the global workload monitor shows only aggregated data, you can use the functional trace to display raw statistical data (single records) from both ABAP systems and the non-ABAP systems J2EE Engine, BC, and ITS in complex system landscapes. The functional trace uses RFC (or agents in non-ABAP systems) to get the raw data, which means that the information has a higher level of detail. For example, you can use the functional trace to trace actions that belong to a business process across system boundaries. You can also display traces such as the SQL trace or DSR trace from the functional trace.

Functional Trace

Purpose

You can display raw statistical data (individual records) and traces from ABAP and non-ABAP systems from complex system landscapes using the functional trace. The statistics and trace data of remote ABAP systems is accessed by RFC. For remote non-ABAP systems, the data is read using NetWeaver Management Agents.

The raw statistics data can originate from ABAP statistics records or Distributed Statistics Records (DSRs). While ABAP statistics records can only trace actions that are processed by ABAP components, with DSRs, you can trace actions that are processed using non-ABAP components. This works for both types of statistics records across component boundaries. Components that write statistics records send data from the statistics record with their communication with other components (their "passport"), meaning that the originator of an action or a data flow of a business process can be traced even beyond component boundaries.

The statistics records and traces are first stored locally on the relevant component and then read using RFC or the agent. The data is transferred to the monitoring system and displayed directly in the functional trace there.

Integration

The functional trace extends the following two transactions:

- The functional trace is an extension of the data selection transaction STAD that can only display raw statistics data for the local ABAP system, and not for multiple ABAP systems and different DSR components, like the functional trace.

- The functional trace is also an extension of the Global Workload Monitor (transaction ST03G). The Global Workload Monitor can only display aggregated statistical data that has been collected by a special collector.

  The functional trace, on the other hand, receives raw statistics data directly using RFC, or, in the case of non-ABAP systems, from an agent. It provides a finer resolution of information. For example, you can use the functional trace to trace actions that belong to a business process across system boundaries. You can also display traces in the functional trace. For more information, see Difference Between Functional Trace and Global Workload Monitor.

Features

The functional trace provides the following functions:

- You can use system selection to choose the systems for which you want to analyze statistics records and traces. You can restrict the analysis to the local system or extend it to include systems in a system landscape or a Business Process. You can create system lists.
- You can define a period for reading the statistics records in the data selection. The raw statistics records are read for this period for the components specified in the system selection.

  You can also specify parameters in the data selection with which you can also filter the raw statistics records, such as by the initial user and the initial system. The system displays the filtered statistics records in the analysis view.
- If errors occur, you can display the application logs of the function trace to find the cause of the error.
- You have various options for displaying and analyzing the raw data. For example, you can display the statistics records sorted chronologically in a call hierarchy or in a list.
- In the analysis view, you can display traces for ABAP systems (SQL trace and runtime analysis) and DSR traces in addition to the raw statistics records. You can activate SQL traces directly from the functional trace.

More information:

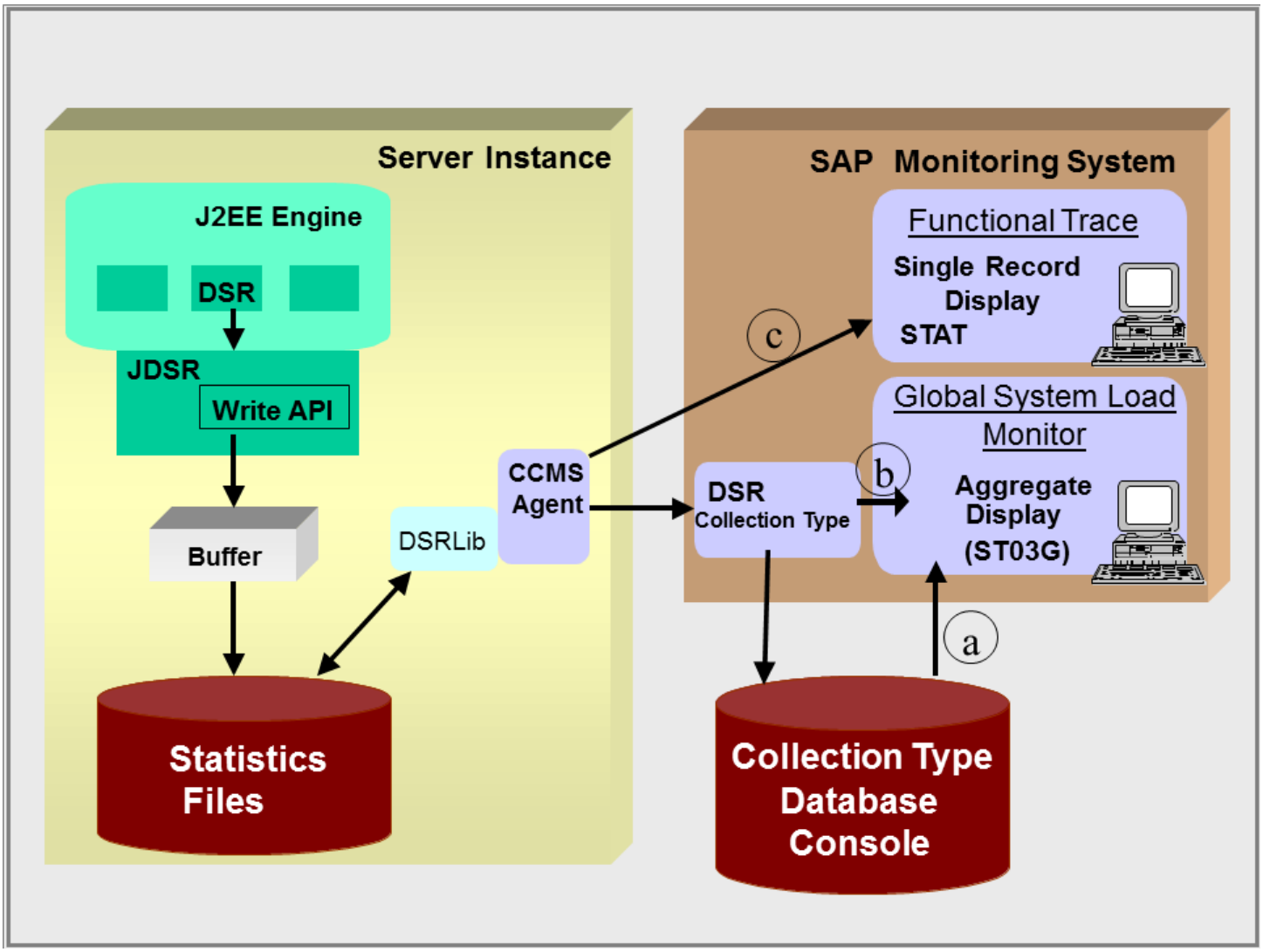
Operating the Functional Trace

Difference Between Functional Trace and Global Workload Monitor

The difference between the functional trace and the Global Workload Monitor is the type of data displayed and the way in which the data is displayed.

While the Global Workload Monitor displays aggregated data, the functional trace provides a more detailed view, since it displays raw statistical data and can therefore, for example, trace the actions that belong to a business process across system boundaries. The functional trace also displays traces from ABAP systems (SQL trace and runtime analysis) and from non-ABAP systems (DSR traces).

The figure below shows the way in which the statistics records for the J2EE Engine are displayed in the two statistics display transactions Global Workload Monitor (ST03G) and functional trace (STATTRACE):



Since the J2EE Engine is a non-SAP R/3 System, the agent exports the statistics records. Depending on the type of display, the agent either passes the data to the DSR collector to be aggregated (display variants a and b in the Global Workload Monitor) or directly in the display transaction (display variant c in the functional trace). There are the following display variants:

1. Display Collector Aggregates After Hourly Collector Run

   The collector aggregates the data during the transfer. The statistics records collected by the hourly collector run are stored in the database and displayed in the Global Workload monitor (transaction ST03G).

2. Display Collector Aggregates Between Hourly Collector Runs

   So that you do not have to wait until the hourly collector run to display aggregated statistics files, the Global Workload Monitor (transaction ST03G) provides the Last Minutes' Load function, which allows you to aggregate and display statistical data during runtime without storing it in the database.

3. Display Raw Data as Single Records

   With single record display (c), the raw statistical data is displayed in the functional trace (transaction STATTRACE). The data is read directly by the functional trace from the statistics files for each analysis using the agent. This means that the granularity of the information in the functional trace is finer than that of the data in the Global Workload Monitor. If traces were activated, the trace data is also transferred to the monitoring system.

See also:

Operating the Functional Trace

Operating the Functional Trace

Use

This section provides an overview of the functions of the functional trace and contains links to additional information.

Features

The functional trace (transaction STATTRACE) is divided into a navigation area in the left subwindow, which you can show and hide by choosing Full Screen On/Off and an analysis area in the right subwindow.

Functions

The following functions are available to you in the navigation area:

Function	Description
Data selection	You can use Data Selection to select the data to be analyzed. You can filter which individual statistics records (raw records) and, if appropriate, trace data are to be displayed. You can filter the data records by the following criteria: • Start date • Start time • Read period • Initial system • Initial user • Initial action • Transaction ID The system displays the filtered statistics records in the analysis view. The data selection function interacts with the system selection function. In the system selection, you define the systems from which statistics records are read. In the data selection, you define a period for reading the statistics records. The raw statistics records are read for this period for the components specified in the system selection. If you do not specify a specific period, the system uses the default filtering, that is it filters to the first ten minutes after starting the transaction.

Function	Description
Settings & log	The following settings and log functions are available: System selection Use this function to define the components from which you want to display raw statistical data. Display and Analysis Options You can use this function to select the display variant. You can specify whether statistics records are displayed hierarchically or in a list. You can also specify the time zone and the RFC wait time. Activating/Deactivating the Trace You can use this function to activate the SQL, enqueue, RFC, or buffer trace for ABAP systems that you have selected in the system selection, as in the performance analysis (transaction ST05). Application Log If an error occurred in the functional trace, you can use this function to find the cause of the error.

General Data

If you have performed an analysis and the desired statistics record, the system displays the following general information at the top of the output area:

- Period analyzed (date, time)
- Components analyzed
- Components that do not deliver data
- Time zone

The date and time of the first and last statistics record of the period being considered are also shown.

ALV Tree Control

After a successful analysis, the raw statistics data is displayed as a call hierarchy in an ALV Tree Control.

ALV Grid Control

As there is no sort function for the call hierarchy, you can display the statistics records as a list. The list display uses an ALV Grid Control, with which you can extensively adjust the selected view to your requirements. Using the standard functions of the ALV Grid Control, you can

- Show and hide columns
- Sort rows by the contents of a column
- Set and delete filters
- Perform summations

- Export tables as a file type of your choice
- Display tables as graphics
- Save sort orders, filters, and selected columns as your layout

See also:

System Selection

System Selection

Use

Use this function to define the components for which you want to display raw statistical data and, if appropriate, traces. The creation of the raw statistical data and the writing of the traces is independent of this system selection. The system selection is used primarily to display data for specific systems so that the interface is structured in as clear a way as possible.

The following functions are also available to you:

- You can check which components are entered in the CCMS System Component Repository (SCR).
- You can save and recall a total of five different sets, each of which contains a set of monitored systems.

Integration

In the system selection, you define the systems from which statistics records are read. In addition to system selection, you use data selection to define a time period for reading the statistics records. The raw statistics records are read for this period for the systems specified in the system selection.

You can also specify parameters in the data selection with which you can also filter the raw statistics records, such as by initial user and initial system. The system displays the filtered statistics records in the analysis view.

With system selection, you can also access the systems that are known to the Solution Manager and, in this way you can, for example, monitor all systems that are assigned a particular business process. However, for this it is necessary that you specify the RFC destination and the name of the data model of the Solution Manager. Choose SolMan to do this. The utilized data model is CBP Data Model.

Prerequisites

- Before you can analyze statistical and trace data from remote components with the functional trace, system data (such as the RFC destination) must be known. You can enter this data in the table manually, or call it up using Systems.
- To be able to analyze individual statistics records from ABAP systems, the function group SAPWL_GLOB_STAT must exist in the corresponding system. The function group SAPWL_GLOB_STAT is available as of SAP Basis 4.0B.
- To be able to display traces from ABAP systems, the function group SAPWL_GLOB_TRACE must exist in the corresponding system. The function group SAPWL_GLOB_STAT is available as of SAP Basis 4.6B.

Activities

To select and analyze systems, proceed as follows:

1. Start the functional trace by choosing Administration → CCMS → Control/Monitoring → Performance → Workload → STATTRACE - Statistics Records (All) and Traces or with transaction STATTRACE.
2. Choose System Selection.

   The system displays the current system list. To display another system list, choose an entry in the Systems menu. The Features section below contains detailed information about this menu and the structure of system lists.
3. Make changes to the displayed list if required. You can, for example, (de)activate systems or add new systems. You can also create a new list and save it as a set.
4. To start an analysis for the selected systems of a list, choose Apply.

   The system first performs a consistency check of the destination to the monitoring system. If the consistency check fails for an entry, this entry is deactivated and a message is created for the application log. The raw statistics data is filtered in accordance with the analysis data entered using data selection.

Features

To obtain a selection of components that can be monitored, choose the Systems menu. The menu has the following entries:

Entry	Meaning
Local	Includes the local ABAP system and all components for which statistical data is collected in this ABAP system. DSR statistical data is collected in the system with which the NetWeaver management agent that is responsible for the transfer is registered.
All	Lists all components that are registered in the SCR. This is both ABAP systems and non-ABAP systems (DSR components).
Solution Manager	Shows all components that are known to the Solution Manager. The system first displays a table with the available Solutions. Choose the desired Solution. The associated systems are then displayed. You can also select systems that belong to a particular business process. To do this, choose Business Processes.. Choose the desired process and the desired system.
Set No. 1 - 5	Lists the components that you have previously saved as one of the five possible sets.
Current List	Contains those components that were active when the system selection was called.

The following data is displayed for the selected components:

Column	Meaning
Activated	Indicator with which you can activate and deactivate the analysis of the component
Component Name	Component name (from the SCR) and, for ABAP systems, the name of the system
Comp. type	Name of the component type (from the SCR) and, for ABAP Systems, the entry SAP R/3
Mon.Sys	Monitoring system in which the statistical data of the component is collected; for ABAP systems, the system itself

Column	Meaning
Mon. Sys. Dest.	RFC destination of the monitoring system; this entry is empty if the monitoring system is the local ABAP system
Indirect Dest.	RFC destination of an ABAP system (for example, the system of the Solution Manager) in which the destination of the monitoring system is known; access to the statistical data of the monitoring system is then performed indirectly through this intermediate system
Release	Release of the SAP Web Application Servers; the system makes this entry automatically

ℹ Note

- The specifications for component name, component type, and the name of monitoring system are mandatory.
- An empty field for a destination and the entry NONE are equivalent.
- Ensure that you use the correct notation for all fields of the table (upper- and lower-case).

You can change the specified data in the table. To save the table contents to the database, choose the Save menu and one of the five sets available.

See also:

System Selection Example

Selecting Data for the Functional Trace

Example: System Selection with Indirect Destination

The indirect destination is the RFC destination of an SAP System (such as the Solution Manager system), in which the destination of the monitoring system (monitored system) is known. The statistical data for the monitored system is then accessed indirectly using this intermediary system.

For example, you have three ABAP systems: A, B, and C, and you want to monitor systems B and C from system A. The RFC destination of system C is, however, only known to system B. In this case, the destination of system A to system B is the indirect destination. To create a system list in the system selection for this example, follow the procedure below:

1. Open the functional trace using transaction STATTRACE.
2. Choose System Selection → Systems and then any free set.
3. Insert three rows by choosing Insert Rows; one for each system. The columns of the rows mean the following:

Column	Description

Column	Description
Activated	Indicator with which you can activate and deactivate the analysis of the component
Component	Component name (from the SCR) and, for ABAP systems, the name of the system
Comp. Type	Name of the component type (from the SCR) and, for ABAP Systems, the entry SAP R/3
Mon.Sys	Monitoring system in which the statistical data of the component is collected; for ABAP systems, the system itself
Dest. MonSys	RFC destination of the monitoring system; this entry is empty if the monitoring system is the local ABAP system
Indirect Dest.	RFC destination of an ABAP system (for example, the system of the Solution Manager) in which the destination of the monitored system is known; access to the statistical data of the monitored system is then performed indirectly through this intermediate system
Release	Release of the SAP Web Application Servers; the system makes this entry automatically

ℹ Note

1. Enter A, B, and C as component names.
2. Enter the component type, in this case SAP R/3.
3. Specify the system in which the statistics records are collected as the monitoring system for the system.

   For ABAP systems, this is always the system itself, that is, for system A, enter A as the monitoring system, entering the monitoring system B for system B, and so on.
4. The fields RFC Destination to the monitoring system (Dest.MonSys) and Indirect Destination for the Monitoring System (Ind. Dest.) remain empty in the row for system A, because it is the local system.
5. In the row for system B, enter the RFC destination from system A to system B in the Dest. MonSys field. Ind. Dest remains empty, since you are not using an indirect destination in this case.
6. In the row for system C, enter the RFC destination from system A to system B as the Ind. Dest and the RFC destination from B to C as Dest. MonSys
7. Finally, activate all systems in the Activated column and save the set.

See also:

System Selection

Selecting Data for the Functional Trace

Selecting Data for the Functional Trace

Use

You can use data selection to select the data to be analyzed. With this function, you filter which statistics records (raw records) are to be displayed in the analysis view of the functional trace (transaction STATTRACE).

Prerequisites

You have defined the systems from which statistics records are to be analyzed in the system selection.

Procedure

Follow the procedure below to select data for the functional trace:

1. Start the functional trace (transaction STATTRACE).
2. Choose Data Selection in the left subwindow of the initial screen.

   You can show and hide the left subwindow by choosing Full Screen On/Off.
3. To determine the analysis interval, specify start date, start time, and the read period(in minutes).
4. You can optionally restrict the individual records to be displayed using the following specifications:
   - Initial system
   - Initial user
   - Initial action
   - Transaction ID

   With these input parameters, the system filters using the passport, which contains values for these parameters. If statistics records are written beyond component boundaries, the passport is sent together with the communication between the components. You can use the passport to determine which steps belong to an action, even if they were performed on different components.

   The initial system is the starting system of an action that runs over multiple components. The action that is started in this system is the initial action that is started by an initial user and for which the transaction ID is assigned. The transaction ID is the GUID from the passport that identifies all dialog steps.
5. If desired, you can choose the options Read Additional Records and No ADM Records:
   - If you determine that the delivered data is not sufficient for your requirements and want to fill out a new time window, activate Read Additional Records, so that the newly collected statistics records are added to the statistics records that have already been collected. If you do not activate this option, the previously read statistics records are deleted, and the system displays only the statistics from the new query.
   - The No ADM records option is activated by default; that is, the ADM statistics records are hidden. This is useful, since there is a large number of ADM statistics records and this can therefore affect the performance.
6. Confirm your selection.

Result

The system displays the statistics records with their general information. You have the following options for a new data selection:

- Fill out a new time window using New Selection
- Choose 1 Time Unit Previously to display the statistics records that were written one time unit earlier, where the time unit corresponds to the read period that you used for the previous data selection
- Choose 1/2 Time Unit Previously to display the statistics records that were written half a time unit earlier
- Choose 1/2 Time Unit Later to display the statistics records that were written half a time unit later
- Choose 1 Time Unit Later to display the statistics records that were written one time unit later

For more information about individual statistics records, choose the relevant record to display the corresponding statistics record in the Detail View.

See also:

Analysis View

Analysis View

Definition

The analysis view of the functional trace (transaction STATTRACE) displays the raw statistical data that has been filtered in accordance with the system selection and the data selection.

You can also for ABAP systems (SQL traces and runtime analyses) and display traces for non-ABAP systems.

Displaying the Raw Statistical Data

- A data record contains the most important basic data, such as:
  - Action performed
  - User
  - Service
  - Subrecords for DSRs, where the following abbreviations are used among others:
    - RS for RFC server
    - RC for RFC client
    - CL for client
    - AD for ADM message
    - TB for table records
    - HC for HTTP Client Records
    - CS for call subrecords (a DSR component calls an external component)
  - Response, DB, DBP, and CPU time
  - Call, wait, load, and generation times
  - Process and thread IDs
  - Memory usage

You can use the usual layout functions to add columns, such as the GUID from the passport or the component name.

- The analyzed (filtered) raw statistical data is displayed in one of the following display types, depending on your settings in the display and analysis options:

Hierarchy Display:

In the hierarchy display, the system first displays a list of initial systems; that is, systems in which an action was started. When an action was also processed in other components or instances, the system indicates this with >>>. The system displays a complete statistics record next to an initial system. This contains the totals of the values of all statistics records that are involved in the action triggered by the initial system.

If you want to display what this complete statistics record consists of, the call hierarchy that was used, expand the tree for the corresponding initial system. The system displays all components that the action ran through and the associated raw statistics records.

ℹ Note

An administrator determines that a particular background job repeatedly lasts too long. To determine exactly how the time was spent, the administrator enters the time period to be investigated in data selection and specifies the background job as the initial action. A list of systems from which the background job was initially started then appears. The administrator can expand the tree for an initial system whose action lasted a long time and display the call hierarchy. This means that the administrator can see the individual stations that the action ran through. The statistics records for the individual stations are always displayed in chronological order.

List Display

In the list display, the individual records are grouped and listed by transaction ID with color coding. The list display uses an ALV Grid Control, with which you can extensively adjust the selected view to your requirements. You can use the standard functions of the ALV Grid Control to

- Show and hide columns
- Sort rows by the contents of a column
- Set and delete filters
- Perform summations
- Export tables as a file type of your choice
- Display tables as graphics
- Save sort orders, filters, and selected columns as your layout

You can switch between the Hierarchy and List displays by selecting the appropriate entry in the Displaytree in the lower left subwindow.

You can show and hide the left subwindow by choosing Full Screen On/Off.

- By double clicking a raw statistics record, you can switch to the detail view, which provides more detailed information.

See also:

Display and Analysis Options

Trace Display

As of SAP Web Application Server 6.40, you can also display the raw statistical data traces of ABAP systems and non-ABAP systems, as long as the traces were previously activated.

i Note

You can activate and deactivate SQL traces and RFC, Enqueue, and buffer traces directly in the functional trace using the option Activate and Deactivate Trace in (De)Activate Settings & Log.

You can display the traces in the analysis view using TRACE Data. You can select the following traces in the hierarchical display:

- SQL Trace
- Runtime Analysis
- DSR Trace
- DSR Trace and Statistics Records

Only the first three options listed above are available in list display.

Detail View

Use

If you have performed an analysis, the system displays the basic information for the raw statistics records in the analysis view. You can view more detailed information in the detail view.

Activities

Follow the procedure below to display detail views:

1. Choose a statistics record in the analysis view.

   The Detail Analysis of Selected Statistics Record screen appears, in which you can display detail information in list form. The detail information is displayed using different detail views. There are detail views, among others, for the times,

databases, data quantities transferred, and so on.

2. If you require a different detail view, open the Detail Viewdropdown menu.

   You can select a detail view in this menu. The following detail views are especially important:

Detail View	Description
Client Info	The Client Info detail view corresponds to the client info record (certificate subrecord) of the passport. With distributed statistics records (DSRs), the passport is sent with the communication so that it is possible to trace, for example, the initiator of an action or the data flow of a business process even beyond component boundaries. The Client Info detail view contains the following information: • Name and type of the initial components, such as component ECA of type SAP R/3 • Service type, such as background • Initial user • Initial action performed, such as a background job • Action type • Name of the calling component, such as BCE This means that component ECA starts a background job in BCE.
RFC Dest.Records Client	This RFC detail view and the following RFC detail views provide detailed information about the actions of the DSR components. The components that call other components (destinations) are called clients. This detail view shows which components the client has called. The following details are displayed, among others: • Local destination • Remote destination • Number of calls • Call time • Received data (in bytes)
RFC Single Records Client	The individual data records for the client's calls are displayed in this view. This detail view provides the following information in addition to that provided by RFC Dest. Records Client: • Program name • Name of the executed function The system always displays the statistics records that had the highest performance demands. The system displays up to five statistics records.

RFC DEST.Records Server	Like RFC Dest.Records Client with the difference that the component is functioning as a server here. The components that are called by other components (destinations) are called servers. This detail view shows which components called this server.
RFC Single Records Server	Like RFC Single Records Client with the difference that the individual data records displayed here are for the calls of the server.

See also:

Analysis View

Display and Analysis Options

Display and Analysis Options

Use

You have the following options through the Display and Analysis Options function:

- · You can change the display variant of the analysis view (default setting: hierarchy). The statistics records are sorted chronologically, as far as possible, in the functional trace. Using the display and analysis options, you can choose whether the records in the analysis view are to be displayed in a call hierarchy or in a list. You can choose between list display and a hierarchy after an analysis has been performed. The options are displayed in the lower left subwindow.
- · You can change the timeout with RFC Wait Time, that is, the period that the system waits for a remote system to deliver data (default setting: 2 minutes).
- · You can also select a different time zone (default setting: CET).

Application Log

Use

You can determine the cause of an error in the function trace using the application log function.

Activities

1. Select the application log function.

   The Display Log screen appears. The system displays the current log and, if appropriate, the associated message list in the upper half of the screen.

The following message types exist:

Termination

Error

Warning

Information

1. The message texts are displayed in the lower half of the window.

See also:

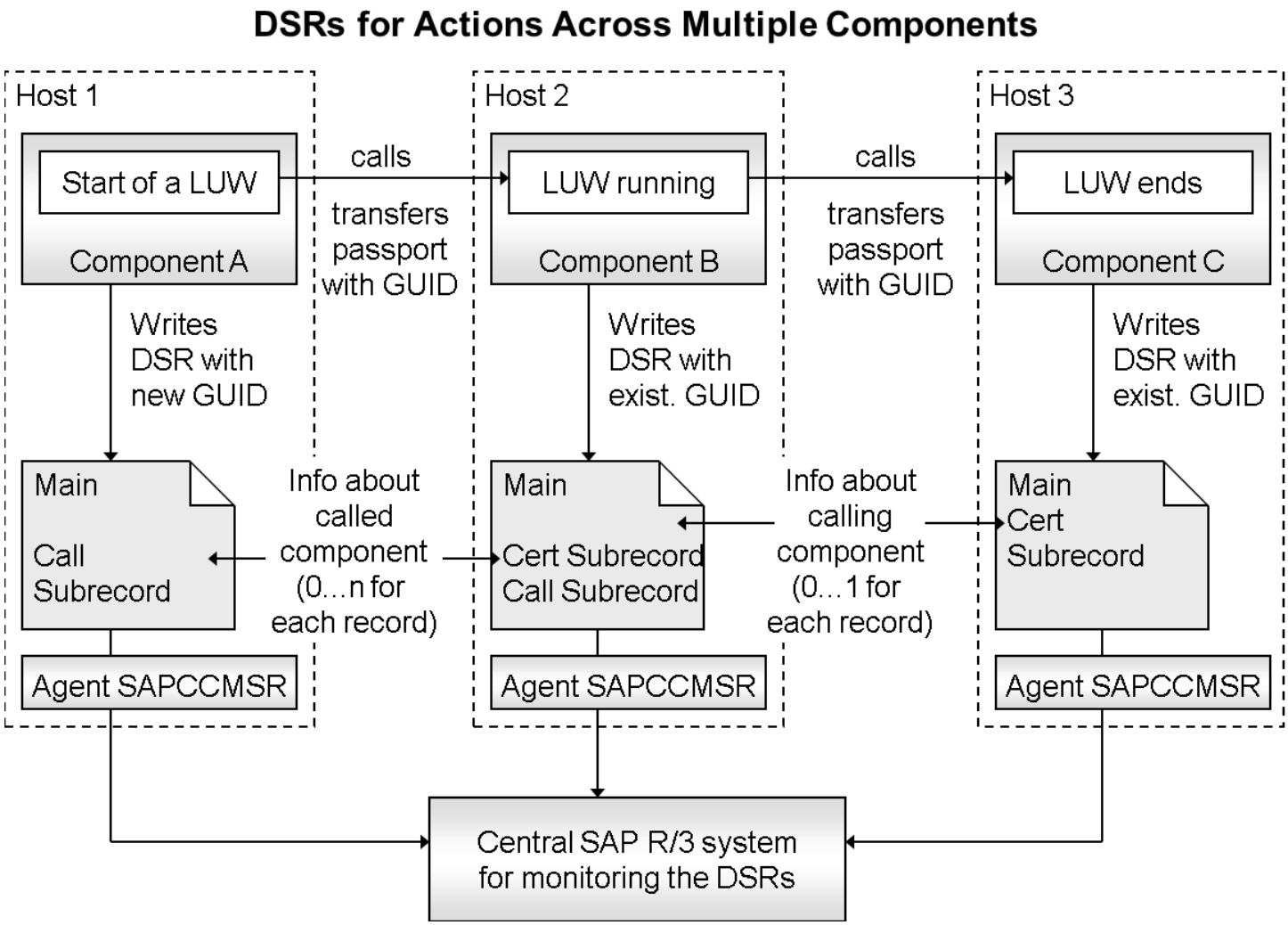
Operating the Functional Trace

Distributed Statistics Records (DSRs)

Definition

Statistics records are created to enable you to monitor the performance of an SAP System and its components. These statistics records provide information about the workload generated and the resources used in the system by actions. This provides you with a very exact picture of the quality of a system. The extension of this concept for non-ABAP components uses Distributed Statistics Records (DSRs). With DSRs, as with the statistics records for ABAP systems, you can trace actions that are processed over several components.

For this reason, there is a passport that is sent together with every communication. Among other things, the passport contains a GUID that is generated with a new Logical Unit of Work (LUW) and which is used when calling other components within the LUW. By evaluating the DSRs globally, you can collect and analyze all of the data for a LUW.



Structure

A DSR (= an action) consists of a main record and the subrecords connected to it:

- Main record

  The main record contains performance and administration information about the action of a component.

- Certificate Subrecord (Cert Subrecord)

  The certificate subrecord specifies the source of the LUW. The data contained in this subrecord forms the passport, together with the GUID. There is a maximum of one certificate subrecord for each main record.

- Call Subrecord

  The call subrecord contains information about the called component. There can be any number of call subrecords for each main record.

Integration

You can display the DSR in the monitoring SAP System using the Global Workload Monitor and the functional trace:

- The raw statistical data (single record analysis) is displayed in the functional trace (transaction STATTRACE).
- The data is displayed in the Global Workload Monitor (transaction ST03G) after the collector aggregates it. You can display the aggregated data from different points of view, such as workload overview or time profile.

For more information, see Difference Between Functional Trace and Global Workload Monitor.

Passport

Definition

If the system is generating Distributed Statistics Records (DSRs), that is, of statistical records of the instrumented non-ABAP systems, the passport is sent during communication between the components. Among other things, the passport contains a GUID that is generated with a new Logical Unit of Work (LUW) and which is used when calling other components within the LUW. By evaluating the DSRs globally, you can collect and analyze all of the data for a LUW. The passport contains a trace flag with which performance trace information can be written for every component involved in a LUW for exactly this LUW.

Structure

The passport corresponds to the certificate subrecord (cert subrecord) of the DSR and contains the following fields:

- TransID/GUID
- TraceFlag to the set the trace flag
- Initial SysID/ComponentID with the ID of the initial system or initial component
- Initial ServiceType with the initial service type
- Initial Action with the initial action
- Initial ActionType with the initial action type
- Initial UserID with the initial user ID.

  These fields are only filled when the passport is created. All subsequent components leave these fields unchanged.

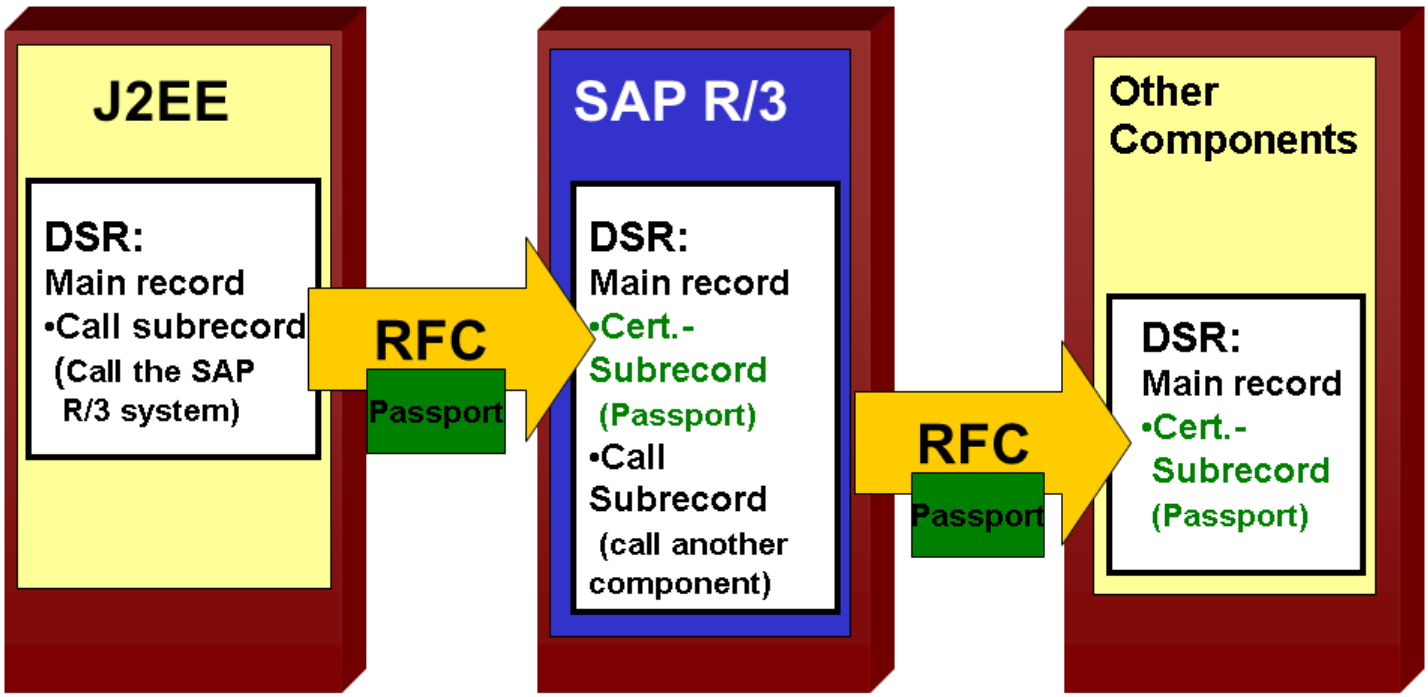
- PreSysID/PreComponentID with the ID of the previous system or previous component

ℹ Note

The ID of the previous system or previous component is always filled with a system or component's own ID before the passport is sent. This means that the direct predecessor can be identified when the passport is received.

Integration

- The functional trace (transaction STATTRACE) can filter raw statistics records using the data of the certificate subrecord (also known as client info record). To do this, you must enter the appropriate values in the data selection input parameters.
- The figure below shows how the passport is forwarded and linked to the relevant statistics records:



1. The passport is created in the component in which a LUW is initiated. In this example, this is the J2EE Engine. The J2EE Engine sends the passport to the ABAP system and writes a call subrecord.
2. The ABAP system receives the passport and stores its data as a certificate subrecord. It calls another component, for which a call subrecord is written.
3. The passport is transferred to another component during the RFC call and the certificate subrecord is written in turn into the statistics there.
4. The complete statistics records are transferred to the central monitoring system (CEN) and displayed.

Troubleshooting

Use

You can find troubleshooting information (problem analysis scenarios) for specific installable software units in the relevant documentation sections.

A central entry point for all issues is the SAP Technology Troubleshooting Guide on http://wiki.sdn.sap.com/wiki/display/TechTSG.

Integration Tests for ABAP Applications

Use

It is necessary to test the functions and performance of your solution during the entire life cycle of a SAP solution. SAP Test Workbench provides you with an environment for all test phases, which you can use for testing in the following cases:

- Implementation of SAP solutions
- Integration of new components and business scenarios
- Customer developments
- Function tests
- Integration tests with other components
- Upgrades, regression tests
- Importing support packages

Integration

The SAP test tools Test Workbench and Extended Computer-Aided Test Tool are part of SAP Web Application Server.

Features

Test Preparation

- Creation of manual and automated test cases
- Management of manual and automated test cases
- Creation of test plans
- Definition and management of tests

Perform Test

- Execution of mass tests using Extended Computer-Aided Test Tool and Computer Aided Test Tool
- Integration of test cases and test scripts of non-SAP providers
- Assignment of worklists (test packages) to individual testers

Test Evaluation

- Permanent overview of test progress and test results
- Complete documentation of test processes in the test plans (test cases, test case descriptions, test results, test case notes, error messages)
- Detailed tabular and graphical evaluation of all test plans
- Export test results to office applications
- Message processing

Setting Up Service Connections for SAP Remote Support

If you want to use SAP remote services (for example, SAP EarlyWatch or Remote Consulting), or if you would like to permit an SAP support consultant to work directly in your system to make a more precise problem diagnosis, then you need to set up a remote service connection. Remote access has the major advantage that these operations are then immediately available to you.

Before you can open such a connection, a remote network connection to SAP must have been set up and the Service Connector must be installed on your PC. Once the network connection is set up and the Service Connector is installed, you can create different types of service connections that permit SAP employees access to your system.

You can find detailed information on setting up remote service connections to SAP including documentation on the SAP Support Portal at http://support.sap.com/remoteconnection.

You have to set up a remote service connection for each system. There are different connection types available to make it possible for SAP employees to access your system. These differ based on the type of SAP system that is to be accessed and the type of connection that you require. In the following table you will find the most important connection types, along with the related components where you can open customer service messages if you have any problems or questions:

Connection Type	Details	Set Up Information	Message Component
Connection to SAP Solution Manager	The service connection runs on the responsible SAP Solution Manager of the affected system.	962516	XX-SER-NET-HTL
R/3 Support	The "classic" R/3 support connection from ABAP systems using SAProuter without Web Dynpro.	812732	SV-SMG-SVC
HTTP Connection	For a service session you require an HTTP connection to your systems to a specific URL; Use this connection type for Java systems and ABAP systems using Web Dynpro.	592085	XX-SER-NET-HTL

i Note
You can find a complete list of the connection types in SAP Support Portal at http://support.sap.com/remoteconnection. Select the entry **Connection Types Available** on this page.

There are also roles for read-only access for remote support. These roles are available in the `STPI` plug-in and are generated when a managed system is connected to SAP Solution Manager. These are:

- `SAP_RCA_SAT_DISP` for ABAP
- `SAP_JAVA_SUPPORT` for Java

i Note
You can only generate the role `SAP_JAVA_SUPPORT` using SAP Solution Manager. If you are not operating SAP Solution Manager, use the role `SAP_JAVA_SUPPORT` instead.

Database Administration

Use

Here you can find more information on routine administration for databases supported by SAP.

Database Administration for IBM Db2 for i

Use

You need to perform various tasks to administer your IBM Db2 for i database in an SAP environment.

Getting Started

If you are new to IBM Db2 for i, see the SAP Database Guide: IBM Db2 for i.

Tools

You can use the following SAP and IBM tools for the administration of IBM Db2 for i:

- CCMS for IBM Db2 for i
- Backup Recovery and Media Services. For more information, see the IBM documentation.

Tasks on Demand

The table below shows tasks that you need to perform when required:

Reason	Task	More Information
Database recovery after data loss	Backup and Recovery	**SAP Note** 825473
Maintain access to other systems, such as a BW source system	• For information about how to connect from an IBM i, Windows and Linux PPC to an IBM Db2 for i database, see **SAP Note** 146624. • For information about how to connect from an IBM i with a BW system to a non-SAP database on IBM i, see **SAP Note** 523381.	None
New database release	Database upgrade	For more information, see the IBM documentation.
Install software fixes	• Order, load and apply program temporary fixes (PTF's) for IBM i • Download qxdaedrs.dll for Windows: **SAP Note** 751451 • Update JDBC drivers: **SAP Note** 654800	For more information, see the IBM documentation.
System copy required	System copy	• For more information, see the SAP Help Portal. • **SAP Note** 585277
Password change required	On IBM i, sign on as QSECOFR and use command CHGUSRPRF for all instance users (SID<nn>) on all servers. For more information on changing passwords on a Windows operating system, see **SAP Note** 705886.	For more information about authority concept for SAP on IBM i, see **SAP Note** 173579.

Periodic Tasks

The table below shows tasks that you need to perform periodically:

Frequency	Task	Recommended Tool
Daily / weekly	Run database backup	SAP System Save Strategies
Daily / weekly	Verify database backup	Backup Overview (IBM Db2 for i)
Daily	Check disk space	State on Disk (IBM Db2 for i)

Database Administration for IBM Db2 for Linux, UNIX, and Windows

Get an overview of the relevant tools for database administration of IBM Db2 for Linux, UNIX, and Windows and the relevant documentation.

You need to perform various tasks to administer your database in an SAP environment. To do so, you can use either Db2 tools or SAP system tools such as the DBA Cockpit.

→ Recommendation

Where possible, use the tools provided by SAP to perform these tasks.

Tasks on Demand

The following table shows tasks that you need to perform when required:

Task	Description
Database recovery	In the case of a database failure with data loss, recover the database by Db2 means as described in *Database Administration Guide: SAP on IBM Db2 for Linux, UNIX, and Windows*.
Space management	Check the growth of tablespaces and, if required, maintain the storage settings according to your requirements using the DBA Cockpit.
System performance monitoring	Using the DBA Cockpit, check, for example, the following: • Lock waits and deadlocks • Performance snapshots of your database • Expensive SQL statements, database cache, and access plans of these SQL statements using the EXPLAIN function • Database configuration
Database upgrade	If required, upgrade your database to the latest version as described in the appropriate database upgrade guide.
System copy	If required, perform a system copy using the installer as described in the appropriate system copy guide for your SAP NetWeaver release.

Periodic Tasks

The following list shows tasks that you need to perform periodically:

ℹ Note

Where possible, use the DBA Cockpit for these tasks.

- Schedule regular backups of the database using the DBA Planning Calendar.
- Check the alert message log.
- Check the database growth.
- Perform troubleshooting by checking the database logs, that is, the database diagnostic log and database notification log.

More Information

For more information, see the following documents:

- *Database Administration Guide: SAP on IBM Db2 for Linux, UNIX, and Windows*
- *Database Administration Using the DBA Cockpit: IBM Db2 for Linux, UNIX, and Windows*
- *Installation Guide: IBM Db2 High Availability Solution: IBM Tivoli System Automation for Multiplatforms*
- *Upgrade to Version <no> of IBM Db2 for Linux, UNIX, and Windows*
- *System Copy for SAP Systems Based on SAP NetWeaver <Release>*
- *Installation: Systems Based on SAP NetWeaver <Release>*

To find the guide relevant for you, use the SAP NetWeaver guide finder.

Database Administration for IBM Db2 for z/OS

You need to perform various tasks to set up administration for IBM Db2 for z/OS in an SAP environment.

Here you can find a list of guides that provide information about database administration for SAP on IBM Db2 for z/OS:

- **Database Administration Guide for SAP on IBM Db2 for z/OS**

  https://help.sap.com/viewer/db2_administration_guide
- **Planning Guide for SAP on IBM Db2 for z/OS**

  https://help.sap.com/viewer/db2_planning_guide
- **Security Guide for SAP on IBM Db2 for z/OS**

  http://help.sap.com/viewer/db2_security_guide
- **Installation Guides**

  https://support.sap.com/en/tools/software-logistics-tools.html under ***<System Provisioning>* Installation Option of Software Provisioning Manager**

  To find all guides relevant for SAP on IBM Db2 for z/OS, you can also use the SAP NetWeaver Guide Finder.

Database Administration for Microsoft SQL Server

Use

You need to perform various tasks to administer your MS SQL Server database in an SAP environment.

Tools

You can use the following tools for the MS SQL Server database administration:

- SQL Server Configuration Manager
- SQL Server Management Studio
- DBA Cockpit

Tasks on Demand

You need to perform the following tasks:

- Start or stop the SQL Server database.
- Restore the Database
- Perform a system copy.

  For more information, see the system copy guide for your SAP product at:https://support.sap.com/sltoolset

Periodic Tasks

You need to perform the following tasks periodically or daily:

ℹ Note

Whenever possible, use the Planning Calendar for these tasks.

- Backups

  For more information, see the DBA Planning Calendar.
- Monitor the MS SQL Server database

  For more information, see the Database Performance Overview.
- Database Server Checks

More Information

SAP / MS SQL Server DBA in CCMS

Database Administration for Oracle

Use

You need to perform various tasks to administer your Oracle database in an SAP environment.

Getting Started

If you are new to the Oracle database, see Getting Started with Oracle and the SAP System.

For information on the concepts behind Oracle database administration (DBA), see Approach to Oracle DBA.

Tools

You can use the following SAP tools for Oracle DBA:

- BR*Tools for Oracle DBA (outside the SAP system)
- Other Tools for Oracle DBA (outside the SAP system)
- CCMS: Oracle (in the SAP system), including the DBA Planning Calendar.

Tasks on Demand

The table below shows tasks that you need to perform when required:

Example

If you see a space management alert (see below in *Periodic Tasks*), indicating that your tablespaces are running out of space, you perform space management to correct the problem.

Reason	Task	More Information
Database start or stop	Instance Management with BR*Tools	Instance Management
Database failure with data loss	Restore and Recovery with BR*Tools	Restore and Recovery
Tablespace or data file management	Space Management with BR*Tools	Space Management
Table or index management	Segment Management with BR*Tools	Segment Management
Performance problem	Maintain Database Parameters	None
New database version	Database upgrade	**http://service.sap.com/instguides Other Documentation Database Upgrades Oracle**
System copy required	Database copy	**http://service.sap.com/instguides SAP NetWeaver SAP NetWeaver <Product> 7.1 Installation**

Periodic Tasks

The table below shows tasks that you need to perform periodically:

Note

Whenever possible, use the **DBA Planning Calendar** for these tasks.

You can choose from a range of predefined action patterns that include the tasks listed here.

Frequency	Task	Recommended Tool

Frequency	Task	Recommended Tool

Daily	• Run database system check
	• Run database backup
	• Monitor the Oracle database and check for alerts:
	  ◦ Space Management Alerts
	  ◦ Database Performance Alerts
	  ◦ Database Backup and Restore Alerts
	  ◦ Database Consistency Alerts
	  ◦ Database Health Alerts
	• Displaying the Status of a Day's Actions
	• Run update statistics
	- daily task with Oracle 10g or later
		DBA Planning Calendar with a predefined action pattern

Troubleshooting

The following problems are the most common in an Oracle environment:

- Archiver stuck- for more information, see Backup and Database Copy with BR*Tools
- Online backup crashed - for more information, see Fixing an Online Backup Crash
- Tablespace full - for more information, see Extending a Tablespace with BR*Tools

More Information

- You can find **full** information on all aspects of Oracle DBA at:

  SAP Database Guide: Oracle

- For more information about Oracle DBA, see:

  www.sdn.sap.com/irj/sdn/ora

- For more information about advanced Oracle DBA, see:
  - Advanced Backup and Recovery
  - Oracle Real Application Cluster
  - SAP/Oracle Database Monitor for advanced Oracle database monitoring, also suitable to monitor an Oracle Real Application Cluster (RAC)

Database Administration for SAP HANA

Information about administration tasks for SAP HANA is available on the SAP Help Portal for the following:

- DBA Cockpit for SAP HANA

  A tool to monitor and administer SAP HANA databases in an ABAP environment

- SAP HANA cockpit

  A Web-based tool to monitor, administer, and maintain SAP HANA systems

- SAP HANA Platform

  Here, you can find the following:

  - SAP HANA Administration Guide

    Information about how to configure, manage, maintain, and optimize your SAP HANA installation, including backup and recovery.

  - SAP HANA Security Guide

    Information about how to enable security for SAP HANA, including SAP HANA backup encryption.

Related Information

DBA Cockpit for SAP HANA
SAP HANA Cockpit
SAP HANA Platform documentation

Database Administration for SAP MaxDB

Use

This section gives you an overview of the most important administration tasks that you need to perform for your SAP MaxDB database.

ℹ Note

The documentation for the SAP MaxDB database system also generally applies to **SAP liveCache** databases. Differences are indicated in the documentation where necessary. For more information about the administration of SAP liveCache databases, see Database Administration in CCMS: SAP liveCache Technology.

Technical System Landscape

More information: **Concepts of the Database System**, Technical System Landscape

Tools

You can choose one of the following tools to manage and monitor your SAP MaxDB database:

- General SAP administration tools, for example DBA Cockpit, CCMS, Database Assistant and Alert Monitor

  More information: DBA Cockpit: SAP MaxDB, Database Administration in CCMS: SAP MaxDB

- Standalone SAP MaxDB administration tools, for example Database Studio (graphical user interface), Database Manager CLI, Database Analyzer and XCONS (command line tools)

  More information: **Concepts of the Database System**, Database Tools

Tasks on Demand

Perform the tasks in the table below when the corresponding event occurs.

Event	Task	Tool	More Information
Database OFFLINE	Start the database (ONLINE operational state)	DBA Cockpit Database Studio	Operational State
Database failure with loss of data	Restoring the Database	Database Studio	Restoring Databases
Damaged index	Restoring the damaged index	Database Studio	*Restoring Databases*
Performance problems	Analyzing Slow-Running Transactions	Database Assistant DBA Cockpit Database Analyzer Database Studio	Analyzing Database Performance
Database connection to another system required	Creating a Connection	Database Assistant Database Studio	Database Connection
New database version available	Upgrading the database	SAPInst Installation Manager	Installation
System copy required	Creating a database copy (prerequisite for a system copy)	SAPInst Database Studio	Database Copy
Other errors	Analyzing the problem	Database Assistant Database Studio XCONS	Troubleshooting

Periodic Tasks

Regularly perform the tasks listed in the table below. In SAP systems, use the DBA Planning Calendar for these tasks whenever possible. Outside of SAP systems, use the Database Studio tool.

Occurrence	Task	Tools	More Information
Daily	Monitor the database and check if there are any alerts: • Monitoring the Data Area • Monitoring the Log Area • Caches (hit rate) • Activities Overview (I/O, locking, logging) • User Tasks (database sessions) • Performance • Backup/Recovery	Alert Monitor DBA Planning Calendar Database Studio	Monitoring Databases
	Monitoring CPU usage	Operating system commands	Processes

Occurrence	Task	Tools	More Information
	Scheduling a Complete Data Backup If you cannot or do not want to perform a complete data backup every day, then you should perform at least an incremental data backup on each productive day. The more current the last data backup is, the fewer log entries have to be imported again if you need to restore the database.	DBA Planning Calendar Database Studio	Backing Up Data
Weekly	Archiving Backup Files (archiving log backups) Only necessary for log backups on data carriers of the File type	Operating system commands Database Manager CLI	Archiving Backup Files
	Scheduling an Interactive Log Backup Only necessary if automatic log backup is switched off	DBA Planning Calendar Database Studio	Backing Up Log Entries
	Scheduling a Database Structure Check We recommend that you check the database structures at times when the database load is low, or using a system copy.	DBA Planning Calendar Database Studio	Checking Database Structures
	Scheduling Updates of the SQL Optimizer Statistics	DBA Planning Calendar Database Studio	SQL Optimizer Statistics SAP Note 927882

More Information

- Database Administration
- Concepts of the Database System
- Glossary

Database Administration for SAP ASE

Use

You need to perform various tasks to administer SAP Adaptive Server Enterprise (SAP ASE) in an SAP environment.

If you are new to SAP ASE, see the following guides:

- Database Administration Guide: SAP Business Suite on SAP Adaptive Server Enterprise
- Security Guide: SAP Applications on SAP Adaptive Server Enterprise
- System Copy for SAP Systems Based on SAP NetWeaver <Release>

- Installation: Systems Based on SAP NetWeaver <Release>

To find the guide relevant for you, you can use the SAP NetWeaver guide finder.

Additional Information

- Component-based documentation for all functions and processes that are supported by SAP ASE: https://help.sap.com/viewer/p/SAP_ASE
- Best practices, presentations, blogs and more: https://www.sap.com/community/topic/ase.html

Security

The infrastructure of SAP NetWeaver technology platform supports you by delivering comprehensive security features for heterogeneous environments.

In today's world of collaborative business processes and open system environments, security no longer means just adding a firewall and using passwords to log on. It requires a complete approach that not only applies to your own IT landscape, but also to issues that arise beyond your own borders, in which even simple organizational measures can have a significant impact. This section describes the security functions and features available with SAP NetWeaver technology platform.

For information about our security recommendations, see the *SAP NetWeaver Security Guide*.

Related Information

User Authentication and Single Sign-On
Identity Management
Network and Transport Layer Security
Recommended WS Security Scenarios
System Security
Digital Signatures and Encryption
Digital Signature (CA-DSG)
Security Developer Documentation

Security Developer Documentation

This section provides information about security that is relevant for developers. See the following table:

Section	Description
Secure Programming	This section provides information about developing secure applications. It describes common security errors and weaknesses to watch out for as well as approved procedures so that your application functions securely.
Developing Authentication Enhancements	This section provides developer information regarding authentication and single sign-on.

Related Information

Secure Programming
Developing Authentication Enhancements