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Installation and Upgrade Guide for Linux

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1 Installation Overview

This guide explains how to install, upgrade, downgrade, and uninstall SAP ASE.

Installing SAP ASE for the First Time

1. Review the system requirements.
2. Identify the components and options to install.
3. Obtain a license.
4. Install SAP ASE using the GUI mode, console mode, or a response file.
5. Perform postinstallation tasks.

Upgrading to a New Version of SAP ASE

1. Determine your upgrade eligibility and review system requirements.
2. Identify the components and options to upgrade.
3. Install the new SAP ASE using the GUI mode, console mode, or a response file.
4. Run the `preupgrade` utility to test upgrade eligibility.
5. Upgrade SAP ASE.
6. Perform postupgrade tasks.

Uninstalling SAP ASE

See Uninstalling SAP ASE [page 104].

See the configuration guide for information about configuring attributes of your SAP ASE server, Backup Server, and XP Server to meet your specific needs.

1.1 Download SAP ASE Software

The SAP ASE installation and upgrade packages are available on the SAP Software Download Center.

Procedure

1. To download the installation media for SAP ASE, go to:

   Software Downloads Site.
2. Under *INSTALLATIONS & UPGRADES*, go to:

Option	Description
For a major release	*By Alphabetical Index (A-Z)* > *A* > *SAP Adaptive Server Enterprise* > *SAP ASE 16.1* > *INSTALLATION* Select your operating system, then choose the installation package from the bottom of the page.
For support packages and patches	*By Alphabetical Index (A-Z)* > *A* > *SAP Adaptive Server Enterprise* > *SAP ASE 16.1* > *Support Packages and Patches* > *SAP ASE SERVER 16.1* Select your operating system, then choose the support package or patch from the bottom of the page.

1.2 SAP ASE Editions

Analyze your system and scalability requirements to determine which edition of SAP ASE is appropriate for your enterprise.

SAP ASE Editions

- Enterprise edition – has no limit on scalability and supports all of the options that can be purchased or licensed separately.
- Platform edition – has no limit on scalability. Some options are included and others can be purchased or licensed separately. Does not include the Disaster recovery package.

Determining the Edition

Use `sp_lmconfig 'edition'` to determine the edition that is currently running.

Unlocking Editions and Optional Features

The SAP ASE installer automatically installs a SySAM license server if you choose the full installation option or enter a served license when prompted for the SySAM license key. You can also install the license server using the installer's custom installation option. For more information, see the SySAM Users Guide.

1.3 SAP ASE Components and Utilities

SAP ASE is based on a client/server model, communicating with its clients over the network via the Tabular Data Stream (TDS) protocol. Each client process may execute on one machine and communicate with a database server on the same or a different machine.

SAP ASE runs as an application on top of an operating system. The hardware that the operating system runs on is completely transparent to SAP ASE, which sees only the operating system's user interfaces. To enhance performance on multiprocessor systems, configure multiple processes (engines).

SAP ASE is divided into a database management system (DBMS) component and a kernel component. The kernel component uses the operating system services for process creation and manipulation, device and file processing, and interprocess communication. The DBMS component manages SQL statement processing, accesses data in a database, and manages different types of server resources.

SDK for SAP ASE

For download and installation instructions, see 2093510 – How to Download Free SDK for SAP ASE [Windows, Linux, Unix]. For more information, see *SAP Open Server and SDK for SAP ASE New Features Guide*.

SySAM Utilities

The SySAM utilities are available from the SAP ASE installation image and installed in the SAP ASE top level directory. See Licensing Your Software [page 11] and the SySAM User Guide.

QP-Tune

Run this components from the SAP ASE server image directly.

1.3.1 Running SAP ASE on VMware vSphere 5.0

You can install and run SAP ASE on VMware vSphere 5.0.

Refer to the VMware Compatibility Guide to view hardware supported by VMware. The performance of SAP ASE may depend on the vSphere configurations for the hardware you choose. Refer to VMware published best practices for running vSphere on the hardware.

1.4 Administration and Management Console

Administration and Management Console (AMC) provides a single, comprehensive, Web-administration console for real-time performance, status, and availability monitoring of large-scale SAP enterprise servers.

For detailed AMC information, see the *Administration and Management Console for SAP ASE* documentation.

1.5 SAP ASE Options

SAP offers various optional features for SAP ASE, such as data compression, partitions, and encrypted columns.

Table 1: SAP ASE Options

Option	Description
Database MemScale	The MemScale option is a licensed option introduced in SAP ASE version 16.0 SP02 as part of the SQL Server Administration group. This option includes various features, including: • Compiled queries (simplified native access plans) • Transactional memory • Latch-free indexes If you have a license for the SAP ASE In Memory Database feature, MemScale includes this functionality. Enable all of the features included in the ASE_MEMSCALE license by turning the `sp_config enable mem scale` option on. **Note** When you enable an individual feature that is part of the MemScale option, the license manager verifies that you have the ASE_MEMSCALE license, and that you have enabled the `enable mem scale` configuration option.
In Memory Database	Fully integrated within SAP ASE, this option equips applications with instant responsiveness and very high throughput. SAP ASE in-memory databases have zero-disk footprint and reside completely in memory.
Always-on	Enables enterprises to recover from adverse events by restoring operations as quickly as possible and recovering as much information as possible, reducing the return to operations and mitigating data loss. Integrated "zero data loss" support is via synchronous replication for custom applications, using sync rep technology. See the *HADR Users Guide* for information.
Workload Analyzer	Enables the capture, analysis, and replay of a production workload non-disruptively and enables the user to utilize the captured workload to diagnose problems and understand and manage configuration changes proactively. See the *Workload Analyzer Users Guide* for information.
Security and Directory Services	Provides lightweight directory services and network-based authentication and encryption using SSL and Kerberos.
Encrypted Columns	Increases security parameters and allows for addition of datatypes.
Partitions	Enables semantic partitioning for table row data.

Option	Description
Active Messaging	Provides a cost-effective solution for eliminating delays in information as it flows through the enterprise, providing immediate insight into business events as they occur.
Compression	Enables compression for regular and large object data, which uses less storage space for the same amount of data, reduces cache memory consumption, and improves performance due to lower I/O demands.
Tivoli Storage Manager (TSM)	Enables the database to back up and restore operations to IBM Tivoli Storage Manager.

SAP ASE editions and optional features are unlocked by SySAM licenses. See the *SySAM Users Guide*.

To install any of these optional features to an existing SAP ASE installation, use the same steps as you used to install SAP ASE.

2 Licensing Your Software

When you purchase an SAP product, you receive an e-mail message that tells you how to generate SAP ASE license keys on the Web. The e-mail message also provides specific product and licensing information. Use this information when you generate your licenses.

Context

Before installing your product, choose a SySAM license model, and obtain license files from the SAP Support Portal.

> **Note**
>
> If you purchased your product from Sybase or an authorized Sybase reseller, go to the Sybase Product Download Center (SPDC) to generate license keys.

Procedure

1. Choose a SySAM license model.

License Model	Description
Unserved license model	Licenses are obtained directly from the license file. If you are using an unserved license, save the license file to the machine on which you install the product.
Served license model	A license server manages the allocation of licenses among multiple machines.

> **Note**
>
> The SAP ASE installer automatically installs a SySAM license server if you choose the full installation option or enter a served license when prompted for the SySAM license key. You can also install the license server using the installer's custom installation option. See the *SySAM Users Guide* to generate licenses.

2. For the served license model, decide whether to use an existing or new license server.

   The license server and your product installation need not share the same machine, operating system, or architecture.

> **Note**
>
> There can be only one instance of a SySAM license server running on a given machine. To set up a SySAM 2 license server on a machine that is already running a SySAM 1.0 license server, follow the migration instructions in the *SySAM Users Guide*. A migrated license server can serve licenses for both SySAM 1.0 and SySAM 2-enabled products.

3. Get your host IDs.

   When you generate licenses, you must specify the host ID of the machine where the licenses will be deployed.

   - For unserved licenses – the host ID of the machine where the product will run. If you are running a product with per-CPU or per-chip licensing that supports SySAM sub-capacity and want to run the product in a virtualized environment, see *SySAM Users Guide > SySAM Sub-capacity Licensing*.
   - For served licenses – the host ID of the machine where the license server will run.
4. Before installing your product, obtain license files from SAP Support Portal or from SPDC using the access information in your welcome e-mail message.

   If you plan to use sub-capacity licensing, see the *SySAM Users Guide* for information on how to configure using the `sysamcap` utility.

   Use `sp_lmconfig` to configure and show license management-related information in SAP ASE. See `sp_lmconfig` in *Reference Manual: Procedures*.

Related Information

https://help.sap.com/viewer/p/SYSAM

2.1 Product Licensing

Available licenses are determined by product edition. Optional features are sold and licensed separately.

Whether you install a licensed or evaluation edition, you have 90-day access to all features and options. To use an option beyond the 90-day evaluation period, you must purchase and install an appropriate SAP Software Asset Management (SySAM) license.

The e-mail message you receive when you purchase an SAP product provides specific product and licensing information. Before installing and configuring any product edition, know which features you are licensed to use.

2.2 SySAM License Server

If you choose to use the served licensed model, make sure you have installed the required SySAM license server version.

The license server is a lightweight application that serves licenses to products running on any operating system.

A license server can run on a low-end machine or a machine with spare cycles. For example, a license server serving 100 different licenses to 200 product instances, used 50MB of memory, 5 minutes of CPU time per week, and 100MB of disk space per year.

SAP ASE 16.1 SP00 PL02 requires SySAM 2.5 or later. To determine the current license server version, run the `sysam version` command from within the license server installation. This command is not available in SySAM version 2.0 and earlier. For example:

```
#> ${SYBASE}/SYSAM-2_0/bin/sysam version
SYSAM 2.5 SP00
lmgrd v11.19.6.0 build 293152 x64_linux - Copyright (c) 1988-2024 Flexera. All
Rights Reserved.
5:54:46 (SYBASE) FlexNet Licensing version v11.19.6.0 build 293152 x64_linux
```

Use the SAP ASE 16.1 SP00 PL02 installer to install SySAM version 2.5.

SAP ASE 16.1 SP00 PL02 and SySAM 2.5 use FlexNet Publisher version 11.19.6.

To check the version of FlexNet Publisher used by your license server, examine the license server log or execute the `lmgrd -v` command.

You cannot start the license server until there is at least one served license saved to the `licenses` directory on the license server host machine. For more information, see the SySAM Users Guide.

Security Recommendations

- Make sure the SySAM license server ports are secured (not open to a public network).
- Run the SySAM license server as a user with least privileges.

2.3 Knowing the Product License Type

SAP sells products under different license types, which entitle the customer to different rights of use. For example, whether a product is entitled to be used in production, or standby, or development and test environments.

The license type determines the quantity of licenses required; dictating, for example, whether a license is required for each machine; or for each CPU, or CPU chip; or per terabyte of storage.

For example, a product purchased under the CPU License (CP) type requires one license per CPU on the machine, partition, or resource set where it will run. The same product purchased under the Server License (SR) type requires a single license for the machine, partition, or resource set.

Your account can have the same product licensed under multiple license types. Make sure you select the correct license type when you generate your SySAM license file.

When you generate licenses, each license type is presented on the License Information screen in bold font. For example:

```
License Type: CPU License (CP)
```

2.3.1 Optional Feature Licenses

Some SAP ASE applications are offered as base products with optional features that require a separate license.

Customers can mix license types. For example, customers can order SAP ASE under the Server License (SR) license type and order an optional feature (for example, High Availability or Enhanced Full Text Search) under the CPU License (CP) type.

Optional features are licensed only with the base product of the same product edition. For example, if you order SAP ASE, you cannot use a Small Business Edition optional feature license with the Enterprise Edition base product. In addition, the entitled use of the license types must be compatible; for example, both types should allow use in a production environment.

3 Preparing to Install SAP ASE

Before you start the installer, prepare your system.

Context

The release bulletin contains last-minute information about installing and upgrading SAP ASE software. Find the latest release bulletin at the SAP ASE Help Portal.

Procedure

1. Back up your current system.
2. Verify that you can uncompress files on your UNIX machine. To uncompress:

Option	Description
`.zip` files	Use the `unzip` command
`.tgz` files	Use `gzip` or GNU `Tar`

3. Ensure that the account used to start the server has read and write permissions for the directory in which you are installing the server. You may need to create non-administrative logins to install the server into personal directories.
4. Unset the LD_ASSUME_KERNEL variable.
5. Review the SySAM licensing procedures, and plan your server configuration using the configuration guide for your platform.
6. Create an account that has administrative privileges with which to perform all installation and device-creation tasks. This user account could be "sap" or any other user name, as long as you use the same name so that the installer and products have permission to read and write the files. Also ensure that this account has a home directory it has write permissions on.

   This user must have administrative privileges from the top (or root) of the disk partition or operating system directory, down to the specific physical device or operating system file. Maintain consistent ownership and privileges for all files and directories. A single user—the system administrator with read, write, and execute permissions—should perform all installation, upgrade, and setup tasks.

   If you are installing SAP ASE on more than one computer, create the "sap" user account on each machine.
7. Log in to the machine as "sap".
8. Decide where to install SAP ASE:
   - Make sure there is sufficient disk space and temporary directory space available.
   - Ensure there are no spaces in the path name of the directory.
9. Verify that your network software is configured.

SAP ASE and client applications use network software even when they are installed on a machine that is not connected to a network.

If you are having connection problems, or to verify your network configuration, ping the host.

10. Adjust the shared memory for your operating system.

Related Information

Preupgrade Tasks [page 64]
Reenabling Auditing [page 86]
Upgrade Java in the Database [page 60]

3.1 System Requirements for Linux

Before installing SAP ASE version 16.1 SP00 PL02, install the latest patches and system requirements. Do not use a patch that is earlier than the version suggested for your operating system. Use the patch recommended by the operating system vendor, even if it supersedes the patch listed.

For general information about platform support for SAP ASE and other products, see SAP Product Availability Matrix (PAM).

To list all currently installed patches and display the operating system version level, enter:

```
rpm -q -a
```

Supported Operating Systems

For current information on supported operating systems and required patches, see SAP Note 3576582. This note is updated with new information on supported operating systems and patches as required.

System Requirements

- Minimum RAM required for SAP ASE, with default stack size, packet size, and user log cache size – 127 MB
- Minimum RAM per additional user – approximately 324KB
- Default user stack size – 128KB

SAP ASE supports Pentium and higher chip sets. Recommended RAM is 1GB.

Disk Space Requirements

Table 2: Linux Disk Space Requirements

Product	Linux X64 Requirements	Linux X64 PSeries Requirements
SAP ASE typical installation	921MB	1092MB
Default databases created during installation	306MB	164MB
Total	1071MB	1256MB

To run the installer in Chinese, Japanese, or Korean, install the appropriate RPM package.

Table 3: Linux RedHat 9.x and 10.x RPM Packages

Language	RPM Package
Chinese	`fonts-chinese`
Japanese	`fonts-japanese`
Korean	`fonts-korean`

Table 4: Linux SuSE 15.4 RPM Packages

Language	RPM Package
Traditional Chinese	`ttf-founder-traditional`
Japanese	`sazanami-fonts`
Korean	`baekmuk-ttf`

3.2 System Requirements for Clients

Check the system requirements for the machine on which you plan to install the client applications and utilities.

For information about client system requirements, see *Product Platforms and Compatibilities* in the *SAP Open Server and SDK for SAP ASE New Features Guide*.

3.3 Installation Directory Contents and Layout

SAP ASE includes server components that are installed into specific directories.

Product	Description
SAP ASE	Installed into the `ASE-16_1/bin` directory: • SAP ASE – the database server. • Backup Server – an application based on SAP Open Server that manages all database backup (`dump`) and restore (`load`) operations. • XP Server – an Open Server application that manages and executes extended stored procedures (ESPs) from within SAP ASE. • Job Scheduler – provides a job scheduler for SAP ASE. Job Scheduler components are located in `ASE-16_1/jobscheduler/.ASE-16_1`
Connectivity	Installed into the `OCS-16_1` directory: • Open Client (`<Client Library>`, `<dblib>`) • ESQL/C • ESQL/COBOL • XA Installed into the `DataAccess` and `DataAccess64` directories: • ODBC (Windows, Linux, and IBM AIX) – a driver used to connect to SAP ASE from ODBC-based applications. • ADO.NET (Windows only) – a provider used to connect to SAP ASE from .NET based applications.
Shared Directory	The `shared` directory contains components and libraries that are shared by several other components. In earlier versions, this directory was named `shared-1_0`. • Java Runtime Environment (JRE) – is a runtime Java virtual machine used to execute Java-based programs, such as SAP ASE Cockpit. SAP ASE includes the JRE. In typical installations, by default, the JRE is fully installed. In custom installations, if you select a component for installation that requires the JRE, the JRE is also automatically selected. It is located in the `shared/SAPJRE-8_1 *` directory.
Administration and Management Console (AMC)	AMC logs and utilities – files related to the Web-based tool for monitoring the status and availability of SAP ASE servers. They are installed into the `$SYBASE/AMC` directory.
Language Modules	Installed into the `locales` directory. Provides system messages and date/time formats.
Character Sets	Installed into the `charsets` directory. Provides character sets that are available for use with SAP ASE.

Product	Description
Collation Sequences	Installed into the `collate` directory. Provides the collation sequences that are available for use with SAP ASE.
SySAM	Installed into the `SYSAM-2_0` directory. Provides asset management of SAP ASE servers and optional features.
Web Services	Installed into the `WS-16_1` directory. An optional product that provides access to SAP ASE using HTTP/SOAP and WSDL.
Interactive SQL	Interactive SQL is a GUI tool that allows you to execute SQL statements, build scripts, and display data from SAP ASE. It is installed into the `DBISQL-16_1` directory.
`jutils-3_0` Utilities	`ribo` is a tool used to trace TDS traffic between a client program and SAP ASE.
SAP jConnect for JDBC	Installed into the `jConnect-16_1` directory. Provides a Java Database Connectivity (JDBC) driver for SAP ASE.
Workload Analyzer Utility	Installed into the `WLA` directory. Provides SAP ASE workload analyzing command line utilities.

3.4 SAP Java Runtime Environment

Ensure that you have the required operating system patches for the SAP Java Runtime Environment (JRE).

The following JRE versions are shipped with SAP ASE.

Table 5: JRE Support

Product/Feature	Version	Location
PCI/JVM/Utilities	SAP JRE 8.1.108	`$SYBASE/shared/ase/`
AMC	SAP Machine 21.0.10	`$SYBASE/shared/amc/`
Installer/uninstaller	SAP Machine 21.0.10	`$SYBASE/jre64/`

Related Information

SAP Note 3462722

3.5 Creating the SAP ASE User Account

To ensure that SAP ASE product files and directories are created with consistent ownership and privileges, create a system administrator account.

Context

One user—typically the system administrator, who has read, write, and execute privileges—should perform all installation, configuration, and upgrade tasks.

Procedure

1. To create a system administrator account, choose an existing account, or create a new account and assign a user ID, group ID, and password for it.

   This account is sometimes called either the “sybase” or “sap” user account.

   If you have installed other SAP software, the "sybase" user should already exist. For instructions on creating a new user account, see your operating system documentation.

   Installation of the database always-on option requires sudo permission. For more information, see the *Database Always-On Users Guide*.
2. Verify that you can log in to the machine using this account, and that the account has a home directory it has write permissions on.

3.6 Adjusting the Operating System Shared Memory Parameters

Adjust shared memory segments if SAP ASE cannot obtain large memory as a single segment, or if Backup Server stripes fail due to insufficient segments.

Context

Depending on the number and types of devices used for backup (`dump`) and recovery (`load`), you may need to adjust the shared memory segment parameter in the operating system configuration file to accommodate concurrent Backup Server processes. There are six default shared memory segments available for process attachments.

If any reconfiguration through `sp_configure` requires additional memory, SAP ASE allocates shared memory segments after start-up. To account for these additional segments, allocate the maximum memory that is

available to SAP ASE by using the `allocate max shared memory` configuration parameter. See the *System Administration Guide*.

Procedure

1. The operating system shared memory default, for most Linux releases, is 32MB. The minimum required by SAP ASE is 64MB for a default server that uses 2K pages. A higher value is required if you plan to increase the SAP ASE server's `total memory`. Set the stack size to `unlimited` to avoid shared memory attachment problems. Set this using `ulimit -s unlimited` on the Bourne shell, or `limit stacksize unlimited` on the C shell.
2. To check and adjust the operating system shared memory parameter, use the `sysctl(8)` method:

   To check the current shared memory size, enter:

   ```
   # /sbin/sysctl kernel.shmmax
   ```

   To adjust the shared memory size at runtime, enter the following, where <nnn> is 1073741824 for 1GB of shared memory:

   ```
   # /sbin/sysctl -w kernel.shmmax=nnn
   ```

   > **Note**
   >
   > The default operating system shared memory for some older Linux releases is 32MB. The minimum required by SAP ASE is 64MB for a default server with 2K pages. A higher value is required if you plan to increase the SAP ASE `max` setting.

3. To guarantee that the minimum operating shared value is applied every time the system is started, edit the `/etc/sysctl.conf` file.

3.7 Multipathing

Multipathing is the ability of a server to communicate with the same physical or logical block storage device across multiple physical paths between the host bus adapters (HBAs) in the server and the storage controllers for the device, typically in Fibre Channel (FC) or iSCSI SAN environments. You can also achieve multiple connections with direct attached storage when multiple channels are available.

Multipathing provides connection fault tolerance, failover, redundancy, high availability, load balancing, and increased bandwidth and throughput across the active connections. Multipathing automatically isolates and identifies device connection failures, and reroutes I/O to alternate connections.

Typical connection problems involve faulty adapters, cables, or controllers. When you configure multipathing for a device, the multipath driver monitors the active connection between devices. Because multipathing is managed at the device level, when the multipath driver detects I/O errors for an active path, it fails over the traffic to the device's designated secondary path. When the preferred path becomes healthy again, control can be returned to the preferred path. Multipathing prevents single points of failure in any highly available system.

A common example of multipath connectivity is a SAN-connected storage device. Usually one or more Fibre Channel HBAs from the host are connected to the fabric switch and the storage controllers are connected to the same switch. A simple example of multipath connectivity is: two HBAs connected to a switch to which the storage controllers are connected. In this case, the storage controller can be accessed from either of the HBAs that are providing multipath connectivity.

All OS platforms provide their own solutions to support multipathing. There are numerous other vendors that also provide multipathing applications for all available platforms, such as:

- AIX – Multiple Path I/O (MPIO)
- HP-UX 11.31 – Native MultiPathing (nMP)
- Linux – Device-Mapper (DM) Multipath
- Solaris – Multiplexed I/O (MPxIO)
- AntemetA Multipathing Software for HP EVA Disk Arrays
- Bull StoreWay Multipath
- NEC PathManager
- EMC PowerPath
- FalconStor IPStor DynaPath
- Fujitsu Siemens MultiPath
- Fujitsu ETERNUS Multipath Driver
- Hitachi HiCommand Dynamic Link Manager (HDLM)
- HP StorageWorks Secure Path
- NCR UNIX MP-RAS EMPATH for EMC Disk Arrays
- NCR UNIX MP-RAS RDAC for Engenio Disk Arrays
- ONStor SDM multipath
- IBM System Storage Multipath Subsystem Device Driver (SDD)
- Accusys PathGuard
- Infortrend EonPath
- OpenVMS
- FreeBSD - GEOM_MULTIPATH and GEOM_FOX modules
- Novell NetWare
- Sun StorEdge Traffic Manager Software
- ATTO Technology multipath driver Fibreutils package for QLogic HBAs
- RDAC package for LSI disk controllers
- lpfcdriver package for Emulex HBAs
- Veritas Dynamic Multi Pathing (DMP)
- Pillar Data Systems
- Axiom Path
- iQstor MPA

3.7.1 Setting Up Multipathing

If you choose to use it, set up multipathing before you install SAP ASE.

Procedure

1. Edit the `/etc/multipath.conf` file:
   - Comment out the following lines at the top of the file. This section of the configuration file, in its initial state, blacklists all devices. You must comment it out to enable multipathing:

     ```
     blacklist {
           devnode "*"
     }
     ```

   - Add configuration information. For example:

     ```
             multipath {
                     wwid    360060e80056fb70000006fb700000816
                     alias   TEST_DATA
                     path_grouping_policy failover
                     mode 660
                     uid 8205
                     gid 471
             }
     ```

2. Run these commands:

Option	Description
`modprobe dm-multipath`	Adds multipathing module to Linux kernel
`modprobe dm-round-robin`	Adds multipathing round-robin module to Linux kernel
`/etc/init.d/multipathd start`	Starts multipath service
`multipath`	Automatically detects multiple paths to devices and configure multipathing
`chkconfig multipathd on`	Turns on multipath service
`multipath -l`	Displays all paths to devices

   The `/dev/mapper/mpath<N>` devices are persistent and are created early in the boot process. Use these device names to access the multipathed devices.

   For example:
   - `/usr2/sybase/ASE161/dev/wdb_data` – is a symbolic link pointing to `/dev/raw/raw73`.
     - `/dev/raw/raw73` – is a raw character device mapped to `/dev/mapper/mp_wdb_data`.
       - `/dev/mapper/mp_wdb_data` – is a multipath device that contains two paths:
         - `/dev/sdbf` – is a block device that corresponds to SCSI generic raw character device `/dev/sg61`.
         - `/dev/sds` – is a block device that corresponds to SCSI generic raw character device `/dev/sg20`.

3.8 VMware vSphere 5.0

Configure your VM before you install SAP ASE.

3.8.1 BIOS Settings

Change some BIOS settings before you install and run SAP ASE on the VMware guest operating system.

Enable or Disable	Settings
Enable	• Virtualization technology • Turbo mode • Hardware-based virtualization support • Hyperthreading (workload dependent) • Wake on LAN (required for VMware vSphere Distributed Power Management) • Execute Disable (required for vMotion and DRS) • Static high performance and balanced policies

Disable	• Node interleaving
	• C1E halt state
	• Power saving
	• Any unused features, such as:
	  • Video BIOS shadowable
	  • Video RAM cacheable
	  • On-board audio
	  • On-board modem
	  • On-board serial ports
	  • On-board parallel ports
	  • On-board game port
	  • Floppy disk drive
	  • CD-ROM drive
	  • USB port

3.8.2 The Guest Operating System

Disable unnecessary foreground and background processes.

> **Note**
>
> You should install the VMware Tools on the guest operating system. VMware Tools includes utilities that enhance the performance of the virtual machine's guest operating system and improve management of the virtual machine.

3.8.3 CPU Considerations

To improve performance for latency-sensitive applications running on guest operating systems, schedule all virtual machines on the same Non-Uniform Memory Access (NUMA) node. Allocate all virtual memory from the local physical memory attached to that NUMA node.

When you schedule processor affinity for vCPUs on a specific NUMA node, use the vSphere Client to set the processor affinity:

- To change the VM settings for processor affinity – in the vSphere Client, select *Resources* > *Advanced CPU* > *Scheduling Affinity*.
- To change the virtual machine settings for memory affinity – in the vSphere Client, select *Resources* > *Advanced Memory* > *NUMA Memory Affinity*.

3.8.3.1 Virtual CPUs

In a production environment, verify that the total virtual CPU resources for the virtual machines do not exceed the CPU capacity of the host machine. That is, the total number of CPUs for the virtual machine cannot exceed the CPU capacity of the physical machine.

You should undercommit CPU resources on the host machine; if the host CPU capacity is overloaded, the virtual database performance may degrade. Never overcommit CPU resources in a production environment.

A reasonable upper limit for CPU resources is about 80 percent of consumption. Consider creating an alert to be sent to the virtual infrastructure administrator when CPU resources reach 90 percent of consumption.

Multithreaded applications like SAP ASE may benefit from using multiple CPUs. To ensure that the physical CPUs are not oversubscribed, limit the total number of virtual CPUs to the total number of physical CPUs minus 1.

Configuring virtual SAP ASE with excess virtual CPUs can impose a small resource requirement on vSphere because unused virtual CPUs continue to consume timer interrupts. vSphere coschedules virtual CPUs and attempts to run the virtual CPUs in parallel whenever possible. Unused virtual CPUs impose scheduling constraints on the used virtual CPUs and might degrade performance.

3.8.3.2 CPU Scheduling

You may see improved performance if you ensure that the virtual machine remains scheduled when the vCPU is idle.

To determine whether a scheduled virtual machine is providing optimal database performance:

- Set `monitor_control.halt_desched` to false.
- vCenter (the VMware management utility) should normally monitor performance. However, periodically use the vSphere Client to collect additional statistical measurements, or use the `esxtop` or `resxtop` vSphere command line utilities.
  `esxtop` provides performance insight concerning CPU resource contention. Database administrators should work with their VMware administrator to interpret `esxtop` statistics.

Generally, the system is overloaded if the load average listed on the first line of the `esxtop` CPU Panel is greater than or equal to the number of physical processors on the system.

The "`usage percentage of physical CPUs`" on the PCPU line may indicate an overloaded system. A reasonable upper limit in production environments is 80 percent usage; 90 percent usage should be used as an alert to the VMware administrator that the CPUs are approaching an overloaded condition. However, make decisions concerning usage levels based on the criticality of the database you are virtualizing and the desired load percentage.

The critical statistics are:

Statistic	Description
%RUN	The percentage of total time the processes on the VMkernel are running on the processor; a high value for `%RUN` does not necessarily indicate that the virtual machine is resource constrained.
%RDY	The percentage of time the processes on the VMkernel are ready to run, but are not scheduled to a core. A process on the VMKernel in a run queue is waiting for the CPU scheduler to let it run on a PCPU. A value of greater than 10 percent may indicate resource contention.
%CSTP	The percentage of time the processes on the VMkernel are stopped to allow other virtual CPUs on the virtual machine to catch up (this is the unscheduled state). A value greater than 5 percent typically indicates that the virtual machine's workload is not balanced.

3.8.4 Memory Considerations

Configure the value for virtual memory equal to the value of the SAP ASE server `max memory` configuration parameter.

When consolidating SAP ASE instances, vSphere allows you to share memory across virtual machines that may be running the same operating systems, applications, or components. In this situation, vSphere uses a proprietary transparent page-sharing technique to reclaim memory, and allows databases to run with less virtual memory than physical memory (see your VSphere documentation). You can use transparent page sharing for consolidation purposes in a test or development environment. However, never overcommit on production environments.

3.8.5 Resource Management

vSphere advanced workload management features, such as VMware vMotion and VMware DRS, free SAP ASE from the resource limitations of a single host.

You can use vMotion to move running SAP ASE virtual machines from one physical vSphere to another to balance available resources. DRS can dynamically allocate and balance computing resources by continuously monitoring the resource pools associated with virtual machines in a VMware cluster.

You can safely overcommit virtual resources for SAP ASE in nonproduction environments where predictable and consistent performance is not critical.

3.8.6 Hardware-Assisted Memory Virtualization

Some processors address memory management unit (MMU) virtualization overhead by providing hardware support that virtualizes the MMU.

Without hardware-assisted MMU virtualization, VMware ESX maintains "shadow page tables" that directly map a guest's virtual memory to a host's physical memory address.

These shadow page tables are maintained for the processor, and are kept synchronized with the guest page tables. This allows ordinary memory references to execute without additional overhead, since the hardware translation lookaside buffer (TLB) caches direct guest virtual memory to a host's physical memory address translations that are read from shadow page tables. However, extra work is required to maintain the shadow page tables.

Hardware assistance eliminates software memory virtualization overhead. In particular, it eliminates the overhead required to keep shadow page tables synchronized with guest page tables, although the TLB miss latency is significantly higher than without hardware assistance. This means that hardware assistance provides workload benefits that depend primarily on the memory virtualization overhead that is caused when using software memory virtualization.

If a workload involves a small amount of page table activity (for example, process creation, mapping the memory, or context switches), software virtualization does not cause significant overhead. However, workloads that include a large amount of page table activity, such as workloads from a database, are likely to benefit from hardware assistance.

Allow vSphere to choose the virtual machine monitor based on the combination of CPU and guest operating system. In most cases, you see better performance by using hardware-assisted virtualization rather than by using shadow page tables.

3.8.7 Linux Huge Pages

Linux huge pages can increase the efficiency of translation lookaside buffer access, improving database performance.

Since using huge pages at the operating system level allows for approximately a 10 percent improvement in SAP ASE performance; consider using them in any 64-bit production system. In larger memory configurations

(that is, configurations where SAP ASE uses more than 256 GB RAM), huge pages are required to start an SAP ASE server.

SAP ASE versions 15.0.3 and later support huge pages. By default, huge page support is enabled in VMware ESX versions 3.5 and later.

While encouraged to use huge pages in SAP ASE, SAP strongly recommends that you disable Transparent Huge Pages (THP), which are not the same as huge pages, on all your SAP ASE servers. See Disable Transparent Huge Pages [page 28] for more details.

3.8.7.1 Disable Transparent Huge Pages

Transparent Huge Pages (THP) is a feature that is generally activated for the Linux kernel shipped with SUSE Linux Enterprise Server (SLES) 11 and Red Hat Enterprise Linux (RHEL) 6 versions certified for usage with SAP ASE. Due to the special manner of SAP ASE's memory management, using THP may lead to hanging situations and performance degradations.

Context

You experience that your SAP ASE database does not react anymore, that the CPU load is high and/or severe performance issues occur. Additionally, Transparent Huge Pages are activated on your SAP ASE servers. Until further notice, SAP strongly recommends that you disable Transparent Huge Pages on all your SAP ASE servers.

> **Note**
>
> Transparent Huge Pages is supported on Intel-based hardware platforms only.

The following checks and steps should be performed on all hosts of the affected SAP ASE system. They have to be executed as the root user in the Linux shell.

Procedure

1. To check whether Transparent Huge Pages are activated and currently being used by processes, execute the below commands in the Linux shell:
   a. `cat /sys/kernel/mm/transparent_hugepage/enabled`
   b. `cat /proc/meminfo | grep AnonHugePages`

   If the first output shows "[always] madvise never", that is "always" is shown inside square brackets, then THPs are activated according to the value of the relevant Linux Kernel parameter. If the second output shows a value greater than 0 Kb (Kilobytes), then this is evidence that some processes use THPs.
2. If both steps show that Transparent Huge Pages are activated or in use, deactivate them by executing the commands below in the Linux shell:
   a. `echo never > /sys/kernel/mm/transparent_hugepage/enabled`

b. `cat /sys/kernel/mm/transparent_hugepage/enabled`

The first command will deactivate Transparent Huge Pages by setting the relevant Kernel parameter to "never". Right after executing this command, the hanging situation will be resolved. You can verify whether the Kernel parameter has the correct value by executing the second command which should show the output "always madvise [never]" where the new value is in square brackets.

3. Note that unless the value of the Kernel parameter has not been persisted, it is only set/valid until the host is restarted the next time. To prevent toggling the value from [never] back to [always] causing THPs to be activated again, use one of the below strategies to persist it:
   a. Add the parameter "transparent_hugepage=never" to the kernel boot line in the `/etc/grub.conf` file of the Bootloader.
   b. Integrate the parameter "transparent_hugepage=never" within your system boot scripts (for example,. `/etc/rc.local`).

3.8.8 Networking

Consider using VMXNET 3 virtual network interface cards (NICs) for your SAP ASE running on Windows virtual machines.

VMXNET3 supports an adaptive interrupt coalescing algorithm, which helps drive high throughputs to virtual machines using multiple vCPUs with parallelized workloads (for example, multiple threads). For this reason, you may see a performance improvement when using VMXNET3 NICs running on the Windows guest operating system compared to using the default E1000 adapter.

3.8.9 Storage

vSphere uses datastores to store virtual disks. Datastores provide an abstraction of the storage layer that hides the physical attributes of the storage devices from the virtual machines.

VMware administrators can create a single datastore to use as a consolidated pool of storage, or they can create multiple datastores to isolate various application workloads.

If you use a traditional storage area network (SAN) deployment, you should create a dedicated datastore, which allows database administrators to define individual service-level guarantees for different applications, similar to provisioning dedicated logical unit numbers (LUNs) for physical disks. You can use vSphere features such as VMware vSphere Storage I/O Control, Storage vMotion, and Storage DRS to prioritize and manage datastore workloads.

You should use dedicated datastores for production SAP ASE servers, and consolidated datastores for less demanding test or development environments.

4 Installing SAP ASE

Install SAP ASE using your chosen method.

Prerequisites

Complete installation planning tasks.

Context

> **Note**
>
> If you are installing the SAP ASE Always-On option for high-availability disaster recovery, you must have `sudo` permission on your system to perform the installation. See *Database Always-On Users Guide* for complete instructions on installing and configuring this licensed option.

Procedure

1. Choose an installation method:
   - GUI mode (recommended)
   - Console mode
   - Silent mode (response file)
2. Follow the instructions for your chosen method.
3. Perform postinstallation steps.

4.1 Installing SAP ASE in GUI Mode

Use GUI mode to install SAP ASE and related products.

Prerequisites

Shut down all programs before running the installer.

Context

The installer creates the target directory (if it does not yet exist) and installs the selected components into that directory.

> **Note**
>
> Version 16.0 included new major versions of SAP ASE and many supporting components. Installing version 16.0 and higher into the same directory with existing products should not impact the existing products.
>
> SAP ASE version 15.5 and later uses InstallAnywhere for its installation, while versions earlier than 15.5 and other products use InstallShield Multiplatform. Do not use both installers to install products into the same directory, as this creates files to be installed incorrectly and overwritten without warning.

At the end of the installation, verify that the product has installed correctly. You may also need to perform additional configuration procedures.

Procedure

1. Download the SAP ASE installation image, and extract it to a directory on your machine. See Download SAP ASE Software [page 6].
2. Go to the directory where you extracted the installation image and start the installer:

   ```
   ./setup.bin
   ```

   If there is not enough disk space in the temporary disk space directory, set the environment variable IATEMPDIR to `<tmp_dir>` before running the installer again, where `<tmp_dir>` is where the installation program writes the temporary installation files. Include the full path to `<tmp_dir>`.
3. If you are prompted with a language selection list, specify the appropriate language.
4. On the Introduction screen, click *Next*.
5. In the Choose Install Folder screen, the default directory or enter a new path to specify where to install SAP ASE, then click *Next*.

   Do not use the following when specifying the installation path:

   - Double-byte characters
   - Single- or double-quote characters

   The installer does not recognize these, and displays an error. If you see *Choose Update Installation*, this means that there is an older version of SAP ASE in the directory you specified for the installation, and you need to perform an upgrade rather than a new installation. See SAP ASE Upgrades [page 58].
6. In the Choose Install Set screen, select the type of installation:

Option	Description
Typical	(Default) Recommended for most users, this option installs a default set of components, including: the SAP ASE Cockpit. .

Option	Description
Typical SAP ASE, database always-on option	Installs all the necessary files for an SAP ASE with integrated "zero data loss" database always-on support via synchronous replication for custom applications, using sync rep technology. Using this requires the always-on license option. This option is available for Linux x64. It is not available on Linux on Power systems. **Note** Before you continue with your installation of SAP ASE with the database always-on option, see the *HADR Users Guide* for complete information on installation, configuration, and use.
Full	Installs every SAP ASE component, including all the supported language modules, as well as the Administration and Management Console (AMC). This option, as with the *Typical SAP ASE, database always-on option* installation, also includes the database always-on option.
Customize	Lets you select the components to install. Some components are automatically installed if they are required to run your selected components. **Note** You must select the *Administration and Management Console* option to get AMC installed.

7. (Database always-on option only) Enter and confirm the `sudo` password to install the SAP Host Agent.

   Optionally, you can choose not to install the SAP Host Agent at this time is you do not have `sudo` permission.
8. Select the software license type:
   - *Install licensed copy of SAP Adaptive Server Enterprise*
   - *Evaluate SAP Adaptive Server Enterprise*
     An evaluation is valid for 30 days from the installation date.
9. In the End-user License Agreement screen, choose the most appropriate region, read the license terms, then select *I agree*. Select *Next*.
10. In the SySAM License screen:
    a. Specify the license type:
       - Enter a license file. If it is a served license key, you are prompted to set up the license server.
       - Use an existing license server.
       - Proceed without specifying license information for the duration of 30 days from the installation date.
    b. Specify the product edition:
       - *Enterprise Edition*
       - *Small Business Edition*
       - *Unknown* – select this if you are unsure about the license type.

> **Note**
>
> Choosing *Unknown* prevents you from being able to select *Optimize SAP ASE* later in the installation process.

Depending on the edition, you can also select the license type under which the product is licensed.

c. Configure your server to send e-mail notifications about license management events that require attention:
   - SMTP server host name
   - SMTP server port number
   - E-mail return address
   - Recipient e-mail addresses
   - Message severity that triggers e-mail messages

11. In the preinstallation summary, review:
    - Product name – SAP Adaptive Server Enterprise
    - Installation folder – The path into which SAP ASE is installed
    - Product features – The list of features you are installing
    - Disk space information – Both the amount of space required, as well as what is available in the location you specified.

    Verify the installation type and that you have enough disk space for the installation. Click *Previous* to make changes, *Install* to install the server, or *Cancel* to cancel the installation.

    The installation status window displays the progress of the installation process.

    > **Note**
    >
    > Installing the server can take several minutes.

Next Steps

Configure some basic settings for SAP ASE, Backup Server, Job Scheduler self-management, Web Services, ASE Cockpit, and the Administration and Management Console (AMC).

Related Information

Configuration Options [page 38]
SAP ASE Upgrades [page 58]
Managing SAP ASE with Administration and Management Console

4.2 Installing SAP ASE in Console Mode

Choose command line installation if you prefer a nonwindowing interface, or if you are developing custom installation scripts.

Prerequisites

Launch the installer in console mode. If the installer launches automatically, click *Cancel* to cancel the GUI installation, then launch the `setup` program from a terminal or console.

Context

The steps for installing components in an interactive text mode are the same as those described for installing in GUI mode, except you use the following command to execute the installer from the command line, and you enter text to select installation options:

```
./setup.bin -i console
```

Procedure

1. Download the SAP ASE installation image, and extract it to a directory on your machine. See Download SAP ASE Software [page 6].
2. At the command line, start the installation program:

   ```
   ./setup.bin -i console
   ```
3. Follow the remaining prompts to install SAP ASE, then specify the basic settings for your installation. The flow of the installation is identical to a GUI installation, except output is written to a terminal window and responses are entered using the keyboard.

4.2.1 Command Line Options

Options for installing or uninstalling SAP ASE in console mode.

Option	Purpose
`-i console`	Uses the console interface mode, where messages appear on the Java console and the wizard runs in console mode.

Option	Purpose
`-i silent`	Installs or uninstalls the product in silent mode, without user interaction.
`-D`	Passes custom variables and properties. For example, to override the default installation directory when you run the installer, enter: `<install_launcher_name> -DUSER_INSTALL_DIR=/sybase`
`-r`	Generates a response file and a reference.
`-f`	References response files.
`-l`	Sets the installer's locales.
`-\?`	Displays the installer help.

4.3 Installing SAP ASE Using a Response File

Unattended or silent installations are typically used to update multiple systems across the enterprise.

Context

By saving installation configuration information into a response file during the initial GUI installation, you can perform subsequent installations of SAP ASE using a silent—or unattended—method.

> **Note**
>
> SAP ASE uses a rearchitected installation program that is incompatible with response files generated for versions 15.0.3 and earlier. Do not use response files from these earlier versions; instead, create a new one from a 16.1 SP00 PL02 installation.

To create a response file when installing in GUI or console mode, specify the `-r` command line argument. The `-r` argument records your responses to the installation wizard prompts and creates a response file when the InstallAnywhere wizard exits. The response file is a text file that you can edit to change any responses before you use it in any subsequent installations. You can find a sample response file named in `sample_response.txt` in the `<installer image>` directory.

Procedure

1. Download the SAP ASE installation image, and extract it to a directory on your machine. See Download SAP ASE Software [page 6].
2. Create a response file during GUI installation:

   ```
   setup.bin -r [<response_file_name>]
   ```

   Where:

   - `-r` – specifies the command line argument.
   - `<response_file_name>` – is the absolute path of the file into which the installation information is stored, such as `/tmp/responsefile.txt`.

   > **Note**
   >
   > The directory path you specify must already exist.

3. Verify that the response file includes the passwords for the SAP ASE sa login by including the following in the file:

   ```
   SY_CFG_ASE_PASSWORD=<ASE sa password>
   ```

   The password must be at least six characters long.

   You can also set the password using the environment variable:

   - SY_CFG_ASE_PASSWORD

   > **Note**
   >
   > Secure these response files appropriately if they contain passwords.

4. To enable a different user for the SAP ASE you are installing, define these properties:

   ```
   SY_CFG_USER_ACCOUNT_CHANGE=<yes | no>
   SY_CFG_USER_ACCOUNT_NAME=<user name>
   SY_CFG_USER_ACCOUNT_PASSWORD=<user password>
   SY_CFG_USER_DATA_DIRECTORY=<data directory>
   ```

   You need not configure `SY_CFG_USER_ACCOUNT_NAME` or `SY_CFG_USER_ACCOUNT_PASSWORD` unless you set `SY_CFG_USER_ACCOUNT_CHANGE` to **`yes`**.

   For the `SY_CFG_USER_DATA_DIRECTORY` property, enter a directory other than the installed directory to which SAP ASE can create all the data files during configuration.

   SAP ASE creates these files during installation to place in the data directory:

   - The interfaces file.
   - RUN_server file.
   - Configuration utilities log files.
   - SAP ASE configuration file (`.cfg`) – under the `ASE-16_1` subdirectory.
   - SAP ASE shared memory file (`.krg`) – under the `ASE-16_1` subdirectory.
   - SAP ASE SySAM properties file – under the `ASE-16_1/sysam` subdirectory.
   - Job Scheduler template `.ini` files – under the `ASE-16_1/jobscheduler/Templates` subdirectory

Database device files and server error log files are created in the data directory, but you can move them after the installation is finished.

> **Note**
>
> Make sure that the user you specify in this property setting has read/write/modify permissions to access the data directory.

5. To enable Administration and Management Console (AMC), define these properties:

```
CHOSEN_INSTALL_SET= Full (or CHOSEN_INSTALL_SET= Custom with
CHOSEN_FEATURE_LIST containing the value of “fase_amc”)
SY_CFG_ASE_AMC_ENABLE=true
SY_CFG_ASE_AMC_PORT_NUMBER=<port number>
```

If you don't set `CHOSEN_INSTALL_SET` to `full`, or `CHOSEN_INSTALL_SET` to `Custom` with `CHOSEN_FEATURE_LIST` containing the value of `fase_amc`, even if `SY_CFG_ASE_AMC_ENABLE` is set to `true`, AMC still cannot be installed successfully.

4.3.1 Installing in Silent Mode

To perform a silent, or unattended installation, run the installer and provide a response file that contains your preferred installation configuration.

Prerequisites

Use `setup.bin -r <responseFileName>` to generate an installation response file during a console or GUI installation, or edit and use the `sample_response.txt` sample responses file located in the installer image's top directory (`<installer_image>/sample_response.txt`)

Procedure

Run the following, where `<responseFileName>` is the absolute path of the file name containing the installation options you chose:

```
setup.bin –f responseFileName -i silent
-DAGREE_TO_SAP_LICENSE=true -DRUN_SILENT=true
```

> **Note**
>
> You must agree to the SAP License Agreement when installing in silent mode. You can either:
>
> - Include the option `-DAGREE_TO_SAP_LICENSE=true` in the command line argument, or,
> - Edit the response file to include the property `AGREE_TO_SAP_LICENSE=true`.

Except for the absence of the GUI screens, all actions of InstallAnywhere are the same, and the result of an installation in silent mode is exactly the same as one performed in GUI mode using the same responses.

4.4 Configuration Options

Use GUI mode to minimally configure an SAP ASE server and related products for use.

Prerequisites

The Configure window shows a list of everything you can configure. By default, all products are de-selected. Select products that you want to configure now. If you are configuring in console mode, enter the corresponding number:

- *Configure new SAP ASE*
  - *Setup ASE HADR* – this option is only available with the always-on licensed option. See the *HADR Users Guide* for complete information.
    This option is available for Linux x64. It is not available on Linux on Power systems.
  - *Configure new Backup Server* – see the *System Administration Guide*.
  - *Configure new XP Server* – see the *Transact-SQL Users Guide*.
  - *Configure new Job Scheduler* – see the *Job Scheduler Users Guide*.
    - *Enable Self Management*
    - *Configure Historical Monitoring Data Repository*

      > **Note**
      >
      > Configure this option only if you are using SAP ASE in SAP Business Suite Applications. Do not select this option if you are configuring SAP ASE for Custom Application.

When finished, click *Next* in the GUI wizard, or enter *0* in console mode. You are now ready to begin configuring the SAP ASE server.

Procedure

1. The Configure Servers with Different User Accounts window allows you to configure the servers under a different user account. Select one:

Option	Description
Yes	The dialog displays: • *User name* – enter the user name. • *User password* – enter and confirm a password that is at least six characters long. This field cannot be empty.
No	This is the default.

   SAP ASE, Backup Server, XP Server, and Job Scheduler are then automatically configured under the account name you specify.

2. In the User Configuration Data Directory window, specify the directory in which to install SAP ASE.

> **Note**
>
> The default directory is the installation directory. If you specify a different directory, make sure you or the account specified in the Configure Servers with Different User Account window has write permission to it.

The installer creates these files in the main installation directory:

- The interfaces file.
- SAP ASE configuration file (`.cfg`).

The installer creates these files the `ASE-16_1` directory:

- `RUN_server` file – in the `ASE-16_1/install` subdirectory.
- Configuration utilities log files – in the `ASE-16_1/init/logs` subdirectory.
- SAP ASE shared memory file (`.krg`) – in the `ASE-16_1` subdirectory.
- SAP ASE SySAM properties file – in the `ASE-16_1/sysam` subdirectory.
- Job Scheduler template `.ini` files – in the `ASE-16_1/jobscheduler/Templates` subdirectory.

Database device files and server error log files are also created in the data directory you specify, but you can move them after the installation is finished.

3. In the *Configure New SAP ASE* window, entering the configuration values for the new SAP ASE.

Configuration	Value
SAP ASE Name	The default is the machine name.
System Administrator's Password	Enter and confirm your password.
Host Name	By default, the ASE installer automatically chooses native host names. Use this field to specify a different host name, such as to bind virtual hosts to physical hosts in a cloud environment. This field allows applications to not be affected by the name change of a virtual machine due to a relocation or reconfiguration.
Port Number	Default is 5000. If port 5000 is used, the installer automatically defaults to the next available port.
Error Log	Name and location of the error log file. Defaults to the full path of the `<servername>.log`.
Application Type	These options are numbered only in console mode: • 1. (Default) MIXED – both OLTP and DSS. • 2. OLTP – online transaction processing generally consists of smaller, less complex transactions. • 3. DSS – decision-support systems generally have less update activity with large complex queries.
Page Size	• 2KB • (Default) 4KB – if you plan to load database dumps from an SAP ASE with a page size that is not

Configuration	Value
	4KB, enter the page size that matches the database dump. **Note** The default logical page size in earlier versions of SAP ASE was 2KB. • 8KB • 16KB
Default Language	The default is us-english. In typical installations, only us-english is available.
Default Character Set	Default is `iso_1`.
Default Sort Order	Default is `bin_iso_1`
Optimize SAP ASE Server Configuration	Optimize the configuration for your system. If you select this option, you see: • Available physical memory for SAP ASE (MB) – the default is 80 percent of physical memory. • Available CPU for SAP ASE – the default is 80 percent of the CPU or 1, which ever is higher. The default values are dynamic and machine-dependent. **Note** If you specify a value that is larger than the available resource for allocation to the server, this optimize configuration may fail, causing the server to not start.
Create Sample Databases	Select this option for the installer to install sample databases. The installer automatically calculates any additional space needed for your master device.

Click *Previous* to go back to the User Configuration Data Directory window, or *Next* to configure the following additional fields:

Configuration	Value
Master Device	Name, including location, of the master device. Defaults to the full path of `master.dat`.
Master Device Size (MB)	The default sizes are: • 2 KB page size – 36 MB • 4 KB page size – 52 MB • 8 KB page size – 104 MB

Configuration	Value
	• 16 KB page size – 208 MB
Master Database Size (MB)	The default sizes are: • 2 KB page size – 18 MB • 4 KB page size – 26 MB • 8 KB page size – 52 MB • 16 KB page size – 104 MB
System Procedure Device	Name, including location, of the system procedure device. Defaults to the full path of `sysprocs.dat`.
System Procedure Device Size (MB)	The default is 196 for all page sizes.
System Procedure Database Size (MB)	The default is 196 MB for all page sizes.
System Device	Name, including location, of the system device. Defaults to the full path of `sybsysdb.dat`.
System Device Size (MB)	The default options are: • 2 KB page size server – 3 MB • (Default) 4 KB page size server – 6 MB • 8 KB page size server – 12 MB • 16 KB page size server – 24 MB
System Database Size (MB)	The default options are: • 2 KB page size server – 3 MB • (Default) 4 KB page size server – 6 MB • 8 KB page size server – 12 MB • 16 KB page size server – 24 MB
Tempdb Device	Name, including location, of the `tempdb` device. Defaults to the full path of `tempdbdev.dat`.
Tempdb Device Size (MB)	The default is 100 MB for all page sizes.
Tempdb Database Size (MB)	The default is 100 MB for all page sizes.
Enable PCI in SAP ASE	Enable the pluggable component interface. The PCI is a generic interface internal to SAP ASE that is installed by default when you install or upgrade SAP ASE. See *Java in SAP Adaptive Server Enterprise*.
PCI Device	Appears when you select *Enable PCI*. The default is `sybpcidbdev_data.dat` in `$SYBASE/data`.

Configuration	Value
PCI Device Size (MB)	Appears when you select *Enable PCI*. • 2 KB page size server – 48 MB • (Default) 4 KB page size server – 96 MB • 8 KB page size server – 192 MB • 16 KB page size server – 384 MB
PCI Database Size (MB)	Appears when you select *Enable PCI*. The PCI device and PCI database size are the same: • 2 KB page size server – 48 MB • (Default) 4 KB page size server – 96 MB • 8 KB page size server – 192 MB • 16 KB page size server – 384 MB
Enable AMC	Enable the Administration and Management Console (AMC). AMC is a Web-based tool that provides a graphical user interface for the administration and management options of your SAP ASE servers.
AMC Server Port	Appears when you select *Enable AMC*. The default port number is 8080.

Click *Previous* to go back to the first Configure New SAP ASE window, or *Next* to configure a new Backup Server.

4. In the *Configure New Backup Server* window, configure the following:

Configration	Value
Backup Server Name	The default is `<ASE_server_name>`_BS.
Port Number	The port number of the Backup Server. The default is 5001.
Error Log	The full path to the error log file. Defaults to the full path of `<ASE_server_name>`_BS.log.
Allow Hosts	Specify any remote hosts you want to use or want to connect to this Backup Server. Comma-separated lists of hosts that are allowed to connect to this Backup Server. When null, only the dataserver running on the same host as the Backup Server can access this Backup Server. The default value is null.

Click *Previous* to go back to the second Configure New SAP ASE window, or *Next* to configure a new XP Server.

5. In the *Configure New XP Server* window, configure the following:

Configuration	Value
XP Server Name	The default XP Server name is <ASE_server_name>_XP. This format and name cannot be changed.
Port Number	The port number of the XP Server. The default is 5002.
Error Log	The full path to the error log file. Defaults to the full path of <ASE_server_name>_XP.log.

Click *Previous* to go back to the first Configure New Backup Server window, or *Next* to configure a new Job Scheduler.

6. In the *Configure Job Scheduler* window, configure the following:

Configuration	Value
Job Scheduler Agent name	The default is <ASE Server Name>_JSAGENT.
Port number	The default is 5003.
Management device	The full path to the device. Defaults to the full path of sybmgmtdb.dat.
Management device size	The default is 76 MB.
Management database size	The default is 76 MB.

Click *Previous* to go back to the first Configure New XP Server window, or *Next* to configure a new Self Management.

7. Self Management allows you to create a scheduled job to run `update statistics` on any table in any server database in the SAP ASE. In the *Configure Self Management* window, specify the following:

Configuration	Value
Self Management User Name	Entering a new user name creates it in SAP ASE. The default is "sa".
Self Management User Password	This field is activated if you enter a new username in the *Self Management User Name* field, then click *Next*. Enter and confirm a password that is at least six characters long. This field cannot be empty.

8. Verify that the values that appear in the New Server Configuration Summary window are correct. Click *Previous* to change any values, or click *Next* to proceed. You see the Configure New SAP ASE window.

   The configuration begins, and you see its progress in the Configure New SAP ASE window.
9. In the Installation Completed window:

Option	Description
GUI mode	Click *Done*
Console mode	Press *Enter* to exit the installation

Results

SAP ASE and related products have been successfully installed and configured for use. You can install sample databases to begin experimenting with your servers, or see the *System Administration Guide* for more advanced topics.

Related Information

Installing Sample Databases [page 48]
Installing SAP ASE in GUI Mode [page 30]
SAP ASE Upgrades [page 58]
Managing SAP ASE with Administration and Management Console

5 Postinstallation Tasks

After you install the server, set it up.

The SAP ASE installation includes directories that contain sample client library applications. These sample programs are included for training purposes only and are not intended to be installed in a production environment.

If you are setting up a production environment, remove these directories:

- `$SYBASE/OCS-16_1/sample`
- `$SYBASE/DataAccess*/ODBC/samples`
- `$SYBASE/jConnect-16_1/sample2`
- `$SYBASE/jConnect-16_1/classes/sample2`
- `$SYBASE/ASE-16_1/sample`
- `$SYBASE/WS-16_1/samples`

Related Information

Installing Sample Databases [page 48]

5.1 Verifying That Servers are Running

Verify that the servers are running.

Prerequisites

Before starting the server, make sure you have stopped, then started the services related to the server.

Context

If you have already started the server, do not run the command a second time. Running it more than once can cause problems.

Procedure

1. From a UNIX command line, set the environment variables.
   - In the C shell:

     ```
     source <ASE_install_location>/SYBASE.csh
     ```
   - In the Bourne shell:

     ```
     <ASE_install_location>/SYBASE.sh
     ```
2. Show all SAP ASE-related processes that are on the system:

   ```
   $SYBASE/$SYBASE_ASE/install/showserver
   ```

5.2 Verifying Your Connection to the Servers

Use `isql` to verify your connection to the servers.

Context

1. At the command prompt, enter the following:

   ```
   isql -Usa -P<password> -S<server_name>
   ```

   Where:
   - `<password>` – is the password for sa.
   - `<server_name>` is the SAP ASE server name.

   You see the `isql` prompt if the login is successful.
2. At the `isql` prompt, enter:

   ```
   1> select @@version
   2> go
   ```

   The output should show that you are at the current version and edition of SAP ASE.

5.3 Test the Installation and Network Connections

The SAP ASE server communicates with other SAP ASE servers, Open Server applications (such as Backup Server), and client software on your network. Clients can talk to one or more servers, and servers can communicate with other servers using remote procedure calls.

Context

For SAP products to interact with one another, each product must know where the others reside on the network. SAP stores this information in the interfaces file (`sql.ini`) on Windows or in a Lightweight Directory Access Protocol (LDAP) server.

Follow the instructions in *Managing SAP ASE from the Command Line* to configure the SAP ASE server for monitoring.

Procedure

1. Use the `libtcl.cfg` file to specify an LDAP server name, port number, directory information tree (DIT) base, user name, and password to connect to an LDAP server.

   For details, see *Use the Lightweight Directory Access Protocol as a Directory Service* in the configuration guide.
2. Use the `dsedit` utility to add a server to the directory service.

   If you do not have X-Windows installed on your system to use `dsedit`, use `dscp`.

   For details, see *Set Up Communications Across the Network > Create a Directory Services Entry* in the configuration guide and the *Utility Guide*.
3. Adding a server to the interfaces file.

   For details, see *Set Up Communications Across the Network > Create a Directory Services Entry* in the configuration guide.

5.4 The System Administrator Account

When you install SAP software, the software creates a system administrator account called "sa," which can use any database on an SAP ASE server, including `master`, with full privileges.

The user specified the password for "sa" during the installation and configuration of SAP ASE. See the *Security Administration Guide* for more information about passwords.

5.5 Installing Sample Databases

The sample databases, which contain fictitious information, are designed to help you learn how to use SAP ASE. The sample databases are intended for training purposes only. Do not install them in an SAP ASE production environment.

File Name	Description
`$SYBASE/$SYBASE_ASE/scripts/installpubs2`	Installs the `pubs2` sample database. This database contains data that represents a publishing operation. Use this database to test your server connections and to learn Transact-SQL. Most of the examples in the SAP ASE documentation query the `pubs2` database. **Note** The `master` device size should be at least 30MB to install the full `pubs2` database, including the `image` data.
`$SYBASE/$SYBASE_ASE/scripts/installpubs3`	Installs the `pubs3` sample database. This updated version of `pubs2` uses referential integrity. In addition, its tables are slightly different than the tables used in `pubs2`. Where noted, the SAP ASE documentation uses the `pubs3` database in its examples.
`$SYBASE/$SYBASE_ASE/scripts/installpix2`	Installs the `image` data that is used with the `pubs2` database. Run the `installpix2` script after you run `installpubs2`. The `image` data requires 10MB—there are six pictures, two each in the PICT, TIFF, and Sun raster file formats. Run `installpix2` script only to use or test the `image` datatype. SAP does not supply any tools for displaying `image` data; you must use appropriate window graphics tools to display the images after you have extracted them from the database.

`$SYBASE/$SYBASE_ASE/sample/backupserver`	Makefiles are provided for UNIX and Windows.:q
	To build a backupserver sample for UNIX, do the following at the prompt:
	`setenv SYBPLATFORM <platform>`
	`make sample`
	The SAP ASE SDK header file abbreviations for `<platform>` are:
	• linuxamd64
	• ibmplinux
	• sun_svr4
	• ibmaix64
	• sunx64
	• hpia64

File Name	Description
	This will create the library `libsample.so`. Copy this library to <$SYBASE/$SYBASE_ASE/lib>, or start the backup server passing its location using the `-A` parameter.

Related Information

Postinstallation Tasks [page 45]
Configuration Options [page 38]

5.5.1 Default Devices for Sample Databases

The SAP ASE installation includes scripts for installing the us_english sample database, foreign language sample databases, and the image data associated with the US English `pubs2` sample database on a default device.

These scripts are located in `$SYBASE/$SYBASE_ASE/scripts`.

By default, these scripts install the sample databases on the `master` device. Because the databases use valuable space on the `master` device that is best reserved for system tables – each sample database requires 3MB on a 2KB server, and multiples of 3MB on a 4KB, 8KB, and 16KB server on your database device – we recommend that you change the default to a device other than the `master` device.

To change the default location where the scripts install these databases, use `sp_diskdefault`. See `sp_diskdefault` in *Reference Manual: Procedures*. Alternatively, use a text editor to revise the script directly.

5.5.2 Running the Database Scripts

After you determine your default device, run the scripts to install the sample databases.

Prerequisites

Back up the original `installpubs2` and `installpubs3` scripts, in case you have problems with the edited scripts.

Procedure

1. Start SAP ASE.
2. Go to the scripts directory at `$SYBASE/$SYBASE_ASE/scripts`.
3. Use `isql` to log in to the SAP ASE server and run the script:

   ```
   isql -Usa -P<password> -S<server_name> -i<script_name>
   ```

   Where:

   - `<server_name>` – is the destination server for the database.
   - `<script_name>` – is the full path to and file name of the script to run.

   For example, to install `pubs2` on a server named VIOLIN, enter:

   ```
   isql -Usa -P<password> -SVIOLIN -i $SYBASE/$SYBASE_ASE/scripts/installpubs2
   ```

4. Install the `image` data associated with `pubs2`:

   ```
   isql -Usa -P<password> -S<servername>
     -i$SYBASE/$SYBASE_ASE/scripts/installpix2
   ```

   The `pubs3` database does not use `image` data.

   For more information about running these scripts, see the *Configuration Guide for UNIX*.

5.5.3 Installing the interpubs Database

The `interpubs` database is similar to `pubs2`, and contains French and German data.

Prerequisites

Back up the original `installintpubs` script, in case you experience problems with the edited script.

Procedure

1. Set your terminal to display 8-bit characters.
2. Verify that iso_1, iso_15, Roman8, Roman 9, or UTF-8 is installed as either the default character set or as an additional character set.

   The `interpubs` database contains 8-bit characters and is available for use at SAP ASE installations using the ISO 8859-1 (iso_1), ISO 8859-15 (iso_15), Roman 8, or Roman9 (for HP-UX) character set.
3. Determine the type (raw partition, logical volume, operating system file, and so on) and location of the device where you will be storing the `interpubs` database. You will need to provide this information later.

4. Execute the script, using the `-J` flag to ensure that the database is installed with the correct character set:

```
isql -U<sa> -P<password> -S<servername> -Jiso_1 \
 -i $SYBASE/$SYBASE_ASE/scripts/iso_1/installintpubs
```

5.5.4 Installing the jpubs Database

If you installed the Japanese language module with your server, you can run the `installjpubs` script to install `jpubs`, which is a database similar to `pubs2` that contains Japanese data. `installjpubs` uses the EUC-JIS (eucjis), UTF-8 (utf8), or the Shift-JIS (sjis) character sets.

Prerequisites

Copy the original `installjpubs` script, in case you experience problems with the edited script.

Procedure

1. Set your terminal to display 8-bit characters.
2. Verify that the EUC-JIS, Shift-JIS, or the UTF-8 character set is installed either as the SAP ASE default character set or as an additional character set.
3. Determine the type (raw partition, logical volume, operating system file, and so on) and location of the device where you will be storing the `jpubs` database. You will need to provide this information later.
4. Execute the `installjpubs` script, using the `-J` flag to ensure that the database is installed with the correct character set:

   ```
   isql -U<sa> -P<password> -S<servername> -Jeucjis \
    -i $SYBASE/$SYBASE_ASE/scripts/eucjis/installjpubs
   ```

   or:

   ```
   isql -U<sa> -P<password> -S<servername> -Jsjis \
    -i $SYBASE/$SYBASE_ASE/scripts/sjis/installjpubs
   ```

   For more information on the `-J` option in `isql`, see the *Utility Guide*.

5.5.5 Maintaining Sample Databases

The sample databases contain a guest user option that allows authorized users to access the database. Guest users have a wide range of privileges, including permissions to `select`, `insert`, `update`, and `delete` user tables.

Context

We recommend that you remove the guest user option from user databases in production systems. For more information about the guest user and a list of guest permissions, see the *System Administration Guide*.

Procedure

- If possible, and if space allows, give each new user a clean copy of the sample databases so that he or she is not confused by other users' changes.
- If space is a problem, instruct users to issue the `begin transaction` command before updating a sample database.
- After users have finished updating one of the sample databases, instruct them to issue the `rollback transaction` command to undo the changes.

5.6 Raw Partitions on Linux

You can create and mount database devices on raw bound devices for raw disk I/O. Raw disk I/O enables direct memory access from your address space to the physical sectors on the disk, while omitting needless memory copy operations from the user address space to the kernel buffers.

Raw disk I/O assumes that logical and physical I/O are simultaneous, and that writes are guaranteed to flush to the disk when the system `write` call returns. When preparing a raw partition device, follow these guidelines:

- Do not initialize a database device on the partition that contains your installation software. Doing so destroys all existing files on that partition.
- A raw partition designated for use by any other software application cannot be mounted for use by the operating system for any other purpose, such as for file systems or swap space.
- After a configuration utility or the `disk init` command has initialized a portion of a partition as a database device, the entire partition cannot be used for any other purpose. Any space left on the partition beyond the size specified for the device can be reused with the `disk resize` command.
- To avoid any possibility of using a partition that contains the partition map, do not use cylinder 0.
- Place the database device on a character device, because the server recovery system needs unbuffered system I/O.

- To determine whether a device is a block device or a character device, run:

```
ls -l <device path>
```

5.6.1 Choosing a Raw Partition

Select a raw partition on which to create and mount database devices.

Context

For more information on choosing a raw partition, see your operating system documentation.

Procedure

1. Determine which raw partitions are available.
2. Determine the sizes of the raw partitions.
3. From the list of available raw partitions, select a raw partition for each device.
4. Verify with the operating system administrator that the partition you have chosen is available.
5. Make sure the "sybase" user has read and write privileges to the raw partition.

5.6.2 Examples for Creating Raw Partitions

Specific system administration is required before you can enable and use raw devices. The available tools to configure devices depend on the distribution configuration.

You must allocate physical disk space in partitions on the disks where you want to set up raw devices. The physical I/O subsystem can be on either SCSI or EIDE devices.

> ⓘ Note
>
> You can create partitions with the Linux default `fdisk(8)` utility. You must have root privileges to use the command `fdisk`. See the `fdisk(8)` man pages for a complete description of the command.

Example

This example shows how to set up partitions as raw devices, on four SCSI disks in the system—`sda`, `sdb`, `sdc`, and `sdd`.

1. Start `fdisk` on `/dev/sdd`:
   ```
   # fdisk /dev/sdd
   ```
   The system returns:
   ```
   The number of cylinders for this disk is set to 8683
   ....
   Command (m for help):
   ```
2. Enter **p** to print the current partition layout. The output is:
   ```
   Disk /dev/sdd: 64 heads, 32 sectors, 8683 cylinders
   Units = cylinders of 2048 * 512 bytes
   Device Boot Start   End   Blocks  Id  System
   /dev/sdd1       1  7499  7678960  83  Linux
   /dev/sdd2    7500  8012   525312  82  Linux swap
   /dev/sdd4    8013  8683   687104   5  Extended
   ```

Example

This example shows the extended partition (`sdd4`) has 687,104 free blocks, starting from 8013 and ending at 8683. You can assign the remaining partitions later. This example assigns an additional partition for raw bound disk I/O:

1. Use the `n` command to create a new partition, and enter **l** (for "logical") at this prompt:
   ```
   Command (m for help): n
   Command action
   l  logical (5 or over)
   p  primary partition (1-4)
   ```
2. Accept the default by pressing *Enter* when you see:
   ```
   First cylinder (8013-8683, default 8013):
   ```
3. Accept the default by pressing *Enter* again, when you see:
   ```
   Last cylinder or +size or +sizeM or +sizeK
   (8013-8683, default 8683): 8269
   ```
4. Use the `t` command, enter **5** at this prompt:
   ```
   Partition number (1-8): 5
   ```
5. Enter **60** at this prompt:
   ```
   Hex code (type L to list codes): 60
   ```
   The output is:
   ```
   Changed system type of partition 5 to 60 (Unknown)
   ```
6. Repeat steps 1–5 to create four partitions for raw device I/O.
7. Verify the setup using `p` to print the full partition table before writing it out. Make sure that there are no overlapping partitions and the type for the unassigned partitions is Unknown type 60.

You can now write this partition table to disk and quit the `fdisk(8)` utility.

5.6.3 Administering Raw Devices

Administer raw disk partitions using a plain text file that contains comments and examples for possible configurations.

Procedure

- If you are using a Red Hat Enterprise Linux system running release 3 or 4:
  a. Administer the partitions using the `/etc/sysconfig/rawdevices` file:

```
# raw device bindings
# format: <rawdev> <major> <minor
>#         <rawdev> <blockdev>
# example: /dev/raw/raw1 /dev/sda1
#          /dev/raw/raw2 8 5
/dev/raw/raw1 /dev/sdd1
/dev/raw/raw2 /dev/sdd2
/dev/raw/raw3 /dev/sdd3
/dev/raw/raw4 /dev/sdd4
```

  b. Create the raw devices.
  c. Bind the raw devices by starting them from `/etc/rc.d/init.d/rawdevices`:

```
[root@legolas init.d]# cd /etc/rc.d/init.d
[root@legolas init.d]# sh rawdevices start
Assigning devices:
/dev/raw/raw1  -->   /dev/sdd5
     /dev/raw/raw1:     bound to major 3, minor 5
/dev/raw/raw2  -->   /dev/sdd6
     /dev/raw/raw2:     bound to major 3, minor 6
/dev/raw/raw3  -->   /dev/sdd7
     /dev/raw/raw3:     bound to major 3, minor 7
/dev/raw/raw4  -->   /dev/sdd8
     /dev/raw/raw4:     bound to major 3, minor 8
done
```

  d. To make sure the raw device binding runs whenever you restart the system, enter:

```
# /sbin/chkconfig rawdevices on
```

- If you are using Red Hat Enterprise Linux system running release 5 or later, modify the `/etc/udev/rules.d/60-raw.rules` file:

```
# Enter raw device bindings here.
#
# An example would be:
#   ACTION=="add", KERNEL=="sda", RUN+="/bin/raw /dev/raw/raw1 %N"
# to bind /dev/raw/raw1 to /dev/sda, or
#   ACTION=="add", ENV{MAJOR}=="8", ENV{MINOR}=="1", RUN+="/bin/raw /dev/raw/
raw2 %M %m"
# to bind /dev/raw/raw2 to the device with major 8, minor 1.
ACTION=="add", KERNEL=="sdb5", OWNER=="sybase",RUN+="/bin/raw /dev/raw/raw1
%N"
ACTION=="add", KERNEL=="sdb6", OWNER=="sybase",RUN+="/bin/raw /dev/raw/raw2
%N"
ACTION=="add", KERNEL=="sdb7", OWNER=="sybase",RUN+="/bin/raw /dev/raw/raw3
%N"
```

- If you are using SuSE:
  a. Modify the `/etc/raw` file:

```
# /etc/raw
#
# sample configuration to bind raw devices
# to block devices
#
# The format of this file is:
# raw<N>:<blockdev>
#
# example:
# ---------
# raw1:hdb1
#
# this means: bind /dev/raw/raw1 to /dev/hdb1
#
# ...
raw1:sda7
raw2:sda8
raw3:sda9
```

  b. Bind the raw devices by starting them with the script `/etc/init.d/raw`:

```
# cd /etc/init.d
# sh raw start
bind /dev/raw/raw1 to /dev/sdb1... done
bind /dev/raw/raw2 to /dev/sdb2... done
bind /dev/raw/raw3 to /dev/sdb3... done
...
```

  c. To make sure the raw device binding runs whenever you restart the system, enter:

```
# /sbin/chkconfig raw on
```

5.6.4 Accessing Raw Devices from the Server

After you create partitions and bind the devices for raw disk I/O, Adaptive Server can use them.

Prerequisites

Confirm that you have root privileges to execute the raw `-qa` command on your system to avoid seeing a message similar to:

```
Cannot open master raw device '/dev/rawctl'
(Permission denied)
```

Context

If the SAP ASE server is running as user "sybase," then apply read, write, and owner permissions to the `/dev/raw/raw#` device entries and the raw bound control device `/dev/rawctl`. See the `chown(1)`, `chgrp(1)`, and `chmod(1)` commands to apply correct permissions.

Procedure

1. Verify your settings by querying the device binding with the `raw` command:

   ```
   # raw -qa
   ```

   You should see:

   ```
   /dev/raw/raw1: bound to major 3, minor 5
   /dev/raw/raw2: bound to major 3, minor 6
   /dev/raw/raw3: bound to major 3, minor 7
   /dev/raw/raw4: bound to major 3, minor 8
   ```

2. Using the raw devices, SAP ASE and the installation and configuration utility, `srvbuild`, detect and present size automatically. Enter the absolute path to the raw device when creating devices such as `master`, `sybsystemprocs`, `sybtempdb`.

5.7 Starting and Stopping the AMC

This topic describes how to start and stop the AMC.

Navigate to the SAP ASE installation directory. Here you can see a directory called AMC containing `AMC.jar`, `AMC.properties`, and a directory called scripts. Open a command prompt or terminal and then change to the scripts directory. Now run the command `start_AMC.bat` (or `start_AMC.sh` on Linux). This runs the AMC application in an embedded Tomcat server. You can access the AMC user interface at `http://localhost:8080/`. To stop the AMC application, run the command `stop_AMC.bat` or `stop_AMC.sh` on Linux.

Related Information

Managing SAP ASE with Administration and Management Console

6 SAP ASE Upgrades

You can perform a direct upgrade to 16.1 SP00 PL02 from versions 16.0 or later. For versions prior to 16.0, you can perform an indirect, or step-wise upgrade.

The following table illustrates upgrade types, and supported upgrade paths available in SAP ASE.

Table 6: Supported Upgrade Paths

Upgrade Type	Upgrade Path Recommendations
Major upgrade	You can perform an upgrade to SAP ASE version 16.1 SP00 PL02 from the following versions by executing the upgrade sequence from the same node on which the database resides: • Version 16.0 to 16.0 PL05 • Version 16.0 SP01 to 16.0 SP01 PL04 • Version 16.0 SP02 to 16.0 SP02 PL09 • Version 16.0 SP03 to 16.0 SP03 PL15 • Version 16.0 SP04 to 16.0 SP04 PL08 A major upgrade requires that you perform preupgrade tasks.
Indirect upgrades	You need to perform an indirect, step-wise[1] upgrade to SAP ASE 16.1 SP00 PL02 from these versions: • Version 15.5.x • Version 15.7.x [1] An indirect, step-wise upgrade from one of these versions requires that you first upgrade to SAP ASE version 16.0, and then to version 16.1 SP00 PL02.

Upgrade Considerations

- Upgrades are supported only between nonclustered editions of SAP ASE. You cannot upgrade from SAP ASE Cluster Edition to a nonclustered edition.
- You can upgrade from a 32-bit version of SAP ASE to a 64-bit version.
- If your server has replicated databases, consult the *SAP Replication Server Configuration Guide* before starting the preparatory upgrade tasks.
- Only upgrades to and from the same page size are supported. If you are migrating between servers with the same major version number, you can use `sybmigrate` to re-create the schema, and load data from one page size to another. See the *SAP ASE Utility Guide*.
- SAP ASE version 16.1 SP00 PL02 includes both new and changed system catalogs that may affect your existing applications. See the *SAP ASE What's New* for a complete list.

> **Note**
>
> Once you upgrade to SAP ASE 16.1 SP00 PL02, you cannot revert to an earlier version.

Related Information

Managing SAP ASE with Administration and Management Console
Installing SAP ASE in GUI Mode [page 30]
Configuration Options [page 38]

6.1 Considerations When Upgrading from a Developer Edition of SAP ASE

Starting with SAP ASE version 16.0 SP03, SAP has removed the Developer Edition license for SAP ASE. If you are currently using a Developer Edition license and want to upgrade to SAP ASE 16.0 SP03, you can use our free SAP ASE Enterprise Edition evaluation.

To upgrade your Developer Edition to an evaluation version:

1. Download the evaluation version.
2. Build a new server with the evaluation version.
3. Upgrade the user databases by performing a dump and load, or an unmount and mount of the user databases.
4. To determine the database version, run the following query and verify the output; it should report `16003000` (which is the version string for 16.0 SP03):

   ```
   select convert (int, dbinfo_get (<db_id>, 'asevers'))
   ```

For more information, see:

- *SAP ASE Reference Manual: Commands* > `dump database` and `load database` commands.
- *SAP ASE System Administration Guide: Volume 2* > *Upgrading a Dump to the Current Version of SAP ASE*.
- *SAP ASE Reference Manual: Commands* > `mount` and `unmount` commands.
- *SAP ASE System Administration Guide: Volume 2* > *Database Mount and Unmount*.
- *SAP ASE Database Encryption* > *Mount/Unmount an Encrypted Database*.
- *SAP ASE System Administration Guide: Volume 2* > *Backing Up and Restoring User Databases* .

Related Information

When an Upgrade Fails [page 111]
https://help.sap.com/viewer/p/SYSAM

6.2 Upgrade Java in the Database

If you have enabled Java in the database, create the `sybpcidb` database before upgrading to SAP ASE version 16.1 SP00 PL02.

Procedure

1. Create the `sybpcidb` database, which stores configuration information for the pluggable component interface (PCI) and all pluggable component adapter (PCA) components. This database is used by the `installpcidb` script. For example:

   ```
   1> disk init
   2> name = "sybpcidb_dev",
   3> physname = "${SYBASE}/data/sybpcidb_dev.dat",
   4> size = "48M"
   5> go
   1> create database sybpcidb on sybpcidb_dev = 48
   2> go
   ```

   The device and database sizes depend on the SAP ASE server page size. The minimum and default size requirements for `sybpcidb` are:

   - 2KB page size server – 48 MB
   - (Default) 4KB page size server – 96 MB
   - 8KB page size server – 192 MB
   - 16KB page size server – 384 MB

2. Disable Java in the database:

   ```
   1> sp_configure 'enable java', 0
   2> go
   ```

3. Enable Java PCI Bridge for SAP ASE:

   ```
   1> sp_configure 'enable pci', 1
   2> go
   ```

4. Reenable the feature after you have successfully upgraded:

   ```
   1> sp_configure 'enable java', 1
   2> go
   ```

Related Information

Preupgrade Tasks [page 64]
Reenabling Auditing [page 86]
Preparing to Install SAP ASE [page 15]

6.3 Upgrade and Runtime Logging

To improve the performance of runtime logging, SAP recommends that you use the SAP ASE queuing strategy.

If you create a new server installation that does not use an existing configuration file, SAP ASE creates a configuration file that sets the `user log cache queue size` and `user log cache size` parameters to DEFAULT.

As a result, in version 16.0 and later, SAP ASE enables queuing strategy for log records because it is assumed that the default value for `user log cache queue size` is set to 1, and that `user log cache size` is set to 4 times the server page size.

The queuing strategy for log records requires that the `user log cache size` configuration parameter is at least 4 times the server page size. If you are upgrading an installation to version 16.0, the preupgrade utility will report the following error if `user log cache size` is less than 4 times the server page size:

```
***ERROR: configuration parameter 'user log cache size' is too
low for upgrade. It is <size>, but must be at least <minimum size>.
```

Ensure that `user log cache size` has been set to at least 4 times the server page size to allow the upgrade to continue.

Unless you have a specific reason not to, SAP recommends that you use the queuing strategy to improve the performance of runtime logging. If you do not want to enable the queuing strategy, then after the installation has been successfully upgraded to 16.0, change `user log cache queue size` to 0. The `user log cache size` parameter can be set to any multiple of the server page size (it is not restricted to a minimum of 4 times the server page size), if `user log cache queue size` is set to 0.

6.4 Preparing to Upgrade

Use the `preupgrade`, `upgrade`, `sqlupgrade`, and `sqlupgraderes` utilities to upgrade SAP ASE versions earlier than 16.1.

Prerequisites

> ⚠ Caution
>
> Since it is not possible to downgrade once you upgrade to SAP ASE 16.1 or higher, make sure to back up all databases, including `master` and other system databases, before beginning the upgrade process.

Context

To perform an upgrade from:

- Version 16.0 or later to version 16.1 SP00 PL02, run the `preupgrade` utility to check the upgrade eligibility then use `sqlupgrade` (or `sqlupgraderes`) to upgrade the server.

You must have system administrator privileges to perform an upgrade.

Each new server version contains features that introduce parameters, commands, reserved words, and so on. The `preupgrade` utility checks the old server by making sure all necessary directories and settings are correct for the upgrade. The utility also checks for deprecated functions from release 12.5.x and later. If you have hidden the text of `syscomments` for objects, they will be ignored during the check.

When running the `preupgrade` utility, the server must be running. You need not start the server before running the `sqlupgrade` upgrade utility; the utility starts the server when needed.

The `preupgrade` utility is located in `$SYBASE/ASE-16_1/bin`. In SAP ASE 16.0 SP02 PL05 and later, the `preupgrade` utility is also available at the top level of the image directory to allow for a preupgrade check before installing SAP ASE.

Manually drop objects before you execute procedures for the first time. The first time you run the server after an upgrade, the server internally rebuilds procedures from the text in `syscomments`. The procedure may not execute properly if it contains code that drops, then re-creates, an existing object.

Procedure

Choose one of:

- Go to the `$SYBASE/ASE-16_1/bin` directory and run the `preupgrade` utility.
- For versions 16.0 SP02 PL05 and later, run the `preupgrade` utility located at the top level of the image directory.

6.5 Changes in SAP ASE Directories

The directory structures for SAP ASE installations differ, depending on version.

Table 7: Directory Changes

Component	Location
SAP ASE	• 12.5.4 – `$SYBASE/ASE-12_5` • 15.0.2, 15.0.3, 15.5, 15.7 GA, and 15.7 ESD #1, ESD #2, ESD #3, and SP100 – `$SYBASE/ASE-15_0` • 16.0 and later – `$SYBASE/ASE-16_0` • 16.1 and later – `$SYBASE/ASE-16_1`
SAP Control Center	In SAP ASE version 16.0 SP02, SAP Control Center is replaced by SAP ASE cockpit. • 15.7 SP100 – `$SYBASE/SCC-3_2` • Versions of 16.0 earlier than SP02 – `$SYBASE/SCC-3_3`
SAP ASE Cockpit	The SAP ASE cockpit was introduced in SAP ASE version 16.0 SP02, and replaced the SAP Control Center. In version 16.0 SP04, SAP ASE Cockpit was replaced by Administration and Management Console for SAP ASE. • 16.0 SP02 – `$SYBASE/COCKPIT-4`
JRE	• 12.5.4 – `$SYBASE/shared/jre142` • 15.0.2 – `$SYBASE/shared/jre142_*` • 15.0.3 – `$SYBASE/shared/JRE-6_0*` • 15.5, 15.7 GA, and 15.7 ESD #1 – `$SYBASE/shared/JRE-6_0*` • 15.7 ESD #2, ESD #3, and SP100 – `$SYBASE/shared/JRE-7_0*` • 16.0 and later – `(32-bit) $SYBASE/shared/SAPJRE-7_1_*_32BIT` and (64-bit) `$SYBASE/shared/SAPJRE-7_1_*_64BIT`
Language settings (`locales`)	• 12.5.4 and 15.0.2 – `$SYBASE/locales` • 15.0.3, 15.5, 15.7 GA, and 15.7 ESD #1, ESD #2, ESD #3, and SP100 – `$SYBASE/locales` and `$SYBASE/ASE-15_0/locales` • 16.0 and later – `$SYBASE/locales` and `$SYBASE/ASE-16_0/locales` • 16.1 and later – `$SYBASE/locales` and `$SYBASE/ASE-16_1/locales`
Connectivity	• 12.5.4 – `$SYBASE/OCS-12_5` • 15.0.2, 15.0.3, 15.5, 15.7 GA, and 15.7 ESD #1, ESD #2, ESD #3, and SP100 – `$SYBASE/OCS-15_0` • 16.0 and later – `$SYBASE/OCS-16_0` • 16.1 and later – `$SYBASE/OCS-16_1`

Component	Location
Web Service	• 12.5.4 – `$SYBASE/WS-12_5` • 15.0.2, 15.0.3, 15.5, 15.7 GA, and 15.7 ESD #1, ESD #2, ESD #3, and SP100 – `$SYBASE/WS-15_0` • 16.0 and later – `$SYBASE/WS-16_0` • 16.1 and later – `$SYBASE/WS-16_1`
SySAM	• 12.5.4 – `$SYBASE/SYSAM-1_0` • 15.0.2, 15.0.3, 15.5, 15.7 GA, and 15.7 ESD #1, ESD #2, ESD #3, SP100, 16.0, 16.1 and later – `$SYBASE/SYSAM-2_0`
Job Scheduler	• 12.5.4 – `$SYBASE/JS-12_5` • 15.0.2, 15.0.3, 15.5, 15.7 GA, and 15.7 ESD #1, ESD #2, ESD #3, and SP100 – `$SYBASE/ASE-15_0/jobscheduler` • 16.0 and later – `$SYBASE/ASE-16_0/jobscheduler` • 16.1 and later – `$SYBASE/ASE-16_1/jobscheduler`
Unified Agent	• 15.0.2 and 15.0.3 – `$SYBASE/UAF-2_0` • 15.5, 15.7 GA – `$SYBASE/UAF-2_5` • 15.7 ESD #1, ESD #2, ESD #3, and SP100 – `$SYBASE/SCC-3_2` • Versions of 16.0 earlier than SP02 – No longer shipped. Included with SCC. • 16.0 SP02 – No longer shipped. Included with SAP ASE cockpit.
Workload Analyzer Utility	SAP ASE Workload Analyzer Utility was introduced in SAP ASE 16.0 SP03 PL07. • 16.0 SP03 PL07 and later – `$SYBASE/WLA`

6.6 Preupgrade Tasks

To ensure a successful upgrade, review and perform preparatory tasks as necessary. Depending on the old server configuration, you may not need to perform all preparatory tasks.

Prerequisites

- You need the master and system procedures files to upgrade the server. By default, the `master` (`master.dat`) and system procedures device (`sysprocs.dat`) files are in the `$SYBASE/data` directory.
- The previously installed version of the server must be running. If you are upgrading Backup Server or XP Server, those servers must not be running.

Context

> **Note**
>
> Follow these steps only if you are performing a major upgrade from an SAP ASE version earlier than 16.1.

Skip these preparatory tasks if you plan to use `sqlupgrade`, which performs these tasks automatically.

Procedure

1. Check system and upgrade requirements.
2. Ensure that the directory to which your TEMP environment variable points exists.
3. Verify the name and location of the `runserver` file, and that you have renamed it to `RUN_<servername>` as it appears in the `interfaces` file, where `<servername>` is the name of the old server.

   The default `RUN_<servername>` file for a server called SYBASE is `RUN_SYBASE`. If the `RUN_<servername>` file for your current server is named differently, use the actual name of your server during the upgrade process.
4. Verify that the text of all stored procedures you upgrade is available in `syscomments` by either:

   - Reinstalling the procedures with text, or,
   - Removing and reinstalling the procedures after the upgrade.

   This step can allow you to inspect the stored procedures for any hidden or unwanted text.
5. Make sure reserved words use quoted identifiers.
6. Verify that users are logged off.
7. Use `dbcc` to check for database integrity.
8. Back up databases.
9. Dump the transaction log.
10. Verify that `master` is the default database for the "sa" user.
11. Prepare the database and devices for upgrade using the `preupgrade` utility. See `preupgrade` in the *Utility Guide* for more information. After `preupgrade` finds no errors by exiting with status 0 (zero):
    a. Create a `sybsystemdb` database if it does not already exist.
    b. Disable auditing by running `sp_configure 'auditing', 0`.
    c. Disable Job Scheduler.
    d. Obtain the current audit settings for the pre-16.1 SAP ASE using `sp_displayaudit`; use this saved information to reenable auditing after you complete the upgrade.
    e. If you made any site-specific changes to the permissions for system stored procedures, obtain the current permission settings for them using `sp_helprotect`; then use this saved information to reenable the permissions after you complete the installation. Pay special attention to
       - Any stored procedures that are not granted execute permission to public, such as `sp_addauditrecord`, `sp_monitor`, and `sp_sysmon`.
       - Any stored procedures where execute permission has been revoked from public.
    f. Disable disk mirroring.
    g. Verify that your SYBASE environment variable points to the location of the new server software files you just installed.

Fix any problems that `preupgrade` utility reports.

You can safely ignore any warnings SAP ASE issues about configuration parameters not being set to the default, as these are only for your information.

12. Ensure that the procedure cache size is at least 150 percent of the default procedure cache size, or between 53,248 and 2,147,483,647 2KB pages.
13. If you have enabled the Java in the database feature, create the `sybpcidb` database and disable the feature during the installation.
14. Install SAP ASE into the old SAP ASE directory.

> ⚠ Caution
>
> Do not run the environment variable script more than once.

Related Information

Reenabling Auditing [page 86]
Preparing to Install SAP ASE [page 15]
Upgrade Java in the Database [page 60]

6.6.1 Upgrade Stored Procedures

If you modified any system stored procedures without altering their names, back them up before you upgrade SAP ASE. The upgrade process overwrites these modified procedures with default versions.

6.6.2 Reserved Words

Reserved words are pieces of SQL syntax that have special meaning when used as part of a command.

Transact-SQL does not allow words that are part of command syntax to be used as identifiers unless they are enclosed in quotation marks. If you are upgrading SAP ASE, you see errors when you run queries, stored procedures, or applications that use these identifiers in your user databases.

> ⓘ Note
>
> Before upgrading, use `sp_renamedb` to change the name of any user database that is a reserved word.

If you change an object name, also change applications and stored procedures that refer to that object. Conflicts between object names do not prevent the upgrade process from completing. However, applications that refer to conflicting object names may not work after the upgrade. Rename all objects that use reserved words.

As part of the preupgrade process, you can have `sqlupgrade` and `sqlupgraderes` perform a reserved-word check for you. See the *Reference Manual: Building Blocks* for a complete list of reserved words.

6.6.2.1 Running a Reserved Word Check

Run the reserved word check on the SAP ASE server you are upgrading.

Context

Even if you plan to use `sqlupgraderes` to upgrade SAP ASE noninteractively, you can still first run the interactive `sqlupgrade` utility to perform reserved-word checks and other potential upgrade eligibility problems, and then continue with the upgrade if no problems are found.

Both `sqlupgrade` and `sqlupgraderes` automatically install new reserved words and the `sp_checkreswords` system procedure, which detects and displays identifiers in your existing databases that conflict with reserved words in the new database. You can use `sp_checkreswords` at any time while performing preupgrade tasks.

> **Note**
>
> Do not use an older version of `sp_checkreswords` to check for reserved words, as it does not contain the most current list of reserved words.

Procedure

1. Checking for reserved words generates a list of identifiers that conflict with reserved words, and the owners of those identifiers, in the file `$SYBASE/$SYBASE_ASE/init/logs/sqlupgrade<MMDD.nnn>`. Review this file to determine which identifiers to change.
2. The `sqlupgrade` utility installs `sp_checkreswords` and checks the reserved words during the upgrade.

6.6.2.2 Addressing Reserved Words Conflicts

Change any database names that are reserved words.

Procedure

1. Use `sp_dboption` to set the database to single-user mode, then run `sp_renamedb`, specifying the new name.
2. If other identifiers are reserved words, you can use:
   - `sp_rename` to change the name of the object, before or after the upgrade.
   - Quoted identifiers.

- Brackets around the identifier. For example:

```
create table [table] ( [int] int, [another int] int )
```

3. Run `sp_checkreswords` in `master` and in each user database to display the names and locations of conflicting identifiers.

   See *Reference Manual: Procedures* for information about `sp_dboption`, `sp_rename`, and `sp_checkreswords`.

6.6.2.3 Quoted Identifiers

To avoid reserved word conflicts, all users on the server must invoke the `quoted_identifier` option in all stored procedures and queries that include the reserved words.

To invoke the `quoted_identifier` option of the `set` command in procedures and queries that include the reserved words, enclose the reserved words that are identifiers in double quotation marks. The `set quoted_identifier` option tells SAP ASE to treat any character string enclosed in double quotation marks as an identifier.

See *Reference Manual: Commands* for more information on `set quoted_identifier`.

6.6.3 Preparing the Database and Devices

Before starting the upgrade process, confirm that you have enough space for the upgrade to succeed.

Procedure

1. To calculate the free space required for the upgrade to succeed, double the size of the largest catalog that you are going to upgrade, then add approximately 10 percent. For example, if you have a large number of stored procedures or compiled objects in any database, the `syscomments` and `sysprocedures` system tables require additional space.

   The `preupgrade` utility scans the system catalogs and performs this calculation automatically.
2. If you are:
   - Not using two-phase commit or distributed transaction management (DTM) applications, create a `sybsystemdb` with a minimum of 4MB if it does not already exist.
   - Using two-phase commit or DTM, create either:
     - A minimum-sized `sybsystemdb` for upgrade and expand it later, or
     - A `sybsystemdb` of 5MB to 20MB, depending on your expected usage. Approximately 25 percent of the database should be data storage, and 75 percent should be log storage.

3. If it does not already exist, create the `sybsystemdb` database. Servers that use a 2KB logical page size require a `sybsystemdb` that is at least 4MB. Servers that use a larger logical page size require a `sybsystemdb` that is at least as large as the `model` database:

   ```
   1> create database sybsystemdb on default = '4M'
   2> go
   1> use sybsystemdb
   2> go
   1> sp_create_syscoordinations
   2> go
   ```

   SAP ASE uses this database for tracking transactions, and during recovery. It is also used by applications using two-phase commit and DTM.
4. Verify that the `sybsystemdb` database is large enough. For an upgrade, the default size for `sybsystemdb` is 124MB, or enough free space to accommodate the existing `sybsystemdb` database, and the largest catalog that is to be upgraded, plus 10 percent for logging upgrade changes. You may need more space if you are adding user-defined stored procedures.
5. If you use Java in the database, the `preupgrade` utility detects that you set `sp_configure "enable java"` to `1`, and requests that you enable PCI and configure `sybpcidb` before you upgrade the server.
6. Increase the default database size:
   a. Use `alter database` to increase the size of the `master` database.
      For example:

      ```
      1> alter database tempdb on master=<X>
      2> go
      1> alter database model on master=<X>
      2> go
      ```

      <X> is the megabytes of space you are adding.

      Repeat this process for each temporary and `model` databases, making sure that `model` is at no point larger than `tempdb`.
   b. Use `sp_helpdb` to verify the size of each system database you increase in size.
   c. Use `sp_configure` to update the values as indicated by the `preupgrade` utility.
      This example updates the number of locks available for all users on the SAP ASE server to 6,000:

      ```
      sp_configure 'number of locks', 6000
      ```

6.6.4 The sybprocsdev device

System stored procedures are stored in the `sybsystemprocs` database, which is stored in the `sysprocsdev` device. You may need to increase the size of `sysprocsdev` before upgrading SAP ASE.

Regardless of page size, when configuring a new server, the size of `sybsystemprocs` is:

- Minimum – 184 MB
- Default – 196 MB

For upgrades, you need an additional 10 percent of this.

You may need more space if you are adding user-defined stored procedures.

If your `sybsystemprocs` database does not meet these requirements and you have enough room on the device to expand the database to the required size, use the `alter database` command to increase the database size.

Use:

- `sp_helpdb` to determine the size of the `sybsystemprocs` database:

```
1> sp_helpdb sybsystemprocs
2> go
```

- `sp_helpdevice` to determine the size of the `sysprocsdev` device:

```
1> sp_helpdevice sysprocdev
2> go
```

If the `<db_size>` setting is less than the required minimum, increase the size of `sysprocdev`.

6.6.4.1 Increasing the Size of the sybsystemprocs Database

Create a new database with sufficient space if your current `sybsystemprocs` database does not have the minimum space required for an upgrade. The minimum size of `sybsystemprocs` is 184MB; the recommended size is 196MB.

Prerequisites

Create a current backup of your old database.

Context

Although you can drop the old database and device and create a new `sysprocsdev` device, SAP recommends that you leave the old database and device and add a new device that is large enough to hold the additional memory, and alter the `sybsystemprocs` onto the new device.

Procedure

1. In `isql`, use `alter database` to increase the size of the `sybsystemprocs` database. For example:

```
1> use master
2> go
1> alter database sybsystemprocs on sysprocsdev=40
2> go
```

In this example, "sysprocsdev" is the logical name of the existing system procedures device, and 40 is the number of megabytes of space to add. If the system procedures device is too small, you may receive a message when you try to increase the size of the `sybsystemprocs` database.

If there is space available on another device, expand `sybsystemprocs` to a second device, or initialize another device that is large enough.

2. Verify that the SAP ASE server has allocated more space to `sybsystemprocs`:

```
1> sp_helpdb sybsystemprocs
2> go
```

Results

When the database is large enough to accommodate the increased size of `sybsystemprocs`, continue with the other preupgrade tasks.

6.6.4.2 Increasing Device and Database Capacity for System Procedures

Perform one of these methods if you cannot fit the enlarged `sybsystemprocs` database on the system procedures device. The minimum size of `sybsystemprocs` is 184 MB; the recommended size is 196MB.

Procedure

- Perform this step if the device that contains `sybsystemprocs` is a file on a storage system – where the device is not a raw device, and thus can have its size modified – and there is additional space on the storage system that contains that file.
- Make the existing device larger.
  a. Use `disk resize` to extend the device.

     For example, if `sybsystemprocs` exists entirely on device `sybprocsdev`, and both the device and the database are 124 MB, The desired size of sybsystemprocs is 196 MB:

     ```
     1> disk resize name=sybprocsdev, size='72M'
     2> go
     ```

     This adds the requisite space on `sybprocsdev` (196 MB - 124 MB = 72 MB).
  b. Use `alter database` to increase the size of the database.

     ```
     1> alter database sybsystemprocs on sybprocsdev='72M'
     2> go
     ```

  Your existing device should now be larger.
- Use the following method only if the previous step could not make your existing device larger, as this method drops and re-creates the database.

> **Note**
>
> This procedure removes all stored procedures you have created at your site. Before you begin, save your local stored procedures using the `defncopy` utility. See the *Utility Guide*.

- This procedure involves dropping the database. For more information on `drop database`, see the *Reference Manual*.

  a. Determine which device you must remove:

  ```
  select <d.name>, <d.phyname>
  from sysdevices d, sysusages u
  where u.vstart between d.low and d.high | u.vdevno = d.vdevno
  and u.dbid = db_id("sybsystemprocs")
  and d.status & 2 = 2
  and not exists (select vstart
      from sysusages u2
      where u2.dbid != u.dbid
      and u2.vstart between d.low and d.high | u.vdevno = d.vdevno)
  ```

  Where:

  - `<d.name>` – is the list of devices to remove from `sysdevices`.
  - `<d.phyname>` – is the list of files to remove from your computer.
  - `u.vstart between d.low and d.high` – is the syntax you use for SAP ASE version 12.5.4
  - `u.vdevno = d.vdevno` – is the syntax you use for SAP ASE versions 15.0 and later

  The `not exists` clause in this query excludes devices that are used by `sybsystemprocs` and other databases.

  Make a note of the names of the devices to use in subsequent steps.

  > **Caution**
  >
  > Do not remove any device that is in use by a database other than `sybsystemprocs`, or you will destroy that database.

  b. Drop `sybsystemprocs`:

  ```
  1> use master
  2> go
  1> drop database sybsystemprocs
  2> go
  ```

  c. Remove the device:

  ```
  1> sp_configure "allow updates", 1
  2> go
  1> delete sysdevices
      where name in ("<devname1>", "<devname2>", ...)
  2> go
  1> sp_configure "allow updates", 0
  2> go
  ```

  The `where` clause contains the list of device names returned by the query in step 1.

  > **Note**
  >
  > Each device name must have quotes. For example, "`<devname1>`", "`<devname2>`", and so on.

If any of the named devices are OS files rather than raw partitions, use the appropriate OS commands to remove those files.

d. Remove all files that were returned in the `<d.phyname>` list.

> **Note**
>
> File names might not be complete path names. If they are relative paths, note that they are relative to the directory from which your server was started.

e. Find another existing device that meets the requirements for additional free space, or use a `disk init` command similar to the following to create an additional device for `sybsystemprocs`, where `/sybase/work/` is the full, absolute path to your system procedures device:

```
1> use master
2> go
1> disk init
2> name = 'sysprocsdev',
3> physname = '/sybase/work/sysproc.dat',
4> size = '200M'
5> go
```

The size you provide should be the number of megabytes of space needed for the device, multiplied by 1024. `disk init` requires the size to be specified in 2KB pages. In this example, the size is 200 MB (200 x 1024 = 204,800). For more information on `disk init`, see the *Reference Manual: Commands*.

f. Create a `sybsystemprocs` database of the appropriate size on that device, for example:

```
1> create database sybsystemprocs on sysprocsdev = 180
2> go
```

g. In the old server installation directory, enter:

```
isql -Usa -P<password> -S<server_name> -i$SYBASE/ASE-16_0/scripts/
installmaster
```

6.6.5 SYBSHUTWAIT and SYBBOOTWAIT Environment Variables

Use `SYBSHUTWAIT` and `SYBBOOTWAIT` to extend the default timeout periods when SAP ASE utilities take longer than expected to shut down or start a server during an upgrade or server creation.

- `SYBSHUTWAIT` — controls how long the utility waits for the server to shut down before proceeding.
- `SYBBOOTWAIT` — controls how long the utility waits for each database to complete recovery after the server starts.

SYBSHUTWAIT

Set `SYBSHUTWAIT` when an upgrade, configuration, or server creation utility fails because it could not confirm that the server shut down within the expected time. This can occur on systems where the server takes longer than usual to complete an orderly shutdown, for example when there are many open connections or large amounts of in-flight work to roll back.

Syntax:

```
setenv SYBSHUTWAIT <seconds>
```

The value is in seconds. Set the variable before running the utility.

SYBBOOTWAIT

Set `SYBBOOTWAIT` when an upgrade fails with a message such as:

```
Database '<dbname>' recovery completion check failed. Database '<dbname>' is
offline One or more databases are offline. Those databases will not upgrade now.
```

This indicates that one or more databases took longer to recover than the default timeout period allows. The upgrade utility marks those databases as offline and continues, which means they are not upgraded in the current session.

Syntax:

```
setenv SYBBOOTWAIT <seconds>
```

The value is in seconds. Set the variable before running the utility.

Note that:

- The value applies per database, not to the total recovery time for all databases.
- If `SYBBOOTWAIT` is not set, the utility uses a default timeout of 5 minutes per database.
- If a database does not come online within the configured timeout, the utility issues a timeout error.

The following utilities support the `SYBSHUTWAIT` and `SYBBOOTWAIT` environment variables:

- `srvbuild`
- `srvbuildres`
- `sqlupgrade`
- `sqlupgraderes`
- `updatease`

6.7 Upgrade to SAP ASE 16.1 SP00 PL02

If you are performing a major upgrade from a version earlier than 16.1, and you successfully run the `preupgrade` utility to test upgrade eligibility (verifying that you have enough free space in databases, there are no reserved word conflicts, and so on), you can upgrade the server, using `sqlupgrade` or `sqlupgraderes`.

6.7.1 Upgrading Interactively Using sqlupgrade

Use the interactive `sqlupgrade` tool to upgrade SAP ASE using an X-Windows or Motif GUI.

Prerequisites

Set the OLDSYBASE_ASE variable to the SYBASE_ASE that is appropriate to your older server. If you are upgrading from 16.0, for example, OLDSYBASE_ASE should be `ASE-16_0`.

We recommend that you also set the OLDSYBASE, and OLDSYBASE_OCS environment variables to point to the older version installation of SAP ASE, so the upgrade utility that you run from the new $SYBASE directory automatically populates input fields with the correct information as you upgrade.

If you have not already done so, source the `$SYBASE/SYBASE.csh` file on C shell (`SYBASE.sh` for the Bourne shell) before running `sqlupgrade`.

The `sqlupgrade` utility automatically restarts the server you are upgrading.

Procedure

1. Verify that you have backed up databases, devices, and so on, and click *Next*.
2. Enter:

   ```
   $SYBASE/$SYBASE_ASE/bin/sqlupgrade
   ```

   The available command options for `sqlupgrade` are:
   - `-s <sybase_dir>` – specifies the value to use for the SYBASE environment variable.
   - `-r <resource_file>` – executes the specified resource file.
   - `-D <data_directory>` – specifies a working directory that differs from the default $SYBASE directory. This allows users other than the sa to configure and use SAP ASE without the need to have access permission to the $SYBASE directory. If you do not use `-D`, SAP ASE uses $SYBASE as the default.
   - `-v` – prints the version number and copyright message for `sqlupgrade` and then exits.
3. In the Specify SAP ASE Directories dialog, enter:
   - The full path of the new SAP ASE release directory.
   - The full path of the data directory for the new SAP ASE release directory. This field allows you to specify a working directory that differs from the default $SYBASE directory, which allows users other than the sa to configure and use SAP ASE without the need to have access permission to the $SYBASE directory.
   - The name of the component directory that contains the new SAP ASE version.
   - The full path of the old release directory.
   - The name of the component directory that contains the earlier version of SAP ASE.
   - The name of the component directory that contains the earlier version of Open Client/Server Library.

   Click *OK*.

4. Select the server to upgrade from the list of servers.
5. Enter the password for the sa login, then click *OK*.
6. Specify an upgrade option, then click *OK*. `sqlupgrade` performs a preupgrade review to verify that your current server meets the requirements for upgrade to the new version.

   If your current server fails the preupgrade review, fix the problem based on the information from the results of the test.
7. Click *OK* to upgrade your server.

   You see the Status Output window, which shows the completion status and informational messages about the upgrade process.

   > ⚠ Caution
   >
   > Do not interrupt the upgrade, connect to SAP ASE, or run any stored procedures while the upgrade is in progress.

   You can also check progress by viewing the `sqlupgrade` log in `$SYBASE/$SYBASE_ASE/init/logs/sqlupgrade<MMDD>.<NNN>`, where:
   - `<MM>` – is the month.
   - `<DD>` – is the date.
   - `<NNN>` – is a three-digit number identifying the `sqlupgrade` server upgrade session.

   After all preupgrade checks are successful, `sqlupgrade` shuts the old server down, then starts the new SAP ASE `dataserver` binary on the old `master` device.

Results

When the upgrade succeeds, you can:

- Click *OK* to specify another server to upgrade, or
- Exit `sqlupgrade` and perform post-upgrade tasks.

The upgrade process:

- Creates the `RUN_servername` file, which contains the information required to restart the server
- Runs the `installmaster` script to create system procedures

To verify that the upgrade was successful, log in to the server and run:

- `select @@version` – SAP ASE should return `16.1`.
- `sp_configure "upgrade version"` – SAP ASE should return `16100000`.

6.7.2 Upgrading Noninteractively Using sqlupgraderes

You can upgrade SAP ASE without the graphical user interface (GUI), in noninteractive mode by using values from a resource file that defines the attributes for the server to be upgraded.

Prerequisites

Set the OLDSYBASE_ASE variable to the SYBASE_ASE that is appropriate to your older server. If you are upgrading from 16.0 for example, OLDSYBASE_ASE should be `ASE-16_0`.

In addition, set the OLDSYBASE, and OLDSYBASE_OCS environment variables to point to the older version installation of SAP ASE. The upgrade utility that you run from the new `$SYBASE` directory populates input fields with the correct information as you upgrade.

Source `SYBASE.csh` before running `sqlupgraderes` if you have not already so.

The `sqlupgraderes` utility automatically restarts the server you are upgrading.

Procedure

1. Edit the sample resource file included in your SAP ASE distribution in `$SYBASE/$SYBASE_ASE/init/sample_resource_files`. Use a text editor to edit the resource file.
2. Execute `sqlupgraderes` by entering the following at the UNIX prompt, where `<resource_file>` specifies the resource file containing the attributes that describe the server to upgrade:

   ```
   $SYBASE/$SYBASE_ASE/bin/sqlupgraderes -r <resource_file>
   ```

   The available command options for `sqlupgraderes` are:
   - `-s <sybase_dir>` – specifies the value to use for the SYBASE environment variable. •
   - `-r <resource_file>` – executes the specified resource file.
   - `-D <data_directory>` – specifies a working directory that differs from the default $SYBASE directory. This allows users other than the sa to configure and use SAP ASE without the need to have access permission to the $SYBASE directory.
   - `-v` – prints the version number and copyright message for sqlupgraderes and then exits.

   Running the `sqlupgraderes` utility creates a new file containing the values you specified for the upgrade session, and writes it to the `sqlupgradeMMDD.NNN-server_name.rs` file in `$SYBASE/$SYBASE_ASE/init/logs/`.

   Where:
   - `<server_name>` – is the server you are upgrading.
   - `<MM>` – is the month.
   - `<DD>` – is the date.
   - `<NNN>` – is a three-digit number identifying the `sqlupgrade` session.

If the resource file you are modifying was created by `sqlupgrade`, the prefix of the attribute name may vary. `sqlupgraderes` ignores this prefix when processing the resource file. The attributes and their default values are:

- `sybinit.release_directory` – $SYBASE [`<path = _name_of_old_release>`]
- `sybinit.product` – sqlsrv
- `sqlsrv.server_name` – `<server_name>`
- `sqlsrv.new_config` – no default value
- `sqlsrv.sa_login` – `<current_login>`
- `sqlsrv.sa_password` – `<current_password>`
- `sqlsrv.do_upgrade` – Yes
- `sqlsrv.do_reserved_word_check` –Yes

All attributes are required, and all values are case-sensitive.

6.7.3 Major Upgrade from Versions Before 16.1 Manually

You can upgrade manually from a major release earlier than 16.1 without using a wizard or utility.

Prerequisites

- Source the old `SYBASE.csh` or `SYBASE.sh` file.
- Start the old SAP ASE server.
- Source the new `SYBASE.csh` or `SYBASE.sh` file.
- Run `$SYBASE/ASE-16_1/bin/preupgrade`.
- Run `sp_encryption 'mkey_startup_file'`.
  If the output of this command specifies the default path of the master key startup file, such as `$SYBASE/$SYBASE_ASE/init/ase_encrcols_mk_<<server_name>>.dat`, within the release directory of the older version or in a location that will become inaccessible after the upgrade, follow these steps:
  1. Copy the master key startup file to a suitable location, such as the release directory of the latest version or a location that won't be affected by the upgrade cleanup.
  2. Reset the master key startup file using the `sp_encryption` procedure.
- If the old SAP ASE will become obsolete, follow these steps:
  1. Copy the certificate files from the old release to the new release location.
  2. In the old version of SAP ASE, execute the following command to remove the certificate:

     ```
     sp_ssladmin 'dropcert', '<certificate_path_old_release>'
     ```
  3. In the new version of SAP ASE, add the certificate for the new location:

     ```
     sp_ssladmin 'addcert', '<certificate_path_new_release>', '<password>'
     ```
  4. Refresh the certificate:

     ```
     sp_ssladmin 'refreshcert'
     ```

Context

To upgrade SAP ASE manually, use the `upgrade.exe` executable located in `$SYBASE/ASE-16_1/bin`.

Procedure

1. Copy the interfaces file from old installation directory to new directory if they are not the same.
2. Copy the `<server_name>.cfg` file from old directory to the new `$SYBASE` directory.
3. Copy `RUN_server_name` file in old `$SYBASE/$SYBASE_ASE/install` directory to the new `$SYBASE/ASE-16_1/install`
4. Update the paths in the `RUN_server_name` file located in `$SYBASE/ASE-16_1/install`.
5. Source the `SYBASE.csh` or `SYBASE.sh` file in the new directory.
6. Start SAP ASE by executing the new `RUN_server_name` file.
7. Run `upgrade.exe`. If problems occur, fix them, and re-run the upgrade process.
8. Run `updatease.exe` to reinstall the SAP ASE-supplied stored procedures and update the system catalogs. This prevents errors caused by changes to the system catalogs.

6.8 Upgrading in Silent Mode

To perform a silent, or unattended installation, run the installer and provide a response file that contains your preferred installation configuration.

Procedure

1. Create a response file during a console or GUI upgrade:

   ```
   setup.bin -r <response_file_for_upgrade>
   ```

2. If you are upgrading to SAP ASE 16.1 SP00 PL02 from SAP ASE 16.0 or later, set the following properties in the response file to **`true`**:

Property	Description
`DO_UPDATE_INSTALL`	When you set `DO_UPDATE_INSTALL` to **`true`**, the installer reviews and updates the installed components in `$SYBASE`.
`DO_UPDATE_ASE_SERVER`	(Optional) When you set `DO_UPDATE_ASE_SERVER` to **`true`**, the installer installs (or reinstalls) system procedures, messages, scripts, and so on in the SAP ASE instance.

Property	Description
	DO_UPDATE_ASE_SERVER is valid only if you set DO_UPDATE_INSTALL to true. The DO_UPDATE_ASE_SERVER property requires that you also set: • UPDATE_ASE_SERVER_NAME_[<n>]=<SAP_ASE_name_to_update> • UPDATE_ASE_PASSWORD_[<n>]=<SAP_ASE_password> – if the SAP ASE password is null, set this value to "NA". For example: DO_UPDATE_ASE_SERVER=true UPDATE_ASE_SERVER_NAME_1=SYBASE1 UPDATE_ASE_PASSWORD_1=NA UPDATE_ASE_SERVER_NAME_2=SYBASE2 UPDATE_ASE_PASSWORD_2=NA You also can set UPDATE_ASE_SERVER_NAME_[<n>] and UPDATE_ASE_PASSWORD_[<n>] property values through the UPDATE_ASE_SERVER_NAME_[<n>] and UPDATE_ASE_PASSWORD_[<n>] environment variables. If you choose to update the SAP ASE instance manually after the installation, you need not set DO_UPDATE_ASE_SERVER.

3. Run:

```
setup.bin –f <response_file_for_upgrade> -i silent
-DUSER_INSTALL_DIR=<install_location> -DAGREE_TO_SAP_LICENSE=true
```

where:

- <response_file_for_upgrade> – is the absolute path of the file name containing the upgrade options you chose.
- <install_location> – is the directory in which you are upgrading SAP ASE.

Agree to the SAP License Agreement when upgrading in silent mode using one of these methods:

- Include the option -DAGREE_TO_SAP_LICENSE=true in the command line argument
- Edit the response file to include the property AGREE_TO_SAP_LICENSE=true.

Except for the absence of the GUI screens, all actions of InstallAnywhere are the same, and the result of an upgrade in silent mode is exactly the same as one done in GUI mode with the same responses.

Related Information

Installing SAP ASE Using a Response File [page 35]
Installing in Silent Mode [page 37]

6.9 Postupgrade Tasks

After you have upgraded, make sure your new SAP ASE server is up and running.

Context

The upgrade process does not cause any changes in existing statistics, so you need not run `update statistics` on any tables after the upgrade.

Procedure

1. To explicitly re-compile the objects, run `dbcc upgrade_object()` for each database.
2. If you have any system stored procedures that you had saved from before the upgrade (because you had modified them without altering their names), reload them now.
3. Execute:

   ```
   dbcc gam (<dbname>,0,0,'check')
   ```

   This command performs upgrade operations on `text` and `image` columns that are deferred during the SAP ASE upgrade process, and prevents `dbcc checkstorage` from taking a long time when it is run for the first time after the upgrade.

Related Information

Restoring Functionality in SAP ASE After Upgrading [page 85]
How Compiled Objects Are Handled When Upgrading SAP ASE [page 95]

6.9.1 Running the instmsgs.ebf Script

Run message-related scripts after upgrading from version 16.0 to version 16.1 SP00 PL02.

Procedure

1. If you upgraded from SAP ASE version 16.0 SP releases, run `uninstmsgs.ebf` to safeguard your modified messages in the `master` database before you install the default version 16.1 SP00 PL02 messages:

   ```
   isql -Usa -P<password> -w1000 -iuninstmsgs.ebf -orestoremsgs.ebf
   ```

2. Run `instmsgs.ebf` to install the default 16.1 SP00 PL02 messages:

   ```
   isql -Usa -P<password> -iinstmsgs.ebf
   ```

   > **Note**
   >
   > To undo `instmsgs.ebf` changes, run this script once you have downgraded to the version from which you upgraded:
   >
   > ```
   > isql -S -Usa -P<password> -irestoremsgs.ebf
   > ```

3. If you use localized files, install any localized language using `langinstall`, `sqlloc`, or `syconfig`.

   If you run `instmsgs.ebf` after installing the 16.1 SP00 PL02 localized messages, this script may delete some new messages.

6.9.2 Correcting Text and Image Errors

Databases that contain text or image columns from versions of SAP ASE earlier than 12.0 are known to have garbage flags in the text/image status area on text/image pages. These garbage flags may cause errors or data corruption after you upgrade the database to later versions.

Determine Whether the Database Contains Text or Image Columns

Determine whether the earlier-than-12.0 database contains text or image columns. These column types are indicated in the system table `syscolumns` with a value of 34 for image and 35 for text. If the database does not contain text or image columns, no further steps are needed.

Accelerate `dbcc checkdb`

If most of the tables in your database do not contain text or image columns, use the following command to skip checking on those tables and only check tables that have text and image columns:

```
dbcc checkdb(dbid | dbname [, "skip_tables_with_no_text" ])
```

Find Errors and Possible Corruption

If the database does contain text or image columns, follow these steps to determine if there are errors and possible corruption.

1. Execute:

   ```
   1> use <database_name>
   2> go
   1> select name from sysobjects where id in
   2> (select id from syscolumns where type = 34 or type = 35)
   3> go
   ```

2. Using the latest SAP ASE version, run the following on each database to detect garbage flags:

   ```
   1> dbcc checkdb(dbname, skip_ncindex)
   2> go
   ```

   If `dbcc checkdb` reports 12918 errors as shown below, the database contains garbage flags and must be fixed. If the database does not report these types of errors, no further steps are needed.

   ```
   Flags (0x%x) in Text/Image/Unitext Page Status Area on text page %u
   (partition id %d) does not match the attribute of text page
   chain starting from page %u. Run DBCC REBUILD_TEXT to fix it.
   ```

Fixing Garbage Flags on a Database Where a Cross-Platform Dump and Load Has Not Been Performed

If the database contains garbage flags, and you have never performed a cross-platform dump and load on the database, correct the garbage flags by executing the appropriate command.

- If error 12918 is reported for several tables, correct garbage flags for all tables in a database by executing.

  ```
  dbcc rebuild_text('all')
  ```

- If error 12918 is reported for a limited number of tables, correct garbage flags on specified tables by executing:

  ```
  dbcc rebuild_text('table_name')
  ```

- If error 12918 is reported for only one table, correct garbage flags on the specified columns in a table by executing:

```
dbcc rebuild_text('table_name', 'column_name')
```

Fixing Garbage Flags on a Database Where a Cross-Platform Dump and Load Has Been Performed

> **Note**
>
> In 15.7 SP110 or later, this issue has been fixed and a cross-platform database load does not corrupt text or image data even if there are garbage flags.

- If the database contains garbage flags and you have performed a cross-platform database load on either:
  - Version 15.0 ESD#2 or later, but before version 15.0.2, or,
  - Version 15.0.2 or later, and the source database version (the version on the source platform where the dump file was generated) is 15.0 or later,

  Then run `dbcc rebuild_text` with the `repairtext` option. The `repairtext` is the 5th parameter and should be set to a value of 1. For example:

```
dbcc rebuild_text('all' | 'table_name', 'column_name' | null, null, null, 1)
```

  The `repairtext` option repairs corrupted text and image data caused during a cross-platform database load by garbage flags. This `repairtext` option prints each page number in the error log for the text/image data that is repaired.

  > **Note**
  >
  > If you run the `dbcc rebuild_text` command with the `repairtext` option on a database that contains garbage flags but on which a cross-platform database load was never performed, or if a cross-platform database load was performed on a version 15.0.2 or later from a source database version prior to 15.0, this command will corrupt correct text and image data by byte-swap. Make sure you are aware of the version on which a cross-platform database load was performed and the source database version.

- If the cross-platform database load was performed on 15.0.2 or later (12.5.3, or 12.5.4) and the source database version (the version on the source platform where the dump file was generated), is earlier than 15.0 (for example 12.5, or 12.5.3), correct the garbage flags by executing the appropriate command.
  - If error 12918 is reported for several tables, correct garbage flags for all tables in a database by executing:

```
dbcc rebuild_text('all')
```

  - If error 12918 is reported for a limited number of tables, correct garbage flags on specified tables by executing:

```
dbcc rebuild_text('table_name')
```

- If error 12918 is reported for only one table, correct garbage flags on the specified columns in a table by executing:

  ```
  dbcc rebuild_text('table_name', 'column_name')
  ```

6.9.3 Restoring Functionality in SAP ASE After Upgrading

Restore functionality in the server after an upgrade.

Procedure

1. If you changed any configuration parameters before upgrading, use `sp_configure` to set them back to their earlier values.
2. Use `sp_dboption` to reset any database options you disabled before upgrading.
3. Before you use the upgraded server, verify that all custom scripts point to SAP ASE 16.1 SP00 PL02.
4. Verify procedure cache allocation. The size should be the same as before upgrading, unless the original size was smaller than the default value.
5. Verify data cache allocation.

   During the upgrade process, the server ensures that the default data cache size remains the same. Therefore, during the preupgrade process before the upgrade, the size of the default data cache is obtained and written to the configuration file as an absolute value, not as a default. This enables the server to have the same default data cache size as before the upgrade. If this size is less than the default size of 8MB, the server allocates a default data cache of 8MB.
6. If you unmirrored devices, remirror them using the `disk remirror` command.
7. If you used compiled objects, see How Compiled Objects Are Handled When Upgrading SAP ASE [page 95].
8. If you used two-phase commit in the earlier version of SAP ASE, run the script to install the two-phase commit tables:

   ```
   isql -U<sa> -P<sa_password> -S<server_name>
     -i$SYBASE/$SYBASE_ASE/scripts/installcommit
   ```

Related Information

Postupgrade Tasks [page 81]
How Compiled Objects Are Handled When Upgrading SAP ASE [page 95]

6.9.4 Reenabling Auditing

If the server you upgraded from was configured for auditing, reenable auditing in the upgraded server.

Procedure

1. Enter:

   ```
   sp_configure 'auditing', 1
   ```

2. Reenable auditing for all system stored procedures for which auditing was enabled before the upgrade.
   a. Use the output of `sp_displayaudit` recorded during the preupgrade process to identify the system stored procedures for which auditing was enabled.
   b. Reenter the audit options using `sp_audit`. For example, if you had enabled stored procedure auditing for `sp_addgroup` stored procedure in your server before upgrading, run:

      ```
      sp_audit "exec_procedure", "all", "sp_addgroup", "on"
      ```

Related Information

Preupgrade Tasks [page 64]
Preparing to Install SAP ASE [page 15]
Upgrade Java in the Database [page 60]

6.9.4.1 Updating Threshold Procedures for Audit Segments

An post-upgrade task is required for threshold procedures used to archive audit segments.

If your previous installation used a threshold procedure, similar to this, execute the following to archive the `<sysaudits>` table:

```
INSERT MyPre161SysAuditHistoryTable SELECT * FROM
sysaudits_0n
```

where `<n>` corresponds to the `sysaudits` table number 1–8 and `MyPre161SysAuditHistoryTable` is a table defined prior to version 16.1, then you must alter `MyPre161SysAuditHistoryTable` to add a `nodeid` column using:

```
alter table MyPre161SysAuditHistoryTable
    add nodeid tinyint NULL
```

See the *Reference Manual: Tables* for system tables for details about the `sysaudits` tables.

6.9.5 Restoring Permissions on System Stored Procedures

If the server you upgraded from had site-specific permissions on system stored procedures, restore those permissions in the upgraded server.

6.10 Migrate From 32-Bit to 64-Bit

You can migrate from 32-bit to 64-bit versions on different computers or partitions.

To migrate SAP ASE from the 32-bit to the 64-bit version, first install and configure the 64-bit operating system.

To migrate, you can:

- Use `dump` and `load`.
- Use the `bcp` utility.
- Replace the binary.

6.10.1 Migrating Data Using a Dump-and-Load Method

To perform migrations, back up and restore databases using the `dump` and `load` commands.

Procedure

1. In the 32-bit SAP ASE server, run `dbcc` checks (`checkdb`, `checkalloc`, `checkcatalog`, and `checkstorage`) on all databases in the 32-bit SAP ASE server to ensure they are error free.
2. Create a 64-bit server in a new directory.
3. Create devices and databases to match those in the 32-bit server. Make sure the `<sysusages>` mapping is correct.

   > **Note**
   >
   > Allow 10 percent additional space for the `sybsystemprocs` database.
4. Dump the databases from the 32-bit server.
5. Load the databases to the 64-bit server.
6. If you have partitioned tables, update partition statistics.
7. Run `dbcc` checks on the 64-bit server and make sure they run cleanly.

   For information on upgrading compiled objects, see Finding Compiled Object Errors Before Production [page 96].

6.10.2 Migrating Data Using bcp

If you use DDL scripts to create devices, databases, tables, rules, stored procedures, triggers, and views, you can use `bcp` to migrate data from a 32-bit SAP ASE to a 64-bit SAP ASE.

Context

If you:

- Do not have DDL scripts, use the `ddlgen` utility to re-create the schema for the SAP ASE you are about to migrate. See the *Utility Guide*.
- Have DDL scripts to create devices, databases, tables, rules, stored procedures, triggers, and views, you can use `bcp` to move data out of the old database and into the new.

Procedure

1. In the 32-bit SAP ASE, run `dbcc` checks (`checkdb`, `checkalloc`, `checkcatalog`, and `checkstorage`) on all databases in the 32-bit SAP ASE to ensure they are error free.
2. Use `bcp` to extract all the data from all the tables in the databases.
3. Create a new 64-bit SAP ASE in a new directory.
4. Create devices, databases, and tables.
5. Use `bcp` to bulk copy data into tables.
6. Re-create all views, triggers, and stored procedures.
7. Run `dbcc` checks on the 64-bit SAP ASE server and make sure they run cleanly.

6.10.3 Migrating Data by Replacing the Binary

Migrate data from a 32-bit server to a 64-bit server by replacing the binary.

Procedure

1. In the 32-bit SAP ASE, run `dbcc` checks (`checkdb`, `checkalloc`, `checkcatalog`, and `checkstorage`) on all databases in the 32-bit SAP ASE to ensure that they are error free.
2. Copy the files for the 64-bit SAP ASE into a new directory.
3. Shut down the 32-bit server.
4. Copy the `interfaces` file and the configuration file from the 32-bit $SYBASE directory to the 64-bit $SYBASE directory.

5. Copy the 32-bit `$SYBASE/$SYBASE_ASE/install/RUN_<server>` file to the equivalent 64-bit `$SYBASE/$SYBASE_ASE/install` directory.
6. Edit the `RUN_server` file to reflect the new location of the `interfaces`, configuration, and log files.
7. Remove all references to the 32-bit `$SYBASE` directories from your `<$PATH>` definition.
8. Change to the 64-bit `$SYBASE` directory and source the `SYBASE.csh` script (C shell).
9. Change to the 64-bit `$SYBASE/$SYBASE_ASE/bin` directory and execute:

   ```
   startserver -f < RUN_server>
   ```
10. After the 64-bit server starts, run `installmaster`, `installmodel`, and `instmsgs.ebf`.
11. If you used `dbccdb` for `dbcc checkstorage`, run `installdbccdb`. This re-creates tables in the `dbccdb`. This may cause you to lose data.
12. Drop and re-create the compiled objects, such as stored procedures, triggers, views, and defaults.
13. If you have partitioned tables, update partition statistics.
14. Run `dbcc` again on all databases to verify that they run cleanly.

6.11 SAP ASE Components and Related Products

After you finish upgrading SAP ASE, upgrade its components and related products.

Refer to *Using SAP Failover in a High Availability System* for instructions on how to upgrade an SAP ASE configured with high availability.

6.11.1 Upgrading Job Scheduler

After upgrading to a new SAP ASE server, upgrade Job Scheduler.

Context

> **Note**
>
> You must have `$SYBASE/$SYBASE_OCS/bin` directory in `$PATH` so the `isql` executable is accessible. Use `isql` to perform all the steps in this task.

Procedure

1. Copy the directory services entry for JSAGENT (or jsagent) from the old server to the new server.
2. Make sure the new server is running.

3. Ensure that at least 9000 locks are configured. If the number of locks on the server is fewer than 9000, increase it:

```
1> sp_configure "number of locks", 9000
2> go
```

4. Before you restart the SAP ASE server and run Job Scheduler, run the `installjsdb` script to Job Scheduler tables and stored procedures:
   a. Disable Job Scheduler:

```
1> sp_configure "enable job scheduler", 0
2> go
1> sybmgmtdb..sp_sjobcontrol @name=NULL, @option="stop_js"
2> go
```

   b. Run the `installjsdb` script:

```
isql –Usa –Psa_password –S<servername>
–i$SYBASE/$SYBASE_ASE/scripts/installjsdb
```

> **Note**
>
> The directory with the `isql` executable (`$SYBASE/$SYBASE_OCS/bin`) must be in your path.

   The `installjsdb` script looks for the `sybmgmtdb` database.
   c. Enable Job Scheduler:

```
 sp_configure "enable job scheduler", 1
```

   d. To start Job Scheduler, either restart the server, or enter:

```
1> use sybmgmtdb
2> go
1> sp_sjobcontrol @name=NULL, @option="start_js"
2> go
```

5. Restart the SAP ASE server if you restarted Job Scheduler manually.
6. (Optional) Add more log space. Some 64-bit platforms require additional space for the `sybmgmtdb` log:

```
1> use master
2> go
1> alter database sybmgmtdb LOG on sybmgmtdev=20
2> go
```

7. To upgrade `sybmgmtdb`, run the `installjsdb` script that is included, saving the output to a file:

```
isql -Usa -P<sa_password> -S<servername> -n -i$SYBASE/$SYBASE_ASE/scripts/
installjsdb
-o<output_file>
```

> **Note**
>
> When upgrading to SAP ASE version 16.1 SP00 PL02 from earlier versions, make sure that the size of `sybmgmtdb` is at least 160 MB, so that it has at least 60 MB of free log space.

6.11.1.1 Upgrading Job Scheduler Templates

After upgrading to the new server, upgrade the templates and jobs created by Job Scheduler.

Context

> **Note**
>
> Several changes impact the Job Scheduler templates. These changes make some templates incompatible with earlier versions of the server. The current templates are version 3.0 in the XML files.

Procedure

1. Disable Job Scheduler.
2. Upgrade any environment variables, scripts, or applications that refer to the Job Scheduler directory path. The Job Scheduler directory is under the `ASE-16_1` directory, in `$SYBASE/$SYBASE_ASE/jobscheduler` .

   Directories below `jobscheduler` remain the same.
3. Copy files from the `jobscheduler` directory to the `ASE-16_1` directory. If you are installing the new server directories over the old server directories, the installer automatically moves your files to the new `jobscheduler` directory.
4. If you modified SAP-supplied templates, stored procedures, or XML documents, do not overlay the new templates with your modified versions. If you do, you lose the enhancements provided by the revised templates. Carefully merge your template changes into the SAP template files, or better yet, rename your modified templates.
5. You may need to make minor modifications to jobs you created from 2.0 or earlier templates. In some templates, parameters changed from `varchar(5)` to `int`. The following table lists the templates that changed in version 2.1 and the changes you must make to the SQL code in the jobs created from the templates.

   Table 8: Changed Job Scheduler Templates

Template	Modified Files	Datatype for <parameter> Changed from varchar(5) to int
`dump database`	`jst_dump_databases`	`@use_srvr_name`
`dump database log`	`jst_dump_log`	`@truncate_flag` and `@use_srvr_name`
`update statistics`	`jst_update_statistics`	`@index_flag`

Template	Modified Files	Datatype for <parameter> Changed from varchar(5) to int
rebuild indexes	jst_reorg_rebuild_indexes	@dump_flag
rebuild table	jst_reorg_rebuild_tables	@dump_flag
reclaim indexes	jst_reclaim_index_spac	@dump_flag
reclaim tables	jst_reclaim_table_space	@resume_flag

6. Some Job Scheduler templates have been modified to support new server functionality. These changes are related to new parameters for specifying a partition name, or a data change value for the new server commands that added these options. If you have jobs created from any of the enhanced templates, modify the SQL of the jobs for the 16.1 SP00 PL02 servers.

   If you have a job scheduled to run on a pre-16.0 server and you need it to also run on 16.1 SP00 PL02 servers, leave the existing job alone and create a new job for pre-16.0 servers, as the job commands are different.

   You need not modify any jobs you run on pre-16.0 servers. The following table lists the templates that changed in version 3.0 and the changes you must make to jobs created from them.

   Table 9: Modified Job Scheduler Templates

Template	Modified File	Change Description	Job Modifications
delete statistics	jst_delete_statistics	Added @ptn_name as third parameter.	Optional.
update statistics	jst_update_statistics	Added @ptn_name as fifth parameter, @datachg_threshold as the 10th parameter, and added reference.	Required. Include values (or NULL) for new parameters.
rebuild indexes	jst_reorg_rebuild_indexes	Added @ndx_ptn_name as third parameter.	Required. Include value (or NULL) for new parameter.
reclaim indexes	jst_reclaim_index_space	Added @ptn_name as third parameter.	Required. Include value (or NULL) for new parameter.
reclaim tables	jst_reclaim_table_space	Added @ptn_name as second parameter.	Required. Include value (or NULL) for new parameter.
multiple	jst_get_freespace, jst_get_usedspace	Replace reserved_pgs and data_pgs with reserved_pages and data_pages.	No impact on job SQL.

7. Install the template stored procedures and move them to the Job Scheduler template stored procedure directory. For example:

```
cd $SYBASE/$SYBASE_ASE/jobscheduler/Templates/sprocs
```

Run the stored procedure installation script for each server being updated:

```
installTemplateProcs <<servername>> <<username>> <<password>>
```

> **Note**
>
> Upgrade template stored procedures on all Job Scheduler servers and target servers that are updated to SAP ASE version 16.1 SP00 PL02.

8. Install and move the template XML documents into the JS template XML directory. For example:

```
cd $SYBASE/$SYBASE_ASE/jobscheduler/Templates/xml
```

9. Before running the `installTemplateXml` XML installation script, set the SYBASE_ASE_SA_USER environment variable and SYBASE_ASE_SA_PWD variable in the `SYBASE.csh` file before running the XML installation script:
10. Run the XML installation script on 16.1 SP00 PL02 servers with Job Scheduler installed:

```
installTemplateXml <servername> <machinename> <serverport>
    <username> <password> [<language_code>]
```

Use "en" for the `<language_code>` or omit the parameter completely, as "en" is the default.

> **Note**
>
> Upgrade template XML documents on all Job Scheduler servers updated to SAP ASE version 16.1 SP00 PL02. Do not install them on pre-16.0 servers or servers where Job Scheduler is not installed.

6.11.2 Upgrading Java in the Database

If Java in the database functionality is currently enabled, you must run the `installpcidb` script, which creates tables and stored procedures in the `sybpcidb` database.

Procedure

1. Use `isql` to run the `installpcidb` script, saving the output to an operating system file.

```
isql -Usa -P<<sa_password>> -S<<server_name>>
  -i$SYBASE/$SYBASE_ASE/scripts/installpcidb -o<<output_file>>
```

2. Enable the Java in the database functionality:

```
1> sp_configure 'enable pci', 1
2> go
1> sp_configure 'enable java', 1
2> go
```

You may need to increase `'max memory'` to enable these parameters. Restart the server for changes to take effect. You can configure the maximum size of the PCI bridge memory pool through the `'pci memory size'` configuration parameter. For more information, see *Java in Adaptive Server Enterprise*.

6.11.2.1 Enabling Java in the Database in a High Availability System

You can use the Java in the database feature on a system that also uses high availability.

Context

Drop high availability companionship before installing the `sybpcidb` database, and reestablish companionship afterwards.

Java in the database functionality must be either enabled or disabled on both nodes of the high availability system.

6.11.3 Upgrading Backup Server

You can upgrade Backup Server at any point after you upgrade SAP ASE using similar steps. XP Server does not have a formal upgrade process.

Procedure

1. If you are:

Option	Description
Upgrading during the initial server installation	Select: • *Upgrade Existing Servers* when the installer prompts • *Upgrade SAP ASE Server and Backup Servers* This launches the `sqlupgrade` utility. Click *OK*.
Upgrading after the initial installation	Start the `sqlupgrade` utility from the command line. Enter: `$SYBASE/$SYBASE_ASE/bin/sqlupgrade`

2. Perform the upgrade steps as prompted.

6.11.4 Updating Databases Using Dump and Load

You can perform an indirect, step-wise update of SAP ASE databases and transaction logs from versions of SAP ASE as early as 16.0 using the `dump` and `load` commands. Be sure to follow the appropriate update path when performing the dump and load.

Context

Update recommendations:

- The update process requires space for copying data and logging changes to the system tables. If the source database in the dump was full, the update process might fail. You can use `alter database` to extend the free space in the event of insufficient-space errors.
- After reloading an older dump, run `sp_checkreswords` from the new installation on the loaded database to check for reserved words.

For information on supported upgrade paths, see *SAP ASE Upgrades*.

For details on the dump procedure, see *SAP ASE System Administration Guide: Volume 2 > Upgrading a Dump to the Current Version of SAP ASE*.

Related Information

SAP ASE Upgrades [page 58]

6.11.5 How Compiled Objects Are Handled When Upgrading SAP ASE

SAP ASE upgrades compiled objects based on their source text.

Compiled objects include:

- Check constraints
- Defaults
- Rules
- Stored procedures (including extended stored procedures)
- Triggers
- Views

The source text for each compiled object is stored in the `syscomments` table, unless it has been manually deleted. The upgrade process verifies the existence of the source text in `syscomments`. However, compiled objects are not actually upgraded until they are invoked.

For example, if you have a user-defined stored procedure named `list_proc`, the presence of its source text is verified when you upgrade. The first time `list_proc` is invoked after the upgrade, SAP ASE detects that the

`list_proc` compiled object has not been upgraded. SAP ASE recompiles `list_proc`, based on the source text in `syscomments`. The newly compiled object is then executed.

Upgraded objects retain the same object ID and permissions.

You do not receive any notification if the compiled objects in your database dump are missing source text. After loading a database dump, run `sp_checksource` to verify the existence of the source text for all compiled objects in the database. Then, you can allow the compiled objects to be upgraded as they are executed, or you can run `dbcc upgrade_object` to find potential problems and upgrade objects manually.

Compiled objects for which the source text has been hidden using `sp_hidetext` are upgraded in the same manner as objects for which the source text is not hidden.

For information on `sp_checksource` and `sp_hidetext`, see *Reference Manual: Procedures*.

> **Note**
>
> If you are upgrading from a 32-bit to a 64-bit SAP ASE, the size of each 64-bit compiled object in the `sysprocedures` table in each database increases by approximately 55 percent when the object is upgraded. The preupgrade process calculates the exact size; increase your upgraded database size accordingly.

To determine whether a compiled object has been upgraded when you upgrade to a 64-bit pointer size in the same version, look at the `<sysprocedures.status>` column. It contains a hexadecimal bit setting of 0x2 to indicate that the object uses 64-bit pointers. If this bit is not set, it indicates a 32-bit object, which means it has not been upgraded.

To ensure that compiled objects have been upgraded successfully before they are invoked, upgrade them manually using the `dbcc upgrade_object` command.

Related Information

Postupgrade Tasks [page 81]
Restoring Functionality in SAP ASE After Upgrading [page 85]

6.11.5.1 Finding Compiled Object Errors Before Production

Use `dbcc upgrade_object` to identify potential problem areas that may require manual changes to achieve the correct behavior.

After reviewing the errors and potential problem areas, and fixing those that need to be changed, use `dbcc upgrade_object` to upgrade compiled objects manually instead of waiting for the server to upgrade the objects automatically.

Table 10: Upgrade Problems

Problem	Description	Solution
Missing, truncated, or corrupted source text	If the source text in `syscomments` has been deleted, truncated, or otherwise corrupted, `dbcc upgrade_object` may report syntax errors.	If: • The source text was not hidden – use `sp_helptext` to verify the completeness of the source text. • Truncation or other corruption has occurred – drop and re-create the compiled object.
Temporary table references	If a compiled object, such as a stored procedure or trigger refers to a temporary table (#temp `<table_name>`) that was created outside the body of the object, the upgrade fails, and `dbcc upgrade_object` returns an error.	Create the temporary table exactly as expected by the compiled object, then execute `dbcc upgrade_object` again. Do not do this if the compiled object is upgraded automatically when it is invoked.
Reserved word errors	If you load a database dump from an earlier version of SAP ASE into version 15.7 or later and the dump contains a stored procedure that uses a word that is now reserved, when you run `dbcc upgrade_object` on that stored procedure, the command returns an error.	Either manually change the object name or use quotes around the object name, and issue the command `set quoted identifiers on`. Then drop and re-create the compiled object.

6.11.5.1.1 Quoted Identifier Errors

Quoted identifiers are not the same as literals enclosed in double quotes. The latter do not require you to perform any special action before the upgrade.

Context

`dbcc upgrade_object` returns a quoted identifier error if:

- The compiled object was created in a pre-11.9.2 version with quoted identifiers active (`set quoted identifiers on`).
- Quoted identifiers are not active (`set quoted identifiers off`) in the current session.

For compiled objects the upgrade process automatically activates or deactivates quoted identifiers as appropriate.

Procedure

1. Activate quoted identifiers before running `dbcc upgrade_object`.

When quoted identifiers are active, use single quotes instead of double quotes around quoted `dbcc upgrade_object` keywords.

2. If quoted identifier errors occur, use the `set` command to activate `quoted identifiers`, and then run `dbcc upgrade_object` to upgrade the object.

6.11.5.1.2 Determining Whether to Change select * in Views

Determine whether columns have been added to or deleted from the table since the view was created.

Context

Perform these queries when `dbcc upgrade_object` reports the existence of `select *` in a view:

Procedure

1. Compare the output of `syscolumns` for the original view to the output of the table.

   In this example, you have the following statement:

   ```
   create view all_emps as select * from employees
   ```

   > ⚠ Caution
   >
   > Do not execute a `select *` statement from the view. Doing so upgrades the view and overwrites the information about the original column information in `syscolumns`.

2. Before upgrading the `all_emps` view, use these queries to determine the number of columns in the original view and the number of columns in the updated table:

   ```
   select name from syscolumns
     where id = object_id("all_emps")
   select name from syscolumns
     where id = object_id("employees")
   ```

3. Compare the output of the two queries by running `sp_help` on both the view and the tables that comprise the view.

   This comparison works only for views, not for other compiled objects. To determine whether `select *` statements in other compiled objects need to be revised, review the source text of each compiled object.

   If the table contains more columns than the view, retain the preupgrade results of the `select *` statement. Change the `select *` statement to a `select` statement with specific column names.

4. If the view was created from multiple tables, check the columns in all tables that comprise the view and rewrite the `select` statement if necessary.

6.11.5.1.3 Using dbcc upgrade_object

The following section covers syntax, parameters, permissions, increasing the log segment, error reporting and examples for using `dbcc upgrade_object`.

6.11.5.1.3.1 Syntax for Using dbcc upgrade_object

This section describes the syntax for using `dbcc upgrade_object`.

Syntax

```
dbcc upgrade_object [(<dbid> | <dbname>
      [, [<database>.[<owner>].]<compiled_object_name>' |
      'check' | 'default' | 'procedure' | 'rule' | 'trigger' | 'view'
      [, 'force' | 'check' | 'force_online']])
```

Parameters

`upgrade_object`

upgrades a compiled object from the text stored in the syscomments table. The `upgrade_object` parameters are:

`<dbid>`	Specifies the database ID. If you do not specify `<dbid>`, all compiled objects in the current database are upgraded.
`<dbname>`	Specifies the database name. If you do not specify `<dbname>`, all compiled objects in the current database are upgraded.
`<compiled_object_name>`	Is the name of a specific compiled object you want to upgrade. If you use the fully qualified name, `<dbname>` and `<database>` must match, and you must enclose the fully qualified name in quotes. If the database contains more than one compiled object of the same name, use the fully qualified name. Otherwise, all objects with the same name are parsed, and if no errors are found, upgraded.
`check`	Upgrades all check constraints and rules. Referential constraints are not compiled objects and do not require upgrading.

default	Upgrades all declarative defaults and the defaults created with the `create default` command.
procedure	Upgrades all stored procedures.
rule	Upgrades all rules and check constraints.
trigger	Upgrades all triggers.
view	Upgrades all views. The keywords `check`, `default`, `procedure`, `rule`, `trigger`, and `view` specify the classes of compiled objects to be upgraded. When you specify a class, all objects in that class, in the specified database, are upgraded, provided that `dbcc upgrade_object` finds no errors or potential problem areas.
force	forces an upgrade of the object from `syscomments` even if an upgrade is not required. Errors are raised if the source text contains errors, as well as for other non-syntax errors including normalization issues such as ambiguous object references (error 209). `dbcc upgrade_object` requires the traceflag 3604 to be set to on to send output to the client. `force` specifies that you want to upgrade the specified object even if it contains a `select *` clause. Do not use `force` unless you have confirmed that the `select *` statement is not returning unexpected results. The `force` option does not upgrade objects that contain reserved words, contain truncated or missing source text, refer to nonexistent temporary tables, or do not match the quoted identifier setting. You must fix these objects before they can be upgraded.
check	checks syntax for the specified compiled object in `syscomments` in the specified database. Does not raise errors on occurrences of `select`.
force_online	reads data from the SYSOBJECTS table without waiting for other transactions to finish.

> **Note**
>
> The keywords `check`, `default`, `procedure`, `rule`, `trigger`, and `view` specify the classes of compiled objects to be upgraded. When you specify a class, all objects in that class, in the specified database, are upgraded, provided that `dbcc upgrade_object` finds no errors or potential problem areas.
>
> If `set quoted identifiers` is on, use single quotes around the keywords. If `set quoted identifiers` is off, you can use either double quotes or single quotes.

Permissions

The permission checks for `dbcc` commands differ based on your granular permissions settings. This table shows the permission requirement for each `dbcc` command.

Table 11: Permissions Requirements

DBCC Command Name	Permission Requirement	
	Granular Permissions Disabled	Granular Permissions Enabled
trace flags 3604	• sa_role	• `set tracing` • `monitor qp performance` • `set switch`
`upgrade_object`	• `object owner` • Database owner • sa_role	• `manage database` • Object owner

6.11.5.1.3.2 Increasing the Log Segment Size

You can specify that all compiled objects of a particular class should be upgraded in one execution of `dbcc upgrade_object`.

For example, you can upgrade all triggers by using the `trigger` keyword. However, even though you use only one `dbcc` command, the upgrade of each object is recorded in a separate transaction; the old row is deleted from `sysprocedures` and a new row is written. Therefore, if you run `dbcc upgrade_object` on a large number of compiled objects, your system may run out of log space. Increase the size of the log segment in the databases in which you plan to run this command, to allow sufficient room to log all the upgrades.

6.11.5.1.3.3 Error Reporting

To send all the output from `dbcc upgrade_object` to the window, a System Administrator can execute `dbcc traceon(3604)`.

SAP recommends that you use this command if you think the output of error messages might overflow the error log.

6.11.5.1.3.4 Examples

This section shows examples of using `dbcc upgrade_object`.

- Example 1 – Upgrades all compiled objects in the active database:

  ```
  dbcc upgrade_object
  ```

- Example 2 – Upgrades all stored procedures in the listdb database. Single quotes are used around procedure because set quoted identifiers is on:

  ```
  dbcc upgrade_object(listdb, 'procedure')
  ```

- Example 3 – Upgrades all rules and check constraints in the listdb database. Double quotes are used around rule because set quoted identifiers is off:

  ```
  dbcc upgrade_object(listdb, "rule")
  ```

- Example 4 – Upgrades all stored procedures named list_proc in the listdb database:

  ```
  dbcc upgrade_object(listdb, list_proc)
  ```

- Example 5 – Upgrades the stored procedure list_proc, which is owned by the login “jkarrik”:

  ```
  dbcc upgrade_object(listdb, "listdb.jkarrik.list_proc")
  ```

- Example 6 – Returns an error because the value of dbname is master and the value of database is listdb. These values must match:

  ```
  dbcc upgrade_object(master, "listdb.jkarrik.list_proc")
  ```

7 SAP ASE Downgrades

Downgrading from SAP ASE 16.1 to an earlier version is not supported.

8 Uninstalling SAP ASE

To remove SAP ASE, run the uninstaller. The uninstallation process reverses only those actions originally performed by the installer, leaving intact any files or registry entries you created after the installation.

Prerequisites

Shut down all servers.

Procedure

1. Execute:

   ```
   $SYBASE/sybuninstall/ASESuite/uninstall
   ```

2. Click *Next* in the Uninstall SAP Adaptive Server Enterprise welcome window.
3. Choose one of the following, then click *Next*:

Option	Description
Complete Uninstall	Uninstalls everything originally installed by the installer. Files and folders created after the installation are not removed.
Uninstall Specific Features	Displays a list of features. If any unselected products/components are dependent on features selected for uninstallation, you can still proceed with the uninstallation but dependent features are not uninstalled.

   You see a window indicating that the uninstallation process is being performed. There is no progress bar.

   > **Note**
   >
   > You may need to confirm the deletion of some files that have been modified since installation.

4. When you see the final window, click *Done* to exit the uninstallation program.
5. Manually remove any files or registry entries you created after the installation.

8.1 Removing an Existing SAP ASE Server

Remove an existing SAP ASE server.

Procedure

1. Shutdown the SAP ASE server.
2. From $SYBASE and $SYBASE/$SYBASE_ASE, enter:

   ```
   rm <servername>.*
   ```

3. Change to $SYBASE/$SYBASE_ASE/install and run:

   ```
   rm RUN_<servername>.*
   rm <servername>.*
   ```

4. Edit $SYBASE/interfaces, to remove all references to the SAP ASE.
5. Remove any operating system files for existing database devices.

9 Troubleshoot Your Installation

Determine the cause of problems and apply the recommended solution.

To determine the cause of an error, first look in the log file of the utility being used, to identify the task the utility was performing when it failed. Then check the server error log.

This table lists possible causes and solutions for common problems that you might encounter during a first-time installation, or an upgrade. If you continue to have problems, retry the installation or upgrade.

The Installation Program Cannot Start the SAP ASE Server

- Make sure you meet RAM requirements. If you have the required amount of RAM, remove, then reinstall all applications to the hard drive and restart the installation.
- After SAP ASE is installed, there should be 25MB of free disk space left in the disk drive. SAP ASE needs approximately 18MB to create shared memory files.
- The SAP ASE server may not start if it cannot find a SySAM license or if the grace period has expired. Check the SAP ASE error log for the cause of the license checkout failure and fix the issues.

The Installation Program Cannot Connect to the Upgraded SAP ASE Server

Verify that the environment variables and password are correct.

9.1 Error Logs for Installation Utilities

The information in the error logs may help determine the reason and possible solutions for problems with installation-related utility programs.

Utility	Default Location and File Name
SAP ASE Installer	`$SYBASE/log/ASE_Suite.log`
`srvbuildres`	`$SYBASE/$SYBASE_ASE/init/logs/srvbuild<MMDD>.<NNN>` where: • `<MM>` – is the month. • `<DD>` – is the date. • `<NNN>` – is a three-digit number identifying the `srvbuild` session.

Utility	Default Location and File Name
`sqlupgraderes`	• `$SYBASE/$SYBASE_ASE/init/logs/sqlupgrade<MMDD>.<NNN>` • `$SYBASE/$SYBASE_ASE/bin/upgrade.<NNN>` – is a temporary file created by the upgrade process.

9.2 Error Logs for SAP ASE Servers

The information in the error logs may help to determine the reason and possible solution for an error message.

Server	Default Location and File Name
SAP ASE	`$SYBASE/$SYBASE_ASE/install/<servername>.log`
Backup Server	`$SYBASE/$SYBASE_ASE/install/<servername>.log`
XP Server	`$SYBASE/$SYBASE_ASE/install/<servername>.log`

9.3 Troubleshooting Common Installation Problems

Identify the cause of installation problems and apply the recommended solutions.

If your installation fails, review error messages and your SAP ASE error log to determine the cause of the failure.

Installer Log is Missing

While the installer is still running, the `ASESuite.log` installer log file does not yet exist in the `log` subdirectory of your installed directory. This file is created only after a graceful exit from the installer. If the installer crashes or is interrupted (for example, by pressing `Ctrl` + `C`), the installer standard output and error files (used to create the installer log) are in a temporary directory with file names `lax-*-out.tmp` and `lax-*-err.tmp`. If you encounter any problems with an installation that was interrupted without a graceful exit, view these temporary files to debug the cause.

> **Note**
>
> The temporary directory in which the files are created is not `/tmp/`; you can change it by changing the $IATEMPDIR environment variable (%TEMP% in Windows).

Cannot Use X-Windows

If the setup and configuration utilities do not show correctly, you may need to adjust the resolution on your monitor.

To change to a smaller font size, issue the following UNIX commands:

```
% cd $SYBASE/ASE-16_1
% chmod +w xappdefaults
% cd xappdefaults
% chmod +w *
% foreach i(*)
? cat $i | sed -e "s/140/100/g" | sed -e "s/^#D/D/g" | sed -e "s/^#S/S/g" > p
? mv p $i
? end
%
```

The installation utilities will now use approximately 25 percent less window space.

Cannot Eject the CD or DVD from the Drive

If you cannot eject the CD from the drive, check:

- Whether the disk drive path is the current directory (`pwd`) in a UNIX terminal window. If it is, change (`cd`) to another directory.
- For `sybhelp` processes. If these processes exist, kill them using the UNIX `kill` command.

DISPLAY Environment Variable Not Set Correctly

The resolution to the DISPLAY variable problem should instruct you to open Exceed (under Hummingbird Connectivity) and set DISPLAY equal to `hostname:<b>`, where `<b>` is the number in the parentheses following Exceed in the Exceed window.

Client Not Authorized to Connect to Server

This error message means a remote machine does not have permission to display the user interface on the local machine where you start working:

```
Xlib: connection to "host_name" refused by server
Xlib: Client is not authorized to connect to Server
xhost: unable to open display "host_name"
```

To correct the problem:

1. Enter the following command at the UNIX prompt of your *local* machine, where `<remote_machine>` is the machine on which you are running the installer:

   ```
   xhost +<remote_machine>
   ```

2. Restart the installer.

Port Already in Use

Enter a different port number on the `srvbuild` window. The command `netstat -a` produces a list of port numbers in use.

SAP ASE Fails to Start

The shared memory of the operating system may not be set high enough. Adjust the shared memory value. Restart the installation or upgrade process.

Installer Fails to Start

Verify that the operating system has all the patches required by the SAP JRE.

Cannot Start XP Server

You may receive the following message from XP Server when it is invoked by `xp_cmdshell` or some other extended stored procedure:

```
Msg 11018, Level 16, State 1:
Procedure "xp_cmdshell", Line 2:
XP Server must be up for ESP to execute.
(return status = -6)
```

Verify that there is an XP Server entry in the SAP ASE `sysservers` table. If you created XP Server in a different `srvbuild` session than SAP ASE and you did not specify a related SAP ASE server, `srvbuild` cannot update the `sysservers` table. Verify that the XP server exists in the interfaces file or LDAP server.

Use `sp_addserver` to add an entry to the `sysservers` table.

Troubleshooting Resource File Installations

If you encounter problems during the build, configuration, or upgrade process while using the `srvbuild[res]`, `sqlloc[res]`, or `sqlupgrade[res]`, it may be that these utilities did not allow enough time for a SAP ASE server to shut down properly.

Set the SYBSHUTWAIT environment variable to force the utilities to wait for the SAP ASE server to shut down. For example, this command forces the utility to wait for two minutes before proceeding with the next task:

```
% setenv SYBSHUTWAIT 120
```

9.3.1 If the Installation Quits While You Are Configuring an SAP ASE Server

Perform specific steps if the installation suddenly quits.

Procedure

1. View the contents of the log file generated by the SAP ASE server.
2. Take any suggested actions to correct the problem. If the installation fails after:
   - The installation program created any operating system files, such as the master device or system procedures device files, delete those files.
   - The installation program starts the SAP ASE server that you are attempting to install, shut down that server.
3. Use the `srvbuild` utility to restart the configuration.

9.4 Stopping an SAP ASE Server After a Failure

If the installation or upgrade session fails after you start a SAP ASE server for any reason, use the `shutdown` command.

Procedure

1. Log on as "sa".
2. Shut down the SAP ASE server using the `shutdown with nowait` command. This stops the SAP ASE server immediately, without waiting for currently executing SQL statements to finish:

   ```
   1> shutdown with nowait
   2> go
   ```

3. If the installation or upgrade session fails after you start the SAP ASE server, use the `shutdown` command.

9.5 If SAP ASE Fails the Preupgrade Eligibility Test

Examine the log file to determine why SAP ASE is ineligible for an upgrade.

Context

If SAP ASE fails the preupgrade test, you see:

```
Server <SERVER_NAME> failed preupgrade eligibility test.
See log for more information.
```

Procedure

1. From the Upgrade window, select *Exit*.
2. Examine the log file in `$SYBASE/$SYBASE_ASE/init/logs`.

   After you resolve any problems, shut down the SAP ASE server and use `sqlupgrade` to complete the upgrade session.

9.6 When an Upgrade Fails

If the upgrade process fails, the installation program displays error messages.

Once you start SAP ASE on the new version, you cannot start SAP ASE on the earlier version. Attempts to do so result in having to restore from backups.

9.6.1 If You Can Identify the Cause of the Upgrade Failure

If the error logs or messages clearly indicate the cause of failure, and you are confident that your databases have not been damaged, you can attempt to fix the problem and immediately re-run the upgrade.

Context

If the upgrade process fails again and you cannot determine the cause of failure, check the error log file to find out when and where the upgrade failed, and contact SAP Product Support.

By default, the log file is located in `$SYBASE/$SYBASE_ASE/install/<<servername>>log`.

Procedure

1. Exit the `sqlupgrade` program.
2. Perform the necessary actions to fix the problem.

   For example, if the error log indicates that the upgrade failed because your existing databases do not contain enough space, use the `alter database` command to increase the available space.
3. If needed, shut down the SAP ASE server.

   Shutting down the server enables the installation program to start the server and re-run the upgrade session.
4. Start `sqlupgrade` again.
5. Select *Upgrade SAP ASE*, and proceed with the upgrade.

9.6.2 Restoring Databases After a Failed Upgrade

You may need to restore your databases due to a failed upgrade.

Procedure

- If you think the upgrade failure or its cause may have damaged your databases, restore the databases from backups. For information about restoring databases, see the *System Administration Guide*.
- If you are concerned about the possible corruption of your databases, exit `Server Config`, but do not attempt to restart the upgrade session until you have restored the databases from backup. After restoration is complete, retry the upgrade.

9.6.3 Recovering from a Failed Upgrade

Upgrade issues may be due to a failure to upgrade an individual database, or a failure to complete configuration changes after all databases have been upgraded.

Context

Use the output from the upgrade utility to correct the problem that caused the failure.

Procedure

- If the upgrade failed because the process ran out of some resource, such as data or log space, locks, or auxiliary scan descriptors, add space to the database using the `alter database` command.

  You may also correct other resource failures by changing the server's configuration using the `sp_configure` stored procedure.
- If an upgrade failure leaves a database offline, and the failure can be corrected only by making data changes in the database, you can gain access to the failed database by using `isql` or a similar program to connect to the affected server as user "sa" and issuing this command:

  ```
  dbcc traceon(990)
  ```

  Having set this trace flag, user "sa" can now use the offline database and make the necessary changes to correct the upgrade failure.

  > **Note**
  >
  > This trace flag grants access only to user "sa"; "sa_role" does not work. If you have disabled the "sa" login, reenable it to get access using this method.

  To restart a server that has not successfully upgraded, use:

  ```
  online database <failed_db_name>
  ```

  The server restarts that database's upgrade from the point of failure.
- If the failure occurs after all databases have been upgraded, or if a failure somehow causes the upgrade utility to fail, manually re-run the utility. After you diagnose and correct the failure, run the upgrade utility:

  ```
  $SYBASE/$SYBASE_ASE/bin/upgrade
  ```

  When restarted in this way, the upgrade process says it is "verifying" the upgrade rather than "starting" it, but it makes all the same checks as for the original upgrade.
- To verify that a database has upgraded successfully, check any database's upgrade status using the `online database` command. If any upgrade is required for a database, this command performs it. You may also use a procedure such as this to check all databases at a given installation:

  ```
  declare @dbname varchar(255)
  select @dbname = min(name)
  from master..sysdatabases
  while @dbname is not null
  begin
  online database @dbname
  select @dbname = min(name)
  from master..sysdatabases
  where name > @dbname
  end
  ```
- Reinstall system stored procedures using the scripts from the new version:

  ```
  isql -Usa -P<password> -i $SYBASE/$SYBASE_ASE/scripts/installmaster
  ```

> **Note**
>
> When a server fails during an upgrade process, it attempts to upgrade the databases when it restarts. When the installation is fully recovered, re-run the upgrade utility to ensure that all postupgrade configuration work is done. Then reinstall the system stored procedures.

- During the upgrade process, the log may become too full due to recorded catalog changes. If so, log in to the new server using `isql`, and issue:

  ```
  isql> dump tran <dbname> with truncate_only
  ```

  a. If `truncate_only` indicates that it cannot truncate the log, retry the command as `no_log` instead.
  b. If this does not truncate the log successfully, use the `alter database` command to extend the database as explained below.
- In some cases, preupgrade space estimations are insufficient for the data copy phase of upgrade. You see a message that there is insufficient space in the system segment for the upgrade. When this happens, the upgrade process stops responding, waiting for space to be provided. To increase the size of the database, log in to the new server using `isql`, and use `alter database`:

  ```
  isql> alter database <dbname> on <device_name> = "<2>m"
  ```

  `alter database` allows you to specify the size to alter the database with the unit specifier "m", or "M".

> **Note**
>
> There are certain upgrade failures from which the server cannot recover. For example, attempts to upgrade system tables to version 16.1 are quite sensitive to failures at certain points during the required changes. If you encounter such a failure, restore the failed database from backup. To prevent the upgrade from failing again, correct the problem that caused the original failure before issuing the `online database` command for that database. These catastrophic failures are nearly always caused by running out of resources, as described above, which then causes a failure to undo the aborted transaction.

9.6.4 If You Cannot Identify the Cause of an Upgrade Failure

Your attempts to upgrade may continue to fail.

Procedure

1. If attempts to upgrade continue to fail, check the error log file to identify where and where the upgrade failed.

   By default, the log file is located in `$SYBASE/$SYBASE_ASE/install/<servername>.log`.
2. Contact Product Support with the information.

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