



Database Administration Guide | PUBLIC

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# Database Administration: SAP Business Suite on SAP Adaptive Server Enterprise

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# 1 Document History

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

Version	Date	Description
1.0	2012-05-22	Initial version
1.1	2012-12-18	Minor changes
1.2	2013-05-27	Updated version
1.3	2013-12-14	<p>With the latest Support Packages for SAP NetWeaver 7.02 and higher, the DBA Cockpit has been enhanced with new features for database administration. For more information, refer to the following SAP Notes:</p> <p>SAP Note <a href="#">1757924</a> : SAP NetWeaver 7.02 SP10, 7.3 SP5, 7.31 SP1</p> <p>SAP Note <a href="#">1757928</a> : SAP NetWeaver 7.02 SP11, 7.3 SP6, 7.31 SP2</p> <p>SAP Note <a href="#">1758182</a> : SAP NetWeaver 7.02 SP12, 7.3 SP8, 7.31 SP5</p> <p>SAP Note <a href="#">1758496</a> : SAP NetWeaver 7.02 SP13, 7.3 SP9, 7.31 SP7, 7.40 SP2</p> <p>SAP Note <a href="#">1814258</a> : SAP NetWeaver 7.02 SP14, 7.30 SP10, 7.31 SP9, 7.40 SP4</p> <p>SAP Note <a href="#">1922555</a> : SAP NetWeaver 7.02 SP15, 7.30 SP11, 7.31 SP11, 7.40 SP6</p> <p>SAP Note <a href="#">1956005</a> : SAP NetWeaver 7.02 SP16, 7.30 SP12, 7.31 SP13, 7.40 SP8</p> <p>SAP Note <a href="#">2065842</a> : SAP NetWeaver 7.02 SP17, 7.30 SP13, 7.31 SP16, 7.40 SP11</p> <p>SAP Note <a href="#">2041812</a> : SAP SAP NetWeaver 7.40 SP9</p>
1.4	2014-07-16	Updated Version
1.5	2015-12-30	Updated Version
1.6	2016-03-08	<p>Additional chapters on operating system and runtime configuration:</p> <ul style="list-style-type: none"><li>• <a href="#">Operating System Configuration [page 138]</a></li><li>• <a href="#">Basic SAP Runtime Configuration [page 142]</a></li><li>• <a href="#">Advanced SAP ASE Runtime Configuration [page 157]</a></li></ul>
1.7	2017-02-24	Updated Version
1.8	2017-12-21	Correction of links

Version	Date	Description
1.9	2022-07-18	<p>Updated chapters:</p> <ul style="list-style-type: none"> <li>• <a href="#">Backup and Recovery - Further Information [page 134]</a></li> </ul> <p>New chapters:</p> <ul style="list-style-type: none"> <li>• <a href="#">Configuration: IMRS Caches [page 110]</a></li> <li>• <a href="#">Performance: IMRS Cache Usage [page 71]</a></li> </ul>
2.0	2023-08-31	<p>Updated chapters:</p> <ul style="list-style-type: none"> <li>• <a href="#">Space: Tables and Indexes [page 90]</a></li> </ul> <p>New chapters:</p> <ul style="list-style-type: none"> <li>• <a href="#">Performance: Non-Volatile Cache Usage [page 71]</a></li> <li>• <a href="#">Performance: On Disk Query Plans [page 75]</a></li> <li>• <a href="#">Space: Object Browser [page 88]</a></li> <li>• <a href="#">Space: System Usage [page 90]</a></li> <li>• <a href="#">Configuration: Configuration History [page 96]</a></li> <li>• <a href="#">Configuration: Memory Configuration [page 109]</a></li> <li>• <a href="#">Diagnostics: Missing Statistics [page 124]</a></li> <li>• <a href="#">Diagnostics: SSL Certificates [page 132]</a></li> </ul>

## 2 Introduction

This document provides specific information about the administration of SAP Adaptive Server Enterprise (SAP ASE) in an SAP environment. In addition, it provides references to additional documentation and guidelines as well as recommendations from SAP that are only available in this document. It also helps you to plan, install, and maintain SAP systems on the database.

This guide is primarily intended for database administrators and SAP system administrators who need to install and maintain an SAP system on the database. A basic understanding of the fundamental database concepts and an elementary knowledge of SAP system administration is required.

For more information, see:

<http://help.sap.com/nw> ► *SAP NetWeaver Platform* ► *SAP NetWeaver <Release>* ► *Application Help*  
► *SAP NetWeaver Library: Function-Oriented View* ► *Application Server* ► *Application Server Infrastructure*  
► *Architecture of the SAP NetWeaver Application Server* ►

The following document gives you an overview of the setup for database installation and administration:  
[Getting Started with SAP Applications Using SAP Adaptive Server Enterprise.](#)

### Naming Conventions

In this documentation the following naming conventions apply:










#### SAP NetWeaver System / SAP System

*SAP NetWeaver system* is referred to as *SAP system*. Additionally, the term *SAP system* also refers to any application system that is based on SAP NetWeaver, for example, any product of the *SAP Business Suite*.



## 3 New Features

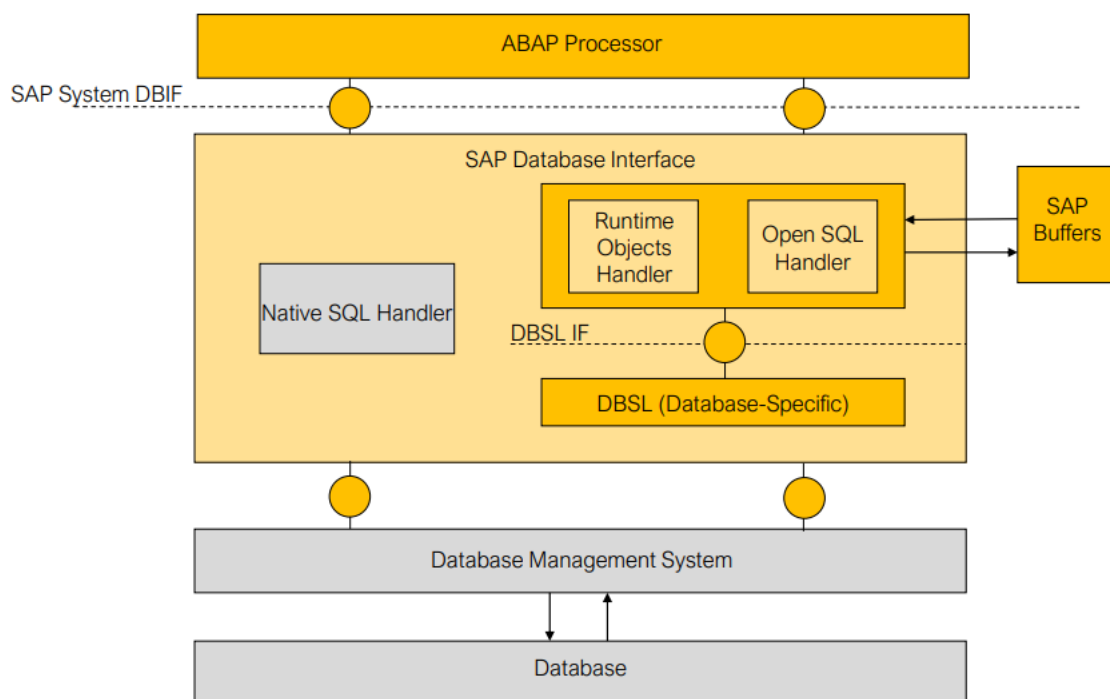
With the latest Support Packages for SAP NetWeaver 7.02 and higher, the DBA Cockpit has been enhanced with new features for database administration. For more information, refer to the following SAP Notes:

- SAP Note [1757924](#): SAP NetWeaver 7.02 SP10, 7.3 SP5, 7.31 SP1
- SAP Note [1757928](#): SAP NetWeaver 7.02 SP11, 7.3 SP6, 7.31 SP2
- SAP Note [1758182](#): SAP NetWeaver 7.02 SP12, 7.3 SP8, 7.31 SP5
- SAP Note [1758496](#): SAP NetWeaver 7.02 SP13, 7.3 SP9, 7.31 SP7, 7.4 SP2
- SAP Note [1814258](#): SAP NetWeaver 7.02 SP14, 7.3 SP10, 7.31 SP9, 7.4 SP4
- SAP Note [1922555](#): SAP NetWeaver 7.02 SP15, 7.3 SP11, 7.31 SP11, 7.4 SP6
- SAP Note [1956005](#): SAP NetWeaver 7.02 SP16, 7.3 SP12, 7.31 SP13, 7.4 SP8
- SAP Note [2065842](#): SAP NetWeaver 7.02 SP17, 7.3 SP13, 7.31 SP16, 7.4 SP11
- SAP Note [2041812](#): SAP NetWeaver 7.40 SP9

## 4 Architecture Overview

### 4.1 SAP Application Server for ABAP

The following figure provides an overview of how the SAP application server for ABAP (AS ABAP) connects to the database.



The ABAP language offers the following options to communicate with the database:

- **Open SQL for ABAP**  
Open SQL allows you to access database tables declared in the ABAP Dictionary regardless of the database platform that your SAP system is using.
- **Native SQL**  
Native SQL allows you to use database-specific SQL statements in an ABAP program. This means that you can use database tables that are not administered by the ABAP Dictionary, and therefore integrate data that is not part of the SAP system.

The ABAP processor uses a database interface to connect to the database. The database interface provides a database platform abstraction layer and translates all Open SQL statements from the ABAP processor into native database-specific SQL statements.

The database interface also performs the database platform-specific mapping between ABAP data types and database data types. Each database platform provides a platform-specific database interface library (DBSL). The DBSL is part of the SAP kernel and is developed in C.

The DBSL shared library for SAP ASE (`dbsybslib.*`) uses the SAP ASE ODBC driver to communicate with the database management system (DBMS). To use the ODBC driver, the DBSL shared library dynamically loads the SAP ASE ODBC libraries while bypassing the driver manager.

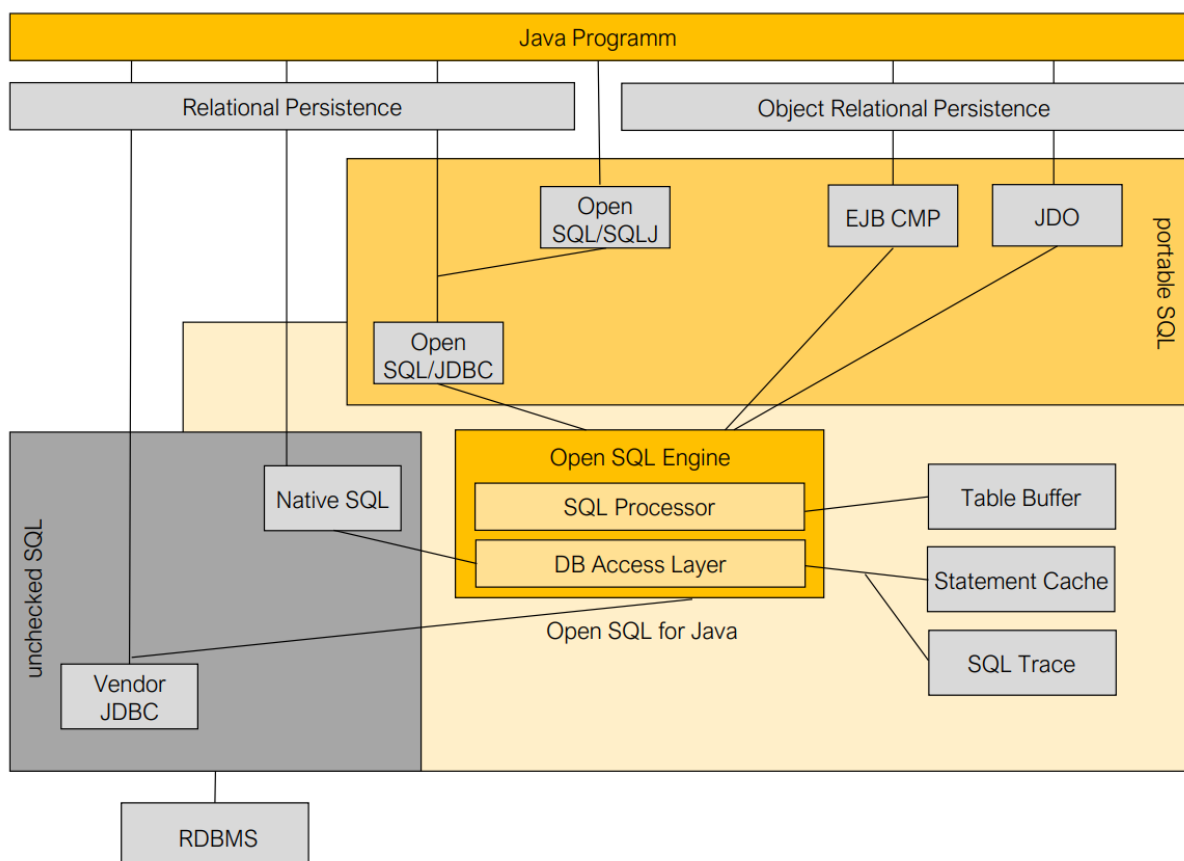
## More Information

[Architecture of the SAP NetWeaver Application Server](#)

[Administration of Application Server ABAP](#)

## 4.2 SAP Application Server for Java

The following figure provides an overview of how the SAP application server for Java (AS Java) connects to the database.



Java programs that run inside the Application Server for Java can use various standardized APIs to access the database – for example, JDO, SQLJ, or JPA.

The database interface provides Java applications with the following options to communicate with the database:

- Open SQL for Java (SAP's database-independent SQL dialect)
- Native SQL (database-dependent)

The Application Server for Java uses various services that assist in the communication with the DBMS, for example, the DBPool service. DBPool is a Java-based database connection pooling utility, which supports connection validation, time-based expiry, and easy configuration.

All communication with the DBMS is done using the SAP ASE jConnect JDBC driver - a pure Java Type 4 JDBC driver that is based on the TDS (Tabular Data Stream) protocol and uses TCP/IP as its network protocol.

## More Information

[Architecture of Application Server Java](#)

[Administering Application Server Java](#)

## 4.3 SAP ASE Components

With regard to SAP ASE itself, we can distinguish the following components:

- SAP ASE server software  
You can have multiple SAP ASE installations on one host.
- SAP ASE server which contains several system databases and zero or more user databases
- SAP ASE backup server
- The user database itself, which contains the data and is managed by the DBMS

### Note

In an SAP system installation, there is one SAP user database that holds the SAP data.

### ISQL Editor

SAP ASE comes with a command line client, the SQL editor *isql*. *isql* is available on UNIX and Windows. It is possible to run SQL scripts in batch mode. The output can be redirected to output files.

### ❖ Example

```
isql -STNT -Usapsa -Ppass-DTNT -i input.sql -o output.txt -X
```

The above example calls *isql*, connects to a server *TNT* with username *sapsa* and password *pass*. The database it uses is *TNT*. The input is received from the file *input.sql* and the output is stored in *output.txt*. The '-X' option specifies that the password is encrypted and sent to the SAP ASE server.

If you are not sure how to use a specific command, run the command with the `-help` option.

The following table provides useful command line options for `isql`:

Option:	Description:
<code>-b</code>	Disables the display of the table headers output
<code>-c cmdend</code>	Changes the command terminator
<code>-D database</code>	Selects the database in which the isql session begins
<code>-i inputfile</code>	Specifies the name of the operating system file to use for input to isql
<code>-o outputfile</code>	Specifies the name of an operating system file to store the output from isql
<code>-P password</code>	Specifies the name of the Adaptive Server to which to connect to
<code>-S server_name</code>	Specifies the name of the Adaptive Server to which to connect to
<code>-U username</code>	Specifies a login name. Login names are case sensitive
<code>-w column_width</code>	Sets the screen width for output
<code>--retservererror</code>	Returns 2 to the calling process and a message when an SQL error occurred (most useful for scripting)
<code>-X</code>	Sends password encrypted

For more information, see: [Commands reference isql](#) 

Useful built-in isql commands in interactive mode:

Command:	Description:
<code>reset</code>	Clears the query buffer
<code>use database_name</code>	Changes the current database
<code>-E editor</code>	vi (UNIX) or edit (Windows) can be modified, for example, <code>-Enotepad</code> allows you to edit the last SQL command in the buffer
<code>:R filename</code>	Reads an operating system file into the command buffer and displays it. Enter the terminator interactively on a line by itself (not in the file)
<code>!!os_command</code>	Executes an operating system command. Place at the start of a line
<code>&gt; file_name or &gt;&gt; file_name</code>	Redirects or appends the output of the T-SQL command to file_name. Appends the output of the T-SQL command to file_name

#### | command

Pipes the output of the T-SQL command to an external command.

#### ❖ Example

Find all lines containing the string 'SAPSR3' in the listing produced by `sp_who`:

```
1>sp_who
```

```
2>go | grep SAPSR3
```

## DBISQL

DBISQL is a graphical SQL editor. It is available on Windows and UNIX (on UNIX it requires an X Server to run). It is possible to install DBISQL on a Windows desktop and connect to an SAP ASE server on a remote UNIX server (provided a firewall does not block the communication). After successful login to an SAP ASE server, the user may enter and edit SQL commands in the upper part of the window. Results are displayed in the lower part. For most users DBISQL is perhaps more convenient when typing in SQL commands interactively. DBISQL offers the possibility to select and repeatedly execute statements from the entered statements (**F9** key, **F5** executes all statements in the buffer). It comes with a built-in graphical plan analyzer and allows you to export and import data to a CSV file. When you have retrieved a result set, DBISQL allows you to generate a corresponding INSERT, UPDATE or DELETE statement for all rows in the result set.

### SAP®Control Center (SCC)

The DBA Cockpit is the recommended graphical database administration tool in an SAP Business Suite environment. SAP®Control Center (SCC) is another graphical DBA tool which is provided by SAP and which can be used for administering SAP ASE servers and databases. SCC is however not specifically designed for use in an SAP Business Suite system.

### SAP ASE Cockpit

The DBA Cockpit is the recommended graphical database administration tool in an SAP Business Suite environment. SAP ASE Cockpit is another graphical DBA tool which is provided by SAP and which can be used for administering SAP ASE servers and databases. However, SAP ASE Cockpit is not specifically designed for use in an SAP Business Suite system.

## More Information

[SAP ASE Components](#) 

## 4.4 SAP ASE Data Access

To connect to the database, an SAP application server requires the following components:

- The ODBC libraries for the ABAP stack
- The JDBC driver for the Java stack

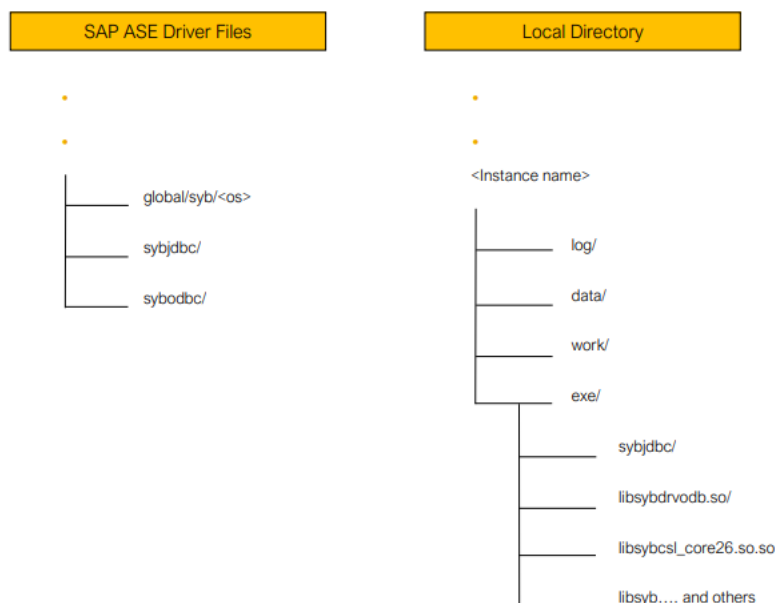
- The database name and connection port for the primary database

These components together enable the client connectivity or data access.

The ODBC driver and the JDBC driver files are located in a *shared* directory. Each SAP application server can use the driver files directly from this directory or copy them to a local directory on the application server during startup. This setup simplifies software maintenance because you only need to keep the driver files in the shared directory.

For the ABAP stack, the connection information for the SAP system is stored in the SAP system environment and profile parameters. The ODBC Driver Manager is not used. For the Java stack the connection information for the SAP system is stored in the connection URL, which in turn is stored in the Java Secure Store.

The following figure shows the directory structure of the SAP ASE client connectivity in a newly installed ABAP and Java system on a UNIX operating system:



## Directory Structure of the Database Client for an ABAP and Java System

The SAP ASE driver files are located in the directory `/usr/sap/<SAPSID>/SYS/global/syb/<os platform>/syb [odbc | jdbc]`.

During startup of the application server, the SAP ASE driver files are copied by the utility `sapcpe` to a local directory on the application server, for example, `/usr/sap/<SAPSID>/<Instance Name>/exe`. This takes place during startup of the application server. The call can be found in the SAP instance profile.

With this copy mechanism, you can maintain and exchange the SAP ASE driver files in the shared directory while the application servers are running. The SAP application servers automatically use the new driver files after the next restart.

During the installation of the database instance, the current SAP installation tool automatically installs the SAP ASE driver for the operating system of the database server. If you install a new application server, the SAP ASE

driver for this operating system is also automatically added by the installer if it is not already available in the global directory.

The main release level of the SAP ASE driver must be higher than or equal to the one of the software release levels of the database server.

The DBSL shared library looks for the SAP ASE ODBC driver as specified by the environment settings for the operating system library path.



## 5 User Administration and Authentication

SAP applications running on the database SAP Adaptive Server Enterprise (SAP ASE) use the authentication mechanisms provided with the SAP NetWeaver Application Server platform. Therefore, the security recommendations and guidelines for user administration and authentication as described in the following guides also apply to SAP Business Suite on SAP ASE:

- **ABAP:**  
<http://help.sap.com/nw>  
▶ *SAP NetWeaver Platform* ▶ *SAP NetWeaver <Release>* ▶ *Security* ▶ *SAP NetWeaver Security Guide*  
▶ *Security Guides for SAP NetWeaver Functional Units* ▶ *Security Guides for the AS ABAP* ▶
- **Java:**  
<http://help.sap.com/nw>  
▶ *SAP NetWeaver Platform* ▶ *SAP NetWeaver <Release>* ▶ *Security* ▶ *SAP NetWeaver Security Guide*  
▶ *Security Guides for the AS Java* ▶

In addition to these guidelines, we include information about user administration and authentication that specifically applies to the use of SAP applications on the database SAP Adaptive Server Enterprise.

You need to ensure the security of the users that the installer created during installation. The table below lists these users:

- Operating system users
- Database logins
- SAP system users

The installer will, by default, have assigned the master password to all users that were created, unless you specified other passwords.

If you change user passwords, be aware that SAP system users might exist in multiple SAP system clients (for example, if a user was copied as part of the client copy). Therefore, you need to change the passwords in all the relevant SAP system clients.


The installer has applied the master password to users **SAP\*** and **DDIC** only for SAP system clients 000 and 001, not to users **SAP\***, **DDIC**, and **EARLYWATCH** in client 066.

Instead, the installer always assigns the following passwords to these users in client 066:

**SAP\*:** 06071992

**EARLYWATCH:** support

### Note

Client 066 is no longer available in newly installed SAP systems based on SAP NetWeaver 7.5. For more information, see SAP Note [1749142](#) .

## 5.1 Operating System Users

During the installation, the installer checks all required accounts (users, groups) and services on the local machine. The installer checks whether the required users and groups already exist. If not, the installer creates the following new users and groups:

### Operating System Users - UNIX

User	Primary Group
UNIX superuser <code>root</code>	No primary group assigned by the installer (group <code>sapinst</code> is assigned as secondary group)
SAP system administrator <code>&lt;sapsid&gt;adm</code>	<code>sapsys</code> ( <code>sapinst</code> as secondary group)
<code>syb&lt;dbsid&gt;</code>	<code>sapsys</code>

### Operating System Users - Windows

User	Comment
SAP system administrator <code>&lt;sapsid&gt;adm</code>	SAP system administrator
<code>syb&lt;dbsid&gt;</code>	Database administrator
<code>SAPService&lt;sapsid&gt;</code>	SAP service user

### Users and Groups of the SAP Host Agent:

User:	Primary Group:	Additional Group:	Comment:
<code>sapadm</code>	<code>sapsys</code>	<code>sapinst</code>	Host Agent administrator

#### **i** Note

We recommend changing the user IDs and passwords for users that are automatically created during installation.

The table below shows the tools to use for user management and user administration:

Tool:	Detailed Description:
Transactions SU01, PFCG (user and role maintenance with SAP NetWeaver AS ABAP)	For more information, see <a href="http://help.sap.com/nw">http://help.sap.com/nw</a>  ▶ <a href="#">SAP NetWeaver Platform</a> ▶ <a href="#">SAP NetWeaver &lt;Release&gt;</a> ▶ <a href="#">Security</a> ▶ <a href="#">SAP NetWeaver Security Guide</a> ▶ <a href="#">User Administration and Authentication</a> ▶

Tool:	Detailed Description:
User Management Engine with SAP NetWeaver AS Java	<p>For more information, see <a href="http://help.sap.com/nw">http://help.sap.com/nw</a></p> <p> <a href="#">SAP NetWeaver Platform</a> &gt; <a href="#">SAP NetWeaver &lt;Release&gt;</a>  &gt; <a href="#">Security</a> &gt; <a href="#">SAP NetWeaver Security Guide</a> &gt; <a href="#">User Administration and Authentication</a> &gt; </p>

## 5.2 Database Logins

During installation, the installer creates the following database users:

Login:	Roles:	Comment:
<b>sapsa</b>	sap_adm, sybase_ts_role	Database Administrator
<b>sapssso</b>	sso_role	Database Security Officer
<b>SAPSR3</b>	sap_mon	ABAP connect / database login
<b>SAPSR3DB</b>	sap_mon	Java connect / database login

### Note

For security reasons, the Adaptive Server default login `sa` is locked by the installer after installation has been completed.

Proceed as described in SAP Note [1796540](#) to change the password for users SAPSR3, SAPSR3DB, sapsa, sapssso, and sa on the database server.

## 5.3 SAP System Users

After installation, ABAP and Java system users are available. The following table shows these users, together with recommendations on how you can ensure the security of these users:

User:	User Name:	Comment:
SAP system user	SAP*	This user exists in at least clients 000, 001, and 066* of the ABAP system.  We recommend that you use strong password and auditing policies for this user.
	DDIC	This user exists in at least clients 000, 001, and 066* of the ABAP system.  We recommend that you use strong password and auditing policies for this user.
	EARLYWATCH	This user exists in at least client 066* of the ABAP system.
	SAPCPIC	This user exists in at least client 000 and 001 of the ABAP system.
Administrator	The name that you gave this user during installation or the default name J2EE_ADMIN	This user exists in at least clients 000 and 001 of the ABAP system and in the User Management Engine (UME) of the Java system.  It has administrative permissions for user management. We recommend that you use strong password and auditing policies for this user.
Guest	The name that you gave this user during installation or the default name J2EE_GUEST	This user exists in at least clients 000 and 001 of the ABAP system and in the User Management Engine (UME) of the Java system. It is used for anonymous access.
Communication user for the J2EE engine	The name that you gave this user during installation or the default name SAPJSF	This user exists in at least clients 000 and 001 of the ABAP system and in the User Management Engine (UME) of the Java system. It is used for remote function calls (RFC) between the ABAP system and the Java.
SDM	SDM	This user is used to access the Software Deployment Manager (SDM) in the Java system.

User:	User Name:	Comment:
User for Adobe Document Services (ADS)	ADSUser	This user exists in at least clients 000 and 001 of the ABAP system and in the User Management Engine (UME) of the Java system. It is used for basic authentication.
User for Adobe Document Services (ADS)	ADS_AGENT	This user exists in at least clients 000 and 001 of the ABAP system and in the User Management Engine (UME) of the Java system. It is used for processing forms between an ABAP and a Java environment.
Data supplier user for System Landscape Directory (SLD) (optional)	The name that you gave this user during installation. The recommended name is SLDDSUSER.	<p>This user exists in at least clients 000 and 001 of the ABAP system and in the User Management Engine (UME) of the Java system.</p> <p>The installer created this user automatically if you chose <i>Configure local SLD</i> during the installation.</p>

### Note

\* Client 066 is no longer available in newly installed SAP systems based on SAP NetWeaver 7.5. For more information, see SAP Note [1749142](#).

### Note

We recommend changing the user IDs and passwords for users that are automatically created during installation.

The table below shows the tools for user management and administration:

Tool:	Detailed Description:
Transactions SU01, PFCG (user and role maintenance with SAP NetWeaver AS ABAP)	<p>For more information, see <a href="http://help.sap.com/nw">http://help.sap.com/nw</a></p> <p>► <i>SAP NetWeaver Platform</i> ► <i>SAP NetWeaver &lt;Release&gt;</i> ► <i>Security</i> ► <i>SAP NetWeaver Security Guide</i> ► <i>User Administration and Authentication</i> ►</p>
User Management Engine with SAP NetWeaver AS Java	<p>For more information, see <a href="http://help.sap.com/nw">http://help.sap.com/nw</a></p> <p>► <i>SAP NetWeaver Platform</i> ► <i>SAP NetWeaver &lt;Release&gt;</i> ► <i>Security</i> ► <i>SAP NetWeaver Security Guide</i> ► <i>User Administration and Authentication</i> ►</p>

## 6 Network and Communication Security

Your network infrastructure is extremely important in protecting your system. Your network needs to support the communication necessary for your business needs, without allowing unauthorized access. A well-defined network topology can eliminate many security threats based on software flaws (at both the operating system level and application level) or network attacks such as eavesdropping. If users cannot log on to your application or database servers at the operating system or database layer, there is no way that intruders can compromise the machines and gain access to the backend system's database or files. Additionally, if users are not able to connect to the server LAN, they cannot exploit well-known bugs and security holes in network services on the server machines. The network topology for SAP on SAP ASE is based on the topology used by the SAP NetWeaver platform. Therefore, the security guidelines and recommendations described in the SAP NetWeaver Security Guide also apply.

UserID and password are encoded only when transported across the network. Therefore, we recommend using encryption at the network layer, either by using the Secure Sockets Layer (SSL) protocol for HTTP connections or Secure Network Communications (SNC) for the SAP protocols dialog and RFC.

For more information, see:

- Network and Transport Layer Security  
<http://help.sap.com/nw>  
▶ *SAP NetWeaver Platform* ▶ *SAP NetWeaver <Release>* ▶ *Security* ▶ *SAP NetWeaver Security Guide*  
▶ *Network and Communication Security* ▶
- Security Guides for Connectivity and Interoperability Technologies  
<http://help.sap.com/nw>  
▶ *SAP NetWeaver Platform* ▶ *SAP NetWeaver <Release>* ▶ *Security* ▶ *SAP NetWeaver Security Guide*  
▶ *Security Guides for Connectivity and Interoperability Technologies* ▶

## 7 File System Permissions

The file systems and logical volumes must have the permissions and owners shown in the following table. The installer sets the required permissions and owners.

### Note

You can create the owners and groups manually if they do not exist. Otherwise, the installer creates them automatically.

#### File System Permissions - UNIX

File System / Logical Volume	Permissions	Owner	Group
/sybase/<DBSID>	750	syb<dbsid>	sapsys
/sybase/<DBSID>/sybsys-tem	750	syb<dbsid>	sapsys
/sybase/<DBSID>/sybtemp	750	syb<dbsid>	sapsys
/sybase/<DBSID>/sapdiag	750	syb<dbsid>	sapsys
/sybase/<DBSID>/sap-data_<n>	750	syb<dbsid>	sapsys
/sybase/<DBSID>/saplog_<n>	750	syb<dbsid>	sapsys

#### File System Permissions - Windows

File System / Logical Volume	Access Privilege Full Control for User/Group
<drive>:\sybase\<DBSID>	syb<dbsid>, Administrators, SYSTEM, SAPLocalAdmin
<drive>:\sybase\<DBSID>\sybsystem	syb<dbsid>, Administrators, SYSTEM, SAPLocalAdmin
<drive>:\sybase\<DBSID>\sybtemp	syb<dbsid>, Administrators, SYSTEM, SAPLocalAdmin
<drive>:\sybase\<DBSID>\sapdiag	syb<dbsid>, Administrators, SYSTEM, SAPLocalAdmin
<drive>:\sybase\<DBSID>\sybdata_<n>	syb<dbsid>, Administrators, SYSTEM, SAPLocalAdmin
<drive>:\sybase\<DBSID>\saplog_<n>	syb<dbsid>, Administrators, SYSTEM, SAPLocalAdmin

After installation, you also need to copy the installation directory to a separate, secure location and then delete the installation directory.

## 8 Maintenance Actions in the DBA Cockpit

The DBA Cockpit provides a set of actions to monitor and to maintain the database. To be able to perform these actions, the SAP user requires some additional authorizations. A user must first have the global authorization and then additionally the appropriate system-specific permission. For example, to administrate a system, the user must have `S_RZL_ADM` authorization for maintenance and the system-specific authorization for maintenance. The following sections provide information about how global and system-specific authorizations are checked and what you need to do to gain the required authorizations.

The maintenance actions provided in the DBA Cockpit set locks to prevent parallel processing. All changes to the database are recorded in an audit log.

### Global Authorization Check

When you start the DBA Cockpit or change to another system in the DBA Cockpit, an authorization check is performed.

You can enable or disable the database maintenance in general using the profile parameter `dba/dba/ccms_maintenance`. If this profile parameter is not set in the instance profile, the default value `1` is used.

Depending on the setting of profile parameter `dba/dba/ccms_maintenance`, the following authorization checks exist:

- If the profile parameter is set to `0`, SAP users cannot perform any maintenance actions, regardless of their personal permissions.
- If the profile parameter is set to `1`, SAP users can perform maintenance actions depending on their personal permission for the authorization object `S_RZL_ADM`. The attribute `ACTVT` of this authorization object defines whether a user may maintain or only monitor objects.

### System-specific Authorization Check

In addition to the permissions that are globally granted, you can restrict access to specific systems that were configured in the DBA Cockpit. You enable or disable the system-specific permission checks using the profile parameter `dba/dba/ccms_security_level`.

If this profile parameter is **not** set in the instance profile, the default value `0` is used. Depending on the setting of profile parameter `dba/dba/ccms_security_level`, the following authorization checks are performed when you select a system in the DBA Cockpit:

- If parameter `dba/dba/ccms_security_level` is set to `0`, no additional system-specific check is performed.
- If parameter `dba/dba/ccms_security_level` is set to `1`, SAP system users can perform actions depending on their personal permission for the authorization object `S_DBCON`.



The attributes `DBA_DBHOST`, `DBA_DBSID`, and `DBA_DBUSER` must match the corresponding attributes for the database connection that was assigned to the selected system. The special value `<LOCAL_SYSTEM>` for the attribute `DBA_DBSID` is used to identify the local system itself.

The attribute `ACTVT` of this `S_DBCON` authorization object defines the level of permitted actions and can have the following values:

Value:	Description:
03 Display	Enables read access to all screens of the DBA Cockpit except to those that only have a maintenance mode and no read-only mode.
23 Maintain	Enables read and maintenance access to all screens of the DBA Cockpit except those that require extended maintenance permissions.
36 Extended maintenance	Enables read and maintenance access to all screens of the DBA Cockpit including special maintenance screens.

#### i Note

The only screen for which extended maintenance permission is required is the `SQL Command Line` screen that you can access in the `Favorites` list of the DBA Cockpit.

You can grant authorizations for using the DBA Cockpit with the following roles:

- `SAP_BC_S_DBCON_USER`  
Read-only role that allows monitoring access to all systems configured within the DBA Cockpit.
- `SAP_BC_S_DBCON_ADMIN`  
Additionally grants administration rights to the user for all systems. This role does *not* include the value *Extended Maintenance*.

#### i Note

Make sure that you have maintained the authorizations for your DBA user and for all batch users that either run jobs of the DBA Planning Calendar or the SAP standard jobs `SAP_COLLECTOR_FOR_PERFMONITOR` and `SAP_CCMS_MONI_BATCH_DP`.

## Granting Database Permissions

To access the database, the database user that is used for monitoring must at least have sufficient authorizations as follows:

- If you want to connect to remote systems running on SAP ASE, you can freely select a user for monitoring. Nevertheless, we recommend that you use the `sapsa` login when adding remote systems because only `sapsa` has sufficient authorizations to execute administrative tasks.
- If you want to connect to remote systems running on any other database platform, see the appropriate DBA Cockpit documentation for the database platform.

- Local systems use a special administration connection. This connection is called +++SYBADM and is automatically generated. When you start the DBA Cockpit and the administration connection does not have yet a user assigned, you are asked for the password of the `sapsa` login. If you do not supply the correct user credentials, a standard connection with the SAP connect user is used instead of the administration connection. In this case all administrative actions of the DBA Cockpit are disabled. You can change the user and password for the administrative connection as described in *Configuring Database Connections* in the Database Administration Guide. This is mandatory for background tasks that require administrative permissions.

## Locking of Actions






For each maintenance action that you have selected using the DBA Cockpit, a lock is set for the system that is being monitored. All locks are released when you exit the DBA Cockpit or when you change to another system.

## Auditing of Maintenance Actions

When you make changes that affect database objects such as Adaptive Server configuration parameters, an audit log is written. You can display this audit log in the DBA Cockpit.

## 9 Additional Information

For more information about specific topics, see the Quick Links as shown in the table below.

Content	Quick Links
Security	<a href="#">Security Community</a> 
Security Guides	<a href="http://help.sap.com/nw">http://help.sap.com/nw</a> <a href="#">▶ SAP NetWeaver &lt;product&gt; ▶ Security ▶</a>
Related SAP Notes	<a href="http://support.sap.com/notes">http://support.sap.com/notes</a>  Use <a href="http://support.sap.com/securitynotes">http://support.sap.com/securitynotes</a>  to stay informed about the latest critical SAP Notes (updated monthly).
Released Platforms	<a href="http://support.sap.com/pam">http://support.sap.com/pam</a> 
Network Security	<a href="http://help.sap.com/nw">http://help.sap.com/nw</a> <a href="#">▶ SAP NetWeaver &lt;product&gt; ▶ Security ▶</a>
SAP Solution Manager	<a href="http://help.sap.com/solutionmanager">http://help.sap.com/solutionmanager</a> <a href="https://support.sap.com/en/solution-manager.html">https://support.sap.com/en/solution-manager.html</a> 
SAP ASE - Security Administration Guide	<a href="https://help.sap.com/docs/SAP_ASE">https://help.sap.com/docs/SAP_ASE</a> <a href="#">▶ &lt;Release&gt; ▶ Security ▶ Security Administration Guide ▶</a>

## 10 Installing Service Packs for SAP ASE

SAP releases support packages (SPs) for SAP ASE, the ODBC driver, and the JDBC driver at regular intervals.

These SPs often contain important software fixes and it is recommended that you install these SPs for SAP ASE and the drivers at regular intervals.

SAP Note [1590719](#) provides the information as to which SPs are available.

SAP ASE SPs always contain a full install image. You can use these images to update an existing copy of SAP ASE.

This chapter provides a high-level overview of the tasks to be performed. For detailed step-by-step instructions, review SAP Note [1607816](#) *SYB: Installing Service Packs for SAP ASE (Windows)* and SAP Note [1599814](#) *SYB: Installing Service Packs for SAP ASE (UNIX + Linux)*.

The whole process of installing an SAP ASE update should not take more than thirty minutes.

To upgrade SAP ASE, proceed as follows:

1. Download the software from the SAP Software Download Center.

The SAP ASE database patches are available under:

<https://launchpad.support.sap.com/#/softwarecenter>

► *Databases* ► *Database and Database Patches* ► *SAP Adaptive Server Enterprise* ► *Database Patches* ►

### i Note

Only the packages in this location have been tested and certified for use with the SAP Business Suite.

Download and save the software package to a local temporary directory. Unpack the package with SAPCAR.

2. Prepare the upgrade.

### → Recommendation

It is recommended that you perform a file system backup of the SAP ASE software installation directory `sybase/<DBSID>` (UNIX, Linux), or `<Drive>:\sybase\<DBSID>` (Windows).

It is also recommended that you verify and note down the currently installed SAP ASE version.

- Shut down the SAP system and the SAP ASE server before you start the SAP ASE upgrade. Neither SAP ASE nor the backup server must be running when you start the SAP ASE upgrade. Also, none of the database utilities (for example, *isql*) must be in use while the upgrade is being performed.
  - Download the latest version of the script [syb\\_update\\_db.TXT](#) that is attached to SAP Notes [1607816](#) and [1599814](#). This script performs important configuration settings in SAP ASE for SAP Business Suite, depending on the SAP ASE version installed.
3. Update the SAP ASE software.  
Call the SAP ASE installer.
  4. Perform post upgrade tasks.  
The post upgrade tasks are mandatory for proper functioning of your SAP ASE server after the upgrade. Perform these steps directly after the software upgrade, before you restart the SAP system.

- Restart the SAP ASE server.
- Unlock the account `sa` as soon as the SAP ASE server has been started.
- Execute the installation scripts. The scripts are located in directory `$Sybase/$Sybase_ASE/scripts` (UNIX/Linux) or `<DRIVE>:\%Sybase%\%Sybase\ASE\scripts` (Windows).  
Run the following scripts:  
`installmaster` (UNIX/Linux), `instmstr` (Windows)  
`installcommit` (UNIX/Linux), `instcomm` (Windows)  
`instmsgs.ebf`  
`installjsdb`  
`installdbextend` (only 15.7 SP42 and higher)  
`instaldbccdb` (optional, only necessary if you configured the DBCC database)
- Execute the script `syb_update_db.TXT`. The current version of this script is always attached to SAP Notes [1599814](#) (UNIX/Linux) and [1607816](#) (Windows). The scripts adapt the SAP ASE configuration and database options for SAP Business Suite, depending on the newly installed SAP ASE version.
- Restart the Job Scheduler and unlock the `sa` account in SAP ASE. Restart the SAP system.

### Update the ODBC and JDBC drivers

The SAP system does not have to be stopped when you copy the new ODBC and JDBC software to the global directory.

- Perform a file system backup of the directory `/sapmnt /<DBSID>/global/syb/<platform>/` (UNIX/Linux) or `<Drive>:\usr\sap\<SID>\SYS\global\syb\NTAMD64\` (Windows).
- Copy the file `DBCLNT157SPxx_x.SAR` to the directory and unpack it with the tool `SAPCAR`.
- Restart the SAP system to activate the newly installed driver software.

# 11 The DBA Cockpit

The DBA Cockpit is a platform-independent tool that you can use to monitor and administer your database. The advantage of using the DBA Cockpit is that it has been specifically designed for the administration and monitoring of databases in an SAP system landscape. Therefore, the functions of the DBA Cockpit especially support database administrators in adapting their databases for the workload of SAP systems. The DBA Cockpit eases the work of database administrators because all important performance tuning, monitoring, and administration tasks are available in a single transaction.

## Central Monitoring of the Databases in an SAP System Landscape

The DBA Cockpit is part of SAP NetWeaver systems and integrated into SAP Solution Manager. You can run the DBA Cockpit as part of your system administration activities in SAP Solution Manager. The DBA Cockpit is optimized for handling administration and monitoring the databases of your entire system landscape from a central system. In particular, you can use the DBA Cockpit to handle configuration of databases centrally. You can administer and monitor remote databases from the DBA Cockpit using remote database connections.

The DBA Cockpit provides the following functions:

- Overview screen that allow you to check the status of your system landscape at one glance.
- Database-specific screens that allow you to identify and analyze issues of individual databases in detail.

When you start the DBA Cockpit, the system displays the [System Configuration](#) screen. On this screen, you can decide to proceed as follows:

- Configure and monitor your entire system landscape. To do this, you stay on the entry screen of the DBA Cockpit (this screen is the [System Landscape](#) tab page).
- Monitor and administer individual databases in detail in your system landscape. To do this, you choose the [Database <Your Database>](#) tab page.

## Administration and Monitoring Functions for SAP ASE

If you administer and monitor SAP ASE databases with the DBA Cockpit, the following functions are available:

- [Performance monitoring](#)  
You can display performance and workload statistics, analyze top SQL statements, perform time spent analysis, display snapshots of database objects, and so on.
- [Space monitoring and administration](#)  
The DBA Cockpit allows you to watch the space consumption of your database. Including database objects such as tables, indexes, or tablespaces. You can analyze space allocation and perform administration activities to change the storage layout of your database.
- [Backup and recovery overview](#)  
You get an overview of all performed database backups and recoveries. In addition, you can display information about archived log files and about logging parameters.

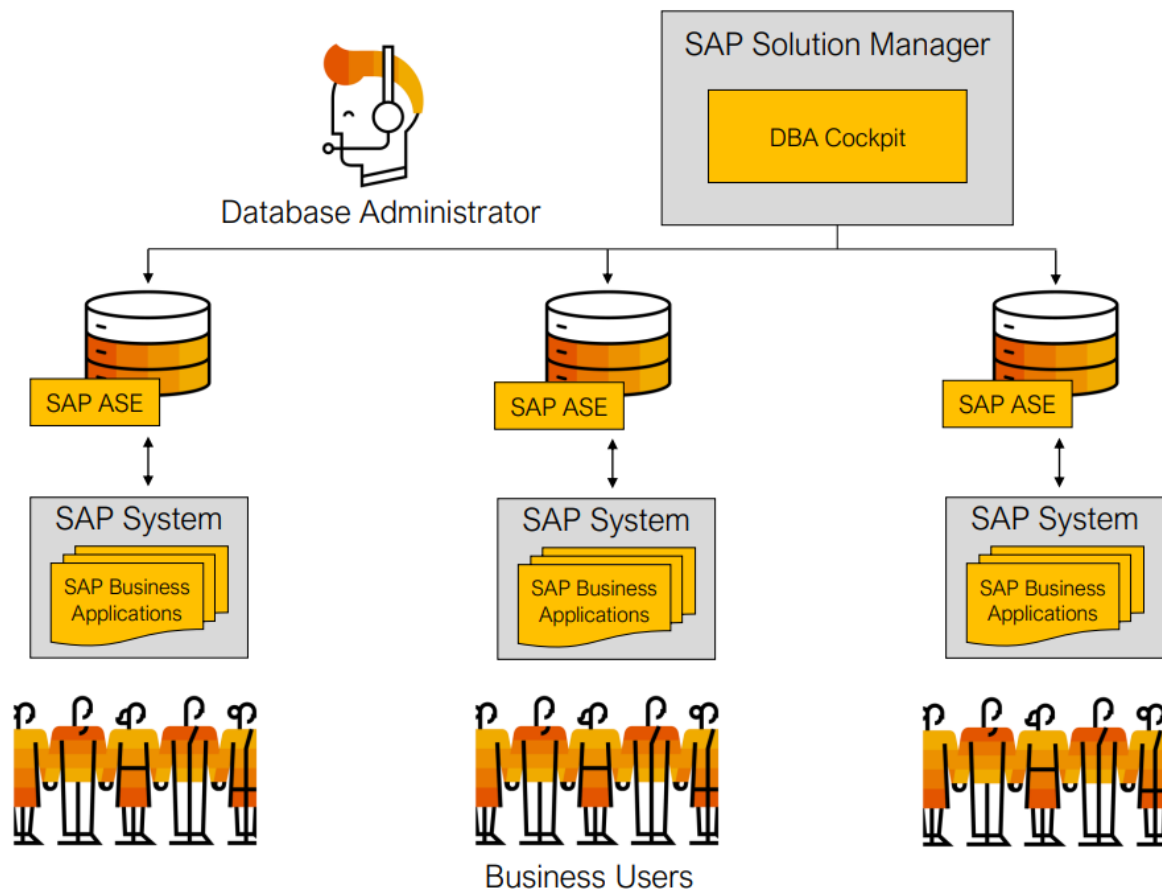
- [Database configuration](#)  
In this area, you get an overview of your database configuration. You can change the database configuration or the data collection framework.
- [Job Scheduling](#)  
Direct access to the DBA Planing Calendar, the DBA log, scheduled tasks, and other tools allow you to plan and keep track of all important jobs for the databases.
- [Diagnostics](#)  
Various diagnostic functions allow you to identify critical situations in your database, such as lock-wait events or missing tables and indexes.

The DBA Cockpit allows you to:

- Navigate between different actions
  - Change to another action without closing the previous action and still hold all data retrieved by this action
  - Handle central configuration
  - Monitor remote systems using remote database connections
- To use the functions offered for remote monitoring, you must configure the system you want to monitor. The local system is configured automatically when you start the DBA Cockpit for the first time. After having configured the connection and depending on the database, more actions are required to configure the database monitor and to set up database administration.

## 11.1 The DBA Cockpit on a Local System and on SAP Solution Manager

The DBA Cockpit is part of every SAP NetWeaver-based system. You can run the DBA Cockpit locally on an SAP NetWeaver-based system by calling the `DBACOCKPIT` transaction. Alternatively, you can run the DBA Cockpit on your SAP Solution Manager system, where you can access all databases in your system landscape using remote connections. If you use the DBA Cockpit as part of the SAP Solution Manager system, this allows you to update and administrate all databases from a central system rather than logging on to each individual system separately.



SAP Solution Manager is an SAP toolset in your system landscape to monitor the full stack of an SAP system: from the operating system up to the business process. SAP Solution Manager is typically installed on a separate system, where it provides central access to tools, methods, and preconfigured contents that you can use during the evaluation, implementation, and operations of your systems. For database administrators, SAP Solution Manager offers a range of tools for root cause analysis, alerting, and reporting.

The tools of the DBA Cockpit complement the available SAP Solution Manager tools, which provide high-level overviews of possible database issues, including alerting functions. In addition to the high-level overviews of SAP Solution Manager, the DBA Cockpit serves as an in-depth analysis tool for database-related issues.







The DBA Cockpit not only provides more tools for the expert database administrator, but it also plays an important part in the SAP Solution Manager infrastructure. The remote database monitoring infrastructure of the DBA Cockpit is used by SAP Solution Manager to extract metrics from remote databases. These metrics are then passed on to the different applications in SAP Solution Manager.

## 11.2 DBA Cockpit: User Interface

The DBA Cockpit is part of every SAP NetWeaver-based system. You can run the DBA Cockpit locally on an SAP NetWeaver-based system by calling the `DBACOCKPIT` transaction. If you use the DBA Cockpit as part of the SAP Solution Manager system, you can update and administrate all databases from a central system rather than logging on to each individual system separately.



The entry screen of the DBA Cockpit with the Web browser-based user interface is divided into the following areas:

Area	Description
Common header area	Provides a standard set of functions, for example, to log off from the DBA Cockpit or to customize the layout.
Top level navigation including second-level navigation	<p>In the top level navigation, you can switch between the following areas:</p> <ul style="list-style-type: none"> <li>Cross-system area on the <a href="#">System Landscape</a> tab page Provides information about the overall system landscape</li> <li>Database-specific area on the <a href="#">Database</a> tab page Provides information about the selected database</li> </ul> <p>In the second-level navigation, the main task areas of database administration are provided, for example, performance monitoring, space management, and job scheduling.</p> <p>For fast navigation, these main task areas provide pull-down menus corresponding to the related detail levels.</p> <p>You can hide the areas <a href="#">Detail Navigation</a>, <a href="#">System Landscape Selector</a>, and <a href="#">Favorites</a> by choosing the <a href="#">Expand or Collapse Launchpad</a> pushbutton on the left side of the top level navigation area. If the launchpad is collapsed, the second-level navigation part provides a simplified system selection field with an F4 help. Your chosen screen layout is stored in the user settings and restored at the next start of the DBA Cockpit.</p>
Detail navigation	<p>Contains the main actions of the main task areas. Depending on the selected main action, a subset of related actions is available.</p> <div> <p>❖ <b>Example</b></p> <p>If you choose <a href="#">Performance</a> in the top level navigation area, the main actions become available, such as <a href="#">Performance Warehouse</a>, <a href="#">Time Spent Analysis</a>, and others.</p> <p>If you choose <a href="#">Performance Warehouse</a>, the subactions <a href="#">Reporting</a> and <a href="#">Configuration</a> become available.</p> </div>
System landscape selector	Provides a quick overview of all configured systems. This area is described in more detail under <i>Customizing of the System Landscape Selector</i> later in this section.
Favorites list	<p>Contains a list of favorite links to special tools and actions.</p> <p>To provide quick access to specific tools and actions, choose  <a href="#">Personalize</a>  <a href="#">Add Favorite</a>  in the common header area. An entry is added to your list of favorites. You can rename or delete favorites by choosing  <a href="#">Personalize</a>  <a href="#">Organize Favorites</a> .</p> <p>For more information, see <a href="#">Special Tools in the Favorites List</a>.</p>

Area	Description
Useful links	<p>Contains the following useful links to:</p> <ul style="list-style-type: none"> <li>• SAP Applications on SAP Adaptive Server Enterprise in SAP Community By choosing this link, you can directly access the SAP Community of SAP on SAP ASE.</li> <li>• SAP ASE Infocenter By choosing this link, you can directly access the documentation for SAP ASE.</li> </ul>
Framework message window	<p>Displays the message window that is provided by the framework. Unlike the classic SAP GUI message processing, this window contains a complete history of all messages that are sent during the session.</p> <p>In addition, you can:</p> <ul style="list-style-type: none"> <li>• Collapse or expand the window by choosing <a href="#">Expand Message Window</a> or <a href="#">Collapse Message Window</a>.</li> <li>• Check if a long text for a message is available by double-clicking the message or by choosing <a href="#">Details</a>.</li> </ul> <div> <p><b>i Note</b></p> <p>By default, the message window is collapsed. When a new message is generated, it is automatically expanded.</p> </div>
Global toolbar	<p>The global toolbar provides a set of globally available functions for navigation and content-related functions like <a href="#">Refresh</a>.</p>
Central system data	<p>This area is common to most actions providing, for example, the time of the last refresh, the startup time, and the database name.</p>
Content area	<p>Displays details of the currently selected action. The content area is divided into the following areas that are optionally available depending on the chosen action:</p> <ul style="list-style-type: none"> <li>• The <a href="#">Selection</a> area where you can enter selection criteria for the content to be displayed</li> <li>• The <a href="#">Summary</a> area that provides views of data, for example, totals or execution times</li> <li>• The content, which depends on the screen and action you have chosen You can refresh the content by choosing the <a href="#">Refresh</a> pushbutton in the global toolbar or by changing the selection criteria and then choosing the <a href="#">Apply Selection</a> pushbutton in the <a href="#">Selection</a> area.</li> </ul>

Area	Description
Chart view in the content area	<p>Some reports are displayed as a chart. To modify the chart view, you can use the <a href="#">Chart Type</a>, <a href="#">Values</a>, and <a href="#">Chart Size</a> menu buttons that are optionally available depending on the screen. By choosing the <a href="#">Chart Size</a> menu button, you can specify the width and height of the chart to be displayed.</p> <p>In addition, you can open a detailed table view by choosing the <a href="#">Toggle Table Display</a> pushbutton.</p>
Content detail area	<p>Only appears with certain actions and displays additional information that is related to the selected action. Typically, this area shows details that are related to the information provided in the main content area.</p>

## Layout of the Content Detail Area

If the content in the content area is displayed as a table, you can select a table row and display more details of this table entry in the detail area. Depending on the area in the DBA Cockpit, this can include the following:

- Current details of the table entry ([Summary](#) tab page)
- History data of the table entry ([History](#) tab page)
- Graphical display of history data ([History – Graphical View](#) tab page)

The graphical view of the history complements the detail view of history data. The graphical view of the history is based on the time series that you can see in the history, which contains all data in table format.

### Note

You can switch off the display of the graphical view of history data in the personalization of the DBA Cockpit screens.

## Customizing the System Landscape Selector

By default, all systems are displayed without any grouping or filtering. For each configured system, the alert status, the name of the system and its database host is displayed. The following menu buttons are available for the list of systems:

- [Refresh System Landscape](#)  
You can refresh the information about the available systems in the list.
- [Group Systems by Selected Criteria](#)  
You can customize the displayed list of systems by grouping them according to the selected criteria:
  - [Database Platform](#)
  - [Name](#)
  - [Custom](#)
  - [Alerts](#)

To use a custom grouping, you must first define and add a custom group to the list. To do so, choose [Add Group](#) from the pop-up menu of the menu button [Group Systems by Selected Criteria](#). Specify a name for the custom group and assign the systems of your choice.

As soon as you have added a custom group, the option [Organize Groups](#) becomes available in the pop-up menu of the menu button [Group Systems by Selected Criteria](#), which lets you maintain an already existing group.

- [Filter Systems by Selected Criteria](#)  
You can filter the list of available systems to show only those systems that match the filter criteria. You filter, for example, by the alert status of the systems.
- [Search Systems](#)  
Provides an input field where you can search for a specific system in the list.

## Special Tools in the Favorites List

The [Favorites](#) list provides easy access to important tools and actions. By default, the [Favorites](#) list contains the following links that cannot be removed:

- EXPLAIN Access Plan
- Schedule an Action
- SQL Command Line

You can extend the [Favorites](#) list, that is, add and organize favorites by choosing [Personalize](#) [Add Favorite](#) or [Personalize](#) [Organize Favorite](#) in the common header area.

## 11.3 The EXPLAIN Access Plan

You can use EXPLAIN to review the access plans of all `SELECT`, `INSERT`, `UPDATE` or `DELETE` statements.

You can access the Web browser-based version of the EXPLAIN function. In the [Favorites](#) list of the Web browser-based user interface, choose [EXPLAIN Access Plan](#).

### Note

The statements might contain optional comments, such as `--OPTLEVEL( <optlevel> ) --`  
`QUERY_DEGREE(< query_degree> --LOCATION( <report> , <position> )`. If no comments are specified, the statements are explained using the default `<optlevel>` and the default `<query_degree>` for the work process.

If a statement was explained successfully, information about the SQL statement text is provided on the following tab pages:

Tab Page	Description
<a href="#">Original Statement</a>	Displays the original SQL statement

Tab Page	Description
<a href="#">Access Plan</a>	Displays the access plan that was generated by the Adaptive Server

## Using the Access Plan

The access plan shows all database operations that are performed when the statement is executed. It is displayed as a graphical tree and each node in the tree represents an operator of the access plan.

You can:

- Display or hide details of an operator by choosing the [Open Node](#) or [Close Node](#) icon on the respective node
- Expand or collapse subtrees by choosing the [Show Child Node](#) icon or the [Hide Child Node](#) icon respectively
- View operation details by double-clicking an operator in the graphical tree  
Global details about an operator are displayed on the following tab pages:
  - [General](#)  
Displays global details about the access plan
  - [Operator <Name of operator>](#)  
Displays details for the selected operator
  - [Catalog Information \(Optional\)](#)  
Displays details for the respective catalog object of the selected operator
  - [Predicates \(Optional\)](#)  
Displays filter predicates for the selected operator
- Search for operators in a complex statement by choosing [Find Nodes for Labels](#)
- Open an extra navigation window for complex access plans by choosing [Toggle Navigation Window](#)
- Print the graphic by choosing [Print the Current Model](#)
- Configure the graphic before you print it by choosing [Configure the Printout](#)
- Display or hide the quick details of all operators by choosing [Collapse](#) or [Expand](#)
- Display global details about the access plan by choosing [View Details](#)
- Display information about the JNet version used (can be required by SAP Support) by choosing the help button

### Note

For each index used in the access plan, the number of key columns that were really used within the access plan is displayed. In the appropriate tool tip, the used index field names are also displayed.

Volatile tables and indexes of volatile tables are marked with an extra volatile label. To change and re-explain the SQL statement, choose [Edit Statement](#).

## 11.4 Managing the System Landscape

The following sections provide information about how to manage your system landscape.

### 11.4.1 Configuration of Systems for Remote Monitoring

To be able to use the DBA Cockpit to monitor remote systems, you have to configure those systems in the DBA Cockpit. If the DBA Cockpit is used as part of Solution Manager Diagnostics, the DBA Cockpit setup is part of the SAP Solution Manager setup. This means that when you integrate systems into the SAP Solution Manager landscape, the related databases are configured in the DBA Cockpit and no DBA Cockpit-specific setup is required anymore.

Alternatively, you can configure your database system either using database information that is stored in the SLD for automatic generation and update of system entries or by manually creating database connections and system configuration entries.

To access the [System Configuration](#) screen, choose [System Configuration](#) on the [System Landscape](#) tab page of the DBA Cockpit. A table of all monitored systems is displayed. In the first column, an icon indicates the current status of each system.

Normally, when you start the DBA Cockpit, the local system is set as default system. To change this setting, select a system from the list and choose [Default System](#).

#### i Note

This setting **only** applies to the user that is currently logged on to the system. It is not a system-wide setting.

To monitor a system remotely, you use the following methods:

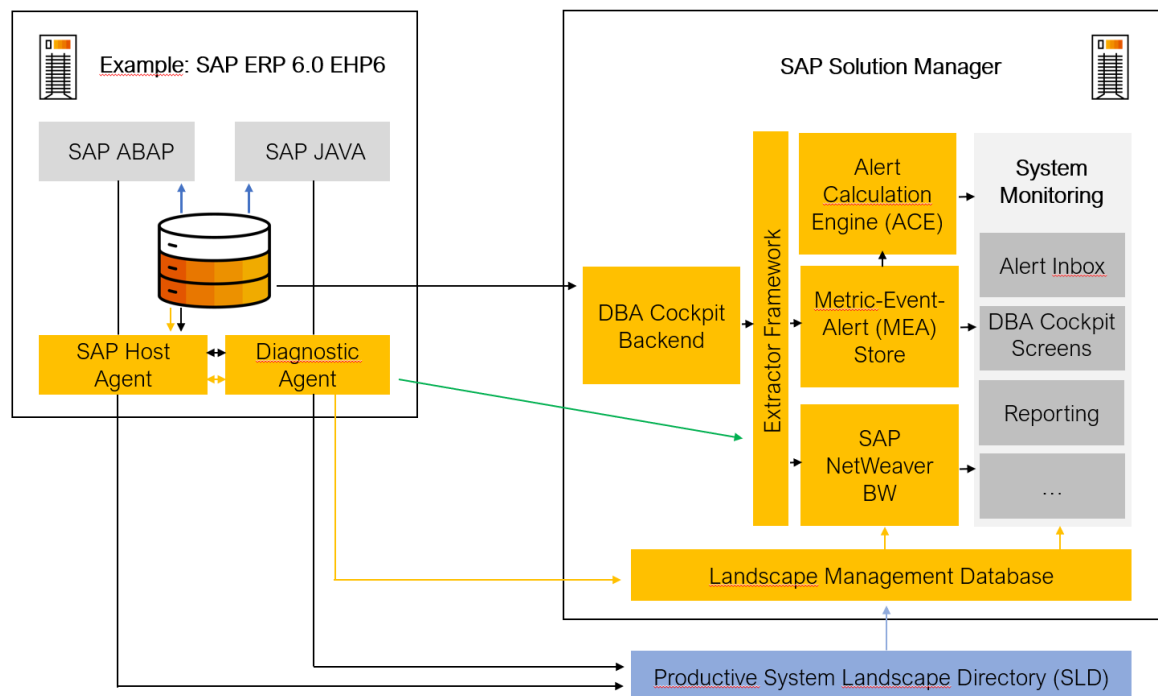
- Remote database connections (**mandatory**)  
This method uses additional connections. It is the main access method for monitoring and administration tasks and it is mandatory. You can specify remote connections for any database and maintain the connections using the DBA Cockpit.
- RFC connection (**additional option for SAP ABAP systems only**)  
For this method, you have to assign an RFC connection to your system. RFC connections are available for SAP ABAP systems only. You can use RFC connections as an optional access path for ABAP-related monitoring functions, for example, for the consistency check of the ABAP Dictionary. This means that the DBA Cockpit uses the RFC connection in parallel to the database connection for the same system.

#### i Note

You can **only** maintain RFC connections with transaction SM59, **not** with the DBA Cockpit.

## 11.4.2 Architecture Overview: End-to-End Monitoring and Alerting in SAP Solution Manager and DBA Cockpit

The architecture of SAP Solution Manager comprises a number of tools and frameworks that collect detail data about databases and their statuses automatically. The tools and frameworks for automatic discovery of databases and database details include the landscape management database (LMDB), the Diagnostics Agent, and the extractor framework:



### Landscape Management Database (LMDB)

In SAP Solution Manager, all elements of a system landscape are modeled in the LMDB. The core task of the LMDB is to provide information about the entire system landscape at a central location. The LMDB copies available data from the SLD, but it enriches the data copied from SLD with additional information.

### Diagnostics Agent

The Solution Manager Diagnostics Agent (Diagnostics Agent), which is installed on every local system of your system landscape, gathers information from the managed systems and reports the information to the SAP Solution Manager system. This includes information about the availability of the database and its host.

The Diagnostics Agent uses SAP Host Agent to discover all databases installed on a host. The Diagnostics Agent and the SAP Host Agent transfer some basic information, such as the database host, the database

type and its name, to the SLD. In addition, the Diagnostics Agent reports technical attributes like cluster topology, database release, and properties required for a remote database connection to the LMDB. This kind of information mapped in the LMDB with the data provided by the SLD. Information about databases that do not run with an SAP system are also pushed to the LMDB by the Diagnostics Agent.

## DBA Cockpit Backend, Extractor Framework, and Data Flow

The DBA Cockpit backend performs data collection via remote database connection and calculates the metrics of the monitored databases, such as performance KPIs, space, or data cache hit ratio. The DBA Cockpit takes snapshots of database statuses, and thus is able to generate historical data (time series), which allows database administrators to keep track of short- and mid-term developments in the database. Data collected by the DBA Cockpit backend is also fed into the extractor framework, the central infrastructure for SAP Solution Manager for data collection and distribution.

The extracted data is reused by the following engines and stores:

- Alert Calculation Engine (ACE)
- Metric-Event-Alert (MEA) Store
- SAP NetWeaver BW for reporting

These engines and stores further process the raw data taken from the databases and generate alerts and metrics for SAP BW reporting, which are then passed on to the different SAP Solution Manager applications, such as the alert inbox, reporting functions and also the SAP BW reporting screens in the DBA Cockpit.

## Predefined Alerting Templates Shipped by SAP

During the SAP Solution Manager setup, you can find predefined monitoring and alerting templates that contain the definitions or values of metrics, events or alerts (MEA).

Depending on the defined threshold values, incidents and notifications are then automatically triggered. For SAP ASE databases, predefined metrics, events, and alerts are available for the following:

- Database availability
- Database exceptions

The availability of the end-to-end alerting in SAP Solution Manager depends on your support license.

### 11.4.3 Setting Up Database Monitoring and Alerting in SAP Solution Manager

To set up the end-to-end monitoring and alerting infrastructure, you use the standard transactions for setting up SAP Solution Manager. You need to perform the following steps:

1. **Install the Diagnostics Agent on your database systems.**

The Diagnostics Agent gathers information from the managed systems and reports them to the SAP Solution Manager system. This also includes information about the availability of the database and its host.



You need to install a Diagnostics Agent on each server (virtual hostname) that you want to monitor. You can use the SAP installer to install the Diagnostics Agent.

2. **Configure data suppliers in the SLD.**

Use the transaction [System Landscape Directory: Local Administration \(RZ70\)](#) to configure SLD data suppliers in the system landscape. Here, you need to provide the port and the host of the SLD. The SLD data suppliers are programs that collect the database attributes [Database Host](#), [Database Type](#) and [Database Name](#) at defined periods. Once the SLD data suppliers are up and running, they push database attributes from the database to the SLD.

3. **Connect the Diagnostics Agent to SAP Solution Manager.**

Use the transaction [SAP Solution Manager Configuration \(SOLMAN\\_SETUP\) > System Preparation](#) to connect the SAP Diagnostics Agent to SAP Solution Manager.

4. **Configure the systems managed by SAP Solution Manager.**

Use the transaction [SAP Solution Manager Configuration \(SOLMAN\\_SETUP\) > Managed System Configuration](#) to perform the following activities:

- Connect the SAP Diagnostics Agent to the managed databases
- Specify system parameters required to configure the managed databases  
Most of these parameters, such as hosts or ports, are automatically detected by the Diagnostics Agent, so only a password is required here.
- Trigger automatic configuration activities  
This includes the setup of database extractors, which collect data for monitoring the databases in SAP Solution Manager.

5. **Set up technical monitoring, including alerting.**

Use the transaction [SAP Solution Manager Configuration \(SOLMAN\\_SETUP\) > Technical Monitoring](#) to set up the technical monitoring of databases in SAP Solution Manager. You set up the following:

- Activation or deactivation of auto-notifications (for example, e-mail notifications) about database alerts  
As a default, auto-notification is activated.
- Recipients and recipient lists of auto-notifications
- Assignment of monitoring templates to selected systems in scope for monitoring

Monitoring templates contain the definitions or values of metrics, events, and alerts (MEA) that trigger incidents and notifications. The SAP templates have predefined settings, but you can also adapt the templates to your customer-specific needs.

More information:

- **Complete setup of SAP Solution Manager:** Documentation for SAP Solution Manager on SAP Help Portal at <http://help.sap.com/solutionmanager>
- **Additional database-specific setup steps:** SAP Note [1027146](#)

## 11.4.4 Configuring Systems for Remote Monitoring Manually

You use this procedure to configure systems that you want to monitor using remote database connections. A manual system configuration is only necessary if the monitored database has not been configured during the integration of a system using SAP Solution Manager.

The configuration does not include the setup of the monitoring infrastructure, but you perform only a basic setup that is necessary to connect to the monitored database. For subsequent configuration steps, see [Enabling the Database for the Data Collection Framework \[page 45\]](#).

### i Note

Depending on the database platform of the selected system, some options might not be available. In this case, you cannot enter any data in the corresponding fields.

- The system(s) that you want to monitor must have a database release that is compatible with the database release of your local database.
  - The user for the database connection must have sufficient database permissions. For more information, see [Maintenance Actions in the DBA Cockpit \[page 24\]](#).
1. Call the DBA Cockpit.  
The *System Configuration* screen appears displaying a list of all available systems with a *Configuration Status* icon that indicates the current system status.

### i Note

When you start the DBA Cockpit for the first time, the local system is automatically added to the list of all available systems. At least one system entry is displayed.

2. Choose the *Add* pushbutton.  
The wizard *Integrate a System* appears.  
The following table lists the steps and recommended actions:

Step Name	Action
<i>Introduction</i>	Provides an overview of the configuration steps  No action to be taken
<i>System Characteristics</i>	Specify the following: <ul style="list-style-type: none"><li>• Name of the system that you want to monitor</li></ul> <div><h3>i Note</h3><p>This name is a unique ID and does not have to be the SAP system ID. You can choose any name <b>except</b> the SAP system ID of the <b>local system</b> that is reserved for the local system entry.</p></div> <ul style="list-style-type: none"><li>• Description of the monitored system</li><li>• Connection type Choose between the following connection types:<ul style="list-style-type: none"><li>• Remote Database Connection</li><li>• Remote Database Connection and RFC Destination</li><li>• Remote Database Connection via RFC Destination</li></ul></li></ul>

Step Name	Action
<p><i>RFC Destination</i></p> <p>(Optional step that is only necessary if, in the previous step, you have chosen a connection type that requires an RFC destination.)</p>	<p>Specify the name of the RFC destination to be used</p> <div> <p><b>i Note</b></p> <p>The specified RFC destination must already exist and be available.</p> </div> <p>You can test the destination by choosing the <i>Test Connection</i> pushbutton. If the connection is not working, you can only proceed if you select the <i>Ignore Communication Errors</i> checkbox.</p>
<p><i>Database Connection</i></p>	<p>Specify the following:</p> <ul style="list-style-type: none"> <li>Name of the database connection This is a unique name that you can freely choose. Alternatively, you can search for an already existing connection name using the related search help. In this case, confirm the selected name using the <input type="text" value="Enter"/> key to prefill the connection attributes.</li> <li>Database platform of the monitored database</li> <li>Connection maximum that limits the parallel use of this connection by the kernel</li> <li>Connection optimum that sets the optimum number of open connections</li> </ul> <div> <p><b>i Note</b></p> <p>You should set this value to <i>0</i> to ensure that the kernel closes connections if they are no longer used.</p> </div> <ul style="list-style-type: none"> <li>User name and password for the user that is used for monitoring</li> <li>List of connection parameters that are required to identify the database</li> </ul>

Step Name	Action
<a href="#">Monitoring Settings</a>	<p>Specify how you want to collect monitoring data:</p> <ul style="list-style-type: none"> <li>If alerts are to be provided for the RZ20 alert monitor, select the <a href="#">Activate Alert Monitoring</a> checkbox.</li> </ul> <div style="background-color: #f0f0f0; padding: 10px; margin: 10px 0;"> <p><b>i Note</b></p> <p>If you are using the DBA Cockpit in SAP Solution Manager 7.1, this option should not be used anymore. Instead, the E2E alerting of SAP Solution Manager is used that requires no specific setup in the DBA Cockpit.</p> </div> <ul style="list-style-type: none"> <li>If the monitoring data is to be collected by the remote system, select the <a href="#">Data Collection by Remote System</a> checkbox.</li> <li>If data for the Central Planning Calendar is to be provided, select the <a href="#">Show Scheduled Jobs in Central Planning Calendar</a> checkbox.</li> <li>Deprecated option: If data about the performance or the size of database objects is to be collected, select the <a href="#">Collect Space and Performance History Data</a> checkbox.</li> </ul> <div style="background-color: #f0f0f0; padding: 10px; margin: 10px 0;"> <p><b>i Note</b></p> <p>This option has been deprecated and should not be used anymore. Instead, proceed as described in <a href="#">Enabling the Database for the Data Collection Framework [page 45]</a>.</p> </div> <p>Depending on the selected database platform, only a subset of options might be available.</p>
<a href="#">Summary</a>	<p>Summarizes all actions to be performed</p> <p>To save your entries, choose the <a href="#">Execute</a> pushbutton.</p>
<a href="#">Execution Protocol</a>	<p>Summarizes all performed actions including error messages</p> <p>To exit the wizard, choose the <a href="#">Finish</a> pushbutton and return to the <a href="#">System Configuration</a> screen.</p>

3. Optional:  
If you want to change an existing configuration entry, select the system entry in the overview list and choose the [Change](#) pushbutton.  
In the dialog box [Change System Configuration Entry](#), enter and save your changes.
4. Optional:  
If you want to delete a configuration entry, select the system entry in the overview list, choose the [Delete](#) pushbutton and confirm the deletion.

## 11.4.5 Enabling the Database for the DBA Cockpit Framework

After a system has been configured in the DBA Cockpit, the database to be monitored needs additional instrumentation to enable the time-based collection and evaluation of data related to performance, configuration, and space.

To instrument this DBA Cockpit Framework (DCF), a separate schema is created in the monitored database that contains all relevant monitoring objects, such as:

- A set of tables that keep the history
- A set of stored procedures to collect data on a regular basis

Regardless whether the database has been configured for monitoring using SAP Solution Manager or using the DBA Cockpit, the first time you select a database system for monitoring in the DBA Cockpit, the existence of the DCF is checked.

All settings for the instrumentation, for example, recurrence patterns for the scheduled data collectors and the amount of data to be collected are determined by templates. SAP provides the following standard templates:

- [SAP Default](#)  
Most of the data collectors run hourly. The sliding window is set to two weeks except for the most important tables and indexes.
- [SAP Detailed](#)  
Most of the data collectors run quarter-hourly. The sliding window is set to two weeks except for the most important tables and indexes.

By modifying these templates, you can influence the automatic setup of the DCF.

For more information, see [DBA Cockpit Framework: Template Definition \[page 114\]](#).

## 11.4.6 Setting Up the DBA Cockpit Framework (DCF) Manually

The DCF is set up individually for each database based on the database version, the usage type of the database, and the SAP coding. To set up the DCF manually, you can either use a template or activate and configure individual history data collectors.

### → Recommendation

We recommend that you use templates to ensure that data is collected homogeneously in your system landscape. Only in rare cases, it might be advisable that you configure individual history data collectors.

1. Call the DBA Cockpit, and on the [Database](#) tab page, choose ► [Configuration](#) ► [DBA Cockpit Framework](#) ► [Data Collectors and Admin Procedures](#) .  
The [Collector Configuration](#) screen appears.
2. Choose the [Implement Template](#) pushbutton.  
The [Implement Template](#) dialog box appears. The default template is marked with an asterisk (\*).  
By default, deprecated functions are preselected for disabling. If you want to keep any old settings, deselect the relevant checkboxes.

### i Note

The option to disable deprecated functions or to keep them is only available if there are deprecated functions that are currently active but recommended for disabling.

3. To set up the template in the monitored database, choose the *Implement* pushbutton.

For more information, refer to [Configuration: DBA Cockpit Framework \[page 111\]](#).

## 11.4.7 Configuring Database Connections

This section describes how you set and maintain technical attributes for remote database connections on the *Database Connections* screen in the DBA Cockpit. The DBA Cockpit uses these connections for administration and monitoring or for application programs that use secondary connections to external databases.

Usually, new connections are created during the system configuration on the *System Configuration* screen as described in [Configuring Systems for Remote Monitoring Manually \[page 41\]](#) and, therefore, do not have to be created on the *Database Connections* screen.

You can also use the *Database Connections* screen to set up database connections that are used for non-monitoring components, for example, for the access to external data resources by SAP BW.

1. Call the DBA Cockpit and on the *System Landscape* tab page, choose *Database Connections*.  
The *Database Connections* screen appears displaying a list of all available database connection definitions grouped by database platform:

Column	Description
<i>Remote Database Connection</i>	Name of the database connection
	<div><div>i Note</div><div>This is a unique name that you can freely choose.</div></div>
<i>DB Name</i>	Name of the database
<i>DB Host</i>	Name of the database host
<i>DB Schema</i>	Name of the database schema to be monitored
<i>User Name</i>	Name of the connect user
<i>Permanent</i>	Specifies whether the connect user must be permanently available
<i>Max. Connections</i>	Maximum allowed number of open connections
<i>Opt. Connections</i>	Optimal number of connections

By default, the database connections that are defined in the local system are displayed.

2. To add a database connection, choose the *Add* pushbutton.  
The *Add Connection Entry* dialog box appears.

3. In the *Add Connection Entry* dialog box, enter the following:

- In the *Connection Name* field, specify the name of the connection.

#### **i** Note

This name is a unique ID that you can choose freely except for names that are reserved by SAP for generated connections. These can be, for example, administrator connections or connections that are used by systems from the system landscape directory (SLD).

- In the *Database System* field, select the name of the database platform from the dropdown list.
- In the *Connection Maximum* field, enter an appropriate value. This value limits the number of database connections that are currently held by the SAP system. The SAP system does not let you exceed this limit.
- In the *Connection Optimum* field, enter an appropriate value. This value is a more flexible limit that can be exceeded.
- If you want the connection to be mandatory for the SAP system, select the *Permanent* checkbox. This parameter defines the availability of the database connection. It is then handled in the same way as the local default connection, that is, if this database connection is not available for a work process, the work process of the SAP system cannot run.

#### **⚠** Caution

You should set this parameter only if the connection is absolutely required to run your SAP system.

- In the *User Name* field, enter the name of the connect user. Make sure that you choose a user with the appropriate authorizations. For more information, see [Maintenance Actions in the DBA Cockpit \[page 24\]](#).
- In the *Password* field, enter a password for the connect user and confirm it in the appropriate field.
- In the parameter table, specify the following additional database-specific parameter values:

Attribute	Description
<i>Database Name</i>	Name of the database
<i>Service Name</i>	Name or number of the service  This value corresponds to the parameter <code>SVCENAME</code> of the database manager configuration (DBM) of the remote database.
<i>Database Host</i>	Name of the remote database server
<i>Schema Name</i>	Name of the schema to be monitored

#### **i** Note

If you omit this field, the name of the SAP connect user is used as schema.

4. To save your entries, choose the *Add* pushbutton.

5. To change a database connection, expand the respective database platform in the [Remote Database Connection](#) column, select a connection, and choose the [Change](#) pushbutton.  
The [Change Connection Entry](#) dialog box appears.
6. Enter your changes in the appropriate fields and choose [Save](#).
7. To check if you have entered the correct user and password information as well as the correct technical connection data, you can test a database connection. To do so, select a connection and choose the [Test](#) pushbutton.  
The test result is displayed in the [Connection Test Protocol](#) in the content detail area.
8. To delete a connection, select a connection and choose the [Delete](#) pushbutton.

#### Caution

If the selected database connection is still used by a system that is registered in the DBA Cockpit, you **cannot** delete it.

## 11.4.8 Configuring Systems for Remote Monitoring Using the System Landscape Directory (SLD)

The system landscape directory (SLD) contains data from all database systems that are available in your system landscape. You can use this data to set up the system configuration in the DBA Cockpit instead of setting it up manually or using SAP Solution Manager.

When you set up the DBA Cockpit for the first time, you use this procedure to import the appropriate data from the SLD. During production operation, you use the procedure to synchronize the data between the SLD and the DBA Cockpit periodically.

#### Note

We recommend that you only use the SLD for the setup of your system landscape if SAP Solution Manager is not available.

1. To import database connection data from the SLD, call the DBA Cockpit.
2. On the [System Landscape](#) tab page, choose [SLD System Import](#).  
The [SLD System Import](#) screen appears. Depending on the system landscape, one or more of the following nodes are displayed:
  - [New Database Systems in the SLD](#)  
All database systems that are registered in the SLD and that so far have been unknown to the DBA Cockpit are displayed.
  - [Changed Systems From Earlier SLD Imports](#)  
All database systems for which the main data differs between the SLD and the DBA Cockpit are displayed.
  - [Systems No Longer Registered in the SLD](#)  
All systems that were originally imported from the SLD into the DBA Cockpit but that are no longer registered in the SLD are displayed.
  - [Systems Identical in the SLD and in the DBA Cockpit](#)  
All systems that are registered in the SLD and that are identical in the DBA Cockpit are displayed.
  - [Unsupported Database Systems in the SLD](#)



All database systems that are registered in the SLD but not supported by the DBA Cockpit are displayed.

### i Note

Each database system is described as follows:

```
<Name (system ID) of the database system> on <main database host>
( <database platform> )
```

3. To import database system data, choose the [Change](#) pushbutton.  
The actions allowed for each database system are displayed in the second column of the tree.
4. Select the actions that you want to execute for the selected database systems and choose the [Import](#) pushbutton. By default, only the import of new database systems is selected.  
The selected actions are executed. A short message for each executed action is displayed in the content detail area.

### i Note

Connection data that is retrieved from the SLD might not be complete for one of the following reasons:

- Depending on the data provided by a system to the SLD, some connection data can be incomplete.
- User or password data is not available via SLD.

When you establish the connection to an imported system for the first time, the DBA Cockpit checks the completeness of the configured system. This means that you are prompted for user, password, and connection information, if necessary. If additional connection information is required, enter the required data as described in [Configuring Database Connections](#).

## 11.4.9 Using the Central Calendar

- You have defined the systems to be displayed in the Central Calendar by double-clicking the required system in the screen [DBA Cockpit: System Configuration Maintenance](#) and selecting [Collect Central Planning Calendar Data](#).
  - In the DBA Planning Calendar of the DBA Cockpit where you call the Central Calendar, you have planned the action [Central Calendar Log Collector](#) to run regularly. This collects information from the defined remote systems for display in the Central Calendar.  
For more information, see [Jobs: DBA Planning Calendar \[page 116\]](#).
1. Start the Central Calendar from the DBA Cockpit by choosing [Jobs](#) > [Central Calendar](#) .  
The Central Calendar is displayed. If you have already run or planned actions, you see entries by day, one for each system.  
Here is an example of entries for [Thursday February, 08](#) (for example) affecting two systems, [FUD](#) and [FIB](#):

3	FUD	2
4	FIB	1

## i Note

On system FUD for Thursday 8th February, there were three actions planned, two of which had the highest status severity. For example, the highest status severity for FUD might be *Finished with warning*, in which case the entry for FUD is displayed with a yellow background. This means that two actions ended with a warning.

On system FIB for the same day, there were four actions planned, one of which ended with the highest severity. For example, the highest severity for FIB might be *Finished with error*, in which case the entry for FIB is displayed with a red background. This means that one action ended with an error.

The following table shows the color-coded statuses in the Central Calendar, which you can also see by choosing [Legend](#):

Color	Status
Light blue	<i>Planned</i>
Dark blue	<i>Running</i>
Green	<i>Finished successfully</i>
Yellow	<i>Finished with warning</i>
Red	<i>Finished with error</i>
Dark yellow	<i>No longer available</i>
Dark red	<i>Scheduling failed</i>

2. To see a summary of the actions for a day, double-click the day header.  
The system displays a summary of the actions and status for each system on the day you selected, as in the following example:

Example:

System	Total	No longer available	Scheduled	Running	Finished	Warning	Error	Overdue
<i>FUD</i>	<i>3</i>	<i>1</i>		<i>2</i>				
<i>FIB</i>	<i>4</i>		<i>3</i>				<i>1</i>	

3. To see the individual actions for a system, double-click the entry for the system on the required day.  
You see the relevant day in the DBA Planning Calendar. You can perform all usual functions in the DBA Planning Calendar.
4. To refresh the display for the system from which you called the Central Calendar, choose [Refresh](#).
5. To refresh the display for all systems, choose [Remote Refresh](#).

You can remotely refresh the display as follows:

Method	How the Refresh Runs
<a href="#">Run in Dialog</a>	Runs in dialog mode, which can take a long time, so <b>not</b> recommended
<a href="#">Start immediately</a>	Runs immediately in the background as a job
<a href="#">Schedule at</a>	Runs in the background at the time that you specify

#### → Recommendation

We recommend that you schedule action [Central Calendar Log Collector](#) to run regularly, as described above in *Prerequisites*.

6. If required, you can customize the calendar display as follows:
  1. Specify a factory calendar in [Calendar ID](#).  
Holidays are displayed in the same background color as weekend days. This in no way restricts the planning of actions in the DBA Planning Calendar.
  2. Switch to day, week, or month view by choosing
    - ▶ [Administration](#) ▶ [View Day](#) ▶
    - ▶ [Administration](#) ▶ [View Week](#) ▶
    - ▶ [Administration](#) ▶ [View Month](#) ▶
  3. Choose [Save Settings](#) and change [Number of Weeks](#) or [Entries per Day](#) in the display.

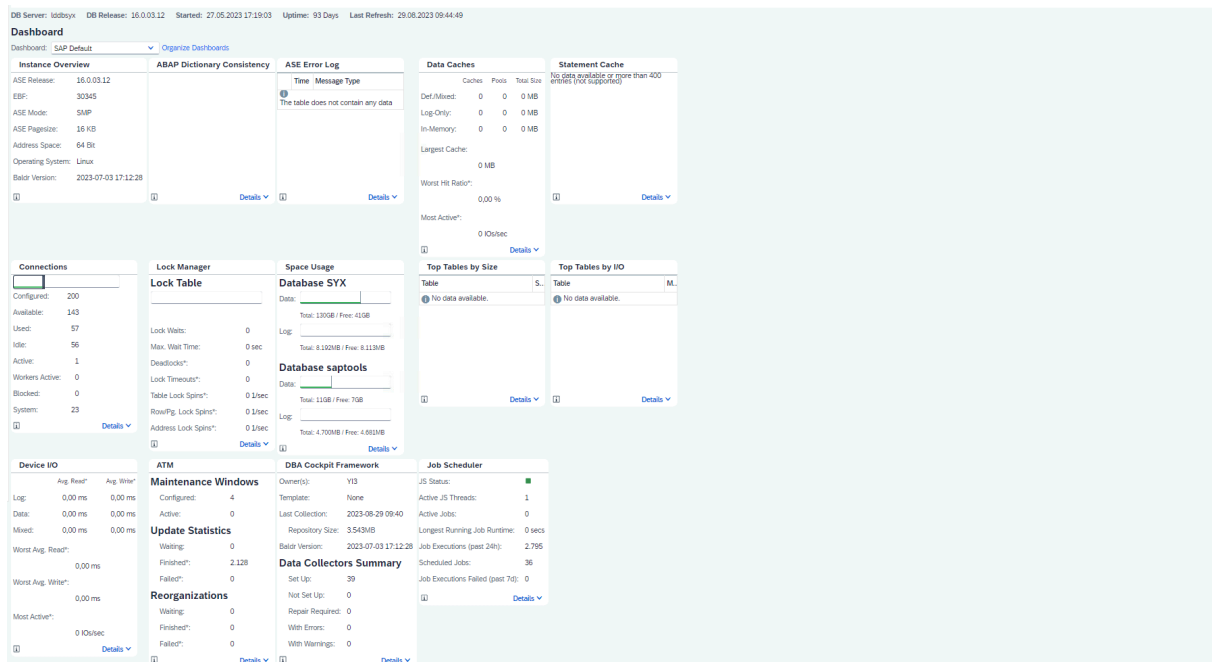
## 11.5 Performance

The following sections provide information about the main task areas that are available under [Performance](#) on the [Database](#) tab of the DBA Cockpit.

### 11.5.1 Performance: Dashboard

#### Use

The dashboard shows a summary of the most important metrics. You get information about properties of the database, host, cache qualities, memory sizes, locks, and deadlocks, workload counters, backup, growth of the database, and physical I/O counters. The screen is displayed when you switch from the [System Landscape](#) tab to the [Database](#) tab of the DBA Cockpit. Dashboards are defined by a number of plug-ins, where each plug-in covers a certain aspect of SAP ASE monitoring in overview-type manner.



The DBA Cockpit provides a library of about twenty plug-ins. Users can define their own dashboards. The scope can be *Single System* or *Landscape*. Choose *Organize Dashboards* at the top right-hand corner to customize the dashboard.

## More Information

SAP Note [1722359](#): SAP Applications on SAP Adaptive Server Enterprise - Best Practices for Migration and Runtime

## 11.5.2 Performance: System Activity

To access information about the workload run on the SAP ASE server and resources consumed by it, call the DBA Cockpit and choose **Performance** **System Activity** on the *Database* tab of the DBA Cockpit.

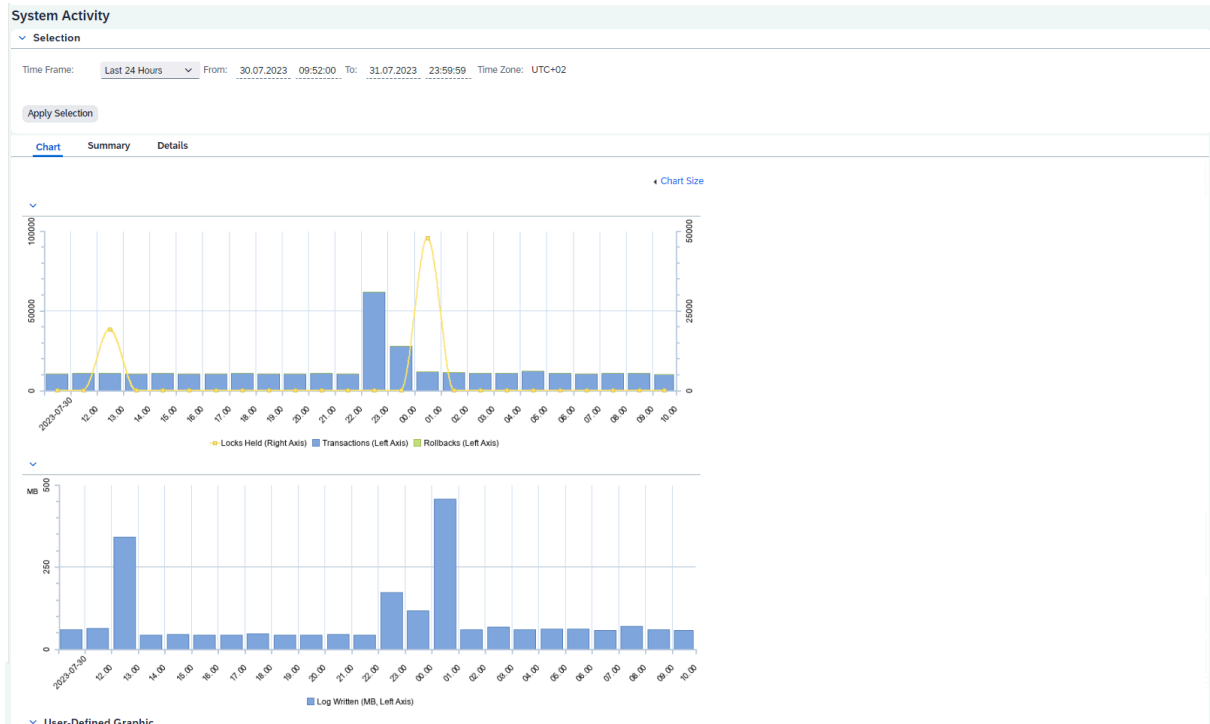
### Note

To monitor data on the *System Activity* screen, you have to make sure that the DBA Cockpit framework (DCF) is set up correctly. If the DCF is not available or set up incorrectly, a warning is displayed. For more information, see [DBA Cockpit Framework: Data Collectors and Admin Procedures \[page 111\]](#).

The *System Activity* screen provides the following:

- A selection area where you specify the time frame for which you want the performance overview to be displayed.
- Overview charts that display the retrieved monitoring data with important key figures that have been aggregated over the selected time period.

- A summary that delivers information on resource consumption, network I/O (packets sent and received), and on the workload profile.
- A [Details](#) subscreen, that provides the possibility to determine a finer granularity for the time frame. You can choose between [Hour](#), [Day](#), or [Week](#).



The [System Activity](#) screen provides a high-level overview of the workload run on the SAP ASE server. It shows transactions, connections (2-4 connections correspond to one work process), reads (SELECT statements), writes (DMLs), and rollbacks. Make sure that the number of rollbacks is not too high. Physical reads should not be less than 10% of the logical reads.

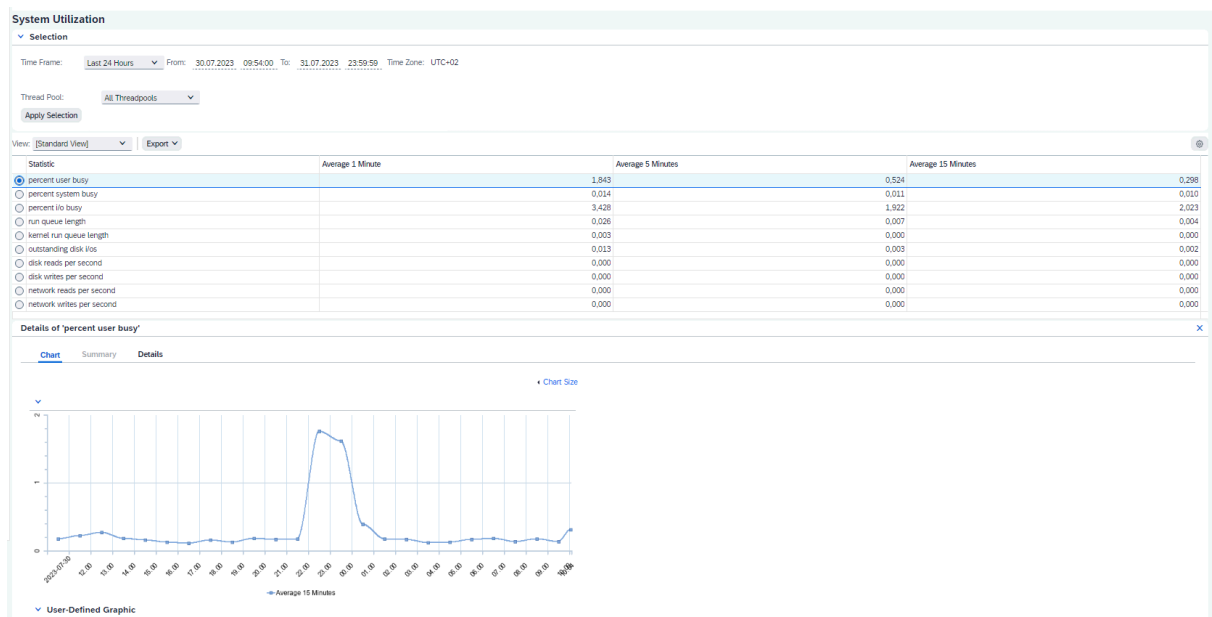
## 11.5.3 Performance: System Utilization

You can access information about system utilization by calling the DBA Cockpit and choosing [Performance](#) [System Utilization](#) on the [Database](#) tab of the DBA Cockpit.

### Note

To monitor data on the [System Utilization](#) screen, you have to make sure that the DBA Cockpit framework (DCF) is set up correctly. If the DCF is not available or set up incorrectly, a warning is displayed. For more information, see [DBA Cockpit Framework: Data Collectors and Admin Procedures \[page 111\]](#).

In the [Selection](#) area, you can specify the time frame and the thread pool for which you want system utilization to be displayed



To display detailed information, you select the appropriate entry that you want to analyze in the overview table. The **Chart** tab shows the details of the thread analysis in a graphical representation. The **Summary** tab contains general information, the description of the thread and the recommended action. The **Details** tab provides an overview on an hourly, daily or weekly basis.

The *percent* values (*percent user busy*, *percent system busy*, *percent I/O busy*) should not exceed 80%. If they do, the CPU is running at full capacity or is overloaded.

The value *run queue length* shows whether processes have to wait for a long time,

## 11.5.4 Performance: System Time Breakdown

### Use

You can access the system breakdown overview by calling the DBA Cockpit and choosing **Performance** **System Time Breakdown** on the **Database** tab of the DBA Cockpit.

With SAP ASE 16.0 screen **Performance: System Waits** has been replaced with screen **Performance: System Time Breakdown**.

#### Note

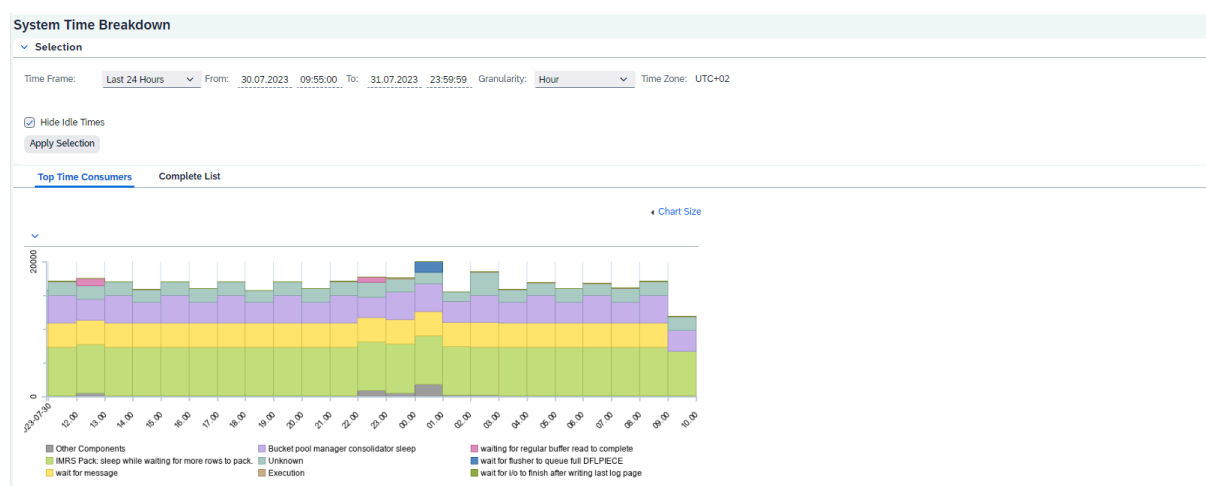
To monitor data on the **System Time Breakdown** screen, you have to make sure that the DBA Cockpit framework (DCF) is set up correctly. If the DCF is not available or set up incorrectly, a warning is displayed. For more information, see [DBA Cockpit Framework: Data Collectors and Admin Procedures \[page 111\]](#).

In the **Selection** area, you can specify the time frame for which you want the system breakdown to be displayed.

In the **Top Time Consumers** overview you can choose a time span in the graph that you want to analyze in detail.

The graph that appears in the [Chart](#) tab is referred to as the secondary overview and displays additional information supporting the graph displayed under [Top Time Consumers](#).

As database administrator you should monitor the wait events shown in the graphic below. If you observe irregularities (like in the first column), select them and read the [Recommended Action](#). You can also refer to information on other DBA Cockpit screens. The processing events refer to the execution of SQL statements ([Sorting](#) and so on). The chart below shows the time consumption of these processing events.



The [Chart](#) tab shows the details of the thread analysis in a graphical representation. The [Details](#) tab provides an overview on an hourly, daily or weekly basis. The detail data is displayed in the [Details](#) area below the overview table.

## More Information

SAP Note [1954245](#): SYB: Performance degradation due to high CPU usage in SAP ASE

## 11.5.5 Performance: Spinlock Contention

### Use

You can access information about SAP ASE spinlocks by calling the DBA Cockpit and choosing [Performance](#) [Spinlock Contention](#) on the [Database](#) tab of the DBA Cockpit.

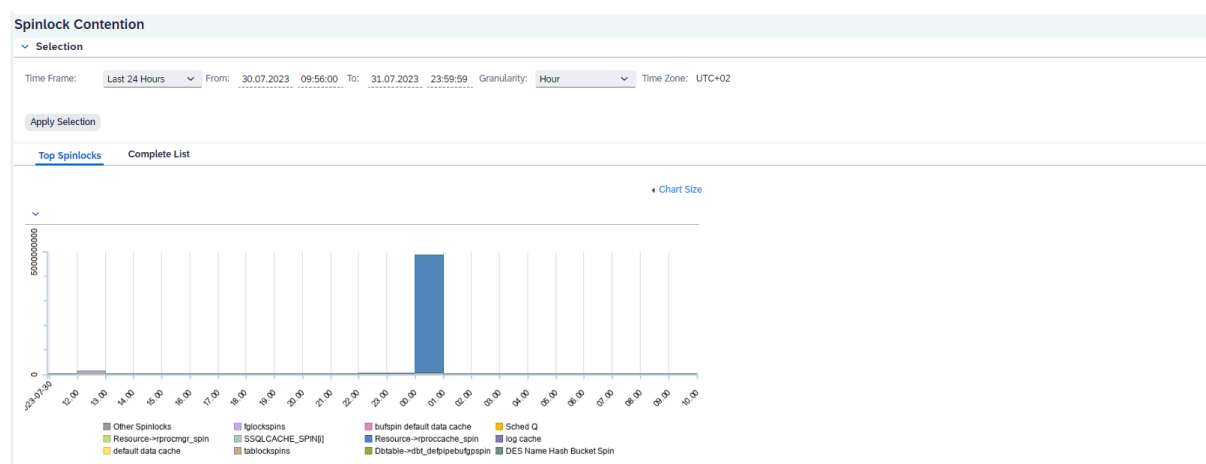
#### Note

To monitor data on the [Spinlock Contention](#) screen, you have to make sure that the DBA Cockpit framework (DCF) is set up correctly. If the DCF is not available or set up incorrectly, a warning is displayed. For more information, see [DBA Cockpit Framework: Data Collectors and Admin Procedures \[page 111\]](#).

A spinlock is a simple locking mechanism that prevents a process from accessing the system resource currently used by another process. All processes trying to access the resource must wait (or “spin”) until the lock is released.

The data collector `spinlocks` allows historical monitoring of spinlock activity.

When a user task makes changes to a system resource, a spinlock denies all other tasks access to this resource while the changes are being made. Although spinlocks are held for very brief durations, they can reduce performance in systems with high transaction rates. Spinning is one of the major causes of high CPU usage on the database server.



## More Information

[Configuring the data cache to improve performance](#)

Search for SAP Notes (<http://support.sap.com/notes>) and use the names in the legend of the *Top Spinlocks* screen.

## 11.5.6 Performance: Process Monitor

You can access information about database processes by calling the DBA Cockpit and choosing **Performance** **Process Monitor** on the *Database* tab of the DBA Cockpit.

The process overview is a snapshot of the processes that are currently executed in the system. It is primarily intended for information-gathering, for example, for tuning, or for troubleshooting. Historical data is not included in the process overview.

For each process the statement and transaction processing time, the CPU usage, the name of the client host, the server process ID of a process that is blocking this one (if any), the name of the database, the command being run, the login name, and other values are displayed.

To analyze performance data for database processes, you proceed as follows:

1. You identify the task type of the processes.



You can analyze [Internal Applications](#) (database internal processes) or [External Applications](#) (work processes of the SAP application server, for example).

2. You specify the [Task Status](#).
3. To refresh the monitoring data, you choose the [Apply Selection](#) pushbutton. The following information is displayed for each process:

Column:	Description:
<a href="#">SPID</a>	Server Process Identifier
<a href="#">Command</a>	Name of the command that launched the process
<a href="#">Statement Runtime</a>	Statement Runtime in seconds
<a href="#">Transaction Runtime (sec)</a>	Transaction Runtime in seconds
<a href="#">Transaction State</a>	The following statuses are displayed: <a href="#">Open</a> , <a href="#">In Process</a> , <a href="#">Completed</a> or <a href="#">Closed</a>
<a href="#">CPU</a>	CPU Sample
<a href="#">Engine Number</a>	Unique identifier of the engine that the process is executing on
<a href="#">Priority</a>	Priority at which the process is executing
<a href="#">Locks Held</a>	Locks that are held by an update are kept in place by the system until the update has been processed.
<a href="#">Blocking SPID</a>	Server process identifier of the process holding the lock that this process has requested, if waiting for a lock
<a href="#">Application</a>	Application name
<a href="#">SAP User Name</a>	Name of the SAP logon user
<a href="#">SAP Proc. Type / Transaction Code</a>	Process type of SAP transaction / transaction code (dialog process)
<a href="#">SAP Program</a>	Name of the SAP program
<a href="#">Host Name</a>	Client host name
<a href="#">Client OSPID</a>	OS process identifier of the client application
<a href="#">Login</a>	Login user name

4. To display detailed information, you select the appropriate entry that you want to analyze in the overview table. The detail data is displayed in the [Process Details](#) area below the overview table. The [Process](#) tab shows information on the process metadata, the client metadata and the transaction. Choose the [SQL Statement](#) tab for further details on the SQL statement. Use [EXPLAIN](#) to analyze the EXPLAIN access plan. For more information, see [The EXPLAIN Access Plan \[page 36\]](#).

You can trace or kill a process in the process monitor if you discover, for example, that the activity has been running for a long time.

To trace and analyze a process, select it in the overview table and choose the [Trace Activity](#) pushbutton. The activity trace starts in a separate Web browser providing detailed information about the selected process. By default, the screen is refreshed every five seconds. You can choose different refreshing intervals by pausing the trace, specifying a different time interval, and then resuming the trace.

The screenshot shows the 'Process Monitor' interface. At the top, there's a 'Selection' section with filters for Task Type, Task Status, and Client PID. Below this is a table of processes with columns: Server Process ID, Command, Statement Runtime (ms), Transaction Runtime (sec), Transaction State, CPU, Engine Number, Priority, Locks Held, Blocking SPID, Application, SAP User Name, SAP Proc. Type / Transaction Code, SAP Program, Host Name, Client OS Process ID, and Login Name. Process 6, 'ASTC HANDLER', is selected. Below the table, the 'Process Details' section is expanded, showing 'Process Metadata', 'Client Metadata', 'Transaction', and 'Resources'.

Server Process ID	Command	Statement Runtime (ms)	Transaction Runtime (sec)	Transaction State	CPU	Engine Number	Priority	Locks Held	Blocking SPID	Application	SAP User Name	SAP Proc. Type / Transaction Code	SAP Program	Host Name	Client OS Process ID	Login Name
1	MEMORY TUNE	0	0		0.00	10	0	0	0							
3	DEADLOCK TUNE	0	0		0.00	0	2	0	0							
4	SHUTDOWN HA...	0	0		0.00	0	5	0	0							
5	SPF HANDLER	0	0		0.00	3	6	0	0							
6	ASTC HANDLER	0	0		0.00	1	5	0	0					SYX		probe
7	ASTC HANDLER	0	0		0.00	0	5	0	0					SYX		probe
8	ASTC HANDLER	0	0		0.00	1	5	0	0					SYX		probe
9	ASTC HANDLER	0	0		0.00	1	5	0	0					SYX		probe
10	CHECKPOINT SL...	0	0		0.00	3	5	0	0							
11	HK WASH	0	0		0.00	0	7	0	0							

**Process Details**

**Process Metadata**

Server Process ID: 6  
Kernel Process ID: 2.162.705  
Login Name: probe  
Server User ID:  
Database: master  
Engine Number: 1  
Engine Group Name:  
Execution Class:  
Priority: 5  
Seconds Connected: 5.589.773 sec

**Client Metadata**

Application:  
SAP User Name:  
SAP Proc. Type / Transaction Code:  
SAP Program:  
Host Name: SYX  
Client IP:  
Client OS Process ID:  
Client Driver Version:

**Transaction**

Transaction State:  
Type:  
Start Time:  
Transaction Runtime: 0 sec  
Fallover State: Resident Tx  
Transaction Name:

**Resources**

Number of Child Processes: 0  
Family ID: 6  
Heap Memory Reserved: 8 KB  
Heap Memory In Use: 0 KB

**Activity**

Status: sleeping  
Command: ASTC HANDLER  
Wait Event: wait coord: pause during idle loop  
Locks Held: 0  
Blocking SPID: 0  
Blocking XLOID: 0

The screen [Diagnostics: Lock-Wait Events \[page 126\]](#) provides further information to identify the reason for long-running processes.

To cancel an activity, select the process and choose the [Kill Process](#) pushbutton.

## 11.5.7 Performance: Thread Activity

You can access information about system threads by calling the DBA Cockpit and choosing [Performance](#) [Thread Activity](#) on the [Database](#) tab of the DBA Cockpit.

### Note

To monitor data on the [Thread Activity](#) screen, you have to make sure that the DBA Cockpit framework (DCF) is set up correctly. If the DCF is not available or set up incorrectly, a warning is displayed with a link to the collector configuration screen. There you can perform the required steps. For more information, see [DBA Cockpit Framework: Data Collectors and Admin Procedures \[page 111\]](#).

Thread pools group CPU resources, and contain threads used to execute SAP ASE server tasks associated with that thread pool. Threads host engines that execute user tasks, run specific jobs, and process requests from

a work queue. The SAP ASE server contains system-defined thread pools and, if present, user-created thread pools. Thread pools are available only when the SAP ASE server is configured for threaded mode.

The SAP ASE server includes these system-defined thread pools:

Thread pool:	Description:
<code>syb_default_pool</code>	The default engine thread pool. Each thread in <code>syb_default_pool</code> is an engine. All user tasks and all multiplexed system tasks (such as the housekeeper) run in <code>syb_default_pool</code> . However, you can move some tasks out of <code>syb_default_pool</code> by creating additional thread pools.
<code>syb_system_pool</code>	A thread pool used for system threads. Each thread in <code>syb_system_pool</code> is dedicated to running a specific task. <code>syb_system_pool</code> contains at least one thread for the system clock and other asynchronous signals. All I/O handling threads run in <code>syb_system_pool</code> .
<code>syb_blocking_pool</code>	A thread pool that the SAP ASE server uses to process blocking call requests from multiplexed tasks, which are normally operating system calls that may cause a multiplexed – or engine – thread to block for an unacceptable amount of time. Threads in <code>syb_blocking_pool</code> typically consume very few CPU resources.

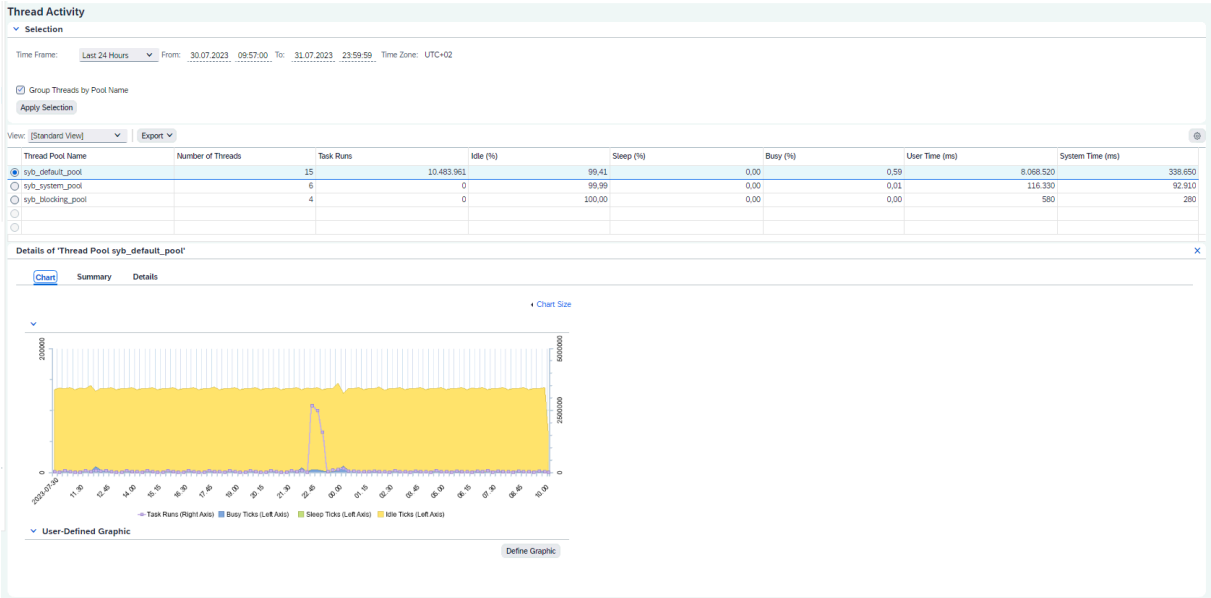
In the [Selection](#) area, you can specify the time frame for which you want system threads to be displayed.

After having applied your selection, you can review the threads that occurred in the given time frame and that were captured by the related data collector. To review the performance of aggregated threads, choose [Group Threads by Pool Name](#).

For each system thread, the following information is displayed:

Column:	Description:
Thread Pool Name	Only system thread pools can start with the <a href="#">syb_</a> prefix.
Task: Runs	Threads are used to execute SAP ASE server tasks associated with the thread pools. The number shows how many tasks have been executed.
Idle	Amount of time a thread was idle waiting for incoming tasks.
Sleep	Amount of time (in %) that the thread was going into sleep mode.
Busy	Amount of time (in %) that the thread has run.
User Time (ms)	Total thread user CPU time in milliseconds

Column:	Description:
System Time (ms)	Total thread system CPU time in milliseconds



To display detailed information, you select the appropriate entry that you want to analyze in the overview table. The detail data is displayed in the *Details* area below the overview table. The *Chart* tab shows the details of the thread analysis in a graphical representation. The *Summary* tab contains general information, the description of the thread and the recommended action. The *Details* tab provides an overview on an hourly, daily or weekly basis.

Since SAP ASE 16.0, DBAs can activate dynamic thread assignment by configuring the *number of worker processes* and *max parallel degree* parameters.

If the value in the column *Busy (%)* is higher than 80%, the CPU resources and the number of threads have to be increased. Make sure that the value in the column *Busy (%)* for thread pool `syb_default_pool` does not fall below the critical value of 20%. In this case, you have to reduce the number of threads. For more information, refer to the documentation on the command `alter thread pool`.

### 11.5.8 Performance: Temporary Database Activity

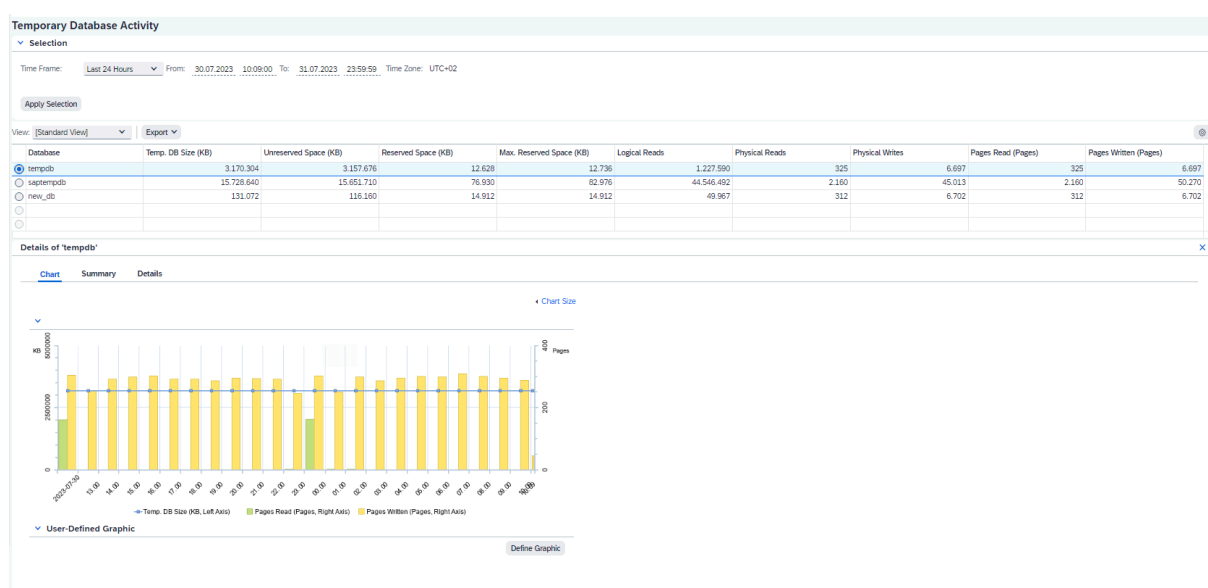
You can access information about temporary database performance by calling the DBA Cockpit and choosing *Performance* *Temporary Database Activity* on the *Database* tab of the DBA Cockpit.

Using the information provided on this screen, you can:

- Review temporary database activity that occurred in the past and that were captured by the related data collector.
- Review temporary database activities that are currently occurring on the database server.

In the *Selection* area, you can specify the time frame for which you want database activities to be displayed.

Column:	Description:
<i>Temp. DB Size (KB)</i>	Temporary database size
<i>Unreserved Space (KB)</i>	Unreserved space in temporary database
<i>Reserved Space (KB)</i>	Reserved space in temporary database
<i>Max. Reserved Space (KB)</i>	Maximal size of reserved space
<i>Logical Reads</i>	Total number of reads from memory
<i>Physical Reads</i>	Number of buffer reads from disk
<i>Physical Waits</i>	Total number of buffers written to disk
<i>Pages Read (Pages)</i>	Total number of pages read
<i>Pages Written (Pages)</i>	Total number of pages written to disk



The value in column *Temp DB Size* shows the size of the temporary database. Keep an eye on the value of *Unreserved Space*. If you observe that the unreserved space drops to a critical level, you have to increase the size of tempdb.

For more information, see [Increasing Default Database Sizes](#).

To display detailed information, you select the appropriate entry that you want to analyze in the overview table. The detail data is displayed in the *Details* area below the overview table. The *Summary* tab shows general information on the database and additional metrics. The *Details* tab provides an overview for the database activities according to the time frame you have chosen.

## 11.5.9 Performance: I/O

You can access information on I/O Performance by calling the DBA Cockpit and choosing **Performance** **I/O** on the *Database* tab of the DBA Cockpit.

### Note

To monitor data on the *Performance: I/O* screens, you have to make sure that the DBA Cockpit framework (DCF) is set up correctly. If the DCF is not available or set up incorrectly, a warning is displayed. For more information, see [DBA Cockpit Framework: Data Collectors and Admin Procedures \[page 111\]](#).

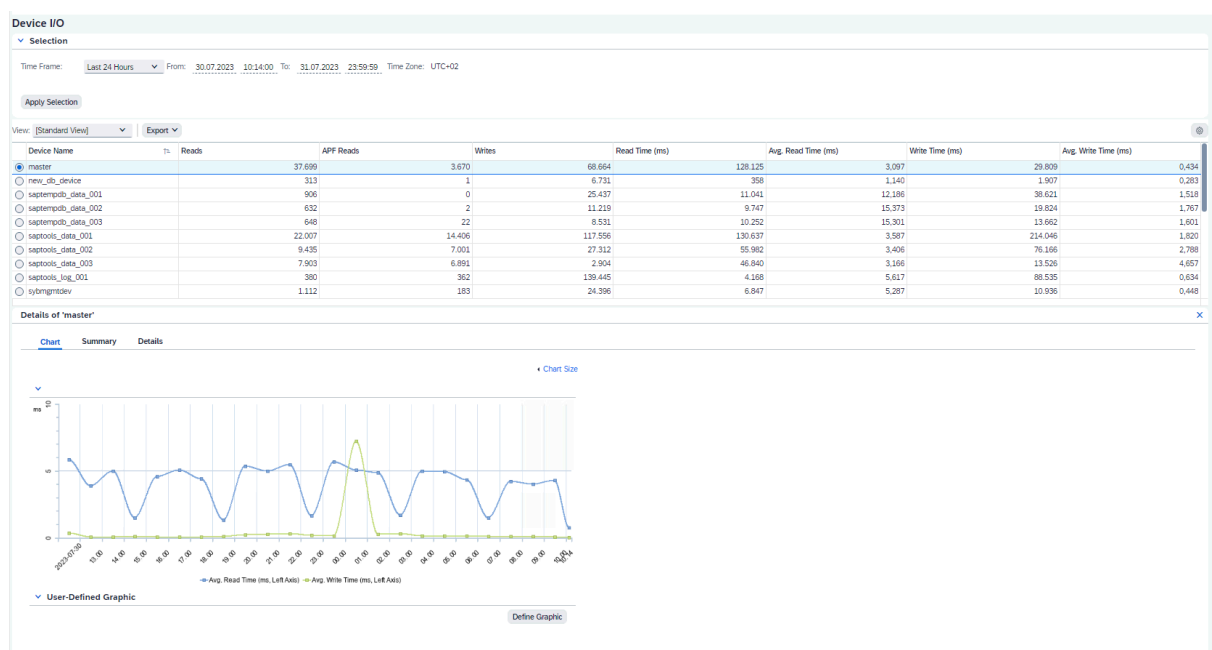
When you analyze the distribution of I/O load, it is important to keep in mind that it is not so much the distribution of I/O that affects performance, but the distribution of I/O to the physical resources, such as physical disks and I/O channels. If I/O times are poor, check whether a specific device is overloaded or whether the I/O system as a whole is overloaded.

### 11.5.9.1 Performance: Device I/O

You can access information on device I/O by calling the DBA Cockpit and choosing **Performance** **I/O** **Device I/O** on the *Database* tab of the DBA Cockpit.

In the *Selection* area, you can specify the time frame for which you want the overview to be displayed.

The data collector *Devices* allows historical monitoring of device I/Os.



If you experience performance problems and the *Avg. Read Time (ms)* and the *Avg. Write Time (ms)* exceed 8 ms (*Avg. Read Time*) or 2 ms (*Avg. Write Time*), you will have to check the storage subsystem.

Additionally, the screen ► [Space](#) ► [Devices](#) ► provides information on device allocation and expansion over time.

## 11.5.9.2 Performance: Table I/O

You can access information by calling the DBA Cockpit and choosing ► [Performance](#) ► [I/O](#) ► [Table I/O](#) ► on the [Database](#) tab of the DBA Cockpit.

The data collector `Tables` allows historical monitoring of table I/Os.

The [Tables](#) screen provides information that you can use to analyze tables under the following aspects:

- Which tables are accessed the most and require extra tuning?
- Which tables have frequent update operations and are, therefore, potential candidates for new statistics?
- Which tables are candidates for reorganization due to space fragmentation?

(To answer the last question, consider as well the contents of screen ► [Space](#) ► [Tables](#) ►)

To analyze table data, you proceed as follows:

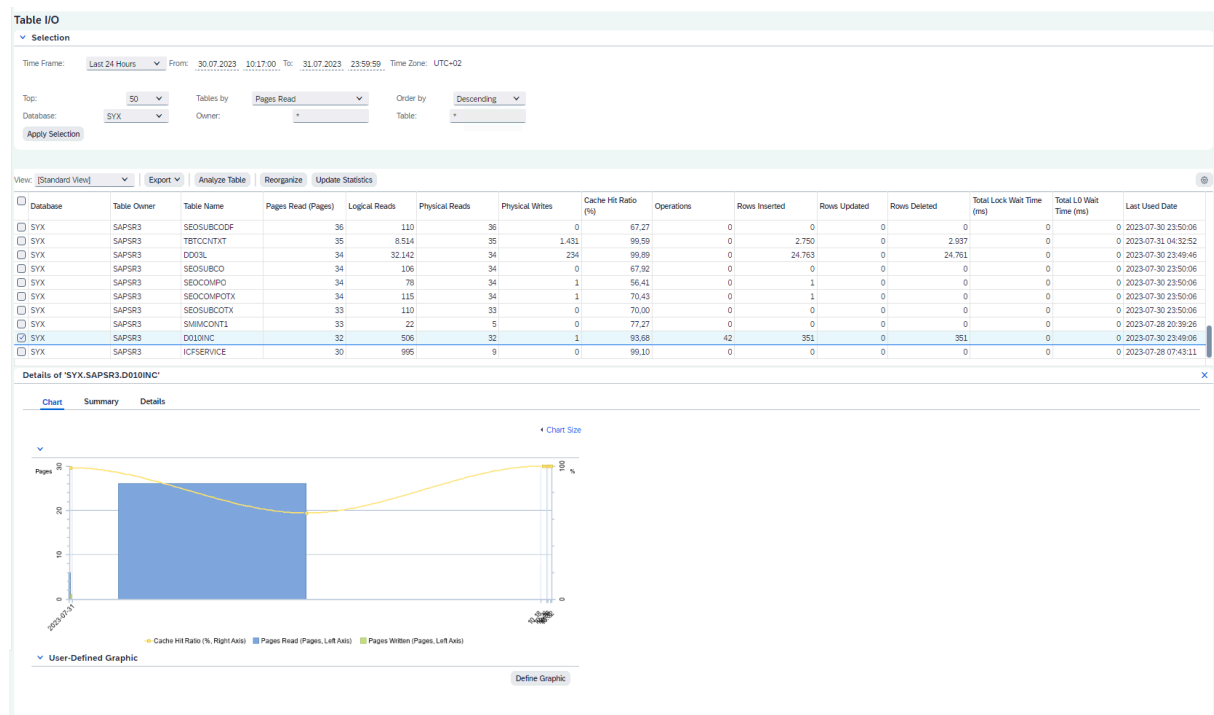
1. You identify the time period where you experienced performance problems, for example, bad user response time.
2. In the [Selection](#) area, you specify the appropriate time frame. Choose a value for [Tables by](#) that corresponds to your performance problem. Choose, for example, [Physical Reads / Physical Writes](#), if you experience I/O problems.
3. You restrict the result set in the overview table, for example, by limiting the maximum number of rows, by using wildcards.
4. To refresh table data, you choose the [Apply Selection](#) pushbutton.

The following information is displayed:

Column:	Description:
<a href="#">Logical Reads</a>	Total number of buffers read
<a href="#">Physical Reads</a>	Number of physical read operations
<a href="#">Physical Writes</a>	Number of buffers read from disk
<a href="#">Cache Hit Ratio (%)</a>	Hit Ratio in %
<a href="#">Operations</a>	Number of times that the object was accessed
<a href="#">Rows Inserted</a>	Number of rows inserted
<a href="#">Rows Updated</a>	Number of updates
<a href="#">Rows Deleted</a>	Number of rows deleted
<a href="#">Total Lock Wait Time (ms)</a>	Number of times a task waited for a lock for the object

Column:	Description:
<i>Last Used Date</i>	Last date the index was used in plan during execution

- To display data, you select a line in the overview table. The data is displayed in the *Chart* area in the form of graphics.



## 11.5.9.3 Performance: Index I/O

You can access information by calling the DBA Cockpit and choosing **Performance** **I/O** **Device I/O** on the *Database* tab of the DBA Cockpit.

In the *Selection* area, you specify the time frame for which you want the overview to be displayed.

The data collector *Indexes* allows historical monitoring of index I/Os.

To analyze index data, you proceed as follows:

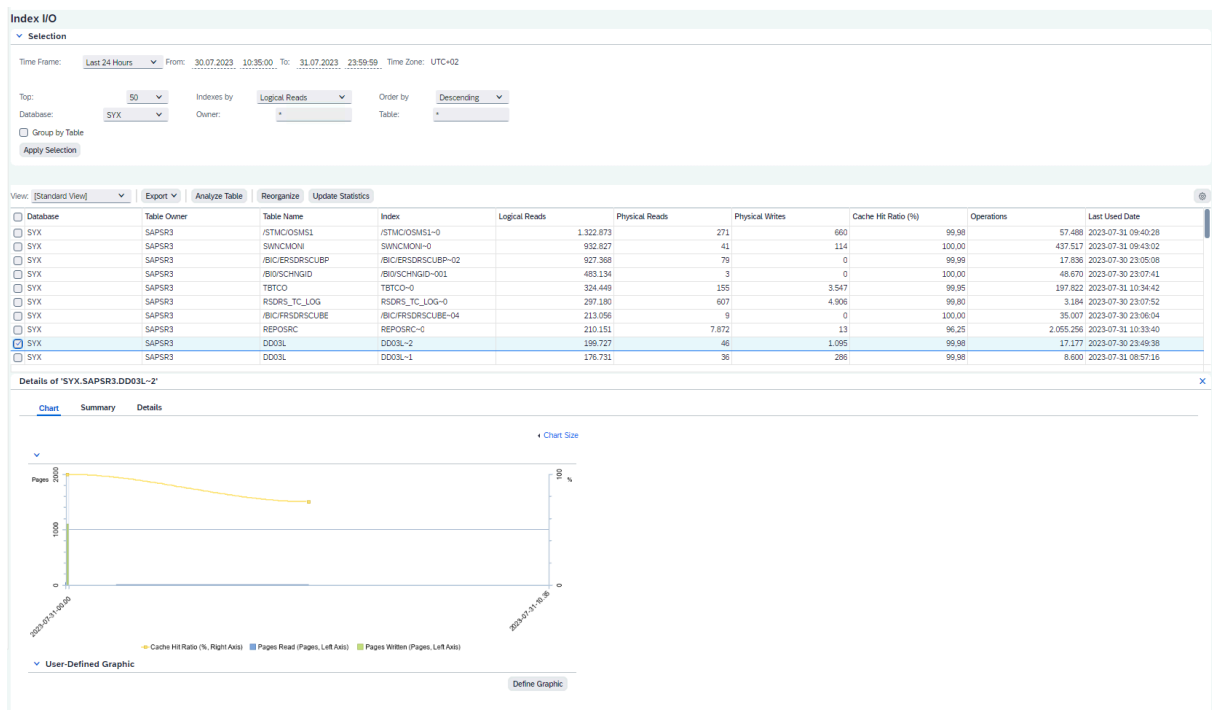
- You identify the time period where you experienced performance problems, for example, bad user response time.
- In the *Selection* area, you specify the appropriate time frame. Choose a value for *Indexes by* that corresponds to your performance problem. Choose, for example, *Physical Reads* / *Physical Writes*, if you experience I/O problems.
- You restrict the result set in the overview table, for example, by limiting the maximum number of rows, by using wildcards.
- To refresh the data, you choose the *Apply Selection* pushbutton.



The following information is displayed:

Column:	Description:
<a href="#">Logical Reads</a>	Total number of buffers read
<a href="#">Physical Reads</a>	Number of physical read operations
<a href="#">Physical Writes</a>	Number of buffers read from disk
<a href="#">Cache Hit Ratio (%)</a>	Hit Ratio in %
<a href="#">Operations</a>	Number of times that the object was accessed
<a href="#">Rows Inserted</a>	Number of rows inserted
<a href="#">Rows Updated</a>	Number of updates
<a href="#">Rows Deleted</a>	Number of rows deleted
<a href="#">Total Lock Wait Time (ms)</a>	Number of times a task waited for a lock for the object
<a href="#">Last Used Date</a>	Last date the index was used in plan during execution

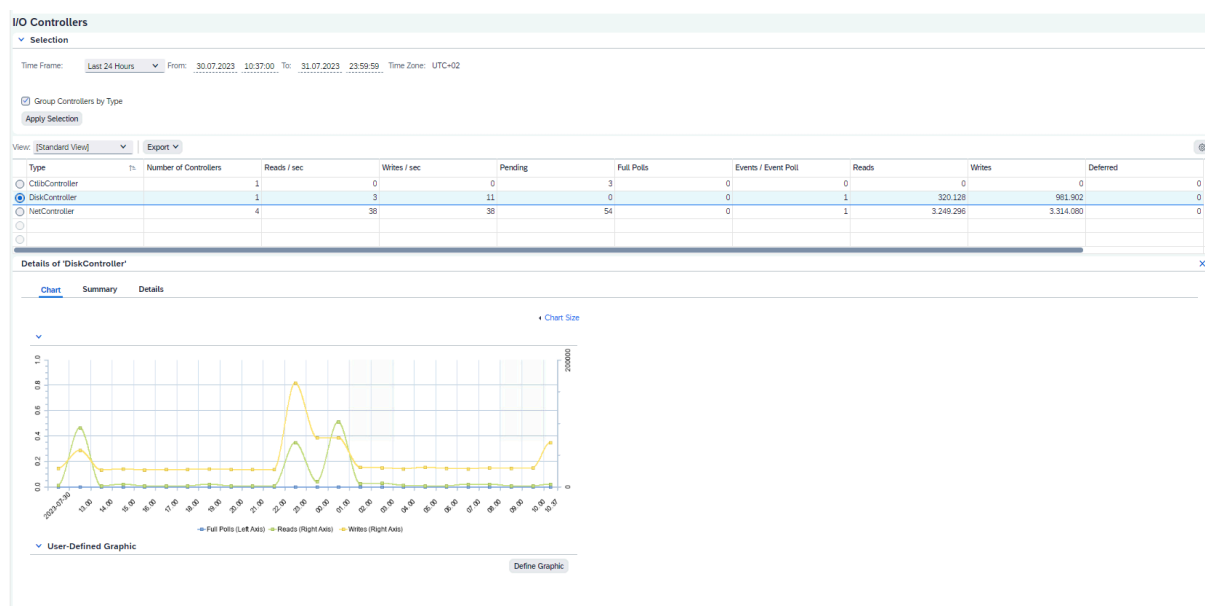
- To display data, you select a line in the overview table. The data is displayed in the [Chart](#) and [Details](#) content area.



## 11.5.9.4 Performance: I/O Controllers

You can access information by calling the DBA Cockpit and choosing ► [Performance](#) ► [I/O](#) ► [I/O Controllers](#) ► on the [Database](#) tab of the DBA Cockpit.

The data collector `I/O Controller` allows historical monitoring of disk, network and CTLIB controllers.



The CTLIB controller is used by SAP ASE. You can ignore this controller for SAP applications on SAP ASE.

If you observe high values in the column [Pending](#) for the [DiskController](#) and/or the [NetController](#), you will have to increase the number of I/O controllers. Change the value of the corresponding parameters.

For more information, see SAP Note [1539124](#): SYB: Database Configuration for SAP applications on SAP ASE

## 11.5.10 Performance: Memory Pools

You can access information on memory usage by calling the DBA Cockpit and choosing ► [Performance](#) ► [Memory Pools](#) ► on the [Database](#) tab of the DBA Cockpit.

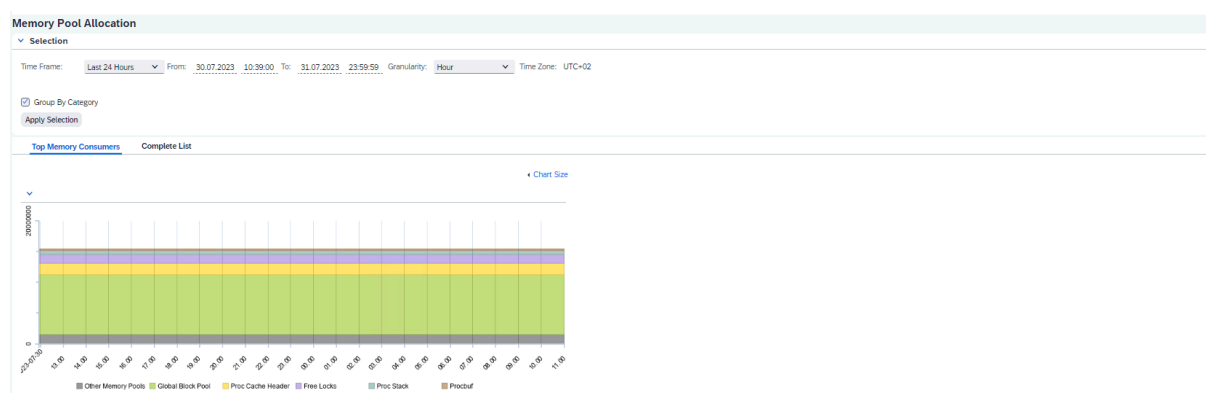
### 11.5.10.1 Performance: Memory Pool Allocation

You can access information on memory usage by calling the DBA Cockpit and choosing ► [Performance](#) ► [Memory Pools](#) ► [Memory Pool Allocation](#) ► on the [Database](#) tab of the DBA Cockpit.

Screen [Memory Pool Allocation](#) provides an overview on the top memory consumers of the SAP ASE server.

In the [Selection](#) area, you can specify the time frame for which you want the overview to be displayed.

The data collector `Memory Usage` enables historical analysis of SAP ASE memory usage. The minimum SAP ASE version required is 15.7.0.100.



In the case of insufficient storage capacity, increase the values of the corresponding parameters.

For more information, see SAP Note [1539124](#) SYB: Database Configuration for SAP applications on SAP ASE

## 11.5.10.2 Performance: Procedure Cache Usage

You can access information on memory usage by calling the DBA Cockpit and choosing [Performance](#) [Memory Pools](#) [Procedure Cache Usage](#) on the [Database](#) tab of the DBA Cockpit.

To analyze procedure cache data, you proceed as follows:

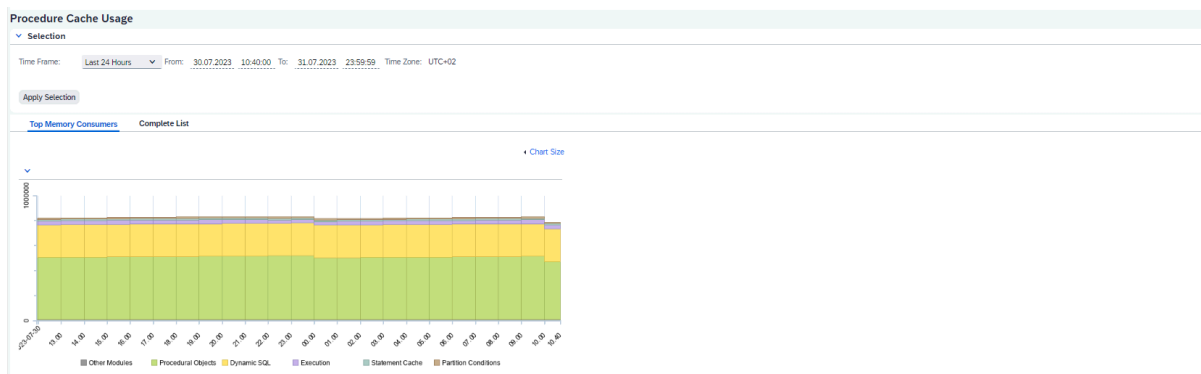
1. You identify the time period where you experienced performance problems.
2. To refresh table data, you choose the [Apply Selection](#) pushbutton

The following information is displayed:

Column:	Description:
<a href="#">Module ID</a>	A unique ID of a procedure cache allocating module
<a href="#">Module Name</a>	Name of the procedure cache allocating module
<a href="#">Active (Pages)</a>	Number of memory pages allocated at the moment for the module
<a href="#">Change Active</a>	Change in the number of memory pages allocated for the module
<a href="#">HWM</a>	High Water Mark: Maximum number of pages allocated
<a href="#">Num Pages Reused</a>	Number of procedure cache pages for this module replaced by another request

3. To display data, you select a line in the overview table. The data is displayed in the [Chart](#) or [Details](#) content area.

The graphic below shows that the procedure cache is used by various consumers during the processing of user tasks. Resource-intensive [Sort](#) operations can cause sudden peaks of memory usage. [Sort](#) operations can cause important query plans to be discarded from the procedure cache.

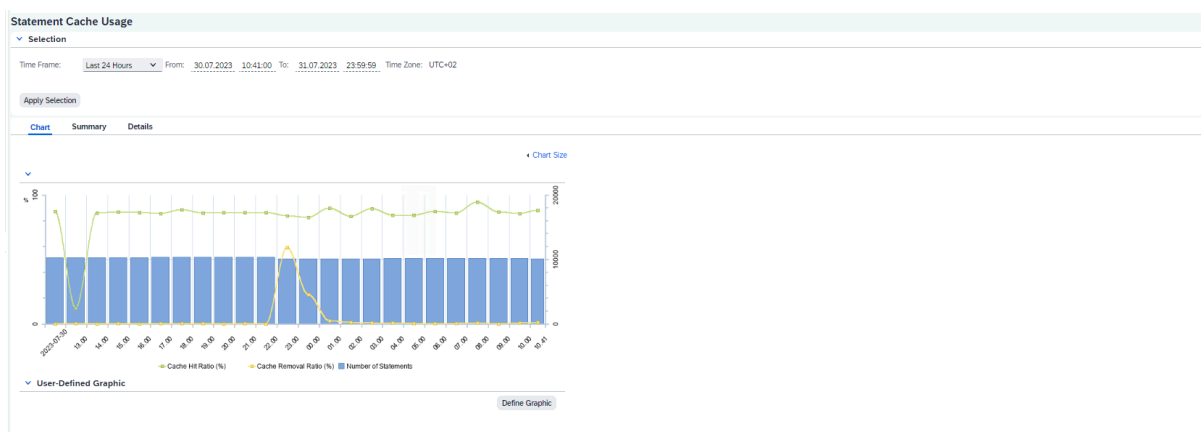


## 11.5.10.3 Performance: Statement Cache Usage

### Use

You can access information on memory usage by calling the DBA Cockpit and choosing [Performance](#) [Memory Pools](#) [Statement Cache Usage](#) on the [Database](#) tab of the DBA Cockpit.

The statement cache lets SAP ASE compare a newly received ad hoc SQL statement to cached SQL statements. If a match is found, SAP ASE uses the plan cached from the initial execution. In this way, SAP ASE does not have to recompile SQL statements for which it already has a plan.



Make sure that the [Cache hit ratio](#) does not fall below the critical value of 95% (you see the value on the [Summary](#) screen). The [Number of Removals](#) should be less than 10% of the [Number of Statements](#) in the cache. To increase the size of the statement cache, see SAP Note [1539124](#) [SYB: Database Configuration for SAP applications on SAP ASE](#).

## More Information

[Setting the Statement Cache](#) 

### 11.5.10.4 Performance: Data Cache Usage

You can access information about the usage of a data cache by calling the DBA Cockpit and choosing [► Performance](#) [► Memory Pools](#) [► Data Cache Usage](#) [►](#) on the [Database](#) tab of the DBA Cockpit.

Using the information provided on this screen, you can:

- Review data cache usage that occurred in the past and that were captured by the data collector.
- Review the data cache usage that is currently occurring on the database server.


In the [Selection](#) area, you can specify the time frame for which you want the data cache usage to be displayed. After having applied your selection, the data cache usage is displayed.

The following information is displayed for each database:

Column:	Description:
Cache ID	Unique identifier for the cache
Cache Name	Name of the cache
I/O Buffer Size (KB)	Size of the I/O buffer for the cache pool
Physical Reads	The number of buffers that have been read from disk into the pool
Stalls	Number of 'dirty' buffer retrievals
Pages Read	The number of buffers that were fetched and replaced at the <b>Most Recently Used</b> (MRU) portion of the pool
Buffers to MRU	The number of buffers that were fetched and replaced at the <b>Last Recently Used</b> (LRU) portion of the pool: fetch-and-discard

To display detailed information, you select the appropriate entry that you want to analyze in the overview table. The detail data is displayed in the [Details](#) area below the overview table.

The [Summary](#) tab shows general information on the data cache usage. The [Details](#) tab provides an overview for the data cache usage according to the time frame you have chosen.

Make sure that the [Cache hit ratio](#) does not fall below the critical value of 95% (see [Summary](#) screen). To increase the size of the data cache, see SAP Note [1539124](#)  *SYB: Database Configuration for SAP applications on SAP ASE*.

Choose ► **Configuration** ► **Data Caches** ► in the DBA Cockpit, if you want to change the configuration. For more information, see [Configuration: Data Caches \[page 99\]](#)

For more information on the usage of caches in Adaptive Server, see [Caches in Adaptive Server](#) in the SAP ASE System Administration Guide.

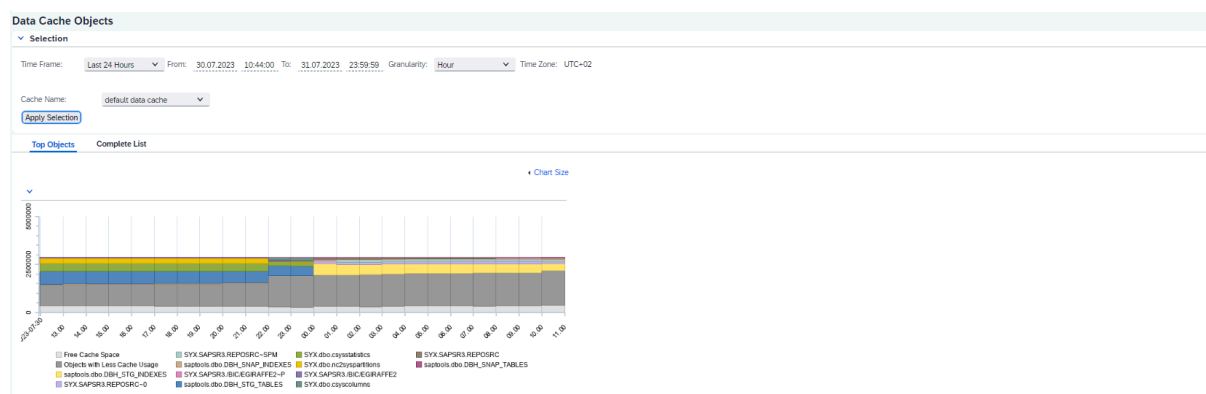
## 11.5.10.5 Performance: Data Cache Objects

### Use

You can access information about data cache objects by calling the DBA Cockpit and choosing ► **Performance** ► **Memory Pools** ► **Data Cache Usage** ► on the **Database** tab of the DBA Cockpit.

#### Note

To monitor data on the [Data Cache Usage](#) screen, you have to make sure that the DBA Cockpit framework (DCF) is set up correctly. If the DCF is not available or wrongly set up, a warning is displayed including a link to the Collector Configuration screen where you can perform the required steps. For more information, see [DBA Cockpit Framework: Collector Configuration \[page 111\]](#).



The system displays information about the objects in the data cache. It shows, for example, which parts of a table have been loaded into the data cache. If you observe sudden peaks or changes in the [Top Objects](#) chart, you will have to investigate whether objects have been discarded from the data cache. In this case, you have to configure the data cache accordingly. For more information, see [Configuration: Data Caches \[page 99\]](#).

### More Information

[The SAP ASE Data Cache](#) 

## 11.5.10.6 Performance: Non-Volatile Cache Usage

For more information about non-volatile cache usage select ► [Performance](#) ► [Memory Pools](#) ► [Non-Volatile Cache Usage](#) ► on the [Database](#) tab of the DBA Cockpit.

After you applied the selection, you will see more information about the non-volatile cache usage. The following information is displayed for each database:

Column	Description
Cache Name	Name of the cache
Cache Size	Total size of non-volatile cache in kilobytes
Cache Hits	Number of cache hits
Cache Writes	Number of buffers written from the non-volatile cache to disk
Cache Reads	Number of buffers read into the cache from disk
Cache Partitions	Number of partitions currently configured for the cache
Status	Status of non-volatile cache. One of: <ul style="list-style-type: none"><li>• Active</li><li>• Pending/Active</li><li>• Pending/Delete</li><li>• Update Cache</li><li>• Cache Create</li><li>• Cache Delete</li></ul>

If you select an item in the overview table, you will get more detailed information about this item in the [Detail](#) screen.

## 11.5.10.7 Performance: IMRS Cache Usage

You can access information about the usage of an IMRS cache by selecting ► [Performance](#) ► [Memory Pools](#) ► [IMRS Cache Usage](#) ► on the [Database](#) tab in the DBA Cockpit.

In the [Selection](#) area, you can select the time frame for which you want to view IMRS cache usage.

The following information is displayed for each database:

Column	Description
Cache Name	Name of the IMRS cache
Number of Rows	Number of rows in the cache (across all tables using the cache)
Number of Rows Packed	Number of rows packed by the pack operation
Number of Rows HWM	Greatest number of rows in the cache at one time (High Water Mark)

Column	Description
Number of Versions	Number of older row versions in the IMRS, excluding the latest row version
Number of Versions HWM	Greatest number of older row versions, excluding the latest row version, at one time (High Water Mark)

To get more detailed information about the IMRS cache, click on one of the entries in the summary table. The [Summary](#) tab displays general information about IMRS cache usage. The [Details](#) tab provides an overview of IMRS cache usage according to the previously selected time frame.

## 11.5.11 Performance: SQL Statements

You can access information about the SQL statements by calling the DBA Cockpit and choosing ► [Performance](#) ► [SQL Statements](#) ► on the [Database](#) tab of the DBA Cockpit.

### i Note

Keep in mind that you have to make sure that the DBA Cockpit framework (DCF) is set up correctly. If the DCF is not available or set up incorrectly, a warning is displayed with a link to the collector configuration screen. There you can perform the required steps. For more information, see [DBA Cockpit Framework: Data Collectors and Admin Procedures \[page 111\]](#).

### 11.5.11.1 Performance: Cached Statements

You can access information about the SQL statement cache by choosing ► [Performance](#) ► [SQL Statements](#) ► [Statement Cache](#) ► on the [Database](#) tab of the DBA Cockpit.

This function provides monitoring capability for all prepared SQL statements that reside in the global SQL statement cache. The information about the cached statements is gathered during their preparation and execution.

#### Filtering

The global SQL statement cache of an SAP system may contain thousands of entries. By selecting the criterion from the [Top SQL Statements](#) by drop down list box, only the most expensive entries for that criterion is displayed. By default, the output is limited to the top 100 entries, but can be changed easily. The [Custom](#) filter allows you to do a more specific filtering based on multiple threshold values as well as a text filter on the SQL statement text (a table name, for example).

Choose [Apply Selection](#) to refresh the display.



Cached Statements

Selection

Top SQL Statements by

Total Elapsed Time

Custom

SQL Statement Text

Parallel Degree

Last Used Time

Statement Type

Total Elapsed Time

Number of Executions

Avg. Elapsed Time

Physical I/Os / Rows Processed

Avg. Scan Rows

Rows Read / Rows Processed

Logical I/Os / Rows Processed

Group Similar SQL Statements (1)

Reduce Output to a Maximum of

100

SQL Statements

Apply Selection

View: [Standard View]

Export

Discard Statement

SQL Statement	Total Elapsed Time (ms)	Total Share (%)	Use Count	Average Elapsed Time (ms)	Total CPU Time (ms)	Lock Wait Time (ms)	Rows Read / Rows Process...	Logical I/Os / Rows Process...	ABAP Program
select 'dbname'=>db_name(1,dbid), 'DataSize(KB)'=>convert(bigint, sum(case when tl.logmap1=4 then @mapagesize/1024*tl.size else n...	8,065,485	21.37	18,674	432	611,012	73	3	0	
SELECT TOP 1 'SDATE', 'STIME', 'IDATE', 'TTIME', 'UNAM', 'UDAT', 'UTIME', 'SQLK', 'EDTK', 'DBNA', 'CLAS', 'TYPE', 'OCCURS', 'SUBC'...	5,630,349	14.92	4,251,293	1	1,751	0	1	4	REP1
SELECT 'DATA' FROM 'REPOSRC' WHERE 'PROGNAME' = ? AND 'R3STATE' = ? P R3 REP1.0 T REPOSRC M.000 'Y'	4,665,712	12.41	2,038,886	2	6,093	0	1	5	REP1
SELECT COUNT_BIG('C0', MIN('AS4DATE')) 'C2' FROM 'E070' WHERE 'TRKORR' LIKE ? AND 'TARSYSTEM' = ? AND '...	1,093,823	2.90	15,934	69	1,093,621	0	3,882	778	SDC_SYS...
SELECT TOP 1 'SDATE', 'STIME', 'IDATE', 'TTIME', 'UNAM', 'UDAT', 'UTIME', 'SQLK', 'EDTK', 'DBNA', 'CLAS', 'TYPE', 'OCCURS', 'SUBC'...	1,064,791	2.82	11,260	48	13	597,348	1	4	REP1
SELECT 'LDATA' FROM 'REPOLOAD' WHERE 'PROGNAME' = ? AND 'R3STATE' = ? AND 'MACH' = ? AND 'MAJOR_VERS' = ? P R3 REP1.0 T REPOLOAD ...	862,711	2.29	388,525	2	5,909	343	1	7	REP1
SELECT * FROM 'TBTCO' WHERE 'JOBNAME' LIKE ? ESCAPE ? AND 'STATUS' IN ( ?, ?, ?, ?, ? ) P R3 SAPLSCSM_BTC_JOB_MONITORING.5052...	757,676	2.01	148,152	5	749,953	0	2	2	SAPLSCS...
DELETE FROM 'RSDRS_TC_LOG' WHERE 'TESTCASEDATE' < ? P R3 RSDRS_TC_RUN-27 T RSDRS_TC_LOG M.000 'Y'	743,678	1.97	1,024	389	145,393	0	0	2	RSDRS_T...
SELECT TABNAME, BLOCKNR, FIELDSLG, FIELDS FROM 'DONTF' WHERE TABNAME = ? ORDER BY TABNAME, BLOCKNR P R3 NTAB.0 T DONTF M.000 I.2 ...	726,711	1.93	168,788	4	360	0	1	4	NTAB
DELETE FROM 'ISTMCIOSMS1' WHERE 'SYS_ID' = ? AND 'ELEMENT_TYPE' = ? AND 'TIME_GRANULARITY' = ? AND 'TIMESTAMP_SERVER' < ? P R3/S...	646,054	1.71	7,818	43	108,183	55	0	1	ISTMCICL...
SELECT VERSION, UUID, CRIMESTMP, ABTIMESTMP, DYTIMESTMP, FLD CNT, TABLENGTH, KEYCNT, KEYLENGTH, CLIENTPOS, TABTYPE, TABFORM, REFNA...	534,969	1.42	824,345	1	139	0	1	4	NTAB
INSERT INTO saptools.ATM_HISTORY (ATM_TYPE, DBNAME, OBJOWNER, OBJNAME, PARTNAME, START_TIME, END_TIME, PROFILE_ID, THRESHOLD_TYPE, THRESHO...	506,923	1.34	137,024	1	261	178,584	0	4	CL_SQL...
SELECT 'X' 'PROGRAM_NAME' FROM 'RIS_PROG_TADIR' 'X' LEFT OUTER JOIN 'TRDIR' 'B' ON 'X' 'PROGRAM_NAME' = 'B' 'NAME' WHERE 'B' '...	438,948	1.16	3	49,913	53,500	0	45,825	853	CL_RIS...
select c.udomain, name, p.phyname, size, c.unreservedpg(disk), loan, unreservedpg(s) as freespace from master.sysdevices d, master...	417,635	1.11	18,474	1	76	0	2	2	
SELECT DISTINCT 'SYS_ID' FROM 'ISTMCIOSMS1' P R3/ISTMCICL_OSM1_METRIC_STORE_DB=CP-691 T/ISTMCIOSMS1 M.000 'Y'	407,195	1.08	4,904	83	349,748	18	93,053	711	ISTMCICL...
SELECT VERSION, UUID, CRIMESTMP, ABTIMESTMP, DYTIMESTMP, FLD CNT, TABLENGTH, KEYCNT, KEYLENGTH, CLIENTPOS, TABTYPE, TABFORM, REFNA...	360,704	0.96	142,376	3	195	0	1	4	NTAB
MERGE INTO 'BALDAT' AS T1 USING ( SELECT ?, ?, ?, ?, ?, ?, ? ) AS T2 ( 'DATAAGING', 'CLUSTRI', 'CLUSTD', 'MANDANT', 'RELL...	340,530	0.90	475,126	1	423	50	0	8	SAPLSBA...
select 'D1' 'SID_RSDRS001' as 'S_570', is('D1' 'SID_RSDRS001', 000004, '0') as 'K_570', 'D1' 'SID_RSDRS001' as 'S_574...	322,810	0.86	518	623	196,534	0	186,505	5,614	
SELECT TOP 1 COUNT_BIG('C0') 'C0' FROM 'RSDRS_TC_LOG' 'X' WHERE ( 'TESTCASEDATE' = ? AND 'TESTCASETIME' >= ? OR 'TESTCASEDATE' > ? ) ...	315,845	0.84	1,024	308	167,976	0	19,427	92,935	RSDRS_T...
SELECT 'REFERENCE' FROM 'E070A' WHERE 'TRKORR' = ? AND 'ATTRIBUTE' = 'EXPORT_TIMESTAMP' ROWS LIMIT 1 P R3 SDC_SYSNF02-3323 T E07...	268,446	0.71	32,382	8	132	0	1	4	SDC_SYS...

## SQL Statement Details and Cached Query Plans

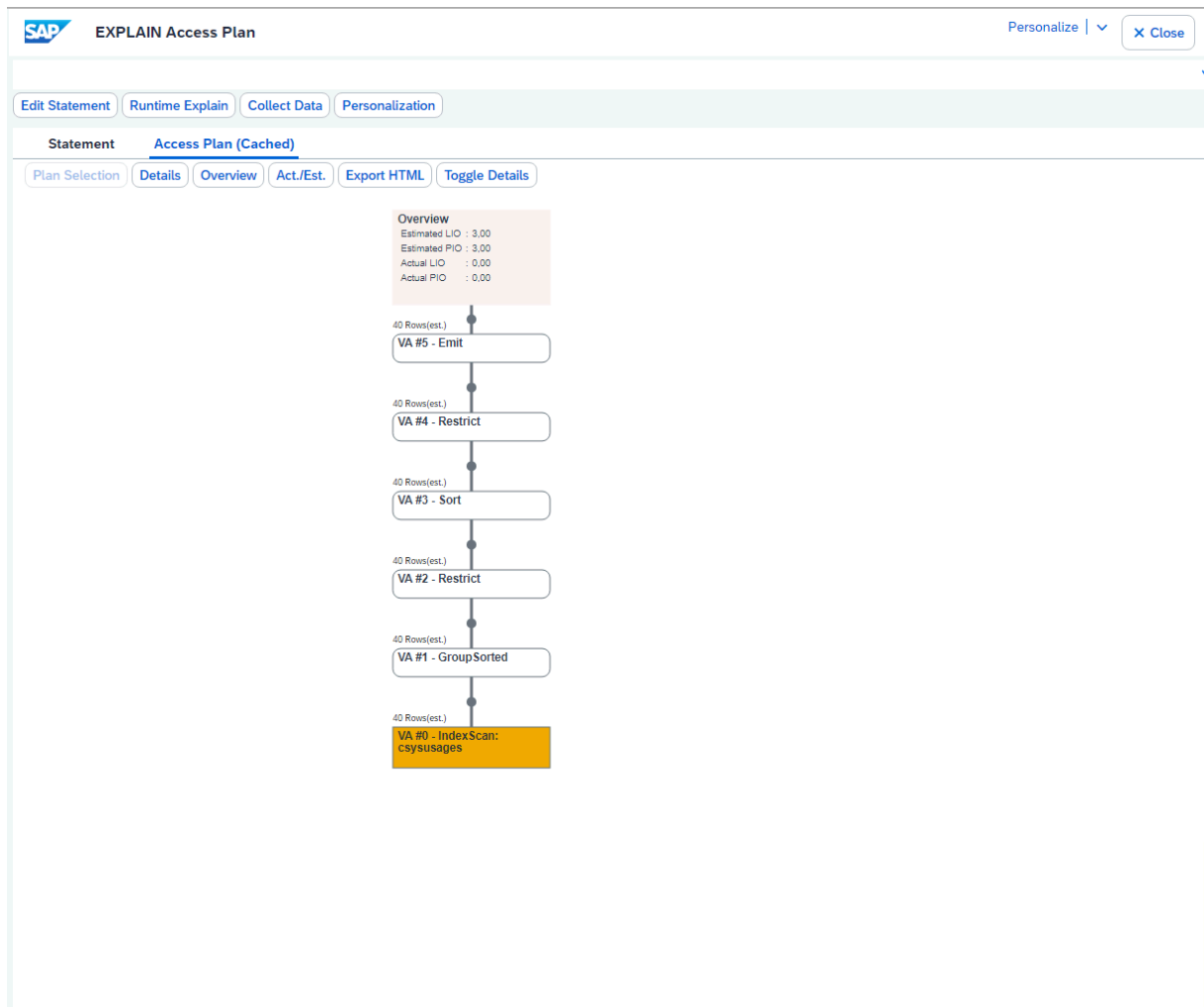
The records displayed provide identifying information, statistics, and part of the SQL statement text. Due to the potential size of the SQL statement text, only the first 150 characters are shown. If you want to see the entire statement text as well as detailed execution statistics for a particular statement, select the respective entry in the table. [SQL Statement Details](#) are shown in the lower part of the screen.

As SAP ASE uses non sharable access plans, multiple identical or varying access plans may exist for a single SQL statement. To display detailed information for an access plan, select [Cached Query Plans](#). Choose a plan from the list and select [Show Plan](#). For more information, see EXPLAIN in section [The EXPLAIN Access Plan \[page 36\]](#).

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## 11.5.11.2 Performance: TOP SQL Statements

### Top SQL Statements

You can identify the Top SQL statements for a selected period of time by calling the DBA Cockpit and choosing **Performance** **SQL Statements** **Top SQL Statements** on the **Database** tab of the DBA Cockpit.

Top SQL statements are long-running statements. These statements are costly from a time perspective.

Top SQL Statements									
Selection									
Time Frame: Last 24 Hours From: 30.07.2023 13:27:00 To: 31.07.2023 23:59:59 Time Zone: UTC+02:00:01									
Top SQL Statements by Total Elapsed Time									
Custom									
SQL Statement Text	[1]	Total Elapsed Time	≥	0	ms	Avg. Scan Rows	≥	0	
Parallel Degree	≥	0	Number of Executions	≥	0	Rows Read / Rows Processed	≥	0	
Statement Type	All	Avg. Elapsed Time	≥	0	ms	Logical I/Os / Rows Processed	≥	0	
						Physical I/Os / Rows Processed	≥	0	
Reduce Output to a Maximum of 100 SQL Statements									
Apply Selection									
View: [Standard View] Export									
SQL Statement	Total Elapsed Time (ms)	Use Count	Average Elapsed Time (ms)	Total CPU Time (ms)	Lock Wait Time (ms)	Rows Read / Rows Processed	Logical I/Os / Rows Processed	ABAP Program	
select d.device_no, name, phone_name, size, curunreservedpgs(dbid, lstart, unreservedpgs) as freespace from master.sysdevices d, master...	417.365	275	1.517	0	0	2	1		
SELECT 'X' "PROGRAM_NAME" FROM "RIS_PROG_TADIR" "X" LEFT OUTER JOIN "TRDIR" "B" ON "X"."PROGRAM_NAME" = "B"."NAME" WHERE "B"."...	135.863	1	135.863	16.414	0	88.595	1.996	CL_RIS...	
select 'dbname'<db_name(1)dbid, 'DataSize(KB)'<convert(bigint, sum(case when t1.Legmap=4 then @dbpage*pages/1024*1.5 size else n...	134.886	282	476	10.361	0	3	0		
SELECT 'NAME' FROM "TRDIR" WHERE "NAME" LIKE ? P R3 CL_CHECKVARIANT=====CP-2242 TTRDIR M.000 Y	92.766	2	46.383	9.323	0	5.035	47	CL_CL_C...	
SELECT 'DATA' FROM "REPOSRC" WHERE "PROGNAME" = ? AND "R3STATE" = ? P R3 REP1.0 T REPOSRC M.000 Y	52.554	12.830	4	56	0	1	5	REP1	
SELECT TOP 1 "SDATE", "STIME", "IDATE", "TTIME", "UNAM", "UDAT", "UTIME", "EDTX", "DBNA", "CLAS", "TYPE", "OCCURS", "SUBC"...	43.284	24.284	1	0	0	1	3	REP1	
DELETE FROM "SEDI_NAV_OO_LOCA" WHERE NOT EXISTS ( SELECT 1 "id" FROM "TRDIR" "P" WHERE "P"."NAME" = "SEDI_NAV_OO_LOCA" "INCLUDE"...	32.195	1	32.195	585	0	20.237	27.305	CL_SEDI...	
DELETE FROM "ISTMCIOSMS1" WHERE "SYS_ID" = ? AND "ELEMENT_TYPE" = ? AND "TIME_GRANULARITY" = ? AND "TIMESTAMP_SERVER" < ? P R3/S...	27.052	492	54	7.278	0	0	1	ISTMCIOL...	
SELECT TOP 50 -1 AS INSTANCED, DBNAME, USER_NAME AS TABOWNER, TAB_NAME AS TABNAME, ' ' AS PART_NAME, 0 AS ID, 0 AS PARTITIONID, ...	18.669	2	9.334	17.567	0	2.647	516	CL_SQL...	
SELECT COUNT_BIG("id", MIN("AS4DATE" ) "cl", MAX("AS4DATE" ) "c2" FROM "E070" WHERE "TRKORR" LIKE ? AND "TARSYSTEM" = ? AND ...	17.325	248	69	17.325	0	3.882	777	SDC_SYS...	
SELECT TOP 50 -1 AS INSTANCED, DBNAME, USER_NAME AS TABOWNER, TAB_NAME AS TABNAME, ' ' AS PART_NAME, 0 AS ID, 0 AS PARTITIONID, ...	16.962	1	16.962	15.780	0	4.118	907	CL_SQL...	
SELECT VERSION, UID, CRTIMESTMP, ABTIMESTMP, DYTIMESTMP, FLDICNT, TABLENGTH, KEYCNT, KEYLENGTH, CUENTPOS, TABTYPE, TABFORM, REFNA...	16.375	5.252	3	1	0	1	4	NTAB	
SELECT TOP 50 -1 AS INSTANCED, DBNAME, USER_NAME AS TABOWNER, TAB_NAME AS TABNAME, ' ' AS PART_NAME, 0 AS ID, 0 AS PARTITIONID, ...	15.983	1	15.983	14.748	0	3.529	836	CL_SQL...	
SELECT * FROM "RSDO_TMPNM_ADM" WHERE "NAMETYPE" = ? AND ("FREE" = 'X' OR "TIMESTMP" <= ? ) ORDER BY "RSDO_TMPNM_ADM"."TIMESTMP"...	15.423	2.128	7	15.289	0	1	0	SAPLRSD...	
SELECT * FROM "BTCTO" WHERE "JOBNAME" LIKE ? ESCAPE ? AND "STATUS" IN ( ? , ? , ? , ? ) P R3 SAPLSCSM_BTCTO_JOB_MONITORING5052...	11.587	2.256	5	11.575	0	2	2	SAPLSCS...	
SELECT * Buffer Loading ? "POIND", "OBJCT", "OBJ_NAME", "KORRNUM", "SRCSYSTEM", "AUTHOR", "SRCDP", "IDCYCLASS", "GENFLAG", "EDT"...	10.317	9.472	1	0	0	1	3	SAPLS000	
SELECT DISTINCT "SYS_ID" FROM "ISTMCIOSMS1" P R3/ISTMCIOL_OSMS_METRIC_STORE_DB-CP-691 T/ISTMCIOSMS1 M.000 Y	9.606	82	117	8.809	0	134.745	1.036	ISTMCIOL...	
SELECT DISTINCT "TIME_GRANULARITY" FROM "ISTMCIOSMS1" WHERE "SYS_ID" = ? AND "ELEMENT_TYPE" = ? P R3/ISTMCIOL_OSMS_METRIC_STORE_D...	9.040	492	18	9.040	0	22.454	1.031	ISTMCIOL...	
select 'D1:"SID_RSORS001" as "S____570", sr('D1:"SID_RSORS001": 000004, 0) as "K____570", 'D1:"SID_RSORS001" as "S____574...	7.750	14	553	5.288	0	186.505	5.614		
MERGE INTO "BALDAT" AS T1 USING ( SELECT ? , ? , ? , ? , ? , ? , ? ) AS T2 ("DATAINGO", "CLUSTR", "CLUSTD", "MANDANT", "RELL...	6.022	7.303	0	0	0	0	7	SAPLSBA...	

## 11.5.11.3 Performance: On Disk Query Plans

You can get information about the text and associated abstract plan for a query stored in the sysqueryplans system table by selecting [Performance](#) [SQL Statements](#) [On-Disk Query Plans](#) from the [Database](#) tab of the DBA Cockpit.

An abstract plan describes the execution plan of a query using a language created for that purpose. For more information, see [Introduction to Abstract Plans](#).

On-Disk Query Plans				
Selection				
Database: A52				
Apply Selection				
View: [Standard View] Export Drop				
Abstract Plan Group	User Name	Abstract Plan ID	SQL Statement	Abstract Query Plan
ap_stdout	dbco	379.222.912	if exists (select 1 from master.sysdatabases where ...	( nested ( values 1 ) ) ( subq ( scalar_agg ( l_scan c databases [m...
		395.222.969	SELECT so.name, sc.name, upper(st.name), ISNULL...	( nl_join ( nl_join ( nl_join ( sort ( nl_join ( l_scan ncsysobjects ( ...
		427.223.083	if exists (select 1 from master.sysdatabases where ...	( nested ( values 1 ) ) ( subq ( scalar_agg ( l_scan c databases [m...
		443.223.140	SELECT so.name, sc.name, upper(st.name), ISNULL...	( nl_join ( nl_join ( nl_join ( sort ( nl_join ( l_scan ncsysobjects ( ...
		475.223.254	if exists (select 1 from master.sysdatabases where ...	( nested ( values 1 ) ) ( subq ( scalar_agg ( l_scan c databases [m...
		491.223.311	SELECT so.name, sc.name, upper(st.name), ISNULL...	( nl_join ( nl_join ( sort ( nl_join ( nl_join ( l_scan ncsysusers1 ( t...
		523.223.425	if exists (select 1 from master.sysdatabases where ...	( nested ( values 1 ) ) ( subq ( scalar_agg ( l_scan c databases [m...
		539.223.482	SELECT so.name, sc.name, upper(st.name), ISNULL...	( sort ( nl_join ( nl_join ( nl_join ( nl_join ( l_scan ncsysusers1 ( t...
		571.223.596	SELECT so.name, sc.name, upper(st.name), ISNULL...	( nl_join ( nl_join ( nl_join ( sort ( nl_join ( l_scan ncsysobjects ( ...
		603.223.710	SELECT so.name, sc.name, upper(st.name), ISNULL...	( nl_join ( nl_join ( nl_join ( sort ( nl_join ( l_scan ncsysobjects ( ...

## 11.5.12 Performance: Resource Utilization

You can access information about resource utilization by calling the DBA Cockpit and choosing ► [Performance](#) ► [Resource Utilization](#) ► on the [Database](#) tab of the DBA Cockpit.

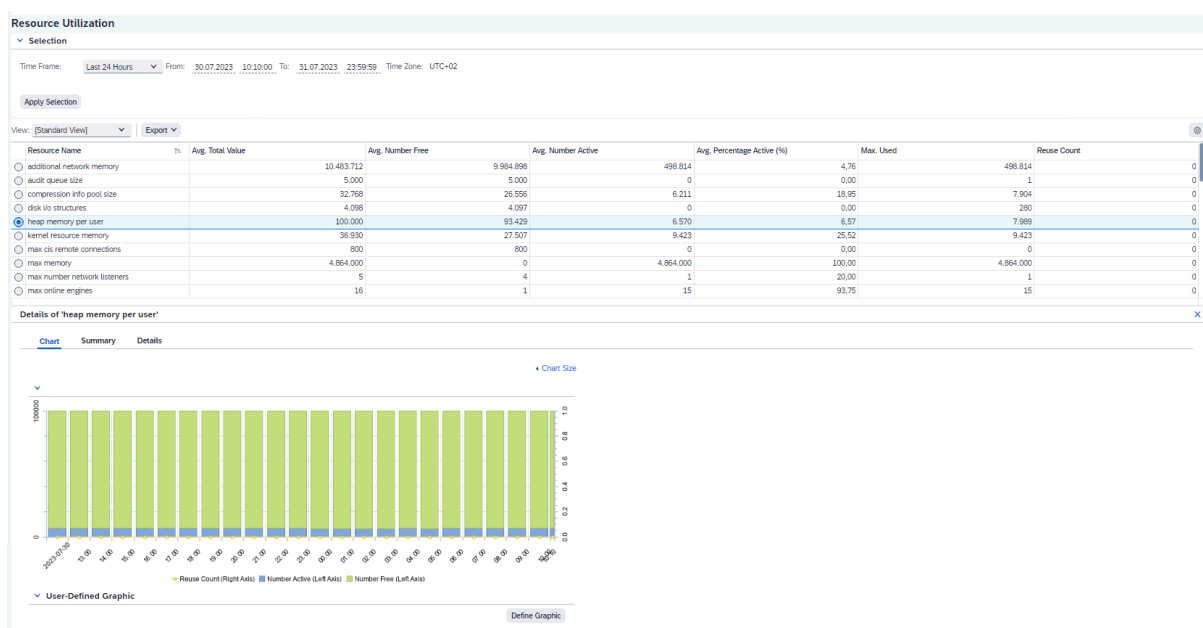
### Note

To monitor data on the [Resource Utilization](#) screen, you have to make sure that the DBA Cockpit framework (DCF) is set up correctly. If the DCF is not available or set up incorrectly, a warning is displayed with a link to the collector configuration screen. There you can perform the required steps. For more information, see [DBA Cockpit Framework: Data Collectors and Admin Procedures \[page 111\]](#).

The data collector `ASE_Resources` allows historical monitoring of server resources as being reported through system procedure `sp_monitorconfig`.

Details about SAP ASE's internal resource pools as well as their usage are displayed.

In the [Selection](#) area, you can specify the time frame for which you want the resource consumption to be displayed.



If you observe a high [Reuse Count](#), increase the corresponding resource pool. The [Resource Name](#) is a configurable parameter. For more information, see SAP Note [1539124](#): [SYB: Database Configuration for SAP Applications on SAP ASE](#).

If the value in the column [Max. Used](#) constantly stays below the configured value in the column [Average Total Value](#), you should reduce the respective parameter.

### 11.5.13 Performance: Resource Limit Violations

You can access information about resource limit violations by calling the DBA Cockpit and choosing

► *Performance* ► *Resource Limit Violations* on the *Database* tab of the DBA Cockpit.

**i Note**

To monitor data on the [Resource Limit Violations](#) screen, you have to make sure that the DBA Cockpit framework (DCF) is set up correctly. If the DCF is not available or set up incorrectly, a warning is displayed with a link to the collector configuration screen. There you can perform the required steps. For more information, see [DBA Cockpit Framework: Data Collectors and Admin Procedures \[page 111\]](#).

The DBA Cockpit can be used to configure the SAP ASE Resource Governor. Resource limits can be defined in screen [► Configuration ► Resource Limit](#). A new data collector [Resource Limits](#) can be set up to periodically collect resource limit violations and to prepare them for display. Screen [► Performance ► Resource Limit Violations](#) allows you to analyze resource limit violations that have occurred in the system.

In the *Selection* area, you can specify the time frame, the *Login Name* and the *Resource Limit Type* for which you want the resource limit violation to be displayed.

After having applied your selection, you can review the information that were captured in the given time frame.

To display detailed information, you select the appropriate entry that you want to analyze in the overview table.

[illegible]

#### 11.5.14 Performance: Performance Warehouse

You can analyze performance data of your database system using the Performance Warehouse. To access the Performance Warehouse, call the DBA Cockpit and choose **Performance** **Performance Warehouse**.

The following content areas are available in the Performance Warehouse:

- Reporting
- Configuration

## Prerequisites

An SAP Solution Manager system with Solution Manager Diagnostics (SMD) enabled is required.

## Features

In the Performance Warehouse, performance indicators that are collected by the DBA Cockpit are stored in an SAP NetWeaver Business Warehouse system. This SAP NetWeaver BW system is used by the Solution Manager Diagnostics (SMD) back-end of an SAP Solution Manager system. SMD already uses this SAP NetWeaver BW to store workload data of SAP applications. To configure the extraction of data into the SMD BI, you use the SMDSetup Wizard.

Based on this architecture, the DBA Cockpit uses SAP NetWeaver BW technology to provide reports for performance analysis, which you can customize according to your needs. All collected data has a time dimension, so you can analyze the database performance for any point in time or over a specified time frame.

Almost all reports are displayed as a chart to visualize the key performance indicators (KPIs). In addition, there is also a detailed table view. To navigate within these reports, you can use the SAP NetWeaver BW drilldown feature. Violations to performance thresholds are highlighted based on predefined SAP BW exceptions to make you immediately aware of performance issues.

By default, the Performance Warehouse is delivered with predefined content that you can use to create your own reports according to your needs.

### 11.5.14.1 Performance Warehouse: Reporting

You use the data provided on the [Reporting](#) screen to analyze database performance problems in the present or the past. To access the [Reporting](#) screen of the Performance Warehouse, call the DBA Cockpit and choose [► Performance ► Performance Warehouse ► Reporting ►](#) on the [Database](#) tab of the DBA Cockpit.

## Specifying the Time Frame

To display detailed reports, you first have to specify the time frame for which you want to analyze data by defining the following:

- Granularity  
You can choose between [Minute](#), [Hour](#), [Day](#), or [Month](#). Depending on your selection, the values for your time frame might change.

- Time frame  
If you choose [Custom Selection](#) from the dropdown list, you can manually enter the starting and ending time for your analysis. To activate your custom selection, choose [Apply Filter](#). For any other selection from the dropdown list, the reports are automatically refreshed.

The reports are categorized and for each category there is one tab page. On every tab page, you find a button row for the reports. Every pushbutton in the button row represents a specific view on the database performance, for example, [I/O](#), [Prefetcher](#), [Sort Heap](#), and so on.

## Displaying a Report

To display a report, choose the appropriate view pushbutton on the respective tab page.

### i Note

The availability of the tab pages and of the pushbuttons on each tab page can vary depending on the selected system. Some reports are only available if special database features are enabled.

The reports consist of two sections:

- In the upper section, a chart is displayed to visualize the key performance indicators. The chart provides a subset of the key columns from the detail table view.

### i Note

The chart display is optional and not available for all views.

- In the lower section, a detailed table view is available.

You can drill down your reports by either using the context menu of a column header in the [Detail: <Category – View>](#) screen area or by specifying the respective value using the pushbuttons in the [Detail: Navigation](#) screen area. Here, you can also add and remove columns or key figures, or you can set filters on columns.

In addition, there are predefined exceptions (for example, [Chart: Exceptions](#) or [Details: Exceptions](#)) for almost all reports on key performance indicators. The used thresholds are based on Early Watch Alerts and each violation to these thresholds is displayed in red.

### i Note

If you want to reset a report to its initial state, choose [Reset Report](#) in the central system area.

## 11.5.14.2 Performance Warehouse: Configuration

You configure all configuration parameters that are related to the performance warehouse on the [Configuration](#) screen. For example, you can configure the framework, the templates used for the reports and the report categories.

The DBA Cockpit uses BI Business Explorer (BEx) Web templates to analyze the performance data that is stored in the Solution Manager Diagnostics (SMD) BI. You can create your own BI BEx Web templates based on this data and integrate new BI BEx Web templates into the performance warehouse.

You can access the [Configuration](#) screen of the performance warehouse by calling the DBA Cockpit and choosing [► Performance ► Performance Warehouse ► Configuration ►](#)

On the screen [Performance Warehouse: Configuration](#), the following tab pages are available:

- Configuration
- Web Reports
- Report Categories

## Configuration

Here, you can view or modify the configuration parameters of the performance warehouse for the monitored system. To modify some of these parameters, use the [Edit](#), [Save](#), and [Cancel](#) pushbuttons in the toolbar.

Depending on your database platform, the displayed selection of values can vary. The following parameters are displayed for all database platforms:

Parameter	Description
BI Server	BI server where the database performance data is located
Reporting Time Zone	The performance data time-stamps are converted to one global time zone for all reports in SMD BI

### **i** Note

The [Default](#) checkbox is selected if the default value for your complete landscape is the same as the one specified for your system.

## Web Reports

Here, you can configure the display on the [Reporting](#) screen. That is, you can view and modify the integrated BI BEx Web templates in the tree table. To modify some of these parameters, use the [Edit](#), [Add](#), and [Delete](#) pushbuttons in the toolbar.

The main report categories appear and for each report category, you can view or modify the views by expanding the appropriate report category. These views appear as pushbuttons on the respective category tab page on the [Reporting](#) screen. To change the sequence within a category, use the [Up](#) or [Down](#) pushbuttons.

To display details about a view, simply select it in the table. The following parameters are displayed in the [Details for Web Reports](#) area below the table view:



Parameter	Description
Report	Specifies the name of the report  This text appears on the view pushbutton on a category tab page.
Description	Detailed description for the report  This text appears as a tooltip for the pushbutton of the key indicator on a category tab page.
Category	Specifies the report category  Each category is represented on a separate tab page.
Web Report (Default)	Technical name of the BI BEx Web templates
Web Report (Day)	Technical name of the BI BEx Web templates for granularity <i>Day</i>
Web Report (Month)	Technical name of the BI BEx Web templates for granularity <i>Month</i>
Data Providers (Time)	Specifies the data provider of the BI BEx Web templates with a time dimension  The drilldown of the time dimension is changed according to the selected granularity.
Active	If selected, the report is available for performance analysis.
Default	If selected, the report is executed as soon as the tab page is selected.
Database	Name of database platform
Release (min)	Minimum database release for this report
Release (max)	Maximum database release for this report

### **i** Note

Depending on your database platform, there might be more checkboxes available for database-specific features. If you select these checkboxes, the report is only displayed if the specific database features have been set up in the monitored database system.

## Report Categories

Here, you can view and modify the categories for BI BEx Web templates of the reports that are displayed the *Reporting* screen. To modify some of these parameters, use the *Edit*, *Add*, and *Delete* pushbuttons in the toolbar. To change the sequence of the categories on the *Reporting* screen, use the *Up* or *Down* pushbuttons.

Parameter	Description
Category	Name of the category
Description	Detailed description for the category

## 11.6 Space

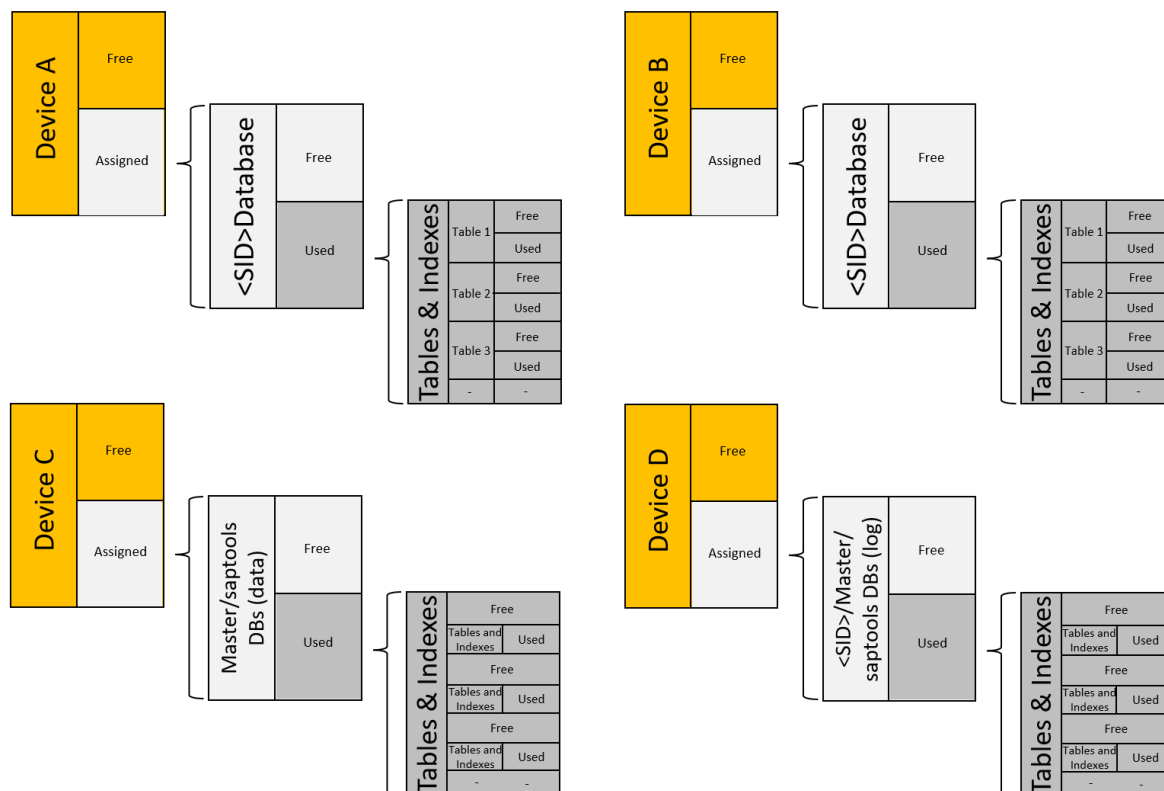
The DBA Cockpit allows you to watch the space consumption of your database, including database objects such as tables and indexes. You can analyze space allocation and perform administration activities to change the storage layout of your database.

If you neglect space management, this can lead to downtime due to normal database growth when database objects fill up. If this happens, applications cannot write to the database and you have to quickly make more space available. Therefore, it is much better to anticipate the problem by monitoring and pro-actively managing the disk space in your database.

The following sections provide information about the main task areas that are available under [Space](#) on the [Database](#) tab of the DBA Cockpit:

- [Space: File Systems \[page 83\]](#)
- [Space: Devices \[page 83\]](#)
- [Space: Databases \[page 85\]](#)
- [Space: Transaction Log Usage \[page 87\]](#)
- [Space: Object Browser \[page 88\]](#)
- [Space: System Usage \[page 90\]](#)
- [Space: Tables and Indexes \[page 90\]](#)

The following example shows how disk space can be allocated on different devices and explains the terms *Assigned*, *Free* and *Used*. This will help you to understand the space consumption monitoring in the DBA Cockpit:



## 11.6.1 Space: File Systems

You can use the screen [File Systems](#) to identify how much free space is available in the file systems used by SAP ASE.

Choose **Space > File Systems** on the [Database](#) tab of the DBA Cockpit.

Make sure that the [DBA Cockpit Framework \(DCF\)](#) [page 111] is set up correctly.

The data collector `File Systems` allows historical monitoring of file system free space.

The [File Systems](#) screen helps you to determine how much free space is available to extend the database space.

## 11.6.2 Space: Devices

You can use the screen [Devices](#) to access information about database devices.

Choose **Space > Devices** on the [Database](#) tab of the DBA Cockpit.

The term *device* does not only refer to a distinct physical device: it can refer to any piece of a disk (such as a disk partition) or a file in the file system that is used to store databases and their objects. A database can occupy all available space on the device, or other databases can share space on the device, or any combination of the two. Segments (logical groupings of storage within a database) allow you to keep some data logically or physically separate from other data.

For Adaptive Server, devices provide a logical map of a database to physical storage, while segments provide a logical map of database objects to devices. To achieve your space allocation goals, it is important that you understand the interplay between these logical layers. For more information, refer to [Overview of Disk Resource Issues](#) and [Creating and Using Segments](#) in the *System Administration Guide*.

Devices

View: [Standard View]

Export

Show Growth

Name	Physical Device Name	Device Size (MB)	Used Size (MB)	Free Space (MB)	Creation Date	Last Resize Date	Direct I/O Enabled	Using dsync	Skip Header
<input type="radio"/> syssecurity_log_001	/sybase/SYX/sysecurity/syb...	20		1	19 2017-03-16 10:00:49		Yes	No	No
<input type="radio"/> sysprocdev	/sybase/SYX/sybsystem/sybp...	300		166	134 2017-03-16 09:54:37		Yes	No	No
<input type="radio"/> sysmtdbdev	/sybase/SYX/sybsystem/sybs...	50		1	47 2017-03-16 09:54:58		Yes	No	No
<input checked="" type="radio"/> SYX_data_001	/sybase/SYX/sapdata_1/SYX...	35.840	25.518	82	82 2017-03-28 09:11:10	2021-09-10 21:43:02	Yes	No	No
<input type="radio"/> SYX_data_002	/sybase/SYX/sapdata_1/SYX...	25.600	25.600	0	0 2017-03-28 09:12:19		Yes	No	No
<input type="radio"/> SYX_data_003	/sybase/SYX/sapdata_1/SYX...	25.600	25.600	0	0 2017-03-28 09:12:32		Yes	No	No
<input type="radio"/> SYX_data_004	/sybase/SYX/sapdata_1/SYX...	51.200	4.725	25.875	2017-03-28 09:12:42	2018-03-23 10:13:02	Yes	No	No
<input type="radio"/> SYX_data_005	/sybase/SYX/sapdata_1/SYX...	25.600	9.429	16.171	2017-04-12 12:42:17		Yes	No	No
<input type="radio"/> SYX_log_001	/sybase/SYX/saplog_1/SYX_L...	8.192	71	8.121	2017-03-16 10:00:49	2019-01-16 09:06:19	Yes	No	No
<input type="radio"/> tempdbdev	/sybase/SYX/sytempdbdev...	3.072		13	3.059 2017-03-16 09:55:13		No	No	No

Details of Device SYX\_data\_001

Device

Fragments

Databases

Segments

Device Metadata

Device Number: 6

Name: SYX\_data\_001

Physical Device Name: /sybase/SYX/sapdata\_1/SYX\_data\_001.dat

Controller Type: 0

Status: 2

Status 2: 1

Creation Date: 2017-03-28 09:11:10

Last Resize Date: 2021-09-10 21:43:02

Device Size

Block Offset First Page: 0

Block Offset Last Page: 18.350.079

Device Size: 35.840 MB

Used Size: 25.518 MB

Options

Direct I/O Enabled: Yes

Using dsync: No

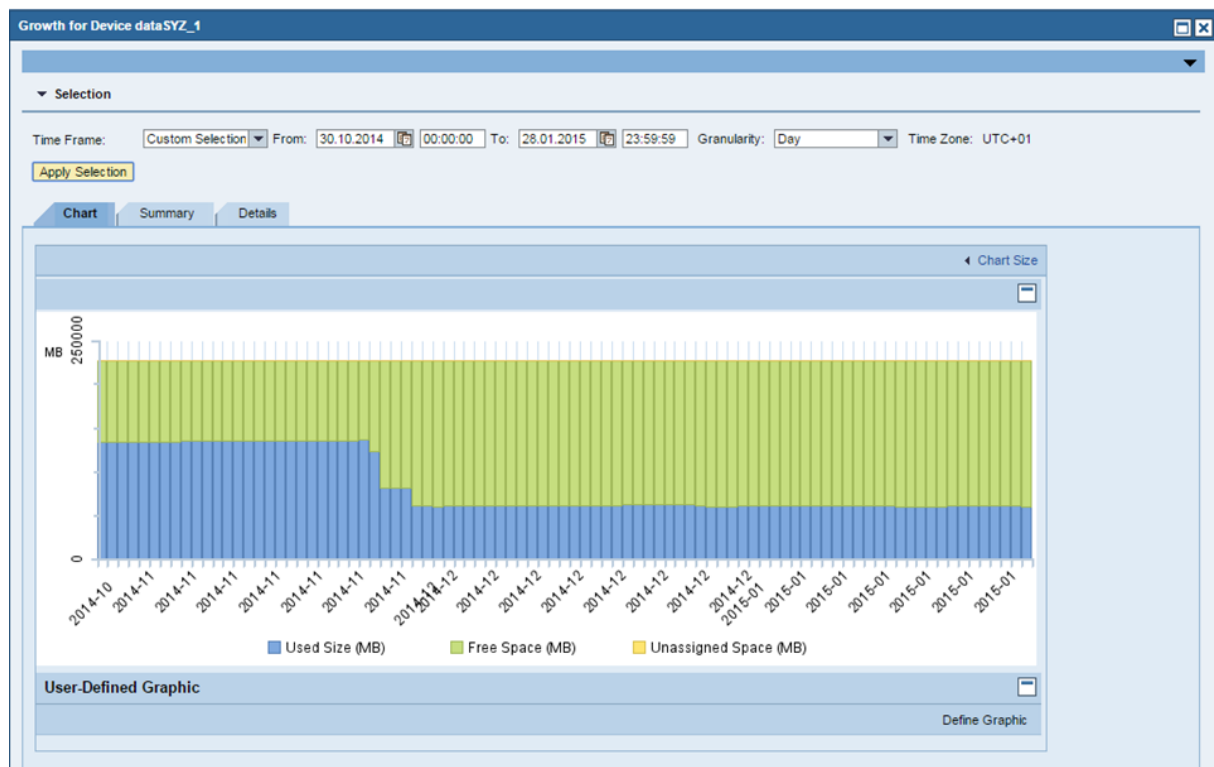
Skip Header: No

Default Disk: No

To display detailed information, you select the appropriate entry that you want to analyze in the overview table. The detail data is displayed in the *Device Details* area below the overview table:

- The *Device* tab shows general information on the device and additional metrics.
- The *Fragments* tab provides an overview on *disk pieces*. Fragments are a group of logical pages on the same device. Fragments permit storage for the same group of segments.
- The *Databases* tab shows all databases that use this device. For information on the *Databases* tab, refer to [Space: Databases](#).
- The *Segments* tab shows information about the used segments. Each database can have up to 32 named segments. Adaptive Server creates and uses three of these segments:
  - system segment– contains SAP ASE system catalogs
  - default segment – used if no segment is specified. This segment is used by SAP to store the data
  - logsegment – stores the transaction log. The log segment is reserved entirely for the log.

To get an overview of the growth of a selected device, choose [Show Growth](#).



## 11.6.3 Space: Databases

You can use the screen [Databases](#) to access information about all databases of an SAP ASE database server.

Choose [Space](#) [Databases](#) on the [Database](#) tab of the DBA Cockpit.

Monitoring the space that is consumed by the database does not only require that you check the current space consumption but also that you consider the progress of the space growth to answer questions such as the following:

- Is data continuously growing and is it predictable that the database runs out of space?
- Did archiving operations or reorganizations successfully reduce the space consumption?
- Can I identify any short-term growth that is related to specific activities of an application, such as client copy, for example.

The [Database](#) screen provides information on the data and log space, the available free space, and the durability level.

Databases										
View: <span>Standard View</span> <span>Export</span> <span>Show Growth</span> <span>Extend DB Space</span>										
Name	Database Owner	Last Log Dump	Data Total (MB)	Data Free (MB)	Log Total (MB)	Log Free (MB)	Durability Level	Mixed Data/Log	Encryption Status	
db1	DBA_User	2023-07-31 13:04:54	24	9	9	9	full	Yes	Not Encrypted	
master	sa	2023-07-31 00:57:27	300	265	265	265	full	Yes	Not Encrypted	
model	sa	2023-07-31 00:57:31	24	9	9	9	full	Yes	Not Encrypted	
new_db	sapsa	2023-07-31 13:34:11	128	113	113	113	no_recovery	Yes	Not Encrypted	
newdb2	DBA_User	2023-07-31 13:04:58	24	9	9	9	full	Yes	Not Encrypted	
saptempdb	sa	2023-07-31 13:34:11	15,360	15,285	15,285	15,285	no_recovery	Yes	Not Encrypted	
saptools	sapsa	2023-07-31 13:34:11	10,840	6,787	4,700	4,681	full	No	Not Encrypted	
sybmgtmtdb	sa	2023-07-31 13:34:11	148	74	144	142	full	No	Not Encrypted	
sybsecurity	sa	2023-07-31 13:34:11	204	179	20	19	full	No	Not Encrypted	
sybsystemdb	sa	2023-07-31 13:34:11	72	56	57	57	full	Yes	Not Encrypted	

Details of Database db1

Database
Devices
Fragments
Segments

Database Metadata
DBID: 10
Name: db1
Server User ID: 8
Database Owner: DBA\_User
Creation Date: 2022-01-14 08:34:47
Last Log Dump: 2023-07-31 13:04:54
Durability Level: full
Cache Binding: -
Encryption Status: Not Encrypted
Log
Log Pointer: 1,452
Mixed Data/Log: Yes

Space Consumption
Data Total: 24 MB
Data Free: 9 MB
Data Used: 62.50 %
Log Total: 9 MB
Log Free: 9 MB
Log Used: 0.00 %
Assigned Space Total: 24 MB

Status
Drop in Process: No
Suspect Pages: No
Status: 0
Status 2: -32,768
Status 3: 131,072
Status 4: 0
Options
Truncate Log on Checkpoint: No
Read Only: No
No Free Space Acctg.: No

The *Durability Level* can have one of the following values:

## Durability Level:

## Description:

### full

All transactions are written to disk. This is the default if you do not specify a durability level when you create the database, and ensures full recovery from a server failure. All system databases use this durability level (the traditional durability level for disk-resident databases).

### Note

It is of high importance that the <SID>database of an SAP installation has this durability level.

### no\_recovery

Transactions are not durable to disk and all changes are lost if the server fails or is shut down. For disk-based databases, Adaptive Server periodically writes data at runtime to the disk devices, but in an uncontrolled manner. After any shutdown (polite, impolite, or server failure and restart) a database created with *no\_recovery* is not recovered, but is re-created from the model or template database.

### at\_shutdown

Transactions are durable while the server is running and after a polite shutdown. All durability is lost if the server fails.

To display detailed information, you select the appropriate entry that you want to analyze in the overview table. The detail data is displayed in the *Database Details* area below the overview table.

The *Database* and *Device* tab show general information and additional metrics.

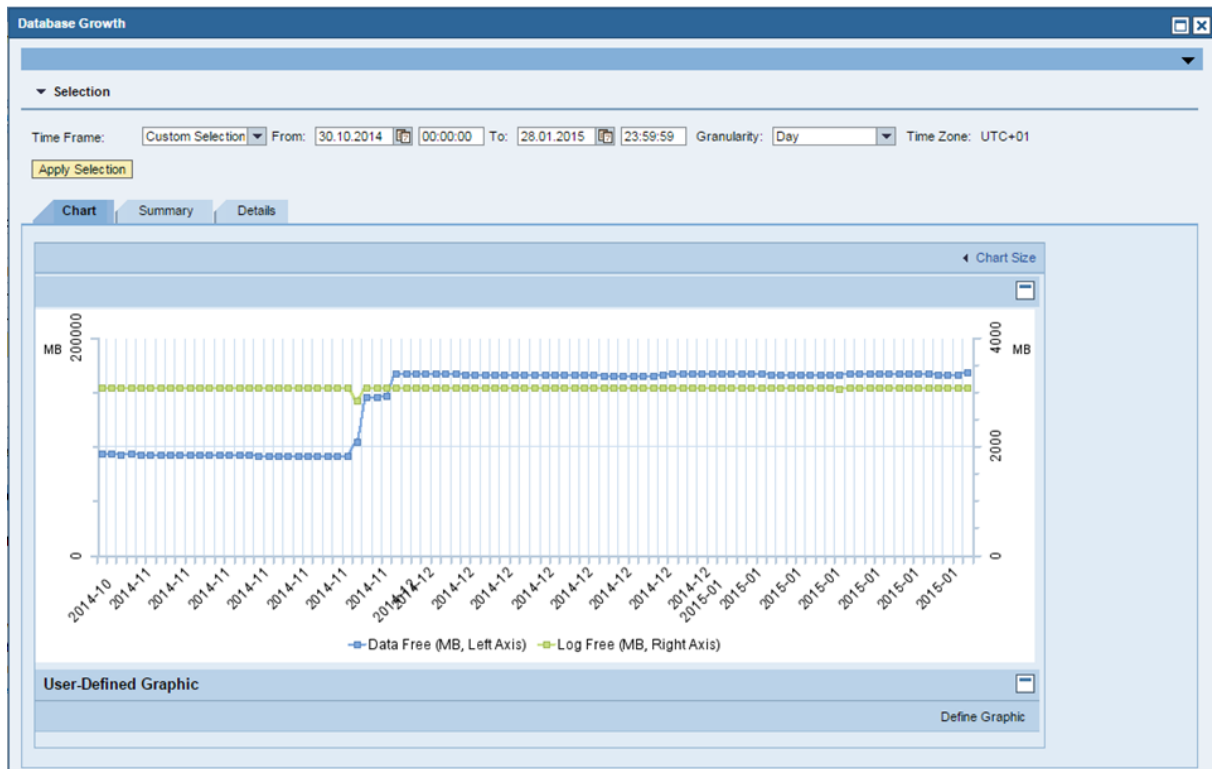
The *Fragments* tab provides an overview on *disk pieces*. Fragments are a group of logical pages on the same device. Fragments permit storage for the same group of segments.

The *Segments* tab shows information about the used segments. Each database can have up to 32 named segments. Adaptive Server creates and uses three of these segments:

- system segment*– contains most system catalogs

- *default segment* – used if you do not specify one when creating an object. This segment is used by SAP to store all data
- *logsegment* – stores the transaction log

To obtain a graphical overview about the growth of the database, choose *Show Growth*.



You can create new SAP ASE devices and extend the space of the existing database through the wizard *Extend DB Space*.

## 11.6.4 Space: Transaction Log Usage

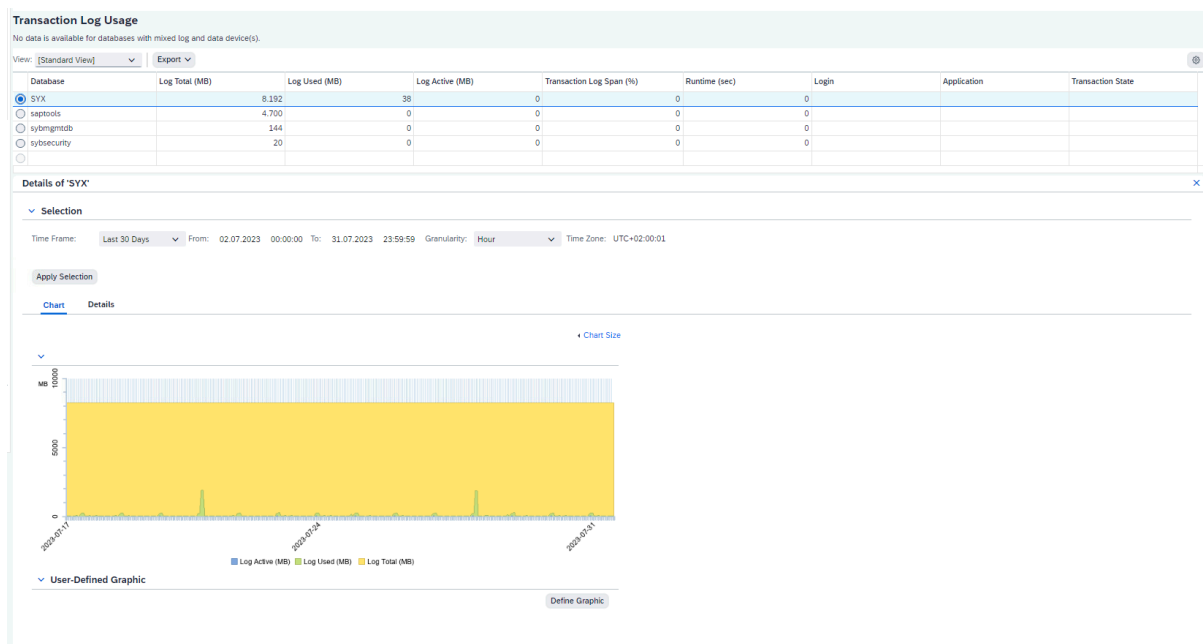
### Use

*Transaction Log Usage* allows granular and historical monitoring of the log consumption per database. The database system logs all database transactions that change application data. It writes information about these changes into log entries. If necessary, the system can later use these log entries to roll back or repeat data modification during crash recovery or roll-forward recovery.

Make sure that the *DBA Cockpit Framework (DCF)* [page 111] is set up correctly.

The minimum SAP ASE version required is 15.7.0.110.

To display detailed information, you select the appropriate entry that you want to analyze in the overview table. The [Chart](#) tab shows the details of the analysis in a graphical representation. The [Summary](#) tab contains general information, the description and the recommended action. The [Details](#) tab provides an overview on an hourly, daily or weekly basis.



## More Information

[Transaction Log Space Management](#)

[Log Threshold Events](#) to manage shortcomings in the transaction log: [Diagnostics \[page 122\]](#)

## 11.6.5 Space: Object Browser

You can use the [Object Browser](#) to look up various objects when you select **Space** **Object Browser** on the [Database](#) tab of the DBA Cockpit.

You can choose between different types of objects:

- Stored Procedure
- View
- User Table
- System Table
- Scalar or Tab. Valued User-Defined Function
- Default
- Index



- Partition
- C-User Defined Function

If you select *System Table* as the object type and *master* as the database and apply these settings, a list of system tables located in the master database is displayed.

**Objects Browser** - Maintenance Not Allowed

Selection

Top: 100    Object Type: System Table  
 Database: master    Owner: \*    Object: \*  
 Apply Selection

List of Objects    Navigation Hierarchy Tree

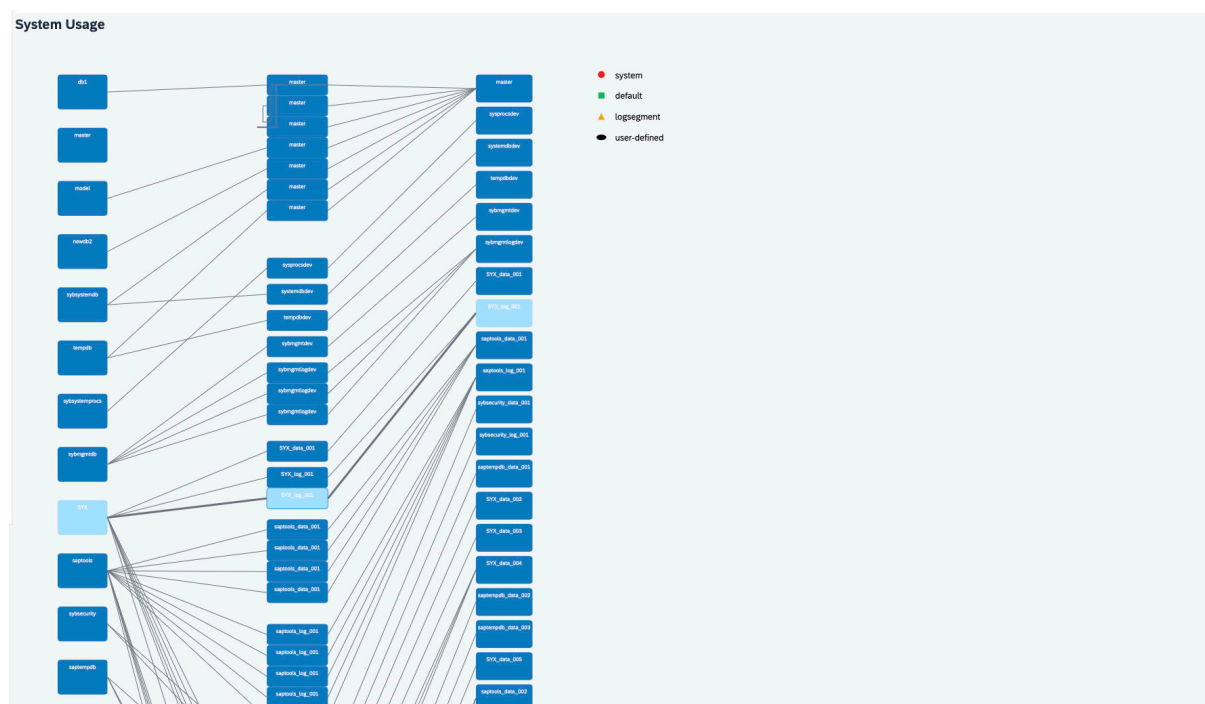
View: [Standard View]    Export

Object Name	Database	Object Owner	Type	Creation Date
<input type="radio"/> sysalternates	master	dbo	System Table	2011-08-04 15:27:25
<input type="radio"/> sysattributes	master	dbo	System Table	2011-08-04 15:27:25
<input type="radio"/> syscertificates	master	dbo	System Table	2011-08-04 15:27:25
<input type="radio"/> syscharsets	master	dbo	System Table	2011-08-04 15:27:25
<input type="radio"/> syscolumns	master	dbo	System Table	2011-08-04 15:27:25
<input type="radio"/> syscomments	master	dbo	System Table	2011-08-04 15:27:25
<input type="radio"/> sysconfigures	master	dbo	System Table	2011-08-04 15:27:25
<input type="radio"/> sysconstraints	master	dbo	System Table	2011-08-04 15:27:25
<input type="radio"/> syscurconfigs	master	dbo	System Table	2011-08-04 15:27:25
<input type="radio"/> sysdams	master	dbo	System Table	2013-10-11 15:43:28
<input type="radio"/> sysdatabases	master	dbo	System Table	2011-08-04 15:27:25
<input type="radio"/> sysdepends	master	dbo	System Table	2011-08-04 15:27:25
<input type="radio"/> sysdevices	master	dbo	System Table	2011-08-04 15:27:25

You can also filter the objects by different databases, by different owners, and by different objects. You can apply a filter if you want to see TOP 100, TOP 500, or all objects. Depending on the object type, you can find more information about the objects in the details screen, such as Summary, Columns, Indexes, Partitions, Statistics, ATM information, etc.

### 11.6.6 Space: System Usage

You can get a graphical overview of the databases and the devices connected to these databases by selecting **Space** **System Usage** on the **Database** tab of the DBA Cockpit.



When you select one of these databases, fragments, or devices, you get more information about the size of the database or device, how much space can still be allocated in the database or on the device, etc. You will get more information about the different segments of a database - system, log segment, and defaults.

[illegible]

### 11.6.7 Space: Tables and Indexes

The following sections provide information about the main task areas that are available under *Space*.

- Tables

- Indexes
- Single Table Analysis
- Deferred Tables
- Compression Advisor

Make sure that the [DBA Cockpit Framework \(DCF\)](#) [page 111] is set up correctly.

## Tables

You can access the [Tables](#) screen by calling the DBA Cockpit and choosing ► [Space](#) ► [Tables and Indexes](#) ► [Tables](#) in the navigation frame of the DBA Cockpit.

To analyze space with regard to tables and indexes, you have to ask yourself the following questions:

- Which are the largest and fastest growing tables in the system?
- Which tables do I need to reorganize regarding space reclaim and performance degradation?

To answer these questions, you have to collect the appropriate data about tables first. Typically, there are several thousands of tables in an SAP system environment. For performance reasons, you cannot analyze data that is retrieved on demand. Therefore, data is continuously collected by background jobs of the DBA Cockpit framework (DCF), which allows a fast evaluation of not only current data but also of history data.

The [Tables](#) screen displays information on all tables of the database, such as the used, unused or reserved space, the number of rows, the number of rows deleted, forwarded, and so on.

Tables

Selection

Time Frame:

Last 30 Days

From: 02.07.2023 00:00:00 To: 31.07.2023 23:59:59 Time Zone: UTC+02:00:01

Top:

50

Tables by:

Data Change

Order by:

Descending

Database:

SYX

Owner:

\*

Table:

\*

Apply Selection

Last data collection was performed at 2023-07-31 12:00.

View:

Standard View

Export

Analyze Table

Reorganize

Update Statistics

	Database	Table Owner	Table Name	Reserved Total (KB)	Used Total (KB)	Unused Total (KB)	Data Total (KB)	Data Utilized Total (KB)	Number of Rows	Data Change (%)	Data Page Cluster Ratio (%)	Large I/O Efficiency (%)	Deleted Rows	Forwarded Rows	Number of Partitions
<input type="checkbox"/>	SYX	SAPSR3	VBMOD	128	32	96	16	0	1	366.429.444,82	100,00	100,00	20	0	1
<input type="checkbox"/>	SYX	SAPSR3	ZZBFAE	948	856	91	840	721	52.632	276.442.399,56	99,99	99,99	1	0	1
<input type="checkbox"/>	SYX	SAPSR3	ZZBOX1	128	32	96	16	0	4	227.286.575,00	0,00	12,50	8	0	1
<input type="checkbox"/>	SYX	SAPSR3	VER34017_S	128	32	96	16	0	3	156.909.066,67	0,00	12,50	80	0	1
<input type="checkbox"/>	SYX	SAPSR3	VER34030_S	128	32	96	16	0	2	152.574.800,00	0,00	12,50	235	0	1
<input type="checkbox"/>	SYX	SAPSR3	VER34030_T	112	32	80	16	0	2	126.000.000,00	0,00	12,50	335	0	1
<input type="checkbox"/>	SYX	SAPSR3	VER34017_T	128	32	96	16	0	3	123.200.000,00	0,00	12,50	260	0	1
<input type="checkbox"/>	SYX	SAPSR3	TBTCV	128	32	96	16	0	1	59.956.151,72	100,00	100,00	4	0	1
<input type="checkbox"/>	SYX	SAPSR3	VBDATA	256	64	192	32	58	21	19.124.421,18	100,00	100,00	19	0	1
<input type="checkbox"/>	SYX	SAPSR3	VHDR	128	32	96	16	0	1	18.692.344,82	100,00	100,00	12	0	1
<input type="checkbox"/>	SYX	dbo	sapsta_allve_chk	128	32	96	16	0	1	9.665.741,37	100,00	100,00	1	0	1
<input type="checkbox"/>	SYX	SAPSR3	TBTC5	128	50	77	34	7	67	3.493.811,73	99,99	99,99	1	0	1
<input type="checkbox"/>	SYX	SAPSR3	DDLOG	2.003	1.779	224	1.747	1.711	1.810	1.265.361,64	65,04	52,28	91	0	1
<input type="checkbox"/>	SYX	SAPSR3	SWNCMONINDEX	624	462	161	446	10	139	998.787,94	95,74	77,41	4.169	0	1
<input type="checkbox"/>	SYX	SAPSR3	SWW_SYREGISTER	256	64	192	32	16	1	881.771,42	0,00	12,50	1	0	1
<input type="checkbox"/>	SYX	SAPSR3	VERTESTLIVER297...	384	80	304	48	16	1	827.200,00	100,00	100,00	65	0	1
<input type="checkbox"/>	SYX	SAPSR3	TRBAT3	128	32	96	16	0	4	663.559,48	100,00	100,00	14	0	1
<input type="checkbox"/>	SYX	SAPSR3	VERTESTLIVER297...	384	80	304	48	16	1	662.400,00	100,00	100,00	65	0	1
<input type="checkbox"/>	SYX	SAPSR3	ALMBCDATA	128	32	96	16	0	8	455.554,06	0,00	12,50	7	0	1
<input type="checkbox"/>	SYX	SAPSR3	ALMBCADM	128	32	96	16	0	4	372.015,02	100,00	100,00	3	0	1

To analyze table data, you proceed as follows:

1. You specify the time frame and other criteria for which you want the tables to be displayed.
2. To refresh table data, you choose the [Apply Selection](#) push button. The following information is displayed:

Column:	Description:
Database	Name of the database
Table Owner	Name of the table owner
Table Name	Name of the table
Reserved Total	Total amount of space reserved by the object in KB
Used Total	Total amount of space used in KB
Unused Total	Total amount of unused space in KB
Data Total	Total amount of space used by data for this table in KB
Data Utilized Total	Amount of utilized data for this table in KB
Number of Rows	Table rows
Data Change	Percentage of data change since the last statistics update was performed on the object's indexes
Data Page Cluster Ratio	Data cluster ratio in %
Large IO Efficiency	Information about I/O efficiency
Deleted Rows	Number of data records that were deleted since the last reorganization
Forwarded Rows	Rows that grow in length with subsequent updates

To display further details of the selected table, you select a line in the overview table and choose [Table Details](#). By analyzing and maintaining single tables, you can optimize tables and indexes to:

- Save disk space by releasing unused space
- Improve access to a table by reorganizing fragmented tables or indexes

For more information, refer to: [Automatic Table Maintenance for SAP Adaptive Server Enterprise](#).

This article shows how the DBA Cockpit and its automatic table maintenance for SAP ASE ensures good cluster ratios on tables and indexes, frees up unused space and ensures accurate optimizer statistics.

## Indexes

You can navigate to the [Indexes](#) screen by selecting [Space](#) > [Indexes](#) on the [Database](#) tab. The [Indexes](#) screen displays information about all indexes in the database, such as the reserved total, the used total, the unused total, and so on.

**Indexes**

Selection

Time Frame: Last 30 Days From: 02.07.2023 00:00:00 To: 31.07.2023 23:59:59 Time Zone: UTC+02:00:01

Top: 50 Indexes by Reserved Total Order by Descending

Database: SYX Owner: \* Table: \*

☐ Group by Table

[Apply Selection](#)

Last data collection was performed at 2023-07-31 00:00.

View: [Standard View](#) [Export](#) [Analyze Table](#) [Reorganize](#) [Update Statistics](#)

Database	Table Owner	Table Name	Index	Reserved Total (KB)	Used Total (KB)	Unused Total (KB)	Data Total (KB)	Data Utilized (KB)	Index Page Cluster Ratio (%)	Data Page Cluster Ratio (%)	Index Height	Leaf Pages
<input type="checkbox"/> SYX	SAPSR3	WBCROSSGT	WBCROSSGT-0	2,325,154	2,324,505	648	2,324,489	2,208,247	51.84	13.52	3	144,414
<input type="checkbox"/> SYX	SAPSR3	D010TAB	D010TAB-1	1,223,330	1,221,757	1,573	1,221,741	876,155	55.85	30.19	2	76,108
<input type="checkbox"/> SYX	SAPSR3	D010TAB	D010TAB-0	1,043,641	1,041,107	2,533	1,041,091	916,628	83.31	2.24	2	64,751
<input type="checkbox"/> SYX	SAPSR3	DDPRS	DDPRS-0	951,040	943,022	8,018	943,006	1,345,148	88.52	35.69	2	58,709
<input type="checkbox"/> SYX	dbo	sysstatistics	sysstatistics	714,416	692,458	21,957	692,442	7,954	1.79	54.12	2	39,441
<input type="checkbox"/> SYX	SAPSR3	/BIC/EGIRAFFE2	/BIC/EGIRAFFE2-P	680,208	127,872	552,336	85,248	0	100.00	0.00	1	2,664
<input type="checkbox"/> SYX	SAPSR3	/BIC/EGIRAFFE2	/BIC/EGIRAFFE2-020	680,016	127,872	552,144	85,248	0	100.00	0.00	1	2,664
<input type="checkbox"/> SYX	SAPSR3	/BIC/EGIRAFFE2	/BIC/EGIRAFFE2-050	679,936	127,872	552,064	85,248	0	100.00	0.00	1	2,664
<input type="checkbox"/> SYX	SAPSR3	/BIC/EGIRAFFE2	/BIC/EGIRAFFE2-070	679,936	127,872	552,064	85,248	0	100.00	0.00	1	2,664
<input type="checkbox"/> SYX	SAPSR3	/BIC/EGIRAFFE2	/BIC/EGIRAFFE2-010	679,824	127,872	551,952	85,248	0	100.00	0.00	1	2,664
<input type="checkbox"/> SYX	SAPSR3	/BIC/EGIRAFFE2	/BIC/EGIRAFFE2-080	679,792	127,872	551,920	85,248	0	100.00	0.00	1	2,664
<input type="checkbox"/> SYX	SAPSR3	/BIC/EGIRAFFE2	/BIC/EGIRAFFE2-040	679,392	127,872	551,520	85,248	0	100.00	0.00	1	2,664
<input type="checkbox"/> SYX	SAPSR3	/BIC/EGIRAFFE2	/BIC/EGIRAFFE2-060	678,928	127,872	551,056	85,248	0	100.00	0.00	1	2,664
<input type="checkbox"/> SYX	SAPSR3	D010INC	D010INC-1	673,857	671,470	2,386	671,454	552,067	69.40	25.19	2	41,754
<input type="checkbox"/> SYX	SAPSR3	D010INC	D010INC-0	612,915	609,798	3,117	609,782	552,553	86.51	3.84	2	37,886
<input type="checkbox"/> SYX	SAPSR3	WBCROSSGT	WBCROSSGT-NAM	592,465	591,938	526	591,922	425,299	49.83	25.38	2	36,824
<input type="checkbox"/> SYX	SAPSR3	/BIC/B0001764000	/BIC/B0001764000-0	557,760	557,408	352	557,376	418,435	92.52	99.94	2	34,664
<input type="checkbox"/> SYX	dbo	syspartitions	nc2syspartitions	446,848	417,016	29,832	417,000	8,458	5.10	15.27	2	23,846
<input type="checkbox"/> SYX	SAPSR3	Z3WWWLOGHIST	Z3WWWLOGHIST-0	355,888	344,129	11,760	344,112	184,039	63.96	78.48	2	21,435
<input type="checkbox"/> SYX	SAPSR3	E071	E071-0	321,501	320,448	1,053	320,432	271,680	97.08	33.80	2	19,978

If you have selected an item in the [Overview](#) screen, you can get more information about this index in the [Detail](#) screen. However, you can also analyze the table by navigating to the [Object Browser](#) screen or schedule reorganizations or statistics updates of the selected table(s) by navigating to the [Schedule an Action](#) wizard using the [Reorganize](#) or [Update Statistics](#) button.

## Single Table Analysis

You can access the [Single Table Analysis](#) screen by calling the DBA Cockpit and choosing [Space](#) [Tables and Indexes](#) [Single Table Analysis](#) in the navigation frame of the DBA Cockpit.

The tab pages [Summary](#), [Columns](#), [Indexes](#), [Partitions](#), [Statistics](#), and [ATM](#) are available on the [Single Table Analysis](#) screen providing detail information about tables or indexes.

### Activities

To optimize tables, you can use the following push buttons on the [Single Table Analysis](#) screen:

- Performance History
- Space History
- Reorganize  
Schedules a job for a single table using the [Jobs: DBA Planning Calendar \[page 116\]](#).
- Update Statistics  
Schedules a job for a single table using the [Jobs: DBA Planning Calendar \[page 116\]](#). To decide if statistics are out-of-date, you can check the statistics time.
- Check Table  
Schedules a job that checks whether a table would benefit from compression.
- Recompile Statements

## Deferred Tables

Choose ► [Space](#) ► [Tables and Indexes](#) ► [Deferred Tables](#) ► to identify tables that have been created with deferred space allocation, as well as empty tables that are candidates for being recreated with deferred space allocation. Deferred tables require a minimum SAP ASE release of 15.7.0.020. Use report `RSSYBCONVDTA` to migrate empty tables created with older SAP ASE releases.

## Compression Advisor

Data and index compression in relational databases enables more efficient data storage, reduced memory consumption, and improved performance due to lower I/O demands. While data compression has been available since the initial release of SAP ASE for SAP NetWeaver-based applications, index compression was introduced with SAP ASE version 16.0, and is therefore not active in most of today's installations running SAP applications on SAP ASE. Compressing indexes in a multi-terabyte database, specifically in environments with very high load and limited maintenance windows, can pose a challenge. Consequently, DBAs may want to focus solely on those indexes that show significant space saving when compressed.

The DBA Cockpit Compression Advisor is designed to support the DBA in identifying such indexes, and to support the alteration and rebuild of the same. In addition, indexes and actually also tables that are already compressed can be examined with regard to their compression ratios. Also, altered indexes to be decompressed can be looked at, if considered to be not efficient. The DBA Cockpit Compression Advisor will be released with an upcoming Support Package of SAP NetWeaver ABAP 7.02, 7.3, 7.31 and 7.4. SAP Note [2098300](#) provides a reduced version based on an ABAP program described in the section Using Report `RSSYBCOMPRADVSR`. This report will become deprecated once the version integrated into DBA Cockpit has been released.

For more information, refer to the article: [Compression Advisor for SAP Adaptive Server Enterprise](#)

## 11.7 Configuration

The following sections provide information about the main task areas that are available under [Configuration](#) on the [Database](#) tab of the DBA Cockpit.

### 11.7.1 SAP Configuration Check

The configuration requirements and recommendations specified by SAP can be compared with your configuration of an SAP ASE database with the DBA Cockpit. The existing parameterization is checked against SAP recommendations.

To run the configuration check, open transaction `DBACOCKPIT`, switch to the [Database](#) tab, and select ► [Configuration](#) ► [SAP Configuration Check](#) ► from the menu.

### i Note

This feature is available starting with SAP NetWeaver 7.02 SP17, SAP NetWeaver 7.30 SP13, SAP NetWeaver 7.31 SP14, SAP NetWeaver 7.40 SP09.

SAP publishes database parameter recommendations for SAP systems running on SAP ASE in the SAP Note [1539124](#).

In the DBA Cockpit, you can use the [Check Results](#) screen to compare the existing parameterization of an SAP ASE database against these SAP recommendations. When you access the screen, the SAP parameter recommendations are automatically downloaded and checked against the SAP recommendations.

The checks are performed depending on the current system characteristics, such as the application type, the operating system, and so on. To correct these deviations, you can either change the respective parameters or declare the deviations as intended.

### i Note

A parameter is deviating if its current or its deferred value is different from the SAP recommendations. A deferred parameter value is a value that comes into effect after the database has been restarted.

1. On the [Database](#) tab page, choose ► [Configuration](#) ► [Parameter Check](#) .  
The DBA Cockpit automatically downloads the SAP parameter recommendations and compares them with the parameterization of your database.
2. To display information about which parameters are intended to deviate from the standard recommendation, choose the [Intended Deviations](#) tab page.  
On this tab page, you can find information about when the deviation was declared as intended and by whom. To display the comments in full length, click the relevant text in the comment column.
3. To display the system attributes and attribute values that are relevant for the parameter check, choose the [Check Environment](#) tab page.

## Declaring Parameter Deviations as Intended

If a parameter value in the SAP recommendations (that is, in the SAP parameter notes) is not valid for a specific customer situation, you can declare the parameter deviation as intended. By doing so, you avoid that a specific deviation is displayed every time you run the parameter check tool.

On the [Check Results](#) tab page, select a row from the table and choose the [Declare Intended](#) menu button.

The relevant parameter deviation is moved to the [Intended Deviations](#) tab page.

### i Note

Since the list of intended deviations is stored in a table of the saptools schema, the data collection framework (DCF) must be set up correctly. Otherwise, the [Declare Intended](#) pushbutton is disabled.

## Reversing the *Declare Intended* Status

During a parameter check, it can occur that a deviation that you formerly declared as intended is no longer valid. The status of intended deviations is automatically reversed to not intended in the following situations:

- The current parameter value in the monitored system has changed from the value at the moment when the deviation was declared as intended.
- The current deferred parameter value in the monitored system has changed from the value at the moment when the deviation was declared as intended.
- The SAP recommendation has changed, that is, the check has been changed since the parameter was declared as intended.
- The database version has changed since the parameter was declared as intended.

To reverse the *Declare Intended* status, choose the *Intended Deviations* tab page and choose *Delete Deviation*.

As a result, the deviations appear again on the *Check Results* tab page.

### Note

Most of the configuration parameters are dynamic; there is no need to reboot the SAP ASE server for changes to take effect. The dynamic configuration allows easy reconfiguration, even in production environments.

## 11.7.2 Configuration: Configuration History

For more information about the configuration history of an SAP ASE database server, navigate to ► *Configuration* ► *Configuration History* ► on the *Database* tab of the DBA Cockpit.

This screen displays various sections (Server, Database, Data Cache, Startup/ Shutdown, Audit, and Trace Flag), the associated parameters, the previous values, and the current values for the parameters. It also shows the timestamp when the item was changed and the user who changed it.

Configuration History								
Selection								
Time Frame: Last 7 Days From: 14.07.2023 00:00:00 To: 20.07.2023 23:59:59 Time Zone: UTC+02								
Area: Any								
Apply Selection								
View: [Standard View] Export								
Timestamp	Area	Type	Target Object	Element	Changed From	Changed To	Parameter Type	User Name
2023-07-14 00:00:01	Trace Flag	set switch	11906	session-specific: 167, override...	Old Value:off	New Value:on		sapsa
2023-07-14 01:00:01	Trace Flag	set switch	11906	session-specific: 88, override...	Old Value:off	New Value:on		sapsa
2023-07-14 02:00:00	Trace Flag	set switch	11906	session-specific: 108, override...	Old Value:off	New Value:on		sapsa
2023-07-14 03:00:00	Trace Flag	set switch	11906	session-specific: 87, override...	Old Value:off	New Value:on		sapsa
2023-07-14 04:00:01	Trace Flag	set switch	11906	session-specific: 234, override...	Old Value:off	New Value:on		sapsa
2023-07-14 05:00:01	Trace Flag	set switch	11906	session-specific: 256, override...	Old Value:off	New Value:on		sapsa
2023-07-14 06:00:01	Trace Flag	set switch	11906	session-specific: 55, override...	Old Value:off	New Value:on		sapsa
2023-07-14 07:00:00	Trace Flag	set switch	11906	session-specific: 18, override...	Old Value:off	New Value:on		sapsa
2023-07-14 08:00:00	Trace Flag	set switch	11906	session-specific: 133, override...	Old Value:off	New Value:on		sapsa
2023-07-14 09:00:00	Trace Flag	set switch	11906	session-specific: 35, override...	Old Value:off	New Value:on		sapsa
2023-07-14 10:00:00	Trace Flag	set switch	11906	session-specific: 126, override...	Old Value:off	New Value:on		sapsa
2023-07-14 11:00:00	Trace Flag	set switch	11906	session-specific: 211, override...	Old Value:off	New Value:on		sapsa
2023-07-14 12:00:00	Trace Flag	set switch	11906	session-specific: 171, override...	Old Value:off	New Value:on		sapsa
2023-07-14 13:00:00	Trace Flag	set switch	11906	session-specific: 43, override...	Old Value:off	New Value:on		sapsa
2023-07-14 14:00:00	Trace Flag	set switch	11906	session-specific: 276, override...	Old Value:off	New Value:on		sapsa
2023-07-14 15:00:01	Trace Flag	set switch	11906	session-specific: 71, override...	Old Value:off	New Value:on		sapsa
2023-07-14 16:00:01	Trace Flag	set switch	11906	session-specific: 19, override...	Old Value:off	New Value:on		sapsa
2023-07-14 17:00:00	Trace Flag	set switch	11906	session-specific: 184, override...	Old Value:off	New Value:on		sapsa
2023-07-14 18:00:01	Trace Flag	set switch	11906	session-specific: 110, override...	Old Value:off	New Value:on		sapsa
2023-07-14 19:00:00	Trace Flag	set switch	11906	session-specific: 61, override...	Old Value:off	New Value:on		sapsa



## 11.7.3 Configuration: Server Configuration

### Use

You can access information about the configuration of an SAP ASE database server by calling the DBA Cockpit and choosing ► [Configuration](#) ► [Server Configuration](#) ► on the [Database](#) tab of the DBA Cockpit.

The tab page displays all groups, their associated parameters, and the current values for the parameters.

Configuration parameters are user-definable settings that control various aspects of the behavior of the SAP ASE server. The SAP ASE server supplies default values for all configuration parameters. You can use configuration parameters to tailor the SAP ASE server for an installation's particular needs. Configuration parameters are used for a wide range of services, from basic to specific server operations, and for performance tuning.

#### **i** Note

Change configuration parameters with caution. Arbitrary changes in parameter values can adversely affect the performance and other aspects of server operation.

Configuration parameters are grouped according to the area of behavior they affect. This makes it easier to identify all parameters that you might need to tune to improve a particular area of the SAP ASE server performance.

#### **i** Note

For more information, see chapter *The parameter hierarchy* in the [System Administration Manual](#).

Parameter values are displayed in the following columns:

Parameter Value:	Description:
Run Value	The value Adaptive Server is currently using. It changes when you modify a dynamic parameter's value and, for static parameters, after you restart Adaptive Server.
Config Value	<p>Most recent value to which the configuration parameter has been set. When you modify a dynamic parameter:</p> <ul style="list-style-type: none"><li>• The configuration and run values are updated.</li><li>• The configuration file is updated.</li><li>• The change takes effect immediately.</li></ul> <p>When you modify a static parameter:</p> <ul style="list-style-type: none"><li>• The configuration value is updated.</li><li>• The configuration file is updated.</li><li>• The change takes effect only when you restart Adaptive Server.</li></ul>

Parameter Value:	Description:
Default Value	The value the SAP ASE server is shipped with. If you do not explicitly reconfigure a parameter, it retains its default value.
Memory Used	The amount of memory used (in kilobytes) by the parameter at its current value. Some related parameters draw from the same memory pool. For instance, the memory used for stack size and stack guard size is already accounted for in the memory used for number of user connections. If you added the memory used by each of these parameters separately, it would total more than the amount actually used. In the <a href="#">Memory Used</a> column, parameters that <i>share</i> memory with other parameters are marked with a hash mark (#).
Unit	The unit value in which the configuration parameter is displayed.
Type	Displays whether the configuration option is static or dynamic.  Changes to static parameters require that you restart the SAP ASE server for the changes to take effect. Changes to dynamic parameters take effect immediately without having to restart the SAP ASE server. Parameters of type read-only are not changeable.

## How to Modify Configuration Parameters

Set or change configuration parameters in the following way:

1. Select the parameter.
2. Choose [Change](#).
3. Enter the new value in the [Change Configuration Parameter](#) quick activity.  
The value range indicates the range of allowed values.

To get help information on configuration parameters, select the parameter and read the configuration parameter details in the lower part of the screen.

For more information, see the chapter [Configuration Parameters](#) in the [System Administration Manual](#) and the [Sybase Performance and Tuning Guide](#).

## More Information

SAP Note [1722359](#): [SAP Applications on SAP Adaptive Server Enterprise - Best Practices for Migration and Runtime](#)

## 11.7.4 Configuration: Global Trace Flags / Switches

### Use

You can access information about *Global Trace Flags and Switches* that have been set globally by calling the DBA Cockpit and choosing ► *Configuration* ► *Global Trace Flags / Switches* ► on the *Database* tab of the DBA Cockpit.

### More Information

Trace Flags 

## 11.7.5 Configuration: Data Caches

You can access information about the configuration of data caches and cache pools by calling the DBA Cockpit and choosing ► *Configuration* ► *Data Caches* ► on the *Database* tab page of the DBA Cockpit.

For more information on data cache configuration, refer to the *Sybase Administration Manual*, chapter *Configuring Data Caches*.

## 11.7.6 Configuration: Logins

You can access information about the database logins by calling the DBA Cockpit and choosing ► *Configuration* ► *Logins* ► on the *Database* tab of the DBA Cockpit.

The screen *Logins* provides the names, the activation time, the login time, the assigned roles and further information on the database users.

## 11.7.7 Configuration: Log Thresholds

You can access information about log thresholds of an SAP ASE database server by calling the DBA Cockpit and choosing ► *Configuration* ► *Log Thresholds* ► on the *Database* tab of the DBA Cockpit.

A threshold has a free space amount and a stored procedure associated with it. When log segment free space falls below the free space amount, the threshold will act as a trip wire, activating the associated stored procedure.

The procedure may alert users, dump the transaction log, increase the log space in a database, or take some other action.

On the [Threshold Configuration](#) screen, you can maintain thresholds on the database system, that is, create, change and drop thresholds. On the [Threshold Configuration](#) screen, all defined thresholds for the database system are displayed. You can perform the following actions:

- Create a threshold by choosing the [Create](#) button and entering the relevant settings.  
Thresholds that are violated too often force the event monitor to collect and write details of each threshold violation to the respective monitor tables. For more information, see [Diagnostics: Log Threshold Events \[page 128\]](#).  
To get meaningful predicate values when defining thresholds, use the statistics that are available on the [Performance: System Utilization \[page 53\]](#) screen.
- Edit an existing threshold by selecting one of the displayed thresholds and choosing the [Edit](#) button.
- Drop a threshold by selecting one of the displayed thresholds and choosing the [Delete](#) button.

## 11.7.8 Configuration: Resource Limits

### Use

The DBA Cockpit can be used to configure the SAP ASE Resource Governor. Resource limits can be defined in screen ► [Configuration](#) ► [Resource Limits](#) ►. A new data collector [Resource Limits](#) can be set up to periodically collect resource limit violations and to prepare them for display. Screen ► [Performance](#) ► [Resource Limit Violations](#) ► allows you to analyze resource limit violations that have occurred in the system.

The Resource Governor provides the SAP ASE administrator with a mechanism to limit the resources a given process may request or acquire. It can limit the runaway queries at the application or login level. It can limit:

- I/O cost, estimated and/or actual
- Elapsed time, estimated and/or actual
- Number of rows to be returned, estimated and/or actual

You can choose to enforce your resource limits:

- Prior to execution
- During execution
- Or both

You can set different resource limits for different times of day. For example, you may choose to let the [batch](#) login have all the resources it wants from midnight to 6 am, but limit the resources the rest of the time.

Resource limits are enabled at the server level. This allows the server to allocate memory for time ranges and limits to login sessions.

Choose tab [Time Ranges](#) to create, change, and delete time ranges.

### More Information

[Resource Governor](#) 

## 11.7.9 Automatic Table Maintenance

The following sections provide information about Automatic Table Maintenance.

### 11.7.9.1 The ATM Framework

Sophisticated business applications like the SAP Business Suite execute millions of DML statements a day. In a data warehouse scenario, for example, reports are constantly being generated to determine whether business targets are being met while the background tasks are executed to load collected data into data cubes or to delete obsolete data. This constant manipulation of data sets causes data fragmentation, leaves non-reusable free space behind, and, finally, invalidates optimizer statistics, which can end up in poor query performance.

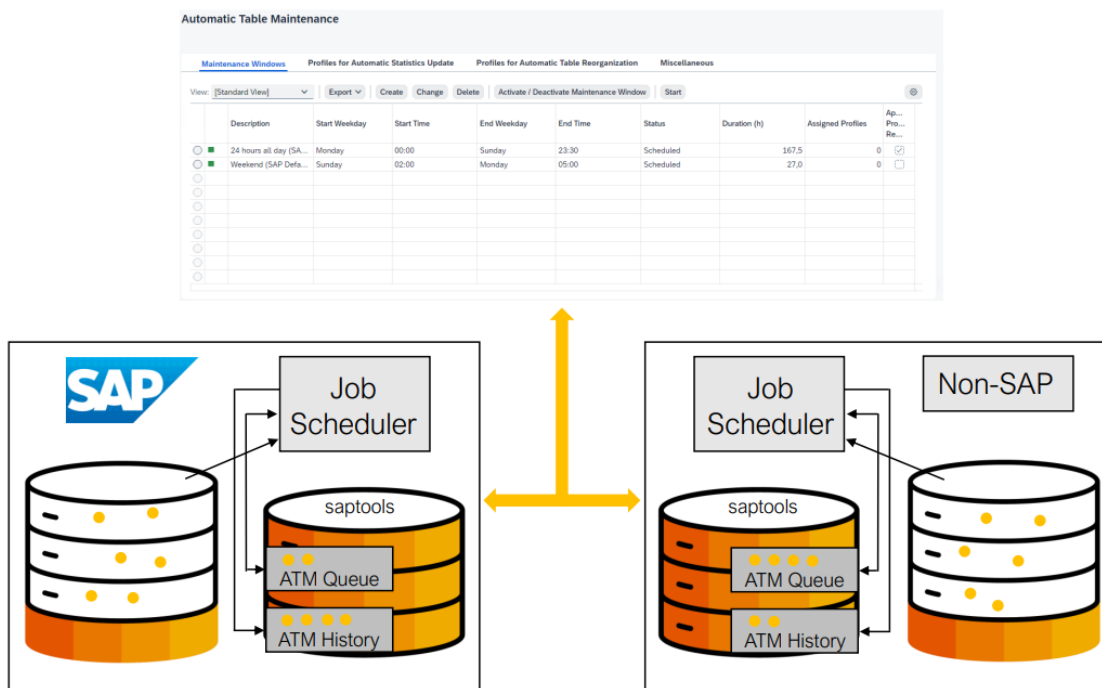
The SAP DBA Cockpit for SAP ASE introduces a flexible framework that allows you to set up and control automatic table maintenance (in the following referred to as ATM). Considering the thousands of tables and indexes a typical SAP system creates on the database, this framework dramatically reduces manual administrative activities and thus significantly reduces the TCO of the SAP on SAP ASE solution.

Terminology used in the context of automatic table maintenance:

Term:	Description;
ATM profile	An ATM profile defines the objects that ATM should monitor as well as the maintenance activities that should be executed once defined thresholds are violated.
ATM window	An ATM window defines a time frame within which ATM is allowed to evaluate and maintain objects. ATM profiles are assigned to ATM windows to control which objects are to be maintained in a certain time window and which are not.
ATM queue	Objects that require maintenance are stored in the ATM queue. ATM might not be able to maintain all identified objects before an ATM window expires. In this case, ATM will continue to process queued objects during the next ATM window.
ATM history	Objects that were maintained by ATM are dropped from the ATM queue, but, at the same time, activities are logged in the ATM history. Thus, the ATM history allows monitoring of past ATM activities.
Job Scheduler	ATM makes use of the Job Scheduler that is built in to the SAP ASE DBMS.

The following graph provides a general overview of how ATM operates on an SAP ASE DBMS:

## DBA Cockpit



The DBA Cockpit acts as the central point to:

- Set up ATM on any remote SAP ASE DBMS
- Configure ATM windows and ATM profiles
- Monitor the ATM queue and ATM history
- Monitor ATM execution

All objects of the ATM framework are thereby created in a private database named saptools, which is also used by the DBA Cockpit to store historical performance data and space information.

The Job Scheduler (JS) executes a stored procedure that is created and scheduled by the DBA Cockpit, as defined by ATM windows. This stored procedure evaluates maintenance requirements that are defined by ATM profiles, and, in a second step, it also executes maintenance commands on identified objects.

ATM is part of the DBA Cockpit with Enhancement Package 2 for SAP NetWeaver 7.0 Support Package 9

### **i** Note

ATM is not supported for SAP ASE releases older than 15.5. In addition, system and proxy tables are excluded from automatic maintenance.

## 11.7.9.2 Setup and Maintenance of the ATM Framework

Deploying ATM on SAP ASE is very easy. All you need to do is make the system known to the DBA Cockpit and initiate the setup process in the [Configuration > ATM Configuration](#) screen.

**Automatic Table Maintenance**

Automatic Table Maintenance									
Maintenance Windows									
Profiles for Automatic Statistics Update									
Profiles for Automatic Table Reorganization									
Miscellaneous									
View: [Standard View] Export Create Change Delete Activate / Deactivate Maintenance Window Start									
	Description	Start Weekday	Start Time	End Weekday	End Time	Status	Duration (h)	Assigned Profiles	Ap... Pro... Re...
<input type="radio"/>	24 hours all day (SA...	Monday	00:00	Sunday	23:30	Scheduled	167,5	0	<input checked="" type="checkbox"/>
<input type="radio"/>	Weekend (SAP Defa...	Sunday	02:00	Monday	05:00	Scheduled	27,0	0	<input type="checkbox"/>
<input type="radio"/>									
<input type="radio"/>									
<input type="radio"/>									
<input type="radio"/>									
<input type="radio"/>									
<input type="radio"/>									
<input type="radio"/>									
<input type="radio"/>									

The DBA Cockpit detects that ATM has not yet been set up on the system. When you click the [Setup ATM](#) button, all required tables, routines, and procedures are created in the saptools database. In addition, a default ATM configuration is created that immediately enables the system for automatic table maintenance.

Updates and fixes for ATM are provided through SAP Support Packages and SAP Notes. If the ATM framework that was already set up on a system requires an update, the DBA Cockpit will recognize a version mismatch and will ask you to update ATM by choosing [Repair ATM](#).

### Note

The saptools database is available on every SAP system by default. If ATM is going to be deployed on a non-SAP system, the saptools database needs to be created manually (see also SAP Note [1593987](#)).

## Default ATM Configuration

The default ATM configuration that is created when you initially deploy ATM on an SAP ASE DBMS tries to automate table maintenance, without risking negative impact on the applications that are connected to SAP ASE. This means objects only undergo lightweight maintenance activities on regular business days. More costly maintenance activities are executed during the weekend, with very large objects being excluded from such maintenance activities entirely. The default ATM configuration also ensures full availability of all objects at any time.

### Default ATM Profiles

ATM profile [Small Tables](#) for update statistics:

- Includes tables containing 100 up to 9999 rows.
- Triggers update of index statistics if data change exceeds 20%.
- Commands are executed with low priority.

ATM profile *Medium Tables* for update statistics:

- Includes tables containing 10000 up to 999999 rows.
- Triggers update of index statistics if data change exceeds 20%.
- Commands are executed with low priority.

ATM profile *Large Tables* for update statistics:

- Includes tables containing 1000000 up to 999999999999 rows.
- Triggers update of index statistics if data change exceeds 20%.
- Commands are executed with low priority.

#### **i Note**

If an SAP application database is found on the DBMS, special objects in that database are excluded from getting updated statistics as known from best practices through additional exclusion profiles.

If an SAP application database is found on the DBMS, special objects in that database are excluded from getting updated statistics as known from best practices through additional exclusion profiles.

ATM profile *All Tables – Remove Row Forwarding* for reorganization:

- Includes all tables
- Triggers reorganization using the subcommand `compact` if the percentage of forwarded rows exceeds 10%.
- Commands are executed with low priority.

ATM profile *All Tables – Reclaim Space for reorganization*:

- Includes all tables.
- Triggers reorganization using the subcommand `compact` if space utilization falls below 90%.
- Commands are executed with low priority.

ATM profile *Small to Medium Tables – Rebuild Indexes for reorganization*

- Includes tables with up to 10GB of reserved space.
- Triggers rebuild of all indexes that have an index page cluster ratio below 90%.
- Commands are executed with low priority.

### **Default ATM Windows**

ATM window *24 hours all day*

- Starts Monday at 00:00 and ends Sunday 23:30.
- ATM profiles are applied repeatedly on an hourly basis until the ATM window expires.
- Two ATM profiles are assigned by default
  - Update statistics profile *Small Tables*
  - Update statistics profile *Medium Tables*

ATM window *Weekend*

- Starts Sunday at 02:00 and ends Monday 05:00.
- ATM profiles are applied only once or until the ATM window expires.



- Four ATM profiles are assigned by default:
  - Update statistics profile [Large Tables](#)
  - Reorganization profile [All Tables – Remove Row Forwarding](#)
  - Reorganization profile [All Tables – Reclaim Space](#)
  - Reorganization profile Small to [Medium Tables – Rebuild Indexes](#)

### Miscellaneous Settings

In the [Miscellaneous](#) tab of the [ATM Configuration](#) screen, you can configure options like the number of days.

## 11.7.9.3 ATM Profiles

### ATM Profile Types

ATM profiles are separated by the type of maintenance operation concerned, which is either update statistics or reorganization. For each of the two maintenance operations, there are in total three types of ATM profiles that can be defined:

#### Standard ATM Profiles

Tables are identified by a characteristic, such as row count or size. Standard ATM profiles are used to maintain all tables that do not require special care.

#### ATM Profiles for Special Objects

Tables are identified by a full, qualified name (supporting a wildcard at the right end of the table's name). This type of ATM profile is used for tables that require special care – for example, due to the size of the table or its need for special maintenance options. Tables matching any active ATM profile of type [ATM Profile for Special Objects](#) will be excluded from any [Standard ATM Profile](#).

#### ATM Profiles for Excluding Objects from ATM

Tables are identified by a full, qualified name (supporting a wildcard at the right end of the table's name). This type of ATM profile is used for tables that should be excluded from either update statistics or reorganization. This means that tables matching any active ATM profile of type [ATM Profile to Exclude Objects from ATM](#) will be excluded from any [Standard ATM Profile](#) or [ATM Profile for Special Objects](#). Examples are queue tables that are constantly undergoing a massive data change, causing continuously inaccurate statistics.

#### **i** Note

A single object can qualify for multiple ATM profiles of the same type. You may, for example, want to define an ATM profile that initiates sampled statistics with low priority if data change exceeds 20%. But for the same set of objects, you are able to define another ATM profile that initiates full statistics with high priority if data change exceeds 50%.

## Maintaining ATM Profiles

The  [Configuration](#)  [ATM Configuration](#)  screen allows you to

- Define new ATM profiles
- Change existing ATM profiles
- Delete existing ATM profiles
- Activate or deactivate ATM profiles

## Creating ATM Profiles

1. Chosse [Create](#).
2. Enter values for [Profile Metadata](#), [Object Selection](#), and [Maintenance Options](#).

### ❖ Example

Choose the following values, if you want to initiate sampled update statistics on all index columns once data change of a table has exceeded a value of 5 %:

Input Field:	Value:
Profile Type	ATM Profile for Special Objects
Type or Threshold	Data Change
Threshold Value	5%
Evaluate Threshold per Data Partition	Yes
Type of Statistics	Collect Statistics on all Index Columns
Number of Histogram Steps	20
Number of Consumers	1
Collect Sampled Statistic	Yes
Sampling Rate	25%
ASE Execution Priority	Medium

There are two types of priorities that can be configured for an ATM profile. With the so-called maintenance priority, you define the importance the requested maintenance operation has compared to maintenance operations defined by other ATM profiles. With the so-called ASE execution priority, you specify the amount of CPU resources that should be assigned to the maintenance operations while they are being executed.

The next example shows a dialog for changing an existing ATM profile of type Standard ATM Profile for reorganization. This ATM profile is limited to tables with a size of 0 to 10000MB. Indexes are rebuilt as soon as the index page cluster ratio falls below 90%, using a reduced ASE execution priority.

Some applications, especially data warehouse applications, make use of SAP ASE's partitioning feature. Depending on the dimensions used to partition the data, some data partitions may undergo heavy data changes, while some other data partitions may remain mostly or completely unchanged. In such cases, it does

not make sense to update statistics on all partitions or to reorganize the whole object. If you check [Evaluate Threshold per Data Partition](#), ATM will evaluate thresholds for each data and index partition individually, and maintenance operations will also be executed individually, as required by an individual data or index partition.

## 11.7.9.4 ATM Windows

With ATM windows, you define what type of table maintenance requirements and operations are evaluated and executed on certain objects within a defined time frame. You may, for example, want to ensure accurate optimizer statistics on certain objects during regular business time, while update statistics on other, usually very large objects, should be maintained outside regular business time. You may also want to move table or index reorganization into the weekend, while wanting to run update statistics at any time.

### Maintaining ATM Windows

The  [Configuration](#) > [ATM Configuration](#) > screen allows you to:

- Define new ATM windows
- Change existing ATM windows
- Delete existing ATM windows
- Activate or deactivate ATM windows
- Assign ATM profiles to an ATM window or remove assigned ATM profiles from an ATM window

ATM windows are scheduled jobs in the SAP ASE Job Scheduler. Deactivation of an ATM window will unschedule the job for further executions and, if appropriate, cancel current executions. Changing an ATM window will reschedule the respective job.

ATM windows can be configured to repeatedly apply ATM profiles until the window expires. In this case, the ATM job will not complete execution after the evaluation of maintenance requirements has finished and no objects remain in the ATM queue. Instead, the ATM job will go into sleep mode and wake up once every hour to re-evaluate and re-execute maintenance requirements continuously until the ATM window finally expires.

Temporary overlapping between ATM windows is permitted. In addition, a single ATM profile can be assigned to multiple ATM windows. Details on how ATM windows and assigned ATM profiles are processed are given in the chapter [Processing ATM Windows and Assigned ATM Profiles](#).

#### **i** Note

ATM profiles of type [ATM Profiles for Excluding Objects from ATM](#) cannot be assigned to specific ATM windows. Those ATM profiles are valid for all ATM windows by definition.

## 11.7.9.5 Diagnostics: Automatic Table Maintenance – ATM History

The ► [Diagnostics](#) ► [Automatic Table Maintenance](#) ► [ATM History](#) ► screen shows all maintenance operations that have been executed by ATM in the previous days and weeks. This information allows you to fine-tune your ATM configuration and to ensure correct behavior of ATM in the respective application environment.

When you select one of the records shown, the maintenance command that was executed as well as the ATM profile that initiated maintenance of the object will be displayed (see details section below).

By default, the ATM history spans 8 weeks. A different ATM history size can be configured in the [Miscellaneous](#) tab of the ► [Configuration](#) ► [ATM Configuration](#) ► screen.

### i Note

In addition to the [ATM Queue](#) and [ATM History](#) screen, details regarding ATM for a single table can also be reviewed using the ► [Space](#) ► [Tables and Indexes](#) ► [Single Table Analysis](#) ►

## 11.7.9.6 Diagnostics: Automatic Table Maintenance – ATM Queue

As described in the chapter entitled [Processing ATM Windows and Assigned ATM Profiles](#), ATM is executed in two phases. Phase 1 will identify objects that require maintenance according to the defined ATM profile and put those objects into an ATM queue. Phase 2, finally, will execute maintenance, as defined in the ATM queue, until the ATM window has expired or no entry can be found in the ATM queue.

If the ATM windows are too short to process all identified maintenance requirements, the ATM queue will fill up and the required maintenance operations will not be executed. The screen ► [Diagnostics](#) ► [Automatic Table Maintenance](#) ► [ATM Queue](#) ► allows you to monitor the current ATM queue.

When you select one of the records shown, the maintenance command that is going to be executed as well as the ATM profile that initiated maintenance of the object will be displayed.

## 11.7.9.7 Diagnostics: Automatic Table Maintenance – ATM Log

ATM writes its own message log while evaluating maintenance requirements and finally executing maintenance operations. While its main target group is SAP support, this message log can also help DBAs understand error conditions and performance-related issues. You can access the ATM log by navigating into the ► [Diagnostics](#) ► [Automatic Table Maintenance](#) ► [ATM Log](#) ► screen of the DBA Cockpit.

By default, ATM logs for the last 14 days are kept. This number of days as well as the number of messages being written into the ATM log can be configured in the [Miscellaneous](#) tab of the ► [Configuration](#) ► [ATM Configuration](#) ► screen.

## 11.7.10 Configuration: Automatic Database Expansion

### Use

You can configure automatic database expansion by calling the DBA Cockpit and choosing ► [Configuration](#) ► [Automatic DB Expansion](#) ► on the [Database](#) tab of the DBA Cockpit.

The DBA Cockpit supports administration of the automatic database expansion feature offered by SAP ASE.

#### ⚠ Caution

Note that the automatic database expansion framework might need to be installed first, see SAP Note [1815695](#) 📄.

### More Information

The white paper [Configuring Automatic Database Space Expansion in SAP Adaptive Server Enterprise](#) 📄 introduces system administrators to the automatic database expansion feature in SAP Adaptive Server Enterprise (SAP ASE).

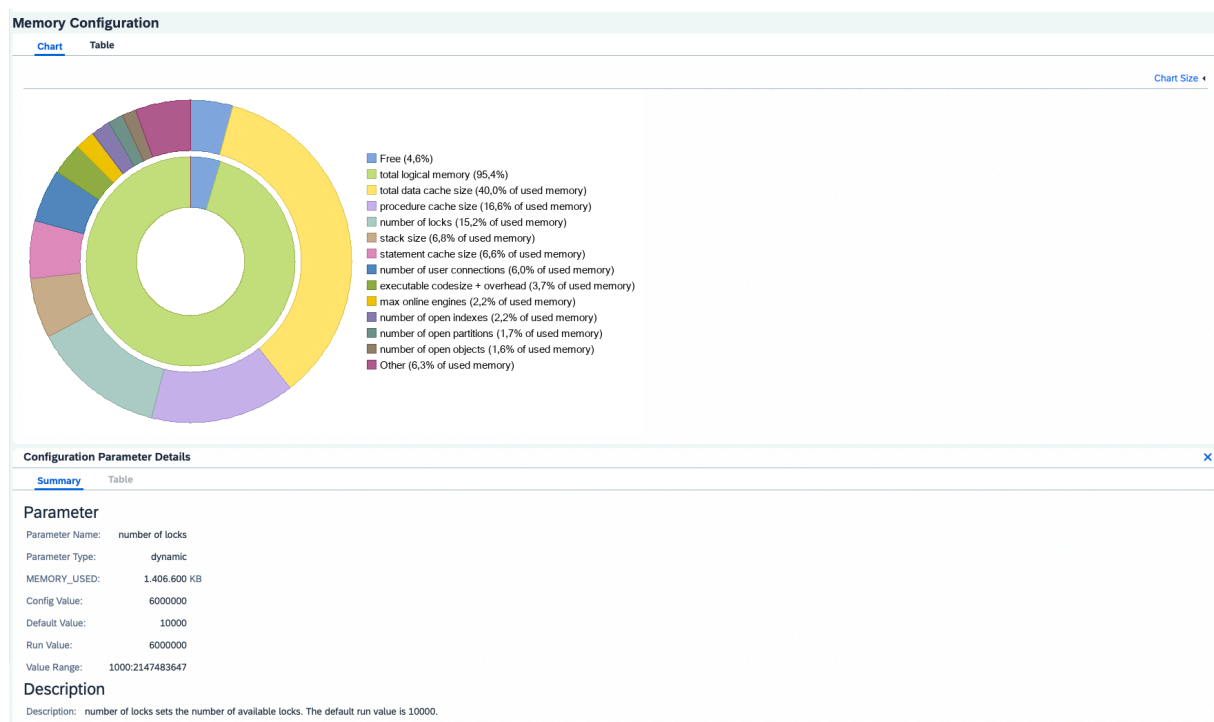
[Expanding Databases Automatically](#) 📄

## 11.7.11 Configuration: Memory Configuration

Get more information about the total logical memory via selecting ► [Configuration](#) ► [Memory Configuration](#) ► on the [Database](#) tab of the DBA Cockpit.

Total logical memory is the amount of memory used by the current configuration of SAP ASE. The donut diagram on this screen provides the following information:

- The inner layer consists of total logical memory and free memory. It shows the percentage of unavailable memory (95.4%) and free memory (4.6%).
- The outer layer breaks down the total logical memory used by various SAP ASE parameters.



When you select one of these SAP ASE parameters in the outer layer of the donut chart, you get more information about the configuration parameter, such as the parameter type, the configuration value, the run value, the memory used by the parameter.

By navigating to the [Table](#) tab this screen also allows you to configure this parameter if the type of the parameter is static or dynamic, but not read-only. If you select the number of locks in the table and want to change it, a pop-up window will appear where you can enter a new value for this parameter. After that you can check if the input for this parameter is ok. You can then execute the change. After refreshing the screen, you will see the configured value for this parameter, as it is a dynamic change.

## 11.7.12 Configuration: IMRS Caches

You can access information about the configuration of IMRS caches by selecting [Configuration](#) [IMRS Caches](#) on the [Database](#) tab of the DBA Cockpit.

The [IMRS Caches](#) screen provides an overview of the IMRS caches that have been created on a specific database system. On this screen, you can perform the following actions:

- Create a new IMRS cache by clicking the [Create](#) button and entering the name and size.
- Change the current size of an existing IMRS cache or associated database by clicking the [Change](#) button.
- Remove an existing IMRS cache by clicking the [Delete](#) button.

### Note

In some cases, the configured size may differ from the current size in the overview. If you reduce the size of an IMRS cache, a restart is required for the changes to take effect.

## 11.7.13 Configuration: DBA Cockpit Framework

The section [DBA Cockpit Framework: Data Collectors and Admin Procedures \[page 111\]](#) provides information about how to use the DBA Cockpit framework (DCF) to collect history data of the monitored databases.

To monitor data on several screens of the DBA Cockpit, you have to make sure that the DCF is set up correctly. If the DCF is not available or set up incorrectly, a warning is displayed with a link to the [Collector Configuration](#) screen. There you can perform the required steps. For more information, see DBA Cockpit Framework: Collector Configuration.

The DCF is based on pre-defined templates. For information about these templates, see [DBA Cockpit Framework: Setup Templates \[page 114\]](#).

### 11.7.13.1 DBA Cockpit Framework: Data Collectors and Admin Procedures

The screen [Data Collectors and Admin Procedures](#) provides an overview of the state of the installed history data collectors. You can use this screen to change the configuration of specific data collectors. Furthermore, you can set up the DBA Cockpit Framework (DCF) using templates as described in [Setting Up the DBA Cockpit Framework \(DCF\) Manually \[page 45\]](#).

You can access information about the history data collectors by calling the DBA Cockpit and choosing [► Configuration ► DBA Cockpit Framework ► Data Collectors and Admin Procedures ►](#) on the [Database](#) tab of the DBA Cockpit.

In the central system data area of the [Data Collectors and Admin Procedures](#) screen, status messages are displayed that provide information such as the following:

- Whether back-end automatic update is enabled or disabled  
By default, the automatic back-end update function is enabled. This means that the installed DBA Cockpit framework is checked once daily. If it needs to be updated due to SAP code changes or database changes, these updates are performed automatically.
- Which task scheduler is used  
By default, the SAP ASE Job Scheduler is used to execute the stored procedures regularly.

In the content area, the following information is displayed:

Column	Description
Object	Name of the object  Typically, the name refers to the data that is collected – for example, the data collector <a href="#">Tables</a> stores table-related metrics in the history tables.

Column	Description
Object Type	<p>Type of object</p> <p>The following collector types are possible:</p> <ul style="list-style-type: none"> <li>• <a href="#">SAP Data Collection and Preparation (STP)</a> These data collectors have their own mechanism to calculate the delta of the different snapshots.</li> <li>• <a href="#">Cleanup of Message Logs (STP)</a> The <i>Framework</i> data collector is not a typical data collector type, but a cleanup job for the messages generated by the above mentioned data collector types.</li> </ul>
Setup	<p>Indicates the setup status</p> <p>The following values are possible:</p> <ul style="list-style-type: none"> <li>• Green: The data collector is set up as intended.</li> <li>• Yellow: The data collector is not set up properly. We recommend that you repair the data collector.</li> <li>• Red: The data collector is not set up. Set up the data collector according to the assigned template.</li> <li>• Grey: The data collector is not set up and the assigned template also flags this data collector to be deactivated.</li> </ul>
Collection Interval	Schedule of the data collector
Available Days	Availability of the collected data for a given number of days, starting now
Days Kept in History	<p>Number of days the sliding history window contains the data</p> <p>The data in the history is deleted after this set time.</p>
Size on Disk (MB)	Space consumption in the local history of the data that is stored by the data collector
Errors	Number of errors that the data collector has captured and the scheduler has recorded
Owner	SAP system name
Version	Version of the SAP system
Warnings	Number of warnings that the data collector has captured and the scheduler has recorded



## Maintaining History Data Collectors

To maintain data collectors – for example, to set them up, change, or analyze them, or to remove data from them – choose a data collector from the list.

In the content detail area of the [Data Collectors and Admin Procedures](#) screen, the [Configuration](#) and [Object Log](#) tab pages appear with the relevant data collector details displayed.

Depending on your setup status, you can proceed with the following maintenance actions:

Action	Setup Status	Steps to Be Performed
Setting up a single history data collector	Grey or red as the data collector is not set up yet	On the <a href="#">Configuration</a> tab, choose the <a href="#">Set Up</a> pushbutton.
		<div> <b>Note</b>            You must set up the <a href="#">Framework</a> collector before all other data collectors.         </div>
Repairing a single history data collector	Yellow as the data collector is set up but should be updated or needs to be repaired	On the <a href="#">Configuration</a> tab, choose the <a href="#">Repair</a> pushbutton.
Changing a single history data collector	Green	<ol style="list-style-type: none"> <li>On the <a href="#">Configuration</a> tab, choose the <a href="#">Change Settings</a> pushbutton and enter your changes.</li> <li>To apply your changes, choose the <a href="#">Apply Changes</a> pushbutton. If you want to discard your changes, choose the <a href="#">Reset Changes</a> pushbutton.</li> </ol>
Removing data of a single history data collector	Yellow or green	On the <a href="#">Configuration</a> tab, choose the <a href="#">Prune</a> pushbutton. By doing so, the collected data and the generated messages of the data collector are removed.
Dropping a single history data collector	Yellow or green	On the <a href="#">Configuration</a> tab page, choose the <a href="#">Drop</a> pushbutton.
Analyzing a single history data collector	Yellow or green	On the <a href="#">Data Collector Log</a> tab, you can choose between the following pushbuttons: <ul style="list-style-type: none"> <li><a href="#">Show Error Messages</a></li> <li><a href="#">Show Warnings</a></li> <li><a href="#">Show Information Messages</a></li> </ul>

## 11.7.13.2 DBA Cockpit Framework: Setup Templates

The DBA Cockpit framework is based on pre-defined templates. These templates ensure a homogeneous setup of the history data collectors in your system landscape. You can only maintain these templates on the [Setup Templates](#) screen in the DBA Cockpit.

On the [Setup Templates](#) screen, you can perform the following actions:

- Create new templates
- Change single history data collectors in a template
- Set a default template
- Delete a template

### Note

In the SAP Solution Manager setup wizard for managed systems for the database, the templates are available for use but cannot be maintained.

SAP provides two default templates as described in [Enabling the Database for the DBA Cockpit Framework \[page 45\]](#).

You can access the [Setup Templates](#) screen by calling the DBA Cockpit and choosing [Configuration](#) [DBA Cockpit Framework](#) [Setup Templates](#) on the [Database](#) tab of the DBA Cockpit.

From the [Template](#) dropdown list, choose the appropriate template for your setup.

The following information is displayed:

Column	Description
Object	<p>Name of the history object</p> <p>Typically, the name refers to the data that is collected, for example, the data collector <a href="#">Tables</a> stores table-related metrics in the history tables.</p>
Object Type	<p>The following object types are available:</p> <ul style="list-style-type: none"><li>• <a href="#">SAP Data Collection and Preparation (STP)</a> These history data collectors have their own mechanism for delta calculation of the different snapshots.</li><li>• <a href="#">Cleanup of Message Logs (STP)</a> The <a href="#">Framework</a> data collector is not a typical data collector type, but a cleanup job for the messages generated by the above mentioned data collector types.</li></ul>
Release (min)	Minimum database release required for the history data collector
Release (max)	Maximum database release supported by the history data collector

Column	Description
Collection Interval	Schedule of the history data collector
Days Kept in History	Number of days of the sliding history window The data in the history is deleted after this number of days.

## Creating a New Object Template

You can create a new data collector template either by copying an existing template or by generating a template that is based on the configuration of an individual system as follows:

- Copying an existing template:
  1. On the [Setup Templates](#) screen, choose a template from the [Template](#) dropdown list and choose the [Save As New Template](#) pushbutton.  
The [Save As New Template](#) dialog box appears.
  2. Enter a unique name and a description of the new template.
  3. Save the template.
- Creating a template based on a system configuration:
  1. Choose [► Configuration ► DBA Cockpit Framework ► Collector Configuration ►](#).
  2. On the [Setup Templates](#) screen, choose the [Save as New Template](#) pushbutton.

### i Note

The [Save As New Template](#) pushbutton is only enabled if the respective system configuration fulfills the minimum template requirements of SAP that are defined by the [SAP Default](#) template. This means that every new template must determine a finer granularity or a longer retention time for the history data than the [SAP Default](#) template does.

3. In the [Save As New Template](#) dialog box, enter a unique name and a description of the new template.
4. Save the template.

## Changing a Single History Data Collector in a Template

1. Choose a non-SAP template from the [Template](#) dropdown list.
2. On the [Configuration](#) tab page in the content detail area, choose the [Change Settings](#) pushbutton.

### i Note

You **cannot** change an SAP template. Instead, you can create a custom template based on the SAP template and change this newly created template.

3. In the content detail area, enter your changes in the respective fields.
4. Apply your changes.

### i Note

If you want to discard your changes, choose the [Reset Changes](#) pushbutton.

## Setting a Default Template

The default template is preselected in the template-based setup and in the SAP Solution Manager setup wizard for managed systems.

To change a default template, choose a template from the [Template](#) dropdown list and choose the [Set As Default](#) pushbutton.

### i Note

The current default template is marked with an asterisk (\*). If the default template is currently selected, the [Set As Default](#) pushbutton is disabled.

## Deleting a Template

You can delete a template by choosing it from the [Template](#) dropdown list and choosing the [Delete](#) pushbutton.

A list of all systems is displayed that are assigned to this template. If there are entries in the list, the default template is assigned to these systems before the template is deleted.

### i Note

You **cannot** delete SAP templates or the current default template.

If you want to delete the current default template, you first have to unmark it as the default by setting a different template as the new default.




## 11.8 Jobs

The following sections provide information about the main task areas that are available under [Jobs](#) on the [Database](#) tab of the DBA Cockpit.

### 11.8.1 Jobs: DBA Planning Calendar

You use the DBA Planning Calendar to automate database administration actions that have to be performed regularly. You can schedule operations such as online backups which are then automatically performed, and you can check whether the operations were successful.


The main function of the DBA Planning Calendar is to define the start times and parameters for database actions. Since these actions run without administrator interaction, you have to make sure in advance that the necessary resources are available.

The DBA Planning Calendar is part of the DBA Cockpit. You can start the DBA Planning Calendar by calling the DBA Cockpit and choosing  [Jobs](#)  [DBA Planning Calendar](#)  on the [Database](#) tab of the DBA Cockpit.

The initial screen of the DBA Planning Calendar consists of a [Selection](#) area and the calendar. In the following, both are described in more detail.

## The Selection Area

The [Selection](#) area contains all information and parameters required for selecting the set of actions to be displayed. You can:

- Select the category of an action:
  - [DBA Actions](#)  
These are plannable actions.
  - [External Actions](#)  
These are plannable actions that have not been started through the DBA Planning Calendar but have been started manually or by external job schedulers.
  - [All Actions](#)  
These are all plannable actions, regardless of how they have been scheduled.
  - [DB Collectors](#)  
These are actions that are automatically selected by the system to collect data, for example, on performance or history.
- Select the week to be displayed  
The default is the current week. To navigate to another week, use the  help.
- Select a factory calendar  
Specifying a factory calendar only has an impact on the calendar display. Holidays are the same color as weekend days. This does not result in any restrictions on planned actions.

## The Calendar

The calendar displays all scheduled jobs. The status of each job is indicated using different colors. To display the meaning of each color, choose the [Legend](#) pushbutton. The following information is displayed:

Color	Status	Description	Action
<a href="#">Light blue</a>	<a href="#">Planned</a>	The action has not yet started.	–
<a href="#">Dark blue</a>	<a href="#">Running</a>	The action has not yet finished.	–
<a href="#">Green</a>	<a href="#">Finished successfully</a>	The action has run successfully.	–
<a href="#">Yellow</a>	<a href="#">Finished with warning</a>	The action has finished with a warning.	Check the job log for details.

Color	Status	Description	Action
<i>Red</i>	<i>Finished with error</i>	An error has occurred and the action was interrupted.	Check the job log for details and reschedule the action.
<i>Dark yellow</i>	<i>No longer available</i>	No more information is available.	–
<i>Dark red</i>	<i>Scheduling failed</i>	Scheduling failed, that is, there is no status available and the action is overdue.	–

## Setting Up and Working with the DBA Planning Calendar

The following sections provide information about how you initially set up the DBA Planning Calendar and how you perform standard actions, such as:

- Scheduling an Action
- Changing an Action
- Deleting an Action
- Executing an Action
- Displaying Scheduled Actions
- Troubleshooting

### Scheduling an Action

The DBA Planning Calendar offers standard jobs to execute database backups, transaction log dumps, table reorganizations and table statistics updates.

#### ❖ Example

You choose the standard job `Database Dump`.

Specify the database dump parameters.

Schedule the job in the DBA Planning Calendar.

For more information, see [Backup and Recovery \[page 134\]](#).

1. To add new actions to the DBA Planning Calendar, you can do one of the following:
  - Click a calendar cell.
  - Position the cursor on a calendar cell and choose the *Add* pushbutton.
  - Choose *Schedule an Action* in your *Favorites*.
 The *Schedule an Action* wizard appears.
2. In the *Job Selection* step, do the following:
  1. Choose the job that you want to schedule from the *Action* dropdown list.

- Specify one of the following options:

Option:	Description:
<a href="#">Start Immediately</a>	The job starts immediately in the background after you have completed the required steps in the wizard.
<a href="#">Start on</a>	Specifies the date and time when the action is to start
<a href="#">Start as Recurring Action</a>	Activates the <a href="#">Recurrence</a> step where you can further specify a recurrence pattern for this job as described later on in this section

- In the [Parameter](#) step, change, or enter the basic parameters for the action.

- Optional:**

If you previously selected the [Start as Recurring Action](#) option in the [Job Selection](#) step, you now have to enter a recurrence pattern in the [Recurrence](#) step.

The following table describes the parameters to be specified in more detail:

Parameter:	Description:
<a href="#">Recurrence Pattern</a>	Interval for the action in weeks, days, or hours  Depending on the selected recurrence pattern, you need to specify the pattern in more detail, that is, the days of the week for weekly periods and the hours of the day for a daily period. The action is repeated at the interval that you enter.  If you select <a href="#">Once only</a> , the action is executed only once.
<a href="#">Recurrence Range</a>	Range of time where the action recurs, that is, for a specific time interval or for a limited number of occurrences

#### Caution

The system warns you if there is a conflict with an existing action, but it does not prevent you from inserting the new action.

You must decide whether the actions might conflict in terms of database access or performance. The system does not check for conflicts between actions with identical start times but checks for actions within a range of approximately 30 minutes.

- On the [Summary](#) screen, review the specified parameters and schedule the job by choosing the [Execute](#) pushbutton.
- Exit the [Schedule an Action](#) wizard.

## Changing an Action

This section tells you how to change an action in the DBA Planning Calendar.

## i Note

If you want to change a recurring action, the changes only affect recurrences of the action in the future. The action is split into two actions, one describing the old action, and one the new action.

The action to be changed must be in the state *Planned* (that is, not already executed). If an action has already been executed, you can only display it.

1. In the DBA Planning Calendar, click a calendar cell that contains an action.  
The *Action Description* detail area appears displaying the action parameters and, if available, the recurrence pattern.
2. From the *Change* menu button, choose one of the following options:
  - If you want to edit the currently selected occurrence only, choose *Selected Occurrence*.
  - If you want to change all occurrences of a recurring job, choose *All Occurrences*.The *Change Scheduled Action* dialog box appears displaying the action parameters and, if available, the recurrence patterns.
3. Apply and save your changes.

## Deleting an Action

This section tells you how to delete an action from the DBA Planning Calendar.

If you want to delete an action from the DBA Planning Calendar, it must be in the state *Planned* (that is, not already executed).

## i Note

If an action has already been executed, you can only display it. For more information, see *Displaying Scheduled Actions*.

1. In the DBA Planning Calendar, click a calendar cell that contains the action to be deleted.  
The *Action Description* detail area appears displaying the action parameters and, if available, the recurrence pattern.
2. From the *Delete* menu button, choose one of the following options:
  - If you want to delete the currently selected occurrence only, choose *Selected Occurrence*.
  - If you want to delete all occurrences of a recurring job, choose *All Occurrences*.

## Executing an Action

You might have to reschedule an action, for example, after it has failed or if there is a resource bottleneck that needs immediate reaction.

1. Click the action that you want to re-execute.  
The *Action Description* detail area of the action appears where you can check the action parameters.
2. Choose the *Re-Execute* pushbutton.

## Displaying Scheduled Actions

From the DBA Planning Calendar, you can view all action-related information. This includes:

- Action parameters
- Job logs if the action has already run  
These logs provide detailed information on the results of an action.
- Recurrence patterns



The status of an action is indicated by the color of the calendar cell where an action is inserted.

To display a scheduled action, click a calendar cell that contains an action. The [Action Description](#) detail area appears displaying scheduling information or the return status of a finished action.

The following tab pages are displayed:

- [Action Parameters](#)  
Displays the parameters of the action
- [Recurrence](#)  
Displays the recurrence patterns and only appears if the action is part of a recurring action
- [Job Log](#) (optional)  
The background processing job log generated by the action is displayed under [Job Log](#). All messages that have been written by the background job are also displayed.  
To display long texts, if any are available, double-click a message.
- [Program Log](#)  
Some actions write log files onto the database server. If such a program log exists, it is displayed on this tab page.

### Troubleshooting

Since any action scheduled in the DBA Planning Calendar can fail, you must at least check the more critical actions such as database backups. The following steps describe how you check whether a job was executed correctly and how to proceed if it failed.

1. Check the status of the job in the DBA Calendar. The status of a job is indicated by different colors.  
If the job finished successfully, the calendar cell is marked green.
2. If the job terminated with a warning, an error, consult the job log.




#### Note

If you want to completely clean up your jobs, choose the [Cleanup](#) pushbutton. This deletes all jobs, all scheduling data, and all related protocol records. It also resets the DBA Planning Calendar to its initial state.

We recommend that you clean up after an SAP system upgrade or if jobs have become corrupt.

## 11.8.2 Jobs: DBA Log

The DBA log provides information about protocol records that are written by all database-related programs of the CCMS and database administration tools.

You can access the DBA log by calling the DBA Cockpit and choosing  [Jobs](#)  [DBA Log](#)  on the [Database](#) tab of the DBA Cockpit.

When you access the DBA log for the first time, the system displays the log information for the current week.

You can display information about previous weeks by using the F4 help of the [From](#) field in the [Selection](#) area.

## 11.9 Diagnostics

The following sections provide information about the main task areas that are available under *Diagnostics* on the *Database* tab of the DBA Cockpit.

### 11.9.1 Diagnostics: ASE Error Log

You can access information about the error log of the SAP ASE database server by calling the DBA Cockpit and choosing **Diagnostics** **ASE Error Log** on the *Database* tab of the DBA Cockpit.

#### Note

To monitor data on the *Error Log* screen, you have to make sure that the DBA Cockpit Framework (DCF) is set up correctly. If the DCF is not available or set up incorrectly, a warning is displayed including a link to the *Collector Configuration* screen. There you can perform the required steps. For more information, see *DBA Cockpit Framework: Collector Configuration* [page 111].

Choose a time frame and the severity of the error, and choose *Apply Selection*.

If you select an error message, further details will be displayed below the list of errors.

ASE Error Log						
Selection						
Time Frame: Last 14 Days From: 22.07.2023 00:00:00 To: 04.08.2023 23:59:59 Time Zone: UTC+00						
Severities: <input checked="" type="checkbox"/> Critical <input checked="" type="checkbox"/> Error <input checked="" type="checkbox"/> Warning <input checked="" type="checkbox"/> Informational						
Search: *						
Apply Selection						
View: [Standard View] Export						
	Time	Message Type	Severity	Server Process ID	MSG_SHORT	Error Message
<input type="radio"/>	2023-08-04 00:00:27	Information	0	218	REORG REBUILD of index 'DBH_STG_STMTCACHE-1' on table 'DBH_STG_STMTCACHE' in database 'saptools' ...	300.337
<input type="radio"/>	2023-08-04 00:00:27	Information	0	218	REORG REBUILD of index 'DBH_STG_STMTCACHE-2' on table 'DBH_STG_STMTCACHE' in database 'saptools' ...	300.337
<input type="radio"/>	2023-08-04 00:00:27	Information	0	218	Beginning REORG REBUILD of index 'DBH_STG_STMTCACHE-1' on table 'DBH_STG_STMTCACHE' in database 'saptools' ...	300.336
<input type="radio"/>	2023-08-04 00:00:27	Information	0	218	REORG REBUILD of index 'DBH_STG_STMTCACHE-3' on table 'DBH_STG_STMTCACHE' in database 'saptools' ...	300.337
<input type="radio"/>	2023-08-04 00:00:27	Information	0	218	Beginning REORG REBUILD of index 'DBH_STG_STMTCACHE-2' on table 'DBH_STG_STMTCACHE' in database 'saptools' ...	300.336
<input type="radio"/>	2023-08-04 00:00:27	Information	0	218	Beginning REORG REBUILD of index 'DBH_STG_STMTCACHE-3' on table 'DBH_STG_STMTCACHE' in database 'saptools' ...	300.336
<input type="radio"/>	2023-08-04 00:00:27	Information	0	218	REORG DEFRAG of 'DBH_SNAP_CACHEDOBJECTS' partition 'DBH_SNAP_CACHEDOBJECTS_1520005415' in databas...	300.201
<input type="radio"/>	2023-08-04 00:00:27	Information	0	218	Beginning REORG DEFRAG of 'DBH_SNAP_CACHEDOBJECTS' partition 'DBH_SNAP_CACHEDOBJECTS_1520005415' ...	300.197
<input type="radio"/>	2023-08-03 16:39:27	Information	0	13	Completed processing to generate RSA keypair.	110.300
<input type="radio"/>	2023-08-03 16:39:27	Information	0	13	Begin processing to generate RSA keypair.	110.299
<input type="radio"/>	2023-08-03 00:00:29	Information	0	64	REORG REBUILD of index 'DBH_STG_TABLES-1' on table 'DBH_STG_TABLES' in database 'saptools' comple...	300.337
<input type="radio"/>	2023-08-03 00:00:29	Information	0	64	REORG REBUILD of index 'DBH_STG_TABLES-2' on table 'DBH_STG_TABLES' in database 'saptools' comple...	300.337
<input type="radio"/>	2023-08-03 00:00:29	Information	0	64	Beginning REORG REBUILD of index 'DBH_STG_TABLES-1' on table 'DBH_STG_TABLES' in database 'saptoo...	300.336
<input type="radio"/>	2023-08-03 00:00:29	Information	0	64	Beginning REORG REBUILD of index 'DBH_STG_TABLES-2' on table 'DBH_STG_TABLES' in database 'saptoo...	300.336
<input type="radio"/>	2023-08-03 00:00:29	Information	0	64	REORG REBUILD of index 'DBH_STG_SYSLD-0' on table 'DBH_STG_SYSLD' in database 'saptools' comp...	300.337
<input type="radio"/>	2023-08-03 00:00:29	Information	0	64	Beginning REORG REBUILD of index 'DBH_STG_SYSLD-0' on table 'DBH_STG_SYSLD' in database 'sapto...	300.336
<input type="radio"/>	2023-08-03 00:00:28	Information	0	64	REORG REBUILD of index 'DBH_STG_STMTCACHE-2' on table 'DBH_STG_STMTCACHE' in database 'saptools' ...	300.337
<input type="radio"/>	2023-08-03 00:00:28	Information	0	64	REORG REBUILD of index 'DBH_STG_STMTCACHE-3' on table 'DBH_STG_STMTCACHE' in database 'saptools' ...	300.337
<input type="radio"/>	2023-08-03 00:00:28	Information	0	64	Beginning REORG REBUILD of index 'DBH_STG_STMTCACHE-2' on table 'DBH_STG_STMTCACHE' in database '...	300.336
<input type="radio"/>	2023-08-03 00:00:28	Information	0	64	Beginning REORG REBUILD of index 'DBH_STG_STMTCACHE-3' on table 'DBH_STG_STMTCACHE' in database '...	300.336

### 11.9.2 Diagnostics: ASE Setup Status

Choose **Diagnostics** **ASE Status** on the *Database* tab of the DBA Cockpit to access information about the SAP ASE database server status, installed licenses and versions.

SAP ASE as part of the SAP NetWeaver stack comes with an all included OEM license. The SAP OEM ASE license is installed during the installation of the SAP system.

## 11.9.3 Diagnostics: Missing Tables and Indexes

### Note

This function is **only** available for local ABAP systems.

You can find out whether tables or indexes are missing from either the database or the ABAP Dictionary by calling the DBA Cockpit and choosing ► *Diagnostics* ► *Missing Tables and Indexes* ► on the *Database* tab of the DBA Cockpit.

The results of the last consistency check are displayed in a tree structure that is grouped into the following sections:

Section	Description
<i>Objects missing from the database</i>	Objects that are defined in the ABAP Dictionary, but not found in the database
<i>Unknown objects in the ABAP Dictionary</i>	Objects that are found in the database, but not defined in the ABAP Dictionary
<i>Inconsistent objects</i>	Results of the detailed comparison of the ABAP Dictionary and the database are displayed here
<i>Other checks</i>	Different checks are performed here: <ul style="list-style-type: none"><li>• It is checked whether the primary index of tables defined in the ABAP Dictionary was created uniquely on the database.</li><li>• Objects in the SAP system tables are checked, which cannot be described at all or which cannot be completely described in the ABAP Dictionary for technical reasons.</li><li>• If inconsistencies for these objects are detected, they are also displayed here. In general, additional information about the type of inconsistency is provided.</li></ul>
<i>Optional indexes</i>	Mismatch between ABAP Dictionary and database regarding secondary indexes

If the database structure has been changed since the last consistency check, choose the *Refresh* pushbutton.

### → Recommendation

To ensure consistency between the ABAP Dictionary and the database, the consistency check should be performed once a month or whenever the database structure has changed.

## 11.9.4 Diagnostics: Missing Statistics

The following sections provide an overview of the *Missing Statistics* screen.

### Aim of the Missing Statistics

This functionality is an extension of the ATM framework. Through the ATM, the DBA Cockpit provides a tool with up-to-date statistics. These are required for the SAP ASE Optimizer. The *Missing Statistics* screen allows you to find out if additional statistics are useful or cause more costs. Based on your decision, you can create an index for the statistics or update the statistics if it makes sense.

### Setting up the Missing Statistics

You can enable and disable the configuration parameter *Collect Missing Statistics* either ad-hoc or hourly using the *Enable/Disable* toggle or the *Activate/Deactivate Missing Statistics* button directly in the ► *Diagnostics* ► *Missing Statistics* ► screen on the *Database* tab.

Last Refresh: 31.08.2023 09:26:06

**Missing Statistics**

Server-Wide Settings

◆ Missing Statistics is disabled. [Enable](#)

View: [Standard View] [Export](#) [Analyze Table](#) [Update Statistics](#)

First Time Missing Date	Database	Table Name	Column Name or Column List	Number of Times Missing
<input type="radio"/> 2022-04-07 13:53:48	SYX	/BDL/MAINTAIN	CHANGED	15
<input type="radio"/> 2022-04-01 13:53:20	SYX	/BDL/STAMP	SUCCESS	246
<input type="radio"/> 2022-04-01 13:53:20	SYX	/BDL/STAMP	SUCCESS	246
<input type="radio"/> 2022-04-01 13:53:20	SYX	/BDL/TASKS	TASKNAME	1.890
<input type="radio"/> 2022-04-01 13:53:20	SYX	/BDL/TASKS	TASKMODE	1.977
<input type="radio"/> 2022-04-01 13:53:20	SYX	/BDL/TASKS	ICON_5	1.932
<input type="radio"/> 2022-04-01 13:53:20	SYX	/BDL/TASKS	STATUS	1.890
<input type="radio"/> 2022-04-01 13:53:20	SYX	/BDL/TASKS	STATUS	1.932
<input type="radio"/> 2022-04-01 22:53:20	SYX	/BDL/TASKS	STATUS	45
<input type="radio"/> 2022-04-07 13:53:48	SYX	/BDL/TASKS	CHANGED	26
<input type="radio"/> 2022-04-07 13:53:48	SYX	/BDL/TASKS	STATUS	14
<input type="radio"/> 2022-04-01 22:31:34	SYX	/BIO/SCHNGID	SID	17.466
<input type="radio"/> 2022-04-01 22:31:34	SYX	/BIO/SREQUID	SID	1.356
<input type="radio"/> 2022-04-01 22:31:43	SYX	/BIC/ARSDRSODS00	/BIC/RSDRSI001	13.680
<input type="radio"/> 2022-04-01 22:31:43	SYX	/BIC/ARSDRSODS00	/BIC/RSDRSI001	2.895
<input type="radio"/> 2022-04-01 22:42:35	SYX	/BIC/ARSDRSODS00	/BIC/RSDRSI004	987
<input type="radio"/> 2022-04-01 22:42:35	SYX	/BIC/ARSDRSODS00	/BIC/RSDRSI004	987
<input type="radio"/> 2022-04-01 22:33:11	SYX	/BIC/ARSDRSODS00	/BIC/RSDRSI005	2.912
<input type="radio"/> 2022-04-01 22:33:11	SYX	/BIC/ARSDRSODS00	/BIC/RSDRSI005	2.911
<input type="radio"/> 2022-04-01 22:33:11	SYX	/BIC/ARSDRSODS00	/BIC/RSDRSI005	2.912

### Overview of Missing Statistics

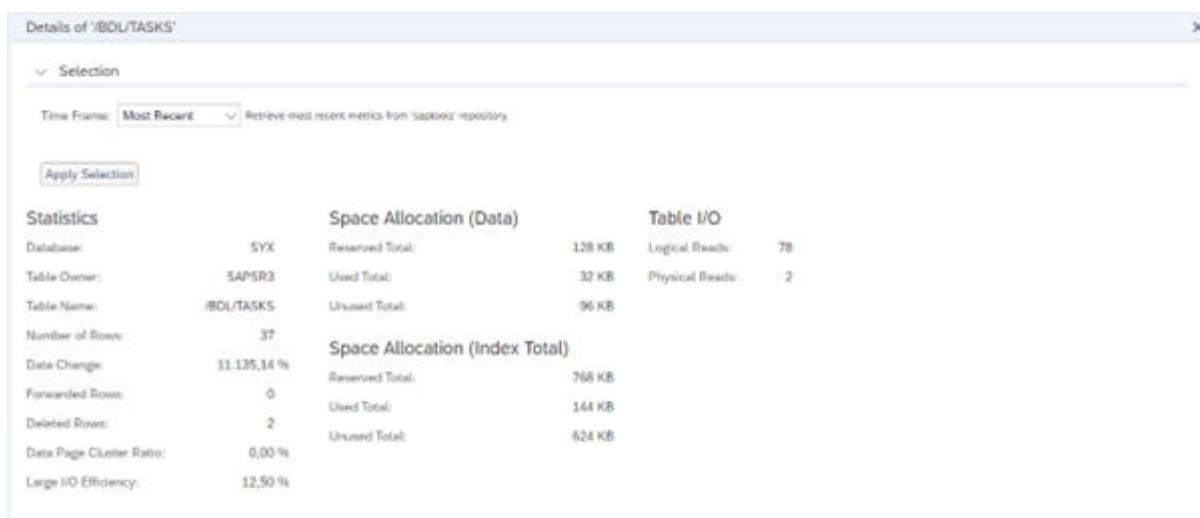
After you enabled the *Capture Missing Statistics* configuration parameter, the overview of *Missing Statistics* captured for a specific database system provides the following information:

- Date when the statistics were missing for the first time (First Time Missing Date)
- Name of the database
- Table name

- name of a single column or a list of columns (Column Name or Column List)
- number of times the statistic was counted as missing (Number of Times Missing)

## Other Functionalities

Once you have selected an item in the [Overview](#) screen, you can get more information about that statistic in the [Detail](#) screen. However, you can also analyze the table by navigating to the [Single Table Analysis](#) screen or update the statistic by navigating to the [Schedule an Action](#) wizard via the [Update Statistics](#) button.



Statistics		Space Allocation (Data)		Table I/O	
Database:	SYX	Reserved Total:	128 KB	Logical Reads:	78
Table Owner:	SAPSR3	Used Total:	32 KB	Physical Reads:	2
Table Name:	/BDL/TASKS	Unused Total:	96 KB		
Number of Rows:	37	Space Allocation (Index Total)			
Data Change:	11.135,14 %	Reserved Total:	768 KB		
Forwarded Rows:	0	Used Total:	144 KB		
Deleted Rows:	2	Unused Total:	624 KB		
Data Page Cluster Ratio:	0,00 %				
Large I/O Efficiency:	12,50 %				

### Note

Due to performance and stability issues, [Missing Statistics](#) is not intended for use in a production environment. At the very least, use in a production environment should be carefully considered.

## 11.9.5 Diagnostics: Special Tables


You can access information about special tables by choosing [Diagnostics](#) > [Special Tables](#) on the [Database](#) tab of the DBA Cockpit.

You can use the information on special tables to identify issues with database tables. Such issues can include the following:

- Tables with incomplete index statistics  
The screen checks for missing or incomplete index statistics and provides an overview of tables with incomplete statistics.
- Tables with sticky statistics  
For more information on sticky statistics, see [sp\\_modifystats](#) in the SAP ASE documentation. *Sticky* means that certain statistic attributes are retained when update statistics is run without any attribute values specified.

- **Tables marked volatile**  
A volatile table is used for transient data, that means for data that is loaded into tables only for a fraction of time and is then removed. A table marked as volatile can have zero rows one minute, 3,000 the next, and then back to zero.
- **Tables configured for parallel scans**  
Tables that SAP ASE can scan in parallel, assuming sufficient work processes are available.
- **Tables configured for partition level locking**  
The granularity of the locking mechanism allows data management systems to support parallel execution of SQL statements on the same data sets and plays a crucial role in improving transactional concurrency. An optimal management of transaction concurrency is essential to effectively support extreme transactional workloads. SAP ASE 16 expands the granularity of its locking mechanism with support for partition-level locking, improving its concurrency capabilities. This feature allows large, high impact DML and DDL statements to execute on different partitions of the same table simultaneously. For example, a risk calculation application that uses tables partitioned by day could greatly benefit from this functionality. With partition level locking, DDLs such as reorg rebuild can work on one partitions, while DMLs such as insert or update can work on another partition concurrently. DBAs use the `sp_chgattribute` command to enable partition-level locking. Partition lock promotion is also supported to allow escalation of finer grain locks.
- **Tables with nonmaterialized columns**  
Nonmaterialized columns exist virtually, but are not physically stored in the row. SAP ASE treats nonmaterialized columns the same way it treats null columns: if a column is not physically present in the row, SAP ASE supplies a default. The default for a nullable column is null, but the default for a nonmaterialized column is a user-defined non-NULL value.




## 11.9.6 Diagnostics: Lock List

You can access information about locks by calling the DBA Cockpit and choosing  **Diagnostics**  **Lock List**  on the **Database** tab of the DBA Cockpit.

Multiple transactions can access the same database object, such as a table, at the same time. To isolate the transactions from one another, the database system sets locks for database objects. Locks for rows or tables can be requested/released implicitly by the database system, or explicitly requested/released by a user. Locks in the database catalog are always requested and released implicitly by the database system. Through the isolation level, you define when the database system sets which type of lock. By doing so, you define the degree of parallelism of transactions and the phenomena that can occur. All changing SQL statements (such as INSERT, UPDATE, DELETE) always request an exclusive lock.

Locking affects performance when one process holds locks that prevent another process from accessing data. The process that is blocked by the lock sleeps until the lock is released. This is called lock contention.

## 11.9.7 Diagnostics: Lock-Wait Events

You can access information about lock-wait events by calling the DBA Cockpit and choosing  **Diagnostics**  **Lock-Wait Events**  on the **Database** tab of the DBA Cockpit.

Using the information provided on this screen, you can:

- Review lock wait events that occurred in the past and that were captured by the lock event data collector. By default, information about lock events is collected by the [Lock Event](#) data collector. For more information, see [DBA Cockpit Framework: Data Collectors and Admin Procedures \[page 111\]](#).
- Review lock wait events that are currently occurring on the database server.

In the [Selection](#) area, you can specify the time frame for which you want lock-wait events to be displayed as well as the type of lock-wait event, such as, lock waits, lock time outs, and deadlocks.

After having applied your selection, the total number of lock-wait events that occurred and that you selected in the [Selection](#) area is displayed in the [Summary](#) area.

For each lock-wait event, the following information is displayed:

Column	Description
<a href="#">Event Type</a>	Type of lock event, which can be a lock wait, a lock timeout or a deadlock
<a href="#">Event Occurrence</a>	Time when the lock event first occurred
<a href="#">Event Resolution</a>	Time when the lock event was solved
<div><b>i Note</b> For events that are still existing, the status displayed is <a href="#">Still Existing</a>.</div>	
<a href="#">Involved Agents</a>	Number of agents involved in the lock event
<a href="#">Max. Wait Time</a>	Max. lock-wait time of any of the involved agents
<a href="#">Lock Objects</a>	Database objects involved in the lock conflict

## 11.9.8 Diagnostics: Automatic Table Maintenance

The [Diagnostics](#) > [Automatic Table Maintenance](#) screen shows all maintenance operations that have been executed by ATM.

### 11.9.8.1 Diagnostics: Automatic Table Maintenance – ATM History

The [Diagnostics](#) > [Automatic Table Maintenance](#) > [ATM History](#) screen shows all maintenance operations that have been executed by ATM in the previous days and weeks. This information allows you to fine-tune your ATM configuration and to ensure correct behavior of ATM in the respective application environment.

When you select one of the records shown, the maintenance command that was executed as well as the ATM profile that initiated maintenance of the object will be displayed (see details section below).

By default, the ATM history spans 8 weeks. A different ATM history size can be configured in the [Miscellaneous](#) tab of the [► Configuration ► ATM Configuration ►](#) screen.

#### **i Note**

In addition to the [ATM Queue](#) and [ATM History](#) screen, details regarding ATM for a single table can also be reviewed using the [► Space ► Tables and Indexes ► Single Table Analysis ►](#)

### **11.9.8.2 Diagnostics: Automatic Table Maintenance – ATM Queue**

As described in the chapter entitled [Processing ATM Windows and Assigned ATM Profiles](#), ATM is executed in two phases. Phase 1 will identify objects that require maintenance according to the defined ATM profile and put those objects into an ATM queue. Phase 2, finally, will execute maintenance, as defined in the ATM queue, until the ATM window has expired or no entry can be found in the ATM queue.

If the ATM windows are too short to process all identified maintenance requirements, the ATM queue will fill up and the required maintenance operations will not be executed. The screen [► Diagnostics ► Automatic Table Maintenance ► ATM Queue ►](#) allows you to monitor the current ATM queue.

When you select one of the records shown, the maintenance command that is going to be executed as well as the ATM profile that initiated maintenance of the object will be displayed.

### **11.9.8.3 Diagnostics: Automatic Table Maintenance – ATM Log**

ATM writes its own message log while evaluating maintenance requirements and finally executing maintenance operations. While its main target group is SAP support, this message log can also help DBAs understand error conditions and performance-related issues. You can access the ATM log by navigating into the [► Diagnostics ► Automatic Table Maintenance ► ATM Log ►](#) screen of the DBA Cockpit.

By default, ATM logs for the last 14 days are kept. This number of days as well as the number of messages being written into the ATM log can be configured in the [Miscellaneous](#) tab of the [► Configuration ► ATM Configuration ►](#) screen.

## **11.9.9 Diagnostics: Log Threshold Events**

You can access information about log threshold events by calling the DBA Cockpit and choosing [► Diagnostics ► Log Threshold Events ►](#) on the [Database](#) tab of the DBA Cockpit.

For more information, see [Configuration: Log Thresholds \[page 99\]](#).



## 11.9.10 Diagnostics: Compression Advisor Log

You can access information about logs of the Compression Advisor by calling the DBA Cockpit and choosing [Diagnostics](#) [Compression Advisor Log](#) on the [Database](#) tab of the DBA Cockpit.

The DBA Cockpit Compression Advisor can help you to evaluate compression ratios throughout your database, and will enable you to focus on objects that provide the highest compression ratios. For more information, see [Compression Advisor for SAP Adaptive Server Enterprise](#).

## 11.9.11 Diagnostics: DBA Cockpit Audit Log

You can track changes to the database made from the DBA Cockpit and to the monitoring setup using the maintenance actions provided in the DBA Cockpit. Changes made from outside – for example, using native database commands – are not displayed here.

1. Call the DBA Cockpit and choose [Diagnostics](#) [Audit Log](#) on the [Database](#) tab of the DBA Cockpit. You can track changes to the database made from the DBA Cockpit and to the monitoring setup using the maintenance actions provided in the DBA Cockpit. These changes include, for example, commands issued from the SQL editor in the DBA Cockpit, maintenance commands for database configuration, or tablespace maintenance using the relevant screens in the DBA Cockpit. Changes made from outside – for example, using native database commands – are not displayed here. The [Audit Log](#) screen displays the following information:

Field	Description
<a href="#">Date</a>	Start date of the action
<a href="#">Time</a>	Start time of the action
<a href="#">System</a>	Target system on which the action was performed
<a href="#">Action</a>	Type of action (name of the action in the DBA Cockpit)
<a href="#">Command</a>	Type of command (for example, ADD, DELETE or EDIT)
<a href="#">Object</a>	Name of the modified object (for example, database or tablespace name)
<a href="#">User</a>	Name of the SAP user who performed the action
<a href="#">From System</a>	System from where the action was performed

2. By default, the system displays all audit entries logged during the current week. If you want to display another week, use the F4 help of the [From](#) field. To display more than one week, you can change the value in the field [Number of Days](#).
3. To display the details of an action, select the corresponding action and choose [Details](#). In the lower half of the screen, the SQL statements that have been executed are displayed.

## i Note

The [Audit Log](#) in the DBA Cockpit is not a certified tool for auditing.

SQL commands issued from the SQL editor in the DBA Cockpit are also logged in the security audit log (transaction SM20). For more information, see SAP Note [3331129](#).

## 11.9.12 Diagnostics: DBA Cockpit Self-Monitoring

You can access information about the overall status of the setup of the DBA Cockpit and its required infrastructure by choosing ► [Diagnostics](#) ► [DBA Cockpit Self-Monitoring](#) ► on the [Database](#) tab of the DBA Cockpit.

You can use the self-monitoring infrastructure of the DBA Cockpit to identify issues that keep the DBA Cockpit from running properly. Such issues can include the following, for example:

- Has the database configuration been set up correctly for monitoring?
- Has the monitoring infrastructure been set up for the DBA Cockpit.
- Is the data collection framework set up, and are all data collectors set up and configured correctly?
- Do the data collectors of the data collection framework run without errors, and do they collect data? .

The self-monitoring infrastructure allows you to display a list of all database checks and to repair issues quickly. The self-monitoring function only checks the monitoring infrastructure, not the database systems.

### Detail Information and Repair Function

On the [Self-Monitoring Details](#) screen area, the DBA Cockpit shows you detailed results of each check and advises you which actions you should take. To analyze and repair the issue identified by the check, you can proceed as follows:

- Use the [Quick Repair](#) pushbutton to let the DBA Cockpit repair the issue quickly in the background (if possible).
- Use the [Go to Repair Tool](#) pushbutton to navigate to the relevant tool that helps you analyze and repair the issue identified by the check.
- Use the [Go to SAP Note](#) pushbutton to display the content of the relevant SAP Note for the issue (if available).

### Self-Monitoring Screens

The self-monitoring infrastructure is available in the DBA Cockpit as follows:

- For your entire monitored system landscape: On the [System Landscape](#) tab under ► [Landscape View](#) ► [Self-Monitoring](#) ►.

- For a single database: On the [Database](#) tab under ► [Diagnostics](#) ► [Self-Monitoring](#) ►.

## Messages from Self-Monitoring on Affected Screens

If there are issues with the setup and infrastructure of the DBA Cockpit, the relevant error messages are also displayed on the screens that are affected by the issues.

## Displaying Check Results of Self-Monitoring

You can use the self-monitoring infrastructure of the DBA Cockpit to identify and solve issues related to database configuration or monitoring setup that keep the DBA Cockpit from running properly. The Self-Monitoring screens display results of automated checks designed for the DBA Cockpit, from which you can navigate to individual check results and to repair tools. You can call up the self-monitoring either for an entire system landscape (on the [System Landscape](#) tab) or for a single database (on the [Database](#) tab). The selfmonitoring details are the same for both screens.

## Displaying Check Results of Self-Monitoring

1. On the [System Landscape](#) tab, choose ► [Landscape View](#) ► [Self-Monitoring](#) ►.  
The DBA Cockpit displays an overview of your system landscape, including information about the database release and whether the data collection framework is enabled. A red check status indicates that one of the self-monitoring checks resulted in an error.
2. To display details about the check status of a system, select a line of the overview table.  
On the [Self-Monitoring: System](#) screen area, the DBA Cockpit displays a list of all checks performed for a system, including a short description of each check and the check status.
3. To display details about a particular check, select a line in the table.  
On the [Self-Monitoring](#) screen area, the DBA Cockpit displays an information message or an error message. In the case of an error message, the DBA Cockpit displays instructions with recommended actions.
4. To navigate to the appropriate tool to repair an issue identified by a check, choose [Go to Repair Tool](#).

## Displaying Check Results of Self-Monitoring on the *Database* Tab Page

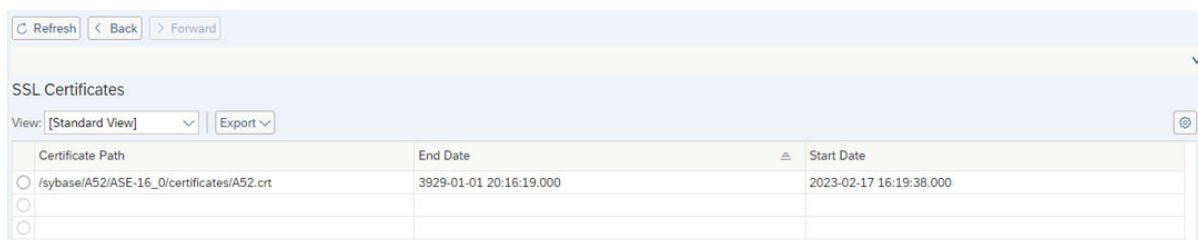
1. On the [Database](#) tab, choose ► [Diagnostics](#) ► [Self-Monitoring](#) ►.  
The DBA Cockpit displays a list of all checks performed for the database, including a short description of each check and the check status.
2. To display details about a particular check, select a line in the table.  
On the [Self-Monitoring](#) screen area, the DBA Cockpit displays an information message or an error message. In the case of an error message, the DBA Cockpit displays instructions with recommended actions.

3. To navigate to the appropriate tool to repair an issue identified by a check, choose [Go to Repair Tool](#).

## 11.9.13 Diagnostics: SSL Certificates

You can get information about installed SSL certificates by going to ► [Diagnostics](#) ► [SSL Certificates](#) ► on the [Database](#) tab of the DBA Cockpit.

You can use this information about installed SSL certificates to identify valid or invalid certificates. The SSL certificate with the lowest date is at the top of the summary screen.



Certificate Path	End Date	Start Date
/sybase/A52/ASE-16_0/certificates/A52.crt	3929-01-01 20:16:19.000	2023-02-17 16:19:38.000

## 11.10 Backup and Recovery

It is very important for your business that you define your recovery objectives and that you develop and test a backup and recovery process that meets these defined objectives. Your business depends on its ability to recreate the database of your SAP system in the case of a failure. A full disaster recovery of an SAP ASE database system requires to recreate the SAP ASE software installation, rebuild the SAP ASE server and to load the SAP database into the SAP ASE server. The SAP ASE software installation and the SAP ASE database server can be recreated from external sources, while the SAP database must be recovered from a database backup. To speed up recovery it is recommended that you perform a backup not only for the SAP database, but also for the SAP ASE server and the SAP ASE software installation.

### Backup of the SAP ASE Software Installation

Refer to your OS vendor's documentation regarding how to ensure recoverability of the OS system with all its file systems.

### SAP ASE Server Backup

The SAP ASE server stores information about databases, devices, SAP ASE logins, and SAP ASE server roles in the master database. It is recommended that you generate frequent backups of the master database.

## Backing Up Databases








SAP ASE provides two different means for backing up a database: The `DUMP DATABASE` command and an external backup method.

The `DUMP DATABASE` command is an online operation - that is, users can stay connected to the system and continue to work. Databases backed up with the `DUMP DATABASE` command have to be restored using the `LOAD DATABASE` command. The external backup method relies on the ability to suspend write access to a database and back up a consistent copy of the database devices using an external mechanism, such as splitting off disk mirrors. The copies of the database devices can be used to recover the database using the `MOUNT` command.

## Backing Up the Transaction Log

For a production system it is mandatory to be able to recover the SAP database up to the latest possible point in time. This requires that the transaction log of the database is backed up with the `DUMP TRANSACTION` command. To recover information in the transaction log, you must load the transaction log dumps with the `LOAD TRANSACTION` command.

## Information on Backup and Recovery of an SAP system on SAP ASE

Note Number:	Title:
SAP Note <a href="#">1585981</a> 	SYB: Ensuring Recoverability for SAP ASE
SAP Note <a href="#">1611715</a> 	SYB: How to restore an SAP ASE database server (Windows)
SAP Note <a href="#">1618817</a> 	SYB: How to restore an SAP ASE database server (UNIX)
SAP Note <a href="#">1588316</a> 	SYB: Configure automatic database and log backups
SAP Note <a href="#">1801984</a> 	SYB: Automated management of long running transactions
SAP Note <a href="#">1887068</a> 	SYB: Using external backup and restore with SAP ASE
SAP Note <a href="#">1841993</a> 	SYB: How to schedule backups in the DBA Cockpit

Technical documentation on the backup and restore procedure of an SAP ASE system:

[System Administration Guide](#)

Volume 2, Chapters 7, 12, 13 and 14.

Technical documentation on the SAP ASE commands `DUMP DATABASE`, `DUMP TRANSACTION`, `LOAD DATABASE`, `LOAD TRANSACTION`, `QUIESCE DATABASE`, `MOUNT`:

[Reference Manual Commands](#)

## 11.10.1 Backup and Recovery - Further Information

The following section provides information about the main task areas that are available under *Backup & Recovery* on the *Database* tab of the DBA Cockpit:

- Prior SAP ASE 16.0 SP03 [page 134], the dump history is available in the screen ► *Backup & Recovery* ► *Database Dump History* ►.
- Since SAP ASE 16.0 SP03 [page 135], the two areas available under *Backup & Recovery* are as follows:
  - *Dump Overview*
  - *Dump History*

## More Information

[Backup and Recovery \[page 132\]](#)

### 11.10.1.1 Prior SAP ASE 16.0 SP03

SAP ASE collects a history of database and transaction log dumps. The content detail area displays additional information on database dumps that are related to the selected database.

Last Refresh: 11.07.2022 11:12:50

Database Dump History

Selection

Time Frame: Last 7 Days From: 05.07.2022 00:00:00 To: 11.07.2022 23:59:59 Time Zone: UTC+02

Apply Selection

View: Standard View Export

Database	Last Database Dump	Last Log Dump	Last Cumulative Dump
<input type="radio"/> master	2022-07-10 17:59:11	NA	NA
<input type="radio"/> model	2022-07-10 17:59:19	NA	NA
<input type="radio"/> OH	2022-07-10 17:46:16	NA	NA
<input type="radio"/> saptools	2022-07-10 18:00:05	NA	NA
<input type="radio"/> SYB	2022-07-10 17:59:10	NA	NA

Dump History of Database 'SYB'

Summary Details

View: Standard View Export

Dump Time	Dump Type	Stripes	Compression Level	Password Protected	Server Name
<input checked="" type="radio"/> 2022-07-05 06:58:08	Database	1	1	0 no	*
<input type="radio"/> 2022-07-06 06:46:23	Database	0	0	0 no	*
<input type="radio"/> 2022-07-06 10:59:27	Database	1	1	0 no	*
<input type="radio"/> 2022-07-07 10:58:59	Database	1	1	0 no	*
<input type="radio"/> 2022-07-08 17:58:19	Database	1	1	0 no	*
<input type="radio"/> 2022-07-09 17:58:14	Database	1	1	0 no	*
<input type="radio"/> 2022-07-10 17:59:10	Database	1	1	0 no	*
<input type="radio"/>					
<input type="radio"/>					
<input type="radio"/>					

## 11.10.1.2 Since SAP ASE 16.0 SP03

With the introduction of BALDR, a new API for retrieving information about backups was made available.

### Dump Overview

The [Dump Overview](#) screen displays the time of the last successful dump and the elapsed time since the last successful dump for each database on the database server. This information is available for database dumps, cumulative dumps, delta dumps, and transaction log dumps.

Dump Overview								
View: [Standard View] [Print Version] [Export]								
Name	Last DB Dump	Time Last DB Dump (min)	Last Log Dump	Time Last Log Dump (min)	Last Cumul. Dump	Time Last Cumul. Dump (min)	Last Delta Dump	Time Last Delta Dump (min)
<input type="radio"/> AS2	2022-02-11 11:14...	34.824	N/A		0	N/A	0	N/A
<input type="radio"/> master	N/A	0	N/A		0	N/A	0	N/A
<input type="radio"/> model	N/A	0	N/A		0	N/A	0	N/A
<input type="radio"/> myDB	N/A	0	N/A		0	N/A	0	N/A
<input type="radio"/> saptools	N/A	0	N/A		0	N/A	0	N/A
<input type="radio"/> sybmgrddb	N/A	0	N/A		0	N/A	0	N/A
<input type="radio"/> sybsecurity	N/A	0	N/A		0	N/A	0	N/A
<input type="radio"/> sybsystemdb	N/A	0	N/A		0	N/A	0	N/A
<input type="radio"/> sybsystemprocs	N/A	0	N/A		0	N/A	0	N/A

### Dump History

The screen gives an overview of the number of failed as well as successful database and transaction dumps.

Summary of Failed Dumps		Summary of Successful Dumps	
Number of failed Database Dumps:	0	Number of successful Database Dumps:	1
Number of failed Transaction Dumps:	1	Number of successful Transaction Dumps:	0

It is possible to filter by a specific database as well as by a specific status.

Database:	<input type="text" value="Any"/>
Status:	<input type="text" value="Successful"/>
<input type="button" value="Apply Selection"/>	

The [Dump History](#) screen has two tabs. The first tab is called [Database Dump](#). This tab allows you to monitor database dumps, cumulative dumps, and delta dumps for a specified period of time.







# 12 Operating System Configuration

The following sections provide information about important configuration settings for the UNIX operating systems. Additional settings can be required or recommended by the corresponding vendor. Therefore, check the relevant SAP Notes.

## i Note

Only the requirements for SAP ASE are discussed here – additional applications running on the database host (e.g. SAP instance(s)) require additional settings and resources.

## 12.1 Prerequisites

The following requirements apply to all UNIX operating systems:

- Set the *keepalive* interval to a value higher than 1200 seconds. The ABAP dispatcher initiates an empty network request to the database connection every 1200 seconds. If the *keepalive* interval is lower, the operating system might close the database connection.
- SAP ASE data and log devices on NFS mounted file systems should only be used with a network appliance filer. SAP ASE supports the database devices on NFS- and CIFS-mounted devices with network appliance filers for storing data.

For performance reasons, you should not enable file system journaling on the file systems where your SAP ASE database device files reside. Access time should not be recorded for database files and directories.

## 12.2 Configuration for Linux

You can find detailed information in the current SAP tuning recommendations provided by your Linux distributor, hardware vendor, and hyperscaler provider.

The following sections provide information about some general considerations for tuning SAP ASE on Linux.

### 12.2.1 IO Subsystem Tuning

An SAP system uses enterprise-class storage and extensive unbuffered access to storage devices. Therefore, we recommend the following:

- Check for recommended settings by your vendor. Use the *none* or if *none* is not available, the *noop* IO scheduler unless your vendor requires a different setting.
- Modern I/O schedulers on Linux should handle the size of the IO queue automatically and depending on the hardware or hyperscaler used. Therefore, we recommend not to set the parameter `/sys/block/<device>/queue/nr_requests`. For older Linux versions, it may be beneficial to set this parameter. Therefore, check for recommendations of your Linux distributor.
- Set the kernel parameter `fs.aio-max-nr` to *1048576*. In addition, make sure that `fs.file-max` has been set in accordance with the aggregated requirements for all processing. We recommend *6291456* as a minimum.
- For DBMS data storage, the *ext4* or *xfs* file systems are preferred over *ext3* because large files can be handled better than *ext3* (*ext4* & *xfs* use extents vs. *ext3*'s indirect blocks for allocations in large files among other benefits).
- Disable the file system journal and use the *noatime*, *nodiratime* mount options. If journaling is not disabled for *ext4*, use *cache=writeback*, *barrier=0* mount options in addition to *noatime*, *nodiratime*. These options ensure that only meta-data changes to the file system are journaled instead of both meta-data and data changes.
- For *xfs* the recommended mount options are *noatime*, *nodiratime*, *logbufs=8*. The *nobarrier* mount option was recommended in the past. This mount option for *xfs* file systems was removed with SUSE 15 SP2.

## 12.2.2 Memory Configuration and Tuning

SAP ASE allocates shared memory for virtually all memory requirements. The Linux kernel parameters `kernel.shmall` and `kernel.shmmax` must be set high enough to be sufficient for each instance of SAP ASE and other processes using shared memory.

We recommend applying Linux paging improvements. For more information, see SAP Note [1557506](#) .

Set the parameter `vm.swappiness` to a reduced value such as 20 or 10, compared to the default value of 60.

Our recommendation for SAP ASE is to configure Linux Huge Pages. Huge pages may help to decrease OS overhead by decreasing the page table size. The use of huge pages therefore provides measurable performance gains.

Since Huge Page memory is locked in memory and cannot be swapped out, this is beneficial for performance and stability of SAP ASE. However, we recommend disabling transparent huge pages. Changing the number and size of huge pages requires a reboot of the operating system. If SAP ASE must be reconfigured frequently, it may not be possible to use huge pages.

We recommend that you configure huge pages in even multiples of 256MB and only configure as many huge pages as necessary to support SAP ASE and any minor configuration changes. For example, if configuring SAP ASE for 350GB of memory, you may want to allocate 360GB to 380GB in huge pages to allow a dynamic increase of SAP ASE memory in case configuration changes need to be made.

Memory configured for huge page memory is not available for normal memory requirements. Make sure that physical memory is large enough to support huge page and normal page memory requirements of all applications running on the database host. If normal memory requirements cannot be met, the operating system starts swapping memory, which can lead to performance problems.

Whether or not SAP ASE uses huge pages is controlled by SAP ASE parameter `enable HugePages`. The following settings are possible:

- `enable HugePages = 0` – SAP ASE will use huge pages, provided that enough huge page memory is available when SAP ASE is booted. Otherwise, SAP ASE uses normal memory (default)
- `enable HugePages = 1` – SAP ASE will not use huge pages
- `enable HugePages = 2` – SAP ASE will use huge pages, provided that enough huge page memory is available when SAP ASE is booted. Otherwise, SAP ASE will not start.

If you want to use of huge pages, we recommend that you set `enable HugePages` to 2. This avoids the following configuration pitfall. When booting, SAP ASE attempts to use all configured shared memory in a single memory allocation. If huge pages are under-configured, it is forced to use normal-sized memory pages instead of huge pages. Since huge pages are locked in memory and can only be used by processes that request them, the amount of memory in huge pages that SAP ASE would have used is now unavailable for most applications. In addition, SAP ASE uses normal memory for which these applications also compete. This can lead to excessive swapping, performance problems, and system instability.

You can check the configuration of huge pages, using the following command:

```
$ cat /proc/meminfo
MemTotal:      529182764 kB
MemFree:       418712 kB
Buffers:       30528 kB
Cached:       74129068 kB
SwapCached:   2666984 kB
...
HugePages Total: 38771
HugePages Free: 38771
HugePages_Rsvd: 0
HugePages_Surp: 0
Hugepagesize: 2048 kB
...
```

The output above shows only 38771 2MB huge pages of 2048 kB size, which are available for a total of 77542MB (or ~75GB). This would not be enough to restart SAP ASE, if it was configured for 350GB.

When SAP ASE is configured to use huge pages, you can set the SAP ASE parameter `lock shared memory` to 0, as huge pages are locked in physical memory. This improves the SAP ASE startup time.

## 12.2.3 Network Configuration and Tuning

Due to unknown hardware at installation time, the core network configurations and tuning for Linux is minimal due to the amount of memory necessary which may not be available in small footprint environments. Because of the high amount of network traffic between SAP applications and the DBMS or between the SAP clients and the central instance server, we strongly recommend tuning the network. Like IO tuning, some of the configurations are changed in the OS kernel and others require changing the network device.

- Check whether TCP send/receive buffers (`net.core.rmem_max`, `net.core.wmem_max`, `net.ipv4.tcp_wmem`, `net.ipv4.tcp_rmem`, etc.) are large enough to support SAP ASE requirements. The defaults of 1MB are likely too small and a better starting position might be 16MB or higher.
- Consider increasing the length of the processor receive queue (`net.core.netdev_max_backlog = 30000`), as well as the transmit queue (`ifconfig <eth#> txqueuelen <value>`). For the latter, a value of 10000 is suggested as a starting point for 10GbE.

## 12.3 Configuration for HP-UX

For more information, see the following SAP Notes:

- SAP Note [837670](#): *Minimum OS patch recommendations for HP-UX*
- SAP Note [172747](#): *SAP on HP-UX: OS kernel parameter recommendations* and supplement with the file system cache tuning referenced in SAP Note [1077887](#).

## 12.4 Configuration for AIX

For SAP ASE specific tuning on IBM AIX, see the white paper [Optimizing SAP Sybase Adaptive Server Enterprise \(ASE\) for IBM AIX](#). This paper discusses many topics that are common to IBM Power series server configurations and OS considerations including LPARs, Virtualized IO Servers (vios) and other aspects that may differ from site to site.

In addition to the topics mentioned in the paper, if the SAP installation includes the HADR solution with RMA and SAP Replication Server (SRS) you must add the following environment variable settings to the appropriate SRS RUNSERVER file on the hosts where SRS is running:

```
export AIXTHREAD_MUTEX_FAST="ON"
export YIEDLOOPTIME=0
export SPINLOOPTIME=500
export MALLOCOPTIONS="threadcache, multiheap:8, considersize"
```

### Note

The `multiheap:8` is an example of creating 8 buckets. The actual number of buckets you should use depends on the number of threads SRS is using, which can be closely approximated by the number of inbound and outbound connections. For most SAP installations, there are only connections for the master database and SID database as well as the RSSD and route queue for local topology - for a total of 4. For the remote topology, the SRS has both inbound and outbound connections for each database plus the RSSD for 5 connections. Consequently, the minimum value that should be used is 4, but 8 might be a better starting point. The maximum value is 32. Note that increasing the number of heap memory buckets may increase the process size in the operating systems as each heap memory allocation pool has a minimum size. Therefore, increasing beyond what is needed may cause the SRS process size to be much larger than the SRS memory configuration values might suggest.

## 12.5 Configuration for Oracle Solaris

For more information about how to use the ZFS file system for database data and log devices, see SAP Note [2300958](#) - *ZFS Certification of SAP ASE 16.0 and Sybase ASE 15.7 on Oracle Solaris 11*.

# 13 Basic SAP Runtime Configuration

After the SAP system installation (or migration), before you can release the system to runtime users, the following SAP-related configurations should be performed.

## 13.1 SAP Profile Parameters

There are some database platform-related SAP profile parameters that can negatively influence the performance of SAP ASE and should therefore be set as described in SAP Note [1996340](#).

In addition, consider tuning the number of cached statements used by SAP work processes (`dbb/dbb/syb/cache_size`) to 300 as per SAP Note [1954245](#). For more information, see also the section [Configuring Statement and Procedure Cache](#) [page 148].

## 13.2 Configure DBA Cockpit

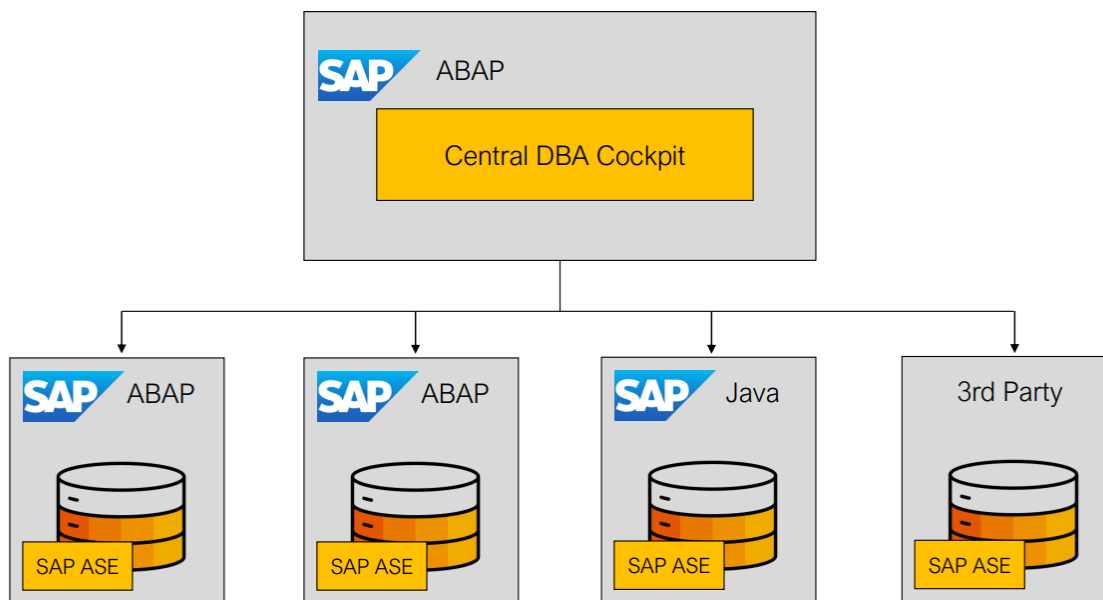
Enable the WebDynpro services required for DBA Cockpit by following the steps described in SAP Note [1245200](#).

Apply the DBA Cockpit patch collection notes according the SAP Basis version of your system:

- SAP Note [1558958](#): SYB: DBA Cockpit Correction Collection SAP Basis 7.02 / 7.3
- SAP Note [1619967](#): SYB: DBA Cockpit Correction Collection SAP Basis 7.31
- SAP Note [1882376](#): SYB: DBA Cockpit Correction Collection SAP Basis 7.4
- SAP Note [2293673](#): SYB: DBA Cockpit Correction Collection SAP Basis 7.5
- SAP Note [2380028](#): SYB: DBA Cockpit Correction Collection SAP Basis 7.51

Consider importing a recent Support Package that is available for the corresponding SAP Basis release and offers more functions in the DBA Cockpit.

As an alternative, you can use a sandbox system, update it to the latest Support Package available for the respective SAP Basis release, and use it as a central DBA Cockpit for your SAP ASE landscape:



## 13.2.1 Set Up Automatic Table Maintenance

A key aspect of DBA Cockpit is to enable Automatic Table Maintenance (ATM). ATM takes care of updating table statistics if the amount of data changed in tables passes a defined threshold. This is important to ensure stable query response times in your SAP system. In addition, ATM evaluates fragmentation of tables and indexes and schedules reorganization if needed.

ATM comes with a default set of maintenance windows and profiles, but you can also customize ATM. For more information about ATM, see the SAP ASE Learning Journey [Administration and Monitoring](#) and the SAP Community [DBA Cockpit: Automatic Table Maintenance for SAP Adaptive Server Enterprise](#).

## 13.2.2 Configure DBA Cockpit Data Collectors

DBA Cockpit for SAP ASE uses a separate database named `saptools` to store DBA Cockpit metadata as well as SAP ASE performance and space metrics. Data collections are scheduled periodically through the SAP ASE built-in job scheduler.

The default data collection configuration schedules metrics collection once an hour and limits the metrics retention to 14 days. This may not be sufficient enough if you wish to compare end-of-month or end-of-quarter report processing. Also, you may want to have more granular data collection intervals for especially the performance related data collectors (for example once every 5 minutes). Review the default data collection configuration and adjust it according to your needs. In addition, you may want to save the adjusted

configuration into a named template so it is easier to transfer it to other SAP ASE servers attached to the DBA Cockpit.

DB Server: lddboyx
DB Release: 16.0.03.12
Started: 27.05.2023 17:19:03
Uptime: 68 Days
Last Refresh: 04.08.2023 12:39:18

**Data Collectors and Admin Procedures**

Back-end automatic update is disabled. [Change](#)

Task Scheduler: ASE Baldr Job Scheduler Wrapper

Owner: Baldr Configuration owned by Y13

Message Level: Info [Change](#)

Baldr Version: 2023-07-03 17:12:28

[Transfer Ownership](#)

Object	Object Type	Collection Interval	Available Days	Days Kept in History	Size on Disk (MB)	Errors	Warnings
<input type="radio"/> Framework	Framework Cleanup (Logs/Statistics)	Daily		14	14	30	0
<input type="radio"/> Automatic Table Maintenance	SAP Admin Procedure						0
<input type="radio"/> Compression Advisor	SAP Admin Procedure						0
<input type="radio"/> Configuration Check	SAP Admin Procedure						0
<input type="radio"/> Database Dump	SAP Admin Procedure						0
<input type="radio"/> Log Threshold	SAP Admin Procedure						0
<input type="radio"/> Reorganisation	SAP Admin Procedure						0
<input type="radio"/> Schedules and Configurations	SAP Admin Procedure						0
<input type="radio"/> Transaction Dump	SAP Admin Procedure						0
<input type="radio"/> Update Statistics	SAP Admin Procedure						0
<input type="radio"/> ASE Instance	SAP Data Collection	15 Minutes		13	14	1	0
<input type="radio"/> ASE Resources	SAP Data Collection	1 Hour		13	14	3	0
<input type="radio"/> Alert Collector	SAP Data Collection	15 Minutes		13	14	50	0
<input type="radio"/> Data Cache Objects	SAP Data Collection	1 Hour		13	14	14	0
<input type="radio"/> Data Cache Usage	SAP Data Collection	10 Minutes		13	14	2	0
<input type="radio"/> Deadlocks and Lock-Timeouts	SAP Data Collection	15 Minutes		0	14	1	0
<input type="radio"/> Devices	SAP Data Collection	1 Hour		360	360	46	0
<input type="radio"/> Error Log	SAP Data Collection	5 Minutes		13	14	28	0
<input type="radio"/> File Systems	SAP Data Collection	1 Hour		13	14	1	0
<input type="radio"/> HA/DR Error Log	SAP Data Collection	Not scheduled		0	14	1	0
<input type="radio"/> HA/DR Paths	SAP Data Collection	Not scheduled		0	14	2	0
<input type="radio"/> HA/DR Replication Agents	SAP Data Collection	Not scheduled		0	14	1	0
<input type="radio"/> HA/DR Resources	SAP Data Collection	Not scheduled		0	14	1	0
<input type="radio"/> I/O Controllers	SAP Data Collection	1 Hour		13	14	1	0
<input type="radio"/> IMRS Caches	SAP Data Collection	Not scheduled		98	14	2	0
<input type="radio"/> Indexes	SAP Data Collection	12 Hours		89	90	1,677	0
<input type="radio"/> Memory Usage	SAP Data Collection	1 Hour		27	28	15	0
<input type="radio"/> Non-Volatile Caches	SAP Data Collection	30 Minutes		4	14	1	0
<input type="radio"/> Proc. Cache Usage	SAP Data Collection	1 Hour		13	14	2	0
<input type="radio"/> Resource Limits	SAP Data Collection	15 Minutes		0	14	2	0
<input type="radio"/> Spindlocks	SAP Data Collection	1 Hour		13	14	22	0
<input type="radio"/> Statement Cache	SAP Data Collection	30 Minutes		13	14	112	0
<input type="radio"/> Statement Cache Usage	SAP Data Collection	1 Hour		13	14	1	0
<input type="radio"/> System Load	SAP Data Collection	1 Hour		13	14	7	0
<input type="radio"/> System Time Breakdown	SAP Data Collection	1 Hour		13	14	3	0
<input type="radio"/> Tables	SAP Data Collection	12 Hours		359	360	1,329	0
<input type="radio"/> Temp. DB Activity	SAP Data Collection	1 Hour		13	14	1	0
<input type="radio"/> Threads	SAP Data Collection	15 Minutes		13	14	5	0
<input type="radio"/> Transaction Log Usage	SAP Data Collection	1 Hour		13	14	1	0

The default `saptool`s database size is 2 GB data and 200MB log. If increasing granularity of data collection or extending the retention periods, you must increase the `saptool`s database size. For medium or large setups, SAP recommends to initially resize the `saptool`s database to 10GB data and 1GB log.



# 14 Basic SAP ASE Runtime Configuration

After the SAP system installation (or migration), before you can release the system to runtime users, you should perform the following SAP ASE related configurations.

## 14.1 Mandatory Settings

Some of the mandatory or recommended configuration settings are not set by the installer. Make sure SAP ASE is configured according to SAP Note [1539124](#) before you continue. You should check the following SAP Notes depending on the SAP ASE version you are using:

- SAP ASE 15.7: SAP Note [1749935](#)
- SAP ASE 16.0: SAP Note [1581695](#)

In these notes there are Recommended [REC] and Required [REQ] configuration parameters. Double check the required [REQ] configuration parameters to make sure that none are set to an unsupported value.

### Note

Recent versions of DBA Cockpit for SAP ASE include an automatic check of these parameters. For more information, see SAP Note [1956005](#).

## 14.2 SAP ASE Sizing

During setup time, some of the memory and CPU resources were configured to be more optimal for the data load and index creation processes. These settings need to be reviewed and optimized for a production runtime environment.

The following examples are for system sizes and recommended SAP ASE configurations for SAP Business Suite systems:

Configuration	Tiny	Small	Medium	Large	Extra Large
Rough DB Size	<512 GB	<1 TB	1-3TB	~5TB	10TB+
SAP ASE Engines / User Threads	2	2-4	4-10	12-18	24+

Configuration	Tiny	Small	Medium	Large	Extra Large
SAP ASE Total Memory	8-16GB	16-32GB	64-128GB	256-384GB	512GB
Locks	1,000,000	1,500,000	5,000,000	10,000,000	15,000,000+
Procedure Cache	1GB	2GB	4GB	8GB	16GB
Statement Cache	512MB	0.5-1GB	1-2GB	2-4GB	5GB
Log Cache	256MB	512MB	1GB	1-2GB	2-4GB
System Tables Cache	64MB	64MB	128MB	256MB	512MB
Queue Cache	(none)	256MB	512MB	1GB	2GB
Temp. DB Cache	(none)	512MB	1GB	1GB	2GB
saptempdb size	32GB	64GB	64-128GB	150GB	200GB
saptools size	5GB	10GB	10GB	20GB	20GB

The following table shows examples of system sizes and recommended SAP ASE configurations for SAP BW:

Configuration	Tiny	Small	Medium	Large	Extra Large
Rough DB Size	<512 GB	<1 TB	1-3TB	~5TB	10TB+
SAP ASE Engines / User Threads	4-8	10-16	12-24	24+	24+
SAP ASE Total Memory	16-32GB	32-128GB	128-256GB	256-512GB	512GB
Locks	2,500,000	5,000,000	7,500,500	10,000,000	15,000,000+
Procedure Cache	1-2GB	2-4GB	4-8GB	8-16GB	16GB
Statement Cache	512MB	512MB	0.5-1GB	1-2GB	5GB
Log Cache	256MB	512MB	1GB	1-2GB	2-4GB
System Tables Cache	64MB	64MB	128MB	256MB	512MB
Queue Cache	(none)	256MB	512MB	1GB	2GB
Temp. DB Cache	(none)	1GB	2GB	4GB	2GB
saptempdb size	32GB	64GB	128GB	150GB	200GB

Configuration	Tiny	Small	Medium	Large	Extra Large
saptools size	5GB	10GB	10GB	20GB	20GB

While the values in the table above are a good starting point, all memory pools need to be carefully monitored and adjusted to the specific workload patterns of your system.

The focus areas for SAP Business Suite systems are:

- Statement cache size, which may need additional tuning depending on the average number of active SAP work processes and depending on the number and types of SAP Business Suite scenarios operated on the system.
- Number of locks, which may need additional tuning depending on the lock consumption caused by Z-programs. Z-programs may also need to be adjusted to reduce the number of locks acquired within a single database transaction.

The focus areas for SAP BW systems are:

- Number of user threads / SAP ASE engines, which may need additional tuning depending on the number of concurrent SAP BW users and the size of the largest tables (option for increased parallelism of scans).
- Number of locks, which may need additional tuning if data loads involve large packages.

## 14.2.1 Shrinking SAP ASE Memory

Additional memory may have been granted to SAP ASE during database migration to speed up the data load and index creation process, while during runtime not all of this memory is planned to be used by SAP ASE. In addition, you may wish to have some spare memory for minor cache adjustments during production, or you are planning to configure other named caches as described in section [Advanced SAP ASE Runtime Configuration \[page 157\]](#)

In either case, you need to shrink SAP ASE's memory footprint initially. While reconfiguring available memory is dynamic, shrinking memory pools almost always requires a reboot of the SAP ASE server.

Let us assume a total of 110GB being granted to SAP ASE during migration, while only 80GB are planned for the runtime. The main memory consumers in an SAP ASE server are default data cache and procedure cache. We therefore shrink these memory pools along with the SAP ASE total memory before we restart the SAP ASE server and reconfiguring these and other memory pools.

```
use master
go
-- Calculate the amount of memory allocated and used by ASE
select cast(sc.name as varchar(30)) as name, (scc.value*2/1024) as MB from
sysconfigures sc, syscurconfigs scc
where sc.name like 'total%memory' and sc.config = scc.config
go
name                                MB
-----
total logical memory                109284
total physical memory               112568
-- Reduce procedure cache to about half of its current size
-- (to be reconfigured later on)
exec sp_configure 'procedure cache size', 0, '5G'
go
```

```
-- Reduce default data cache to about half of its current size, and adjust
-- large IO pool and wash marker settings as a prerequisite
-- (to be reconfigured later on)
exec sp_poolconfig 'default data cache', '16K', 'wash=5G'
exec sp_poolconfig 'default data cache', '128K', 'wash=5G'
exec sp_poolconfig 'default data cache', '20G', '128K'
exec sp_cacheconfig 'default data cache', '40G'
go
-- As above reconfiguration is not dynamic, we are not allowed to reduce the
-- 'max memory' parameter while ASE is still
online
shutdown
go
```

After the SAP ASE server has shutdown, find the SAP ASE configuration file <SID>.cfg in the SAP ASE installation directory. Edit the file and search for the following section:

```
[Physical Memory]
max memory = 57671680
enable HugePages = DEFAULT
```

If 80GB is the target memory to be used by SAP ASE, adjust the max memory parameter to  $80\text{GB} * 1024 = 81920 \text{ MB} * 512 = 41943040$  2KB SAP ASE memory pages. Save the changes made and restart SAP ASE before continuing with the following sections.

## 14.2.2 Configuring Statement and Procedure Cache

Properly tuning procedure and statement caches is extremely critical for SAP systems. If either is undersized appreciably, it could result in significant CPU spikes or saturation as a result of procedure cache spinlock contention, resulting in periods of debilitating performance degradation.

Despite its name, the procedure cache is not only used to execute stored procedures. It is general purpose memory area used for all kind of memory requirements in SAP ASE.

It is divided into an engine local (ELC) and a global part. The ELC is only used by a SAP ASE engine, so that no expensive memory lock operations are required to serialize access to it. This saves CPU cycles. The global part is used by all engines and therefore requires access under spinlocks protection.

The amount of engine local vs. global procedure cache is determined at SAP ASE startup by the following parameters:

- Engine local cache percent, default is 50 percent
- Max online engines
- Procedure cache size

At startup, each engine gets a chunk of memory for the engine local cache, which is determined by the following formula:

```
((procedure cache size)*(engine local cache percent))/(max online engines))
```

This is fixed after startup. If parameter `max online engines` are large and `procedure cache size` is comparatively small, then each ELC is tiny. This leads to excessive use of the global part of the procedure cache and can cause spinlock contention issues on spinlock `rproccache_spin`. Furthermore, ELC memory in the procedure cache is reserved for all engines that might be online, even for engines that are not online. This reserved ELC memory in the procedure cache is unused.

To avoid this pitfall, we recommend:

- Do not set `max online engines` much higher than what you plan to use.
- Ensure procedure cache is large enough at SAP ASE startup.
- Consider increasing `engine local cache percent` on systems with a large value for `max online engines` when memory is given.

The right value for the size of ELC per engine depends a bit on the system load - but we recommend that you start with a value in the range of 100MB - 400MB per engine. For larger systems, you should set the memory to a higher value if memory is given. However, make sure that you do not starve the global part of the procedure cache by setting `engine local cache percent` to a very high value.

Example:

`Max online engines` are set to 48. The actual number of threads in thread pool `syb_default_pool` is 16. `Engine local cache percent` is set to the default 50. The `procedure cache size` is set to 10485760 (2k memory pages), that is 20480MB.

SAP ASE sets  $20480M * 0.5 = 10240M$  aside for the engine local cache. ELC per engine is  $10240M / 48$ , roughly 213M, which is a good starting point. However, some 6827M of the procedure cache is reserved for ELC but unused. In this case, we would reduce the value of `max online engines`. If `max online engines` is reduced to 24, then ELC per engine is about 427M. The configuration still allows increasing the number of engines by 1.5 fold, if there is an extraordinary demand for CPU resources. Reserved but unused memory in procedure cache would be reduced to 3413M. The global part of the procedure cache remains at 50% (10240MB).

During regular operation of an SAP system, the number of concurrent maintenance operations such as statistics updates or index creations are small. However, SAP utilizes the statement cache extensively, making the procedure and statement cache size one of the more critical configuration components.

An important point is that the prepared statement cache local to each SAP work process may need to be adjusted. For more information, see SAP Note [1954245](#). If you are using an SAP ASE database shared library (DBSL) older than listed in SAP Note [1909273](#), the DBSL uses a default of 2000 statements cached per work process, so reducing this cache to 300 is key.

Assuming a total of 80GB physical memory reserved for SAP ASE, we would start with a 4GB procedure cache and a 1GB statement cache according the *Medium* t-shirt size for SAP Business Suite systems:

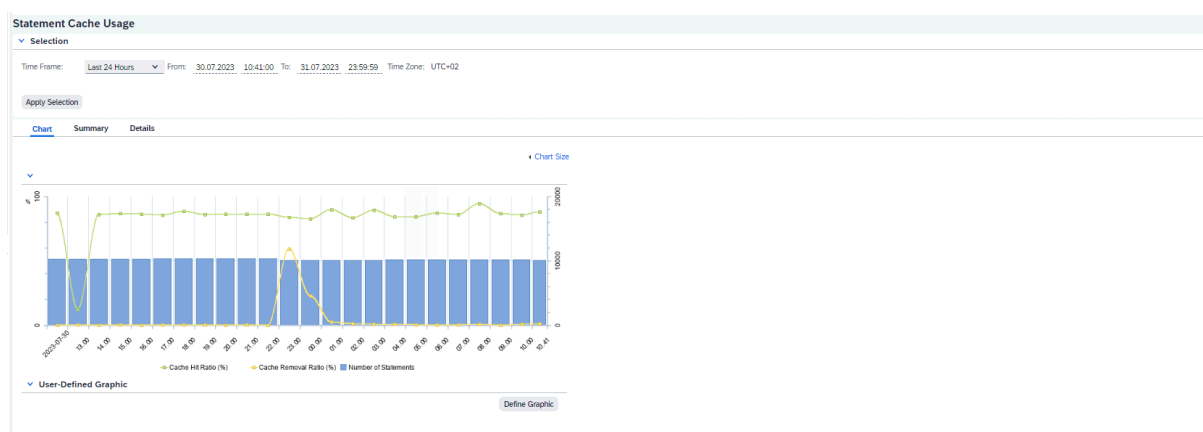
```
-- Procedure cache is the main working memory of ASE. It is used for query
-- compilation, small sorts and work tables, LOB locators, hash joins and it also
-- holds all cached query plans.
exec sp_configure 'procedure cache size', 0, '4G'
go
-- Statement cache is a portion of procedure cache reserved for cached query
-- plans.
-- It must be at least 256MB in size and should be increased if the number of
-- query
-- recompiles caused by plan flushes is high.
exec sp_configure 'statement cache size', 0, '1G'
go
-- Sort buffers are used for in-memory sorting. Limit the number of sort buffers
-- available for a single sort to around 2500. This corresponds to a maximum of
-- 256MB a single sort can consume from data cache for in-memory sorting. If your
-- system workload involves very large sort operations, increasing this number
-- can
-- help improving sort performance.
exec sp_configure 'number of sort buffers', 2500
go
```

Note that the total amount of memory used for procedure cache will still be about 4GB - however, 1GB of the procedure cache will be reserved for the statement cache.

A typical system has a ratio of procedure cache to statement cache of at least 4:1. A lower ratio, such as 2:1 for procedure cache to statement cache, may benefit in some use cases, but higher ratios above 4:1 are likely to cause problems.

Also, note that the above are starting configurations. The actual statement cache size required depends on several factors such as the number of concurrent users and the transaction rate in the system.

Once in production, monitor the statement cache using DBA Cockpit. Navigate to ► [Performance](#) ► [Memory Pools](#) ► [Statement Cache Usage](#) ►:



Ideally, you do not want the Cache Hit Ratio to be less than 90% in average, but an even better metric is to make sure that the statement turnover does not exceed 10% of the total number of statements. This is difficult to see in the above default graph provided by DBA Cockpit. You can however create a user defined graph.

Using the earlier graph, there are approximately 14000 statements total in the cache. In the above graph we can see that at one-point 2000 of the statements were replaced. If it was a one-time occurrence, there would be no need for further tuning. However, if it happens frequently, since 2000 is much higher than 10% of the total of 14000, you would want to increase the statement cache size. Given that 2000 is roughly 15% of the statements, we would start by increasing the statement cache by about 15% and continue monitoring.

## 14.2.3 Configuring User Connections

During the load phase, likely the number of user connections were set just high enough to support the concurrent load streams. Prior to runtime, the number of user connections needs to be set to 4 times the number of SAP work processes across all the SAP application server instances that will be connecting to SAP ASE.

```
use master
go
-- Many SAP applications open temporary secondary database connections to issue
-- a second database transaction independent of the main business transaction
-- (e.g.
-- number range buffer). Also, the DBSL for SAP Sybase ASE opens two ASE
-- connections for each SAP application connection (different isolation levels).
-- You need to reserve sufficient user connections in ASE.
```

```
exec sp_configure 'number of user connections', [total number of SAP WPs * 4]
go
```

One consideration is preventing user connections while the database is in recovery. There are two methods for doing this. The first is to disable logins (except `sa_role` role logins) via the configuration:

```
use master
go
exec sp_configure 'enable logins during recovery', 0
go
```

The alternative and recommended method is to use the configurable database recovery order and hard bindings to `saptempdb` to prevent logins until the SID database is online - and force `saptempdb` to be the last database online using a script like:

```
use master
go
-- Enforce a database recovery order that ensures the hard binding prohibits user
-- logins until all the databases are recovered.
exec sp_dbrecovery_order 'saptools', 1, null, strict
exec sp_dbrecovery_order '<SID>', 2, null, strict
exec sp_dbrecovery_order 'saptempdb', 3, null, strict
go
```

## 14.2.4 Configuring SAP ASE Threads and Parallel Processing

### 14.2.4.1 Max Online Engines

The configuration parameter `max online engines` controls the maximum number of SAP ASE query engines in the default and any user defined thread pools that can be brought online. We recommend that you set the `max online engines` no higher than the number of physical cores.

Due to its effect on memory distribution in the procedure cache, we recommend that you set `max online engines` not much higher than the number of engines you plan to use. For more information, see section [Configuring Statement and Procedure Cache \[page 148\]](#).

Specific tuning recommendations are available in the joint IBM & SAP whitepaper on tuning SAP ASE for AIX.

### 14.2.4.2 Thread Pool Sizing

SAP ASE works best with fewer QP engines running at a higher utilization than with many mostly idle engines. As a result, while it might be tempting to simply configure SAP ASE for the maximum engines, this can result in worse performance than a smaller configuration.

In addition to the SAP ASE query engines, there are several other threads performing network tasks and disk tasks for SAP ASE that can leverage the threads not used for query engines. In addition, the worker processes

for the SAP Central Instance require CPU cycles - in fact, most of the time, SAP worker processes need more CPU resources on the DBMS host than the SAP ASE instance itself.

Experience has shown that configuring SAP ASE to only 30-40% of the maximum is likely a good starting point for most SAP systems having a co-located SAP Central Instance.

### 14.2.4.3 Thread Pool Idle Timeout

The thread pool idle timeout controls how long an SAP ASE engine is idle before it yields the CPU to the operating system. Once yielded to the OS, it takes longer for SAP ASE to wake up the engine to respond to network activity such as new queries arriving, so a longer idle timeout increases the responsiveness of the system. However, if the engines are idle, there is extensive contention on the run queue spinlock as the engines spin looking for work. Consequently, while running with a longer idle timeout may be best from a response time perspective, it might be better to use a shorter timeout to avoid issues with largely idle engines - especially on larger hosts - and especially on development/test systems in which functional tests may not have high concurrency.

### 14.2.4.4 Example Configurations

In our earlier example, we discussed a 32-core host. In a runtime configuration, we may be hosting a SAP Central Instance on this host and want to limit SAP ASE to 16 engines. This can be achieved using a script like:

```
use master
go
alter thread pool syb_default_pool with thread count = 16, idle timeout = 250
go
-- increase number of IO threads on Linux/UNIX
if( @@version not like '%Windows%' )
begin
    exec sp_configure 'number of network tasks', 4
    exec sp_configure 'number of disk tasks', 2
end
go
```

We also used parallel processing during the loading process to speed up index creation. For SAP ERP (or non-BW) systems, you probably want to deactivate parallel processing for queries while allowing parallel worker processes for maintenance activities.

```
use master
go
-- disable parallel processing for queries
exec sp_configure 'max scan parallel degree', 1
go
-- limit parallel degree of maintenance activities to 10
exec sp_configure 'max utility parallel degree', 10
go
-- resize the worker process pool to support about 2-3 maintenance activities
-- making use of worker threads
exec sp_configure 'number of worker processes', 30
go
-- set max parallel degree to max of scan and utility parallel degree
exec sp_configure 'max parallel degree', 10
```



```
go
```

The following paragraph is relevant for SAP BW systems only:

SAP ASE 16.0 SPO1 and higher allows parallel processing for SAP BW queries. While SAP BW benchmarks have shown that SAP ASE scales very well up to a parallel degree of 10, we recommend starting with a parallel degree of 4 (=default) and increase it as needed.

The SQL code generation for SAP BW queries adds an SAP Note with the desired degree of parallelism at the end of the statement. You get notes like this in ST05 SQL traces, the statement cache, or when you display the SQL query in the query monitor (/nRSRT):

```
plan '...(parallel 4) (prop ... (parallel 4))...'
```

SAP ASE decides at execution time whether the parallel degree of the hint is less than or equal to the value of the configuration parameter *max query parallel degree*. If it is higher, SAP ASE limits the parallel degree to the value in the configuration parameter.

The default value of 4 of the parallel hint can be changed with an RSADMIN parameter; use report SAP\_RSADMIN\_MAINTAIN to set a new VALUE for OBJECT= SYBASE\_RSDRS\_PARALLEL\_DEGREE. The health check report RSSYBDBVERSION can be used to display the actual value of SYBASE\_RSDRS\_PARALLEL\_DEGREE, if set.

```
use master
go
-- limit parallel degree for plan hints (as BW uses them) to 6
exec sp_configure 'max query parallel degree', 6
go
-- limit parallel degree for hash-based parallel queries to 4 and
-- limit hash-based parallel scans to tables above ~155MB in size
exec sp_configure 'max scan parallel degree', 4
exec sp_configure 'min pages for parallel scan', 10000
go
-- tell ASE to compile serial plan, and make parallel decision and degree at
-- execution time - this gives faster plan compilation times and more robust
-- plan choice
exec sp_configure 'enable deferred parallel', 1
go
-- limit parallel degree of maintenance activities to 10
exec sp_configure 'max utility parallel degree', 10
go
-- resize the worker process pool to support about
-- 2-3 maintenance activities
-- plus a reasonable amount of parallel queries
exec sp_configure 'number of worker processes', 100
go
-- set max parallel degree to max of scan and utility parallel degree
exec sp_configure 'max parallel degree', 1
go
```

## 14.2.5 Configuring the Default Data Cache

During the setup or migration process, the default data cache was configured with an even distribution of memory between the default and large IO pools, and with a wash marker that caused aggressive IO scheduling.

In a production runtime configuration, we need to distinguish between OLAP and OLTP systems:

- OLAP

For SAP BW systems with OLAP workload, two basic configurations can be used:

- Configure the whole data cache with 16K I/O pools. It is assumed that a considerable part of the data resides in the data cache. The configuration is designed for efficient data caching and improves the performance if the system has a large memory and relatively small fact and ODSO tables.
- Configure 80-90% of the data cache with 128K I/O pools and the remaining part with 16K I/O pools. This configuration with big data cache pools improves the performance when working on large data and relatively small memory configuration. If you expect a lot of disk reads, this configuration can be 20-30% faster than using 16K pools.

- OLTP

The typical OLTP configuration consists of 10-20% 128K I/O pools and smaller I/O pools for the remaining part. Such a configuration favors 128K reads on large fact tables and results on high turnover on a 128K data cache with a low caching ratio and a high number of disk reads. On modern systems the ratio between cold cache access (reads from disk) and warm cache access (reads from in-memory data cache) can be significant. Reading from memory can be up to 150 times faster than reading from disk. Configure the data cache as large as possible to achieve good performance in SAP BW systems.

For SAP Business Suite systems with an OLTP workload, very large index or table scans are not expected and not desired. Therefore, we segment the major data cache to allow both single page and large IO scans of usually small to medium size.

In both cases, the wash marker should be at approximately 10% of the pool size to cause less aggressive IO scheduling. As an example for SAP Business Suite systems with OLTP configuration, the following configuration assumes a total of 80GB physical memory reserved for SAP ASE, which would leave a total of around 62GB for data caches.

```
use master
go
-- Calculate the amount of remaining memory to re-increase the default data
cache
select cast(sc.name as varchar(30)) as name, (scc.value*2/1024) as MB
  from sysconfigures sc, syscurconfigs scc
  where sc.name like 'total%memory' and sc.config = scc.config
go
-- Increase the default data cache size to its new size
exec sp_cacheconfig 'default data cache', '62G'
go
-- Resize the 128K pool to achieve a 80:20 split
exec sp_poolconfig 'default data cache', '12G', '128K'
go
-- Shrink the wash markers in each pool to about 5-10% of the new pool sizes
exec sp_poolconfig 'default data cache', '16K', 'wash=5G'
exec sp_poolconfig 'default data cache', '128K', 'wash=1200M'
go
-- Partition default data cache to reduce spinlock contention. The general rule
is:
-- cache partitions >= number of threads in syb_default_pool, but being within
-- 8, 16, 32 or 64):
exec sp_cacheconfig 'default data cache', 'cache_partition=16'
go
-- Configure APF ratio of 10% for any cache in the system
exec sp_configure 'global async prefetch limit', 10
go
```

Same example for an SAP BW system with OLAP workload:

```
use master
go
```

```
-- Calculate the amount of remaining memory to re-increase the default data
cache
select cast(sc.name as varchar(30)) as name, (scc.value*2/1024) as MB
  from sysconfigures sc, syscurconfigs scc
  where sc.name like 'total%memory' and sc.config = scc.config
go
-- Increase the default data cache size to its new size
exec sp_cacheconfig 'default data cache', '62G'
go
-- Shrink the wash marker of the 16K pool to about 5-10% of the new pool size
exec sp_poolconfig 'default data cache', '16K', 'wash=5G'
go
-- Partition default data cache to reduce spinlock contention. The general rule
is:
-- cache partitions >= number of threads in syb_default_pool, but being within
-- 8, 16, 32 or 64):
exec sp_cacheconfig 'default data cache', 'cache_partition=16'
go
-- Configure APF ratio of 10% for any cache in the system
exec sp_configure 'global async prefetch limit', 10
go
```

At this point, SAP ASE should print informational messages describing what it was able to accomplish online. If large portions of the SAP ASE memory are already in use, you must reboot SAP ASE to ensure all changes become active.

This can be made more dynamic through a script. See [Dynamic Cache Sizing \[page 169\]](#) in the appendix of this document (don't forget to set `@mode = 'runtime'` before executing the script!).

## 14.3 Adding a Loopback Entry to SAP ASE Interfaces

When it boots, the SAP ASE server interrogates the interfaces (`interfaces` file in Linux/UNIX and `sql.ini` file in MS Windows) for the corresponding server entry. Once the server entry is located, SAP ASE scans for *master* entries and attempt to start network socket listeners using the hostname, port numbers, and network driver listed. If multiple *master* lines are found, multiple listeners are created. By default, installation creates a single *master* and *query* line for the server entry using the hostname like the following below:

```
SID
  master tcp ether hostname.domain.com 4901
  query tcp ether hostname.domain.com 4901
```

We recommend adding a loopback entry at 127.0.0.1 to the file as shown below. Note that the IP address is specified instead of `loopback` or `localhost`, and that the entry is at the top of the list.

```
SID
  master tcp ether 127.0.0.1 4901
  query tcp ether 127.0.0.1 4901
  master tcp ether hostname.domain.com 4901
  query tcp ether hostname.domain.com 4901
```

Normally, clients not using LDAP use the file `interfaces/sql.ini` to locate the server connecting to SAP ASE. It tries to connect using the information in the first query line found for the requested server name. If this fails, it attempts to connect using the information for the second (or subsequent) query lines. Attempting to connect may require resolving the DNS hostname. If the server is allowed to listen on 127.0.0.1, any local client

can connect, regardless of whether the DNS service is unavailable or whether the network interface card has failed.

## 14.4 Modifying OCS.CFG for Third Party Compatibility

The default installation for SAP sets the configuration `net password encryption reqd` to `1`, forcing users to connect using connection properties that ensure the password for the connection is sent encrypted vs. clear text. Unfortunately, some 3rd party tools, such as database backup utilities, may not support this option. Rather than leaving the configuration at `0`, an alternative is to modify the `ocs.cfg`. (`$SYBASE/$SYBASE_OCS/config/ocs.cfg` or `%SYBASE%\%SYBASE_OCS\ini\ocs.cfg`) for the program name. For example, assume we have a database backup utility that simply calls `isql`, a good `ocs.cfg` would be:

```
; This is the external configuration definition file.
;
[DEFAULT]
; This is the default section loaded by applications that use
; the external configuration (CS_EXTERNAL_CONFIG) feature, but
; which do not specify their own application name (CS_APPNAME).
; Initially this section is empty - defaults from all properties
; will be the same as earlier releases of Open

[isql]
CS_SEC_ENCRYPTION = CS_TRUE
CS_OPT_QUOTED_IDENT = CS_TRUE
```

The result is that not only password encryption is enabled for 3rd party tools, but also quoted identifiers. For database backup utilities, this might not be important, but for utilities that operate at the table, column, or object level, it might be necessary.

# 15 Advanced SAP ASE Runtime Configuration

The basic SAP ASE runtime configuration outlined in the preceding chapter is not optimal for larger business critical systems. These systems need some additional tuning and optimization based on workload. While the exact tuning and optimization is largely site specific, this section contains several generic advanced configurations that are likely to be suitable for many installations.

## 15.1 Log and Other Named Caches

For performance reasons, it is best to have a few named caches to ensure that critical tables are always retained in memory. For SAP ASE, this includes the transaction log of mission critical databases as well as key system tables. In addition, known application volatile tables such as the SAP queue tables should also have a separate cache to improve I/O performance. See also SAP Note [1724091](#).

```
use master
go
-- reduce default data cache to create a room for named caches. For example,
-- if we earlier had a 62GB default cache and now want to reduce to 40GB
-- to make room to create other caches (and then re-increase this to fill the
space)
exec sp_cacheconfig 'default data cache', '40G'
go
-- stop and restart ASE
shutdown
go
```

When shrinking a data cache, a reboot of your SAP ASE is required before memory is released for creation of other named data caches. In addition to the named data cache for the transaction log, it is suggested to increase log IO size from 16K to 32K as well as ensuring the user log cache configuration is an even multiple of the log IO size.

```
use master
go
set quoted_identifier on
go
-- Create a separate 32K log cache (no cache partitions!),
-- size = 512MB minimum to 1024MB maximum
-- for the 4K pool as a starting configuration (to be increased or decreased as
-- necessary based on post-migration monitoring).
exec sp_cacheconfig 'log_cache', '1280M', 'logonly', 'strict',
'cache_partition=1'
-- Move most of the log cache to the 32K pool...some 16K will be needed for
rollbacks
-- and other large transactions
exec sp_poolconfig 'log_cache', '1024M', '32K'
go
-- Configure a matching ULC (ASE 15.7 only - ASE 16.0 will use PLCBLOCKS) if
@@sbssav < '16.0.00.00'
```

```

begin
    exec sp_configure 'user log cache size', 32768
end
go
-- Create the 'queue cache' (at least 256MB)
-- Since large scans are not expected to happen on these tables, it is not
-- necessary to define a 128K IO pool.
exec sp_cacheconfig 'queue_cache', '512M', 'mixed','relaxed','cache_partition=4'
go
-- Create the 'systables cache' (128M to 512M)
exec sp_cacheconfig 'systables_cache', '256M',
'mixed','relaxed','cache_partition=4'
go

```

After creation of named caches is completed, resize the default data cache to consume unused memory. For more information, see [Dynamic Cache Sizing \[page 169\]](#) in the appendix of this document. Make sure that you do not forget to set `@mode = 'runtime'` before executing the script!

Finally, the log, system and queue tables need to be bound to their respective caches. In order to do so, the SAP database must be put into single user mode.

```

use master
go
print ''
print '<< SAP DATABASE >>'
print ''
go
-- Put the SAP database into single user mode
exec sp_dboption '<SID>', 'single user', true
go
use <SID>
go
if not exists ( select 1 from master..sysdatabases
                where dbid = db_id() and status & 4096 <> 0 )
begin
    print 'Error: Unable to put <SID> into single user mode'
    select syb_quit()
end
go
checkpoint
go
-- Bind the transaction log to the log cache
exec sp_bindcache 'log_cache', '<SID>', 'syslogs'
exec sp_logiosize '32'
go
-- Bind all system tables to the systables cache
-- (without making use of the same)
select so.name as objname, si.name as indname into #bindcache_objects1
from <SID>..sysindexes si, <SID>..sysobjects so
where si.id = so.id and so.type = 'S'
and so.name not in ('syslogs','sysattributes')
go
declare objects_cursor cursor for
select objname, indname from #bindcache_objects1 order by objname, indname
go
declare @objname varchar(255)
declare @indname varchar(255)
open objects_cursor
fetch objects_cursor into @objname, @indname
while @@sqlstatus = 0
begin
    if @objname = @indname
    begin
        print '<SID>: binding table %! to systables_cache', @objname
        exec sp_bindcache 'systables_cache', '<SID>', @objname
    end
end

```

```

else
begin
    print '<SID>: binding index %1! to systables_cache', @indname
    exec sp_bindcache 'systables_cache', '<SID>', @objname, @indname
end
fetch objects_cursor into @objname, @indname
end
close objects_cursor
deallocate objects_cursor
go
-- Bind the SAP queue tables to the queue cache
declare objects_cursor cursor for
    select so.name as objname, si.name as indname,
           su.name || '.' || so.name as objfqname
    from <SID>..sysindexes si, <SID>..sysobjects so, <SID>..sysusers su
    where si.id = so.id and so.type = 'U'
       and so.uid = su.uid and su.name = 'SAPSR3'
       and so.name IN ( 'VBDATA', 'VBHDR', 'VBMOD', 'ARFCRSTATE', 'ARFCSDATA',
                       'ARFCSSTATE', 'QREFTID', 'TRFCQDATA', 'TRFCQIN', 'TRFCQINS',
                       'TRFCQOUT', 'TRFCQSTATE', 'RSBATCHCTRL' )
    order by si.id, si.indid
go
declare @objname varchar(255)
declare @indname varchar(255)
declare @objfqname varchar(286)
open objects_cursor
fetch objects_cursor into @objname, @indname, @objfqname
while @@sqlstatus = 0
begin
    if @objname = @indname
    begin
        print '<SID>: binding table %1! to queue_cache', @objname
        exec sp_bindcache 'queue_cache', '<SID>', @objfqname
    end
    else
    begin
        print '<SID>: binding index %1! to queue_cache', @indname
        exec sp_bindcache 'queue_cache', '<SID>', @objfqname, @indname
    end
    fetch objects_cursor into @objname, @indname, @objfqname
end
close objects_cursor
deallocate objects_cursor
go
use master
go
-- Revert single user mode
exec sp_dboption '<SID>', 'single user', false
go
-- Put the saptools database into single user mode
print ''
print '<< SAPTOOLS DATABASE >>'
print ''
go
exec sp_dboption 'saptools', 'single user', true
go
use saptools
go
if not exists ( select 1 from master..sysdatabases
                where dbid = db_id() and status & 4096 <> 0 )
begin
    print 'Error: Unable to put saptools into single user mode'
    select syb_quit()
end
go
checkpoint
go
-- Bind all system tables to the systables cache

```

```
-- (without making use of the same)
select so.name as objname, si.name as indname into #bindcache_objects2
  from saptools..sysindexes si, saptools..sysobjects so
  where si.id = so.id and so.type = 'S'
  and so.name not in ('syslogs','sysattributes')
go
declare objects_cursor cursor for
  select objname, indname from #bindcache_objects2 order by objname, indname
go
declare @objname varchar(255)
declare @indname varchar(255)
open objects_cursor
fetch objects_cursor into @objname, @indname
while @@sqlstatus = 0
begin
  if @objname = @indname
  begin
    print 'saptools: binding table %! to systables_cache', @objname
    exec sp_bindcache 'systables_cache', 'saptools', @objname
  end
  else
  begin
    print 'saptools: binding index %! to systables_cache', @indname
    exec sp_bindcache 'systables_cache', 'saptools', @objname, @indname
  end
  fetch objects_cursor into @objname, @indname
end
close objects_cursor
deallocate objects_cursor
go
use master
go
-- Revert single user mode
exec sp_dboption 'saptools', 'single user', false
go
```

Each of the named caches should be monitored carefully as soon as application testing starts.

- You may decrease the log cache if the number of physical reads is zero, but increase if the number of physical reads and commit times are rather high.
- You may increase or decrease other named caches depending on their hit ratios.

### i Note

SAP applications mainly make implicit use of temporary databases (LWPs, work tables during query execution, hash join, sorts, etc.), and all of these activities are logged minimally. In addition, none of the other databases are expected to show any noticeable log volume. For this reason, we recommend that you create a separate log cache and to apply 32K IO logging only to the SAP database.

## 15.2 Named Cache for SAP Temporary Database

We frequently recommend that you have a separate cache for the main temporary database, which in case of SAP is `saptempdb`. Otherwise, table scans and other IO intensive activities in the default data cache could cause worktables and other objects in `saptempdb` to be flushed from memory, causing expensive physical




reads to access the worktables. In order to bind a user defined temporary database to a separate named cache, there are several conditions that need to be met:

- No users can be bound to that temp. database
- No active sessions using that temp. database

Consequently, the following steps can only be performed when the SAP application is shut down:

```
-- Make sure all SAP processes are shut down and there are no connections as user
-- SAPSR3 or SAPSR3DB before proceeding. Also, you will need to temporarily
unbind
-- the 'sapsa' login from saptempdb.
use master
go
exec sp_tempdb 'unbind', 'lg', 'sapsa', 'db', 'saptempdb'
go
-- disconnect
select syb_quit()
go
-- reconnect
use master
go
-- Verify no active sessions using saptempdb
exec sp_tempdb 'who', 'saptempdb'
go
-- If no active sessions, unbind all the users
exec sp_tempdb 'unbindall_db', 'saptempdb'
go
-- Verify no users bound to saptempdb
exec sp_tempdb 'show'
go
-- Create the tempdb cache
exec sp_cacheconfig 'saptempdb_cache', '1G', 'mixed'
-- Move around 40% of tempdb cache into a large IO pool
exec sp_poolconfig 'saptempdb_cache', '400M', '128K'
go
-- Bind the saptempdb to the cache
exec sp_bindcache 'saptempdb_cache', 'saptempdb'
go
-- If the above is successful, rebind the SAP users
exec sp_tempdb 'bind', 'lg', 'SAPSR3', 'db', 'saptempdb', null, 'hard'
exec sp_tempdb 'bind', 'lg', 'SAPSR3DB', 'db', 'saptempdb', null, 'hard'
go
-- As sapsa is usually used to run update statistics on SAP objects, sapsa is
also
-- bound to the larger saptempdb. However, in case of sapsa, we default to a soft
-- binding so it can log in without saptempdb being available.
exec sp_tempdb 'bind', 'lg', 'sapsa', 'db', 'saptempdb'
go
```

## 15.3 Optimize Performance of SAP Queue Tables

By default, compression is disabled for volatile SAP tables like the VB- and RFC-queues. For more information about optimizations, see SAP Note [1724091](#) .

## 15.4 Optimize Performance of SAP Lookup and Small Tables

Some of the very small tables might induce heavy decompression overhead due to very frequent read access. Possible optimizations are described in SAP Note [1775764](#). Note that the term small is relative. Several sites have found benefits in uncompressing all tables less than ~40MB in size compressed. This also decreases spinlock contention on the `CPMEMINFO_SPIN` which controls memory allocations from the heap memory used for data compression/decompression. Candidates for tables that likely should be decompressed include:

- Tables less than ~40MB compressed
- Tables commonly fully in cache that have frequent range scans or index leaf scans
















## 15.5 Optimize On-Row LOB Storage

If not already done during migration of the database, you can use the ABAP report attached to SAP Note [1680803](#) to analyze and optimize the on-row LOB length of large tables.

# 16 Runtime Configuration for SAP BW

## 16.1 Correction Collections

We recommend that you implement complete SAP BW correction collections instead of individual SAP Notes. The correction collections are updated to reference important corrections once released. Make sure that you always implement the newest version of a correction collection!

- SAP Note [1605169](#)  SYB: SAP BW 7.02 Correction Collection
- SAP Note [1608417](#)  SYB: SAP BW 7.30 Correction Collection
- SAP Note [1616726](#)  SYB: SAP BW 7.31 Correction Collection
- SAP Note [1821924](#)  SYB: SAP BW 7.40 Correction Collection
- SAP Note [2193724](#)  SYB: SAP BW 7.50 Correction Collection
- SAP Note [1946164](#)  SYB: DDIC patch collection for release 7.02
- SAP Note [1965664](#)  SYB: DDIC patch collection for release 7.30
- SAP Note [1965754](#)  SYB: DDIC patch collection for release 7.31
- SAP Note [1965755](#)  SYB: DDIC patch collection for release 7.40
- SAP Note [1558958](#)  SYB: DBA Cockpit Correction Collection SAP Basis 7.02 / 7.30\*
- SAP Note [1619967](#)  SYB: DBA Cockpit Correction Collection SAP Basis 7.31\*
- SAP Note [1882376](#)  SYB: DBA Cockpit Correction Collection SAP Basis 7.40
- SAP Note [2293673](#)  SYB: DBA Cockpit Correction Collection SAP Basis 7.50
- SAP Note [2380028](#)  SYB: DBA Cockpit Correction Collection SAP Basis 7.51
- SAP Note [1946165](#)  SYB: Solution Manager Technical Monitoring Patch Collection

## 16.2 Table Partitioning of Fact Tables of an InfoCube

The physical partitioning of database tables and the handling of SAP BW fact tables have different aspects to be considered:

- First, table partitioning accelerates query performance by allowing partition pruning. As of SAP ASE 16.0 parallel queries are allowed. SAP BW requests can easily be deleted by dropping a partition during the SAP BW collapse operation. Expensive database commands like the update of statistics or the maintenance of indexes will benefit from the smaller amount of data associated to a database partition.
- Second, if there are too many partitions there is more overhead in the database optimizer to find the best access plan. Critical database limits can be violated regarding the number of partitions.


For SAP BW on SAP ASE, we strongly recommend that you partition the E fact table of an InfoCube by a time criterion (0CALTHMONTH, 0CALTHYEAR, or 0FISCPER). This allows the database server to perform partition elimination (partition pruning) for SAP BW queries. Partitioned E fact tables do not have any negative side effect. Features to merge database partitions for an archived period or to add new partitions on top for the coming years are available (*repartitioning*).

The F fact tables of InfoCubes are partitioned by SAP BW requests dimensions; each new data load to the InfoCube creates another partition. We strongly recommend that you perform the SAP BW collapse operation regularly to keep the number of requests, that means the number of database partitions, small. Too many requests have a negative impact on the performance and can lead to database issues.

The following maximum number of partitions per F table (=number of uncompressed SAP BW requests) are recommended:

- SAP ASE 15.7:  
Do not exceed a maximum of 1000 partitions to keep query performance acceptable and to avoid database issues.
- SAP ASE 16.0 and higher:  
Make sure that the number of partitions is not higher than 1000. A higher number of partitions have a negative impact on performance. SAP ASE 16.0 can handle up to 4000 partitions per database table.

For more information, see SAP Note [2187579](#)  SYB: *Physical partitioning of fact tables*.

Read SAP Note [1691300](#)  SYB: *Unpartitioned F fact tables for InfoCubes* to avoid partitioning of F fact tables of designated InfoCubes on demand if the cube cannot be compressed frequently.

## 16.3 Table Statistics

Accurate table statistics are essential for the SAP ASE optimizer to find an efficient query execution plan. Missing or outdated statistics can lead to an inefficient query plan and slow execution. The complexity of SAP BW reporting queries and the large amount of data in SAP BW fact tables increase this problem.

### 16.3.1 Automatic Table Maintenance (ATM)

Considering the thousands of tables and indexes a typical SAP system creates on the database, the ATM framework automates manual administrative activities and provides the basis for the query performance of SAP BW. Carefully set up the ATM framework and check if it is working properly on a regular basis!

For more information, see [Set Up Automatic Table Maintenance \[page 143\]](#).

### 16.3.2 Process Chain Step Construct Database Statistics

While the ATM framework is very helpful for constantly growing tables, the maintenance frequency is not always appropriate for fast changing tables of the SAP BW star schema. It is not unusual in an SAP BW system

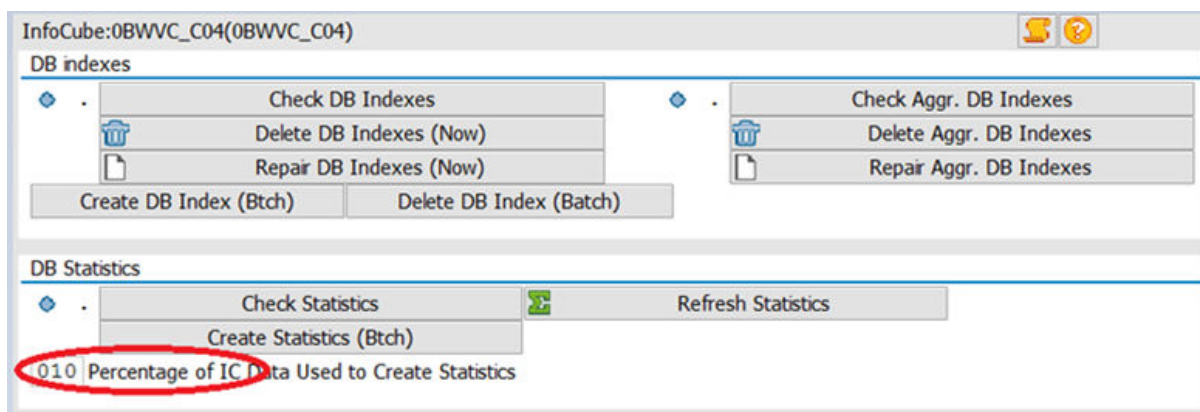
that a significant amount of data is inserted or dropped. The delay between the data load and the update of statistics with ATM can be too long; this affects SAP BW queries in the meantime.

Check if your SAP BW process chains include the step `Construct Database Statistics`. In general, we strongly recommend that you refresh the statistics of an InfoCube and the underlying star schema tables at the end of every SAP BW process chain that loads data to an InfoCube or maintains data of a cube. Perform these steps especially after a database migration!

### 16.3.3 Percentage of data used to create statistics with sampling

The `UPDATE INDEX STATISTICS` command requires leaf-level scans of indexes. It can increase I/O contention, use the CPU to perform sorts, and use data and procedure caches. The use of these resources can adversely affect queries running on the server if `UPDATE STATISTICS` is executed when usage is high. To reduce I/O contention and resources, run the `UPDATE STATISTIC` command for the SAP BW star schema using a sampling method, which can reduce the I/O and time if your maintenance window is small and the data set is large.

The percentage to use with sampling for star schema tables depends on your needs. The SAP default value is too small for the needs of SAP BW on SAP ASE. Call the Administrator Workbench InfoCube Management (/nRSA1) and choose the *Performance* tab.



The default value of 10% is too small. A value greater than 30% is a good starting point. You can test various percentages until you get a result that fits best.


Although a sampling of the data set may not be completely accurate, the histograms and density values are usually reasonable within an acceptable range.

The percentage maintained in the InfoCube performance tab is used for updating the statistics of all tables of the InfoCube's star schema: fact tables, dimension tables, SID tables and so on. It can lead to inaccurate statistics if some of these tables are small. In such situations, we do not recommend sampling. For this reason, SAP Note [2103636](#) - SYB: Better table statistics for star schema tables of an InfoCube introduced a threshold of 10.000.000 rows.


Sampling is only be used for tables with more rows than this threshold. Sampling is not used for partitions if a table is partitioned. SAP recommends implementing this SAP Note as soon as possible. The SAP Note is part of the Correction Collections. Inaccurate statistics of the star schema tables should be refreshed (deleted and recreated) after the implementation of the SAP Note.

## 16.3.4 Refreshing the statistics of star schema tables

You can refresh (*delete and recreate*) the statistics of the InfoCube's star schema tables if the sampling percentage has been changed, if there are doubts about accuracy of the statistics, or if the performance of SAP BW queries is unexpectedly slow. The statistics of these tables can be refreshed with report `RSSYBREFRESHINFCUBESTATISTICS` on InfoCube level. You can restrict the statistic refresh to the fact tables, the dimension tables, the SAP BW aggregates if defined, or the tables of the InfoObjects. You can perform a test run without statistics refresh if the appropriate flag is set. This can be helpful to identify the affected tables if necessary. Execute the report as batch job in the background if the statistics of many large tables need to be refreshed.

The report `RSSYBREFRESHINFCUBESTATISTICS` is available with SAP Note [2138611](#)  SYB: *Better table statistics for star schema tables of an InfoCube.*



### i Note

Important: Implement SAP Note [2159214](#)  SYB: *ASE Error SQL226* in `RSSYBREFRESHINFCUBESTATISTICS` in advance if you want to refresh the table statistics.

## 16.4 SAP BW Reporting

### 16.4.1 Intra-query parallelism for SAP BW Reporting

SAP BW makes use of SAP ASE's capabilities for parallel query processing with SAP ASE 16.0 SP01 and higher. Parallel queries are not supported for SAP BW on SAP Sybase ASE 15.7. In addition, the following SAP Notes must be implemented:


- SAP Note [2103636](#)  SYB: *Adaptions for SAP ASE 16.0 SP01 PL01*
- SAP Note [2155343](#)  SYB: *New SAP ASE optimization goal `sap_olap`*

We strongly recommend that you collapse the SAP BW InfoCubes frequently in order to move a large part of the data into E fact tables, which should be partitioned by a time criterion. This enables the SAP ASE optimizer to prune partitions which are not in the selection and to execute the query in parallel.

The generated queries of the SAP BW reporting are executed with a parallel degree of 4 by default. This value can be changed by setting the `RSADMIN` parameter `SYBASE_RSDRS_PARALLEL_DEGREE` accordingly. Run report `SAP_RSADMIN_MAINTAIN` to change it; a parallel degree of 0 or 1 means serial execution which is only needed in support investigations.


The SAP ASE database configuration supports the parallel query execution, see section [Configuring SAP ASE Threads and Parallel Processing \[page 151\]](#).

## 16.4.2 Reducing the complexity of SAP BW queries

Read SAP Note [514907](#)  *Processing complex queries*, especially after a migration to SAP ASE. The threshold value for SAP BW queries should be less than or equal to 50, the threshold value for DataMarts should be less than or equal to 20.

Run ABAP report `RSSYBDBVERSION` to check the values for the threshold parameters.

## 16.4.3 SAP ASE optimization goal `sap_olap`

The user defined optimization goal named `sap_olap` was defined and is used for SAP BW reporting queries. The content of this goal can change with different releases of SAP ASE. It is maintained by the SAP ASE upgrade scripts. This optimization goal is specified as an abstract plan hint with every reporting query. Do not set SAP ASE parameter optimization goal to `sap_olap` even if the system is an SAP BW system. For more information, see SAP Note [2081796](#)  - SYB: SAP ASE optimization goals supported for SAP NetWeaver-based applications.

## 16.4.4 Query Plan Optimization with Star Joins

SAP ASE version 16.0 introduces the use `fact_table` abstract plan hint, which specifies the central fact table in a star join query and triggers special query plan optimization strategies for execution of the query.

The use `fact_table` abstract plan hint allows the query processor to choose a parallel hash join plan for the star join query. Parallel plans enable the query processor to push bloom filter probes (which allow for faster joins between dimension and fact tables) under the `xchg` operator, further reducing the number of qualifying rows from fact tables

The SAP BW SQL query generator provides optimizer hints for faster query execution.


The hint named `fact_table` instructs the database optimizer to use the snowflake schema optimization strategy. This hint is used in queries with cube fact tables and with queries using ODSO tables.

## 16.5 SAP BW Warehouse Management (“WHM”)


### 16.5.1 Loading data to InfoCubes and database indexes

There are two different approaches how to deal with database indexes and data load into InfoCubes. For some database systems it is preferred to drop the database indexes of the fact table before loading data into an

InfoCube. They have to be created again afterwards. For other databases and especially for SAP ASE, we recommend that you load data into InfoCubes with existing indexes. Keeping the indexes during data load has two major advantages:

- SAP ASE offers a special index maintenance mode (*ins by bulk*), which is useful for SAP BW. The different indexes of the fact tables are maintained in several concurrent threads at the same time. This concurrent maintenance is faster than dropping the indexes before the load, loading the data into the table without indexes, and recreating them afterwards.
- To perform SAP BW reporting at the same time as the data load operation benefits from having indexes. We recommend that you remove the process step *Delete Indexes of an InfoCube* out of SAP BW process chains used for loading data into cubes. A workaround is described in SAP Note [2107943](#)  P34: *PC: Globally deactivate DROPINDEX process with RSADMIN*. Set the `RSADMIN` parameter as described in the SAP Note to X. With this, the drop index step is skipped in all process chains. This helps customers to change all process chains at the same time. In general, SAP recommends adapting process chains manually!

## 16.5.2 SAP BW Compression/Collapse/Condense

It is essential to perform the SAP BW compression on a regular basis to keep the number of database partitions small, see section [Table Partitioning of Fact Tables of an InfoCube \[page 163\]](#). The following SCN document provides a good overview on compression, in addition to the information provided above: [All about Compression](#) 

## 16.5.3 SAP BW threshold value for data loading

Use transaction `RSCLUSTV6` *BW Threshold Value for Data Loading* to check and set the following values:

- *Package Size*  
The value 50,000 is a good starting point. Changing this value requires performance tests and possibly adjustments in the SAP ASE configuration (number of locks, log space, and so on).
- *Partition Size* (Size of a PSA partition)  
Do not assign a value.

## 16.5.4 Enable parallelism on application level for data loads

Loading data into InfoCubes benefits significantly from parallel execution. Check your Data Transfer Process (DTP) if parallelism is enabled. In the Maintenance screen for DTPs, choose *Goto* → *Settings for Batch Manager*.

The *Number of Processes* in the *Settings for Parallel Processing* dialog should be set to 3-5 or even higher depending on the resources available during data load time. SAP ASE has to be configured accordingly, see section [Configuring SAP ASE Threads and Parallel Processing \[page 151\]](#)



# 17 Appendix

## 17.1 Dynamic Cache Sizing

```
use master
go
set nocount on
go
declare @mode          varchar(30)
-- choose one of 'import' or 'runtime'
set @mode = 'runtime'
declare @phys_memory   int,
        @logical_memory int,
        @overhead      float,
        @memory_available int,
        @cache_increase int,
        @default_cache_size int,
        @new_cache_size int,
        @new_cache_size_C varchar(30),
        @max_engines   int,
        @global_partn  int,
        @partn_clause  varchar(30),
        @pool_size_128K int,
        @wash_size_16K int,
        @wash_size_128K int,
        @cur_pool_size_16K int,
        @cur_pool_size_128K int,
        @cur_wash_size_16K int,
        @cur_wash_size_128K int,
        @param_c       varchar(30)
if @mode <> 'runtime' and @mode <> 'import'
begin
    print 'invalid mode'
    select syb_quit()
end
select @phys_memory=(scc.value*2/1024)
    from sysconfigures sc, syscurconfigs scc
    where sc.name = 'total physical memory'
    and sc.config = scc.config
select @logical_memory=(scc.value*2/1024)
    from sysconfigures sc, syscurconfigs scc
    where sc.name = 'total logical memory'
    and sc.config = scc.config
select @memory_available=@phys_memory-@logical_memory,
    @overhead=round((@phys_memory-@logical_memory)*0.062,0)
select @cache_increase=(@memory_available-@overhead)*0.9
if @cache_increase < 256
    select @cache_increase=0
-- get the size of the default data cache
select @default_cache_size=cu.value/1024
    from master.dbo.sysconfigures co, master.dbo.syscurconfigs cu
    where parent = 19
    and co.config = cu.config and co.config = 19
    and co.name = cu.comment
```

```

        and name like '%default data cache%'
select @new_cache_size=@default_cache_size+@cache_increase
select @new_cache_size_C=convert(varchar(30),@new_cache_size)+'M'
select @logical_memory as logical_memory,
       @phys_memory as physical_memory,
       @default_cache_size as default_cache_size,
       @cache_increase as cache_increase,
       @new_cache_size as new_cache_size,
       @new_cache_size_C as new_cache_size_C
if @cache_increase > 0
    exec sp_cacheconfig 'default data cache', @new_cache_size_C
select @max_engines=scc.value
    from sysconfigures sc, syscurconfigs scc
    where sc.name='max online engines'
    and sc.config = scc.config
select @global_partn=power(2,round(log(@max_engines)/log(2),0))
select @partn_clause='cache_partition='+convert(varchar(10),@global_partn)
select @max_engines as max_engines,
       @global_partn as global_partn,
       @partn_clause as partn_clause
-- Partition default data cache to reduce spinlock contention. The general rule
is:
-- cache partitions >= number of threads in syb_default_pool, but being within
-- 8, 16, 32 or 64):
exec sp_cacheconfig 'default data cache', @partn_clause
-- get the size of the new default data cache
select @default_cache_size=cu.value/1024
    from master.dbo.sysconfigures co, master.dbo.syscurconfigs cu
    where parent = 19
    and co.config = cu.config and co.config = 19
    and co.name = cu.comment
    and name like '%default data cache%'
-- During import, we use 50% of default data cache for large IO
-- During runtime, we use 20% of default data cache for large IO
if @mode = 'import'
    select @pool_size_128K=cast((@default_cache_size*0.5) as integer)
else
    select @pool_size_128K=cast((@default_cache_size*0.2) as integer)
select @param_c=convert(varchar(10),@pool_size_128K)+'M'
select @default_cache_size as default_cache_size,
       @pool_size_128K as pool_size_128K, @param_c as param_c
exec sp_poolconfig 'default data cache', @param_c, '128K'
select @cur_pool_size_16K=value/1024, @cur_wash_size_16K=memory_used
    from master.dbo.syscurconfigs
    where config = 20 + (log10(16*1024/@pagesize)/log10(2))
    and comment = 'default data cache'
select @cur_pool_size_128K=value/1024, @cur_wash_size_128K=memory_used
    from master.dbo.syscurconfigs
    where config = 20 + (log10(128*1024/@pagesize)/log10(2))
    and comment = 'default data cache'
-- Each cache pool has a wash area, which determines the point in the LRU chain
-- when ASE will consider a dirty page for background write to disk.
-- During import, we set the wash markers at 50% of each pool
-- During runtime, we set the wash markers at around 5-10% of each pool

if @mode = 'import'
begin
    select @wash_size_16K=cast((@cur_pool_size_16K*0.5) as integer)
    select @wash_size_128K=cast((@cur_pool_size_128K*0.5) as integer)
end
else
begin
    select @wash_size_16K=cast((@cur_pool_size_16K*0.1) as integer)
    select @wash_size_128K=cast((@cur_pool_size_128K*0.1) as integer)
end
select @param_c='wash='+convert(varchar(10),@wash_size_16K)+'M'
select @default_cache_size as default_cache_size, @cur_pool_size_16K as
pool_size_16K, @wash_size_16K as wash_size_16K

```

```

exec sp_poolconfig 'default data cache', '16K', @param_c
select @param_c='wash='+convert(varchar(10),@wash_size_128K)+'M'
select @default_cache_size as default_cache_size, @cur_pool_size_128K as
pool_size_128K, @wash_size_128K as wash_size_128K
exec sp_poolconfig 'default data cache', '128K', @param_c
-- During import, we set an APF ratio of 50% for any cache in the system
-- During runtime, we set an APF ratio of 10% for any cache in the system
if @mode = 'import'
    exec sp_configure 'global async prefetch limit', 50
else
    exec sp_configure 'global async prefetch limit', 10
go

```

## 17.2 Check Completeness of Table Statistics

The following SQL script identifies any indexed table column that does not have optimizer statistics:

```

use <SID>
go
SELECT tabowner, tabname, keycnt, row_count(db_id(),t3.objid) as rowcnt
FROM (
    SELECT cast(tabowner as varchar(10)) as tabowner,
           cast(tabname as varchar(30)) as tabname,
           count(*) AS keycnt,
           objid
    FROM (
        SELECT DISTINCT t1.tabowner, t1.tabname, t1.objid, t1.indexcol
        FROM ( SELECT su.name AS tabowner, so.name AS tabname,
                     so.id AS objid, st.partitionid,
                     index_col(su.name || '.' || so.name, si.indid, sc.colid)
                     AS indexcol
                FROM sysobjects so, sysindexes si, syscolumns sc,
                     sysusers su, systabstats st
                WHERE so.uid = su.uid AND so.id = si.id
                      AND so.id = sc.id AND so.type = 'U'
                      AND st.id = so.id AND st.indid = 0 AND st.rowcnt > 0
                      AND so.sysstat3 & 128 = 0
                      AND si.indid > 0 AND si.indid < 255
                      AND sc.colid <= si.keycnt
            ) t1
        WHERE indexcol IS NOT NULL
    ) t2
    WHERE NOT EXISTS ( SELECT 1 FROM sysstatistics ss, syscolumns sco
                      WHERE ss.id = t2.objid AND ss.id = sco.id
                            AND sco.name = t2.indexcol
                            AND convert(smallint,ss.colidarray) = sco.colid
                            AND ss.formatid = 100 AND ss.c4 IS NOT NULL
                      )
    AND row_count(db_id(),t2.objid) > 100
GROUP BY tabowner, tabname, objid ) t3
go

```

If this SQL script returns any row, you should create index statistics for each table listed manually such as:

tabowner	tabname	keycnt	rowcnt
SAPSR3	AGR_FLAGS	1	3000
SAPSR3	/BIC/B0000176000	1	12177665
SAPSR3	/BIC/FMADHVI01	3	10100

update index statistics SAPSR3.[AGR\_FLAGS] with hashing



```
go
update index statistics SAPSR3.[/BIC/FMADHVI01] with hashing
go
-- use consumers due to high row count:
update index statistics SAPSR3.[/BIC/B0000176000] with consumes = 3, hashing
go
```

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