Oracle® Solaris Cluster Data Service for SAP MaxDB Guide

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Preface

Oracle Solaris Cluster Data Service for SAP MaxDB Guide explains how to install and configure Oracle Solaris Cluster data services.

Note – This Oracle Solaris Cluster release supports systems that use the SPARC and x86 families of processor architectures: UltraSPARC, SPARC64, AMD64, and Intel 64. In this document, x86 refers to the larger family of 64-bit x86 compatible products. Information in this document pertains to all platforms unless otherwise specified.

This document is intended for system administrators with extensive knowledge of Oracle software and hardware. Do not use this document as a planning or presales guide. Before reading this document, you should have already determined your system requirements and purchased the appropriate equipment and software.

The instructions in this book assume knowledge of the Oracle Solaris operating system and expertise with the volume-manager software that is used with Oracle Solaris Cluster software.

Using UNIX Commands

This document contains information about commands that are specific to installing and configuring Oracle Solaris Cluster data services. The document does *not* contain comprehensive information about basic UNIX commands and procedures, such as shutting down the system, booting the system, and configuring devices. Information about basic UNIX commands and procedures is available from the following sources:

- Online documentation for the Oracle Solaris operating system
- Oracle Solaris operating system man pages
- Other software documentation that you received with your system

Typographic Conventions

The following table describes the typographic conventions that are used in this book.

TABLE P–1 Typographic Conventions

Typeface	Description	Example
`AaBbCc123`	The names of commands, files, and directories, and onscreen computer output	Edit your `.login` file. Use `ls -a` to list all files. `machine_name% you have mail.`
`AaBbCc123`	What you type, contrasted with onscreen computer output	`machine_name%` **`su`** `Password:`
aabbcc123	Placeholder: replace with a real name or value	The command to remove a file is `rm` *filename*.
AaBbCc123	Book titles, new terms, and terms to be emphasized	Read Chapter 6 in the *User's Guide*. A *cache* is a copy that is stored locally. Do *not* save the file. **Note:** Some emphasized items appear bold online.

Shell Prompts in Command Examples

The following table shows UNIX system prompts and superuser prompts for shells that are included in the Oracle Solaris OS. In command examples, the shell prompt indicates whether the command should be executed by a regular user or a user with privileges.

TABLE P–2 Shell Prompts

Shell	Prompt
Bash shell, Korn shell, and Bourne shell	`$`
Bash shell, Korn shell, and Bourne shell for superuser	`#`
C shell	`machine_name%`
C shell for superuser	`machine_name#`

Related Documentation

Information about related Oracle Solaris Cluster topics is available in the documentation that is listed in the following table. All Oracle Solaris Cluster documentation is available at http://www.oracle.com/technetwork/indexes/documentation/index.html#sys_sw.

Topic	Documentation
Concepts	*Oracle Solaris Cluster Concepts Guide*
Hardware installation and administration	*Oracle Solaris Cluster 3.3 3/13 Hardware Administration Manual* and individual hardware administration guides
Software installation	*Oracle Solaris Cluster Software Installation Guide*
Data service installation and administration	*Oracle Solaris Cluster Data Services Planning and Administration Guide* and individual data service guides
Data service development	*Oracle Solaris Cluster Data Services Developer's Guide*
System administration	*Oracle Solaris Cluster System Administration Guide*
	Oracle Solaris Cluster Quick Reference
Software upgrade	*Oracle Solaris Cluster Upgrade Guide*
Error messages	*Oracle Solaris Cluster Error Messages Guide*
Command and function references	*Oracle Solaris Cluster Reference Manual*
	Oracle Solaris Cluster Data Services Reference Manual

Access to Oracle Support

Oracle customers have access to electronic support through My Oracle Support. For information, visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info or visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs if you are hearing impaired.

Getting Help

If you have problems installing or using Oracle Solaris Cluster, contact your service provider and provide the following information.

- Your name and email address (if available)
- Your company name, address, and phone number
- The model number and serial number of your systems
- The release number of the operating environment (for example, Oracle Solaris 10)

- The release number of Oracle Solaris Cluster (for example, Oracle Solaris Cluster 3.3)

Use the following commands to gather information about your system for your service provider.

Command	Function
`prtconf -v`	Displays the size of the system memory and reports information about peripheral devices
`psrinfo -v`	Displays information about processors
`showrev -p`	Reports which patches are installed
`prtdiag -v`	Displays system diagnostic information
`/usr/cluster/bin/clnode show-rev -v`	Displays Oracle Solaris Cluster release and package version information for each node

Also have available the contents of the `/var/adm/messages` file.

◆ ◆ ◆ CHAPTER 1

Installing and Configuring HA for SAP MaxDB

This chapter explains how to install and configure HA for SAP MaxDB. From version 7.5, SAP DB is distributed under the name MaxDB for MySQL (MaxDB). In this book, all versions of this database are referred to as MaxDB.

Note – If you are using the Oracle Solaris 10 OS, you can install and configure this data service to run in the non-global zone. HA for SAP MaxDB is supported in non-global zones.

This chapter contains the following sections.

- "HA for SAP MaxDB Overview" on page 10
- "Overview of the Installation and Configuration Process for HA for SAP MaxDB" on page 10
- "Planning the HA for SAP MaxDB Installation and Configuration" on page 11
- "Installing and Configuring SAP MaxDB" on page 16
- "Verifying the SAP MaxDB Installation and Configuration" on page 20
- "Installing the HA for SAP MaxDB Packages" on page 21
- "Configuring the `HAStoragePlus` Resource Type to Work With HA for SAP MaxDB" on page 23
- "Registering and Configuring HA for SAP MaxDB" on page 25
- "Tuning the HA for SAP MaxDB Fault Monitors" on page 32
- "Verifying the HA for SAP MaxDB Installation and Configuration" on page 35
- "Upgrading the `SUNW.sap_xserver` Resource Type" on page 38

HA for SAP MaxDB Overview

To eliminate single points of failure in an SAP MaxDB system, HA for SAP MaxDB provides the following features:

- Fault monitoring and automatic failover for the SAP MaxDB application. You must configure HA for SAP MaxDB as a failover data service.
- Fault monitoring and automatic restart for SAP xserver. You must configure SAP xserver as a multiple master data service.

For conceptual information about failover data services and multiple master data services, see the *Oracle Solaris Cluster Concepts Guide*.

Each component of SAP MaxDB has data service that protects the component when the component is configured in Oracle Solaris Cluster. See the following table.

Note – The files that are associated with the `SUNW.sap_xserver` resource type are supplied with the Oracle Solaris Cluster HA for SAP liveCache data service. The Oracle Solaris Cluster HA for SAP liveCache data service is installed when you install HA for SAP MaxDB data service.

TABLE 1–1 Protection of SAP MaxDB Components by Oracle Solaris Cluster Data Services

SAP MaxDB Component	Data Service
SAP MaxDB	HA for SAP MaxDB
	The resource type is `SUNW.sapdb`.
SAP xserver	Oracle Solaris Cluster HA for SAP liveCache
	The resource type is `SUNW.sap_xserver`.
NFS file system	Oracle Solaris Cluster HA for NFS
	The resource type is `SUNW.nfs`.
	For more information about this data service, see *Oracle Solaris Cluster Data Service for Network File System (NFS) Guide*.

Overview of the Installation and Configuration Process for HA for SAP MaxDB

The following table summarizes the tasks for installing and configuring HA for SAP MaxDB and provides cross-references to detailed instructions for performing these tasks. Perform the tasks in the order that they are listed in the table.

TABLE 1–2 Tasks for Installing and Configuring HA for SAP MaxDB

Task	Cross-Reference
Plan the HA for SAP MaxDB installation and configuration	Your SAP MaxDB documentation. *Oracle Solaris Cluster Data Services Planning and Administration Guide* "Planning the HA for SAP MaxDB Installation and Configuration" on page 11
Install and configure SAP MaxDB	"Installing and Configuring SAP MaxDB" on page 16
Verify the SAP MaxDB installation and configuration	"Verifying the SAP MaxDB Installation and Configuration" on page 20
Install the HA for SAP MaxDB packages	"Installing the HA for SAP MaxDB Packages" on page 21
Configure the `HAStoragePlus` resource to work with HA for SAP MaxDB	"Relationship Between Resource Groups and Device Groups" in *Oracle Solaris Cluster Data Services Planning and Administration Guide* "Synchronizing the Startups Between Resource Groups and Device Groups" in *Oracle Solaris Cluster Data Services Planning and Administration Guide* "Configuring the `HAStoragePlus` Resource Type to Work With HA for SAP MaxDB" on page 23
Register and configure the HA for SAP MaxDB data service	"Registering and Configuring HA for SAP MaxDB" on page 25
(Optional) Tune the HA for SAP MaxDB fault monitors	"Tuning the HA for SAP MaxDB Fault Monitors" on page 32
Verify the HA for SAP MaxDB installation and configuration	"Verifying the HA for SAP MaxDB Installation and Configuration" on page 35
(Optional) Upgrade the `SUNW.sap_xserver` resource type	"Upgrading the `SUNW.sap_xserver` Resource Type" on page 38

Planning the HA for SAP MaxDB Installation and Configuration

This section contains the information that you need to plan your HA for SAP MaxDB installation and configuration.

Note – HA for SAP MaxDB can be configured to run in a whole root or a sparse root non-global zone, if required.

Note – Before you begin, consult your SAP MaxDB documentation for configuration restrictions and requirements that are not imposed by Oracle Solaris Cluster software. For information about restrictions that the Oracle Solaris Cluster software imposes, see the Oracle Solaris Cluster documentation.

Configuration Requirements

The configuration requirements in this section apply only to HA for SAP MaxDB.

Caution – If your data service configuration does not conform to these requirements, the data service configuration might not be supported.

For requirements that apply to all data services, see "Configuration Guidelines for Oracle Solaris Cluster Data Services" in *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

SAP MaxDB Software Version Requirements

Use SAP MaxDB versions 7.8.2.26, 7.9.7.10, or compatible versions.

HA for SAP MaxDB Configuration Requirements

Configure HA for SAP MaxDB as a failover data service. You cannot configure HA for SAP MaxDB either as a scalable data service or as a multiple master data service. For more information, see the following sections:

- "How to Enable SAP MaxDB to Run in a Cluster" on page 18
- "How to Register and Configure a SAP MaxDB Resource" on page 29

SAP xserver Configuration Requirements

To enable client applications to access HA for SAP MaxDB, you must use SAP xserver. Configure SAP xserver as a multiple master data service. Do *not* configure SAP xserver as a failover data service.

Configure SAP xserver so that SAP xserver starts on all nodes to which the SAP MaxDB resource can fail over. To implement this configuration, ensure that the node list of the SAP

xserver resource group contains all nodes that are in the node list of the SAP MaxDB resource group. For more information, see "How to Register and Configure an SAP xserver Resource" on page 26.

Supported Configurations of This Data Service

The HA for SAP MaxDB data service supports configurations that conform to the requirements in "Configuration Requirements" on page 12.

If you plan to use SAP MaxDB with other highly available SAP MaxDB applications, you must also configure the Oracle Solaris Cluster data services for those applications. For more information, see the following table.

SAP MaxDB Application	Oracle Solaris Cluster Data Service	Associated Document
SAP liveCache	Oracle Solaris Cluster HA for SAP liveCache	*Oracle Solaris Cluster Data Service for SAP liveCache Guide*
SAP Web Application Server	Oracle Solaris Cluster HA for SAP Web Application Server	*Oracle Solaris Cluster Data Service for SAP Web Application Server Guide*
SAP NetWeaver	Oracle Solaris Cluster HA for SAP NetWeaver	*Oracle Solaris Cluster Data Service for SAP NetWeaver Guide*

The examples that follow show these supported configurations of HA for SAP MaxDB:

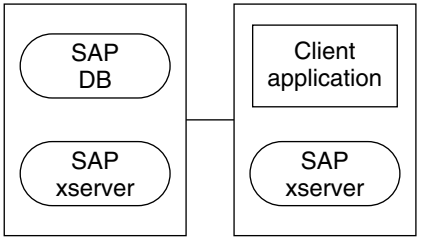
- Two-node cluster configuration
- Four-node cluster configuration with SAP R/3
- Four-node cluster configuration with SAP R/3 and SAP liveCache

Note – HA for SAP MaxDB might support additional configurations. However, you must contact your Oracle service provider for information about additional configurations.

EXAMPLE 1–1 Two-Node Configuration

This example shows a two-node configuration in which a client application accesses the SAP MaxDB resource through the SAP xserver resource. The characteristics of this configuration are as follows:

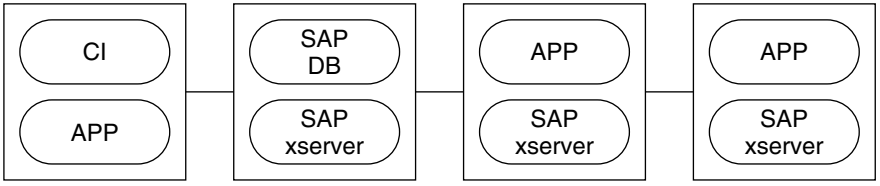
- The SAP MaxDB resource is configured as a failover data service.
- The SAP xserver resource is configured as a multiple master data service.



EXAMPLE 1–2 Four-Node Configuration With SAP R/3

This example shows a four-node configuration in which SAP MaxDB is used with SAP R/3. This configuration uses multiple Advanced Planner & Optimizer (APO) application servers. The characteristics of this configuration are as follows:

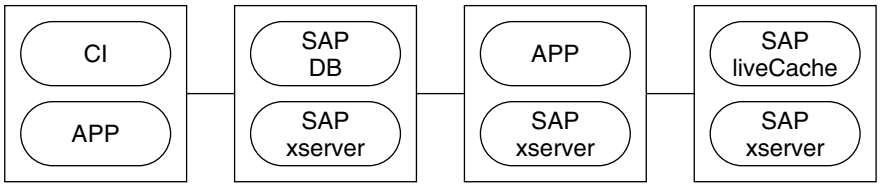
- The SAP MaxDB APO Central Instance (CI) resource is configured as a failover data service.
- The SAP MaxDB resource is configured as a failover data service.
- The SAP xserver resource is configured as a multiple master data service.
- APO application server (APP) resources are configured as scalable data services.



EXAMPLE 1–3 Four-Node Configuration With SAP R/3 and SAP liveCache

This example shows a four-node configuration in which SAP MaxDB is used with SAP R/3 and SAP liveCache. This configuration uses multiple APO application servers. The characteristics of this configuration are as follows:

- The SAP MaxDB APO CI resource is configured as a failover data service.
- The SAP MaxDB resource is configured as a failover data service.
- The SAP xserver resource is configured as a multiple master data service.
- APP resources are configured as scalable data services.
- The SAP liveCache resource is configured as a failover data service.



Configuration Considerations

The configuration considerations in the subsections that follow affect the installation and configuration of HA for SAP MaxDB.

Device Group for the SAP MaxDB Application

Ensure that you create a device group for the SAP MaxDB application as follows:

- Install SAP MaxDB on its own global device group. For more information, see "Installing and Configuring SAP MaxDB" on page 16. This separate global device group for SAP MaxDB ensures that the SAP MaxDB resource can depend on the `HAStoragePlus` resource only for SAP MaxDB.
- Create an `HAStoragePlus` resource for the global device group on which SAP MaxDB is installed. For more information, see "Configuring the `HAStoragePlus` Resource Type to Work With HA for SAP MaxDB" on page 23.
- Ensure that the resource for SAP MaxDB depends on the `HAStoragePlus` resource for the global device group on which SAP MaxDB is installed. For more information, see "Registering and Configuring HA for SAP MaxDB" on page 25.

Dependencies of the SAP MaxDB Application on SAP xserver

Configure SAP MaxDB so that SAP MaxDB starts only on a node where SAP xserver is running. To implement this configuration, configure resources and resource groups as follows:

- Ensure that the resource for SAP MaxDB depends on the resource for SAP xserver.
- Create on the SAP MaxDB resource group a strong positive affinity for the SAP xserver resource group.

For more information, see "Registering and Configuring HA for SAP MaxDB" on page 25.

Administration of SAP xserver by a User Other Than Root

You might be required to administer SAP xserver as a user other than root. In this situation, you must create and define that user as follows:

- You must create that user on all cluster nodes or zones that master SAP xserver.
- You must define that user when you register and configure HA for SAP MaxDB. For more information, see "Registering and Configuring HA for SAP MaxDB" on page 25.

Configuration Planning Questions

Answer the questions in this section to plan the installation and configuration of HA for SAP MaxDB.

- Which resource group will you use for the SAP MaxDB application resource and for the logical host name for the SAP MaxDB resource?

  Use the answer to this question when you perform the procedure "How to Enable SAP MaxDB to Run in a Cluster" on page 18.
- What is the logical host name for the SAP MaxDB resource? Clients access the data service through this logical host name.

  Use the answer to this question when you perform the following procedures:

  - "How to Install and Configure SAP MaxDB" on page 16
  - "How to Enable SAP MaxDB to Run in a Cluster" on page 18
- Where will the system configuration files reside?

  See *Oracle Solaris Cluster Data Services Planning and Administration Guide* for the advantages and disadvantages of using the local file system instead of the cluster file system.

Installing and Configuring SAP MaxDB

To enable HA for SAP MaxDB to make SAP MaxDB highly available, additional installation and configuration operations are required. These operations supplement the standard installation and standard configuration of SAP MaxDB.

During a standard installation, SAP MaxDB is installed with a physical host name. To enable SAP MaxDB to run in a cluster, you must modify SAP MaxDB to use a logical host name.

For information about the standard installation and standard configuration of SAP MaxDB, see the following documentation:

- If you are using SAP MaxDB with SAP R/3, see the SAP R/3 documentation for information about how to install and configure SAP R/3 with SAP MaxDB.
- If you are using SAP MaxDB independently of SAP R/3, see the SAP MaxDB documentation.

▼ How to Install and Configure SAP MaxDB

1 **On one node of the cluster, install the SAP MaxDB software.**

Ensure that you install SAP MaxDB on its own global device group.

2 **Perform a standard configuration of SAP MaxDB.**

3 **Create the `.XUSER.62` file in the home directory of the operating system user who administers the SAP MaxDB instance.**

a. **Create a plain text file that contains information about the database user who administers the SAP MaxDB database instance.**

For information about the content of this file, see the SAP MaxDB documentation. For the name of the server on which the database is running, specify the logical host name for the SAP MaxDB resource that you specified in "Configuration Planning Questions" on page 16.

For an example of the content of this file, see Example 1–4.

b. **As SAP MaxDB admin user, generate the `.XUSER.62` file from the plain text file that you created in Step a.**

Use the SAP MaxDB command `xuser` for this purpose.

```
# xuser -b user-info-file
```

`-b` *user-info-file* Specifies the plain text file from which you are generating the `.XUSER.62` file

4 **Copy the `/usr/spool/sql` directory and its contents from the node on which you installed SAP MaxDB to all nodes where resources for SAP MaxDB and SAP xserver will run.**

To ensure that the same owner owns the directory and its contents on all nodes, use the `tar`(1) command and the `ssh`(1).

```
# tar cfB - /usr/spool/sql | ssh destination "cd /;tar xfB -"
```

destination Specifies the node to which you are copying the `/usr/spool/sql` directory and its contents

The following example shows a plain text file that contains information about a database user who administers an SAP MaxDB instance.

5 **Distribute `/etc/opt/sdb` on all nodes to run SAP MaxDB.**

Copy the `/etc/opt/sdb` directory and its contents from the node on which you installed SAP MaxDB to all nodes where resources for SAP MaxDB and SAP xserver will run.

To ensure that the same owner owns the directory and its contents on all nodes, use the `tar`(1) command and the `ssh`(1).

```
# tar cfB - /etc/opt/sdb | ssh destination "cd /;tar xfB -"
```

destination Specifies the node to which you are copying the `/etc/opt/sdb` directory and its contents

Example 1–4 Information About a Database User Who Administers a SAP MaxDB Instance

```
DEFAULT
dbm
```

```
dbm
TST
srvr-1
     blank line
     blank line
-1
-1
     blank line
```

This example specifies the following information about a database user who administers an SAP MaxDB instance:

- The user key that is used to address this combination of `XUSER` data is named `DEFAULT`.
- The user name and password of the database user are `dbm`.
- The name of the SAP MaxDB instance is `TST`.
- The logical host name for the SAP MaxDB resource is `srvr-1`.
- No structured query language (SQL) mode is specified.
- The default time-out value of the SAP MaxDB instance is used.
- The default isolation level of the SAP MaxDB instance is used.

For more information, see the SAP MaxDB documentation.

▼ How to Enable SAP MaxDB to Run in a Cluster

1 Create a failover resource group to contain the SAP MaxDB application resources and the logical host name for the SAP MaxDB resource.

Use the resource group that you identified when you answered the questions in "Configuration Planning Questions" on page 16.

```
# clresourcegroup create -n node-zone-list  sapdb-rg
```

sapdb-rg	Specifies that the resource group that you are creating is named *sapdb-rg*.
`-n` *node-zone-list*	Specifies a comma-separated, ordered list of zones that can master this resource group. The format of each entry in the list is *node*. In this format, *node* specifies the node name and *zone* specifies the name of a non-global Oracle Solaris zone. To specify the global zone, or to specify a node without non-global zones, specify only *node*. This list is optional. If you omit this list, the global zone of each cluster node can master the resource group.

2 Ensure that all network resources that you intend to you use are added to your name service database.

3 Add a logical host name resource to the failover resource group that you created in Step 1.

```
# clreslogicalhostname create -g sapdb-rg \
-h sapdb-logical-hostname  sapdb-logical-hostname
```

`-g` *sapdb-rg*
Specifies that the logical host name's database resource is to be added to the failover resource group that you created in Step 1.

`-h`
Specifies the host name list. You must use this option either when more than one logical host needs to be associated with the new SAP MaxDB resource or when the IP alias logical host does not have the same name as the SAP MaxDB resource itself. SAP MaxDB is the resource for the *sapdb-logical-hostname* that you specified in "Configuration Planning Questions" on page 16.

sapdb-logical-hostname
Specifies the logical host name of the server on which the database is running. This host name must be the logical host name for the SAP MaxDB resource that you specified in "Configuration Planning Questions" on page 16.

Note – If you require a fully qualified hostname, you must specify the fully qualified name with the `-h` option and you cannot use the fully qualified form in the resource name.

---

4 Bring the resource group that you created in Step 1 online in a managed state.

```
# clresourcegroup online -M sapdb-rg
```

`-emM` Enables the resource group *sapdb-rg* created in Step 1 and moves it to the `MANAGED` state.

Example 1–5 Enabling SAP MaxDB to Run in a Cluster

This example shows the sequence of commands that are required to enable SAP MaxDB to run in a cluster. The commands are run on only one cluster node.

1. The following command creates a failover resource group to contain the SAP MaxDB application resources and the logical host name for the SAP MaxDB resource. The resource group is named `sapdbrg`. The `sapdbrg` resource group can be brought online on all cluster nodes or zones.

   ```
   # clresourcegroup create sapdbrg
   ```

2. The following command adds a logical host name resource to the `sapdbrg` resource group. The logical host name of the server on which the database is running is `srvr-1`. When the `sapdbrg` resource group is brought online, an attempt is made for each node to discover a network interface on the subnet that the host name list identifies.

   ```
   # clreslogicalhostname create -g sapdbrg -h sdrvr-1 -d sapdblr
   ```

Note – If you require a fully qualified hostname, you must specify the fully qualified name with the `-h` option and you cannot use the fully qualified form in the resource name.

3. The following command moves the `sapdbrg` resource group to the `MANAGED` state, brings the resource group online, and monitors the resources in the resource group.

```
# clresourcegroup online -eM sapdbrg
```

Verifying the SAP MaxDB Installation and Configuration

Before you install the HA for SAP MaxDB packages, verify that the SAP MaxDB software is correctly installed and configured to run in a cluster. This verification does *not* verify that the SAP MaxDB application is highly available because the HA for SAP MaxDB data service is not yet installed.

▼ How to Verify SAP MaxDB Installation and Configuration on Each Node

Perform this procedure on each node or zone that can master the SAP MaxDB resource group.

1 Log in as superuser to a node or zone that can master the SAP MaxDB resource group.

2 Switch the SAP MaxDB resource group to the node that you logged in to in Step 1.

```
# clresourcegroup switch -n node  sapdb-rg
```

`-n` *node* — Specifies the node to which the SAP MaxDB resource group is to be switched

sapdb-rg — Specifies that the SAP MaxDB resource group *sapdb-rg* is to be switched to another node

3 Confirm that the SAP MaxDB database can be started and be stopped.

a. Become the OS user who administers the SAP MaxDB database.

```
# su - os-sapdb-adm-user
```

os-sapdb-adm-user — Specifies the UNIX user identity of the OS user who administers the SAP MaxDB database. This user's home directory contains the `.XUSER.62` file that was created during the installation and configuration of SAP MaxDB. For more information, see "Installing and Configuring SAP MaxDB" on page 16. You specify this user when you set the `DB_User` extension property as explained in "How

to Register and Configure a SAP MaxDB Resource" on page 29.

b. Start the SAP xserver.

```
$ x_server start
```

c. Manually start the SAP MaxDB database instance on the node that you logged in to in Step 1.

```
$ dbmcli -U sapdb-adm-key db_online
```

`-U` *sapdb-adm-key* — Specifies that the `dbmcli` command is run with the user key of the database user who administers the SAP MaxDB instance. This user key is created during the installation and configuration of SAP MaxDB. For more information, see "Installing and Configuring SAP MaxDB" on page 16. You specify this user key when you set the `User_Key` extension property as explained in "How to Register and Configure a SAP MaxDB Resource" on page 29.

d. Confirm that the SAP MaxDB database instance is started.

e. Manually stop the SAP MaxDB database instance.

```
$ dbmcli -U sapdb-adm-key db_offline
```

`-U` *sapdb-adm-key* — Specifies that the `dbmcli` command is run with the user key that you used for starting the database in Step c

f. Confirm that the SAP MaxDB database instance is stopped.

Installing the HA for SAP MaxDB Packages

If you did not install the HA for SAP MaxDB packages during your initial Oracle Solaris Cluster installation, perform this procedure to install the packages. To install the packages, use the `installer` program.

Note – You need to install the HA for SAP MaxDB packages in the global cluster and not in the zone cluster.

▼ How to Install the HA for SAP MaxDB Packages

Perform this procedure on each cluster node where you want the HA for SAP MaxDB software to run.

You can run the `installer` program with a command-line interface (CLI) or with a graphical user interface (GUI). The content and sequence of instructions in the CLI and the GUI are similar.

Note – Even if you plan to configure this data service to run in non-global zones, install the packages for this data service in the global zone. The packages are propagated to any existing non-global zones and to any non-global zones that are created after you install the packages.

Before You Begin Ensure that you have the Oracle Solaris Cluster installation media.

If you intend to run the `installer` program with a GUI, ensure that your `DISPLAY` environment variable is set.

1. **On the cluster node where you are installing the data service packages, become superuser.**
2. **Load the Oracle Solaris Cluster installation media into the DVD-ROM drive.**

   If the Volume Management daemon `vold(1M)` is running and configured to manage DVD-ROM devices, the daemon automatically mounts the DVD-ROM on the `/cdrom` directory.
3. **Change to the installation wizard directory of the DVD-ROM.**

   - **If you are installing the data service packages on the SPARC platform, type the following command:**

     ```
     # cd /cdrom/cdrom0/Solaris_sparc
     ```

   - **If you are installing the data service packages on the x86 platform, type the following command:**

     ```
     # cd /cdrom/cdrom0/Solaris_x86
     ```
4. **Start the installation wizard.**

   ```
   # ./installer
   ```
5. **When you are prompted, accept the license agreement.**
6. **From the list of Oracle Solaris Cluster agents under Availability Services, select the data service for SAP MaxDB.**
7. **If you require support for languages other than English, select the option to install multilingual packages.**

   English language support is always installed.

8. **When prompted whether to configure the data service now or later, choose Configure Later.**

   Choose Configure Later to perform the configuration after the installation.

9. **Follow the instructions on the screen to install the data service packages on the node.**

   The installation wizard displays the status of the installation. When the installation is complete, the wizard displays an installation summary and the installation logs.

10. **(GUI only) If you do not want to register the product and receive product updates, deselect the Product Registration option.**

    The Product Registration option is not available with the CLI. If you are running the installation wizard with the CLI, omit this step.

11. **Exit the installation wizard.**

12. **Unload the installation media from the DVD-ROM drive.**

    a. **To ensure that the DVD-ROM is not being used, change to a directory that does *not* reside on the DVD-ROM.**

    b. **Eject the DVD-ROM.**

       ```
       # eject cdrom
       ```

Configuring the HAStoragePlus Resource Type to Work With HA for SAP MaxDB

For maximum availability of the SAP MaxDB database, resources that HA for SAP MaxDB requires must be available before the SAP MaxDB database instance is started. An example of such a resource is the file system where programs and libraries for the SAP MaxDB runtime environment reside. To ensure that these resources are available, configure the `HAStoragePlus` resource type to work with HA for SAP MaxDB.

For information about the relationship between resource groups and disk device groups, see "Relationship Between Resource Groups and Device Groups" in *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

Configuring the `HAStoragePlus` resource type to work with HA for SAP MaxDB involves the following operation:

- Registering and configuring an `HAStoragePlus` resource

▼ How to Register and Configure an HAStoragePlus Resource

Perform this procedure on any one cluster node.

1 Register the `SUNW.HAStoragePlus` resource type.

```
# clresourcetype register SUNW.HAStoragePlus
```

2 Create an `HAStoragePlus` resource for the global device group on which SAP MaxDB is installed.

Create this resource in the SAP MaxDB resource group. This resource must perform an affinity switchover for all global devices that are defined for this resource.

```
# clresource create -d -g sapdb-rg \
-t SUNW.HAStoragePlus -p filesystemmountpoints=mountpoint-list \
-p globaldevicepaths=sapdb-device-group \
-p affinityon=TRUE hsp-resource
```

`-d`
Specifies that a new resource is to be created in a disabled state.

`-g` *sapdb-rg*
Specifies that the resource is to be added to the SAP MaxDB resource group.

`-t SUNW.HAStoragePlus`
Specifies that the resource is an instance of the `SUNW.HAStoragePlus` resource type.

`-p filesystemmountpoints=`*mountpoint-list*
Specifies a list of valid mount points for the file system.

`-p globaldevicepaths=`*sapdb-device-group*
Specifies the name of the global device group on which the SAP MaxDB software is installed.

`-p affinityon=TRUE`
Specifies that this resource performs an affinity switchover for all global devices that are defined for this resource.

hsp-resource
Specifies that the resource that you are creating is named *hsp-resource*.

The resource is created in the enabled state.

Example 1–6 Creating an HAStoragePlus Resource

```
# clresource create -g sapdbrg \
-t SUNW.HAStoragePlus -p filesystemmountpoints=/global/sapdbdata \
-p globaldevicepaths=sapdbdg -p affinityon=TRUE hsprs
```

This example shows the creation of a `SUNW.HAStoragePlus` resource that has the following characteristics:

- The resource is named `hsprs`.

- The resource is a member of a resource group that is named `sapdbrg`. The creation of this resource group is shown in Example 1–5.
- The resource is an instance of the `SUNW.HAStoragePlus` resource type. The registration of this resource type is not shown in this example.
- The mount point for the file system is `/global/sapdbdata`.
- The SAP MaxDB software is installed on a global device group that is named `sapdbdg`.
- The `hsprs` resource performs an affinity switchover for all global devices that are defined for this resource.

Next Steps Go to "Registering and Configuring HA for SAP MaxDB" on page 25.

Registering and Configuring HA for SAP MaxDB

To enable HA for SAP MaxDB to make SAP MaxDB highly available, configure Oracle Solaris Cluster data services as follows:

- Configure SAP xserver as a multiple master data service.
- Configure HA for SAP MaxDB as a failover data service.

Before you perform this procedure, ensure that the HA for SAP MaxDB data service packages are installed.

Caution – One SAP xserver serves multiple SAP MaxDB instances and, if SAP liveCache is used, multiple SAP liveCache instances in the cluster. Therefore, do *not* configure more than one SAP xserver resource on the same cluster. If more than one SAP xserver resource runs on the same cluster, conflicts between the SAP xserver resources occur. These conflicts cause all SAP xserver resources to become unavailable. If you attempt to start the SAP xserver a second time, the attempt fails. The error message `Address already in use` is also displayed.

Setting HA for SAP MaxDB Extension Properties

The sections that follow contain instructions for registering and configuring resources. These instructions explain how to set *only* extension properties that HA for SAP MaxDB requires you to set. For information about all HA for SAP MaxDB extension properties, see Appendix A, "HA for SAP MaxDB Extension Properties." You can update some extension properties dynamically. You can update other properties, however, only when you create or disable a resource. The Tunable entry indicates when you can update a property.

To set an extension property of a resource, include the following option to modify the resource:

`-p` *property*`=`*value*

`-p` *property* Identifies the extension property that you are setting

value Specifies the value to which you are setting the extension property

You can also use the procedures in Chapter 2, "Administering Data Service Resources," in *Oracle Solaris Cluster Data Services Planning and Administration Guide* to configure resources after the resources are created.

Administering SAP xserver as a User Other Than Root

You might be required to administer SAP xserver as a user other than root. In this situation, you must create and define that user as follows:

- You must create that user on all cluster nodes or zones that master SAP xserver.
- You must define that user when you register and configure an SAP xserver resource. To define the user who administers SAP xserver, set the `Xserver_User` extension property when you create an SAP xserver resource. For more information about the `Xserver_User` extension property, see "`SUNW.sap_xserver` Extension Properties" on page 44.

▼ How to Register and Configure an SAP xserver Resource

1 Become superuser on a cluster node.

2 Register the `SUNW.sap_xserver` resource type.

```
# clresourcetype register SUNW.sap_xserver
```

3 Create a scalable resource group for the SAP xserver resource.

Configure SAP xserver so that SAP xserver starts on all nodes to which the SAP MaxDB resource can fail over. To implement this configuration, ensure that the node list of the SAP xserver resource group contains all nodes that are in the node list of the SAP MaxDB resource group. This resource group is created when the procedure "How to Enable SAP MaxDB to Run in a Cluster" on page 18 is performed.

```
# clresourcegroup create -n node-zone-list \
-p Maximum_primaries=nodes-in-sapdb-rg \
-p Desired_primaries=nodes-in-sapdb-rg xserver-rg
```

`-n` *node-zone-list*
Specifies a comma-separated, ordered list of zones that can master this resource group. The format of each entry in the list is *node*. In this format, *node* specifies the node name and *zone* specifies the name of a non-global Oracle Solaris zone. To specify the global zone, or to specify a node without non-global zones, specify only *node*.

This list is optional. If you omit this list, the global zone of each cluster node can master the resource group.

`-p Maximum_primaries=`*nodes-in-sapdb-rg*
Specifies the maximum number of nodes on which the SAP xserver resource can start. This number is equal to the number of nodes that are in the node list of the SAP MaxDB resource group. You must specify the same number as the value of the `Desired_primaries` property.

`-p Desired_primaries=`*nodes-in-sapdb-rg*
Specifies the desired number of nodes on which the SAP xserver resource can start. This number is equal to the number of nodes that are in the node list of the SAP MaxDB resource group. You must specify the same number as the value of the `Maximum_primaries` property.

xserver-rg
Specifies that the resource group that you are creating is named *xserver-rg*.

4 Add the `HAStoragePlus` resource to the SAP xserver resource group.

```
# clresource create -g xserver-rg \
-t SUNW.HAStoragePlus \
-p filesystemmountpoints=mountpoints \
-p affinityon=false xserver-storage-resource
```

`-g` *xserver-rg*
Specifies that the resource that you are creating is added to the resource group *xserver-rg*.

`-t SUNW.HAStoragePlus`
Specifies that the resource type of the resource you are creating is `SUNW.HAStoragePlus`.

`-p filesystemmountpoints=`*mountpoint, ...*
Specifies the mount points for the resource group you are creating.

`-p affinityon=false`
Indicates that the SAP xserver resource does not have to be colocated with the device group.

xserver-storage-resource
Specifies that the resource that you are creating is named *xserver-storage-resource*.

The resource is created in the enabled state.

For more details on how to set up an `HAStoragePlus` resource, see "Enabling Highly Available Local File Systems" in *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

5 Create an SAP xserver resource in the resource group that you created in Step 3.

```
# clresource create -d -g xserver-rg \
-t SUNW.sap_xserver \
-p resource_dependencies_offline_restart=storage-resource \
-p resource_dependencies=rest-of-the-tree
```

`-g` *xserver-rg*
Specifies that the resource is to be added to the resource group that you created in Step 3

`-t SUNW.sap_xserver`
Specifies that the resource is an instance of the `SUNW.sap_xserver` resource type

`-p resource_dependencies_offline_restart=`*storage-resource*
Sets a resource dependency between *storage-resource* and the `HAStoragePlus` resource we created in Step 4.

`-p resource_dependencies_offline_restart=`*rest-of-the-tree*
Specifies that the SAP MaxDB resource depends on the listed resources.

xserver-resource
Specifies that the resource that you are creating is named *xserver-resource*.

The resource is created in the enabled state.

6 Bring the resource group that you created in Step 3 online in a managed state.

```
# clresourcegroup online -M xserver-rg
```

`-M` Moves the resource to the `MANAGED` state.

xserver-rg Specifies the name of the resource group.

Example 1–7 Configuring a SUNW.sap_xserver Resource

This example shows the sequence of commands that are required to configure an SAP xserver resource. The commands are run on only one cluster node.

1. The following command creates a multiple master resource group to contain an SAP xserver resource for a four-node cluster. The resource group is named `xsrvrrg`. The `xsrvrrg` resource group can be brought online on all cluster nodes.

   ```
   # clresourcegroup create \
   -p Maximum_primaries=4 \
   -p Desired_primaries=4 xsrvrrg
   ```

2. The following command adds the `HAStoragePlus` resource to the SAP xserver resource group. The `xserver-storage-resource` is called `xsstorrs` and the mount point, `mtp1`.

   ```
   # clresource create -d -g xsrvrrg \
   -t SUNW.HAStoragePlus \
   -p filesystemmountpoints=mtp1 \
   -p affinityon=false xsstorrs
   ```

   The resource is created in the enabled state.

3. The following command creates an SAP xserver resource that is named `xsrvrrs` in the `xsrvrrg` resource group. The SAP xserver resource is an instance of the `SUNW.sap_xserver` resource type. The registration of this resource type is not shown in this example.

   ```
   # clresource create -d -g xsrvrrg -t SUNW.sap_xserver \
   -p resource_dependencies_offline_restart=storage-resource \
   -p resource_dependencies=rest-of-the-tree
   ```

The resource is created in the enabled state.

4. The following command moves the `xsrvrrg` resource group to the `MANAGED` state and brings the resource group online.

   ```
   # clresourcegroup online -M xsrvrrg
   ```

▼ How to Register and Configure a SAP MaxDB Resource

1 Register the `SUNW.sapdb` resource type.

```
# clresourcetype register SUNW.sapdb
```

2 Create a SAP MaxDB resource in the SAP MaxDB resource group.

Ensure that the SAP MaxDB resource depends on the following resources:

- The `HAStoragePlus` resource for the global device group on which SAP MaxDB is installed.
- The SAP xserver resource.

When you create this resource, specify the following information about the SAP MaxDB database instance. This information is created when SAP MaxDB is installed and configured as explained in "Installing and Configuring SAP MaxDB" on page 16.

- The name of the SAP MaxDB database.
- The UNIX user identity of the OS user who administers the SAP MaxDB database instance.
- The user key of the database user who administers the SAP MaxDB database instance.

```
# clresource create -d -g sapdb-rg \
-t SUNW.sapdb \
-p DB_Name=db-name \
-p DB_User=os-sapdb-adm-user \
-p User_Key=sapdb-adm-key \
-p resource_dependencies_offline_restart=storage-resource \
-p resource_dependencies=rest-of-the-tree
```

`-d`
Specifies that the resource that you are creating is not immediately enabled.

`-g` *sapdb-rg*
Specifies that the resource is to be added to the SAP MaxDB resource group.

`-t SUNW.sapdb`
Specifies that the resource is an instance of the `SUNW.sapdb` resource type.

`-p DB_Name=`*db-name*
Specifies the name of the SAP MaxDB database instance in uppercase.

`-p DB_User=`*os-sapdb-adm-user*
Specifies the UNIX user identity of the OS user who administers the SAP MaxDB database. This user's home directory contains the `.XUSER.62` file that was created during the installation and configuration of SAP MaxDB. For more information, see "Installing and Configuring SAP MaxDB" on page 16.

`-p User_Key=`*sapdb-adm-key*
Specifies the user key of the database user who administers the SAP MaxDB database instance. This user key is created during the installation and configuration of SAP MaxDB. For more information, see "Installing and Configuring SAP MaxDB" on page 16.

`-p resource_dependencies_offline_restart=`*storage-resource* \
Specifies that the SAP MaxDB resource depends on the following resources.

- The `HAStoragePlus` resource for the global device group on which SAP MaxDB is installed

`-p resource_dependencies_offline_restart=`*rest-of-the-tree*
Specifies that the SAP MaxDB resource depends on the listed resources.

sapdb-rs
Specifies that the resource that you are creating is named *sapdb-rs*.

The resource is created in the enabled state.

3 Ensure that the SAP MaxDB resource group is brought online only on a node or zone where the SAP xserver resource group is online.

To meet this requirement, create on the SAP MaxDB resource group a strong positive affinity for the SAP xserver resource group.

```
# clresourcegroup set -p rg_affinities=++xserver-rg  sapdb-rg
```

`-p rg_affinities=++`*xserver-rg*
Specifies that the SAP MaxDB resource group declares a strong positive affinity for the SAP xserver resource group.

sapdb-rg
Specifies that theSAP MaxDB resource group is to be modified.

4 Bring the SAP MaxDB resource group online in a managed state.

```
#clresourcegroup online -M sapdb-rg
```

`-emM` Enables the SAP MaxDB resource group and moves it to the `MANAGED` state.

sapdb-rg Specifies the name of the SAP MaxDB resource group to be brought online.

5 **(Optional) Consider configuring your cluster to prevent noncritical resource groups from being brought online on the same node or zone as the SAP MaxDB resource group.**

You might plan to run lower-priority services on a node to which the SAP MaxDB resource can fail over. In this situation, consider using resource group affinities to shut down the noncritical services when the SAP MaxDB resource fails over to the node.

To specify this behavior, declare on the resource group for each noncritical service a strong negative affinity for the SAP MaxDB resource group.

```
# clresourcegroup set -p rg_affinities=--sapdb-rg  noncritical-rg
```

`-p`
Sets the resource group property to the specified value.

noncritical-rg
Specifies the name of the noncritical resource group.

Example 1–8 Creating a SUNW.sapdb Resource

```
# clresource create -d -g sapdbrg -t SUNW.sapdb \
-p DB_Name=TST -p DB_User=dbadmin \
-p User_Key=DEFAULT -p resource_dependencies_offline_restart=hsprs \
-p resource_dependencies=xsrvrrs sapdbrs
```

The resource is created in the enabled state.

This example shows the creation of a `SUNW.sapdb` resource that has the following characteristics:

- The resource is named `sapdbrs`.
- The resource is a member of a resource group that is named `sapdbrg`. The creation of this resource group is shown in Example 1–5.
- The resource is an instance of the `SUNW.sapdb` resource type. The registration of this resource type is not shown in this example.
- The SAP MaxDB database instance that is associated with this resource is named `TST`.
- The UNIX user identity of the OS user who administers the SAP MaxDB database is `dbadmin`.
- The user key of the database user who administers the SAP MaxDB database is `DEFAULT`.
- The SAP MaxDB resource depends on the following resources:
  - An `HAStoragePlus` resource that is named `hsprs`. The creation of the `hsprs` resource is shown in Example 1–6.
  - A `SUNW.sapdb` resource that is named `xsrvrrs`. The creation of the `xsrvrrs` resource is shown in Example 1–7.

Tuning the HA for SAP MaxDB Fault Monitors

Fault monitoring for the HA for SAP MaxDB data service is provided by the following fault monitors:

- The SAP MaxDB fault monitor
- The SAP xserver fault monitor

Each fault monitor is contained in a resource whose resource type is shown in the following table.

TABLE 1–3 Resource Types for HA for SAP MaxDB Fault Monitors

Fault Monitor	Resource Type
SAP MaxDB	`SUNW.sapdb`
SAP xserver	`SUNW.sap_xserver`

System properties and extension properties of these resources control the behavior of the fault monitors. The default values of these properties determine the preset behavior of the fault monitors. The preset behavior should be suitable for most Oracle Solaris Cluster installations. Therefore, you should tune the HA for SAP MaxDB fault monitors *only* if you need to modify this preset behavior.

Tuning the HA for SAP MaxDB fault monitors involves the following tasks:

- Setting the interval between fault monitor probes
- Setting the timeout for fault monitor probes
- Defining the criteria for persistent faults
- Specifying the failover behavior of a resource

For more information, see "Tuning Fault Monitors for Oracle Solaris Cluster Data Services" in *Oracle Solaris Cluster Data Services Planning and Administration Guide*. Information about the HA for SAP MaxDB fault monitors that you need to perform these tasks is provided in the subsections that follow.

HA for SAP MaxDB also enables you to control how the fault monitor responds if the SAP MaxDB parent kernel process is not running. For more information, see "Forcing the SAP MaxDB Database Instance to Be Restarted if the Parent Kernel Process Is Terminated" on page 34.

Tune the HA for SAP MaxDB fault monitors when you register and configure HA for SAP MaxDB. For more information, see "Registering and Configuring HA for SAP MaxDB" on page 25.

Factors That Affect the Interval Between Fault Monitor Probes

To determine whether SAP xserver and the SAP MaxDB database instance are operating correctly, the HA for SAP MaxDB fault monitors probe these resources periodically. The optimum interval between fault monitor probes depends on the time that is required to respond to a fault in a resource. This time depends on how the complexity of the resource affects the time that is required for operations such as restarting the resource.

For example, SAP xserver is a much simpler resource and can be restarted much quicker than SAP MaxDB. Therefore, the optimum interval between fault monitor probes of SAP xserver is shorter than the optimum interval between probes of SAP MaxDB.

Operations by the HA for SAP MaxDB Fault Monitors During a Probe

The optimum timeout for fault monitor probes depends on the operations that a fault monitor performs to probe the resource.

Operations by the SAP MaxDB Fault Monitor During a Probe

During a probe, the SAP MaxDB fault monitor performs the following operations:

1. The SAP MaxDB fault monitor determines whether the SAP MaxDB database instance is online.
2. If the SAP MaxDB database instance is online, the SAP MaxDB fault monitor determines whether the parent kernel process of the SAP MaxDB database instance is running. You can control how the fault monitor responds if the parent kernel process is not running. For more information, see "Forcing the SAP MaxDB Database Instance to Be Restarted if the Parent Kernel Process Is Terminated" on page 34.
3. The SAP MaxDB fault monitor determines whether SAP xserver is available. This fault monitoring supplements the fault monitoring that the SAP xserver fault monitor provides.

Operations by the SAP xserver Fault Monitor During a Probe

During a probe, the SAP xserver fault monitor determines whether SAP xserver is available.

Faults Detected by the HA for SAP MaxDB Fault Monitors

Faults that each HA for SAP MaxDB fault monitor detects are described in the subsections that follow.

Faults Detected by the SAP MaxDB Fault Monitor

The SAP MaxDB fault monitor detects the following faults in SAP MaxDB:

- A status of the SAP MaxDB database instance that is not `ONLINE`, for example, `OFFLINE` or `ADMIN`
- Unexpected termination of the parent kernel process of the SAP MaxDB database instance

The SAP MaxDB fault monitor also detects the unavailability of SAP xserver. This fault monitoring supplements the fault monitoring that the SAP xserver fault monitor provides.

Note – If the SAP MaxDB fault monitor detects that SAP xserver is unavailable twice within the retry interval, the SAP MaxDB fault monitor restarts SAP MaxDB. By restarting SAP MaxDB, the fault monitor ensures that the SAP MaxDB database fails over to another node when SAP xserver is persistently unavailable.

Faults Detected by the SAP xserver Fault Monitor

The SAP xserver fault monitor detects following faults:

- **Unavailability of SAP xserver.** Unavailability of SAP xserver is also detected by the SAP MaxDB fault monitor.
- **Persistent system errors.** A persistent system error is a system error that occurs four times within the retry interval. If a persistent system error occurs, the fault monitor restarts SAP xserver.

Recovery Actions in Response to Detected Faults

To minimize the disruption that transient faults in a resource cause, a fault monitor restarts the resource in response to such faults. For persistent faults, more disruptive action than restarting the resource is required:

- For the SAP MaxDB resource, the fault monitor fails over the resource to another node. The SAP MaxDB resource is a failover resource.
- For the SAP xserver resource, the fault monitor takes the resource offline. The SAP xserver is a multiple master resource.

Forcing the SAP MaxDB Database Instance to Be Restarted if the Parent Kernel Process Is Terminated

By default, unexpected termination of the parent kernel process does *not* cause the SAP MaxDB fault monitor to restart the SAP MaxDB database instance. The SAP MaxDB database instance can continue to function without the parent kernel process. Restarting the SAP MaxDB database instance in this situation might cause unnecessary unavailability of the SAP MaxDB

database instance. Therefore, you should force the SAP MaxDB database instance to be restarted *only* if you require a feature that the parent kernel process provides. An example of such a feature is maintaining the integrity of the log history.

To force the SAP MaxDB database instance to be restarted if the parent kernel process is terminated, set the `Restart_if_Parent_Terminated` extension property of the `SUNW.sapdb` resource to `True`.

Verifying the HA for SAP MaxDB Installation and Configuration

After you install, register, and configure HA for SAP MaxDB, verify the HA for SAP MaxDB installation and configuration. Verifying the HA for SAP MaxDB installation and configuration determines if the HA for SAP MaxDB data service makes the SAP MaxDB application highly available.

Verifying the HA for SAP MaxDB installation involves verifying the operation of the following fault monitors:

- The SAP MaxDB fault monitor
- The SAP xserver fault monitor

▼ How to Verify the Operation of the SAP MaxDB Fault Monitor

Perform this procedure on each node where SAP MaxDB can run.

1 Log in as superuser to a node or zone that can master the SAP MaxDB resource group.

2 Switch the SAP MaxDB resource group to the node or zone that you logged in to in Step 1.

```
# clresourcegroup switch -n node sapdb-rg
```

node Specifies the node to which the SAP MaxDB resource group is to be switched

sapdb-rg Specifies the name of the SAP MaxDB resource group is to be switched to another node

3 Abnormally terminate SAP MaxDB.

a. Determine the process identities of all kernel processes for the SAP MaxDB database instance that you are running.

```
# ps -ef | grep kernel | grep db-name
```

db-name Specifies the name of the SAP MaxDB database instance in uppercase

b. Kill all kernel processes for the SAP MaxDB database instance that you are running.

```
# kill -9 sapdb-kernel-pid
```

sapdb-kernel-pid Specifies the process identities of the SAP MaxDB kernel processes that you determined in Step a

4 Confirm that the HA for SAP MaxDB fault monitor performs the appropriate operation from the following list:

- Restarting the SAP MaxDB resource
- Failing over the SAP MaxDB resource to another node

The expected behavior of the fault monitor depends on the failure history of the resource and the value of the `Failover_enabled` extension property. For more information, see the following sections:

- "Tuning the HA for SAP MaxDB Fault Monitors" on page 32
- "`SUNW.sapdb` Extension Properties" on page 41

5 Terminate SAP MaxDB normally.

a. Become the OS user who administers the SAP MaxDB database.

```
# su - os-sapdb-adm-user
```

os-sapdb-adm-user Specifies the UNIX user identity of the OS user who administers the SAP MaxDB database. This user's home directory contains the `.XUSER.62` file that was created during the installation and configuration of SAP MaxDB. For more information, see "Installing and Configuring SAP MaxDB" on page 16. You specify this user when you set the `DB_User` extension property as explained in "How to Register and Configure a SAP MaxDB Resource" on page 29.

b. Manually stop the SAP MaxDB database instance.

```
# dbmcli -U sapdb-adm-key db_offline
```

`-U` *sapdb-adm-key* Specifies that the `dbmcli` command is run with the user key of the database user who administers the SAP MaxDB database. This user key is created during the installation and configuration of SAP MaxDB. For more information, see "Installing and Configuring SAP MaxDB" on page 16. You specify this user key when you set the `User_Key` extension property as explained in "How to Register and Configure a SAP MaxDB Resource" on page 29.

6 Confirm that the HA for SAP MaxDB fault monitor performs the appropriate operation from the following list:

- Restarting the SAP MaxDB resource

- Failing over the SAP MaxDB resource to another node

The expected behavior of the fault monitor depends on the failure history of the resource and the value of the `Failover_enabled` extension property. For more information, see the following sections:

- "Tuning the HA for SAP MaxDB Fault Monitors" on page 32
- "`SUNW.sapdb` Extension Properties" on page 41

How to Verify the Operation of the SAP xserver Fault Monitor

Perform this procedure on each node that can master SAP xserver.

1 Log in to a node or zone that can master SAP xserver.

2 Abnormally terminate SAP xserver.

a. Determine the process identities of all SAP xserver processes.

```
# ps -ef | grep vserver
```

b. Kill all SAP xserver processes.

```
# kill -9 xserver-pid
```

xserver-pid Specifies the process identities of the SAP xserver processes that you determined in Step a

3 Confirm that the SAP xserver fault monitor restarts the SAP xserver resource.

4 Terminate SAP xserver normally.

a. Become the OS user who administers SAP xserver.

```
# su - os-sapxsrvr-adm-user
```

os-sapxsrvr-adm-user
Specifies the UNIX user identity of the OS user who administers SAP xserver. By default, this user is `root`. You can specify this user by setting the `Xserver_User` extension property. For more information, see "`SUNW.sap_xserver` Extension Properties" on page 44.

b. Manually stop the SAP xserver.

```
# x_server stop
```

5 Confirm that the SAP xserver fault monitor restarts the SAP xserver resource.

Upgrading the SUNW.sap_xserver Resource Type

The `SUNW.sap_xserver` resource type is supplied with the Oracle Solaris Cluster HA for SAP liveCache data service. The Oracle Solaris Cluster HA for SAP liveCache data service is installed when you install HA for SAP MaxDB data service. Upgrade the `SUNW.sap_xserver` resource type if all conditions in the following list apply:

- You have upgraded to the latest version of the Oracle Solaris Cluster HA for SAP liveCache data service.
- You plan to use the HA for SAP MaxDB data service with your existing version of the Oracle Solaris Cluster HA for SAP liveCache data service.

For general instructions that explain how to upgrade a resource type, see "Upgrading a Resource Type" in *Oracle Solaris Cluster Data Services Planning and Administration Guide*. The information that you need to complete the upgrade of the `SUNW.sap_xserver` resource type is provided in the subsections that follow.

Information for Registering the New Resource Type Version

The relationship between a resource type version and the release of Oracle Solaris Cluster data services is shown in the following table. The release of Oracle Solaris Cluster data services indicates the release in which the version of the resource type was introduced.

Resource Type Version	Oracle Solaris ClusterData Services Release
1.0	3.0 5/02 asynchronous release
2	3.1 4/04
3.1	3.2

To determine the version of the resource type that is registered, use the `clresource list` command.

The resource type registration (RTR) file for this resource type is `/opt/SUNWsclc/xserver/etc/SUNW.sap_xserver`.

Information for Migrating Existing Instances of the Resource Type

The information that you need to migrate instances of the `SUNW.sap_xserver` resource type is as follows:

- You can perform the migration only when the resource is unmonitored.
- If you need to use the new features of the `SUNW.sap_xserver` resource type, the required value of the `Type_version` property is `2`.
- If you need to specify the directory that contains programs and libraries for the SAP xserver runtime environment, set the `Independent_Program_Path` extension property. For more information, see "`SUNW.sap_xserver` Extension Properties" on page 44.

The following example shows a command for editing an instance of the `SUNW.sap_xserver` resource type.

EXAMPLE 1–9 Editing an Instance of the SUNW.sap_xserver Resource Type During Upgrade

```
# clresource set -p Independent_Program_Path=/sapdb/indep_prog \
  -p Type_version=2 sapxserver-rs
```

This command edits a `SUNW.sap_xserver` resource as follows:

- The `SUNW.sap_xserver` resource is named `sapxserver-rs`.
- The `Type_version` property of this resource is set to `2`.
- The independent program path is `/sapdb/indep_prog`.

◆ ◆ ◆ APPENDIX A

HA for SAP MaxDB Extension Properties

Extension properties for HA for SAP MaxDB resource types are described in the following sections.

- "SUNW.sapdb Extension Properties" on page 41
- "SUNW.sap_xserver Extension Properties" on page 44

For details about system-defined properties, see the r_properties(5) man page and the rg_properties(5) man page.

SUNW.sapdb Extension Properties

The SUNW.sapdb resource type represents the SAP MaxDB application in a Oracle Solaris Cluster configuration. The extension properties of this resource type are as follows:

dbmcli_Start_Option
: The option that is passed to the dbmcli command to start the SAP MaxDB database instance.

  Data type String

  Default db_online

  Range Not applicable

  Tunable When disabled

DB_Name
: The name of the SAP MaxDB database instance in uppercase. This name is created when SAP MaxDB is installed and configured as explained in "Installing and Configuring SAP MaxDB" on page 16.

  Data type String

  Default No default defined

  Range Not applicable

Tunable When disabled

`DB_User`
The UNIX user identity of the operating system (OS) user who administers the SAP MaxDB database instance. This user's home directory contains the `.XUSER.62` file that was created during the installation and configuration of SAP MaxDB. For more information, see "Installing and Configuring SAP MaxDB" on page 16.

Data type String

Default No default defined

Range Not applicable

Tunable When disabled

`Failover_enabled`
Specifies whether the fault monitor fails over the SAP MaxDB resource if the number of attempts to restart exceeds `Retry_count` within the time that `Retry_interval` specifies. The possible values of this extension property are as follows:

- `True` – Specifies that the fault monitor fails over the SAP MaxDB resource
- `False` – Specifies that the fault monitor does *not* fail over the SAP MaxDB resource

Data type Boolean

Default `True`

Range Not applicable

Tunable Any time

`Independent_Program_Path`
The full path to the directory that contains the following programs and libraries for the SAP MaxDB application:

- Programs that are independent of the database software version
- Libraries for the client runtime environment

HA for SAP MaxDB determines the path to the `dbmcli` command from the value of this property. The `dbmcli` command resides in the `bin` subdirectory of the directory that this property specifies.

Data type String

Default `/sapdb/programs`

Range Not applicable

Tunable When disabled

`Monitor_retry_count`
The maximum number of restarts by the process monitor facility (PMF) that are allowed for the fault monitor.

Data type Integer

Default 4

Range No range defined

Tunable Any time

`Monitor_retry_interval`
The period of time in minutes during which the PMF counts restarts of the fault monitor.

Data type Integer

Default 2

Range No range defined

Tunable Any time

`Pid_Dir_Path`
The full path to the directory under which files that store the process identities of SAP MaxDB kernel processes are created. The process identities of SAP MaxDB kernel processes are stored in the following files:

- *pid-dir*`/ppid/`*db-name*
- *pid-dir*`/pid/`*db-name*

The replaceable items in these file paths are as follows:

- *pid-dir* is the directory that the `Pid_Dir_Path` extension property specifies
- *db-name* is the name of the SAP MaxDB database instance that the `DB_Name` extension property specifies

Data type String

Default `/var/spool/sql`

Range Not applicable

Tunable When disabled

`Probe_timeout`
The timeout value in seconds that the fault monitor uses to probe an SAP MaxDB database instance.

Data type Integer

Default 90

Range 30–99,999

Tunable Any time

`Restart_if_Parent_Terminated`
Determines whether the fault monitor restarts the SAP MaxDB database instance if the parent kernel process is terminated. The possible values of this extension property are as follows:

- `True` – Specifies that the fault monitor restarts the SAP MaxDB database instance if the parent kernel process is terminated
- `False` – Specifies that the fault monitor does *not* restart the SAP MaxDB database instance if the parent kernel process is terminated

Data type Boolean

Default `False`

Range Not applicable

Tunable Any time

`User_Key`
The user key of the database user who administers the SAP MaxDB database instance. This user key is created when SAP MaxDB is installed and configured as explained in "Installing and Configuring SAP MaxDB" on page 16.

Data type String

Default No default defined

Range Not applicable

Tunable When disabled

SUNW.sap_xserver Extension Properties

The `SUNW.sap_xserver` resource type represents SAP xserver in a Oracle Solaris Cluster configuration. The extension properties of this resource type are as follows:

`Confdir_List`
The full path to the directory that contains the SAP MaxDB software and SAP MaxDB database instance.

Data type String

Default `/sapdb`

Range Not applicable

Tunable At creation

`Independent_Program_Path`
The full path to the directory that contains the following programs and libraries for SAP xserver:

- Programs that are independent of the database software version
- Libraries for the client runtime environment

HA for SAP MaxDB determines the path to the `x_server` command from the value of this property. The `x_server` command resides in the `bin` subdirectory of the directory that this property specifies.

Data type String

Default No default defined

Range Not applicable

Tunable When disabled

Introduced in release 3.1 4/04

`Monitor_retry_count`
The maximum number of restarts by the PMF that are allowed for the fault monitor.

Data type Integer

Default 4

Range No range defined

Tunable Any time

`Monitor_retry_interval`
The period of time in minutes during which the PMF counts restarts of the fault monitor.

Data type Integer

Default 2

Range No range defined

Tunable Any time

`Probe_timeout`
The timeout value in seconds for fault monitor probes.

Data type Integer

Default 120

Range No range defined

Tunable Any time

`Soft_Stop_Pct`
The percentage of the `Stop` method timeout that is used to stop SAP xserver by using the SAP MaxDB utility `x_server stop`. If this timeout is exceeded, the `SIGKILL` signal is used to stop all SAP xserver processes.

Data type Integer

Default 50

Range 1–100

Tunable When disabled

`Xserver_User`
The UNIX user identity of the OS user who administers SAP xserver.

Data type String

Default `root`

Range Not applicable

Tunable At creation

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