Oracle® Solaris Cluster Data Service for SAP MaxDB Guide
Ce logiciel et la documentation qui l'accompagne sont protégés par les lois sur la propriété intellectuelle. Ils sont concédés sous licence et soumis à des restrictions d'utilisation et de divulgation. Sauf disposition de votre contrat de licence ou de la loi, vous ne pouvez pas copier, reproduire, traduire, diffuser, modifier, breveter, transmettre, distribuer, exposer, exécuter, publier ou afficher le logiciel, même partiellement, sous quelque forme et par quelque procédé que ce soit. Par ailleurs, il est interdit de procéder à toute ingénierie inverse du logiciel, de le désassembler ou de le décompiler, excepté à des fins d'interopérabilité avec des logiciels tiers ou tel que prescrit par la loi.

Les informations fournies dans ce document sont susceptibles de modification sans préavis. Par ailleurs, Oracle Corporation ne garantit pas qu'elles soient exemptes d'erreurs et vous invite, le cas échéant, à lui en faire part par écrit.

Si ce logiciel, ou la documentation qui l'accompagne, est concédé sous licence au Gouvernement des États-Unis, ou à toute entité qui délivre la licence de ce logiciel ou l'utilise pour le compte du Gouvernement des États-Unis, la notice suivante s'applique:

U.S. GOVERNMENT END USERS. Oracle programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, delivered to U.S. Government end users are "commercial computer software" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

Ce logiciel ou matériel a été développé pour un usage général dans le cadre d'applications de gestion des informations. Ce logiciel ou matériel n'est pas conçu ni n'est destiné à être utilisé dans des applications à risque, notamment dans des applications pouvant causer des dommages corporels. Si vous utilisez ce logiciel ou matériel dans le cadre d'applications dangereuses, il est de votre responsabilité de prendre toutes les mesures de secours, de sauvegarde, de redondance et autres mesures nécessaires à son utilisation dans des conditions optimales de sécurité. Oracle Corporation et ses affiliés déclinent toute responsabilité quant aux dommages causés par l'utilisation de ce logiciel ou matériel pour ce type d'applications.

Oracle et Java sont des marques déposées d’Oracle Corporation et/ou de ses affiliés. Tout autre nom mentionné peut correspondre à des marques appartenant à d'autres propriétaires qu'Oracle.

Intel et Intel Xeon sont des marques ou des marques déposées d'Intel Corporation. Toutes les marques SPARC sont utilisées sous licence et sont des marques ou des marques déposées d'Advanced Micro Devices. UNIX est une marque déposée de The Open Group.

Ce logiciel ou matériel et la documentation qui l'accompagne peuvent fournir des informations ou des liens donnant accès à des contenus, des produits et des services émanant de tiers. Oracle Corporation et ses affiliés déclinent toute responsabilité ou garantie expresse quant aux contenus, produits ou services émanant de tiers. En aucun cas, Oracle Corporation et ses affiliés ne sauraient être tenus pour responsables des pertes subies, des coûts occasionnés ou des dommages causés par l'accès à des contenus, produits ou services tiers, ou à leur utilisation.

Copyright © 2000, 2013, Oracle and/or its affiliates. All rights reserved.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish, or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

If this is software or related documentation that is delivered to the U.S. Government or anyone licensing it on behalf of the U.S. Government, the following notice is applicable:

U.S. GOVERNMENT END USERS. Oracle programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, delivered to U.S. Government end users are “commercial computer software” pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

This software or hardware is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications that may create a risk of personal injury. If you use this software or hardware in dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure its safe use. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software or hardware in dangerous applications.

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Intel and Intel Xeon are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. AMD, Opteron, the AMD logo, and the AMD Opteron logo are trademarks or registered trademarks of Advanced Micro Devices. UNIX is a registered trademark of The Open Group.

This software or hardware and documentation may provide access to or information on content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish, or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

If this is software or related documentation that is delivered to the U.S. Government or anyone licensing it on behalf of the U.S. Government, the following notice is applicable:

U.S. GOVERNMENT END USERS. Oracle programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, delivered to U.S. Government end users are “commercial computer software” pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

This software or hardware is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications that may create a risk of personal injury. If you use this software or hardware in dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure its safe use. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software or hardware in dangerous applications.

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Intel and Intel Xeon are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. AMD, Opteron, the AMD logo, and the AMD Opteron logo are trademarks or registered trademarks of Advanced Micro Devices. UNIX is a registered trademark of The Open Group.

This software or hardware and documentation may provide access to or information on content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish, or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

If this is software or related documentation that is delivered to the U.S. Government or anyone licensing it on behalf of the U.S. Government, the following notice is applicable:

U.S. GOVERNMENT END USERS. Oracle programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, delivered to U.S. Government end users are “commercial computer software” pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

This software or hardware is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications that may create a risk of personal injury. If you use this software or hardware in dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure its safe use. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software or hardware in dangerous applications.

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Intel and Intel Xeon are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. AMD, Opteron, the AMD logo, and the AMD Opteron logo are trademarks or registered trademarks of Advanced Micro Devices. UNIX is a registered trademark of The Open Group.

This software or hardware and documentation may provide access to or information on content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services.
Contents

Preface ..................................................................................................................................................... 5

1 Installing and Configuring HA for SAP MaxDB .................................................................................. 9
   HA for SAP MaxDB Overview .............................................................................................................. 10
   Overview of the Installation and Configuration Process for HA for SAP MaxDB .............. 10
   Planning the HA for SAP MaxDB Installation and Configuration .............................................. 11
      Configuration Requirements .......................................................................................................... 12
      Supported Configurations of This Data Service ......................................................................... 13
      Configuration Considerations ....................................................................................................... 15
      Configuration Planning Questions ................................................................................................. 16
   Installing and Configuring SAP MaxDB .......................................................................................... 16
      ▼ How to Install and Configure SAP MaxDB .............................................................................. 16
      ▼ How to Enable SAP MaxDB to Run in a Cluster ...................................................................... 18
   Verifying the SAP MaxDB Installation and Configuration .......................................................... 20
      ▼ How to Verify SAP MaxDB Installation and Configuration on Each Node ....................... 20
   Installing the HA for SAP MaxDB Packages ................................................................................. 21
      ▼ How to Install the HA for SAP MaxDB Packages ................................................................... 21
   Configuring the HAStoragePlus Resource Type to Work With HA for SAP MaxDB ........... 23
      ▼ How to Register and Configure an HAStoragePlus Resource .............................................. 24
   Registering and Configuring HA for SAP MaxDB .......................................................................... 25
      Setting HA for SAP MaxDB Extension Properties ..................................................................... 25
      Administering SAP xservers as a User Other Than Root ............................................................. 26
      ▼ How to Register and Configure an SAP xservers Resource ................................................... 26
      ▼ How to Register and Configure a SAP MaxDB Resource ....................................................... 29
   Tuning the HA for SAP MaxDB Fault Monitors ............................................................................ 32
      Factors That Affect the Interval Between Fault Monitor Probes .............................................. 33
      Operations by the HA for SAP MaxDB Fault Monitors During a Probe .............................. 33
      Faults Detected by the HA for SAP MaxDB Fault Monitors ..................................................... 33
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

<table>
<thead>
<tr>
<th>Typeface</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
</table>
| 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` |
| aabbcc123 | Placeholder: replace with a real name or value | `Password:` |
| AaBbtCc123 | Book titles, new terms, and terms to be emphasized | The command to remove a file is `rm filename`.
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

<table>
<thead>
<tr>
<th>Shell</th>
<th>Prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bash shell, Korn shell, and Bourne shell</td>
<td><code>$</code></td>
</tr>
<tr>
<td>Bash shell, Korn shell, and Bourne shell for superuser</td>
<td><code>#</code></td>
</tr>
<tr>
<td>C shell</td>
<td><code>machine_name%</code></td>
</tr>
<tr>
<td>C shell for superuser</td>
<td><code>machine_name#</code></td>
</tr>
</tbody>
</table>
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.

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

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.

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

Also have available the contents of the /var/adm/messages file.
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>
<thead>
<tr>
<th>SAP MaxDB Component</th>
<th>Data Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP MaxDB</td>
<td>HA for SAP MaxDB</td>
</tr>
<tr>
<td></td>
<td>The resource type is SUNW.sapdb.</td>
</tr>
<tr>
<td>SAP xserver</td>
<td>Oracle Solaris Cluster HA for SAP liveCache</td>
</tr>
<tr>
<td></td>
<td>The resource type is SUNW.sap_xserver.</td>
</tr>
<tr>
<td>NFS file system</td>
<td>Oracle Solaris Cluster HA for NFS</td>
</tr>
<tr>
<td></td>
<td>The resource type is SUNW.nfs.</td>
</tr>
<tr>
<td></td>
<td>For more information about this data service, see Oracle Solaris Cluster Data Service for Network File System (NFS) Guide.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Task</th>
<th>Cross-Reference</th>
</tr>
</thead>
</table>
| 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                   | "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.

<table>
<thead>
<tr>
<th>SAP MaxDB Application</th>
<th>Oracle Solaris Cluster Data Service</th>
<th>Associated Document</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP liveCache</td>
<td>Oracle Solaris Cluster HA for SAP liveCache</td>
<td>Oracle Solaris Cluster Data Service for SAP liveCache Guide</td>
</tr>
<tr>
<td>SAP Web Application Server</td>
<td>Oracle Solaris Cluster HA for SAP Web Application Server</td>
<td>Oracle Solaris Cluster Data Service for SAP Web Application Server Guide</td>
</tr>
<tr>
<td>SAP NetWeaver</td>
<td>Oracle Solaris Cluster HA for SAP NetWeaver</td>
<td>Oracle Solaris Cluster Data Service for SAP NetWeaver Guide</td>
</tr>
</tbody>
</table>

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.
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.

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 only on the HAStoragePlus resource 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
```
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.

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

   Specifies that the resource group that you are creating is named `sapdb-rg`.

   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 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 srvr-1 -d sapdbhr
```
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...”
      ```
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

-\$\text{U sapdb-adm-key} \text{ 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.}

\$\text{dbmcli -U sapdb-adm-key db_offline}

-\$\text{U sapdb-adm-key} \text{ Specifies that the dbmcli command is run with the user key that you used for starting the database in Step c}

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

-\$\text{U sapdb-adm-key} \text{ Specifies that the dbmcli command is run with the user key that you used for stopping the database in Step f}

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.

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

\text{▼ 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.
When prompted whether to configure the data service now or later, choose Configure Later. Choose Configure Later to perform the configuration after the installation.

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.

(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.

Exit the installation wizard.

Unload the installation media from the DVD-ROM drive.

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

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.
   ```bash
   # clresource type 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.
   ```bash
   # 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

   ```bash
   # clresource create -g sapdb-rg \
   -t SUNW.HASToragePlus -p filesystemmountpoints=/global/sapdbdata \
   -p globaldevicepaths=sapdbdsg -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 xservers 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 xservers 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 xservers resource on the same cluster. If more than one SAP xservers resource runs on the same cluster, conflicts between the SAP xservers resources occur. These conflicts cause all SAP xservers resources to become unavailable. If you attempt to start the SAP xservers 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.**

```bash
# 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 collocated 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.**

```bash
# 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.
Registering and Configuring HA for SAP MaxDB

- `-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 xserv resource. The commands are run on only one cluster node.

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

  # clresourcegroup create \
  -p Maximum_primaries=4 \ 
  -p Desired_primaries=4 xsvrg

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

  # clresource create -d -g xsrvrg \ 
  -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 xserv resource that is named `xsrvrrs` in the `xsrvrg` resource group. The SAP xserv 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 xsrvrg -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.

```bash
# clresourcergroup online -M xsrvrrg
```

### How to Register and Configure a SAP MaxDB Resource

1. **Register the SUNW.sapdb resource type.**
   
   ```bash
   # 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.

   ```bash
   # 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
   ```

   - **-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 \n  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.

# c1resourcegroup 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 the SAP MaxDB resource group is to be modified.

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

# clresourcegroup online -M sapdb-rg
- e=M 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.
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
```

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>
<thead>
<tr>
<th>Fault Monitor</th>
<th>Resource Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP MaxDB</td>
<td>SUNW.sapdb</td>
</tr>
<tr>
<td>SAP xserver</td>
<td>SUNW.sap_xserver</td>
</tr>
</tbody>
</table>

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.
      ```bash
      # ps -ef | grep vserver
      ```
   b. Kill all SAP xserver processes.
      ```bash
      # 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.
      ```bash
      # su - os-sapxsvr-adm-user
      
      os-sapxsvr-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.
      ```bash
      # 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.

<table>
<thead>
<tr>
<th>Resource Type Version</th>
<th>Oracle Solaris Cluster Data Services Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>3.0 5/02 asynchronous release</td>
</tr>
<tr>
<td>2</td>
<td>3.1 4/04</td>
</tr>
<tr>
<td>3.1</td>
<td>3.2</td>
</tr>
</tbody>
</table>

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/SUNWsc1c/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.
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
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.

<table>
<thead>
<tr>
<th>Data type</th>
<th>String</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default</td>
<td>No default defined</td>
</tr>
<tr>
<td>Range</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Tunable</td>
<td>When disabled</td>
</tr>
<tr>
<td>Introduced in release</td>
<td>3.1 4/04</td>
</tr>
</tbody>
</table>

Monitor_retry_count

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

<table>
<thead>
<tr>
<th>Data type</th>
<th>Integer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default</td>
<td>4</td>
</tr>
<tr>
<td>Range</td>
<td>No range defined</td>
</tr>
<tr>
<td>Tunable</td>
<td>Any time</td>
</tr>
</tbody>
</table>

Monitor_retry_interval

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

<table>
<thead>
<tr>
<th>Data type</th>
<th>Integer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default</td>
<td>2</td>
</tr>
<tr>
<td>Range</td>
<td>No range defined</td>
</tr>
<tr>
<td>Tunable</td>
<td>Any time</td>
</tr>
</tbody>
</table>

Probe_timeout

The timeout value in seconds for fault monitor probes.

<table>
<thead>
<tr>
<th>Data type</th>
<th>Integer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default</td>
<td>120</td>
</tr>
<tr>
<td>Range</td>
<td>No range defined</td>
</tr>
<tr>
<td>Tunable</td>
<td>Any time</td>
</tr>
</tbody>
</table>
**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
Index

A
Address already in use error message, 25
affinities
  resource groups
    creating, 30
    planning, 15
affinity switchover, 24

creating (Continued)
  SAP MaxDB resource, 29
  SAP MaxDB resource group, 18
  SAP xserver resource, 27
  SAP xserver resource group, 26
  .XUSER.62 file, 17

C
cautions notice, multiple SAP xserver resources, 25
clusters, running SAP MaxDB in, 18–20
Confdir_List extension property, SUNW.sap_xserver
resource type, 44
configuring
  device groups
    performing, 23–25
    planning, 15
  file systems
    performing, 23–25
    planning, 15
  HA for SAP MaxDB
    overview, 10–11
    performing, 25–31
    planning, 11–16
  HAStoragePlus resource
    performing, 23–25
    planning, 15
  SAP MaxDB application, 16–20
creating
  HAStoragePlus resource, 24

database instance, See SAP MaxDB database instance
database users
  identity of OS user, 42
  sample definition, 17–18
  user key for, 44
  DB_Name extension property, 41
  DB_User extension property, 42
dbmcli command
  path to, 42
  start option, 41
dbmcli_Start_Option extension property, 41
defining
  SAP MaxDB instance user, 17
  SAP xserver user
    planning for nondefault, 15
    specifying nondefault, 26
dependencies
  device groups
    creating, 29
    planning, 15
  SAP MaxDB resource
    creating, 29
dependencies, SAP MaxDB resource (Continued)
  planning, 15
device groups
  configuring
    performing, 23–25
  planning, 15
installation of SAP MaxDB, 16
SAP MaxDB application, 15
directories
  See also paths
    /usr/spool/sql, 17

E
  editing, resource type instances, 39
  enabling
    SAP MaxDB resource group, 30
    SAP xserver resource group, 28
extension properties
  See also properties
  See also system properties
    SUNW.sap_xserver resource type, 44–46
    SUNW.sapdb resource type, 41–44

F
  Failover_enabled extension property, SUNW.sapdb
    resource type, 42
fault monitors
  faults detected by, 33–34
  probe interval, 33
  probe timeout, 33
  response to faults, 33–34
SAP MaxDB
  faults detected, 34
  resource type for, 32
  verifying operation of, 35–37
SAP xserver
  faults detected, 34
  resource type for, 32
  verifying operation of, 37
  tuning, 32–35
faults
  recovery actions, 34
  responses to, 33–34
file systems
  configuration
    performing, 23–25
    planning, 15
  protection by data services, 10
files
  process identity, 43
  RTR, 38
  system configuration, 16

G
  global zone, 9, 22

H
  HA for SAP MaxDB
    overview, 10
    configuration
      performing, 25–31
      planning, 11–16
      with HAStoragePlus resource, 23–25
    fault monitors, 32–35
    installing, 21–23
    verifying installation, 35–37
    SAP liveCache application, use with, 13–14
    SAP R/3 application, use with, 13–14
    service configuration, 12
    software packages, installing, 21–23
  HAStoragePlus resource
    configuration
      performing, 23–25
      planning, 15
    dependency of SAP MaxDB resource on
      creating, 29
      planning, 15
    resource group for, 24
    SAP MaxDB device group, 15
  help, 7–8
I
Independent Program Path extension property
SUNW.sap_xserver resource type, 44
SUNW.sapdb resource type, 42
installing
HA for SAP MaxDB, 21–23
overview, 10–11
verifying installation, 35–37
SAP MaxDB application, 16–20
intervals, fault monitor probes, 33

K
kernel processes
identities, 43
termination of parent extension property, 44
restarting SAP MaxDB after, 34–35

L
libraries
SAP MaxDB
SUNW.sap_xserver resource type, 44
SUNW.sapdb resource type, 42
SAP xserver, 45
local zones, See non-global zone locations, See paths
log history, preserving, 34–35
logical host names
resource group for creating, 18
enabling, 20
planning, 16
resources
creating, 19
planning, 16

M
maximum values
nodes for SAP xserver, 27
maximum values (Continued)
restarting
SUNW.sap_xserver resource type, 45
SUNW.sapdb resource type, 43
migrating, resource type instances, 39
Monitor_retry_count extension property
SUNW.sap_xserver resource type, 45
SUNW.sapdb resource type, 42
Monitor_retry_interval extension property
SUNW.sap_xserver resource type, 45
SUNW.sapdb resource type, 43

N
names, SAP MaxDB database instance, 41
network addresses, See logical host names
NFS file system, protection by data services, 10
nodes, for SAP xserver and SAP MaxDB, 12
non-global zone, 22
non-global zones, 9

O
operating system users
of SAP MaxDB database instance defining, 17
extension property for, 42
sample definition, 17–18
of SAP xserver defining, 15
extension property for, 46
Oracle Solaris Cluster HA for SAP liveCache, relation to SUNW.sap_xserver resource type, 10
overriding, default SAP xserver users, 26

P
packages, 21–23
parent kernel processes extension property, 44
restarting SAP MaxDB after termination of, 34–35
paths
dbmcli command, 42
process identity files, 43
SAP MaxDB programs and libraries
  SUNW.sap_xserver resource type, 44
  SUNW.sapdb resource type, 42
  SAP xserver programs and libraries
  x_server command, 45
persistent faults, recovery actions, 34
Pid_Dir_Path extension property, 43
Probe_timeout extension property
  SUNW.sap_xserver resource type, 45
  SUNW.sapdb resource type, 43
processes
  identities, 43
  termination of parent
    extension property, 44
    restarting SAP MaxDB after, 34–35
programs
  SAP MaxDB
    SUNW.sap_xserver resource type, 44
    SUNW.sapdb resource type, 42
  SAP xserver, 45
properties
  See also extension properties
  See also system properties
  Type_version, 39
protection, SAP MaxDB application, 10

R
recovery actions, after faults, 34
registering
  SUNW.HASstoragePlus resource type, 24–25
  SUNW.sap_xserver resource type
    during initial set up, 26–29
    during upgrade, 38
  SUNW.sapdb resource type, 29–31
resource groups
  HASstoragePlus resource, 24
    logical host name
      creating, 18
      enabling, 20
resource groups (Continued)
  logical host names
    planning, 16
  SAP MaxDB
    creating, 18
    enabling, 20
    planning, 16
  SAP xserver
    creating, 26
    enabling, 28
    planning, 12
resource type registration (RTR) file, 38
resource types
  fault monitors, 32
  migrating instances of, 39
  SUNW.HASstoragePlus
    See also HASstoragePlus resource
    registering, 24–25
  SUNW.nfs, 10
  SUNW.sap_xserver
    extension properties, 44–46
    initial registration, 26–29
    instantiating, 27
    protection by, 10
    registration during upgrade, 38
    relation to Oracle Solaris Cluster HA for SAP
      liveCache, 10
      upgrading, 38–39
  SUNW.sapdb
    extension properties, 41–44
    initial registration, 29–31
    instantiating, 29
    protection by, 10
resources
  logical host name
    creating, 19
    planning, 16
  SAP MaxDB
    creating, 29
  SAP xserver
    creating, 27
responses, to faults, 33–34
Restart_if_Parent_Terminated extension property
  SUNW.sapdb resource type, 44
Restart_if_Parent_Terminated extension property (Continued)
  tuning, 35
restarts
  interval between
    SUNW.sap_xserver resource type, 45
    SUNW.sapdb resource type, 43
maximum allowed
    SUNW.sap_xserver resource type, 45
    SUNW.sapdb resource type, 43
restrictions
  zones, 9, 22
RTR (resource type registration) file, 38

S
SAP liveCache application, use with HA for SAP MaxDB, 13–14
SAP MaxDB application
  configuring, 16–20
  device group for, 15
  fault monitor, 32
  installing, 16–20
  paths to programs and libraries
    SUNW.sap_xserver resource type, 44
    SUNW.sapdb resource type, 42
  processes
    paths to process identity files, 43
    termination of parent, 34–35, 44
  protection by data services, 10
  resource group for
    creating, 18
    enabling, 20
    planning, 16
  running in cluster, 18–20
  software versions, 12
  termination of parent kernel process, 34–35
  verifying installation and configuration, 20–21
SAP MaxDB database instance
  database user, 44
  name, 41
  operating system user, 42
  starting
    dbmcli command options, 41
SAP MaxDB database instance, starting (Continued)
  SAP MaxDB verification, 21
  stopping, 21
SAP MaxDB resource
  creating, 29
  dependency on other resources
    creating, 29
    planning, 15
SAP MaxDB resource group
  affinity for SAP xserver resource group
    creating, 30
    planning, 15
SAP R/3 application, use with HA for SAP MaxDB, 13–14
SAP xserver
  administration by nondefault users
    planning, 15
    specifying, 26
  caution notice, 25
  fault monitor, 32
  multiple instances of, 25
  nodes for, 12
  operating system user, 46
  paths to programs and libraries, 45
  protection by data services, 10
  resource group for
    creating, 26
    enabling, 28
    planning, 12
  service configuration, 12–13
  starting, 21
  stopping
    command for, 37
    time allowed for, 46
  upgrading, 38–39
SAP xserver resource, 27
  dependency of SAP MaxDB resource on
    creating, 29
    planning, 15
SAP xserver resource group
  affinity of SAP MaxDB resource group for
    creating, 30
    planning, 15
SIGKILL signal, 46
Index

Soft_Stop_Pct extension property, 45
software packages, 21–23
starting
  SAP MaxDB database instance
dbmcli command options, 41
  SAP MaxDB verification, 21
  SAP xserver, 21
stopping
  SAP MaxDB database instance, 21
  SAP xserver
    command for, 37
time allowed for, 46
SUNW.HASstoragePlus resource type
See also HASstoragePlus resource
registering, 24–25
SUNW.nfs resource type, 10
SUNW.sap_xserver resource type
extension properties, 44–46
instantiating, 27
protection by, 10
registering
  during initial setup, 26–29
during upgrade, 38
relation to Oracle Solaris Cluster HA for SAP
liveCache, 10
resource type versions, 38
upgrading, 38–39
SUNW.sapdb resource type
extension properties, 41–44
instantiating, 29
protection by, 10
registering, 29–31
system configuration files, location, 16
system properties, effect on fault monitors, 32
transient faults, recovery actions, 34
tuning, fault monitors, 32–35
Type_version property, 39
upgrading, SAP xserver, 38–39
User_Key extension property, 44
users
  of SAP MaxDB database instance
database, 44
operating system, 42
sample definition, 17–18
  of SAP xserver, 46
planning for nondefault, 15
specifying nondefault, 26
/usr/spool/sql directory, 17
verifying, SAP MaxDB application, 20–21
version requirements, SAP MaxDB application, 12
versions, resource types, 38
x_server command, path to, 45
xserver_User extension property
  specifying, 26
SUNW.sap_xserver resource type, 46
.XUSER.62 file
  creating, 17
and DB_User extension property, 42
example, 17–18
zones, 9, 22