

**SPARC: Oracle® Solaris Cluster Data
Service for Oracle VM Server for SPARC
Guide**

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Using This Documentation

- **Overview** – Describes the Oracle Solaris Cluster HA for Oracle VM Server for SPARC software.
- **Audience** – Experienced system administrators with extensive knowledge of Oracle software and hardware.
- **Required knowledge** – Knowledge of the Oracle Solaris operating system, of Oracle Solaris Cluster software, and expertise with the volume manager software that is used with Oracle Solaris Cluster software.

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SPARC: Installing and Configuring HA for Oracle VM Server

This chapter explains how to install and configure Oracle Solaris Cluster HA for Oracle VM Server for SPARC (HA for Oracle VM Server) software and contains the following sections:

- “Installing and Configuring HA for Oracle VM Server” on page 12
- “HA for Oracle VM Server Overview” on page 12
- “Planning the HA for Oracle VM Server Installation and Configuration” on page 13
- “Installing and Configuring Oracle VM Server for SPARC” on page 16
- “Installing the HA for Oracle VM Server Package” on page 17
- “Registering and Configuring HA for Oracle VM Server” on page 18
- “Verifying the Installation and Configuration of Oracle VM Server for SPARC” on page 22
- “Tuning the HA for Oracle VM Server Fault Monitor” on page 23
- “Debugging HA for Oracle VM Server” on page 25

Note - You can also use the Oracle Solaris Cluster Manager browser interface to configure this data service. In the Tasks panel of Oracle Solaris Cluster Manager, click Oracle VM Server for SPARC to start the configuration wizard. For log-in instructions, see [Chapter 12, “Using the Oracle Solaris Cluster Manager Browser Interface”](#) in *Administering an Oracle Solaris Cluster 4.4 Configuration*.

This wizard requires that all cluster nodes have the same root password.

SPARC: Installing and Configuring HA for Oracle VM Server

The following table summarizes the tasks for installing and configuring HA for Oracle VM Server 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 Tasks for Installing and Configuring HA for Oracle VM Server

Task	Instructions
Plan the installation.	“Planning the HA for Oracle VM Server Installation and Configuration” on page 13
Install and configure the Oracle VM Server for SPARC software.	“Installing and Configuring Oracle VM Server for SPARC” on page 16
Install HA for Oracle VM Server packages.	“Installing the HA for Oracle VM Server Package” on page 17
Register and configure HA for Oracle VM Server resources.	“Registering and Configuring HA for Oracle VM Server” on page 18
Verify the HA for Oracle VM Server installation and configuration.	“Verifying the Installation and Configuration of Oracle VM Server for SPARC” on page 22
Tune the HA for Oracle VM Server fault monitor.	“Tuning the HA for Oracle VM Server Fault Monitor” on page 23
Debug HA for Oracle VM Server.	“Debugging HA for Oracle VM Server” on page 25

SPARC: HA for Oracle VM Server Overview

The Oracle Solaris Cluster HA for Oracle VM Server for SPARC (HA for Oracle VM Server) data service provides the ability to split a single physical system into multiple, independent virtual systems. This is achieved by an additional software application in the firmware layer, interposed between the operating system and the hardware platform called the hypervisor. It abstracts the hardware and can expose or hide various resources, allowing for the creation of resource partitions that can operate as discrete systems, complete with virtual CPU, memory, and I/O devices.

You create the logical domain on any one of the nodes of the cluster. However the services configuration must be identical on all the potential primary nodes. The domain configuration is retrieved by the `ldm list-constraints -x ldom` command and stored in the CCR. This globally accessible information is used by the HA for Oracle VM Server agent to create or destroy the domain on the node where the resource group is brought online or offline.

HA for Oracle VM Server provides a mechanism for orderly startup and shutdown, fault monitoring, and automatic failover of the Oracle VM Server for SPARC logical domain service.

The Oracle VM Server for SPARC component is protected by the HA for Oracle VM Server data service.

Note the following points regarding support for the SR-IOV device in the HA for Oracle VM Server data service:

- An SR-IOV device is not supported for live migration of the HA for Oracle VM Server data service. Contact your Oracle support representative to learn whether support for the SR-IOV feature becomes available.
- An SR-IOV device is supported for normal migration of the HA for Oracle VM Server data service. This support requires that the SR-IOV device path is identical on all potential primaries of the data service's resource group.

SPARC: Planning the HA for Oracle VM Server Installation and Configuration

This section contains the information you need to plan your HA for Oracle VM Server installation and configuration.

Configuration Guidelines

Observe the following configuration guidelines that apply only to HA for Oracle VM Server.

For restrictions that apply to all data services, see the [Oracle Solaris Cluster 4.4 Release Notes](#).

- **HA for Oracle VM Server configuration** –Oracle VM Server for SPARC can be configured only as a failover data service and not as a scalable data service. It can be configured only in the global zone.
- **HA for Oracle VM Server virtual disks** – The Oracle VM Server for SPARC virtual disk back end can be of any storage or file system that is supported by Oracle Solaris Cluster software. This includes cluster file systems (Global UFS or Global ZFS), raw disk, NFS, iSCSI, and SAN LUNs. The back end is exported through the virtual disk server of the control domain to a domain as a full disk and is visible to the Oracle Solaris installation software inside the logical domain. Virtual disks from non-control domains are not supported.
- **Multiple domain migration** Oracle VM Server for SPARC 3.5 has the following restriction:

While a migration is in progress on a machine, any operation that might result in the modification of the state or configuration of the domain being migrated is blocked. All

operations on the domain itself, as well as operations such as bind and stop on other domains on the machine, are blocked.

The implication is that it is not possible to switch a resource group that has multiple resources of type `SUNW.ldom`, or multiple resource groups where each resource group has a resource of type `SUNW.ldom`, at the same time as the domain migration will be blocked. Instead, plan to manually serialise domain migration between Oracle Solaris Cluster nodes.

If a resource group has multiple resources of type `SUNW.ldom` then specify a resource dependency between those resources. If there are multiple resource groups where each resource group has a resource of type `SUNW.ldom` then plan to switch one resource group at a time.

- **Live migration and warm migration** – HA for Oracle VM Server software supports Oracle VM Server for SPARC live migration and warm migration. For more information, see your Oracle VM Server for SPARC documentation.

In some cases where the cluster cannot determine the target node to which the HA for Oracle VM Server resource group is migrating, it uses an ordinary resource group switchover instead of using live migration. In such cases, the logical domain shuts down on its current node and then boots on its new node. To achieve live migration, relocate the HA for Oracle VM Server resource group by using the `clresourcegroup switch` command explicitly on the resource group, rather than depending on node evacuation or strong resource group affinities to move the resource group.

You can specify the `Abort_migration` extension property to specify the behavior of the `clrg switchover -n ldom-rg` command for a resource group that contains a `SUNW.ldom` resource. For more information, see the [SUNW.ldom\(7\)](#) manpage.

Live migration is supported only for cluster file systems (Global UFS or Global ZFS), raw disk, NFS, iSCSI, or SAN LUNs, as live migration requires that storage is accessible to all potential primary nodes simultaneously.

Oracle VM Server for SPARC data service creates symlinks for the `libscho.st.so.1` shared object and uses this during live migration of guest domain.

```
# ln -s /usr/cluster/lib/libscho.st.so.1 /usr/lib/secure/libscho.st.so.1
# ln -s /usr/cluster/lib/64/libscho.st.so.1 /usr/lib/secure/64/libscho.st.so.1
```

▼ SPARC: How to Configure Oracle VM Server for SPARC to Reset for Control Domain Failures

The failure policy settings on the primary domain determine the action to be taken on the logical domain when there is a primary domain failures. When configured to `failure-`

policy=reset, the logical domain would panic when the primary domain fails. If the failure policy is not set to reset on all the primary domains, the resource creation would fail. You must set the master-slave domain dependency and auto-boot? variable to appropriate values. Perform the following steps on the node where the ldg0 logical domain is created:

- 1. Set the domain failure policy to reset.**

```
# ldm set-domain failure-policy=reset primary
# ldm list -o domain primary
NAME          STATE    FLAGS  UTIL
primary       active   -n-cv-  0.6%

SOFTSTATE
Solaris running

HOSTID
0x84d4a2ce

CONTROL
failure-policy=reset

DEPENDENCY
master=
```

- 2. Configure the master-slave domain dependency.**

```
# ldm set-domain master=primary ldg0
```

- 3. Set the auto-boot? variable to false.**

```
# ldm set-var auto-boot?=false ldg0
# ldm list -o domain ldg0
NAME          STATE    FLAGS  UTIL
ldg0          active   n---   0.1%

SOFTSTATE
Solaris running

HOSTID
0x84f8a040

CONTROL
failure-policy=reset

DEPENDENCY
master=primary

VARIABLES
```

```
auto-boot?=false
boot-device=vdisk1
keyboard-layout=US-English
```

The `auto=boot?` variable should be set to `false` on the guest domain. Do not change `auto=boot?` to `true` while the guest domain is being managed by a `SUNW.l dom` resource.

SPARC: Installing and Configuring Oracle VM Server for SPARC

This section contains the procedures you need to install and configure an Oracle VM Server for SPARC logical domain.

▼ SPARC: How to Install the Oracle VM Server for SPARC Software

1. On a cluster member, assume the `root` role or assume a role that provides `solaris.cluster.modify` authorization.
2. Go to <http://www.oracle.com/technetwork/server-storage/vm/downloads/index.html?ssSourceSiteId=ocomen>.

Follow instructions to download and install Oracle VM Server for SPARC software.

▼ SPARC: How to Enable the Oracle VM Server for SPARC Instances to Run in a Cluster

1. Become superuser or assume a role that provides `solaris.cluster.admin` authorization on one of the nodes in the cluster that will host the Oracle VM Server for SPARC logical domain.
2. Register the `SUNW.HASStoragePlus` resource type.

```
# clresourcetype register SUNW.HASStoragePlus
```
3. Create a failover resource group.


```
# clresourcegroup create LDom-failover-rg
```

4. **(If using a cluster file system or a highly available local file system) Create an HAStoragePlus resource for the logical domain Virtual Disk Storage.**

```
# clresource create -g LDom-failover-rg \
-t SUNW.HAStoragePlus \
-p FileSystemMountPoints=LDom-mount-points \
LDom-has-resource
```

5. **Enable the failover resource group that now includes the logical domain disk storage resources.**

```
# clresourcegroup online -M -n current-node LDom-failover-rg
```

Installing the HA for Oracle VM Server Package

If you did not install the HA for Oracle VM Server package during your initial Oracle Solaris Cluster installation, perform this procedure to install the package.

▼ How to Install the HA for Oracle VM Server Package

Perform this procedure on each cluster node where you want the HA for Oracle VM Server software to run.

1. **On the cluster node where you are installing the data service package, assume the root role.**
2. **Ensure that the data service package is available from the configured publisher and that the `solaris` and `ha-cluster` publishers are valid.**

```
# pkg list -a ha-cluster/data-service/ha-ldom
# pkg publisher
PUBLISHER                TYPE      STATUS  P  LOCATION
solaris                   origin   online  F  solaris-repository
ha-cluster                 origin   online  F  ha-cluster-repository
```

For information about setting the `solaris` publisher, see [“Adding, Modifying, or Removing Package Publishers”](#) in *Updating Systems and Adding Software in Oracle Solaris 11.4*.

Tip - Use the `-nv` options whenever you install or update to see what changes will be made, such as which versions of which packages will be installed or updated and whether a new BE will be created.

If you do not get any error messages when you use the `-nv` options, run the command again without the `-n` option to actually perform the installation or update. If you do get error messages, run the command again with more `-v` options (for example, `-nvv`) or more of the package FMRI pattern to get more information to help you diagnose and fix the problem. For troubleshooting information, see [Appendix A, “Troubleshooting Package Installation and Update,”](#) in *Updating Systems and Adding Software in Oracle Solaris 11.4*.

3. Install the HA for Oracle VM Server software package.

```
# pkg install ha-cluster/data-service/ha-ldom
```

4. Verify that the package installed successfully.

```
$ pkg info ha-cluster/data-service/ha-ldom
```

Installation is successful if output shows that State is Installed.

5. Perform any necessary updates to the Oracle Solaris Cluster software.

For instructions about updating your software, see [Chapter 10, “Updating Software Packages”](#) in *Updating Your Oracle Solaris Cluster 4.4 Environment*.

SPARC: Registering and Configuring HA for Oracle VM Server

▼ SPARC: How to Configure HA for Oracle VM Server

Before You Begin Install the data service packages during your initial Oracle Solaris Cluster installation.

If you did not install the HA for Oracle VM Server packages as part of your initial Oracle Solaris Cluster installation, go to [“Installing the HA for Oracle VM Server Package”](#) on page 17.

1. Assume the `root` role or a role that provides `solaris.cluster.modify` and `solaris.cluster.admin` authorization on the node in the cluster that hosts the Oracle VM Server for SPARC logical domain.

2. Register the `SUNW.ldom` resource type.

```
# clresourcetype register SUNW.ldom
```

3. (Optional) You can plan to use the live migration with or without the use of SSL certificates.

- If you plan to use live migration with SSL certificates, for resource type version 8 or later, you must use the SSL certificates authentication for the live migration of guest domain. You must first configure the SSL certificates on all potential primary nodes of the resource group that will contain the resource type `SUNW.ldom:8` or later. To perform SSL certificates authentication, you must set the value of the `Use_SSL_Certificate=TRUE`.

For more details, see [Configuring SSL Certificates for Migration](#).

- (Optional) If you plan to use live migration without using SSL certificates, configure the password.

- For the resource type version 6 or later, create a private string named `resourcegroup_resource_ldompasswd` to store the target host password that is required for guest domain migration.

Type the following command on any one node in the cluster:

```
# /usr/cluster/bin/clpstring create -b rname \  
-t rname_rname_ldompasswd  
Enter string value:  
Enter string value again:
```

where `rname` and `rsname` are the resource group and resource name for the `SUNW.ldom` resource that is created.

- For resource type version 5 or earlier, the `Password_file` property is required during resource creation. Create a password file owned by `root` with read only permission to store the target host password required for guest domain migration.

Type the following command on each of the Oracle Solaris Cluster nodes that would host the logical domain resource:

```
# echo password > /var/cluster/.ldg1_passwd
```

```
# /usr/bin/chown root:root /var/cluster/.ldg1_passwd
# /usr/bin/chmod 400 /var/cluster/.ldg1_passwd
```

where `/var/cluster/.ldg1_passwd` is the password file for guest domain `ldg1`.
`password` is the target node root password used for live migration.

4. **Create an Oracle VM Server for SPARC logical domain resource in the failover resource group.**

- **If you are not using live migration, set `Migration_type=NORMAL` during resource creation and do not specify the `Password_file` property.**

```
# clresource create -g ldg1-rg \  
-t SUNW.ldom \  
-p Domain_name=ldg1 \  
-p Migration_type=NORMAL \  
-p Resource_dependencies_offline_restart=ldg1-hasp-rs \  
ldg1
```

- **If you are using live migration, set `Migration_type=MIGRATE` during resource creation and specify `Password_file` for resource type version 5 or earlier.**

Note - The `Password_file` property is obsolete for resource type version 6 or later.

For resource type version 5 or earlier, type the following command:

```
# clresource create -g ldg1-rg \  
-t SUNW.ldom \  
-p Domain_name=ldg1 \  
-p Migration_type=MIGRATE \  
-p Password_file=/var/cluster/.ldg1_passwd \  
-p Resource_dependencies_offline_restart=ldg1-hasp-rs \  
ldg1
```

Note - The `Use_SSL_Certificate` property is only available for resource type version 8 or later. If you have configured both SSL certificates mechanism and private string mechanism for live migration, the value of `Use_SSL_Certificate` decides which mechanism to use.

For resource type version 6 or later, type the following command:

```
# clresource create -g ldg1-rg \  
-t SUNW.ldom \  
-p Domain_name=ldg1 \  
-p Migration_type=MIGRATE \  
-p Resource_dependencies_offline_restart=ldg1-hasp-rs \  
ldg1
```

```
ldg1
```

5. For resource type version 5 or earlier, if an encrypted password is required for the logical domain migration, you must do the following:

- a. Insert the word encrypted into the file you specify with the `Password_file` extension property when creating the resource.**

```
# echo "encrypted" > /var/cluster/.ldg1_passwd
```

- b. Assume the root role and create an encrypted password.**

In the following example, the root password for the primary domain, *password*, is being encrypted and *ldg1* reflects the logical domain name.

```
node1# dd if=/dev/urandom of=/var/cluster/ldom_key bs=16 count=1
node1# chmod 400 /var/cluster/ldom_key
node1# echo password | /usr/sfw/bin/openssl enc -aes128 -e \
-pass file:/var/cluster/ldom_key -out /opt/SUNWscxvm/.ldg1_passwd
node1# chmod 400 /opt/SUNWscxvm/.ldg1_passwd
```

- c. Verify that the encrypted password can be decrypted.**

```
node1# /usr/sfw/bin/openssl enc -aes128 -d -pass file:/var/cluster/ldom_key \
-in /opt/SUNWscxvm/.ldg1_passwd
```

- d. Repeat the preceding steps on all Oracle Solaris Cluster nodes that host the logical domain service.**

- e. Create or update the resource and set the `Password_file` property to the path provided in Step a.**

Note - You can perform this step only when the resource is disabled.

```
# clresource set -p Password_file=/var/cluster/.ldg1_passwd LDom-guest-domain-
resource
```

6. Enable each logical domain resource.

Repeat this step for each logical domain instance, if multiple instances were created.

```
# clresource status
# clresource enable logical-guest-domain-resource
```

▼ SPARC: How to Remove an HA for Oracle VM Server Resource From a Failover Resource Group

1. Assume the `root` role or assume a role that provides `solaris.cluster.modify` and `solaris.cluster.admin` RBAC authorizations.
2. Disable and remove the resource that is used by the HA for Oracle VM Server data service.

```
# clresource disable resource
# clresource delete resource
```

Note - If the resource used a private string `rgname_rlname_ldompasswd` for live migration, the deletion of resource will also result in the deletion of the private string.

SPARC: Verifying the Installation and Configuration of Oracle VM Server for SPARC

▼ SPARC: How to Verify the HA for Oracle VM Server Installation and Configuration

1. As the `root` role, log in to the node that currently hosts the resource group that contains the Oracle VM Server for SPARC logical domain resource.
2. Switch the logical domain resource group to another cluster member.

```
# clresourcegroup switch -n node logical-domain
```

3. Verify the status of the logical domain instance.

```
# ldm list-domain logical-domain
NAME          STATE    FLAGS  CONS  VCPU  MEMORY  UTIL  UPTIME
ldg           active  n---  5000   4     2G     25%  2s
```

4. Repeat the preceding steps until you have tested all the potential nodes on which the logical domain can run.

SPARC: Tuning the HA for Oracle VM Server Fault Monitor

This section describes the HA for Oracle VM Server fault monitor's probing algorithm or functionality, and states the conditions, messages, and recovery actions associated with unsuccessful probing.

Note - For any maintenance or modification activities on the domain, you must disable monitoring, perform maintenance tasks, and then re-enable the resource monitor.

For conceptual information about fault monitors, see the [Concepts for Oracle Solaris Cluster 4.4](#).

Resource Properties

The HA for Oracle VM Server logical domain fault monitor uses the resource properties specified in the resource type `SUNW.ldom`. Refer to the [SUNW.ldom\(7\)](#) man page for a complete list of resource properties used.

Probing Algorithm and Functionality

HA for Oracle VM Server is controlled by the extension properties that control the probing frequency. The default values of these properties determine the preset behavior of the fault monitor and are suitable for most Oracle Solaris Cluster installations. You can modify this preset behavior by performing the following actions:

- Setting the interval between fault monitor probes (`Thorough_probe_interval`)
- Setting the timeout for fault monitor probes (`Probe_timeout`)
- Setting the number of times the fault monitor attempts to restart the resource (`Retry_count`)

The HA for Oracle VM Server fault monitor checks the domain status within an infinite loop. During each cycle, the fault monitor checks the domain state and reports either a failure or success.

If the fault monitor is successful, it returns to its infinite loop and continues the next cycle of probing and sleeping.

If the fault monitor reports a failure, a request is made to the cluster to restart the resource. If the fault monitor reports another failure, another request is made to the cluster to restart the

resource. This behavior continues whenever the fault monitor reports a failure. If successive restarts exceed the `Retry_count` within the `Thorough_probe_interval`, a request is made to fail over the resource group onto a different node.

Operations of the Oracle VM Server for SPARC Probe

- The probe checks the domain state every 60 seconds by using the `ldm list-domain` command.
- The `ldm list-domain` command produces a status line for the domain and is accurate at the instant that the command executes.
- The status modes that are considered to be normal operational modes are as follows: active, suspending, resuming, suspended, and starting. Whenever the `ldm` command reports these status modes, the probe considers that the domain is operating in an acceptable mode.
- The status modes that are considered to be restartable modes are as follows: inactive and stopping. These modes are not considered acceptable and if one of these modes is encountered, the probe requests a restart of the resource.
- The probe also requests a resource to restart if any unknown status modes are reported by the `ldm` command.
- If the logical domain configuration has changed, the probe updates this information to the CCR in the next probe cycle. Alternatively, you can perform the following steps to update the changed configuration to the CCR immediately:

1. Make a dummy update to the resource. For example:

```
# clresource set \  
-p R_DESCRIPTION="Oracle Solaris Cluster HA for Oracle VM Server SPARC Guest  
Domains - Modified" \  
ldg1-rs
```

2. Verify whether the configuration change was successfully done.

From the node where the guest domain is online, type the following commands, where `ld1-rs` is the logical domain resource name and `ldg1` is the guest domain name:

```
# (/usr/cluster/lib/sc/ccradm showkey --key xml_ldg1-rs ldom_domain_config | \  
xmllint --format -) > /var/tmp/ldg1_ccr.xml  
# ldm list-constraints -x ldg1 > /var/tmp/ldg1_current.xml  
# diff /var/tmp/ldg1_current.xml /var/tmp/ldg1_ccr.xml
```

- The probe runs the user-supplied script or binary provided for `plugin_probe`. If this process fails, then the probe will restart the logical domain resource. The exit status of the

`plugin_probe` command is used to determine the severity of the failure of the application. This exit status, called the `plugin_probe` status, must be an integer between 0 (for success) and 100 (for complete failure). The `plugin_probe` status can also be a special value of 201 which results in immediate failover of the application unless `Failover_enabled` is set to `FALSE`.

- If the logical domain resource is repeatedly restarted and subsequently exhausts the `Retry_count` within the `Retry_interval`, then a failover is initiated for the resource group onto another node if `Failover_enabled` is set to `TRUE`.

SPARC: Debugging HA for Oracle VM Server

HA for Oracle VM Server has an extension property named `Debug_level` that enables you to activate debugging for Oracle VM Server for SPARC logical domain resources.

▼ SPARC: How to Activate Debugging for HA for Oracle VM Server

1. Determine whether debugging for HA for Oracle VM Server is active.

```
# grep daemon /etc/syslog.conf
*.err;kern.debug;daemon.notice;mail.crit      /var/adm/messages
*.alert;kern.err;daemon.err                    operator
#
```

If debugging is active, `daemon.debug` is set in the file `/etc/syslog.conf`.

If debugging is inactive, `daemon.notice` is set in the file `/etc/syslog.conf` of the appropriate node.

2. If debugging is inactive, edit the `/etc/syslog.conf` file in the appropriate node to change `daemon.notice` to `daemon.debug`.
3. Confirm that debugging for HA for Oracle VM Server is active.

```
# grep daemon /etc/syslog.conf
*.err;kern.debug;daemon.debug;mail.crit      /var/adm/messages
*.alert;kern.err;daemon.err                    operator
#
```

4. Restart the `syslogd` daemon in the global zone.

```
# svcadm refresh svc:/system/system-log:default
```

5. Set the property `Debug_level` to level 2.

```
# clresource set -p Debug_level=2 logical-domain-resource
```

For more information about the `Debug_level` extension property and permissible values, see the [SUNW.ldom\(7\)](#) man page.

Note - To deactivate debugging, repeat these steps, changing `daemon.debug` to `daemon.notice` and changing the `Debug_level` property to 0.

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