

Oracle® Solaris Cluster 3.3 With Network-Attached Storage Devices Manual

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Preface

This manual provides procedures specific to supporting network-attached storage (NAS) systems placed in an Oracle Solaris Cluster environment.

Oracle Solaris Cluster supports the following NAS devices:

- NAS devices used for shared storage only, beginning with Sun Cluster version 3.1 9/04
- NAS devices used for quorum devices, beginning with Sun Cluster version 3.1 8/05.

Use this manual with Oracle Solaris Cluster 3.3 software on both SPARC and x86 based systems.

Note – This Oracle Solaris Cluster release supports systems that use the SPARC and x86 families of processor architectures: UltraSPARC, SPARC64, and AMD64. In this document, the label x86 refers to systems that use the AMD64 family of processor architectures. The information in this document pertains to both platforms unless otherwise specified in a special chapter, section, note, bulleted item, figure, table, or example.

Who Should Use This Book

This book is for Oracle representatives who are performing the initial installation of an Oracle Solaris Cluster configuration and for system administrators who are responsible for maintaining the system.

This document is intended for experienced system administrators with extensive knowledge of Oracle software and hardware. Do not use this document as a planning or a pre-sales guide. You should have already determined your system requirements and purchased the appropriate equipment and software before reading this document.

How This Book Is Organized

This book contains the following chapters.

Chapter 1, “Installing and Maintaining Oracle's Sun Network-Attached Storage Devices in an Oracle Solaris Cluster Environment,” describes the requirements, recommendations, and restrictions for Sun NAS devices. This chapter also tells you how to install and maintain a Sun NAS device in an Oracle Solaris Cluster environment.

Chapter 2, “Installing and Maintaining Network Appliance Network-Attached Storage Devices in an Oracle Solaris Cluster Environment,” describes the requirements, recommendations, and restrictions for Network Appliance NAS devices. This chapter also tells you how to install and maintain a Network Appliance NAS device in an Oracle Solaris Cluster environment.

Related Books

The following books provide conceptual information or procedures to administer hardware and applications. If you plan to use this documentation in a hardcopy format, ensure that you have these books available for your reference.

The following books support the Oracle Solaris Cluster 3.3 release. You can also access the documentation for the Sun Cluster 3.1 and 3.2 releases. All Sun Cluster and Oracle Solaris Cluster documentation is available at <http://docs.sun.com>. Documentation that is not available at <http://docs.sun.com> is listed with the appropriate URL.

Documentation that describes the Network Appliance filer is listed in “[Related Third-Party Web Site References](#)” on page 7.

TABLE P-1 Oracle Solaris Cluster and Sun Cluster Documentation

Documentation

[Oracle Solaris Cluster 3.3](#)

[Sun Cluster 3.2](#)

[Sun Cluster 3.1](#)

Related Third-Party Web Site References

Note – Oracle is not responsible for the availability of third-party web sites mentioned in this document. Oracle does not endorse and is not responsible or liable for any content, advertising, products, or other materials that are available on or through such sites or resources. Oracle will not be responsible or liable for any actual or alleged damage or loss caused or alleged to be caused by or in connection with use of or reliance on any such content, goods, or services that are available on or through such sites or resources.

When installing or maintaining a Network Appliance filer in an Oracle Solaris Cluster environment, access the <http://now.netapp.com> site. Search for the documents that are listed in the following table for device-specific instructions.

TABLE P-2 Network Appliance Clustered-Filer Documentation

Task	Network Appliance Document
Setting up a Network Appliance NAS appliance	<i>System Administration File Access Management Guide</i>
Setting up a LUN	<i>Host Cluster Tool for UNIX Installation Guide</i>
Installing ONTAP software	<i>Software Setup Guide, Upgrade Guide</i>
Exporting volumes for the cluster	<i>Data ONTAP Storage Management Guide</i>
Installing Network Appliance NAS support software packages on cluster nodes	Log in to http://now.netapp.com . From the Software Download page, download the <i>Host Cluster Tool for UNIX Installation Guide</i> .

Using UNIX Commands

This document contains information about commands that are used to install, configure, or upgrade an Oracle Solaris Cluster configuration. This document might not contain complete information about basic UNIX commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following sources for this information:

- Online documentation for the Oracle Solaris Operating System (Oracle Solaris OS)
- Other software documentation that you received with your system
- Oracle Solaris Operating System man pages

Getting Help

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

- Your name and email address (if available)
- Your company name, address, and phone number
- The model number and serial number of your systems
- The release number of the operating environment (for example, Oracle Solaris 10)
- The release number of Oracle Solaris Cluster (for example, Oracle Solaris Cluster 3.3)

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

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

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

Documentation, Support, and Training

See the following web sites for additional resources:

- [Documentation \(http://docs.sun.com\)](http://docs.sun.com)
- [Support \(http://www.oracle.com/us/support/systems/index.html\)](http://www.oracle.com/us/support/systems/index.html)
- [Training \(http://education.oracle.com\)](http://education.oracle.com) – Click the Sun link in the left navigation bar.

Oracle Welcomes Your Comments

Oracle welcomes your comments and suggestions on the quality and usefulness of its documentation. If you find any errors or have any other suggestions for improvement, go to <http://docs.sun.com> and click Feedback. Indicate the title and part number of the documentation along with the chapter, section, and page number, if available. Please let us know if you want a reply.

Oracle Technology Network (<http://www.oracle.com/technetwork/index.html>) offers a range of resources related to Oracle software:

- Discuss technical problems and solutions on the [Discussion Forums](http://forums.oracle.com) (<http://forums.oracle.com>).
- Get hands-on step-by-step tutorials with [Oracle By Example](http://www.oracle.com/technology/obe/start/index.html) (<http://www.oracle.com/technology/obe/start/index.html>).
- Download [Sample Code](http://www.oracle.com/technology/sample_code/index.html) (http://www.oracle.com/technology/sample_code/index.html).

Typographic Conventions

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

TABLE P-3 Typographic Conventions

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

Shell Prompts in Command Examples

The following table shows the default UNIX system prompt and superuser prompt for shells that are included in the Oracle Solaris OS. Note that the default system prompt that is displayed in command examples varies, depending on the Oracle Solaris release.

TABLE P-4 Shell Prompts

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

Installing and Maintaining Oracle's Sun Network-Attached Storage Devices in an Oracle Solaris Cluster Environment

This chapter contains procedures about installing and maintaining Oracle's Sun network-attached storage (NAS) devices in an Oracle Solaris Cluster environment. Before you perform any of the procedures in this chapter, read the entire procedure. If you are not reading an online version of this document, have the books listed in “[Related Books](#)” on page 6 available.

This chapter contains the following procedures.

- “[How to Install a Sun NAS Device in a Cluster](#)” on page 14
- “[How to Prepare the Cluster for Sun NAS Device Maintenance](#)” on page 18
- “[How to Remove a Sun NAS Device From a Cluster](#)” on page 20
- “[How to Add Sun NAS Directories to a Cluster](#)” on page 21
- “[How to Remove Sun NAS Directories From a Cluster](#)” on page 24

For conceptual information about multihost storage devices, see the *Oracle Solaris Cluster Concepts Guide*.

Note – The instructions for installing and maintaining Sun NAS devices are the same for both global cluster and zone cluster environments, unless stated otherwise.

Requirements, Recommendations, and Restrictions for Sun NAS Devices

This section includes only restrictions and requirements that have a direct impact on the procedures in this chapter. Sun NAS devices include Oracle's Sun StorEdge and Sun StorageTek models. A Sun NAS device is supported as a quorum device only in a two-node cluster. For general support information, contact your Oracle service provider.

Requirements for Sun NAS Devices

This section describes the following requirements.

- “Requirements When Configuring Sun NAS Devices” on page 12
- “Requirements When Configuring Sun NAS Devices for Use With Oracle Real Application Clusters” on page 12
- “Requirements When Configuring Sun NAS Devices as Quorum Devices” on page 13

Requirements When Configuring Sun NAS Devices

When you configure a Sun NAS device, you must meet the following requirements.

- Allow trusted administrative access for rsh.
Oracle Solaris Cluster uses rsh to log into the filer to run fencing. Oracle Solaris Cluster automatically removes file system write permission for a node that has left the cluster, and grants file system write permission for a node that has just joined the cluster. These actions ensure that a node that departed the cluster can no longer modify data.
- Ensure that nodes in the cluster have trusted administrative access to the filer.
- Explicitly grant access to each node in the cluster.
Do not allow general access to directories and do not add access by specifying a cluster host group.

Requirements When Configuring Sun NAS Devices for Use With Oracle Real Application Clusters

When you configure your Sun NAS device for use with Oracle Real Application Clusters (RAC), you must meet the following requirements.

- You must configure the Sun NAS device with fencing support in order to guarantee data integrity.
- You must create a volume on each Sun NAS device for storing Oracle database files, namely:
 - Data files
 - Control files
 - Online redo log files
 - Archived redo log files
- You must create a quota tree (qt tree) for the each directory in the following list:
 - The directory that contains Oracle data files for the cluster
 - The Oracle home directory that is to be mounted on each node
- On each Sun NAS device, you must add an entry to the `/etc/exports` file for the root of the volume that you created for storing Oracle database files.
- You must ensure that the volume is exported *without* the `nosuid` option.

- When adding the Sun NAS directories to the cluster, ensure that the following mount options are set:
 - `forcedirectio`
 - `noac`
 - `proto=tcp`

Requirements When Configuring Sun NAS Devices as Quorum Devices

The administrator has the option of deciding whether to use the Sun NAS device as a quorum device.

Note – You do not need to configure a NAS device as a quorum device in a zone cluster environment. A quorum is not required for a zone cluster, because the zone cluster node role in the zone cluster membership directly depends on the global cluster node role on the machine that is hosting the zone cluster node.

When you use a Sun NAS device as a quorum device, you must meet the following requirements.

- When booting the cluster, you must always boot the Sun NAS device before you boot the cluster nodes.

If you boot devices in the wrong order, your nodes cannot find the quorum device. If a node should fail in this situation, your cluster might be unable to remain in service. If the cluster fails because the Sun NAS quorum device was not available, bring up the Sun NAS device. After that action completes, boot the cluster.
- Oracle Solaris Cluster supports Sun NAS quorum devices starting with the Solaris 10 OS.
- The Sun NAS device must be located on the same network as the cluster nodes. If a Sun NAS quorum device is not located on the same network as the cluster nodes, the quorum device is at risk of not responding at boot time within the timeout period, causing the cluster boot up to fail due to lack of quorum.
- Oracle Solaris Cluster supports the use of the iSCSI data path for certain storage devices. For more information about which devices can be used with the iSCSI data path, contact your Oracle service representative.

Recommendations for Sun NAS Devices

It is strongly recommended that you use Oracle's Sun StorageTek 5320 NAS Cluster Appliance. Clustered filers provide high availability with respect to the filer data and do not constitute a single point of failure in the cluster.

It is strongly recommended that you use the network time protocol (NTP) to synchronize time on the cluster nodes and the Sun NAS device. Refer to your Oracle documentation for instructions about how to configure NTP on the Sun NAS device. Select at least one NTP server for the Sun NAS device that also serves the cluster nodes.

Restrictions for Sun NAS Devices

A Sun NAS device must be connected to all nodes. A Sun NAS device is supported as a quorum device only in a two-node cluster. A Sun NAS device appears as a SCSI shared disk to the quorum subsystem. The iSCSI connection to the Sun NAS device is completely invisible to the quorum subsystem.

Installing a Sun NAS Device in an Oracle Solaris Cluster Environment

▼ How to Install a Sun NAS Device in a Cluster

Before You Begin This procedure relies on the following assumptions:

- Your cluster nodes have the operating system and Oracle Solaris Cluster software installed.
- You have administrative access to the Sun NAS device.

This procedure provides the long forms of the Oracle Solaris Cluster commands. Most commands also have short forms. Except for the forms of the command names, the commands are identical.

To perform this procedure, become superuser or assume a role that provides `solaris.cluster.read` and `solaris.cluster.modify` RBAC (role-based access control) authorization.

1 Set up the Sun NAS device.

You can set up the Sun NAS device at any point in your cluster installation. Follow the instructions in your Sun NAS device's documentation.

When setting up your Sun NAS device, follow the standards that are described in [“Requirements, Recommendations, and Restrictions for Sun NAS Devices”](#) on page 11.

2 On each cluster node, add the Sun NAS device name to the `/etc/inet/hosts` file.

Add a hostname-to-address mapping for the device in the `/etc/inet/hosts` file on all cluster nodes, as shown in the following example:

```
sunnas - 123 192.168.11.123
```

3 On each node in the cluster, add the device netmasks to the `/etc/inet/netmasks` file.

Add an entry to the `/etc/inet/netmasks` file for the subnet on which the filer is located, as shown in the following example.

```
192.168.11.0 255.255.255.0
```

4 In `/etc/nsswitch.conf` on every cluster node, ensure that `files` precedes `nis` and `dns` information sources for `hosts` and `netmasks` information types, as shown in the following example.

```
hosts:      files nis
```

5 Use Oracle's Sun StorEdge Web Administrator to add net addresses for all cluster nodes to the Sun NAS device.

“Product Overview” in the *Sun StorageTek NAS OS Administration Guide* describes the Sun StorEdge Web Administrator graphical user interface (GUI). “Adding and Editing Hosts” in the *Sun StorageTek NAS OS Administration Guide* describes how to add net addresses.

6 Log into your Sun NAS device and use the Sun StorEdge `hostlook` command to verify that the net address for each cluster node resolves correctly, as shown in the following example.

```
pschost-2# telnet 10.8.165.42
Trying 10.8.165.42...
Connected to 10.8.165.42.
Escape character is '^'.
connect to (? for list) ? [menu] admin
password for admin access ? *****
nlnas20 > hostlook pschost-1
pschost-1:
  Name:  pschost-1
  Addr:  10.8.165.42
```

If the NIS+ configuration is correct and is used as the primary Host Order naming service, information about the entered host is displayed.

7 If you are attaching the cluster to Oracle's Sun StorageTek 5320 NAS Cluster Appliance filer for the first time, log into the NAS device and use the `load` command to load the NAS fencing command, as shown in the following example.

```
pschost-2# telnet 10.8.165.42
Trying 10.8.165.42...
Connected to 10.8.165.42.
Escape character is '^'.
connect to (? for list) ? [menu] admin
password for admin access ? *****
nlnas20 > load fencing
nlnas20 >
```

8 If you are attaching the cluster to the Sun StorageTek 5320 NAS Cluster Appliance filer for the first time, configure the fencing command so that it loads automatically after the filer reboots.**a. Use `ftp(1)` to get the `/dvo1/etc/inet/load.ncf` file from your Sun NAS device onto your local machine.**

- b. Using a text editor, in the `inetload.ncf` file on your local machine, add the following entry.


```
fencing
```
 - c. Use `ftp` to put back the `inetload.ncf` file onto your Sun NAS device (in `/dvol/etc/inetload.ncf`).
- 9 Use Sun StorEdge Web Administrator to add trusted administrator access to every cluster node.**
- “Product Overview” in the *Sun StorageTek NAS OS Administration Guide* describes the Sun StorEdge Web Administrator graphical user interface (GUI).
- a. In Web Administrator, create a host group for the cluster, which includes every node in the cluster, by selecting, in the Navigation Pane, UNIX Configuration→Configure NFS→Set Up Hostgroups.
 - b. Use `ftp(1)` to get the `/dvol/etc/approve` file from your Sun NAS device onto your local machine.
 - c. Using a text editor, in the `approve` file on your local machine, add the following entry.


```
admin * @cluster-host-group access=trusted
```

Note – You must add this entry *before* any existing entries in the `approve` file, as shown in the following example.

```
admin * @schostgroup access=trusted
admin * @general access=granted
```

This `approve` file is searched in sequence and stops at the first match. Placing the entry that you add before any existing entries ensures that it is matched first.

<code>admin</code>	A service type that controls administrative access to StorEdge configuration menus and commands through <code>rlogin</code> and <code>rsh</code> or <code>ssh</code> clients. Each <code>admin</code> entry in the <code>approve</code> file specifies the users and hosts that are allowed administrative access.
<code>@cluster-host-group</code>	The name of the host group that you previously created (preceded by the “at” symbol (@)).
<code>access=trusted</code>	How the host group can access administrative services on the Sun NAS device. Oracle Solaris Cluster requires that you grant trusted access for the cluster nodes. Trusted access grants the user access without having to specify an administrative password.

For example, change the contents of your approve file from that shown in the first example to that shown in the second example.

```
# Approve file -- controls client access to resources
files / @trusted access=rw uid0=0
```

```
# Approve file -- controls client access to resources
files / @trusted access=rw uid0=0
admin * @schostgroup access=trusted
```

d. Use `ftp` to put back the approve file onto your Sun NAS device (in `/dvol/etc/approve`).

- 10 Log into your NAS device and use the Sun StorEdge `reload` command to reload the updated approve file, as shown in the following example.

```
pschost-2# telnet 10.8.165.42
Trying 10.8.165.42...
Connected to 10.8.165.42.
Escape character is '^]'.
connect to (? for list) ? [menu] admin
password for admin access ? *****
nlnas20 > approve reload
nlnas20 >
```

- 11 Configure Oracle Solaris Cluster fencing support for the Sun NAS device. If you skip this step, Oracle Solaris Cluster will not provide fencing support for the NAS device.

a. Add the device.

- If you are configuring a NAS device for a global cluster, use the following command from any global cluster node:

```
# clnasdevice add -t sun myfiler
```

`-t sun` Enter sun as the type of device you are adding.

`myfiler` Enter the name of the Sun NAS device that you are adding.

- If you are configuring a NAS device for a zone cluster, use the following command from any global cluster node:

```
# clnasdevice add -t sun -Z zcname myfiler
```

`zcname` Enter the name of the zone cluster where the Sun NAS device is being added.

b. Confirm that the device has been added to the cluster.

- If you are checking a NAS device for a global cluster, use the following command from any global cluster node:

```
# clnasdevice list
```

For more information about the `clnasdevice` command, see the [clnasdevice\(1CL\)](#) man page.

- **If you are checking a NAS device for a zone cluster, use the following command from any global cluster node:**

```
# clnasdevice list -Z zcname
```

You can also perform zone cluster-related commands inside the zone cluster by omitting the `-Z` option. For more information about the `clnasdevice` command, see the [clnasdevice\(1CL\)](#) man page.

- 12 Add the Sun NAS directories to the cluster when the NAS device has been configured to support fencing.**

Follow the directions in “[How to Add Sun NAS Directories to a Cluster](#)” on page 21.

- 13 (Optional) Configure a LUN on the Sun NAS device as a quorum device.**

See “[How to Add a Sun NAS or Sun Storage 7000 Unified Storage Systems NAS Quorum Device](#)” in *Oracle Solaris Cluster System Administration Guide* for instructions for configuring a Sun NAS quorum device.

Maintaining a Sun NAS Device in an Oracle Solaris Cluster Environment

This section contains procedures about maintaining Sun NAS devices that are attached to a cluster. If a device's maintenance procedure might jeopardize the device's availability to the cluster, you must always perform the steps in “[How to Prepare the Cluster for Sun NAS Device Maintenance](#)” on page 18 before performing the maintenance procedure. After performing the maintenance procedure, perform the steps in “[How to Restore Cluster Configuration After Sun NAS Device Maintenance](#)” on page 19 to return the cluster to its original configuration.

▼ How to Prepare the Cluster for Sun NAS Device Maintenance

Follow the instructions in this procedure whenever the Sun NAS device maintenance you are performing might affect the device's availability to the cluster nodes.

Before You Begin This procedure provides the long forms of the Oracle Solaris Cluster commands. Most commands also have short forms. Except for the forms of the command names, the commands are identical.

To perform this procedure, become superuser or assume a role that provides `solaris.cluster.read` and `solaris.cluster.modify` RBAC authorization.

- 1 **Stop I/O to the Sun NAS device.**
- 2 **On each cluster node, unmount the Sun NAS device directories.**
- 3 **Determine whether a LUN on this Sun NAS device is a quorum device.**
`# clquorum show`
- 4 **If the LUNs on this Sun NAS device are not quorum devices, you are finished with this procedure.**
- 5 **If a LUN is a quorum device, perform the following steps:**
 - a. **If your cluster uses other shared storage devices, select and configure another quorum device.**
 - b. **Remove this quorum device.**
See [Chapter 6, “Administering Quorum,”](#) in *Oracle Solaris Cluster System Administration Guide* for instructions about adding and removing quorum devices.

Note – If your cluster requires a quorum device (for example, a two-node cluster) and you are maintaining the only shared storage device in the cluster, your cluster is in a vulnerable state throughout the maintenance procedure. Loss of a single node during the procedure causes the other node to panic and your entire cluster becomes unavailable. Limit the amount of time for performing such procedures. To protect your cluster against such vulnerability, add a shared storage device to the cluster.

▼ How to Restore Cluster Configuration After Sun NAS Device Maintenance

Follow the instructions in this procedure after performing any Sun NAS device maintenance that might affect the device's availability to the cluster nodes.

- 1 **Mount the Sun NAS directories.**
- 2 **Determine whether you want an iSCSI LUN on this Sun NAS device to be a quorum device.**
 - **If no, continue to “[How to Prepare the Cluster for Sun NAS Device Maintenance](#)” on page 18.**

- **If yes, configure the LUN as a quorum device, following the steps in “How to Add a Network Appliance Network-Attached Storage (NAS) Quorum Device” in *Oracle Solaris Cluster System Administration Guide*.**

Remove any extraneous quorum device that you configured in “How to Prepare the Cluster for Sun NAS Device Maintenance” on page 18.

3 Restore I/O to the Sun NAS device.

▼ How to Remove a Sun NAS Device From a Cluster

Before You Begin This procedure relies on the following assumptions:

- Your cluster is operating.
- You have prepared the cluster by performing the steps in “How to Prepare the Cluster for Sun NAS Device Maintenance” on page 18.
- You have removed any device directories from the cluster by performing the steps in “How to Remove a Sun NAS Device From a Cluster” on page 20.

Note – When you remove the device from cluster configuration, the data on the device is not available to the cluster. Ensure that other shared storage in the cluster can continue to serve the data when the Sun NAS device is removed.

This procedure provides the long forms of the Oracle Solaris Cluster commands. Most commands also have short forms. Except for the forms of the command names, the commands are identical.

To perform this procedure, become superuser or assume a role that provides `solaris.cluster.read` and `solaris.cluster.modify` RBAC authorization.

1 Remove the device.

- **If you are removing a NAS device from a global cluster, use the following command from any global cluster node:**

```
# clnasdevice remove myfiler
```

myfiler Enter the name of the Sun NAS device that you are removing.

For more information about the `clnasdevice` command, see the `clnasdevice(1CL)` man page.

- If you are removing a NAS device from a zone cluster, use the following command from any global cluster node:

```
# clnasdevice remove -Z zcname myfiler
```

zcname Enter the name of the zone cluster where the Sun NAS device is being removed.

2 Confirm that the device has been removed from the cluster.

- If you are checking the NAS device for a global cluster, use the following command from any global cluster node:

```
# clnasdevice list
```

- If you are checking the NAS device for a zone cluster, use the following command from any global cluster node:

```
# clnasdevice list -Z zcname
```

Note – You can also perform zone cluster-related commands inside the zone cluster by omitting the `-Z` option. For more information about the `clnasdevice` command, see the [clnasdevice\(1CL\)](#) man page.

▼ How to Add Sun NAS Directories to a Cluster

Before You Begin The procedure relies on the following assumptions:

- Your cluster is operating.
- The Sun NAS device is properly configured and the directories the cluster will use have been exported.
See “[Requirements, Recommendations, and Restrictions for Sun NAS Devices](#)” on page 11 for the details about required device configuration.
- You have added the device to the cluster by performing the steps in “[How to Install a Sun NAS Device in a Cluster](#)” on page 14.

This procedure provides the long forms of the Oracle Solaris Cluster commands. Most commands also have short forms. Except for the forms of the command names, the commands are identical.

To perform this procedure, become superuser or assume a role that provides `solaris.cluster.read` and `solaris.cluster.modify` RBAC authorization.

1 Use Sun StorEdge Web Administrator to create the Sun NAS volumes.

“Product Overview” in the *Sun StorageTek NAS OS Administration Guide* describes the Sun StorEdge Web Administrator graphical user interface (GUI). “Creating File Volumes or Segments” in the *Sun StorageTek NAS OS Administration Guide* describes how to create file volumes.

2 Use Sun StorEdge Web Administrator to add read/write access to every cluster node.



Caution – You must explicitly grant read/write access to each cluster node. Do *not* enable general access and do *not* add access by specifying a cluster host group.

“Setting Up NFS Exports” in the *Sun StorageTek NAS OS Administration Guide* describes how to add read/write access to nodes in the cluster.

3 Log into your NAS device and use the Sun StorEdge `list` command to verify the changes that you made to the `approve` file, as shown in the following example.

```
pschost-2# telnet 10.8.165.42
Trying 10.8.165.42...
Connected to 10.8.165.42.
Escape character is '^]'.
connect to (? for list) ? [menu] admin
password for admin access ? *****
nlnas20 > approve list
=====
acache: approve
=====
files /@trusted access=rw uid0=0
admin * @schostgroup access=trusted
files /vol1 schost1 access=rw
files /vol1 schost2 access=rw
files /vol2 schost1 access=rw
files /vol2 schost2 access=rw
=====
acache: hostgrps
=====
trusted schostgroup
nlnas20 >
```

4 Add the directories.

- **If you are adding the NAS directories to a global cluster, use the following command from any global cluster node:**

```
# clnasdevice add-dir -d /export/dir1,/export/dir2 myfiler
```

`-d /export/dir1,/export/dir2` Enter the directory or directories that you are adding.

`myfiler` Enter the name of the Sun NAS device containing the directories.

For more information about the `clnasdevice` command, see the [clnasdevice\(1CL\)](#) man page.

- **If you are adding the NAS directories to a zone cluster, use the following command from any global cluster node:**

```
# clnasdevice add-dir -d /export/dir1,/export/dir2 -Z zcname myfiler
```

zcname Enter the name of the zone cluster where the Sun NAS directories are being added.

5 Confirm that the directories have been added.

- **If you are checking the NAS directories for a global cluster, use the following command from any global cluster node:**

```
# clnasdevice show -v
```

- **If you are checking the NAS directories for a zone cluster, use the following command from any global cluster node:**

```
# clnasdevice show -v -Z zcname
```

Note – You can also perform zone cluster-related commands inside the zone cluster by omitting the `-Z` option. For more information about the `clnasdevice` command, see the [clnasdevice\(1CL\)](#) man page.

6 If you do not use the automounter, mount the directories by performing the following steps:

- a. **On each node in the cluster, create a mount-point directory for each Sun NAS directory that you added.**

```
# mkdir -p /path-to-mountpoint
```

path-to-mountpoint Name of the directory on which to mount the directory

- b. **On each node in the cluster, add an entry to the `/etc/vfstab` file for the mount point.**

If you are using your Sun NAS device for Oracle Real Application Clusters database files, set the following mount options:

- `forcedirectio`
- `noac`
- `proto=tcp`

When mounting Sun NAS directories, select the mount options appropriate to your cluster applications. Mount the directories on each node that will access the directories. Oracle Solaris Cluster places no additional restrictions or requirements on the options that you use.

▼ How to Remove Sun NAS Directories From a Cluster

Before You Begin This procedure assumes that your cluster is operating.

Note – When you remove the device directories, the data on those directories is not available to the cluster. Ensure that other device directories or shared storage in the cluster can continue to serve the data when these directories have been removed.

This procedure provides the long forms of the Oracle Solaris Cluster commands. Most commands also have short forms. Except for the forms of the command names, the commands are identical.

To perform this procedure, become superuser or assume a role that provides `solaris.cluster.read` and `solaris.cluster.modify` RBAC authorization.

1 If you are using hard mounts rather than the automounter, unmount the Sun NAS directories:

a. On each node in the cluster, unmount the directories you are removing.

```
# umount /mount-point
```

b. On each node in the cluster, remove the entries in the `/etc/vfstab` file for the directories you are removing.

2 Remove the directories.

■ If you are removing NAS directories from a global cluster, use the following command from any global cluster node:

```
# clnasdevice remove-dir -d /export/dir1 myfiler
```

`-d /export/dir1` Enter the directory or directories that you are removing.

`myfiler` Enter the name of the Sun NAS device containing the directories.

To remove all of this device's directories, specify `all` for the `-d` option:

```
# clnasdevice remove-dir -d all myfiler
```

For more information about the `clnasdevice` command, see the `clnasdevice(1CL)` man page.

■ If you are removing NAS directories from a zone cluster, use the following command from any global cluster node:

```
# clnasdevice remove-dir -d /export/dir1 -Z zcname myfiler
```


zcname Enter the name of the zone cluster where the Sun NAS directories are being removed.

To remove all of this device's directories, specify `all` for the `-d` option:

```
# clnasdevice remove-dir -d all -Z zcname myfiler
```

For more information about the `clnasdevice` command, see the [clnasdevice\(1CL\)](#) man page.

3 Confirm that the directories have been removed.

- If you are checking the NAS directories for a global cluster, use the following command from any global cluster node:

```
# clnasdevice show -v
```

- If you are checking the NAS directories for a zone cluster, use the following command from any global cluster node:

```
# clnasdevice show -v -Z zcname
```

Note – You can also perform zone cluster-related commands inside the zone cluster by omitting the `-Z` option. For more information about the `clnasdevice` command, see the [clnasdevice\(1CL\)](#) man page.

See Also To remove the device, see [“How to Remove a Sun NAS Device From a Cluster”](#) on page 20.

Installing and Maintaining Network Appliance Network-Attached Storage Devices in an Oracle Solaris Cluster Environment

This chapter contains procedures about installing and maintaining Network Appliance network-attached storage (NAS) devices in an Oracle Solaris Cluster environment. Before you perform any of the procedures in this chapter, read the entire procedure. If you are not reading an online version of this document, have the books listed in [“Related Books” on page 6](#) available.

This chapter contains the following procedures.

- [“How to Install a Network Appliance NAS Device in a Cluster” on page 30](#)
- [“How to Prepare the Cluster for Network Appliance NAS Device Maintenance” on page 34](#)
- [“How to Restore Cluster Configuration After Network Appliance NAS Device Maintenance” on page 35](#)
- [“How to Remove a Network Appliance NAS Device From a Cluster” on page 36](#)
- [“How to Add Network Appliance NAS Directories to a Cluster” on page 37](#)
- [“How to Remove Network Appliance NAS Directories From a Cluster” on page 39](#)

For conceptual information about multihost storage devices, see the *Oracle Solaris Cluster Concepts Guide*.

Note – The instructions for installing and maintaining Network Appliance NAS devices are the same for both global cluster and zone cluster environments, unless stated otherwise.

Requirements, Recommendations, and Restrictions for Network Appliance NAS Devices

This section includes only restrictions and requirements that have a direct impact on the procedures in this chapter. For general support information, contact your Sun service provider.

Requirements for Network Appliance NAS Devices

This section describes the following requirements.

- “Requirements When Configuring Network Appliance NAS Devices” on page 28
- “Requirements When Configuring Network Appliance NAS Devices for Use With Oracle Real Application Clusters” on page 28
- “Requirements When Configuring Network Appliance NAS Devices as Quorum Devices” on page 29

Requirements When Configuring Network Appliance NAS Devices

When you configure a Network Appliance NAS device, you must meet the following requirements.

- Allow HTTP administrative access.
Sun Cluster uses the HTTP administrative access to support fencing. Sun Cluster automatically removes file system write permission for a node that has left the cluster, and grants file system write permission for a node that has just joined the cluster. These actions ensure that a node that departed the cluster can no longer modify data. You must have the administrator login and password. You need these items when you are configuring the device in the cluster.
- Cluster nodes are configured with Solaris Internet Protocol Multipathing (IPMP).
- Ensure that the `SUNWzlib` package is available on your cluster.
The Network Appliance NAS device requires the `SUNWzlib` package to run on Sun Cluster. If you installed the End User Solaris Software Group on your cluster, you must add the `SUNWzlib` package using the `pkgadd` command.

```
# pkgadd SUNWzlib
```
- When exporting Network Appliance NAS directories for use with the cluster, you must use the form `rw=nodename1;nodename2` to specify access to the directories. You make these entries in the `exports` file on the NAS device.

Requirements When Configuring Network Appliance NAS Devices for Use With Oracle Real Application Clusters

When you configure your Network Appliance NAS device for use with Oracle Real Application Clusters (RAC), you must meet the following requirements.

- You must configure the Network Appliance NAS device with fencing support in order to guarantee data integrity.
- You must create a volume on each Network Appliance NAS device for storing Oracle database files, namely:
 - Data files

- Control files
- Online redo log files
- Archived redo log files
- You must create a quota tree (qtree) for the each directory in the following list:
 - The directory that contains Oracle data files for the cluster
 - The Oracle home directory that is to be mounted on each node
- On each Network Appliance NAS device, you must add an entry to the `/etc/exports` file for the root of the volume that you created for storing Oracle database files.
- You must ensure that the volume is exported *without* the `nosuid` option.
- When adding the Network Appliance NAS directories to the cluster, ensure that the following mount options are set:
 - `forcedirectio`
 - `noac`
 - `proto=tcp`

Requirements When Configuring Network Appliance NAS Devices as Quorum Devices

The administrator has the option of deciding whether to use the Network Appliance NAS device as a quorum device.

Note – You do not need to configure a NAS device as a quorum device in a zone cluster environment. A quorum is not required for a zone cluster, because the zone cluster node role in the zone cluster membership directly depends on the global cluster node role on the machine that is hosting the zone cluster node.

When you use a Network Appliance NAS device as a quorum device, you must meet the following requirements.

- You must install the iSCSI license from Network Appliance.
- You must configure an iSCSI LUN on the Network Appliance NAS device for use as the quorum device.
- When booting the cluster, you must always boot the Network Appliance NAS device before you boot the cluster nodes.

If you boot devices in the wrong order, your nodes cannot find the quorum device. If a node should fail in this situation, your cluster might be unable to remain in service. If the cluster fails because the Network Appliance NAS quorum device was not available, bring up the NAS device. After that action completes, boot the cluster.

- The Network Appliance NAS device must be located on the same network as the cluster nodes. If a Network Appliance NAS quorum device is not located on the same network as the cluster nodes, the quorum device is at risk of not responding at boot time within the timeout period, causing the cluster boot up to fail due to lack of quorum.

Recommendations for Network Appliance NAS Devices

It is strongly recommended that you use a Network Appliance clustered filer. Clustered filers provide high availability with respect to the filer data and do not constitute a single point of failure in the cluster.

It is strongly recommended that you use the network time protocol (NTP) to synchronize time on the cluster nodes and the NAS device. Refer to your Network Appliance documentation for instructions about how to configure NTP on the NAS device. Select at least one NTP server for the NAS device that also serves the cluster nodes.

Restrictions for Network Appliance NAS Devices

When configuring a Network Appliance NAS device as a quorum device, you can only add the quorum device when all cluster nodes are operating and communicating with the Network Appliance NAS device.

Installing a Network Appliance NAS Device in a Sun Cluster Environment

▼ How to Install a Network Appliance NAS Device in a Cluster

Before You Begin This procedure relies on the following assumptions:

- Your cluster nodes have the operating system and Sun Cluster software installed.
- You have the HTTP administrator login and password for the Network Appliance NAS device.

This procedure provides the long forms of the Oracle Solaris Cluster commands. Most commands also have short forms. Except for the forms of the command names, the commands are identical.

To perform this procedure, become superuser or assume a role that provides `solaris.cluster.read` and `solaris.cluster.modify` RBAC (role-based access control) authorization.

1 Set up the Network Appliance NAS device.

You can set up the device at any point in your cluster installation. Follow the instructions in your device's documentation. See [“Related Third-Party Web Site References” on page 7](#) for a list of related device documentation.

When setting up your Network Appliance NAS device, follow the standards that are described in [“Requirements, Recommendations, and Restrictions for Network Appliance NAS Devices” on page 27](#).

2 Install the NAS-support software package `NTAPcLnas` on each node in the cluster.

Perform this step after you have installed the Solaris OS and the Sun Cluster software.

If this is the first Network Appliance NAS device in your cluster, or if you need to upgrade the NAS-support software package, perform this step. See [“Related Third-Party Web Site References” on page 7](#) for instructions about downloading and installing this software.

3 On each cluster node, add the Network Appliance NAS device name to the `/etc/inet/hosts` file.

Add a hostname-to-address mapping for the device in the `/etc/inet/hosts` file on all cluster nodes. For example:

```
netapp-123 192.168.11.123
```

4 On each cluster node, add the device netmasks to the `/etc/inet/netmasks` file.

Add an entry to the `/etc/inet/netmasks` file for the subnet the filer is on. For example:

```
192.168.11.0 255.255.255.0
```

5 Verify that the `hosts` and `netmasks` entries in `/etc/nsswitch.conf` file on all cluster nodes have files appearing before `nis` and `dns`. If they are not, edit the corresponding line in `/etc/nsswitch.conf` by moving files before `nis` and `dns`.

6 Configure Oracle Solaris Cluster fencing support for the Network Appliance NAS device. If you skip this step, Oracle Solaris Cluster will not provide fencing support for the Network Appliance NAS device.

a. Add the device.

- If you are configuring a NAS device for a global cluster, use the following command from any global cluster node:

```
# clnasdevice add -t netapp -p userid=root myfiler
Please enter password
```

-t netapp Enter netapp as the type of device you are adding.
-p userid=root Enter the HTTP administrator login for the NAS device.
myfiler Enter the name of the NAS device you are adding.

- **If you are configuring a NAS device for a zone cluster, use the following command from any global cluster node:**

```
# clnasdevice add -t netapp -p userid=root -Z zcname myfiler
```

zcname Enter the name of the zone cluster where the NAS device is being added.

b. At the prompt, type the HTTP administrator password.

c. Confirm that the device has been added to the cluster.

- **If you are checking the NAS device for a global cluster, use the following command from any global cluster node:**

```
# clnasdevice list
```

For more information about the `clnasdevice` command, see the [clnasdevice\(1CL\)](#) man page.

- **If you are checking the NAS device for a zone cluster, use the following command from any global cluster node:**

```
# clnasdevice list -Z zcname
```

You can also perform zone cluster-related commands inside the zone cluster by omitting the `-Z` option. For more information about the `clnasdevice` command, see the [clnasdevice\(1CL\)](#) man page.

7 Add the Network Appliance NAS directories to the cluster when the NAS device has been configured to support fencing.

Follow the directions in [“How to Add Network Appliance NAS Directories to a Cluster”](#) on page 37.

8 (Optional) Configure a LUN on the NAS device as a quorum device.

See [“How to Add a Network Appliance Network-Attached Storage \(NAS\) Quorum Device”](#) in *Oracle Solaris Cluster System Administration Guide* for instructions for configuring a Network Appliance NAS quorum device.

Maintaining a Network Appliance NAS Device in a Sun Cluster Environment

This section contains procedures about maintaining Network Appliance NAS devices that are attached to a cluster. If a device's maintenance procedure might jeopardize the device's availability to the cluster, you must always perform the steps in [“How to Prepare the Cluster for Network Appliance NAS Device Maintenance” on page 34](#) before performing the maintenance procedure. After performing the maintenance procedure, perform the steps in [“How to Restore Cluster Configuration After Network Appliance NAS Device Maintenance” on page 35](#) to return the cluster to its original configuration.

Network Appliance NAS Device Procedures That *Do Not* Require Cluster Preparation

The following Network Appliance clustered-filer procedures can be performed without affecting the filer's availability.

- Monitoring the status of the cluster as a whole
- Viewing information about the cluster
- Enabling and disabling takeover on a cluster to perform software upgrades or other maintenance
- Halting a filer in a cluster without causing a takeover
- Performing a takeover on the partner filer
- Performing license operations on the cluster feature
- Enabling and disabling the negotiated failover feature on a cluster



Caution – When performing any maintenance procedure other than those listed, perform the steps in [“How to Prepare the Cluster for Network Appliance NAS Device Maintenance”](#) on page 34 before the maintenance procedure. Perform the steps in [“How to Restore Cluster Configuration After Network Appliance NAS Device Maintenance”](#) on page 35 after performing the maintenance procedure.

If you fail to prepare the cluster, you can experience loss of cluster availability. If the cluster loses access to the Network Appliance NAS device's directories, your cluster applications will experience I/O errors, might not be able to fail over correctly, and might fail. If your cluster experiences this kind of failure, you must reboot the entire cluster (booting Network Appliance NAS device before the cluster nodes).

If your cluster loses access to a Network Appliance NAS quorum device, and then a node fails, the entire cluster can become unavailable. In this case, you must either reboot the entire cluster (booting Network Appliance NAS device before the cluster nodes) or remove the quorum device and configure it again.

▼ How to Prepare the Cluster for Network Appliance NAS Device Maintenance

Follow the instructions in this procedure whenever the Network Appliance NAS device maintenance you are performing might affect the device's availability to the cluster nodes.

Before You Begin This procedure provides the long forms of the Oracle Solaris Cluster commands. Most commands also have short forms. Except for the forms of the command names, the commands are identical.

To perform this procedure, become superuser or assume a role that provides `solaris.cluster.read` and `solaris.cluster.modify` RBAC authorization.

- 1 **Stop I/O to the NAS device.**
- 2 **On each cluster node, unmount the Network Appliance NAS device directories.**
- 3 **Determine whether a LUN on this Network Appliance NAS device is a quorum device.**
`# clquorum show`
- 4 **If the LUNs on this Network Appliance NAS device are not quorum devices, you are finished with this procedure.**

- 5 If a LUN is a quorum device, perform the following steps:
 - a. If your cluster uses other shared storage devices, select and configure another quorum device.
 - b. Remove this quorum device.

See [Chapter 6, “Administering Quorum,”](#) in *Oracle Solaris Cluster System Administration Guide* for instructions about adding and removing quorum devices.

Note – If your cluster requires a quorum device (for example, a two-node cluster) and you are maintaining the only shared storage device in the cluster, your cluster is in a vulnerable state throughout the maintenance procedure. Loss of a single node during the procedure causes the other node to panic and your entire cluster becomes unavailable. Limit the amount of time for performing such procedures. To protect your cluster against such vulnerability, add a shared storage device to the cluster.

▼ How to Restore Cluster Configuration After Network Appliance NAS Device Maintenance

Follow the instructions in this procedure after performing any Network Appliance NAS device maintenance that might affect the device's availability to the cluster nodes.

- 1 Mount the Network Appliance NAS directories.
- 2 Determine whether you want an iSCSI LUN on this Network Appliance NAS device to be a quorum device.
 - If no, continue to [Step 3](#).
 - If yes, configure the LUN as a quorum device, following the steps in [“How to Add a Network Appliance Network-Attached Storage \(NAS\) Quorum Device”](#) in *Oracle Solaris Cluster System Administration Guide*.

Remove any extraneous quorum device that you configured in [“How to Prepare the Cluster for Network Appliance NAS Device Maintenance”](#) on page 34.
- 3 Restore I/O to the Network Appliance NAS device.

▼ How to Remove a Network Appliance NAS Device From a Cluster

Before You Begin This procedure relies on the following assumptions:

- Your cluster is operating.
- You have prepared the cluster by performing the steps in [“How to Prepare the Cluster for Network Appliance NAS Device Maintenance”](#) on page 34.
- You have removed any device directories from the cluster by performing the steps in [“How to Remove Network Appliance NAS Directories From a Cluster”](#) on page 39.

Note – When you remove the device from cluster configuration, the data on the device is not available to the cluster. Ensure that other shared storage in the cluster can continue to serve the data when the Network Appliance NAS device is removed.

This procedure provides the long forms of the Oracle Solaris Cluster commands. Most commands also have short forms. Except for the forms of the command names, the commands are identical.

To perform this procedure, become superuser or assume a role that provides `solaris.cluster.read` and `solaris.cluster.modify` RBAC authorization.

1 Remove the device.

- **If you are removing a NAS device from a global cluster, use the following command from any global cluster node:**

```
# clnasdevice remove myfiler
```

myfiler Enter the name of the NAS device you are removing.

For more information about the `clnasdevice` command, see the `clnasdevice(1CL)` man page.

- **If you are removing a NAS device from a zone cluster, use the following command from any global cluster node:**

```
# clnasdevice remove -Z zname myfiler
```

zname Enter the name of the zone cluster where the NAS device is being removed.

2 Confirm that the device has been removed from the cluster.

- If you are checking the NAS device for a global cluster, use the following command from any global cluster node:

```
# clnasdevice list
```

- If you are checking the NAS device for a zone cluster, use the following command from any global cluster node:

```
# clnasdevice list -Z zcname
```

You can also perform zone cluster-related commands inside the zone cluster by omitting the `-Z` option. For more information about the `clnasdevice` command, see the [clnasdevice\(1CL\)](#) man page.

▼ How to Add Network Appliance NAS Directories to a Cluster

Before You Begin The procedure relies on the following assumptions:

- Your cluster is operating.
- The Network Appliance NAS device is properly configured and the directories the cluster will use have been exported.
See [“Requirements, Recommendations, and Restrictions for Network Appliance NAS Devices” on page 27](#) for the details about required device configuration.
- You have added the device to the cluster by performing the steps in [“How to Install a Network Appliance NAS Device in a Cluster” on page 30](#).

This procedure provides the long forms of the Oracle Solaris Cluster commands. Most commands also have short forms. Except for the forms of the command names, the commands are identical.

To perform this procedure, become superuser or assume a role that provides `solaris.cluster.read` and `solaris.cluster.modify` RBAC authorization.

1 Add the directories.

- If you are adding NAS directories to a global cluster, use the following command from any global cluster node:

```
# clnasdevice add-dir -d /export/dir1,/export/dir2 myfiler
```

```
-d /export/dir1,/export/dir2 Enter the directory or directories that you are adding.
```

myfiler Enter the name of the NAS device containing the directories.

For more information about the `clnasdevice` command, see the [clnasdevice\(1CL\)](#) man page.

- **If you are adding NAS directories to a zone cluster, use the following command from any global cluster node:**

```
# clnasdevice add-dir -d /export/dir1,/export/dir2 -Z zcname myfiler
```

zcname Enter the name of the zone cluster where the NAS directories are being added.

2 Confirm that the directories have been added.

- **If you are checking the NAS directories for a global cluster, use the following command from any global cluster node:**

```
# clnasdevice show -v
```

- **If you are checking the NAS directories for a zone cluster, use the following command from any global cluster node:**

```
# clnasdevice show -v -Z zcname
```

You can also perform zone cluster-related commands inside the zone cluster by omitting the `-Z` option. For more information about the `clnasdevice` command, see the [clnasdevice\(1CL\)](#) man page.

3 If you do not use the automounter, mount the directories by performing the following steps:

- a. **On each node in the cluster, create a mount-point directory for each Network Appliance NAS directory that you added.**

```
# mkdir -p /path-to-mountpoint
```

path-to-mountpoint Name of the directory on which to mount the directory

- b. **On each node in the cluster, add an entry to the `/etc/vfstab` file for the mount point.**

If you are using your Network Appliance NAS device for Oracle Real Application Clusters database files, set the following mount options:

- `forcedirectio`
- `noac`
- `proto=tcp`

When mounting Network Appliance NAS directories, select the mount options appropriate to your cluster applications. Mount the directories on each node that will access the directories. Sun Cluster places no additional restrictions or requirements on the options that you use.

▼ How to Remove Network Appliance NAS Directories From a Cluster

Before You Begin This procedure assumes that your cluster is operating.

Note – When you remove the device directories, the data on those directories is not available to the cluster. Ensure that other device directories or shared storage in the cluster can continue to serve the data when these directories have been removed.

This procedure provides the long forms of the Oracle Solaris Cluster commands. Most commands also have short forms. Except for the forms of the command names, the commands are identical.

To perform this procedure, become superuser or assume a role that provides `solaris.cluster.read` and `solaris.cluster.modify` RBAC authorization.

- 1 **If you are using hard mounts rather than the automounter, unmount the NAS directories:**
 - a. **On each node in the cluster, unmount the directories you are removing.**

```
# umount /mount-point
```
 - b. **On each node in the cluster, remove the entries in the `/etc/vfstab` file for the directories you are removing.**
- 2 **Remove the directories.**
 - **If you are removing NAS directories from a global cluster, use the following command from any global cluster node:**

```
# clnasdevice remove-dir -d /export/dir1 myfiler
```

`-d /export/dir1` Enter the directory or directories that you are removing.

`myfiler` Enter the name of the NAS device containing the directories.

To remove all of this device's directories, specify `all` for the `-d` option:

```
# clnasdevice remove-dir -d all myfiler
```

For more information about the `clnasdevice` command, see the `clnasdevice(1CL)` man page.
 - **If you are removing NAS directories from a zone cluster, use the following command from any global cluster node:**

```
# clnasdevice remove-dir -d /export/dir1 -Z zcname myfiler
```

zcname Enter the name of the zone cluster where the NAS directories are being removed.

To remove all of this device's directories, specify `all` for the `-d` option:

```
# clnasdevice remove-dir -d all -Z zcname myfiler
```

3 Confirm that the directories have been removed.

- If you are checking the NAS directories for a global cluster, use the following command from any global cluster node:

```
# clnasdevice show -v
```

- If you are checking the NAS directories for a zone cluster, use the following command from any global cluster node:

```
# clnasdevice show -v -Z zcname
```

You can also perform zone cluster-related commands inside the zone cluster by omitting the `-Z` option. For more information about the `clnasdevice` command, see the [clnasdevice\(1CL\)](#) man page.

See Also To remove the device, see “[How to Remove a Network Appliance NAS Device From a Cluster](#)” on page 36.

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