Oracle® Solaris Cluster 3.3 3/13 With Network-Attached Storage Device Manual

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Contents

Preface

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

Oracle Solaris Cluster 3.3 3/13 supports the following NAS devices:

- NAS appliance-based shared LUNs used for shared storage only, beginning with Sun Cluster version 3.1 9/04
- NAS appliance-based shared LUNs used for quorum devices, beginning with Sun Cluster version 3.1 8/05.
- Sun ZFS Storage Appliance from Oracle

Use this manual with Oracle Solaris Cluster 3.3 3/13 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 Oracle's Sun ZFS Storage Appliances as NAS Devices in an Oracle Solaris Cluster Environment," describes the requirements, recommendations, and restrictions for Sun ZFS Storage Appliances as NAS devices. This chapter also tells you how to install and maintain a Sun ZFS Storage Appliance in an Oracle Solaris Cluster environment.

Related Documentation

The Oracle Solaris Cluster documentation provides 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.

All Oracle Solaris Cluster documentation is available at `http://www.oracle.com/technetwork/indexes/documentation/index.html#sys_sw`.

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

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

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.

Typographic Conventions

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

TABLE P–1 Typographic Conventions

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

Shell Prompts in Command Examples

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

TABLE P–2 Shell Prompts

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

◆ ◆ ◆ CHAPTER 1

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 Documentation" on page 6 available.

This chapter contains the following procedures.

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

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. All nodes in the cluster must have access to configured directories.

  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 (`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 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 Oracle 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 9.

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:     cluster 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 ? ********
   n1nas20 > 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 ? ********
   n1nas20 > load fencing
   n1nas20 >
   ```

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 `/dvol/etc/inetload.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 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.

`admin`	A service type that controls administrative access to StorEdge configuration menus and commands through `rlogin` and `rsh` or `ssh` clients. Each `admin` entry in the `approve` file specifies the users and hosts that are allowed administrative access.
@cluster-host-group	The name of the host group that you previously created (preceded by the "at" symbol (@)).
`access=trusted`	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 ? ********
n1nas20 > approve reload
n1nas20 >
```

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.

- **Perform this command from any 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 want to add a NAS device to a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

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

  `-Z` Specify the cluster where the nas-device-type is registered and where you will operate.

  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.

- **Perform this command from any cluster node:**

  `# clnasdevice list`

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

- **If you want to check a NAS device for a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

  ```
  # 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 19.

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

See "How to Add a Sun NAS or Sun ZFS Storage Appliance 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 16 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 17 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 or a quorum server, 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 16.**

- **If yes, configure the LUN as a quorum device following the steps in "Adding a 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 16.

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 16.
- 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 18.

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.

- **Perform this command from any 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 want to remove a NAS device from a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

  `# 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.

- **Perform this command from any cluster node:**

  ```
  # clnasdevice list
  ```

- **If you want to check the NAS device for a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

  ```
  # 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 to all cluster nodes.

  See "Requirements, Recommendations, and Restrictions for Sun NAS Devices" on page 9 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 12.

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 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 ? ********
n1nas20 > 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
n1nas20 >
```

4 Add the directories.

- **Perform this command from any 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 want to add the NAS directories to a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

  `# 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.**

- **Perform this command from any cluster node:**

  ```
  # clnasdevice show -v
  ```

- **If you want to check the NAS directories for a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

  ```
  # 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.

- **Perform this command from any 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 want to remove the NAS directories from a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

  ```
  # 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.**

- **Perform this command from any cluster node:**

  ```
  # clnasdevice show -v
  ```

- **If you want to check the NAS directories for a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

  ```
  # 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 18.

◆ ◆ ◆ CHAPTER 2

Installing and Maintaining Oracle's Sun ZFS Storage Appliances as NAS Devices in an Oracle Solaris Cluster Environment

This chapter contains procedures about installing and maintaining Sun ZFS Storage Appliances as NAS devices using NFS file systems 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 Documentation" on page 6 available.

Note – To use a Sun ZFS Storage Appliance as a NAS device, the minimum version that you can use is Oracle Solaris Cluster 3.3 5/11.

This chapter contains the following procedures:

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

Note – The instructions for installing and maintaining Sun ZFS Storage Appliance NAS devices are the same for both global cluster and zone cluster environments, unless stated otherwise. When you perform a procedure or step on *a cluster node*, the node is the global cluster node for a global cluster, or the zone cluster node for a zone cluster.

Requirements, Recommendations, and Restrictions for Sun ZFS Storage 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 Oracle service provider.

Requirements for Sun ZFS Storage Appliance NAS Devices

This section describes the following requirements.

Requirements When Configuring Sun ZFS Storage Appliances

When you configure a Sun ZFS Storage Appliance, you must meet the following requirements.

- Do not use the default project. File systems created in the default project will not be fenced from failing cluster nodes.
- If you wish for a file system within a project used by the cluster to be protected by cluster fencing, ensure that the Protocols tab of the file system has the `Inherit from project` property selected for NFS. If you do not want the file system to be protected (for example, to allow file system access when cluster nodes are in non-cluster mode), ensure that the `Inherit from project` setting is not selected. This setting can be changed as needed to allow some file systems within a project to be fenced, and other file systems within the same project to not be fenced. When unselecting the `Inherit from project` setting, verify that the file system has the desired NFS exception settings for the IP address of each cluster node. Ensure that NFS file systems created within a project for cluster use with fencing control are set to inherit NFS properties from their parent project.
- For any projects that have file systems to be protected by cluster fencing, perform the following actions:
  - In the Protocols tab of the project, set the `Share Mode` to `None` or `Read only`.
  - If there are systems outside the cluster that will access the file system in this project, allow them access with the NFS exception entries created for each system. Use the `Host` entries or `Network` entries for these sytems. Use the `Network` entry only if the system is on a different subnet than the subnet used by the cluster to access the NAS device.

- The IP address must use the format of xxx.xxx.xxx.xxx/32. Set the `Access Mode` for the entry to `Read/Write` and select `Root Access` for the entry. Explicitly grant access to projects to all nodes in the cluster. Use only network exceptions when granting cluster access. Add exceptions for each public IP address within the cluster that might be used to access the storage, using the format of xxx.xxx.xxx.xxx/32. If a node has multiple active public network adapters, add the IP address of each one.

  Note – At run time, Oracle Solaris Cluster dynamically changes the NFS exception entries for the cluster nodes to control when a node has `Read/Write` access in a cluster membership. The software also controls when a node has `Read` access because it was evicted from the cluster membership.

- A Sun ZFS Storage Appliance NAS device must be directly connected (through the same subnet) to all nodes of the cluster.
- The cluster can be connected to multiple public networks to communicate with external systems. However, only one network can directly access a specific Sun ZFS Storage Appliance device. The IP addresses configured in the NFS exception entries for the cluster nodes exist in that subnet, and the Sun ZFS Storage Appliance device's network interface that is connected to that network is also configured with an IP address in that subnet. In the `Network` tab of the Sun ZFS Storage Appliance Configuration panel, ensure that the subnet's network interface has `Allow Administration` selected.
- Ensure that the Sun ZFS Storage Appliance is running a qualified firmware release; for example, version 2010Q3.3.

Requirements When Configuring Sun ZFS Storage Appliance NAS Devices for Oracle RAC or HA Oracle

When you configure your Sun ZFS Storage Appliance NAS device for use with HA Oracle, you must meet the following requirements:

- To guarantee data integrity, configure the Sun ZFS Storage Appliance NAS device with fencing support.
- You can install Oracle Database and Clusterware software, as well as place files used by these installations onto NFS shares from the NAS device, but you must ensure that the NFS shares used to store the files are mounted with the required mount options. These mount options must be appropriate for the file type. Do not mix file types with different mount requirements on the same NFS share.

  Consult your Oracle database guide or log into My Oracle Support for the most current list of supported files and mount options. After you log into My Oracle Support, click the Knowledge tab and search for Bulletin 359515.1.

When you configure your Sun ZFS Storage Appliance NAS device for use with RAC, you should also comply with the requirements listed above.

Note – The ZFS Storage Appliance has been qualified as NAS NFS storage for RAC with Oracle Solaris Cluster, without NFS fencing support and in a configuration where the Sun ZFS Storage Appliance and Oracle Solaris Cluster configuration tasks are not required. See "Requirements When Configuring Sun ZFS Storage Appliances" on page 26. However, with Oracle Solaris Cluster 3.3 5/11, you should enable the fencing support that is based on the requirements and configuration tasks described in this chapter.

Requirements When Configuring Sun ZFS Storage Appliance NAS Devices as Quorum Devices

The administrator has the option to create and use iSCSI LUNS on the Sun ZFS Storage Appliance to be used as quorum devices.

Note – You do not need to configure a NAS device as a quorum device in a zone cluster environment. A quorum device 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 ZFS Storage Appliance NAS device as a quorum device, you must meet the following requirements:

- Oracle Solaris Cluster supports Sun ZFS Storage Appliance NAS quorum devices starting with the Solaris 10 OS.
- When booting the cluster, always boot the Sun ZFS Storage Appliance NAS device before you boot the cluster nodes.

  If you boot the quorum device after booting the cluster nodes, your nodes cannot find the quorum device, and thus cannot count the quorum votes of the quorum device. This lack of quorum votes may result in the partition failing to form a cluster. If that situation occurs, reboot the cluster nodes.
- The Sun ZFS Storage Appliance NAS device must be located on the same network as the cluster nodes. If a Sun ZFS Storage 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. This lack of response could cause the cluster nodes to be unable to form a cluster if they do not acquire enough votes (for example, when one node cannot be booted up). This risk is also present at quorum acquisition time for the cluster to resolve split brain situations, in which case it could cause the cluster to fail to stay up.

When you use an iSCSI LUN from a Sun ZFS Storage Appliance NAS device as a cluster quorum device, the device appears to the quorum subsystem as a regular SCSI shared disk. The iSCSI connection to the NAS device is completely invisible to the quorum subsystem.

For instructions on adding a Sun NAS or Sun ZFS Storage Appliance NAS quorum device, see "How to Add a Sun NAS or Sun ZFS Storage Appliance NAS Quorum Device" in *Oracle Solaris Cluster System Administration Guide*.

Restrictions for Sun ZFS Storage Appliance NAS Devices

The Oracle Solaris Cluster interface for configuring the NFS file systems from the Sun ZFS Storage Appliance does not support the configuration at the individual file system level. The configuration of such file systems is restricted to the projects in the Sun ZFS Storage Appliance that contain the file systems.

Installing a Sun ZFS Storage Appliance NAS Device in an Oracle Solaris Cluster Environment

▼ How to Install a Sun ZFS Storage Appliance 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 ZFS Storage Appliance.

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 ZFS Storage Appliance.

You can set up the appliance at any point in your cluster installation. Follow the instructions in your Sun ZFS Storage Appliance's documentation. You can also click Help in the Sun ZFS Storage Appliance GUI to access information specific to the device you are installing.

When setting up your Sun ZFS Storage Appliance, follow the standards that are described in "Requirements, Recommendations, and Restrictions for Sun ZFS Storage Appliance NAS Devices" on page 26.

2 **On each cluster node, add the Sun ZFS Storage Appliance 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:

```
192.192.11.191 sunnas-123
```

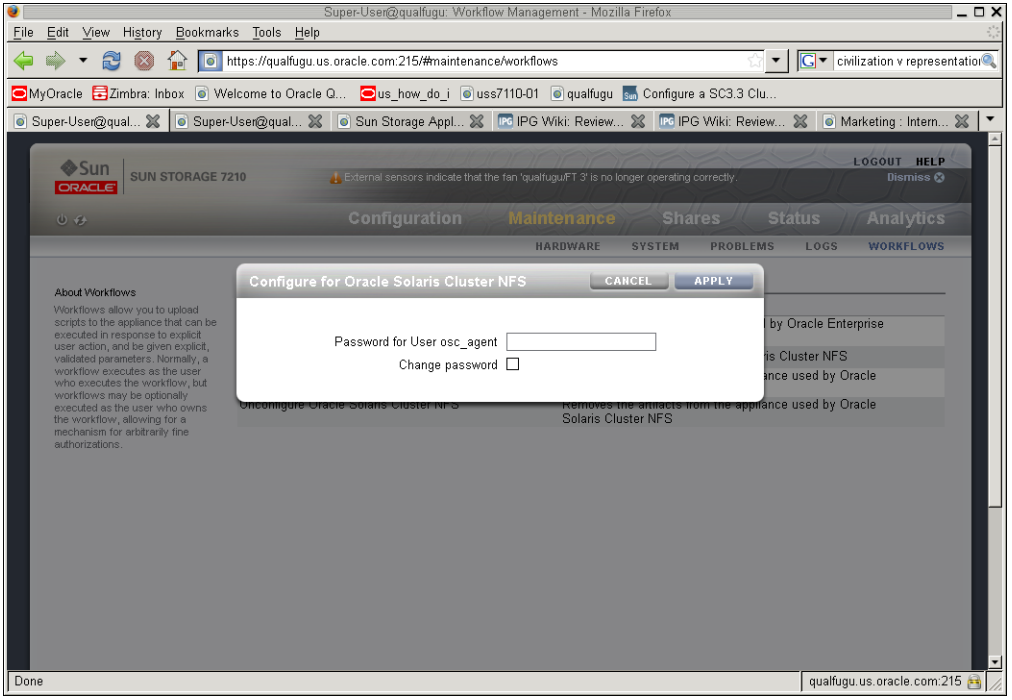
3 **In the `/etc/nsswitch.conf` file on every cluster node, ensure that `files` follows `cluster` and precedes any directory or name service (for example, `nis`, `nisplus`, `ldap`, or `dns`) for `hosts` and `netmasks` information types, as shown in the following example:**

```
hosts:      cluster files nis
```

4 **Configure the filer workflow for Oracle Solaris Cluster NFS.**

a. **In the Sun ZFS Storage Appliance GUI, select `Maintenance`, select `Workflows`, and click the workflow called `Configure for Oracle Solaris Cluster NFS`.**

b. **Provide a password for this workflow. This same password will be used again in Step 6.**



Perform the workflow configuration from only one head in a dual-head configuration.

Note – If the workflow of the specified name is not present, it is likely that the filer is not running the correct software release. See "Requirements for Sun ZFS Storage Appliance NAS Devices" on page 26 for an example of a supported software release.

5 Download the Oracle Solaris Cluster/NFS Plugin and install it in the global zone on all cluster nodes.

a. In a web browser, go to the Oracle ZFS Storage Appliance Plugin Downloads site at `http://www.oracle.com/technetwork/server-storage/sun-unified-storage/downloads/zfssa-plugins-1489830.html`.

b. Click the Accept License Agreement button.

c. Click the Download link for the latest Oracle Solaris Cluster/NFS Plugin for Solaris 10.

The zip file containing the `SUNWsczfsnfs` package is downloaded. Unzip the files until that package is extracted.

On all nodes of the global cluster, navigate to the directory containing the extracted `SUNWsczfsnfs` package and install it. The installation should be done within the global zone.

```
# ls
SUNWsczfsnfs
# pkgadd -d . SUNWsczfsnfs
```

6 Configure Oracle Solaris Cluster fencing support for the Sun ZFS Storage Appliance. If you skip this step, Oracle Solaris Cluster will not provide fencing support for the appliance.

a. Add the device and provide the cluster network addresses used to access the appliance.

- **Perform this command from any cluster node:**

  `# clnasdevice add -t sun_uss -p userid=osc_agent -p "nodeIPs{`*node_name*`}"` *=ip_address myfiler*

  For example:

```
# clnasdevice add -t sun_uss -p userid=osc_agent
-p "nodeIPs{node1}"=10.111.11.111
-p "nodeIPs{node2}"=10.111.11.112 device1.us.example.com
Please enter password
```

`-t sun_uss`	Enter `sun_uss` as the type of device you are adding.
ip_address	Enter the IP address used to perform I/O to the appliance from this node.
myfiler	Enter the name of the Sun ZFS Storage Appliance that you are adding.
node_name	Enter the name of cluster node whose IP addresses is being added.

This step allows the cluster fencing framework to restrict access to the filer for the specified IP address to read-only when nodes leave the cluster.

Note – The IP addresses configured for the cluster nodes should match the ones configured in the Sun ZFS Storage Appliance as described in "Requirements for Sun ZFS Storage Appliance NAS Devices" on page 26.

- **If you want to add an appliance and provide the cluster network addresses used to access the appliance for a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

```
# clnasdevice add -t sun_uss -p userid=osc_agent -Z zcname
-p "nodeIPs{node_name}"=ip_address myfiler
Please enter password
```

ip_address	Enter the IP address used to perform I/O to the appliance from this node.
myfiler	Enter the name of the Sun ZFS Storage Appliance that you are adding.
node_name	Enter the name of cluster node whose IP addresses is being added.
`-Z`	Specify the cluster where the nas-device-type is registered and where you will operate.
zcname	Enter the name of the zone cluster where the Sun ZFS Storage Appliance is being added.

b. At the prompt, type the same password that you used in Step 4.

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

- **Perform this command from any cluster node:**

```
# clnasdevice show
===NAS Devices===
Nas Device:                  device1.us.example.com
 Type:                       sun_uss
 userid:                     osc_agent
 nodeIPs{node1}                  10.111.11.111
 nodeIPs{node2}                  10.111.11.112
 nodeIPs{node3}                  10.111.11.113
 nodeIPs{node4}                  10.111.11.114
```

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

- **If you are checking for the device for a zone cluster but you need to issue the command from the global zone, use the `clnasdevice show` command with the `-Z` option:**

```
# clnasdevice show -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 **To enable fencing support for the NFS file systems used by the cluster nodes, add the associated projects to the cluster configuration.**

Follow the directions in "How to Add Sun ZFS Storage Appliance Directories and Projects to a Cluster" on page 37.

8 **Configure a LUN on the Sun ZFS Storage Appliance NAS device as a quorum device.**

Note – You can skip this step if the cluster does not require a quorum device or if it has been configured with quorum services from other devices or quorum servers.

See "How to Add a Sun NAS or Sun ZFS Storage Appliance NAS Quorum Device" in *Oracle Solaris Cluster System Administration Guide* for instructions for configuring a Sun ZFS Storage Appliance NAS quorum device.

Maintaining a Sun ZFS Storage Appliance NAS Device in an Oracle Solaris Cluster Environment

This section contains procedures about maintaining Sun ZFS Storage 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 Sun ZFS Storage Appliance NAS Device Maintenance" on page 33 before performing the maintenance procedure. After performing the maintenance procedure, perform the steps in "How to Restore Cluster Configuration After Sun ZFS Storage Appliance NAS Device Maintenance" on page 35 to return the cluster to its original configuration.

▼ How to Prepare the Cluster for Sun ZFS Storage Appliance NAS Device Maintenance

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

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.

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 ZFS Storage Appliance NAS device.

If you have data services using NFS file systems from the Sun ZFS Storage Appliance, bring the data services offline and disable the resources for the applications using those file systems. On each node, ensure that no existing processes are still using any of the NFS file systems from the device.

2 On each cluster node, unmount the NFS file systems from the Sun ZFS Storage Appliance NAS device.

If you have a resource of type `SUNW.ScalMountPoint` managing the file system, disable that resource to achieve that.

Note – For more information on disabling a resource, see "How to Disable a Resource and Move Its Resource Group Into the UNMANAGED State" in *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

If that resource is not configured, use the Oracle Solaris `umount(1M)` command. If the file system cannot be unmounted because it is still busy, check for applications or processes that are still on that file system, as explained in Step 1. You can also force the unmount by using the `-f` option with the `umount` command.

3 Determine whether a LUN on this Sun ZFS Storage Appliance NAS device is a quorum device.

```
# clquorum show
```

4 If the LUNs on this 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 or a quorum server, 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 on adding and removing quorum devices.

▼ How to Restore Cluster Configuration After Sun ZFS Storage Appliance NAS Device Maintenance

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

1 **Mount the NFS file systems from the Sun ZFS Storage Appliance NAS device.**

If you have configured a resource of type `SUNW.ScalMountPoint` for the file system, enable the resource and bring its resource group online.

2 **Determine whether you want an iSCSI LUN on this Sun ZFS Storage Appliance NAS device to be a quorum device.**

If you do, configure the LUN as a quorum device by following the steps in "How to Add a Sun NAS or Sun ZFS Storage Appliance 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 ZFS Storage Appliance NAS Device Maintenance" on page 33.

3 **I/O to the NFS file systems from the Sun ZFS Storage Appliance NAS device can be resumed by bringing up the applications using the file systems. If the application is managed by a data service, enable the corresponding resources and bring their resource group online.**

▼ How to Remove a Sun ZFS Storage 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 Sun ZFS Storage Appliance NAS Device Maintenance" on page 33.

- You have removed any device directories from the cluster by performing the steps in "How to Remove Sun ZFS Storage Appliance Directories and Projects and From a Cluster" on page 42.

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 ZFS Storage Appliance NAS device is removed. When the device is removed, change the following items in the cluster configuration:

- Change the NFS file system entries in the `/etc/vfstab` file for that device, and unconfigure any `SUNW.ScalMountPoint` resources.
- Reconfigure applications or data services with dependencies on these file systems to use other storage devices, or remove them from the cluster.

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.

- **Perform this command from any cluster node:**

  `# clnasdevice remove` *myfiler*

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

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

- **If you want to remove a NAS device from a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

  `# clnasdevice remove -Z` *zcname myfiler*

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

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

- **Perform this command from any cluster node:**

  `# clnasdevice list`

- **If you want to check the NAS device for a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

  ```
  # 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 ZFS Storage Appliance Directories and Projects to a Cluster

Before You Begin The procedure relies on the following assumptions:

- Perform the steps in this procedure only if the directory or project is meant to be protected by cluster fencing, restricting access to read-only for nodes that leave the cluster.
- Your cluster is operating.
- The Sun ZFS Storage Appliance NAS device is properly configured and the projects the cluster will use have been exported to all cluster nodes. .

  See "Requirements, Recommendations, and Restrictions for Sun ZFS Storage Appliance NAS Devices" on page 26 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 ZFS Storage Appliance in a Cluster" on page 29.

An NFS file system or directory from the Sun ZFS Storage Appliance is already created in a project, which is itself in one of the storage pools of the device. It is important that in order for a directory (i.e., the NFS file system) to be used by the cluster, to perform the configuration at the project level, as described below.

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 the Sun ZFS Storage Appliance GUI to identify the project associated with the NFS file systems for use by the cluster.**

After you have identified the appropriate project, click `Edit` for that project.

2 **If read/write access to the project has not been configured, set up read/write access to the project for the cluster nodes.**

   a. **Access the NFS properties for the project.**

      In the Sun ZFS Storage Appliance GUI, select the Protocols tab in the Edit Project page.

   b. **Set the Share Mode for the project to None or Read only, depending on the desired access rights for nonclustered systems. The Share Mode can be set to Read/Write if it is required to make the project world-writable, but it is not recommended.**

   c. **Add a read/write NFS Exception for each cluster node by performing the following steps.**

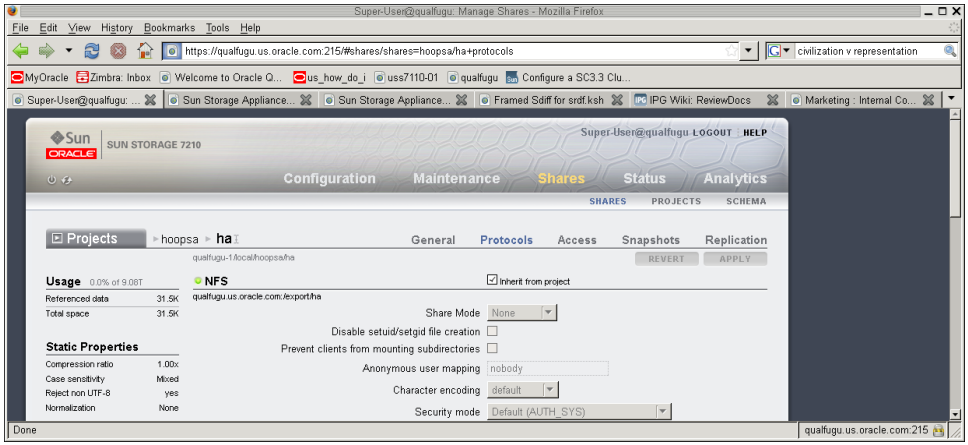
      - **Under NFS Exceptions, click +.**
      - **Select `Network` as the Type.**
      - **Enter the public IP address the cluster node will use to access the appliance as the Entity. Use a CIDR mask of /32. For example, 192.168.254.254/32 .**
      - **Select Read/Write as the Access Mode.**
      - **If desired, select Root Access. Root Access is required when configuring applications, such as Oracle RAC or HA Oracle.**
      - **Add exceptions for all cluster nodes.**
      - **Click Apply after the exceptions have been added for all IP addresses.**

3 **Ensure that the directory being added is set to inherit its NFS properties from its parent project.**

   a. **Navigate to the Shares tab in the Sun ZFS Storage Appliance GUI.**

   b. **Click Edit Entry to the right of the Share that will have fencing enabled.**

   c. **Navigate to the Protocols tab for that share, and ensure that the `Inherit from project` property is set in the NFS section.**



If you are adding multiple directories within the same project, verify that each directory that needs to be protected by cluster fencing has the `Inherit from project` property set.

4 If the project has not already been configured with the cluster, add the project to the cluster configuration.

Use `clnasdevice show -v` command to determine if the project has already been configured with the cluster.

```
# clnasdevice show -v

===NAS Devices===
Nas Device:                     device1.us.example.com
 Type:                          sun_uss
 userid:                        osc_agent
 nodeIPs{node1}                     10.111.11.111
 nodeIPs{node2}                     10.111.11.112
 nodeIPs{node3}                     10.111.11.113
 nodeIPs{node4}                     10.111.11.114
 Project:                       pool-0/local/projecta
 Project:                       pool-0/local/projectb
```

- **Perform this command from any cluster node:**

  `# clnasdevice add-dir -d` *project1*`,`*project2* *myfiler*

  `-d` *project1, project2* — Enter the project or projects that you are adding.

  Specify the full path name of the project, including the pool. For example, `pool-0/local/projecta`.

  myfiler — Enter the name of the NAS device containing the projects.

For example:

```
# clnasdevice add-dir -d pool-0/local/projecta  device1.us.example.com
# clnasdevice add-dir -d pool-0/local/projectb  device1.us.example.com
```

For example:

```
# clnasdevice find-dir -v
=== NAS Devices ===

Nas Device:                     device1.us.example.com
  Type:                         sun_uss
  Unconfigured Project:           pool-0/local/projecta
    File System:                      /export/projecta/filesystem-1
    File System:                      /export/projecta/filesystem-2
  Unconfigured Project:           pool-0/local/projectb
    File System:                      /export/projectb/filesystem-1
```

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

- **If you want to add the project from a Sun ZFS Storage Appliance to a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

  ```
  # clnasdevice add-dir -d project1,project2 -Z zcname  myfiler
  ```

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

5 Confirm that the directory and project have been configured.

- **Perform this command from any cluster node:**

  ```
  # clnasdevice show -v -d all
  ```

  For example:

```
# clnasdevice show -v -d all

===NAS Devices===
Nas Device:                 device1.us.example.com
 Type:                      sun_uss
 nodeIPs{node1}                 10.111.11.111
 nodeIPs{node2}                 10.111.11.112
 nodeIPs{node3}                 10.111.11.113
 nodeIPs{node4}                 10.111.11.114
 userid:                    osc_agent
 Project:                   pool-0/local/projecta
  File System:                  /export/projecta/filesystem-1
  File System:                  /export/projecta/filesystem-2
 Project:                   pool-0/local/projectb
  File System:                  /export/projectb/filesystem-1
```

- **If you want to check the projects for a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

  ```
  # 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.

After you confirm that a project name is associated with the desired NFS file system, use that project name in the configuration command.

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 ZFS Storage Appliance NAS project that you added.

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

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

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 ZFS Storage Appliance NAS device for Oracle RAC or HA Oracle, consult your Oracle database guide or log into My Oracle Support for a current list of supported files and mount options. After you log into My Oracle Support, click the Knowledge tab and search for Bulletin 359515.1.

When mounting Sun ZFS Storage Appliance 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.

7 To enable file system monitoring, configure a resource of type `SUNW.ScalMountPoint` for the file systems.

For more information, see "Configuring Failover and Scalable Data Services on Shared File Systems" in *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

▼ How to Remove Sun ZFS Storage Appliance Directories and Projects and 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 ZFS Storage Appliance NAS Device Maintenance" on page 33.

Note – When you remove the directories, the data on those directories is not available to the cluster. Ensure that other device projects or shared storage in the cluster can continue to serve the data when these directories are removed. When the directory is removed, change the following items in the cluster configuration:

- Change the NFS file system entries in the `/etc/vfstab` file for that device, and unconfigure any `SUNW.ScalMountPoint` resources.
- Reconfigure applications or data services with dependencies on these file systems to use other storage devices, or remove them from the cluster.

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 or the automounter, unconfigure the NFS file system.

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

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

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

Skip this step if you are using the automounter.

2 (Optional) Perform the remaining steps in this procedure only if you want to remove the project containing this directory from the cluster configuration. Before you remove the project, ensure that no directories within the project are in use within the cluster. Remove the projects.

- **Perform this command from any cluster node:**

```
# clnasdevice remove-dir -d project1  myfiler
```

`-d` *project1* Enter the project or projects that you are removing.

myfiler Enter the name of the Sun ZFS Storage Appliance NAS device containing the projects.

To remove all of this device's projects, 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 want to remove a project from a Sun ZFS Storage Appliance device from a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

  ```
  # clnasdevice remove-dir -d project1 -Z zcname myfiler
  ```

  zcname Enter the name of the zone cluster where the Sun ZFS Storage Appliance NAS projects are being removed.

  To remove all of this device's projects, 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 projects have been removed.

- **Perform this command from any cluster node:**

  ```
  # clnasdevice show -v
  ```

- **If you want to check the NAS projects for a zone cluster but you need to issue the command from the global zone, use the `clnasdevice` command with the `-Z` option:**

  ```
  # 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 ZFS Storage Appliance NAS Device From a Cluster" on page 35.

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