

FAS900 Series Appliance Cluster Guide

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Preface

About this guide

This guide describes the following tasks and topics:

- ◆ Preparing to install an FAS900 series cluster
- ◆ How to cable a pair of FAS900 series appliances into a cluster
- ◆ How to configure the cluster when it is first brought up
- ◆ How to perform basic troubleshooting on the cluster

This guide does not cover basic system or network administration, which is covered in the *Data ONTAP System Administration Guide*.

Audience

This guide is for qualified system administrators and service personnel who are familiar with Network Appliance™ equipment and who need to

- ◆ Cable two systems into a standard or mirrored cluster system
- ◆ Convert stand-alone systems into a standard or mirrored cluster system

Terminology

This guide uses the following terms:

- ◆ *Mirrored cluster* refers to a cluster where the data of the local node contains an exact copy of the partner node's data, and vice versa.
- ◆ *Node* refers to either the local or partner filer.
- ◆ *Standard cluster* refers to a cluster that is in the same building or has the local and partner nodes directly connected to each other.

Command conventions

You can enter commands on the system console or from any client that has access to the system using Telnet. In examples of commands run on a UNIX® workstation, this guide uses the command syntax and output of SunOS 4.1x. If you use a different version of UNIX, the command syntax and output might be different.

Keyboard conventions

This guide uses capitalization and some abbreviations to refer to the keys on the keyboard. The keys on your keyboard might not be labeled exactly as they are in this guide.

What is in this guide...	What it means...
hyphen (-)	Used to separate individual keys. Example: Ctrl-D means holding down the Ctrl key while pressing the D key.
Enter	Used to refer to the key that generates a carriage return, although the key is named Return on some keyboards.
type	Used to mean pressing one or more keys on the keyboard.
enter	Used to mean pressing one or more keys and then pressing the Enter key.

Formatting conventions

The following table lists the kinds of formatting this guide uses to identify special information.

Formatting convention	Type of information
<i>Italic type</i>	◆ Words or characters that require special attention. ◆ Placeholders for information you must supply. For example, if the guide requires you to enter the arp -d hostname command, you enter the characters “arp -d” followed by the actual name of the host. ◆ Book titles in cross-references.
Monospaced font	◆ Command and daemon names. ◆ Information displayed on the system console or other computer monitors. ◆ Contents of files.
Bold monospaced font	Words or characters you type. What you type is always shown in lowercase letters, unless you must type it in uppercase letters for it to work properly.

Special messages

This guide contains special messages that are described as follows:

Note

A note contains important information that helps you install or operate the system efficiently.

Caution

A caution contains instructions that you must follow to avoid damage to the equipment, a system crash, or loss of data.

WARNING

A warning contains instructions that you must follow to avoid personal injury.

Safety Information (Sicherheitshinweise)

Safety rules

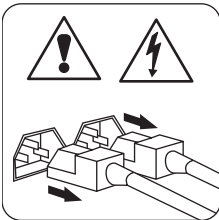
All products are Class 1 laser devices. You must follow these safety rules when working with this equipment:

WARNING

Failure to follow these directions could result in bodily harm or loss of life.

- ◆ When installing disk shelves and a storage appliance into a movable cabinet or rack, install from the bottom up for best stability.
- ◆ DC-based systems must be installed in a restricted access location and the two input power terminals for the DC power supply must be connected to separate isolated branch circuits.
- ◆ To reduce the risk of personal injury or equipment damage, allow internal components time to cool before touching them and ensure that the equipment is properly supported or braced when installing options.
- ◆ This equipment is designed for connection to a grounded outlet. The grounding type plug is an important safety feature. To avoid the risk of electrical shock or damage to the equipment, do not disable this feature.
- ◆ This equipment is furnished with one or more replaceable batteries. There is danger of explosion if the battery is incorrectly replaced. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Warning for units with multiple power cords



If your storage appliance or disk shelf has multiple power cords and you need to turn the unit off, heed the following warning:

WARNING

This unit has more than one power supply cord. To reduce the risk of electrical shock, disconnect all power supply cords before servicing.

Sicherheitsvorgaben

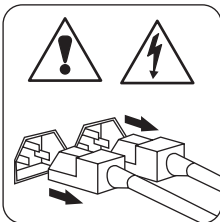
Alle Produkte sind Lasergeräte der Klasse 1. Die folgenden Sicherheitshinweise sind beim Betreiben des Geräts unbedingt zu beachten:

Vorsicht

Nichtbeachtung dieser Anweisungen kann zu schweren Körperschäden führen oder tödlich sein.

- ◆ Bei der Montage der Diskettenregale und Archivierungsgeräte, des NetCache™ -Geräts oder des NearStore™ -Systems in bewegliche Schränke oder Regale sind die Geräte von unten nach oben einzubauen, um optimale Stabilität zu gewährleisten.
- ◆ Gleichstrom-Systeme müssen an Betriebsstätte mit beschränktem Zutritt installiert sein und die beiden Eingangsstromklemmen für das Gleichstrom-Netzteil müssen an separate und isolierte Abzweigleitungen angeschlossen sein.
- ◆ Zum Schutz vor Körperverletzung oder Sachschäden am Gerät lassen Sie die inneren Bauteile stets vor dem Berühren abkühlen. Sorgen Sie dafür, dass das Gerät richtig abgestützt ist oder fest aufrecht steht, bevor Sie neues Zubehör einbauen.
- ◆ Dieses Gerät ist für die Einspeisung aus einer geerdeten Netzverbindung ausgelegt. Der Netzstecker mit Erdungsvorrichtung ist ein wichtiger Sicherheitsschutz. Zum Schutz vor elektrischem Schlag oder Sachschäden am Gerät die Erdung nicht abschalten.
- ◆ Das Gerät ist mit einer oder mehreren auswechselbaren Batterien ausgestattet. Bei unsachgemäßem Auswechseln der Batterie besteht Explosionsgefahr. Batterien nur mit dem vom Hersteller empfohlenen Typ oder entsprechenden Typen ersetzen. Gebrauchte Batterien sind gemäß den Anweisungen des Herstellers zu entsorgen.

Warnhinweis für Geräte mit mehrfachen Netzan-schlussleitungen



Sollte Ihr Archiviergerät, NetCache-Gerät, NearStore-System oder Diskettenregal mehrfache Netzan-schlussleitungen aufweisen und Sie wollen das Gerät abschalten, bitte folgenden Warnhinweis beachten.

ACHTUNG

Gerät besitzt zwei Netzan-schlussleitungen. Vor Wartung alle Anschlüsse vom Netz trennen.

About this chapter

This chapter describes how to plan and prepare for the installation of an FAS900 series clustered system.

Topics in this chapter

This chapter contains the following information:

- ◆ “[Required documentation, tools, and equipment](#)” on page 2
- ◆ “[Clustering concepts](#)” on page 4

Required documentation, tools, and equipment

Required documentation

The following table lists and briefly describes the documentation you might need to reference when preparing a new cluster, or converting two stand-alone systems into a clustered system.

Manual name	Description
<i>System Cabinet Guide</i>	This guide describes how to install NetApp equipment into a system cabinet.
<i>Site Requirements Guide</i>	This guide describes the physical requirements your site must meet in order to install NetApp equipment.
The appropriate disk shelf Guide	These guides describe how to cable a disk shelf to NetApp appliances.
<i>FAS900 Series Hardware and Service Guide</i>	This guide describes how to install an FAS900 Series appliance, connect it to a network, and bring it up for the first time.
<i>NetApp Diagnostics Guide</i>	This guide describes the diagnostics tests that can be run on the appliance.
<i>Upgrade Guide</i>	This guide describes how to upgrade appliance and disk firmware, and how to upgrade appliance software.
<i>Data Protection Guide</i>	This guide describes, among other topics, what a synchronous mirror is, how to enable it, and how to maintain it.
<i>System Administrator's Guide</i>	This guide describes how to maintain your appliance and disk drive software.
<i>Software Setup Guide</i>	This guide describes how to configure the software of a new appliance for the first time.

Required tools

The following list specifies the tools you need to install the cluster:

- ◆ #1 and #2 Phillips screwdrivers
- ◆ Hand level
- ◆ Marker

Required equipment

When you receive your cluster, you should receive the following cables and adapters:

- ◆ Clusters that have DS14 disk shelves—one optical cable per port on the dual Fibre Channel adapter.
- ◆ Clusters that have FC9 disk shelves—one MIA (media interface adapter) for each input LRC on the first disk shelves only.
- ◆ Multiple DB-9 shelf-to-shelf cables for clusters in equipment racks.
- ◆ Two dual-headed optical cable for the IB cluster adapter.

Note

If your cluster will be farther apart than 30 meters, you must use an SC-SC 50/125 cable to connect the local nodes to the partner disk shelves and LC-LC 50/125 cables to connect the IB cluster interconnect adapters.

Clustering concepts

About cluster concepts

There are two types of clusters you can install in your site. The following table lists the cluster types and gives a brief description.

Cluster type	Description
Standard cluster	Appliances are physically close and directly connected to each other. There is no mirroring of the data in this type of cluster.
Mirrored cluster	Appliances are either close to each other or up to 500 meters away from each other. The some of the data of the local node is mirrored (synchronized copy) on the partner node, and vice versa. The local and partner nodes are directly connected to each other.

For detailed information

For details about these cluster types, see the following sections:

- ◆ “[Standard clusters](#)” on page 5
- ◆ “[Mirrored clusters](#)” on page 6

Standard clusters

What standard clusters contain

A standard cluster contains two sets of Fibre Channel disk shelves, a local node, and a partner node. The nodes are connected to each other through an IB cluster adapter, which allows a takeover node to serve data to the disks of a failed partner node. Each node continually monitors its partner, mirroring the data for each other's NVRAM. The two nodes in a cluster can be separated from each other by as much as 500 meters, requiring them to be connected with the LC-LC 50/125 cable and connected to their partner disk shelves with SC-SC 50/125 cables.

Advantages of standard clusters

The advantages of having a standard cluster are as follows:

- ◆ Data continues to be processed if one of the nodes fails and cannot reboot.
- ◆ Data continues to be processed if an adapter on a node fails.
- ◆ System maintenance can be performed without interrupting service.

In any of these situations, the takeover node continues to serve data until the problem is corrected.

How Data ONTAP works with standard clusters

In a clustered system, Data ONTAP functions so that each node monitors the functioning of its partner through a heartbeat signal sent between the nodes. Data from the NVRAM of one node is mirrored by its partner and can take over the partner's disks, if the partner should fail. Also, the nodes synchronize each other's time. Any spare disks belonging to one node are not shared by the partner node.

See the *Data ONTAP System Administrator's Guide* for more information.

Standard cluster setup requirements and restrictions

The following list specifies the requirements and restrictions you must be aware of when setting up a new cluster or converting an existing cluster:

- ◆ IB cluster adapters and cables must be installed.
- ◆ Nodes must be attached to the same network and the NICs must be configured correctly.
- ◆ Cluster software must be licensed and enabled on both nodes.
- ◆ The same system software must be licensed and enabled on both nodes.

Mirrored clusters

What mirrored clusters contain

A mirrored cluster contains two complete copies of the specified data volumes or file systems that you indicated as being mirrored volumes or file systems in your cluster. These copies are called plexes and are continuously and synchronously updated every time Data ONTAP writes data to the disks. Plexes are physically separated from each other across different groupings of disks.

Advantages of mirrored clusters

The advantages of having duplicate copies of your data are as follows:

- ◆ Mirrored data on your cluster survives a double disk error in one of your disk shelves.
- ◆ Mirrored data on your cluster survives if one part of the cluster loses connectivity to your disks.
- ◆ Mirrored data on your cluster survives if your cluster loses connectivity to remote storage.
- ◆ Mirrored data on your cluster survives the destruction of a mirrored site or destruction of connectivity to the remote site.

In any of these situations, the surviving mirrored plex continues to serve data until the problem is corrected. See the *Data Protection Guide* for detailed information about disaster protection through mirroring.

How Data ONTAP works with mirrored clusters

During configuration of the cluster, Data ONTAP identifies spare disks and divides them into separate groupings called pools. These pools of disks are physically separated from each other, allowing for high availability of mirrored volumes. When you add a mirrored volume or add disks to one side of a mirrored volume, Data ONTAP determines how much storage you need for the second half of the mirror, and dedicates that storage from a separate pool to the mirrored volume.

Mirrored cluster setup requirements and restrictions

The following list specifies the requirements and restrictions you must be aware of when setting up a new mirrored cluster or converting an existing cluster to a mirrored cluster:

- ◆ Disks in the same volume must be part of the same plex, with its mirror in a different plex.
- ◆ Disk volumes that you want to mirror must have at least an equivalent number of disks in the mirrored plex of the same or greater disk size.
- ◆ Disk pool 0 volumes must be cabled to FC-AL or dual Fibre Channel adapters in node slots 2 through 5, if available.
- ◆ Disk pool 1 volumes must be cabled to FC-AL or dual Fibre Channel adapters in node slots 8 through 11.
- ◆ The two halves of the mirrored disk should have no common components.
- ◆ Local SyncMirror must be licensed and enabled on the local and partner nodes.
- ◆ There must be sufficient spares in each pool to account for a disk failure.
- ◆ Cluster nodes that are separated by more than 30 meters must use an LC-LC 50/125 cable to connect their IB cluster interconnect adapters.
- ◆ Clusters that are separated by more than 30 meters must use an SC-SC 50/125 plenum cable to connect the local node to the partner disk shelves.

About this chapter This chapter describes the tasks you need to perform to cable a new cluster in either NetApp System Cabinets or in equipment racks.

Topics in this chapter The following topics are covered in this chapter:

- ◆ “[Cluster installation types](#)” on page 10
- ◆ “[Cabling the cluster](#)” on page 11

Cluster installation types

Types of cluster installations

There are two types of cluster installations:

- ◆ “[Clusters in a system cabinet](#)” on page 10
- ◆ “[Clusters in an equipment rack](#)” on page 10

Clusters in a system cabinet

If you ordered a cluster in a system cabinet, it comes in one or more NetApp System Cabinets. The number of system cabinets you receive depends on how much storage is ordered. All internal adapters, such as networking adapters, Fibre Channel adapters, and other adapters, arrive preinstalled in the nodes.

Single system cabinet cluster: If the ordered cluster has six or fewer disk shelves, it arrives in a single system cabinet. This system cabinet has both the Channel A and Channel B disk shelves cabled, and also has the IB cluster adapters cabled.

Multiple system cabinet cluster: If the ordered cluster has more than six disk shelves, the cluster arrives in two or more system cabinets. You must complete the cabling by cabling the local node to the partner node’s disk shelves and the partner node to the local node’s disk shelves. You must also cable the nodes together by cabling the IB cluster adapters. The system cabinets might also need to be connected to each other. See the *System Cabinet Guide* for information about connecting your system cabinets together for clustering.

Clusters in an equipment rack

Depending on the amount of storage you ordered, you need to install the equipment in one or more telco-style equipment racks. These racks can hold one or two nodes on the bottom and eight or more disk shelves. For information about how to install the disk shelves and nodes into the equipment racks, see the appropriate Fibre Channel disk shelf guide and the *FAS900 Series Hardware and Service Guide*.

Cabling the cluster

Type of FC-AL adapter used in the cluster

The dual-port Fibre Channel (dual-port FC-AL) adapters have two ports per adapter. These ports support both the Channel A and Channel B disk shelf loops, with the top port supporting the Channel A loop and the bottom port supporting the Channel B loop. The dual-port Fibre Channel adapter allows the FAS900 series appliance to support more storage than a single-port FC-AL adapter.

Minimum FC-AL adapters needed for mirrored clusters

If the cluster is mirrored, each node must have a minimum of two dual-port FC-AL adapters per node. The number of dual-port FC-AL adapters depends on the number of disk shelves you have in each loop.

Recommended dual-port FC-AL adapter locations

The following table lists the most common recommended locations for the dual-port FC-AL adapters in a single node of the cluster. Check the System Configuration Guide on the NOW Web page at <http://now.netapp.com> to confirm the slot assignment information.

Cluster type	Node slot number on back of the node
Standard cluster—one dual-port FC-AL adapter	Slot 2
Mirrored cluster—one dual-port FC-AL adapter per node	N/A
Standard cluster—Two dual-port FC-AL adapters per node	Slot 2, Slot 3
Mirrored cluster—Two dual-port FC-AL adapters per node	Slot 8 (pool 1), slot 5 (pool 0)
Standard cluster—Four dual-port FC-AL adapters per node	Slot 2, slot 3, slot 4, slot 8
Mirrored cluster—Four dual-port FC-AL adapters per node	Slot 8 (pool 1), slot 5 (pool 0), slot 10 (pool 1), slot 3 (pool 0)

**For detailed
information**

For detailed information about the cabling process, see the following topics:

- ◆ [“Step 1: Preparing your equipment”](#) on page 13
- ◆ [“Step 2: Cabling Channel A”](#) on page 15
- ◆ [“Step 3: Cabling the IB cluster adapters”](#) on page 19
- ◆ [“Step 4: Cabling Channel B”](#) on page 20

Step 1: Preparing your equipment

Where to install a cluster

A cluster can be installed in a system cabinet, multiple system cabinets, or in equipment racks. You must install the equipment as described in the following sections.

- ◆ “[Preparing the system cabinet](#)” on page 13
- ◆ “[Preparing the equipment racks](#)” on page 14

Preparing the system cabinet

To prepare your system cabinets for clustering, complete the following steps.

Step	Action	
1	Install the system cabinet or cabinets, as described in the <i>42U System Cabinet Guide</i> .	
2	If you have a cluster in...	Then...
	A single system cabinet	1. Connect the nodes to the network. 2. Connect the system cabinet to an appropriate power source. 3. Apply power to the system cabinet and configure the cluster, as described in Chapter 3, “Configuring the Cluster,” on page 25.
	Multiple system cabinets	1. Remove the front and rear doors and any side panels that need to be removed to connect the system cabinets together. 2. Connect the system cabinets together, as described in the <i>42U System Cabinet Guide</i>. 3. Connect the nodes to the network. 4. Go to “Step 2: Cabling Channel A” on page 15.

Preparing the equipment racks

To prepare your nodes for clustering in equipment racks, complete the following steps.

Step	Action
1	Install the nodes in the equipment racks, as described in the <i>FAS900 Series Hardware and Service Guide</i> .
2	Install the disk shelves in the equipment rack, as described in the appropriate Fibre Channel disk shelf guide.
3	Label the dual-port FC-AL interfaces, where appropriate.
4	Connect the nodes to the network, as described in the <i>FAS900 Series Hardware and Service Guide</i> .
5	Go to “ Step 2: Cabling Channel A ” on page 15.

Step 2: Cabling Channel A

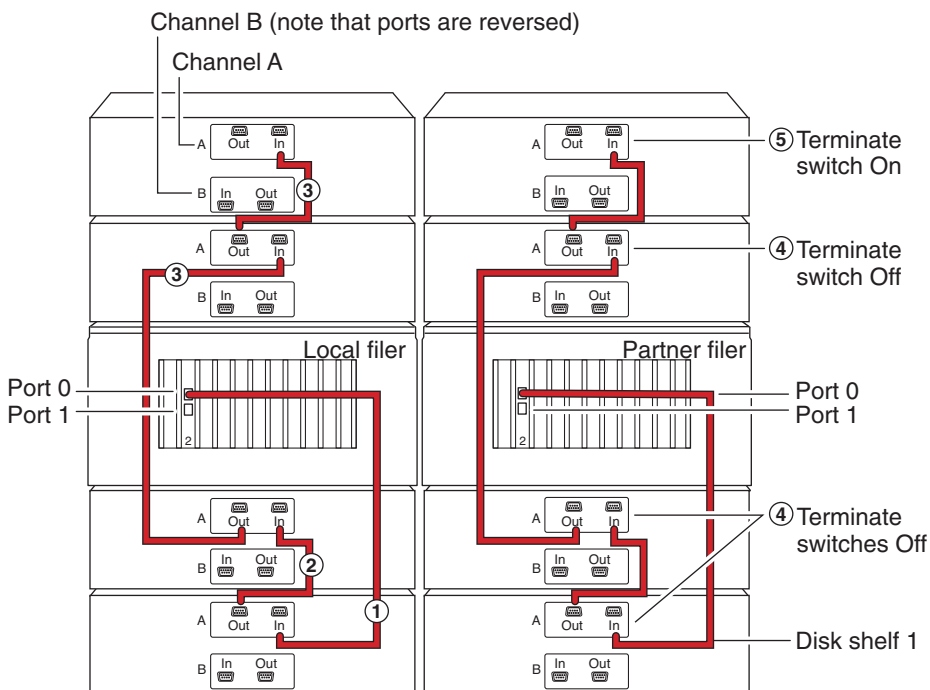
Channel A loop cabling differences

The procedure for cabling the Channel A loops for a standard cluster and mirrored cluster are different. These differences are described in the following sections:

- ◆ “Cabling the Channel A loops in a standard cluster” on page 15
- ◆ “Cabling the Channel A loops in a mirrored cluster” on page 16

Cabling the Channel A loops in a standard cluster

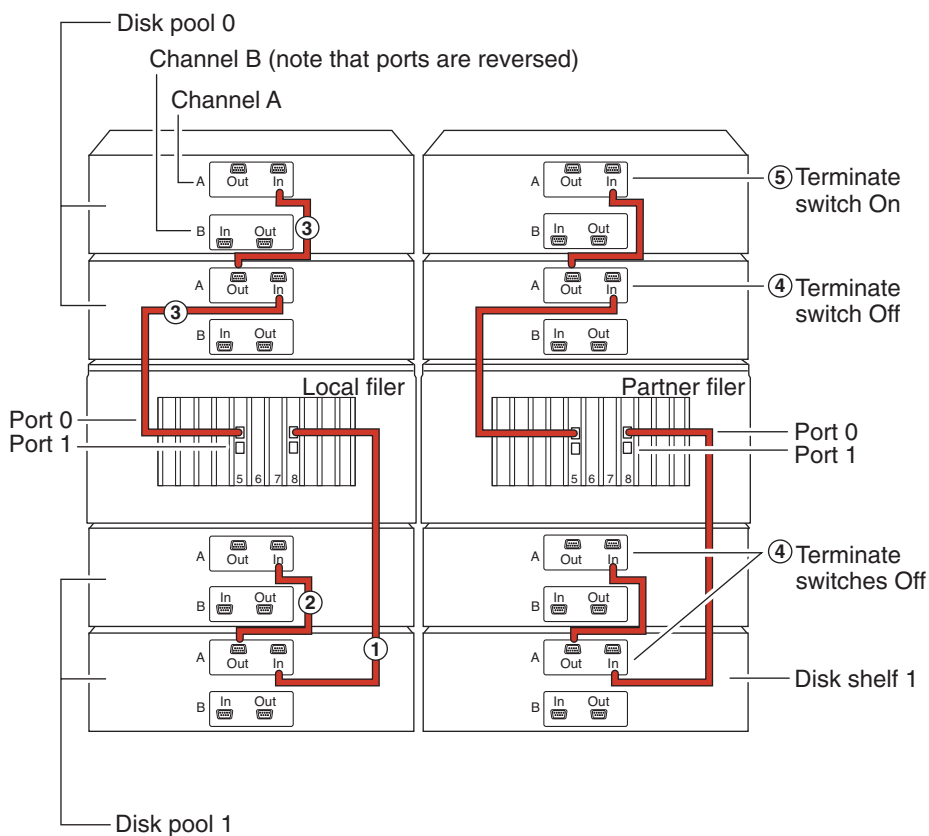
To cable the Channel A loops in a standard cluster, complete the following steps, using the diagram for reference.



Step	Action
1	Cable the dual-port FC-AL in slot 2, Port 0, to the disk shelf 1 LRC Input port.
2	Cable the disk shelf 1 Channel A LRC Output port to the disk shelf 2 Channel A LRC Input port. Label this cable with a solid-colored label.
3	Repeat Step 2, connecting output to input, for the remaining disk shelves in the loop.
4	Set the terminate switches to Off on all but the last disk shelf in the loop, then set the terminate switch on the last disk shelf to On.
5	Repeat Steps 1 through 5 for the partner node.
6	Go to “ Step 3: Cabling the IB cluster adapters ” on page 19.

Cabling the Channel A loops in a mirrored cluster

To cable the Channel A loops in a mirrored cluster, complete the following steps, using the diagram for reference.



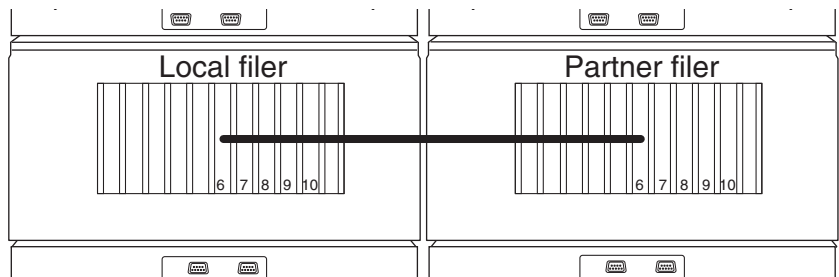
Step	Action
1	Cable the dual-port FC-AL in slot 8, Port 0 to the disk shelf 1 LRC Input port of disk pool 1, then cable the dual-port FC-AL in Slot 3, Port 0 to the disk shelf 1 LRC Input port of disk pool 0.
2	Cable the disk shelf 1 Channel A LRC Output port to the disk shelf 2 Channel A LRC Input port for both disk pools. Label this cable with a solid-colored label.
3	Repeat Step 2 connecting output to input, for the remaining disk shelves in the loop.
4	Set the terminate switches to Off on all but the last disk shelf in the loop, then set the terminate switch on the last disk shelf to On.

Step	Action
5	Repeat Steps 1 through 4 for the partner node.
6	Go to “ Step 3: Cabling the IB cluster adapters ” on page 19.

Step 3: Cabling the IB cluster adapters

Cabling the IB cluster adapters

To cable the IB cluster adapters, complete the following steps, using the diagram for reference.



Step	Action
1	Plug one end of the optical cable into one of the local node's IB cluster adapter ports, then plug the other end into the corresponding partner node's IB cluster adapter port.
2	Repeat Step 1 for the remaining port on the IB cluster adapter.
3	Gently pull on the cable ends to ensure that they are properly seated.
4	Go to “Step 4: Cabling Channel B” on page 20.

Step 4: Cabling Channel B

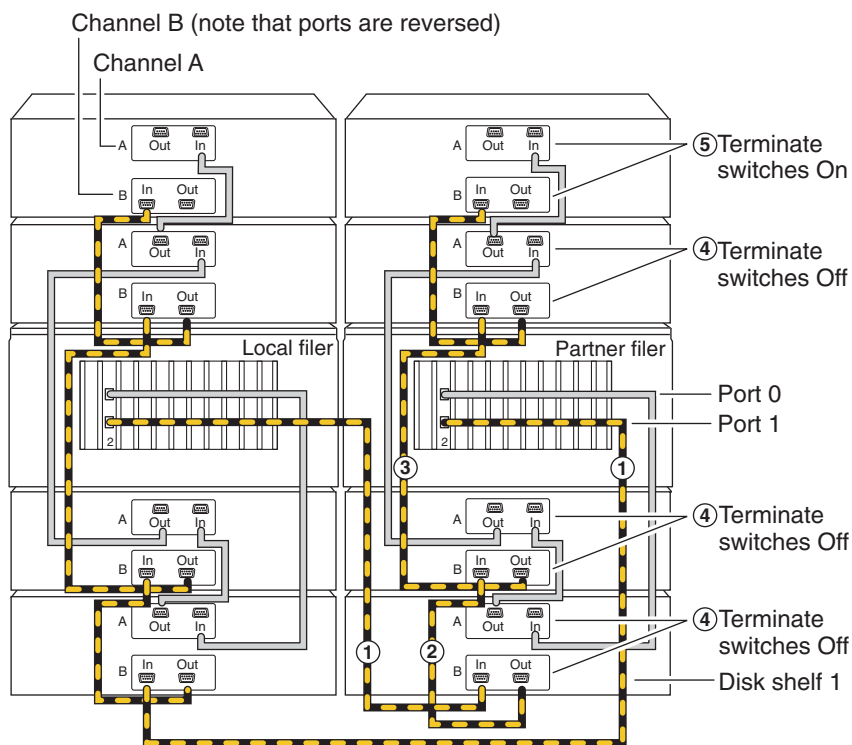
Channel B loop cabling differences

The procedure for cabling the Channel B loops for a standard cluster and mirrored cluster are different. These differences are described in the following sections.

- ◆ “Cabling the Channel B loops in a standard cluster” on page 20
- ◆ “Cabling the Channel B loops in a mirrored cluster” on page 21

Cabling the Channel B loops in a standard cluster

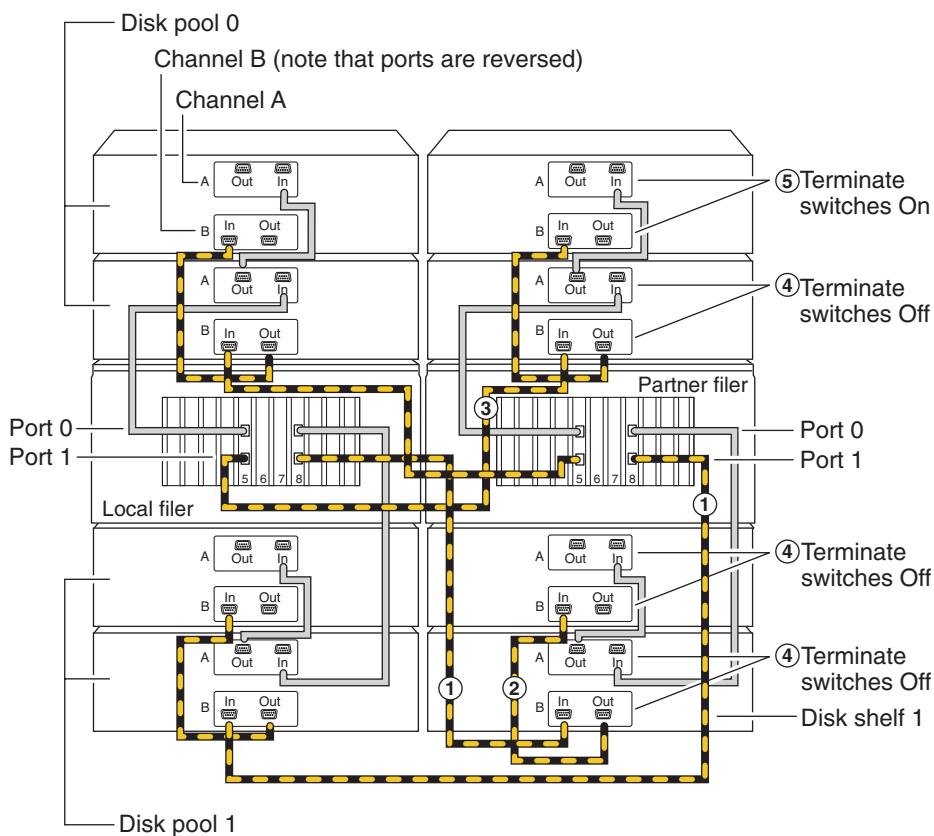
To cable the Channel B loops in a standard cluster, complete the following steps, using the diagram for reference.



Step	Action
1	Cable the dual-port FC-AL adapter in slot 2, Port 1 of the local node, to the partner node disk shelf 1 LRC Input port.
2	Cable the local node's disk shelf 1 Channel B LRC Output port to the local node's disk shelf 2 Channel B LRC Input port. Label this cable with a striped label.
3	Repeat Step 2 for the remaining disk shelves in the loop.
4	Set the terminate switches to Off on all but the last disk shelf in the loop, then set the terminate switch on the last disk shelf to On.
5	Repeat Steps 1 through 4 for the partner node.
6	Go to Chapter 3, " Configuring the Cluster ," on page 25.

Cabling the Channel B loops in a mirrored cluster

To cable the Channel B loops in a mirrored cluster, complete the following steps, using the diagram for reference.



Step	Action
1	Cable the dual-port FC-AL adapter in slot 8, Port 1 of the local node, to the partner node disk shelf 1 LRC Input port of disk pool 1, then cable the dual-port FC-AL adapter in slot 5, Port 1 of the local node to the partner node disk shelf 1 LRC Input port of disk pool 0.
2	Cable the local node's disk shelf 1 Channel B LRC Output port to the local node's disk shelf 2 Channel B LRC Input port. Label this cable with a striped label.
3	Repeat Step 2 for the remaining disk shelves in the loop.
4	Set the terminate switches to Off on all but the last disk shelf in the loop, then set the terminate switch on the last disk shelf to On.

Step	Action
5	Repeat Steps 1 through 4 for the partner node.
6	Go to Chapter 3, “ Configuring the Cluster ,” on page 25.

About this chapter

This chapter describes how to bring up a new clustered system for the first time. It describes how to enable licenses, set cluster options, configure networking for the cluster, and test the configuration.

Topics in this chapter

This chapter addresses the following topic:

- ◆ [“Step 1: Bringing up the cluster for the first time”](#) on page 26
- ◆ [“Step 2: Enabling licenses”](#) on page 27
- ◆ [“Step 3: Setting options and parameters”](#) on page 29
- ◆ [“Step 4: Configuring networking interfaces”](#) on page 32
- ◆ [“Step 5: Checking and testing cluster configuration”](#) on page 35

Step 1: Bringing up the cluster for the first time

What to do to bring up the cluster

After cabling the nodes and storage together, you must connect the cluster to the network, apply power to the system, and configure the nodes of the cluster.

Bringing up the new cluster

To bring up the cluster for the first time, complete the following steps.

Step	Action
1	Connect both nodes to the network, as described in the <i>Hardware and Service Guide</i> .
2	Turn on the power to the disk shelves.
3	Turn on the power to both nodes and wait for the system prompt.
4	Run the diagnostics program by entering the following command: sys-diag Result: The diagnostic program loads.
5	Select the diagnostics tests that check all dual-port FC-AL adapters and the IB cluster adapter. For a description of these tests, see the Diagnostics Guide on the NOW Web site at http://now.netapp.com .
6	Boot both nodes and observe the console output, by entering the following command from each node's console: boot
7	Check the status of the cluster by entering the following command on each node's console: cf status Result: The following message is displayed on the console, indicating that clustering is not activated: cluster monitor not initialized
8	Go to “ Step 2: Enabling licenses ” on page 27.

Step 2: Enabling licenses

- About licenses on the cluster

License activation enables the cluster to run software that is installed on the cluster. For clustering, you must enable the cluster license at bring up.
- Licenses for mirrored clusters

If you are setting up a mirrored cluster, you must also enable the Local SyncMirror license for synchronous mirroring. If you are setting up a cluster with nodes in separate locations, you must also enable the Remote SyncMirror license.
- Other licenses

There are other licenses that you can set, depending on what licensed software is installed on the cluster. The process for enabling each license is the same. See the *System Administrator's Guide* for additional licenses you can set.

Enabling licenses on the cluster

To enable a license on the cluster, complete the following steps.

Step	Action
1	Enter the cluster license and code on both node consoles, as shown in the following example. <code>license cluster = C1234586</code> Note_____ If you are setting up a mirrored cluster, you should enable Local SyncMirror during this step.
2	Reboot both nodes using the following command: <code>reboot</code>
3	Enable clustering on each node by entering the following command on the local node console: <code>cf enable</code>

Step	Action
4	Check to see that clustering is enabled by entering the following command on each node console: <pre>cf status</pre> Cluster enabled, filer 2 is up.
5	Repeat Step 1 for other licenses, using the license type and code for each licensed product installed on the cluster.
6	Reboot both nodes of the cluster.
7	Go to “Step 3: Setting options and parameters” on page 29.

Step 3: Setting options and parameters

What the options do Options help you maintain various functions of your node, such as security, file access, and network communication. During takeover, the value of an option might be changed by the node doing the takeover. This can cause unexpected behavior during a takeover. To avoid unexpected behavior, specific option values must be the same on both the local and partner node.

Each option performs a specific task or has a specific function. See the *System Administrator's Guide* for a description of available options and the function each performs.

Options that must be the same The options listed in the following table must be the same for a takeover to be successfully completed.

Option name	Option name
cifs.show_snapshot	nfs.v2.df.3gb.lim
dns.domainname	nis.domainname
dns.enable	nis.enable
http.admin.enable	pcnfsd.enable
httpd.timeout	raid.reconstruct_speed
httpd.timewait.enable	raid.timeout
ip.path_mtu_discovery.enable	wafl.maxdirsize
nfs.per_client_stats.enable	wafl.root_only_chown
nfs.v2.df.2gb.lim	vol.vopy.throttle

What the parameters do The parameters help keep the individual synchronized and help maintain routing of processes throughout the system.

Parameters that must be the same

The parameters listed in the following table must be the same so that takeover is smooth and data is transferred between the nodes correctly.

Parameter	Parameter
date	date, rdate
NDMP (on or off)	ndmp (on or off)
route table published	route
routed enabled	routed (on or off)
Time zone	timezone

Manually setting options

To manually set options, complete the following steps.

Step	Action
1	View and note the values of the options on the local and partner nodes, using the following command on each console: options Result: The current option settings for the node are displayed on the console. Output similar to the following is displayed: <pre>autosupport.doit DONT autosupport.enable off . . .</pre>
2	Verify that the options that have comments in parentheses are set to the same value for both nodes. The comments are as follows: ◆ Value might be overwritten in takeover ◆ Same value required in local+partner ◆ Same value in local+partner recommended
3	Correct any mismatched options using the following command: options option_name option_value

Manually setting parameters

To manually set parameters, complete the following steps.

Step	Action
1	View the individual parameter settings on both the local and partner nodes, similar to the following example: routed status Result: The default gateway list status is displayed.
2	Verify that the parameters on both nodes are set to the same value.
3	Correct any mismatched values.
4	Go to “ Step 4: Configuring networking interfaces ” on page 32.

Setting options and parameters with the cluster configuration checker

The cluster configuration checker is a script that runs under UNIX or as a CGI script from a UNIX Web server. It detects the following configuration problems:

- ◆ Mismatched licenses
- ◆ Mismatched option settings
- ◆ Incorrectly configured network interfaces
- ◆ Different versions of Data ONTAP on the local and partner nodes

The script is available through download from the NOW Web site at <http://now.netapp.com/NOW/tools>. Look for the cluster configuration checker (cf-config-check.cgi) file.

To run this script from the command line, complete the following steps.

Step	Action
1	Collect the IP addresses and login information for both nodes.
2	Download the script from the NOW Web site, then unzip the script.
3	Run the script, as described in the online instructions on the script Web page. You can run the script from either the command line or through a Web browser that can access both nodes.
4	Examine the script output and correct any errors or differences.
5	Go to “ Step 4: Configuring networking interfaces ” on page 32.

Step 4: Configuring networking interfaces

What the networking interfaces do

When a node in a cluster fails, the surviving node must be able to assume the identity of the failed node on the network. Networking interfaces allow individual nodes in the cluster to maintain communication with the network if the partner fails.

Network connection requirements

Both nodes in the cluster must meet the following network interface connection characteristics:

- ◆ Both nodes must have interfaces that access the same collection of networks and subnetworks.
- ◆ Both nodes must have interfaces that can take over the IP addresses of each other.
- ◆ Both nodes must have interfaces that can take over the MAC (media access control) addresses of each other.

Types of takeover configurations

The following table lists the three types of interface configurations that can be enabled in a cluster.

Interface type	Description
Shared	This type of interface supports both the local and partner nodes. It contains both the local node and partner node's IP addresses. During takeover, it supports the identity of both nodes.
Dedicated	This type of interface only supports the node in which it is installed. It contains the local node's IP address only and does not participate in network communication beyond local node support during takeover.
Standby	This type of interface is on the local node, but only contains the IP address of the partner node. During takeover, this interface supports a virtual filer identity. See the <i>System Administrator's Guide</i> for more information about virtual filers.

Information needed for configuration

You must gather the following information before configuring the interfaces:

- ◆ The IP address for both the local node and partner node
- ◆ The netmask for both the local node and partner node
- ◆ The Ethernet addresses for both the local node and partner node

Configuring networking for the first time

To configure the networking interfaces on a cluster for the first time, complete the following steps.

Step	Action
1	Enter the following command at the local node console: setup
2	Answer the questions displayed on the screen. Please enter IP address for Network Interface ns0 [n.n.n.n]: Please enter netmask [255.255.255.0]: Should interface ns0 take over a partner IP address during failover? [y]: Please enter the IP address to take over: [m.m.m.m]:
3	Enter the following command to halt the node: halt
4	Enter the following command to reboot the node: reboot
5	Repeat Steps 1 through 4 for the partner node.
6	Go to “ Step 5: Checking and testing cluster configuration ” on page 35

Configuring interfaces

To configure an interface as a dedicated, standby, or shared interface, complete the following steps.

Step	Action	
1	Check the current settings of the local node by entering the following command on the console: ifconfig -a Result: You should see output similar to the following: <pre>e0: Flags=40043<UP,BROADCAST,RUNNING,UP_1ARY> mtu 1500 inet 11.22.33.44 netmask fffffff0 broadcast 11.22.33.45 secondary host inet 11.22.33.70 (not in use) ether 00:01:00:00:00:80 (Data Link Provider Interface)</pre>	
2	If you are setting the interface as a...	Then...
	Dedicated interface	1. Enter the following command at the prompt, or directly into the /etc/rc file of the local node: ifconfig e0 local_node_ip_address 2. Repeat Step 1 for the partner node.
	Shared interface	1. Enter the following command at the prompt, or directly into the /etc/rc file of the local node: ifconfig NIC_name ip_address partner \ ip_address Example: ifconfig e0 199.9.204.255 \ partner 199.9.204.254 2. Enter the following command at the prompt, or directly into the /etc/rc file of the partner node: ifconfig NIC_name ip_address partner \ ip_address Note_____ You do not have to enter the MAC address. _____
	Standby interface	1. Enter the following command at the prompt, or directly into the /etc/rc file of the local node: ifconfig e1 local_node_ip_address 2. Repeat Step 1 for the partner node.

Step 5: Checking and testing cluster configuration

Reason to check and test the cluster

After configuring networking and setting licenses and options, you should check your configuration with the cluster configuration utility. This utility runs under UNIX or as a CGI script from a UNIX Web server and test for the following configuration problems:

- ◆ Mismatched licenses
- ◆ Mismatched option settings
- ◆ Incorrectly configured network interfaces
- ◆ Different versions of Data ONTAP on the local and partner nodes

Checking configuration

To run this script from the command line, complete the following steps.

Step	Action
1	Download the cluster configuration checker (cf-config-check.cgi) file from the NOW Web site at http://now.netapp.com/NOW/tools , then unzip the file.
2	Collect the IP addresses and login information for the local and partner nodes.
3	Run the script, as described in the online instructions on the script Web page.
4	Examine the script output and correct any errors or differences indicated in system settings, such as mismatched licenses.
5	Go to “ Testing takeover and giveback ” on page 35.

Testing takeover and giveback

To test takeover and giveback, complete the following steps.

Step	Action
1	Check the cabling on the IB interconnect cables to make sure that they are secure.

Step	Action	
2	Verify that you can create and retrieve files on both nodes for each licensed protocol.	
3	From the local node, enter the following command and observe the output: cf enable Result: Takeover of the partner node is enabled on the local node.	
4	Enter the following command from the local node console: cf takeover Result: The local node takes over the partner node and gives the following output: takeover completed	
5	Make sure that the local node can access both the local and partner disks.	
6	Give back the partner node by entering the following command: cf giveback Result: The local node releases the partner node, which reboots and resumes normal operation. The following message is displayed on the console when the process completes: giveback completed	
7	If takeover and giveback...	Then...
	Is completed successfully	Repeat Steps 2 through 6 on the partner node.
	Fails	Go to Chapter 4, “ Basic Troubleshooting ,” on page 37.
8	Complete setup as described in the <i>Software Setup Guide</i> .	

About this chapter

This chapter describes some common problems you might encounter configuring or operating your cluster and provides steps you can take to correct these problems. This chapter also describes how to address full storage in the cluster and how to convert the cluster into two, stand-alone nodes.

Topics in this chapter

This chapter discusses the following topics:

- ◆ [“Takeover or giveback failures”](#) on page 38
- ◆ [“Recovering from a disaster”](#) on page 40
- ◆ [“Out-of-date software and firmware”](#) on page 42
- ◆ [“Not enough storage”](#) on page 48
- ◆ [“Failed adapters”](#) on page 50
- ◆ [“Removing clustering”](#) on page 52

Takeover or giveback failures

Correcting takeover or giveback failure

The following table describes tests you can run to determine why takeover or giveback failed and also provides information to correct the problem.

Note _____
You must reboot the cluster after completing each test.

To correct a takeover or giveback failure, complete the following steps.

Step	Action	
1	Check communication between the local and partner nodes by entering the following command and observing the messages: cf status Results: If there is a problem with cabling or the adapter, the appropriate message is displayed. Recable the IB cluster adapter or replace the adapter, as needed.	
2	If the error message indicates...	Then...
	An IB cluster adapter error	Check the IB cluster adapter cabling. Make sure that the cabling is correct and properly seated.
	A Channel B cabling error	Check the cabling of the Channel B disk shelf loops and reseal and tighten any loose cables.
	A networking error	Check for network connectivity. See the <i>System Administrator's Guide</i> for more information.
3	Run the cluster configuration checker script, as described in " Setting options and parameters with the cluster configuration checker " on page 31. Correct any errors or differences displayed in the output.	

Step	Action
4	Reboot the cluster and rerun the takeover and giveback tests.
5	If you still do not have clustering enabled, call Customer Support.

Recovering from a disaster

Assumptions about your cluster

The following section assumes that you created a mirrored cluster with the following configuration:

- ◆ The local and partner nodes are in separate physical locations.
- ◆ Clustering and Local SyncMirror are licensed on both nodes.
- ◆ Remote SyncMirror is licensed and running on both nodes, prior to the disaster.
- ◆ The root volume is mirrored with one plex at each site and data volumes are mirrored with one plex at each site.

Types of disasters

You might encounter the following types of disasters:

- ◆ Failure of the cluster interconnect cable between the two sites
- ◆ Failure of access to the partner’s storage
- ◆ Complete loss of communication between the two sites

Recovering from a disaster

To recover from a disaster, complete the following steps.

Note_____

You need the *Data Protection Guide* to help you complete this procedure.

Step	Action
1	Isolate the partner node (node at disaster site) by powering it off. If you cannot physically turn off that node, isolate it by manually isolating (fencing) it, as described in the <i>Data Protection Guide</i> .

Step	Action	
2	If...	Then...
	The local and partner nodes can access their local data, but cannot access or communicate with each other or their remote storage	1. Restore access by replacing or reconnecting the damaged or missing cables. Note_____ Do not force a takeover of the partner. 2. Confirm access to the remote storage by using the following command: sysconfig -v 3. Confirm connection between the local and partner node, using the following command: cf monitor 4. Complete the disaster recovery procedures, as described in the <i>Data Protection Guide</i>.
	The remote node and storage are physically damaged or failed	1. Force the takeover of the partner node by using the following command: cf forcetakeover -d 2. Replace equipment and cabling, as needed. Contact Customer Support for assistance. 3. Complete the disaster recovery procedures, as described in the <i>Data Protection Guide</i>.

Out-of-date software and firmware

Updating outdated software and firmware

Updating your software is a three-part process:

- ◆ Update Data ONTAP on both nodes
- ◆ Update only the node firmware on both nodes
- ◆ Update only disk firmware
- ◆ Update only disk shelf firmware

Note

If you are updating Data ONTAP to a minor release (a dot release), node and disk shelf firmware are automatically updated. If you are updating to a major release of Data ONTAP, you must manually update node and disk shelf firmware.

For detailed information

For detailed instructions about updating Data ONTAP software, filer firmware, and disk shelf firmware, see the following sections.

- ◆ [“Updating Data ONTAP with node and disk shelf firmware”](#) on page 43
- ◆ [“Updating node firmware only”](#) on page 44
- ◆ [“Updating disk firmware only”](#) on page 45
- ◆ [“Updating disk shelf firmware only”](#) on page 46

Updating Data ONTAP

Updating Data ONTAP with node and disk shelf firmware

To update Data ONTAP, node firmware, disk, and disk shelf firmware on each node, complete the following steps.

Step	Action
1	Back up the data on both nodes. See the <i>System Administrator's Guide</i> for backup instructions.
2	Verify that both nodes have network connections and that <code>httpd.admin.enable</code> is set to <code>On</code> for both nodes.
3	Download and untar the most current version of Data ONTAP to both nodes, from http://now.netapp.com/NOW/cgi-bin/software/ on the NOW Web site.
4	Download and run the Data ONTAP Upgrade Utility from http://now.netapp.com/NOW/download/tools/upgrade_ontap on the NOW Web site. Follow the directions to run this script.

Updating node or disk firmware only

Determining the firmware level on the nodes

Before updating firmware on the cluster nodes, you must determine the current version running on the nodes. Both nodes must run the same version of firmware to avoid potential conflicts during takeover.

To determine the firmware revision numbers, complete the following step.

Step	Action	
1	If the cluster is....	Then...
	Running	Enter the following command from each node console and note the version: sysconfig -v
	Rebooting	Note the firmware revisions during boot.
	At the ok prompt	Enter the following command from the node console and note the version: .version

Updating node firmware only

To update node firmware, complete the following steps.

Step	Action
1	Enter the following command from the local node console, if you haven't already downloaded Data ONTAP: download Result: The node firmware is downloaded to the boot disk. Note_____ This process can take several minutes. _____

Step	Action
2	Disable the cluster by entering the following command on the local node: cf disable
3	Shut down the local node by entering the following command: halt
4	Turn off, then turn on the local node.
5	Enter the following command after the node boots: update-flash Result: The system prompts you to continue, then the firmware is copied to the CompactFlash™ card in the node.
6	Reboot the system by entering the following command: bye
7	Repeat Steps 2 through 6 for the partner node.
8	Reenable clustering by entering the following command from the local node's console: cf enable
9	Check the configuration, as described in “Step 5: Checking and testing cluster configuration” on page 35.

Updating disk firmware only

To update disk firmware, complete the following steps.

Note

Only disks that have firmware files present in the `/etc/disk_fw` directory are updated during firmware updates.

Caution

Do not update disk firmware on active nodes. Doing so might cause client drop-off. See the `disk_fw_update` man page for more information.

Step	Action
1	Download the most current version disk firmware from http://now.netapp.com/NOW/download/tools/diskfw/ from the NOW Web site. Place the file in /etc/disk_fw on both nodes.
2	Make sure clustering is enabled by entering the following command: <pre>cf status</pre> Result: If clustering is enabled, the following message is displayed: <pre>Clustering enabled</pre> Note_____ If clustering is disabled, enable it with the cf enable command.
3	Install the new disk firmware on the local node by entering the following command: <pre>disk_fw_update</pre>
4	After the firmware update has completed on the local node, repeat Step 3 on the partner node.

Updating disk shelf firmware only

To update disk shelf firmware, complete the following steps.

Step	Action
1	Download the most current version disk shelf firmware from http://now.netapp.com/NOW/download/tools/diskshelf/ from the NOW Web site. Place the file in /etc/shelf_fw on both nodes.
2	Make sure clustering is enabled by entering the following command: <pre>cf status</pre> Result: If clustering is enabled, the following message is displayed: <pre>Clustering enabled</pre> Note_____ If clustering is disabled, enable it with the cf enable command.

Step	Action
3	Install the new disk firmware on the local node by entering the following commands: <pre>priv set advanced storage download shelf</pre>
4	After the firmware update has completed on the local node, repeat Step 3 on the partner node. Note_____ Disk shelf firmware automatically updates on the next reboot after it has been installed on each disk shelf. _____

Not enough storage

What to do when storage is full

You can add a DS14 disk shelf to a cluster that is made up of DS14 disk shelves without powering down your cluster. This enables you to add disk shelves without a service interruption. However, you cannot add more disk shelves to your cluster than your cluster can support. See the NOW Web page at <http://now.netapp.com> for the amount of storage your cluster can support.

Considerations for adding storage to a cluster

The following list specifies the requirements and restrictions you need to be aware of when adding storage to an existing cluster:

- ◆ Mirrored cluster—if you add a disk shelf to one plex, you should add the same storage capacity disk shelf to the other plex.
- ◆ Standard cluster—If you add a DS14 disk shelf to a cluster that has FC9 disk shelves, the DS14 disk shelf must be the last disk shelf in the loop.

Note

See the System Configuration guide on the NOW Web page at <http://now.netapp.com> for additional restrictions.

Adding storage to a standard cluster

To add storage to an existing cluster, complete the following steps.

Step	Action
1	Install the new disk shelf into your system cabinet or into an equipment rack. See either the <i>System Cabinet Guide</i> or the <i>Fibre Channel DiskShelf14 Hardware Guide</i> for installation instructions.
2	Set the Channel A and B Terminate switches on the new disk shelf to On.
3	Cable the last disk shelf Channel A LRC Output port to the new disk shelf Channel A LRC Input port. Label the cable with a solid-colored label.

Step	Action	
4	Repeat Step 3 for the Channel B loop, but label the cable with a striped label.	
5	Apply power to the new disk shelf.	
6	Set the Channel A and B terminate switches on the previous disk shelf to Off.	
7	Check the firmware version for the old disk shelves and compare it to the new disk shelf.	
8	If the firmware...	Then...
	Must be updated	Go to “ Updating disk firmware only ” on page 45.
	Does not need updating	You can begin using the new disk shelf as a spare.

Failed adapters

Tasks for replacing an adapter

Replacing an adapter consists of the following tasks:

- ◆ “[Removing an adapter](#)” on page 50
- ◆ “[Installing an adapter](#)” on page 50

Removing an adapter

To remove an adapter from a node, complete the following steps.

Step	Action
1	Ground yourself using an antistatic wrist strap.
2	Take over the node that has the adapter you want to replace by entering the following command from its partner’s console: cf takeover Result: The node takes over the partner node. You see a message similar to the following: takeover completed
3	Turn off the power to the target node, then unplug it from the power source.
4	Remove the appropriate cabling to the adapter, then remove the adapter, as described in the <i>Hardware and Service Guide</i> .
5	Go to “ Installing an adapter ” on page 50.

Installing an adapter

To install an adapter in a node, complete the following steps.

Step	Action
1	While grounded, install the new adapter, as described in the <i>Hardware and Service Guide</i> .
2	Close the node and reconnect the appropriate cables to the adapter.

Step	Action
3	Plug the node back into the power source, then apply power.
4	After the node boots, run giveback by entering the following command on the local node's console: <pre>cf giveback</pre> Result: The partner node reboots and functions normally. A successful giveback ends with the following message on the local node: <pre>giveback completed</pre>

Removing clustering

Tasks for removing clustering

- Removing clustering is a two-step process:
- ◆ Disable clustering software, such as the cluster license
 - ◆ Remove the clustering hardware

Disabling clustering software

To disable the clustering software, complete the following steps.

Step	Action
1	Enter the following command on either node console, as shown in the following example: cf disable
2	Disable the cluster license using the following command, as shown in the following example: license cluster=DISABLE
3	Open the /etc/rc file with a text editor and remove references to the partner node in the ifconfig entries, as shown in the following example: Original entry: ifconfig e0 199.9.204.254 partner 199.9.204.255 Edited entry: ifconfig e0 199.9.204.254
4	Repeat Steps 1 through 3 on the partner node.
5	Go to “ Removing clustering hardware ” on page 53.

Removing clustering hardware

To remove the clustering hardware and recable the node's disk shelves, complete the following steps.

Step	Action	
1	Halt both nodes by entering the following command on each console: halt	
2	Turn off the power to each node, then turn off the power to the disk shelves and unplug them from the power source.	
3	Ground yourself, then remove the IB interconnect cable from both nodes.	
4	Open both nodes and remove the IB cluster adapters, then close the nodes. See the <i>Hardware and Service Guide</i> for additional information.	
5	Unplug the local node from the partner node's Channel B disk shelf and do the same for the partner node.	
6	If you are converting to a...	Then...
	System with nonmirrored disks	1. Disconnect all cabling from the Channel B loop on the local node. 2. Repeat Step 1 for the partner node.
	System with mirrored disks or redundant Channel B loop	1. Connect the local node to the open Channel B loop in its local disk shelves, as described in the appropriate disk shelf guide. 2. Repeat Step 1 for the partner node.
7	Power on the disk shelves, then the individual nodes, monitoring the system console for error messages during the boot process.	

Step	Action
8	Run all system diagnostics at the boot prompt by entering the following command on the system console: sysdiag
9	Unset the partner sysid by entering the following command at the prompt: unsetenv partner-sysid
10	Check clustering status by entering the following command: cf status Result: If clustering is disabled, you see the following output: Cluster disabled

About this appendix This appendix lists the regulatory notices you need to be aware of when installing and operating your Network Appliance equipment.

Regulatory notices

FCC notices (U.S. only)

Network Appliance devices are designed for a CFR 47 (Code Federal Regulations) Part 15 Class A environment.

The FCC and Network Appliance guarantee the user's rights to operate this equipment only if the user complies with the following rules and regulations:

- ◆ Install and operate this equipment in accordance with the specifications and instructions in this guide.
- ◆ Modify this equipment only in the ways specified by Network Appliance.
- ◆ Use shielded cables with metallic RFI/EMI connector hoods to maintain compliance with applicable emissions standards.
- ◆ If the system has nine or more fibre channel disk shelves, install the system in two or three NetApp System Cabinets to maintain performance within Part 15 of CFR 47 regulations.

Compliance with Part 15 of CFR 47

This equipment has been tested and found compliant with Part 15 of the CFR 47 rules for Class A digital devices. These rules are designed to provide reasonable protection from interference to electronics equipment operated in a commercial environment.

Operation of this device is subject to the following two conditions:

- ◆ This device cannot cause harmful interference.
- ◆ This device must accept any interference received, including interference that may cause undesired operation.

Compliance with ICES-003

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A conforme à la norme NMB-003 du Canada.

Compliance with EN regulations

Marking by the symbol **CE** indicates compliance of this Network Appliance device to the EMC Directive and the Low Voltage Directive of the European Union. Such marking is indicative that this Network Appliance device meets the technical standards listed in “Declaration of Conformity,” later in this appendix.

Caution

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Bureau of Standards, Metrology, and Inspections notice (BSMI, Taiwan only)

警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Translation of the BSMI notice:

Warning: This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Voluntary Control Council for Interference by Information Technology Equipment (VCCI, Japan)

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Translation of the VCCI-A notice:

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. If such trouble occurs, the user may be required to take corrective actions.

Declaration of Conformity

**Network Appliance, Inc.,
495 East Java Drive
Sunnyvale, California, 94089, U.S.A.,**

declare under our sole responsibility that the products

Type of equipment	Description	Model number	Year of manufacture
Network appliance	NetApp FAS940 and FAS960 appliance	FAS940 FAS960	2002

to which this declaration relates conform to the following standards:

EN 60950:1992, with A1-A4, A11, Information Technology Equipment
(Safety)

EN 55022:1998, Emissions Requirements for Information Technology
Equipment

EN 50024:1998, Immunity Requirements for Information Technology
Equipment

EN 60825-1, Safety of Laser/LED Equipment

IEC 1000-3-2:1995 Limits for Harmonic Current Emissions

IEC 1000-3-3:1994 Limitation of Voltage Fluctuations and Flicker in Low-
Voltage Supply Systems

following the provisions of the directives listed below:

73/23/EEC, Low Voltage Directive (Product Safety)

89/336/EEC, Electromagnetic Compatibility Directive

Part number: 210-00315

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