



Dell EqualLogic FS7600 Series Appliances

Installation and Setup Guide

Regulatory Model Series E02T

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Preface

Dell™ EqualLogic® FS Series appliances, coupled with PS Series arrays, offer a high-performance, high-availability, scalable NAS solution. This manual describes how to maintain and troubleshoot the customer-replaceable components of the EqualLogic FS7600 appliance.

Audience

The information in this guide is intended for hardware administrators responsible for maintaining EqualLogic FS7600 hardware.

Related Documentation

For detailed information about FS Series appliances, PS Series arrays, groups, volumes, array software, and host software, log in to the [Documentation page](#) at the customer support site.

Dell Online Services

You can learn about Dell products and services with this procedure:

1. Visit [dell.com](#) or the URL specified in any Dell product information.
2. Use the locale menu or click on the link that specifies your country or region.

Dell EqualLogic Storage Solutions

To learn more about Dell EqualLogic products and new releases, visit the Dell EqualLogic Tech Center site: [delltechcenter.com/page/EqualLogic](#). Here you can also see articles, demos, online discussions, and more details about the benefits of our product family.

Technical Support and Customer Service

Dell support service is available to answer your questions about PS Series SAN arrays and FS Series appliances.

Contacting Dell

If you are a customer in the United States or Canada in need of technical support, call 1-800-945-3355. If you are outside of the United States or Canada, visit [support.dell.com/support/topics/global.aspx](#).

If you have an Express Service Code, have it ready. The code helps the Dell automated support telephone system direct your call more efficiently.

Warranty Information

The FS7600 appliance warranty is included in the shipping box. For information about registering a warranty, visit [eqsupport.dell.com/utility/form.aspx?source=warranty](#).

Note, Caution, and Warning Symbols



A NOTE symbol indicates important information that helps you make better use of your hardware or software.



A CAUTION symbol indicates potential damage to hardware or loss of data if instructions are not followed.



A WARNING symbol indicates a potential for property damage, personal injury, or death.

1 Before You Begin

Proper planning and adherence to requirements help ensure a successful installation. Before you begin the installation, review the steps for getting started and perform all the preliminary tasks.

Introduction to the EqualLogic FS7600

The Dell™ EqualLogic® FS Series NAS appliances add Network Attached Storage (NAS) capability to the EqualLogic product line to provide a high-performance, scalable unified storage platform. EqualLogic FS Series appliances are powered by the Dell Fluid File System (FluidFS), Dell's high-performance, clustered, and network-accessible file system.

A PS Series group provides iSCSI-accessible block storage. With the latest version of the PS Series firmware and the addition of a Dell EqualLogic FS7600 NAS appliance, the same PS Series group can provide block storage and support for Network Attached Storage.

The EqualLogic FS7600 NAS appliance consists of two 1Gb controllers with battery backup, and two power supplies in one 2U chassis.



- An EqualLogic FS7600 requires a PS Series group running the PS Series firmware version 6.0 or later. For information on updating your PS Series group to the latest firmware version, see the *Release Notes* and the *Updating Storage Array Firmware* document on the customer support website.

A NAS cluster can support multiple, scalable NAS containers. In each container, you can create multiple CIFS shares and NFS exports. Clients with the correct credentials can then access the shares and exports through the NAS client VIP addresses.

The NAS cluster network configuration requires a client network and a SAN/internal network.

For security reasons, the internal network is usually a private network, and the client network is separate from the SAN and internal network. See [Network Configuration Overview on page 17](#).

[Figure 1](#) and [Table 1](#) describe the NAS cluster hardware configuration.

Figure 1: NAS Hardware Configuration

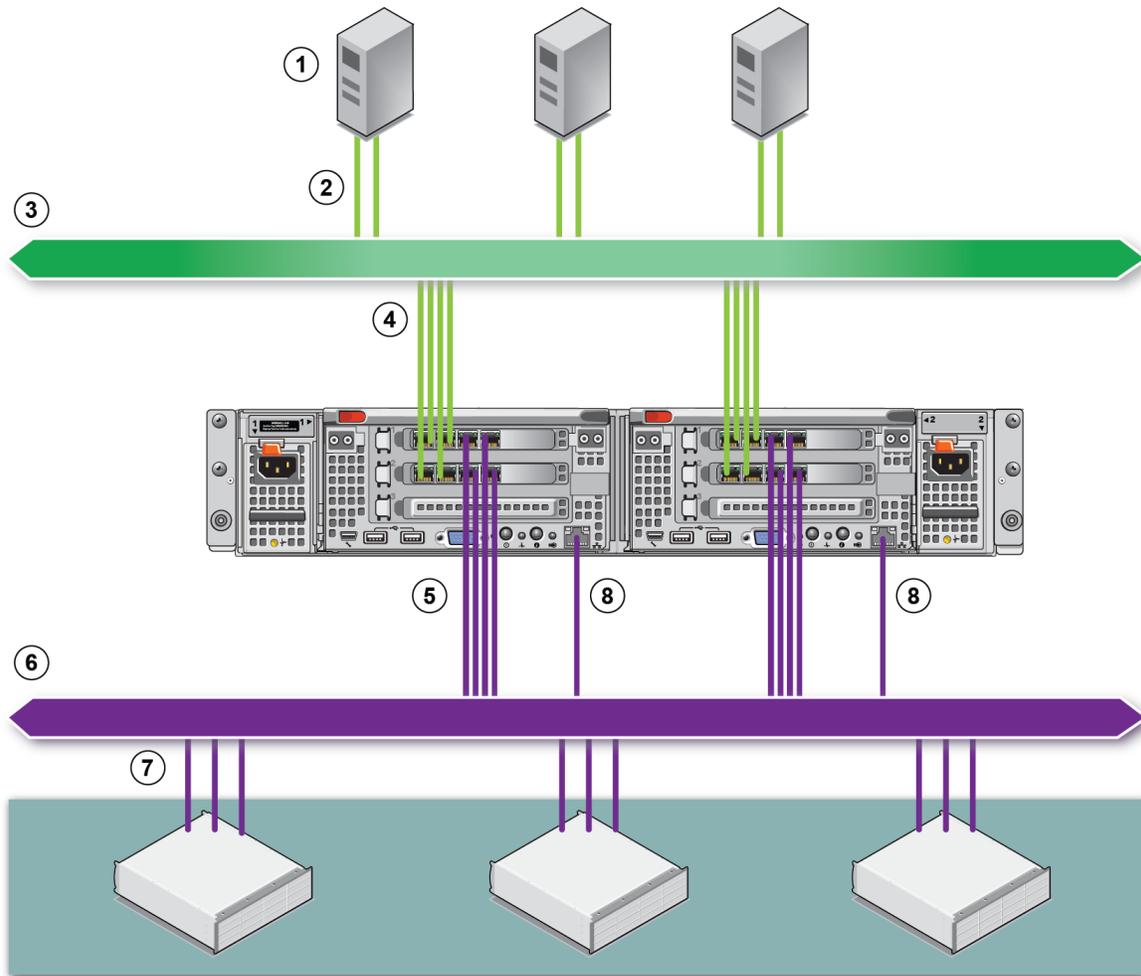


Table 1: NAS Cluster Components

Callout	Description
1	Clients
2	Client connections to the client network
3	Client network
4	NAS controller connections to the client network
5	NAS controller connections to SAN/internal network
6	SAN network
7	SAN (PS Series group)
8	Remote KVM

Steps for Getting Started

To install the EqualLogic FS7600 hardware and create a NAS cluster, follow these steps:

1. Make sure you meet the safety, environmental, and other requirements and have all the necessary hardware. See [Preinstallation Tasks on page 3](#).
2. Install the NAS appliance in the rack. See [Hardware Rack Mounting on page 9](#).
3. Connect the appliance to power. See [Network Cable Connections on page 17](#).
4. Connect the appliance to the networks. See [Network Cable Connections on page 17](#).
5. Use the Group Manager GUI to discover the controllers and configure a NAS cluster. See [NAS Cluster Network Requirements and Recommendations on page 24](#).
6. Create a NAS container and optionally create a CIFS share or NFS export. See [NAS Storage Allocation on page 29](#).

After getting started, see [What to Do Next on page 33](#).

Preinstallation Tasks

Before installing the hardware:

- Read the installation safety precautions. See [Safety Recommendations on page 3](#).
- Learn how to protect sensitive hardware. See [Hardware Protection on page 4](#).
- Make sure the installation meets the environmental requirements. See [Environmental Requirements on page 4](#).
- Unpack the shipping box according to the instructions on the setup poster, and make sure the shipping box contents are complete. See [Shipping Box Contents on page 6](#).
- Gather the hardware needed for the installation but not provided in the shipping box. See [Required Hardware That Is Not Supplied on page 7](#).
- Make sure the rack meets the rack requirements. See [Rack Requirements on page 7](#).
- Gather the tools needed for the installation, if any. See [Required Tools on page 8](#).

Safety Recommendations

Follow these safety recommendations:

- Before you install the EqualLogic FS7600 hardware, read and follow the safety instructions packaged with your system.
- Only individuals with rack mounting experience should install EqualLogic FS7600 hardware in a rack.
- Use care when moving and opening the cartons. Leave the components packaged until you are ready to install them.

- Place the components in a protected area that has adequate airflow and is free of excessive humidity, flammable gas, and corrosive substances.
- You need at least two people to install the hardware. Use proper lifting and carrying techniques when unpacking and moving the components.
- Make sure each FS7600 NAS appliance is fully grounded at all times to prevent damage from electrostatic discharge.
- When handling the FS7600 NAS appliance, use an electrostatic wrist guard or a similar form of protection. See [Hardware Protection on page 4](#).
- Hold the appliance level with the rack when you install it.

Hardware Protection

When not installed in a rack, an FS7600 NAS appliance must be in its original packaging or placed on a sturdy surface that is protected from electrostatic discharge.

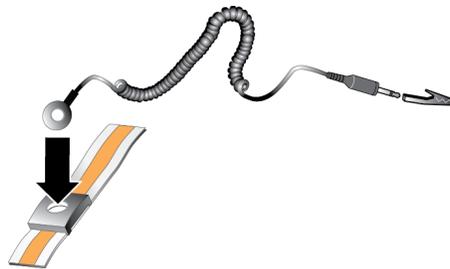
When handling an FS7600 NAS appliance, make sure you use an electrostatic wrist strap or a similar form of protection.

Using an Electrostatic Wrist Strap

You must use an electrostatic wrist strap to protect sensitive hardware from electrostatic discharge.

1. Connect the steel snap on the coiled cord to the stud on the elastic band. See [Figure 2](#).

Figure 2: Using an Electrostatic Wrist Strap



2. Fit the band tightly around your wrist.
3. Connect the banana plug to ground, or attach the plug to the alligator clip and connect the clip to a grounded device such as an ESD mat or the metal frame of a grounded piece of equipment.

Environmental Requirements

The location of the NAS appliance must meet the following environmental requirements:

- Only operate an enclosure from a power source with a voltage range of 90 to 264 VAC.
- Make sure each power source has sufficient electrical overload protection.

- In North America, connect the appliance to a source of power with overcurrent protection provided by a 20 A or less device (UL 489 circuit breakers). In Europe, the overcurrent protection must be provided by a 20 A or less device (IEC circuit breakers).
- Make sure enough space is available for airflow in front of and behind the appliance.
- Make sure the location is properly vented.
- Review the technical specifications in the following section to make sure your environment supports the requirements.

Technical Specifications

Table 2 lists the technical specifications for the NAS appliance.

Table 2: FS7600 NAS Appliance Technical Specifications

Category	Rating
AC Power Supply (per power supply)	
Wattage	Output 717 W
Heat dissipation	2446 BTU/hr
	 The heat dissipation is calculated using the power supply wattage rating. The heat dissipation values are for the entire system, which includes the chassis and two controllers.
Voltage	90 VAC to 264 VAC, autoranging, 47 Hz/63 Hz
	 This system is also designed to be connected to IT power systems with a phase to phase voltage not exceeding 230 V.
Battery Power Supply	
Battery	12.8 V to 13.2 V, 4.8 Ah to 6 Ah, 63 Wh to 77 Wh
Physical	
Height	86.4 mm (3.4 in.)
Width	481.5 mm (18.96 in.)—with rack flange
	446.3 mm (17.6 in.)—without rack flange
Depth	813.0 mm (32.0 in.)—with bezel and handle
	741.0 mm (29.2 in.)—without bezel and handle
Weight (maximum configuration)	30.5 kg (67 lb.)
Weight (empty)	12.86 kg (28.36 lb.)
Environmental	
Operating temperature	Continuous operation: 5°C to 40°C (41°F to 104°F) with a maximum temperature gradation of 20°C (68°F) per hour
Storage temperature	–40°C to 60°C (–40°F to 140°F) with a maximum temperature gradation of 20°C per hour
Operational relative humidity	20% to 80% (non-condensing) with maximum humidity gradation of 10% per hour at maximum wet bulb temperature of 29°C (89°F)

Storage relative humidity	5% to 95% with a maximum humidity gradation of 10% per hour at a maximum wet bulb temperature of 38°C (100°F)														
Maximum operational vibration	0.26 Grms (5 Hz – 350 Hz @ 0.0002G ² /Hz) in operational orientation for 5 minutes														
Maximum storage vibration	1.88 Grms with the following PSD profile (all 6 sides tested for 15 minutes each side) <table border="1"> <thead> <tr> <th>Frequency (Hz)</th> <th>G²/Hz</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>0.13</td> </tr> <tr> <td>20</td> <td>0.13</td> </tr> <tr> <td>70</td> <td>0.004</td> </tr> <tr> <td>130</td> <td>0.004</td> </tr> <tr> <td>165</td> <td>0.0018</td> </tr> <tr> <td>500</td> <td>0.0018</td> </tr> </tbody> </table>	Frequency (Hz)	G ² /Hz	10	0.13	20	0.13	70	0.004	130	0.004	165	0.0018	500	0.0018
Frequency (Hz)	G ² /Hz														
10	0.13														
20	0.13														
70	0.004														
130	0.004														
165	0.0018														
500	0.0018														
Maximum operational shock	31G half-sine shock +/-5% with pulse duration of 2.6 ms +/-10% in the operational orientation														
Maximum storage shock	Square wave shock of 27G, at 235 inches/second (596.90 cm/second) velocity change (all six sides tested)														
Operating altitude	-15.2 m to 3048 m (-50 to 10,000 feet) For altitudes above 2950 feet, the maximum operating temperature is derated 1°F/550 feet.														
Storage altitude	-15.2 m to 10,668 m (-50 ft to 35,000 ft)														
Airborne Contaminant Level Class	G1 as defined by ISA-S71.04-1985														

Shipping Box Contents

Unpack the EqualLogic FS7600. After unpacking, place the appliance on a sturdy surface that is protected from electrostatic discharge.

Make sure you have all the items supplied in the shipping box, described in [Table 3](#).

Table 3: Shipping Box Contents

Part	Description
One FS7600 NAS appliance	Provides high availability and processing power for the NAS cluster.
Bezel	Protects the front of the appliance.
Two power cables	The cables included vary based on region. The connectors on the power cables vary depending on your country.  If power cables are not in the shipping box, contact your PS Series support provider or reseller for power cable information.
Serial debug cable	Enables you to connect to the appliance for troubleshooting.
Rail kit	For mounting the appliance in a standard rack.
Documentation	The following documentation is included in the shipping box: <ul style="list-style-type: none"> Hardware setup poster <i>Installation and Setup Guide</i> (this document) License, regulatory, and warranty information

Required Hardware That Is Not Supplied

You must provide additional hardware that is specific to your environment and not included in the shipping box. See [Table 4](#).

Table 4: Required Hardware – Not Supplied

Component	Description
19 inch (48.3 cm), four-post rack	Provides easy access to hardware in your computing environment. See Rack Requirements on page 7 .
Network cables	Connects FS7600 network ports to a network switch. Use Category 5E or Category 6 cables with RJ45 connectors. Use Category 5 cables only if they meet the TIA/EIA TSB95 standard. See Network Configuration Overview on page 17 .
1GE network switch	Connects devices to a network. Multiple switch stacks are recommended. See Switch Requirements on page 7 .

Rack Requirements

See your support provider for detailed information about supported racks.

The rack and the hardware installation must meet the following requirements:

- Only four-post, square-hole or round-hole, tool-less racks are supported by default. The graphics in this manual show a square-hole rack, but the installation instructions also apply to round-hole racks.
- Use an industry-standard (for example, CEA-310-E), 48.3 cm (19 inch) rack.
- The rack must be rated for 540 kg (1200 pounds) static load or greater.
- The minimum rack depth is 100 cm (40 inches) from the front to the back of the rack.
- The distance between the inside of the front and back rack posts (the mounting surfaces) must be 61 cm (24 inches) to 90 cm (36 inches).
- Secure the rack to the floor for added stability.
- At least 4.1 cm (1.6 inches) of space must be between the rack door and the front of the hardware to accommodate the front bezel.
- The rack (with installed hardware) must meet the safety requirements of UL 60950-1 and IEC 60950-1.
- Mount the hardware in a horizontal position. Any other position voids your warranty and support contract.

Switch Requirements

Dell recommends that you use a highly available network switch configuration for the client and SAN/internal network connections.

Ideally, you want a network switch configuration in which a switch failure does not disrupt the availability of the NAS cluster. That is, no single switch should have all the client or SAN/internal network connections.

See *Network Connection Requirements and Recommendations on page 18*.

Required Tools

If you are installing the appliance in a rack, you will need a #2 Phillips screwdriver (not supplied).

2 Hardware Rack Mounting

For proper operation, you must install the EqualLogic appliance in a rack, as shown in [Figure 5](#).

Appliance Front and Back Panels

[Figure 3](#) and [Table 5](#) describe the front panel of the appliance. [Figure 4](#) and [Table 6](#) describe the back panel of the appliance.

Figure 3: Front Panel (Bezel Off, Fan Cover Closed)

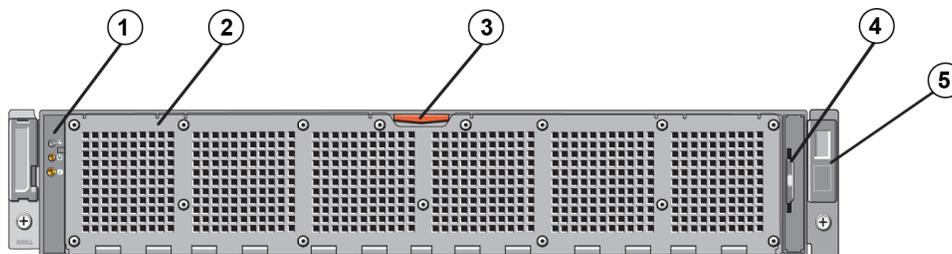


Table 5: Front-Panel Components

Number	Component
1	System health indicator, power, and system identification LEDs.
2	Cooling fan access door Encloses and protects the six hot-swappable cooling fans.
3	Cooling fan access door release latch Press the access door release latch to expose the hot-swappable cooling fans.
4	Information tag A slide-out label panel listing the system NIC and BMC MAC addresses for both controllers.
5	Service tag Displays the appliance service tag information (identical to the service tag information on the back panel).

Figure 4: Back Panel

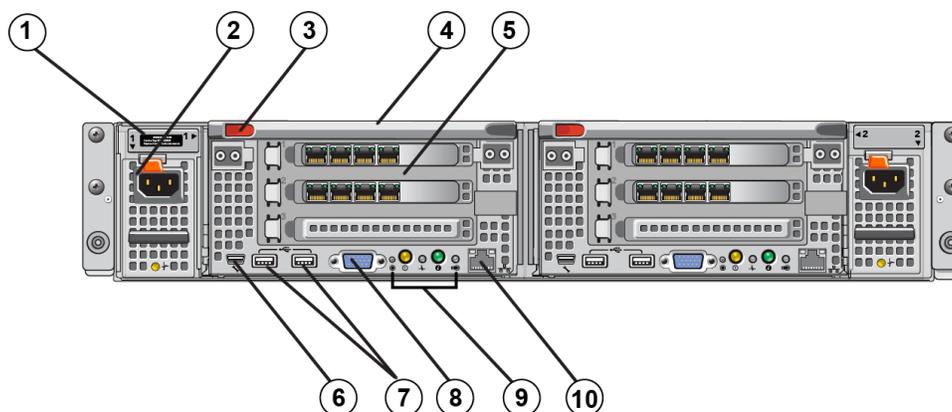


Table 6: Back-Panel Components

Number	Component
1	Service tag Displays the appliance service tag information (identical to the service tag information on the front panel).
2	Power supply (one of two) Left: PSU1 Right: PSU2
3	Controller release latch
4	Controller handle
5	Controller (one of two): Redundant NAS processing unit Left: Controller 1 Right: Controller 2
6	Serial COM port (mini USB connector) Allows you to connect a serial device to the system.  This connector is for service only. Use this connector only if asked to do so by Dell support.
7	USB ports
8	Video port
9	From left to right: Service Action Button, Power-On Indicator/Power Button, Controller Health Indicator, System Identification Button, and Cache Active/Off-Load LED. For information about these indicators and buttons, see the FS7600 NAS appliance <i>Hardware Owner's Manual</i> .
10	Remote KVM

Guidelines for Installing Mounting Rails in a Rack

Plan where to install the mounting rails. The appliance uses 2U of rack space.

Dell recommends that you install the rails according to the following guidelines:

- Make sure the rack meets the requirements in [Rack Requirements on page 7](#). The graphics in this manual show a square-hole rack, but the installation instructions also apply to round-hole racks.
- Install hardware starting from the bottom of the rack.

Steps for Installing an Appliance in a Rack



You need at least two persons to install the appliance in a rack.

1. Obtain the rail kit. See [Shipping Box Contents on page 6](#).
2. Position the left and right rails in the orientation in which you will install the rails.
3. Attach the rails to the rack. See [Attaching the Rails to the Rack on page 11](#).
4. Slide the appliance into the rack.
5. Secure the appliance to the rack. See [Securing the Appliance to the Rack on page 12](#).

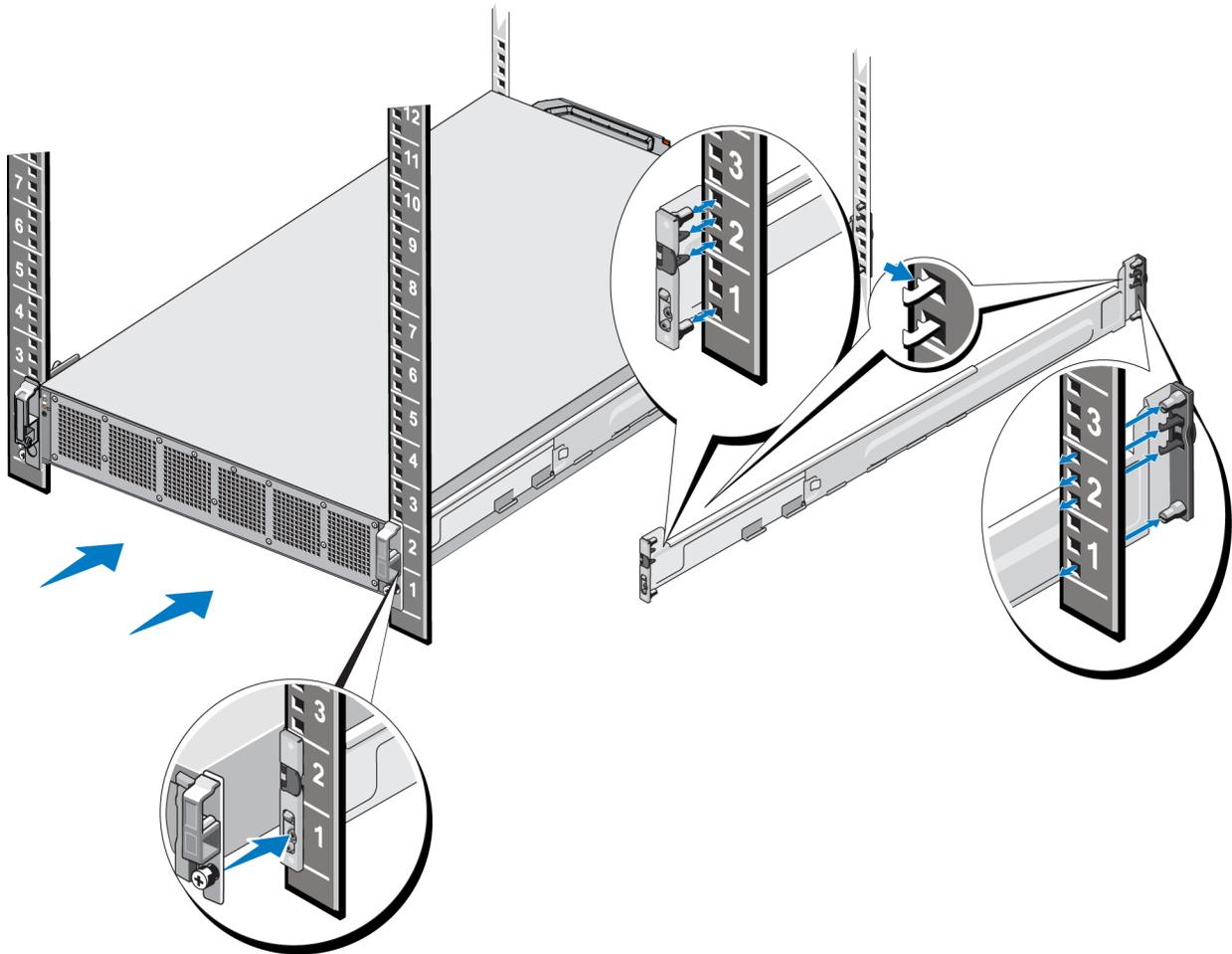
6. Attach the bezel to the appliance. See [Attaching the Bezel on page 12](#).

These steps are described in detail in the following sections.

Attaching the Rails to the Rack

See [Figure 5](#) and follow these steps for attaching each controller rail. For general rack mounting information, see [Guidelines for Installing Mounting Rails in a Rack on page 10](#).

1. Verify where to place the rails in the rack.
2. Align the rails as follows:
 - Make sure the left and right rails are oriented correctly. The rails are stamped L FRONT and R FRONT, respectively. Make sure they are not upside down.
 - The front and rear upper mounting hook aligns with the top hole in any 1U section of the rack.
 - The front lower mounting hook aligns with the bottom hole in any 1U section of the rack.
 - The rear lower mounting hole aligns with the top hole in the next lower 1U section of the rack.
3. Attach the front hooks of the rails to the inside front of the rack.
4. Slide the end of the rail out until it meets the inside rear of the rack. Secure the rear hook to the inside rear of the rack.
5. Optionally, secure the rear rail mount with a #10-32 screw (not included).
6. Check both ends of the rails to make sure they are fully seated in the same rack hole positions and that the rails are level.

Figure 5: Attaching the Rails to a Rack

Securing the Appliance to the Rack

To more securely attach the appliance to the rack, follow these steps:

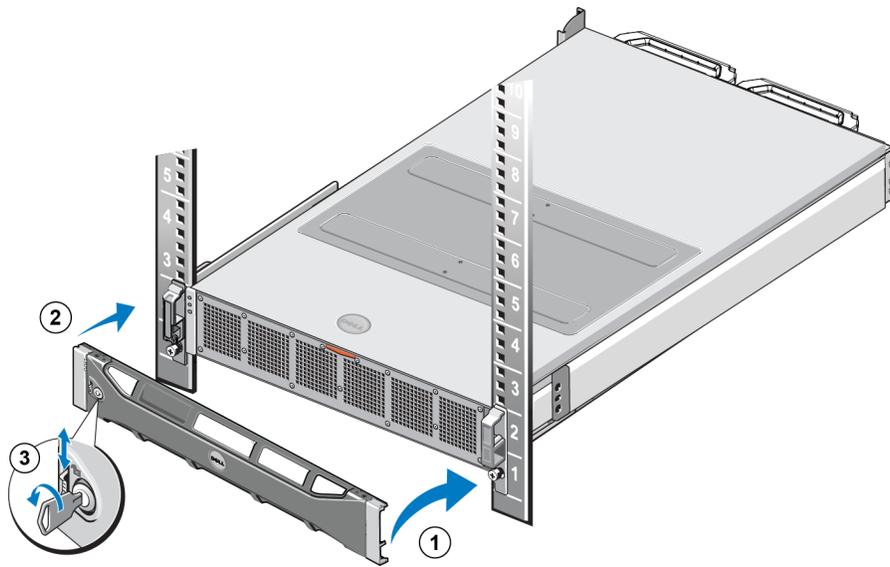
1. Place the appliance on the inner edges of the rails and slide the appliance all the way into place.
2. When fully inserted, the thumbscrews on the front of the appliance will seat into the threaded inserts in the rack. Hand-tighten the thumbscrews on the left and right side of the appliance.
3. Attach the bezel. See [Attaching the Bezel on page 12](#).

Attaching the Bezel

To attach the bezel, see [Figure 6](#) and follow these steps:

1. Insert the right side of the bezel into the slot on the right side of the chassis (callout 1).
2. Push the bezel toward the left side and engage the bezel with the left side of the chassis (callout 2).
3. Use the key to lock the bezel (callout 3).

Figure 6: Attaching the Bezel



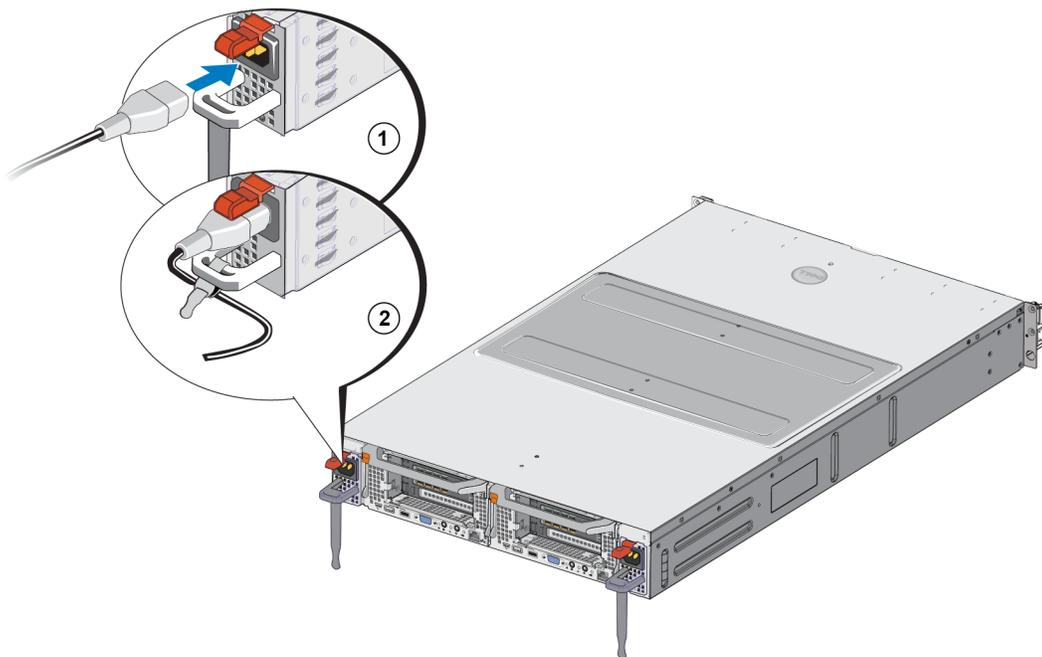
3 Power Connections

After installing the appliance in a rack, connect it to power and make sure it is operational.

Connecting an Appliance to Power

1. Remove the power cables from the shipping box.
2. Plug the power cables into the appliance power supplies. Wrap the hook-and-loop strain relief around the power cable, as shown in [Figure 7](#).
3. Connect the appliance to a power source.

Figure 7: Secure the Power Cable with the Strain Relief



The appliance turns on as soon as the power supplies are connected to a live power source.



Each controller contains a backup power supply (BPS). The BPS batteries begin to charge when the appliance is connected to power. A full charge takes up to eight hours to complete; the NAS appliance is not fully redundant until the battery is fully charged. The BPS provides the clustered solution enough time to write all cached data to disk if the controller experiences a loss of power.

4. Check the LED on the front panel to make sure the appliance is operational (see [Figure 3](#)).

4 Network Cable Connections

Before you connect each appliance to the network hardware, you must set up the required network infrastructure and connect each appliance to the networks used in the NAS cluster.

Network Configuration Overview

The Dell EqualLogic FS7600 requires the following networks:

- Client network—Used for client access to the NFS exports and CIFS shares hosted by the NAS cluster.

The recommended configuration is four client network connections to each controller.

- SAN/internal network—Used for internal communication between the controllers and for communication between the controllers and the EqualLogic PS Series SAN.

The recommended configuration is four SAN/internal network connections to each NAS controller.

For security reasons, the internal network is usually a private network. The client, SAN, and internal networks must be separate subnets.

An FS7600 NAS appliance has four, 4-port NICs, for a total of 16 network connections plus two ports for remote KVM use.

Network Interface Ports

[Figure 8](#) shows the network interface ports on the appliance. [Table 7](#) describes their functions.

Figure 8: FS7600 Network Interface Ports

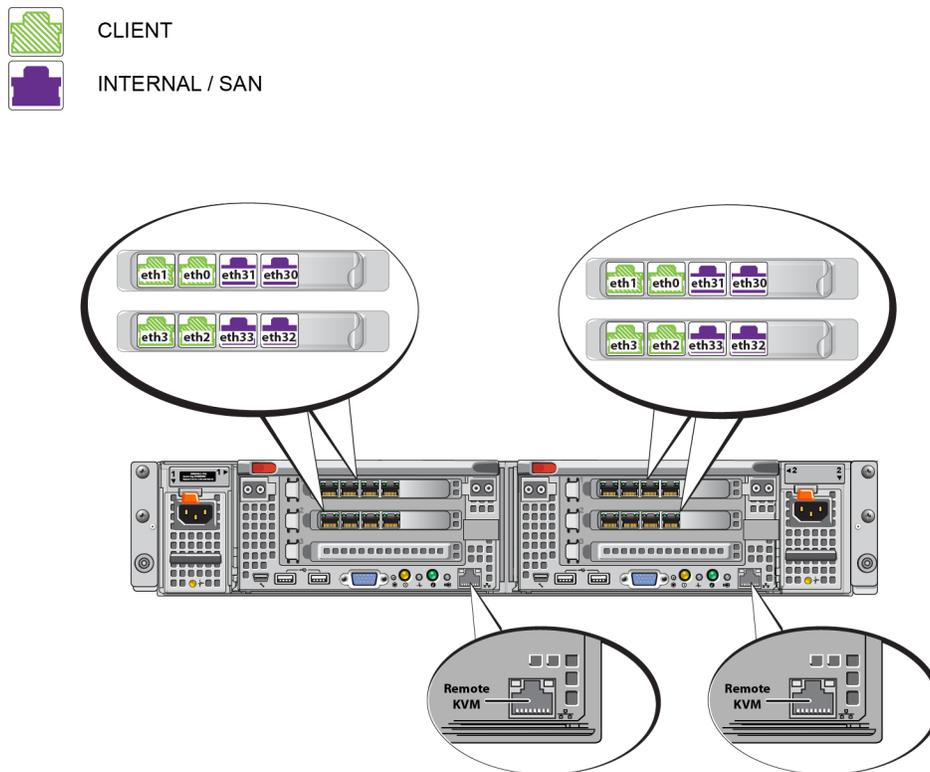


Table 7: Network Interface Port Functions

Ethernet Port Numbers	Function	Comments
Left port pairs in all NICs	Client network	Allows access to the client network (workstations, PCs, shares).
Right port pairs in all NICs	Internal/SAN networks	The internal network connections allow communication between the two controllers. The SAN network connections allow communication between the NAS cluster and the PS Series group (SAN). The SAN and internal networks use two different IP address ranges, but they exist on the same switch or VLAN or Broadcast domain.
LOM port in each controller	Remote KVM	Used by Dell Support personnel for remote KVM troubleshooting purposes.

See [NAS Cluster Network Requirements and Recommendations on page 24](#) for more information.

Network Connection Requirements and Recommendations

Your Dell FS7600 system comes with a Dell service contract. A representative from Global Infrastructure Delivery Services will contact you to install your system. If you have any questions regarding these requirements, discuss them with your Dell service engineer or contact Dell Technical Support.

The Dell FS7600 has the following types of networks:

- Client network—Enables the system to connect to your user clients for file data access.
- SAN/internal network—Enables internal communication between the controllers required for failover and heartbeat, and communication between the controllers and the EqualLogic PS Series SAN for storing user data. The SAN/internal network is connected to the same set of Ethernet switches.

Ideally, you want a network switch configuration in which a switch failure does not disrupt the availability of the NAS cluster. That is, no single switch should have all the client, SAN, or internal network connections.

Requirements and Recommendations for Each Appliance:

- Category 5/6 cables—You need 18 network cables for the FS7600 NAS appliance. Use Category 5 cables only if they adhere to the TIA/EIA TSB95 standard.
- If you rack and cable the FS7600 system yourself, follow the cabling diagram and instructions in [Steps for Connecting Network Cables on page 20](#). Dell strongly recommends using a highly available network topology for both your SAN/internal and client networks.
- Connect the SAN/internal network ports on each network interface card (NIC) to different switches (see [Figure 9](#)).
- Use separate switches for the client network than for the SAN and internal network.
- Use separate subnets for the client network than for the SAN and internal network.
- The client network should be redundant and configured for high availability. Flow control is not required, but Dell recommends using flow control on the client switches.
 - ▲ If you change the default load balancing to LACP or if you use standalone switches, they must be stacked.
- The client network on the FS7600 is set to 1500 MTU by default. However, you can modify the setting on client network switches to enable jumbo frames if required.

Requirements for the SAN/Internal Network:

- Enable flow control on the switches and network interfaces for the SAN/internal network.
- Disable Unicast storm control on the SAN/internal switches. You can use VLANs, but they are not required. If you use VLANs on your switches, the SAN and internal networks must be in the same VLAN.
- Jumbo frames are required on the SAN/internal network. Enable jumbo frames (to support a frame size of 9000 bytes) on the SAN/Internal network switches. Note that Dell PowerConnect switches must be configured to 9216 MTU. Switches from vendors other than Dell might require a different MTU configuration to accept frames of 9000 bytes.
- Do not block IPv6 traffic on your SAN/internal switches.
- Disable IGMP and/or MLD snooping on the switch ports to which the SAN/internal ports of the FS7600 are connected. Refer to your switch manual for instructions on disabling IGMP/MLD snooping on the SAN/internal switch.
- Do not use a router between the NAS appliance and the PS Series arrays.
- Enable Spanning Tree Protocol/PortFast on the SAN/internal network switches.

Steps for Connecting Network Cables

1. Obtain the correct number of network cables. For each controller, you need nine network cables, for a total of 18 cables.
2. Connect the cables for the SAN/internal network connections.
3. Connect the cables for the client network connections. See [Connecting the Client Network Cables on page 21](#).

Figure 9 shows the recommended EqualLogic FS7600 network configuration. Table 8 describes the components shown in the figure.

Figure 9: EqualLogic FS7600 Network Configuration

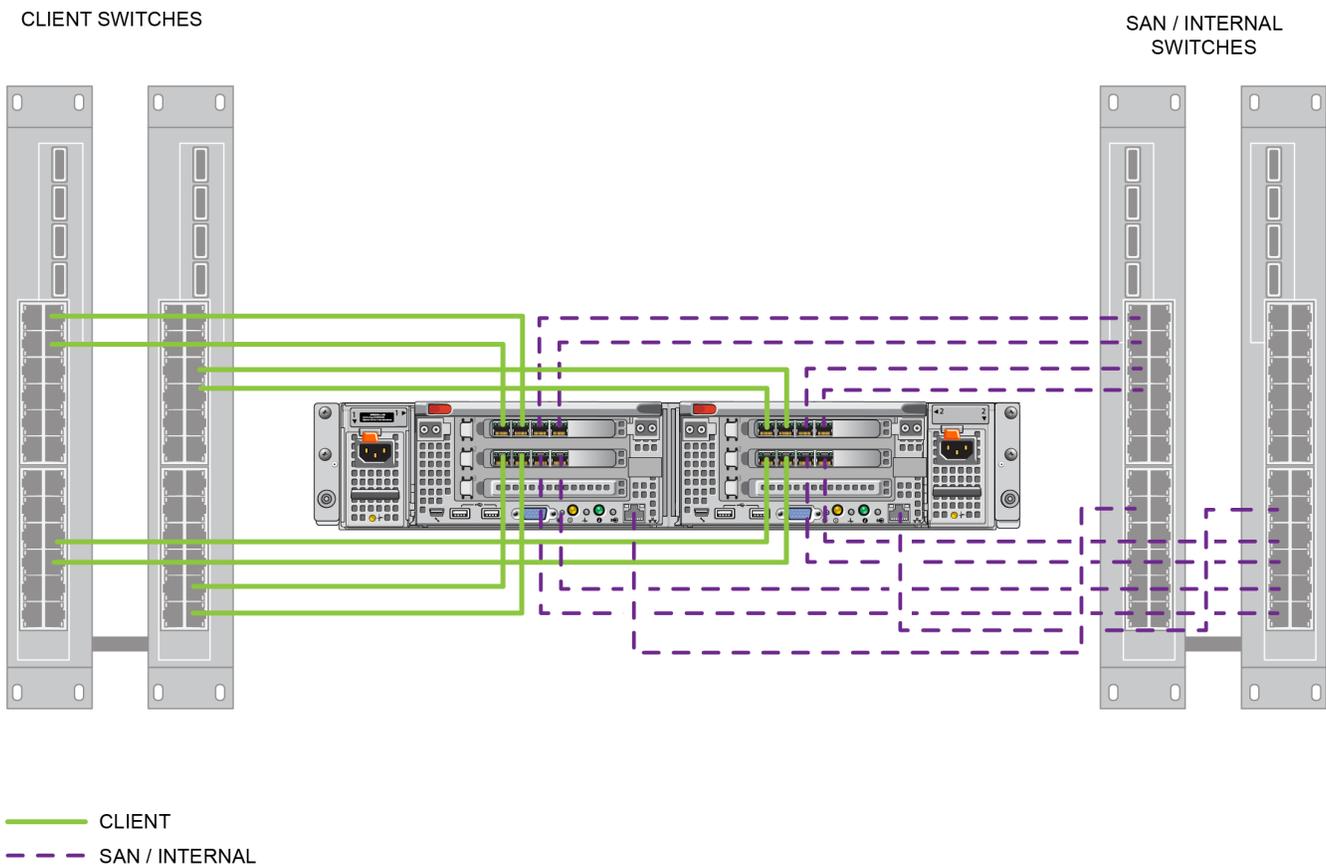


Table 8: Network Component Descriptions

Description	Line Attributes
Switch stack for client connections	Solid line (green)
Switch stack for SAN and internal network connections	Dashed line (purple)

 If you use VLANs within your switch stack, the SAN and internal networks must be in the same VLAN.

Connecting the Client Network Cables

For each controller, refer to the luggage tag attached to the appliance to identify the network ports for the different switches: client, SAN, and internal. See [Figure 9](#) for guidance on how to distribute the client connections to support failover and to eliminate a single point of failure.

- On the left-side controller, connect the top-left client ports to one client switch, then connect the bottom-left client ports to a different client switch.
- On the right-side controller, connect the top-left client ports to the same client switch as the bottom-left client ports on the other controller.
- Connect the bottom-left client ports to the same client switch as the top-left client ports on the other controller.

5 NAS Cluster Configuration

After completing the EqualLogic FS7600 hardware installation, you can configure a NAS cluster.

Steps for Configuring a NAS Cluster

1. See *Gathering the NAS Cluster Configuration Information on page 23*.
2. Complete [Table 9](#).
3. Use the Group Manager GUI to discover each FS7600 NAS appliance that you want to include in the NAS cluster and then start the Configure NAS Cluster wizard. See *Discovering Controllers and Configuring a NAS Cluster on page 26*.

When the Configure NAS Cluster wizard completes, the group begins to configure the NAS cluster. The NAS Cluster Configuration – Progress window appears, enabling you to track the progress of the cluster configuration.

The PS Series group remains fully operational during the NAS cluster configuration.

After you successfully configure a NAS cluster, you can create multiple NAS containers.

Gathering the NAS Cluster Configuration Information

Before beginning the NAS cluster configuration, obtain the following information:

- Service tag number for each FS7600 NAS appliance you want to add to the NAS cluster.

You must add controllers to a NAS cluster in pairs. A NAS cluster can support up to four controllers (two appliances).

The service tag identifies an appliance, which contains two controllers that must be paired with each other. The service tag number is on the right-side ear on the front of the appliance (*Appliance Front and Back Panels on page 9*).

- Initial size of the NAS reserve and the storage pool from which to consume the space.

The NAS reserve is the amount of storage capacity, from an EqualLogic storage pool, dedicated for use by the NAS cluster. The NAS reserve stores the following data:

Internal data. Each controller pair requires a minimum of 512GB of space.



If you specify the minimum NAS reserve size, you will have little to no space for creating containers unless you increase the NAS reserve. Specify a value larger than the minimum to avoid space issues.

After you configure the NAS cluster, you can increase the size of the NAS reserve, as needed. However, you cannot later decrease the NAS reserve.

- Information about the client, SAN, and internal networks used in the NAS cluster.

See *NAS Cluster Network Requirements and Recommendations on page 24* and complete [Table 9](#) before you begin the NAS cluster configuration.

NAS Cluster Network Requirements and Recommendations

A NAS cluster includes three networks: client, SAN, and internal. Network requirements and recommendations are as follows:

- Obtain IP addresses from your network administrator.
- Do not use the same subnet for the internal network, SAN network, and client network.
- Dell recommends that the internal network be a private network. A private network, often implemented in a local area network (LAN), uses private IP address space and adheres to RFC 1918 and RFC 4193 standards.

Client Network

The client network uses a single, virtual IP address for client access to the entire NAS subsystem. The controllers determine which one accepts the client connection and continues to host that connection until the session ends.

 If you use a routed network or want to use many client VIPs for load balancing in a routed environment, see the *Dell EqualLogic Group Manager Administrator's Manual* and online help for configuration instructions.

Client network requirements include:

- NAS cluster name—Unique name that clients use to access the NAS cluster.

If using DNS in the PS Series group, you must manually add the NAS cluster name and NAS cluster IP address to the DNS server.

- NAS cluster IP address—IP address that clients use to access the CIFS shares and NFS exports hosted by the NAS cluster.

After creating the NAS cluster, you can modify the client network configuration and add more NAS cluster IP addresses to ensure proper load balancing across client subnets.

- NAS cluster netmask—Mask that identifies the subnet to which the NAS cluster IP address belongs.
- NAS cluster default gateway—Gateway that enables client access across subnets. The gateway IP in the client network must be a valid, reachable IP for a successful controller failover.
- NAS controller IP addresses for the client network—IP addresses for internal and maintenance operations. Specify one IP address for each controller you are adding to the NAS cluster.

When creating a NAS cluster, in the dialog box that prompts you for the client network information, click the `Auto fill` button to automatically enter one IP address for each NAS controller, based on the NAS cluster IP address.

In addition, each controller also has an actual, unique IP address. These addresses must be configured manually; you cannot use DHCP.

SAN Network

SAN access requirements include:

- NAS cluster management IP address—IP address for PS Series group access to the NAS cluster. Must be on the same subnet as the group IP address.
- NAS controller IP addresses for SAN access—IP addresses for PS Series group access to the NAS controller. Each controller has a real, unique IP address. These addresses must be configured manually; you cannot use DHCP. If you use DNS, you must make sure that the DNS database reflects the IP number by manually setting the subsystem name and IP address.
- Dell recommends four IP addresses for each NAS controller (use [Table 9](#) to plan your initial network configuration). When creating a NAS cluster, in the dialog box that prompts you for the SAN access information, click the `Auto fill` button to automatically enter four IP addresses for each NAS controller, based on the NAS cluster management IP address.

Internal Network

Internal network requirements include:

- Block of IP addresses
- Initial IP address for the address block

You can choose one of the following options:

- 256 IP addresses (/24)—Specifies 256 for the IP address block size. Allows one choice for the initial IP address (0 for the fourth octet).
- 128 IP addresses (/25)—Specifies 128 for the IP address block size. Allows two choices for the initial IP address (0 or 128 for the fourth octet).
- 64 IP addresses (/26)—Specifies 64 for the IP address block size. Allows four choices for the initial IP address (0, 64, 128, or 192 for the fourth octet).

The option you choose depends on your network configuration and the number of available IP addresses. In some cases (for example, in a Class C network), selecting the option for 256 IP addresses is the easiest and provides the most flexibility. However, if you do not want to allocate such a large number of IP addresses, you can select a different option.

The actual size of the IP address block does not affect the NAS cluster performance.

After obtaining the NAS cluster information, use it to complete [Table 9](#). You will need this information when configuring the NAS cluster.

NAS Configuration Reference Table

Obtain the information described in [Gathering the NAS Cluster Configuration Information on page 23](#) and fill in [Table 9](#). Obtain IP addresses from your network administrator.



Do not use duplicate IP addresses for the client, SAN, or internal network. The installation will fail if duplicate IP addresses are present.



Do not use the same subnet for the internal network and the client network. However, you can optionally use the same switch and VLANs as the SAN network; you do not need to create separate VLANs.

Table 9: NAS Cluster Initial Network Configuration

Network	Configuration Information				
Client network	NAS cluster name				
	NAS cluster IP address				
	Netmask				
	Default gateway				
	Controller IP addresses for the client network (one IP address for each controller)				
	Controller 0				
	Controller 1				
	Controller 2				
	Controller 3				
SAN access	Group IP address				
	NAS cluster management IP address				
	Controller IP address for SAN access (four IP addresses for each controller)				
		Controller 0			
		Controller 1			
	Controller 2				
	Controller 3				
Internal network	IP address block size				
	Initial IP address				

Discovering Controllers and Configuring a NAS Cluster

1. In the Group Manager GUI Activities panel, click `Discover NAS devices`.
2. In the Discover Devices dialog box, select the service tag for each NAS appliance that you want to include in the NAS cluster. Make sure that `NAS` appears in the `Product` column for the device.
 - Make sure the appliance has both NAS controllers installed. After being configured into a NAS cluster, an appliance appears in Group Manager as a NAS member.
 - If all the expected devices do not appear in the Discover Devices dialog box, click `Rediscover`. If the expected devices still do not appear, make sure each controller is correctly connected to the networks.
3. Click `Configure NAS Cluster` in the Discover Devices dialog box to start the Configure NAS Cluster wizard.

Each step in the wizard has online help available if you need assistance.

4. When you click `Finish` in the final summary dialog box, the NAS Cluster Configuration – Progress window is displayed; you can track the progress of the cluster configuration. The PS Series group remains fully operational during the NAS cluster configuration.

When the NAS cluster configuration completes, expand `Group Configuration` in the left panel and click `NAS Cluster cluster_name`. The NAS Cluster – Status window displays details about the NAS cluster.



Refer to the release notes for compatibility information for the PS Series Storage Arrays and the FS Series Appliances firmware.'

6 NAS Storage Allocation

After creating a NAS cluster, you can create multiple containers, each with its own size, access controls, and snapshot settings.

Steps for Allocating NAS Storage

A NAS cluster can contain multiple NAS containers. On each container, you can create multiple CIFS shares and NFS exports, as needed by your environment.

To allocate NAS storage for client use:

1. Gather the information for the NAS storage allocation. See [Gathering the NAS Container Information on page 29](#).
2. Create a container and, optionally, a CIFS share or NFS export. See [Creating a NAS Container on page 30](#). You can also create shares and exports on a container at a later time.

When you create a container, CIFS share, or NFS export, clusterwide default values are applied. You can modify the NAS cluster and change the clusterwide default values.



In some cases, you can override a default value when creating a container, share, or export. For example, you can change the default snapshot reserve value when creating a container. In other cases, you must modify the container, share, or export to change a default value. For example, you must modify the container to change the default container security mode or the UNIX file and directory permissions.

3. Make sure clients can access each share or export that you created. See [Accessing a CIFS Share on page 31](#) and [Accessing an NFS Export on page 32](#).

After allocating NAS storage, see [Chapter 7, What to Do Next](#).

Gathering the NAS Container Information

Before creating a NAS container, obtain or decide upon the following information:

- Container name—Identifies the container. Container names must be unique in the PS Series group. The container name must be a valid UNIX file name. Clients use the container name to access NFS exports on the container.
- Container size—Capacity of the container. You can increase or decrease the size of the container with no disruption to users.
- Snapshot reserve (optional)—Percentage of the container size that can be used to store snapshots. Snapshot reserve is consumed from the NAS reserve space allocated to the container. Therefore, user data and snapshots compete for the same container space. Note that data takes precedence over snapshots. If the container begins to run out of space, it takes space from the snapshot reserve. The oldest snapshots are deleted first.

Unless you specify a different value, the container will use the clusterwide default value for the snapshot reserve (50%).

- In-use warning limit—Percentage of the container size that, when consumed by user data or snapshots, results in an event message.

Unless you specify a different value, the container will use the clusterwide default value for the in-use warning limit (80%).

- Security mode and permissions—By default, a container supports NTFS. You can modify the container to change the security mode and permissions. See [Security and Permissions on page 30](#) for more information.

Creating a NAS Container

As part of creating a container, you can select the option to create a CIFS share or an NFS export and specify the share or export name and the directory. However, you can skip creating a share or export at this time, and create shares and exports after creating the container.

NAS clusters support Unicode for the following names:

- CIFS share name
- CIFS directory name
- NFS export name
- NFS directory name

More specifically, this support includes all the characters in any language's alphabet, Arabic numerals, dots (also called periods), and the dash or hyphen character (-).

To create a NAS container:

1. Click `NAS` in the lower-left GUI window and then click `Create NAS Container` in the Activities panel.
2. In the Create NAS Container wizard dialog boxes, enter the information you obtained in [Gathering the NAS Cluster Configuration Information on page 23](#).

As you work through the wizard, remember that each step has online help available if you need assistance.

3. The final dialog box shows a summary of the container configuration and any share or export you created. Click `Finish` to complete the configuration. Click `Back` to make changes.

Security and Permissions

The NAS cluster supports the following share types:

- NTFS (Microsoft)
- UNIX (POSIX)
- Mixed

All three options allow access to the other types. However, the Mixed type changes the permission based on the assigned permissions of the last user who accessed the share. Therefore, the Mixed type is not recommended in environments where share access needs to be controlled.

Microsoft Active Directory and UNIX/Linux POSIX permissions are different, and cannot be accurately related to each other. Determine whether your environment is predominantly Microsoft or Linux, then decide on a share type that allows the best access control with the least management effort.

For example, if your environment chiefly has Microsoft clients, define the shares as NTFS. Active Directory permissions will be applied by user name regardless of whether the client is actually Linux or Microsoft.

Conversely, the permissions used in a predominantly Linux/POSIX environment will be POSIX-based by either an LDAP or NIS server.

Transferring Share Ownership

When you create a CIFS share, it is initially owned by the CIFS administrator. This built-in account has a randomly generated password for security purposes. From the Group Manager GUI where you logged in as the default Group Manager administrator (the `grpadmin` account), you must change the CIFS administrator's password before attempting to access the CIFS share from a client system.

To change the CIFS administrator password, see the *Dell EqualLogic Group Manager Administrator's Manual*.

From a Windows client system, log in to the CIFS share using the new CIFS administrator password and assign or share read-write permissions to individual users or groups.

You can also perform this operation using the Domain Administrator account, if the NAS cluster is part of an Active Directory domain. Only the CIFS administrator or the domain administrator can set the permissions for other local users and groups, or domain users and groups.

Accessing a CIFS Share

For a user to have access to a CIFS share, the following conditions must be met:

- The user must be a valid user and provide a valid password (local or remote authentication).
- The group administrator must set the CIFS administrator password.
- An administrator must log in to the share using the CIFS administrator account (DOMAIN\ADMIN) and password and use the normal Windows operating system process to assign the user write permission to the share.

If the last two conditions are not met, a user can access the CIFS share but cannot write to it.

To access a CIFS share from a Windows system, follow the steps for your Windows version. For example, to access a CIFS share from a system running Windows Server 2008 R2:

1. Click `Start`, then click `Run`.
2. Specify the NAS Cluster IP address in the `Open` field and `share name` and click `OK`.
3. In the Windows security dialog box, enter `_ip_address\share_name` and your CIFS administrator password, then click `OK`.
4. In the `Connect As` dialog box, enter a valid user name and password, then click `OK`. Note that you can enter `CIFSstorage\administrator` for a user name and the CIFS password that you set previously.

Users can now log in to the CIFS share and perform read and write operations. The default permission is to disallow guest access. You can modify the share to allow guest access.

For complete information about accessing CIFS shares, and setting ACLs or SLPs on a CIFS share, see the *Dell EqualLogic Group Manager Administrator's Manual* and the online help available from the Group Manager GUI interface.

Accessing an NFS Export

If you plan to use NFS over TCP, set up the firewall first:

1. Adjust the firewall to allow the FS7600 controllers to be the source IP.
2. Open the firewall to allow for port ranges.

To mount an NFS export on a UNIX system, log in as `root` and run the `mount` command with the following recommended options and parameters:

```
mount -o rw,bg,hard,nointr,tcp,vers=3,timeo=2,retrans=10,rsize=32768,  
wsize=32768 client_access_vip:hostname:/container_name /exported_directory /local_directory
```

The `exported_directory` must be the full path name that you specified when creating the NFS export.

Because the default trusted user setting is “All except root,” only users other than `root` can access the export. You can modify the export and change the trusted users to “Nobody” or “All.”

In addition:

- The default client access permission provides access to all clients. You can modify the export and limit access to specific IP addresses.
- The default access type is read-write. You can modify the export and change it to read-only.

For complete information about accessing an NFS export, see the *Dell EqualLogic Group Manager Administrator's Manual* and the online help available from the Group Manager GUI interface.

7 What to Do Next

You can customize the NAS cluster and create additional containers, CIFS shares, and NFS exports. You can also use snapshots to protect NAS container data.

NAS Cluster Documentation

The *Dell EqualLogic Group Manager Administrator's Manual* provides detailed NAS cluster information. The Group Manager online help describes how to use the Group Manager graphical user interface (GUI) to manage a NAS cluster.

The *Dell EqualLogic Group Manager Administrator's Manual* and the Group Manager command line interface (CLI) help describe how to use the CLI to manage a NAS cluster.

For information about maintaining NAS cluster hardware, see the FS7600 NAS appliance *Hardware Owner's Manual*.

For the latest information about NAS clusters, see the Dell EqualLogic customer support website.

NAS Cluster Operations

You can optionally perform any of the following operations on a NAS cluster:

- Display NAS cluster information—You can display information about a NAS cluster, including the status, space utilization, and network configuration.
- Modify the default values for space and permission settings applied to new containers—When you create a container, the cluster applies default values for space and permission settings.

You can modify the following clusterwide default values for a new container:

- Container in-use space warning limit, snapshot reserve percentage, and snapshot in-use space warning limit
 - File security style (*Mixed*, *NFTS*, or *UNIX*)
 - UNIX file permissions and UNIX directory permissions (744 and 755, respectively)
- Modify the default value for the guest access setting applied to new CIFS shares—When you create a CIFS share, the cluster applies a default value for the guest access setting. You can modify the value of the clusterwide default setting to allow or disallow guest access by unknown users.
 - Modify the default values for permission settings applied to new NFS exports—When you create an NFS export, the cluster applies default values for settings.

You can modify the following clusterwide default values for a new NFS export:

- Read-write or read-only permission
 - Trusted users (*All except root*, *all*, or *nobody*)
- Set up local users and groups.
 - Set up Active Directory for external authentication of Windows users.
 - Set up NIS or LDAP for external authentication of UNIX users.

- Create a container—You can create multiple containers in a NAS cluster.

NAS Container Operations

You can optionally perform any of the following operations on a NAS container:

- Display container information—You can display information about the containers in the NAS cluster, including the status, space utilization, CIFS shares, NFS exports, snapshots, schedules, and quotas.
- Modify the file security style—You can modify the file security style (`Mixed`, `NFTS`, or `UNIX`) for a container.
- Modify the UNIX directory and UNIX file permissions—You can modify the UNIX file and UNIX directory permissions (`Read`, `Write`, and `Execute`) for `Owner`, `Group`, and `Others`.
- Create group and user quotas—You can create group and user quotas to control client space usage in a container.
- Create a CIFS share—You can create multiple CIFS shares on a container.
- Modify whether to allow guest access to a CIFS share—You can allow or disallow guest access to a CIFS share by unknown users.
- Enable NAS antivirus service (on CIFS shares only).
- Create an NFS export—You can create multiple NFS exports on a container.
- Modify the permission settings for an NFS export.

You can modify:

- Client access permission setting (allow access to all clients or only clients with the specified IP address)
- Read-only or read-write permission setting
- Trusted users (`All except root`, `all`, or `nobody`)
- Create a snapshot—To protect container data, you can create snapshots.
- Create a snapshot schedule—To create container snapshots regularly, you can create a snapshot schedule.
- Set up replication and backups (NDMP) to protect your data.

Glossary

Understanding terminology related to a NAS cluster will help you successfully deploy, manage, and maintain your unified storage environment.

Dell FluidFS

High-performance, scalable file system that is configured on storage space.

group

See [PS Series group](#).

group IP address

Highly available IP address that iSCSI initiators use to access iSCSI targets hosted by a PS Series group.

IPMI

Intelligent Platform Management Interface.

NAS controller

One of a pair of hardware components running file sharing software, and integrated into a NAS appliance (for example, an FS7600).

NAS container

Virtual container that consumes space in the NAS reserve. Administrators can create CIFS shares and NFS exports on a NAS container and share them with authorized users. A NAS cluster supports multiple NAS containers.

NAS appliance

Dell hardware that contains two controllers that must be paired together when configured into a NAS cluster. After an appliance is configured, it becomes a NAS member.

NAS member

A NAS appliance that has been configured into a NAS cluster. The NAS member contains two NAS controllers that must be managed as a pair.

NAS reserve

Storage pool space on a PS Series group allocated to a NAS cluster for storing internal data and user data configured with Dell FluidFS.

NAS cluster

Provides highly available and scalable NAS storage by using a PS Series group and at least one EqualLogic NAS appliance, configured and managed through Group Manager.

NAS cluster IP address

Highly available IP address that clients use to access CIFS shares and NFS exports hosted by a NAS cluster.

NAS cluster management IP address

IP address used for internal operations between NAS members and the PS Series group.

PS Series group

One or more PS Series storage arrays configured on a network, accessed through a single IP address and managed as a single system.

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