Updating PS Series Storage Array Firmware

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Overview

This document describes the considerations and procedures for updating the firmware on PS Series storage arrays. It applies to all supported firmware update paths and includes the following sections:

- *Planning & Prerequisites*, beginning on page 1

- *Known Issues and Considerations*, beginning on page 5

- *Upgrading the Firmware*, beginning on page 6

- *Post-Upgrade Tasks*, beginning on page 10

- *CLI Output Examples* on page 11

Note: If you are applying a PS Series firmware patch, follow the instructions in the patch release's upgrade document. Patch releases can be downloaded from the customer support website, located at support.dell.com/equallogic.

A PS Series storage array includes single or dual control modules, each with a compact flash card or microSD card containing the PS Series firmware. To take advantage of new product features, enhancements, and bug fixes, you should always run the latest PS Series storage array firmware.

Do not update firmware until you read and fully understand all the pertinent information in this document.

WARNING: If you are upgrading from version 5.0.0 or version 5.0.1 to any subsequent version, you must follow the instructions in the *Release Notes* for version 5.0.2 of the firmware. Do not follow the procedure listed under *Upgrading the Firmware* on page 6 of this document.

Planning & Prerequisites

Before scheduling a firmware update, allow enough time to address the following requirements:

- *SAN Planning*

- *Planning for Downtime and Minimizing Host Disruption*

- *Working with Multi-Member Groups*

- *Host Software Requirements*

- *Supported Upgrade Paths*

SAN Planning

In a SAN, the various hardware components (including arrays, switches, OS drivers, and NICs) interact with each other and with the operating system and applications. Therefore, a disruption in the availability of one SAN component can have an impact on the entire infrastructure, leading to unplanned downtime.

Before updating a SAN component, you must fully understand the impact of the update on the infrastructure. Careful planning of the upgrade process can help you avoid unplanned downtime. In some cases, performing updates in a planned downtime window may be the best way to protect against unexpected disturbances. In addition, after updating any SAN component, test the newly-updated component in the SAN to be sure it is properly functioning.

Dell recommends that you perform firmware upgrades during off hours or scheduled maintenance periods to avoid disruption of service to the applications and servers that the storage group supports. If possible, perform the upgrade after a backup.

Dell also recommends that you keep initiators and drivers up to date. The Dell EqualLogic support website lists supported initiators. Apply the recommended modifications to your operating system and iSCSI initiators specified in the *iSCSI Initiator and Operating System Considerations* document.

Consider the following when upgrading infrastructure:

• Does the upgrade procedure require a service disruption for the device you are upgrading? If so, what will its duration be?

• Can the existing redundancy at the server, network, and storage level allow service to continue during the upgrade, despite the service disruption?

• Are the iSCSI initiators accessing group volumes configured to automatically retry during service disruptions? Will applications be able to resume processing without I/O errors, failures, or server reboots?

Some typical, but not universal, device timing issues are as follows:

• Network switches can take from 30 seconds to several minutes to reboot after a power cycle or firmware upgrade.

• For cluster configurations, Dell recommends that you place the cluster in maintenance mode during SAN infrastructure upgrades. Average storage array restart times range from 15 seconds to several minutes, depending on your specific configuration.

• After updating a SAN component (for example, an array or a switch), allow the SAN to stabilize before updating another component. For example, use the Group Manager GUI or CLI to make sure that all members and volumes are online. Make sure that iSCSI initiators reconnect to volumes, if applicable. Then, continue with the next step in the update process.

• Initiators need to support error recovery and retry times of one minute or more to allow servers and applications to avoid disruptions that may occur during the upgrade.

Planning for Downtime and Minimizing Host Disruption

The update procedure requires an array restart. During an array restart, volumes with data on the array are temporarily unavailable until the restart completes.

In some cases, you may need to make modifications to the operating system. You should also make sure that applications using volumes can tolerate the restart. In all cases, you should first test them in a non-production environment.

Follow the guidelines in the PS Series *iSCSI Initiator and Operating System Considerations* document for initiator configurations and switch settings, including initiator timeout settings and rapid spanning tree on end node ports. The document also provides examples of operating system and iSCSI initiator configurations that can handle an array restart without disruption. If you do not have one of the identified configurations or if you are unsure of your application's ability to tolerate the restart, plan for downtime when updating firmware. This can involve shutting down hosts accessing the group before and during the upgrade procedure.

Working with Multi-Member Groups

Dell recommends that all PS Series group members run the same version of the storage array firmware; in multi-version configurations, the group can only support functionality common to all versions.

Mixed firmware in a group

If you are adding a new array to an existing group, consider updating the group to the latest firmware before adding the new member to the group. In general, mixed firmware groups are supported only for as long as it takes to update all members. See *Supported Upgrade Paths* and *Version-specific Constraints*, beginning on page 4 for information about specific firmware releases.

Multi-member group updates

In a multi-member group, perform the update procedure on one member at a time. If you must update to an interim version, update all the members to the interim version, then update all the members to the final version. Between updating group members, wait for the SAN to stabilize before continuing with the update. For example, use the Group Manager GUI or CLI to make sure that all members and volumes are online. Also, make sure that iSCSI initiators reconnect to volumes (if applicable).

Upgrading Members Using Maintenance Pools

To avoid the brief interruption in I/O caused by the controller failover during the upgrade process, you can perform firmware upgrades in multi-member groups by moving members into maintenance pools for the duration of the upgrade. When you move a member from one pool to another, the volumes residing on it are moved to other members in the pool and their initiator connections are automatically redirected with no access disruption.

To perform this type of upgrade, first create a maintenance pool. Then, move a member into that pool and upgrade its firmware. After the firmware upgrade completes and the member restarts, you can move the member from the maintenance pool back to the pool in which it previously resided. Repeat the process, one member at a time, until the firmware for all members in the group has been updated. After the upgrade is complete, you can delete the empty maintenance pool.

Alternately, you may also remove the member from the group entirely, upgrade its firmware, and then add it back to the group, repeating the process for each group member.

To perform upgrades using these techniques, there must be sufficient capacity on the other member(s) to temporarily hold the volumes on the member being upgraded. Also, changing members' pool assignments or removing them from the group can be a long operation, depending on the amount of data the group must move to remaining pool members.

Note: See "Setting the RAID policy and pool for a new member" and "Removing a member from the group" in Chapter 6 of the *Group Administration Guide* for instructions on changing a member's pool membership or removing it from the group, respectively.

Host Software Requirements

Host Integration Tools and SAN HeadQuarters

The EqualLogic customer support website (`support.dell.com/equallogic`) lists the versions of Host Integration Tools and SAN HeadQuarters that are recommended for each firmware release.

Note: The minimum supported host software versions may not be able to take full advantage of each firmware release's features.

Browser requirements

You must be running Java 1.5 or higher to update the firmware from the GUI. For Mozilla Firefox browsers, Java 1.6 or higher is required.

Note: The *Release Notes* provide detailed browser support information.

Supported Upgrade Paths

Follow the correct firmware update path. You can update an array directly to the latest firmware version. However, in some cases, you may need to upgrade to an interim version before upgrading to the latest version. For example, to upgrade from Version 4.1 to Version 5.0.2, you must upgrade from version 4.1 to version 4.2 or 4.3, and then to version 5.0.2.

When updating PS Series firmware, follow the paths shown in Table 1 below:

Table 1: Supported Firmware Upgrade Paths

Starting Version	Ending Version
5.0, 5.0.1	5.0.2
4.2*, 4.3*	5.0.2
4.2*	4.3*
4.1*a	4.2*, 4.3*
4.0*	4.1*
3.2*, 3.3*	4.0*
3.1*	3.2*, 3.3*
3.0*	3.1*

Version-specific Constraints

The following constraints apply when upgrading from specific firmware versions:

• For arrays running a PS Series firmware version prior to 2.2.3, you must use the `restart` command to restart the array before copying the update kit to the array.

• If you are running a firmware version earlier than Version 3.0, contact your array support provider for supported upgrade paths.

- After updating a group to PS Series Firmware Version 4.0 or higher, do not add new members running an earlier firmware release.

- Beginning with version 4.1.3, you can use the GUI to upgrade the firmware. For earlier versions, you must use the CLI.

- When updating from V4.1* to V4.*.* using the GUI, the GUI may return to the update menu without restarting the array, making it look as though the update did not occur. However, the update has completed successfully; manually restarting the array through the GUI or the CLI will correct the issue.

- When updating version 4.x firmware to a higher version, the update procedure restarts the controllers individually, with the resumption of service occurring in approximately 15-30 seconds.

- In version 5.0 of the firmware, firmware downgrades are disallowed.

- If you are upgrading from version 5.0.0 or version 5.0.1 to any subsequent version, you must follow the instructions in the *Release Notes* for version 5.0.2 of the firmware. Do not follow the procedure listed under *Upgrading the Firmware* on page 6 of this document.

Known Issues and Considerations

The following issues apply when updating firmware:

Windows Server 2008 R2-based failover cluster

For customers who are using Host Integration Tools with Microsoft Windows Server 2008 R2-based Failover clustering and are planning to upgrade their PS Series Array firmware to V5.0.2 or higher, it is recommended that they upgrade the HIT kit on ALL their cluster nodes to HIT V3.4.2 or higher, before upgrading the firmware.

Pause all collection replications before updating firmware

When planning an update, identify a time period when replication is not occurring. Check all the collection replication schedules. Do not update a PS Series group member while collection replication outbound from the group is in progress; otherwise, the collection replication operation may fail or appear to hang. In addition, make sure that collection replication does not begin while you are upgrading member firmware.

To make sure that no collection replication occurs during an update, you can disable all the collection replication schedules (if the group is running PS Series Firmware Version 3.0 or higher). Then, verify that all in-progress replication operations have completed before updating the member.

GUI Firmware Update will not work in an environment running only the IPV6 protocol

The PS Series group must have IPV4 addresses to use the GUI update procedure. If your group uses an IPV6 address, follow the steps listed under *Upgrading the Firmware Using the CLI* on page 8.

Disallowed firmware downgrades

You cannot downgrade a group member to an earlier firmware version if:

*   You have specifically disabled downgrades in the group, either through the GUI or by running the grpparams `disallow-downgrade` command (see the *Group Administration* guide or the *CLI Reference* for more information).

*   You have used any of the features of the currently installed firmware version that are not available in the previous version.

*   The previous version does not support the control modules or other hardware in the group.

*   You are running version 5.0 of the firmware. In this version, downgrades are disallowed

Upgrading the Firmware

The sections below list the steps for downloading the firmware update kit and for upgrading group member firmware using the Group Manager GUI or CLI.

WARNING: If you are upgrading from version 5.0.0 or version 5.0.1 to any subsequent version, you must follow the instructions in the *Release Notes* for version 5.0.2 of the firmware. Do not follow the procedure listed below.

Downloading the Firmware Update Kit

To download the update kit and associated documentation:

1. On a host that has the FTP utility available, use a web browser to access the Dell customer support website (support.dell.com/equallogic).

2. Log in to your support account. If you do not have a support account, request an account from the Login page.

3. Click Support at the top of the page.

4. Click the Downloads tab, then click PS Series Firmware.

5. Select the PS Series firmware version you are downloading.

6. Download the firmware to a host that has network access to the array.

    Note: Depending on the firmware version, the file may be 12 - 20 MB in size, and may be in .tgz, .tar, or. zip format.

7. Unzip the file to a directory on the host.

Upgrading the Firmware Using the GUI

To perform a firmware upgrade using the GUI, follow the steps listed below.

Note: You must perform the upgrade from a host that has access to both Control Modules in the array and to the switch ports to which they are connected. Use the `ping` command to test network connectivity to the IP address of Ethernet Port 0 on the array.

1. (Optional) Shut down the hosts accessing group volumes. See *Planning for Downtime and Minimizing Host Disruption* on page 2 for more information.

2. On the computer to which you downloaded the firmware kit, start the Group Manager GUI and log in using the `grpadmin` account.

    Note: Only the grpadmin account can update group firmware.

3. Click Group, then Group Configuration, and then the Advanced tab.

4. In the Member Firmware panel, click Update firmware. (Alt+U).

5. Enter the password for the default group administration account on the group (grpadmin), then click OK.

6. In the Select firmware update file dialog box, navigate to the location of the firmware kit you downloaded, then click Open. If this dialog box does not open automatically, click Browse in the Firmware Update dialog box to open it.

7. The Firmware Update dialog box shows firmware for each group member. Additionally, it notes whether the firmware update is an earlier or later version than the firmware currently running.

    In the row with the member you want to update, click the link in the Action column. In the Firmware Update dialog box, select a member to update. The Action column displays a different option depending on the firmware version you are applying and the version currently installed on the member:

    –   Update - Kit firmware is different from the member firmware.

    –   Upgrade - Kit firmware is a higher version than the member firmware.

    –   Downgrade - Kit firmware is a lower version than the member firmware.

    –   Reinstall - Kit firmware is the same version as the member firmware.

    –   Apply patch - Kit firmware is a patch.

8. Select an action to start the update process, which does the following:

    –   Step 1 of 3: FTP the kit to the array

    –   Step 2 of 3: Process firmware update

9. When the preparatory steps are complete, the Action column displays a link to restart the member. Click `Restart` and then click `Yes` in the confirmation dialog box.

Notes: The firmware upgrade is not complete until after the member restarts.

You may briefly lose connectivity to the Group Manager GUI while the member restarts, but the connection will be restored automatically. During the interruption, the Firmware Update dialog box displays a status of Offline.

In a single-member group, or on a member with a single control module, when the member goes offline during its update process, the status may not display correctly. A member that is offline cannot report its status. When the member restarts and is again online, the GUI displays the correct status.

10. Repeat this process for each additional group member.

   Note: Between updating members, wait for the SAN to stabilize before continuing with the update. For example, make sure all members and volumes are online.

11. When all group members have been updated to the same firmware version, click Close.

12. Close and restart the GUI after all members are updated to make sure the GUI is consistent with the new features in the updated firmware.

13. Verify the firmware update by selecting Members in the navigation panel, selecting the member(s) for which you have updated firmware, and then clicking the Controllers tab.

14. Perform the tasks listed under *Post-Upgrade Tasks* on page 10.

Upgrading the Firmware Using the CLI

To update firmware using the CLI, follow these steps.

Note: See *CLI Output Examples* on page 11 for examples of the screen output shown during this process.

1. (Optional) Shut down the hosts accessing group volumes. See *Planning for Downtime and Minimizing Host Disruption* on page 2 for more information.

2. Connect to the array using telnet, SSH, or a serial connection. Connect through an IP address assigned to a network interface on the array (for example, Ethernet Port 0). Do not connect to the group IP address.

   Note: If you are using a serial connection, use the characteristics stated in the *CLI Reference* guide.

3. Log in to the array using the `grpadmin` account

   Note: Only the grpadmin account can update group firmware.

4. Use FTP to copy the firmware .tgz file to the array you are upgrading:

   Note: See *Output shown when copying firmware to array using FTP* on page 11 for sample screen output shown when you perform this step.

   a. Type `ftp` to open an FTP session.

   b. Type `open`, followed by the IP address of the array to open a connection.

      For example: `open 192.168.10.20`

   c. When prompted for an account and password, specify the `grpadmin` account and password.

   d. Enter `binary` to enable a binary mode transfer.

   e. Type `put` followed by the filename to transfer the file.

For example: `put kit_12345678.tgz.` A `Transfer complete` status message appears to indicate that the file transfer was successful.

Note: Filenames are case-sensitive.

    f.   Type `close` to close the session.

    g.   Type `bye` to close the FTP window.

5.   At the Group Manager CLI prompt, enter the `update` command.

Notes: On an array with dual control modules, the `update` command updates both control modules.

        See *Output shown when entering the update command* on page 12 for sample screen output shown when you perform this step.

6.   When prompted, enter `Y` to confirm that you want to update the array's firmware.

7.   Verify the firmware update by entering `member select` *member_name* `show controllers,` where *member_name* is the name of the member you have updated. In the command output, note the `SlotID` value (which shows the control module) and `FW Rev` value (which shows the Firmware version).

    On arrays with dual control modules, both control modules must be running the same firmware. If the `FW Rev` values for the two controllers do not match, contact Dell Technical Support.

    Note: See *Output shown when verifying the Firmware revision* on page 13 for sample screen output shown when you perform this step.

8.   Repeat this process for each additional group member.

9.   Perform the tasks listed under *Post-Upgrade Tasks*.

Post-Upgrade Tasks

The tasks listed below must be performed after upgrading member firmware.

Restart the array

Restart the array immediately after updating the array. During the restart, iSCSI targets for the volumes with data on the array will be unavailable.

If you plan to shut down the array after a firmware update, Dell strongly recommends that you run the restart command and answer Yes to the question of whether you want to perform the update before restarting. After the group restarts, verify the group configuration before running the shutdown command.

Restart the browser

After updating the firmware on a member, the link to reconnect to the Group Manager GUI may not respond when clicked. Restart your browser and you will be able to log in to the GUI again.

Restart hosts

If you had shut down any hosts accessing group volumes prior to upgrading, turn them back on after the upgrade is complete.

CLI Output Examples

The following sections show examples of screen output shown when you upgrade the firmware as described under *Upgrading the Firmware Using the CLI* on page 8.

Output shown when copying firmware to array using FTP

The following example uses FTP to copy a firmware update kit named kit_12345678.tgz from a host to an array with the IP address 192.168.1.53.

Note: This is the output shown during step 4 under *Upgrading the Firmware Using the CLI*, beginning on page 8.

```
$ ftp
ftp> open 192.168.1.53
Connected to psa1.site.com.
220 192.168.1.53 FTP server ready.
Name: grpadmin
331 Password required for grpadmin.
Password: xxxxxxx
230 User grpadmin logged in.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> binary
200 Type set to I
ftp> put kit_12345678.tgz
local: kit_1234567.tgz remote: kit_1234567.tgz
229 Entering Extended Passive Mode (|||65534|)
150 Opening BINARY mode data connection for 'kit_12345678.tgz'.
100%|**********************| 13191 KB 81.26 KB/s 00:00 ETA
226 Transfer complete.
13508472 bytes sent in 02:42 (81.06 KB/s)
ftp> close
221- Data traffic for this session was 13508472 bytes in 1 file.
 Total traffic for this session was 13509009 bytes in 1 transfer.
221 Thank you for using the FTP service on 192.168.1.53.
ftp> bye
```

Output shown when entering the update command

The following example displays the screen output when you enter the `update` command. After you enter the command, the system prompts you for confirmation that you wish to update the array's firmware.

Note: This is the output shown after you enter the command shown at step 6 under *Upgrading the Firmware Using the CLI*, beginning on page 8.

```
> update

This command will update the firmware on the array's flash card memory using the kit that is
already loaded onto the array.

If you choose to proceed, you will be shown the current firmware version and the version to
which you will update. You will then be given the choice to proceed again.

The firmware update will not take effect until the array is restarted.

Do you wish to proceed (y/n) [y]: y

.

.

.
```

Output shown when verifying the Firmware revision

The following example displays the screen output shown when you enter `member select member_name show controllers` to verify the firmware revision on the array's Control Modules. The `SlotID` value shows the Control Module, and the `FWRev.` value shows the firmware revision running on the controller. In this scenario, the controllers are running Version 5.0.0 firmware.

Note: This is the output shown after you enter the command shown at step 7 under *Upgrading the Firmware Using the CLI*, beginning on page 8.

```
> member select memlab2 show controllers
_____ Controller Information _____
SlotID: 0                               Status: active
Model: 70-0011(TYPE 2)                  BatteryStatus: ok
ProcessorTemperature: 55                ChipsetTemperature: 38
LastBootTime: 2010-06-03:13:31:46       SerialNumber: B027885
Manufactured: 2807                      ECOLevel: C00
CM Rev.: R33                            FW Rev.: Storage Array Firmware V5.0.0
NVRAM Battery: good                        (R124915)
BootRomVersion: 3.3.1                    BootRomBuilDate: Wed Sep 27 01:29:14
                                            EDT 2006

_____


_____
SlotID: 1                               Status: active
Model: 70-0011(TYPE 2)                  BatteryStatus: ok
ProcessorTemperature: 55                ChipsetTemperature: 38
LastBootTime: 2010-06-03:13:31:73       SerialNumber: B027885
Manufactured: 2807                      ECOLevel: C00
CM Rev.: R33                            FW Rev.: Storage Array Firmware V5.0.0
NVRAM Battery: good                        (R124915)
BootRomVersion: 3.3.1                    BootRomBuilDate: Wed Sep 27 01:29:14
                                            EDT 2006

_____
_____ Cache Information _____
CacheMode: write-back    Controller-Safe: disabled
Low-Battery-Safe: enabled
```