NetApp

Upgrade center

SANtricity 11.5

NetApp
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Table of Contents

Upgrade center

Concepts

Controller software and firmware upgrades

You can upgrade your storage array's software and firmware for all the latest features and bug fixes.

Components included in the SANtricity OS controller software upgrade

Several storage array components contain software or hardware that you might want to upgrade occasionally.

- **Management software** — System Manager is the software that manages the storage array.
- **Controller firmware** — Controller firmware manages the I/O between hosts and volumes.
- **Controller NVSRAM** — Controller NVSRAM is a controller file that specifies the default settings for the controllers.
- **IOM firmware** — The I/O module (IOM) firmware manages the connection between a controller and a drive shelf. It also monitors the status of the components.
- **Supervisor software** — Supervisor software is the virtual machine on a controller in which the software runs.
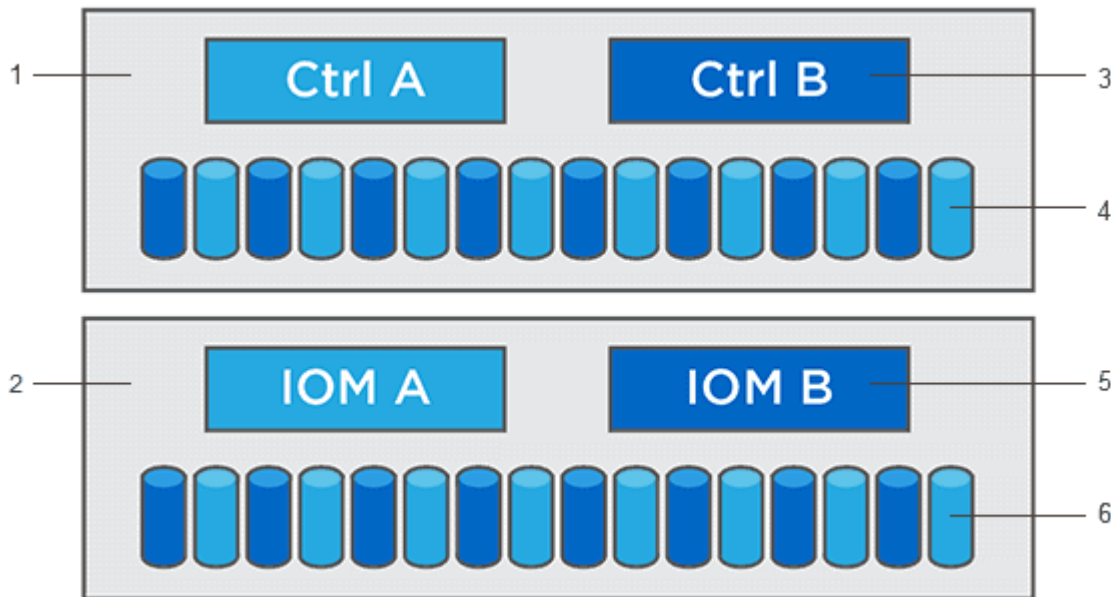
[1] Controller shelf; [2] Drive shelf; [3] Software, controller firmware, controller NVSRAM, supervisor software; [4] Drive firmware; [5] IOM firmware; [6] Drive firmware

You can view your current software and firmware versions in the Software and Firmware Inventory dialog box. Go to **Support › Upgrade Center**, and then click the link for **Software and Firmware Inventory**.

As part of the upgrade process, the host's multipath/failover driver and/or HBA driver might also need to be upgraded so the host can interact with the controllers correctly. To determine if this is the case, see the Netapp Interoperability Matrix Tool.

When to stop I/O

If your storage array contains two controllers and you have a multipath driver installed, the storage array can remain processing I/O while the upgrade occurs. During the upgrade, controller A fails over all of its LUNs to controller B, upgrades, takes back its LUNs and all of controller B's LUNs, and then upgrades controller B. After the upgrade completes, you might need to manually redistribute volumes between the controllers to ensure volumes return to the correct owning controller.

Pre-upgrade health check

A pre-upgrade health check runs as part of the upgrade process. The pre-upgrade health check assesses all storage array components to make sure the upgrade can proceed. The following conditions might prevent the upgrade:

- Failed assigned drives
- Hot spares in use
- Incomplete volume groups
- Exclusive operations running
- Missing volumes
- Controller in Non-optimal status
- Excess number of event log events
- Configuration database validation failure
- Drives with old versions of DACstore

You also can run the pre-upgrade health check separately without doing an upgrade.

Workflow for controller software and firmware upgrade

In SANtricity System Manager, you can upgrade the controller software and firmware by following these steps.
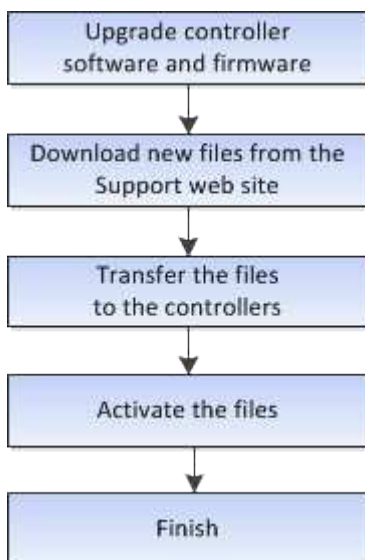
Drive firmware upgrades

Drive firmware controls the low-level operating characteristics of a drive. Periodically, the drive manufacturers release updates to drive firmware to add new features, improve performance, and fix defects.

Online and offline drive firmware upgrades

There are two types of drive firmware upgrade methods: online and offline.

Online

During an online upgrade, drives are upgraded sequentially, one at a time. The storage array continues processing I/O while the upgrade occurs. You do not have to stop I/O. If a drive can do an online upgrade, the online method is used automatically.

Drives that can do an online upgrade include the following:

- Drives in an Optimal pool
- Drives in an Optimal redundant volume group (RAID 1, RAID 5, and RAID 6)
- Unassigned drives
- Standby hot spare drives

Doing an online drive firmware upgrade can take several hours exposing the storage array to potential volume failures. Volume failure could occur in these cases:

- In a RAID 1 or RAID 5 volume group, one drive fails while a different drive in the volume group is being upgraded.
- In a RAID 6 pool or volume group, two drives fail while a different drive in the pool or volume group is being upgraded.

Offline (parallel)

During an offline upgrade, all drives of the same drive type are upgraded at the same time. This method requires stopping I/O activity to the volumes associated with the selected drives. Because multiple drives can be upgraded concurrently (in parallel), the overall downtime is significantly reduced. If a drive can do only an offline upgrade, the offline method is used automatically.

The following drives MUST use the offline method:

- Drives in a non-redundant volume group (RAID 0)
- Drives in a non-optimal pool or volume group
- Drives in SSD cache

Compatibility

Each drive firmware file contains information about the drive type on which the firmware runs. You can download the specified firmware file only to a compatible drive. System Manager automatically checks compatibility during the upgrade process.

How tos

Upgrade software and firmware

You can upgrade your storage array's software and, optionally, the IOM firmware and the nonvolatile static random access memory (NVSRAM) to make sure you have all the latest features and bug fixes.

Before you begin

- You know whether you want to upgrade your IOM firmware.

  Normally, you should upgrade all components at the same time. However, you might decide not to upgrade the IOM firmware if you do not want to upgrade it as part of the SANtricity OS software upgrade or if technical support has instructed you to downgrade your IOM firmware (you can only downgrade firmware by using the command line interface).

- You know whether you want to upgrade the controller NVSRAM file.

  Normally, you should upgrade all components at the same time. However, you might decide not to upgrade the controller NVSRAM file if your file has either been patched or is a custom version and you do not want to overwrite it.

- You know whether you want to activate your OS upgrade now or later.

  Reasons for activating later might include:

  - **Time of day** — Activating the software and firmware can take a long time, so you might want to wait until I/O loads are lighter. The controllers fail over during activation so performance might be lower than usual until the upgrade completes.
  - **Type of package** — You might want to test the new software and firmware on one storage array before upgrading the files on other storage arrays.

- You know whether you want to switch from unsecured drives or internally secured drives to use an external key management server (KMS) for drive security (new feature in release 11.40).
- You know whether you want to use role-based access control in your storage array (new feature in release 11.40).

About this task

You can choose to upgrade only the OS software file or only the Controller NVSRAM file or you can choose to upgrade both files.

Perform this operation only when instructed to do so by technical support.

> ⚠ **Risk of data loss or risk of damage to the storage array** — Do not make changes to the storage array while the upgrade is occurring. Maintain power to the storage array.

Steps

1. If your storage array contains only one controller or you do not have a multipath driver installed, stop I/O activity to the storage array to prevent application errors. If your storage array has two controllers and you have a multipath driver installed, you do not need to stop I/O activity.

2. Select **Support › Upgrade Center**.

3. Download the new file from the Support site to your management client.

   a. In the area labeled SANtricity OS Controller Software upgrade, click **NetApp Support**.

   b. On the Support web site, click the **Downloads** tab, and then select **Software**.

   c. Select **SANtricity OS Controller Software**.

   d. Follow the remaining instructions.

   The file to download has a filename similar to `E28xx_1140` with a `.zip` or `.tar.gz` extension.

   > (i) Digitally signed firmware is required in version 8.42 and above. If you attempt to download unsigned firmware, an error is displayed and the download is aborted.

4. If you do NOT want to upgrade the IOM firmware at this time, click **Suspend IOM Auto-Synchronization**.

   If you have a storage array with a single controller, the IOM firmware is not upgraded.

5. Under SANtricity OS Software upgrade, click **Begin Upgrade**.

   The Upgrade SANtricity OS Software dialog appears.

6. Select one or more files to begin the upgrade process:

   a. Select the SANtricity OS Software file by clicking **Browse** and navigating to the OS software file you downloaded from the Support web site.

   b. Select the Controller NVSRAM file by clicking **Browse** and navigating to the NVSRAM file that you downloaded from the Support site. Controller NVSRAM files have a filename similar to `N2800-830000-000.dlp`.

   These actions occur:

   ◦ By default, only the files that are compatible with the current storage array configuration appear.

   ◦ When you select a file for upgrade, the file's name and size appear.

7. **Optional:** If you selected a SANtricity OS Software file to upgrade, you can transfer the files to the controller without activating them by selecting the **Transfer files now, but do not upgrade (activate upgrade later)** check box.

8. Click **Start**, and confirm that you want to perform the operation.

   You can cancel the operation during the pre-upgrade health check, but not during transferring or activating.

9. **Optional:** To see a list of what was upgraded, click **Save Log**.

   The file is saved in the Downloads folder for your browser with the name `drive_upgrade_log-timestamp.txt`.

After you finish

• Verify that all components appear on the Hardware page.

• Verify the new software and firmware versions by checking the Software and Firmware Inventory dialog box (go to **Support › Upgrade Center**, and then click the link for **Software and Firmware Inventory**).

• If you upgraded controller NVSRAM, any custom settings that you have applied to the existing NVSRAM are lost during the process of activation. You need to apply the custom settings to the NVSRAM again after

the process of activation is complete.

Activate controller software and firmware

You can choose to activate the upgrade files immediately or wait until a more convenient time.

About this task

You can download and transfer the files without activating them. You might choose to activate later for these reasons:

- **Time of day** — Activating the software and firmware can take a long time, so you might want to wait until I/O loads are lighter. The controllers fail over during activation so performance might be lower than usual until the upgrade completes.

- **Type of package** — You might want to test the new software and firmware on one storage array before upgrading the files on other storage arrays.

When you have software or firmware that has been transferred but not activated, you see a notification in the Notifications area of the System Manager Home page and also on the Upgrade Center page.

> (i) You cannot stop the activation process after it starts.

Steps

1. Select **Support › Upgrade Center**.

2. In the area labeled SANtricity OS Controller Software upgrade, click **Activate**, and confirm that you want to perform the operation.

   You can cancel the operation during the pre-upgrade health check, but not during activating.

   The pre-upgrade health check begins. If the pre-upgrade health check passes, the upgrade process proceeds to activating the files. If the pre-upgrade health check fails, use the Recovery Guru or contact technical support to resolve the problem.

   On successful completion of the pre-upgrade health check, activation occurs. The time it takes to activate depends on your storage array configuration and the components that you are activating.

3. **Optional:** To see a list of what was upgraded, click **Save Log**.

   The file is saved in the Downloads folder for your browser with the name `drive_upgrade_log-timestamp.txt`.

After you finish

- Verify that all components appear on the **Hardware** page.

- Verify the new software and firmware versions by checking the Software and Firmware Inventory dialog box (go to **Support › Upgrade Center**, and then click the link for **Software and Firmware Inventory**).

- If you upgraded controller NVSRAM, any custom settings that you have applied to the existing NVSRAM are lost during the process of activation. You need to apply the custom settings to the NVSRAM again after the process of activation is complete.

Upgrade drive firmware

You can upgrade your drives' firmware to make sure you have all the latest features and bug fixes.

Before you begin

- You have backed up your data using disk-to-disk backup, volume copy (to a volume group not affected by the planned firmware upgrade), or a remote mirror.
- The storage array has an Optimal status.
- All drives have an Optimal status.
- No configuration changes are running on the storage array.
- If the drives are capable of only an offline upgrade, I/O activity to all volumes associated with the drives is stopped.

Steps

1. Select **Support › Upgrade Center**.
2. Download the new files from the Support site to your management client.
   a. Under Drive Firmware upgrade, click **NetApp Support**.
   b. On the NetApp Support web site, click the **Downloads** tab, and then select **Firmware**.
   c. Select **Disk Drive & Firmware Matrix**.
   d. Follow the remaining instructions.
3. Under Drive Firmware upgrade, click **Begin Upgrade**.

   A dialog box appears, which lists the drive firmware files currently in use.

4. Extract (unzip) the files you downloaded from the Support site.
5. Click **Browse**, and select the new drive firmware files that you downloaded from the Support site.

   Drive firmware files have a filename similar to `D_HUC101212CSS600_30602291_MS01_2800_0002` with the extension of `.dlp`.

   You can select up to four drive firmware files, one at a time. If more than one drive firmware file is compatible with the same drive, you get a file conflict error. Decide which drive firmware file you want to use for the upgrade and remove the other one.

6. Click **Next**.

   The **Select Drives** dialog box appears, which lists the drives that you can upgrade with the selected files.

   Only drives that are compatible appear.

   The selected firmware for the drive appears in the **Proposed Firmware** information area. If you must change the firmware, click **Back** to return to the previous dialog.

7. Select the type of upgrade you want to perform:
   - **Online (default)**- Shows the drives that can support a firmware download *while the storage array is processing I/O*. You do not have to stop I/O to the associated volumes using these drives when you select this upgrade method. These drives are upgraded one at a time while the storage array is

processing I/O to those drives.

- **Offline (parallel)** - Shows the drives that can support a firmware download *only while all I/O activity is stopped* on any volumes that use the drives. You must stop all I/O activity on any volumes that use the drives you are upgrading when you select this upgrade method. Drives that do not have redundancy must be processed as an offline operation. This requirement includes any drive associated with SSD cache, a RAID 0 volume group, or any pool or volume group that is degraded. The offline (parallel) upgrade is typically faster than the online (default) method.

8. In the first column of the table, select the drive or drives you want to upgrade.

9. Click **Start**, and confirm that you want to perform the operation.

   If you need to stop the upgrade, click **Stop**. Any firmware downloads currently in progress complete. Any firmware downloads that have not started are canceled.

   > ⚠️ Stopping the drive firmware upgrade might result in data loss or unavailable drives.

10. **Optional:** To see a list of what was upgraded, click **Save Log**.

    The file is saved in the Downloads folder for your browser with the name `drive_upgrade_log-timestamp.txt`.

11. If any of the following errors occur during the upgrade procedure, take the appropriate recommended action.

If you encounter this firmware download error…	Then do the following…
Failed assigned drives	One reason for the failure might be that the drive does not have the appropriate signature. Make sure that the affected drive is an authorized drive. Contact technical support for more information. When replacing a drive, make sure that the replacement drive has a capacity equal to or greater than the failed drive you are replacing. You can replace the failed drive while the storage array is receiving I/O.
Check storage array	• Make sure that an IP address has been assigned to each controller. • Make sure that all cables connected to the controller are not damaged. • Make sure that all cables are tightly connected.
Integrated hot spare drives	This error condition must be corrected before you can upgrade the firmware. Launch System Manager and use the Recovery Guru to resolve the problem.

If you encounter this firmware download error…	Then do the following…
Incomplete volume groups	If one or more volume groups or disk pools are incomplete, you must correct this error condition before you can upgrade the firmware. Launch System Manager and use the Recovery Guru to resolve the problem.
Exclusive operations \(other than background media/parity scan\) currently running on any volume groups	If one or more exclusive operations are in progress, the operations must complete before the firmware can be upgraded. Use System Manager to monitor the progress of the operations.
Missing volumes	You must correct the missing volume condition before the firmware can be upgraded. Launch System Manager and use the Recovery Guru to resolve the problem.
Either controller in a state other than Optimal	One of the storage array controllers needs attention. This condition must be corrected before the firmware can be upgraded. Launch System Manager and use the Recovery Guru to resolve the problem.
Mismatched Storage Partition information between Controller Object Graphs	An error occurred while validating the data on the controllers. Contact technical support to resolve this issue.
SPM Verify Database Controller check fails	A storage partitions mapping database error occurred on a controller. Contact technical support to resolve this issue.
Configuration Database Validation \(If supported by the storage array's controller version\)	A configuration database error occurred on a controller. Contact technical support to resolve this issue.
MEL Related Checks	Contact technical support to resolve this issue.
More than 10 DDE Informational or Critical MEL events were reported in the last 7 days	Contact technical support to resolve this issue.
More than 2 Page 2C Critical MEL Events were reported in the last 7 days	Contact technical support to resolve this issue.
More than 2 Degraded Drive Channel Critical MEL events were reported in the last 7 days	Contact technical support to resolve this issue.
More than 4 critical MEL entries in the last 7 days	Contact technical support to resolve this issue.

After you finish

Your drive firmware upgrade is complete. You can resume normal operations.

Review the possible software and firmware upgrade errors

Errors can occur during either the controller software upgrade or the drive firmware upgrade.

Firmware download error	Description	Recommended action
Failed assigned drives	Failed to upgrade an assigned drive in the storage array.	One reason for the failure might be that the drive does not have the appropriate signature. Make sure that the affected drive is an authorized drive. Contact technical support for more information. When replacing a drive, make sure that the replacement drive has a capacity equal to or greater than the failed drive you are replacing. You can replace the failed drive while the storage array is receiving I/O.
Integrated hot spare drives	If the drive is marked as a hot spare and is in use for a volume group, the firmware upgrade process fails.	This error condition must be corrected before you can upgrade the firmware. Launch SANtricity System Manager and use the Recovery Guru to resolve the problem.
Incomplete volume groups	If any drive that is part of a volume group is bypassed, removed or unresponsive, it is considered an incomplete volume group. An incomplete volume group prevents firmware upgrades.	If one or more volume groups or disk pools are incomplete, you must correct this error condition before you can upgrade the firmware. Launch SANtricity System Manager and use the Recovery Guru to resolve the problem.
Exclusive operations (other than background media/parity scan) currently running on any volume groups	Cannot upgrade the firmware if any exclusive operations are in progress on a volume.	If one or more exclusive operations are in progress, the operations must complete before the firmware can be upgraded. Use SANtricity System Manager to monitor the progress of the operations.

Firmware download error	Description	Recommended action
Missing volumes	Cannot upgrade the firmware if any volume is missing.	You must correct the missing volume condition before the firmware can be upgraded. Launch SANtricity System Manager and use the Recovery Guru to resolve the problem.
Either controller in a state other than Optimal	Cannot upgrade the firmware if either controller is in a state other than optimal.	One of the storage array controllers needs attention. This condition must be corrected before the firmware can be upgraded. Launch SANtricity System Manager and use the Recovery Guru to resolve the problem.
SPM Verify Database Controller check fails	Cannot upgrade the firmware because the storage partitions mappings database is corrupted.	A storage partitions mapping database error occurred on a controller. Contact technical support to resolve this issue.
Configuration Database Validation (If supported by the storage array's controller version)	Cannot upgrade the firmware because the configuration database is corrupted.	A configuration database error occurred on a controller. Contact technical support to resolve this issue.
MEL Related Checks	Cannot upgrade the firmware because the event log contains errors.	Contact technical support to resolve this issue.
More than 10 DDE Informational or Critical MEL events were reported in the last 7 days	Cannot upgrade the firmware because there are more than 10 DDE informational or critical MEL events reported in the last seven days.	Contact technical support to resolve this issue.
More than 2 Page 2C Critical MEL Events were reported in the last 7 days	Cannot upgrade the firmware because there are more than two page 2C critical MEL Events reported in the last seven days.	Contact technical support to resolve this issue.
More than 2 Degraded Drive Channel Critical MEL events were reported in the last 7 days	Cannot upgrade the firmware because there are more than two degraded drive channel critical MEL events reported in the last seven days.	Contact technical support to resolve this issue.

Firmware download error	Description	Recommended action
More than 4 critical MEL entries in the last 7 days	Cannot upgrade the firmware because there are more than four critical event log entries reported in the last seven days.	Contact technical support to resolve this issue.
A valid management IP address is required.	A valid controller IP address is required to perform this operation.	Contact technical support to resolve this issue.
The command requires an active management IP address for each controllers to be provided.	A controller IP address for each controller associated with the storage array is required for this operation.	Contact technical support to resolve this issue.
Unhandled download file type returned.	The specified download file is not supported.	Contact technical support to resolve this issue.
An error occurred during the firmware download upload procedure.	The firmware download failed because the controller cannot process the request. Verify the storage array is optimal and retry the operation.	If this error occurs again after verifying the storage array is optimal, contact technical support to resolve this issue.
An error occurred during the firmware activation procedure.	The firmware activation failed because the controller cannot process the request. Verify the storage array is optimal and retry the operation.	If this error occurs again after verifying the storage array is optimal, contact technical support to resolve this issue.
Timeout has reached while waiting for controller {0} to reboot.	The management software is unable to reconnect to controller {0} following a reboot. Validate there is an operational connection path to the storage array and retry the operation if it did not complete successfully.	If this error occurs again after verifying the storage array is optimal, contact technical support to resolve this issue.

You can correct some of these conditions by using the Recovery Guru in SANtricity System Manager. However, for some of the conditions, you might need to contact technical support. The information about the latest controller firmware download is available from the storage array. This information helps technical support to understand the error conditions that prevented the firmware upgrade and download.

FAQs

What do I need to know before upgrading the SANtricity OS Software?

Before you upgrade your controller's software and firmware, be aware of these items.

- You have read the document and the `readme.txt` file and have determined that you want to do the

upgrade.

- You know whether you want to upgrade your IOM firmware.

  Normally, you should upgrade all components at the same time. However, you might decide not to upgrade the IOM firmware if you do not want to upgrade it as part of the SANtricity OS controller software upgrade or if technical support has instructed you to downgrade your IOM firmware (you can only downgrade firmware by using the command line interface).

- You know whether you want to upgrade the controller NVSRAM file.

  Normally, you should upgrade all components at the same time. However, you might decide not to upgrade the controller NVSRAM file if your file has either been patched or is a custom version and you do not want to overwrite it.

- You know whether you want to activate now or later.

  Reasons for activating later might include:

  ◦ **Time of day** — Activating the software and firmware can take a long time, so you might want to wait until I/O loads are lighter. The controllers fail over during activation so performance might be lower than usual until the upgrade completes.
  ◦ **Type of package** — You might want to test the new software and firmware on one storage array before upgrading the files on other storage arrays.

These components are part of the SANtricity OS controller software upgrade:

- **Management software** — System Manager is the software that manages the storage array.
- **Controller firmware** — Controller firmware manages the I/O between hosts and volumes.
- **Controller NVSRAM** — Controller NVSRAM is a controller file that specifies the default settings for the controllers.
- **IOM firmware** — The I/O module (IOM) firmware manages the connection between a controller and a drive shelf. It also monitors the status of the components.
- **Supervisor software** — Supervisor software is the virtual machine on a controller in which the software runs.

As part of the upgrade process, the host's multipath/failover driver and/or HBA driver might also need to be upgraded so the host can interact with the controllers correctly.

> ⓘ | To determine if this is the case, see the NetApp Interoperability Matrix Tool.

If your storage array contains only one controller or you do not have a multipath driver installed, stop I/O activity to the storage array to prevent application errors. If your storage array has two controllers and you have a multipath driver installed, you do not need to stop I/O activity.

Do not make changes to the storage array while the upgrade occurs.

What do I need to know before suspending IOM auto-synchronization?

Suspending IOM auto-synchronization prevents the IOM firmware from being upgraded the next time a SANtricity OS controller software upgrade occurs.

Normally, controller software and IOM firmware are upgraded as a bundle. You can suspend IOM auto-synchronization if you have a special build of IOM firmware that you want to preserve on your enclosure. Otherwise, you will revert to the IOM firmware bundled with the controller software the next time you do a controller software upgrade.

Why is my firmware upgrade progressing so slowly?

The firmware upgrade progress depends on the overall load of the system.

During an online upgrade of drive firmware, if a volume transfer takes place during the rapid reconstruction process, the system initiates a full reconstruction on the volume that was transferred. This operation might take a considerable amount of time. Actual full reconstruction time depends on several factors, including the amount of I/O activity occurring during the reconstruction operation, the number of drives in the volume group, the rebuild priority setting, and the drive performance.

What do I need to know before upgrading drive firmware?

Before upgrading your drive firmware, be aware of these items.

- As a precaution, back up your data using disk-to-disk backup, volume copy (to a volume group not affected by the planned firmware upgrade), or a remote mirror.
- You might want to upgrade only a few drives to test the behavior of the new firmware to ensure it is functioning correctly. If the new firmware is functioning correctly, upgrade the remaining drives.
- If you have any failed drives, fix them before you start the firmware upgrade.
- If the drives can do an offline upgrade, stop I/O activity to all volumes associated with the drives. When I/O activity is stopped, no configuration operations associated with those volumes can occur.
- Do not remove any drives while upgrading drive firmware.
- Do not make any configuration changes to the storage array while upgrading drive firmware.

How do I choose which type of upgrade to perform?

You choose the type of upgrade to perform on the drive depending on the state of the pool or volume group.

- **Online**

  If the pool or volume group supports redundancy and is Optimal, you can use the Online method to upgrade the drive firmware. The Online method downloads firmware *while the storage array is processing I/O* to the associated volumes using these drives. You do not have to stop I/O to the associated volumes using these drives. These drives are upgraded one at a time to the volumes associated with the drives. If the drive is not assigned to a pool or volume group, its firmware can be updated by the Online or the Offline method. System performance may be impacted when you use the Online method to upgrade drive firmware.

- **Offline**

  If the pool or volume group does not support redundancy (RAID 0), or is degraded, you must use the Offline method to upgrade the drive firmware. The Offline method will upgrade firmware *only while all I/O activity is stopped* to the associated volumes using these drives. You must stop all I/O to any associated volumes using these drives. If the drive is not assigned to a pool or volume group, its firmware may be updated by the Online or the Offline method.