



SANtricity OS

E-Series

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SANtricity OS

Overview of upgrading the SANtricity OS

You can upgrade your operating system and system hardware components to the latest version of SANtricity software and firmware.

These upgrade procedures include separate instructions for the following:

- **Single controller** — Includes procedures for upgrading the storage array's software and, optionally, the IOM firmware and the nonvolatile static random access memory (NVSRAM).
- **Multiple controllers** — Includes procedures for upgrading SANtricity OS software on multiple storage arrays of the same type.
- **Drive** — Includes instructions for upgrading the drive's firmware.

Before you begin the upgrade, be sure to review the [Upgrade considerations](#).

Upgrade considerations

To ensure a successful upgrade, review the following upgrade considerations.

Controller upgrades (single or multiple)

Review these key considerations before upgrading controllers.

Current versions

You can view the current versions of your software and firmware, as follows:

- For a single controller, use the SANtricity System Manager interface. Go to **Support > Upgrade Center**, and then click the link for **Software and Firmware Inventory**.
- For multiple controllers, use the SANtricity Unified Manager interface. Go to the **Manage** page for discovered storage arrays. The versions are shown in the **SANtricity OS Software** column. The controller firmware and NVSRAM information is available in a pop-up dialog box when you click on the SANtricity OS version in each row.

Components included in the upgrade

The following components are included in the SANtricity OS upgrade process:

- **System Manager** — System Manager is the software that manages the storage array.
- **Controller firmware** — Controller firmware manages the I/O between hosts and volumes.
- **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.

Components to upgrade separately

The following components must be upgraded separately:

- **Controller NVSRAM** — Controller NVSRAM is a controller file that specifies the default settings for the controllers. Instructions for upgrading the NVSRAM are included with the instructions for upgrading the controllers.
- **Drive firmware** — See [Upgrade drive firmware](#) for separate instructions.
- **Multipath/failover driver** — As part of the upgrade process, the host's multipath/failover driver might also need to be upgraded so the host can interact with the controllers correctly. If hosts running operating systems other than Microsoft Windows have I/O connections to your storage system, upgrade the multipath drivers for those hosts. For compatibility information, refer to the [NetApp Interoperability Matrix](#). For upgrade instructions, refer to the [Linux express configuration](#), [Windows express configuration](#), or [VMware express configuration](#).
- **SANtricity Unified Manager** — Unified Manager is the software that manages multiple storage systems, including the E2800, E5700, EF300, and EF600 models. Unified Manager is part of the SANtricity Web Services Proxy, which is a RESTful API server installed separately on a host system to manage hundreds of new and legacy NetApp E-Series storage systems. For more information, see [SANtricity Web Services Proxy overview](#).
- **Utilities** — Other management utilities require separate upgrades, such as the SANtricity Windows Host Utility, the SANtricity Linux Host Utility, and SANtricity Windows DSM. For more information about these utilities, refer to the [Linux express configuration](#), [Windows express configuration](#), or [VMware express configuration](#).
- **Legacy systems** — If your storage system is part of a storage network that includes older storage systems, you might need to use the legacy SANtricity Storage Manager Enterprise Management Window (EMW) to provide an enterprise view of all of your storage systems. In this case, check to see if there is a newer maintenance release of SANtricity Storage Manager.

Dual controllers and I/O processing

If a storage array contains two controllers and you have a multipath driver installed, the storage array can continue to process I/O while the upgrade occurs. During the upgrade, the following process occurs:

1. Controller A fails over all its LUNs to controller B.
2. Upgrade occurs on controller A.
3. Controller A takes back its LUNs and all of controller B's LUNs.
4. Upgrade occurs on 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.

Health check

A health check runs as part of the upgrade process. This 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.

Immediate or staged upgrade

You can activate the upgrade immediately or stage it for a later time. You might choose to activate later for these reasons:

- **Time of day** — Activating the software can take a long time, so you might want to wait until I/O loads are lighter. Depending on the I/O load and cache size, a controller upgrade can typically take between 15 to 25 minutes to complete. The controllers reboot and 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.

Drive firmware upgrade

Review these key considerations before upgrading your drive firmware.

Drive 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.

Drive upgrade methods

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

| Online upgrade | Offline upgrade |
|---|--|
| <p>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.</p> <p>Drives that can do an online upgrade include the following:</p> <ul style="list-style-type: none"> • 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 <p>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:</p> <ul style="list-style-type: none"> • 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. | <p>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.</p> <p>The following drives MUST use the offline method:</p> <ul style="list-style-type: none"> • Drives in a non-redundant volume group (RAID 0) • Drives in a non-optimal pool or volume group • Drives in SSD cache |

Upgrade software and firmware for a single controller

You can upgrade a single controller, which ensures that you have all the latest features and fixes.

This process involves upgrading the storage array's software and, optionally, the IOM firmware and the nonvolatile static random access memory (NVSRAM).

Before you begin

- Review [Upgrade considerations](#).
- Determine if you want to upgrade the controller NVSRAM file at the same time as the OS firmware.

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.

- Determine if 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).

- Decide if 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.

Step 1: Download software files from support site

In this step, you go to the NetApp Support site to save the new downloadable package (DLP) software files to your management host system.

The time required for the upgrade depends on your storage array configuration and the components that you are upgrading.

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.



If you are upgrading SANtricity OS on a StorageGRID appliance (for example, SG5612 or SG5760), you need to stop I/O activity by placing the appliance into maintenance mode before continuing with this procedure, or data could be lost. For detailed steps, see the installation and maintenance instructions for your StorageGRID appliance.

2. From the System Manager interface, select **Support > Upgrade Center**.
3. In the area labeled "SANtricity OS Software upgrade," click **NetApp SANtricity OS Downloads** to open the NetApp Support site.
4. From the Downloads page, select **E-Series SANtricity OS Controller Software**.



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.

5. Follow the on-screen instructions to download the most recent OS software for your controller model. If you also want to upgrade the NVSRAM, download the NVSRAM file for a single controller.

Step 2: Transfer software files to the controllers

In this step, you transfer the software files to your controller so you can begin the upgrade process. The components are copied from the management client to the controllers and placed in a staging area in flash memory.



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. (Optional). If you are planning to perform an upgrade during a specific maintenance window, you might want to run a pre-upgrade health check to determine if there are any major storage array problems in advance. If this is the case, select **pre-upgrade health check** from the Upgrade Center in System Manager (**Support > Upgrade Center**), and follow any on-screen instructions. Otherwise, you can skip this step, because a health check is part of the upgrade process.
2. If you do NOT want to upgrade the IOM firmware at this time, click **Suspend IOM Auto-Synchronization** and follow the instructions in the dialog box.

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

3. From the Upgrade Center in System Manager, click **Begin Upgrade** from "SANtricity OS Software upgrade."

The Upgrade SANtricity OS Software dialog appears.

4. 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 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.
5. (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.
 6. 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.

7. (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.

If you have already activated your software files, go to [Step 4: Complete software and firmware upgrade](#); otherwise, go to [Step 3: Activate software files](#).

Step 3: Activate software files

Follow this step only if you have software or firmware that has been transferred but not activated. To check this state, look for a notification in the Notifications area of the System Manager Home page or in the Upgrade Center page.

When you perform the activation operation, the current software and firmware is replaced with the new software and firmware. You cannot stop the activation process after it starts.

Steps

1. From the System Manager interface, select **Support › Upgrade Center**.
2. In the area labeled "SANtricity OS Software upgrade," click **Activate**, and confirm that you want to perform the operation.
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`.

Step 4: Complete software and firmware upgrade

Complete the software and firmware upgrade by verifying the versions in the Software and Firmware Inventory dialog box.

Before you begin

- You must have activated your software or firmware.

Steps

1. From System Manager, verify that all components appear on the Hardware page.
2. 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**).
3. 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.
4. 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 | <p>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.</p> <p>When replacing a drive, make sure that the replacement drive has a capacity equal to or greater than the failed drive you are replacing.</p> <p>You can replace the failed drive while the storage array is receiving I/O.</p> |
| Check storage array | <ul style="list-style-type: none">• 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. |

| If you encounter this firmware download error... | Then do the following... |
|---|---|
| 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. |
| 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. |

| If you encounter this firmware download error... | Then do the following... |
|---|--|
| 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. |

What's next?

Your controller software upgrade is complete. You can resume normal operations.

Upgrade software and firmware for multiple controllers

You can upgrade multiple controllers of the same type with SANtricity Unified Manager.

Before you begin

- Review [Upgrade considerations](#).
- Determine if you want to activate your software upgrade now or later. You might choose to activate later for these reasons:
 - **Time of day** — Activating the software 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 OS software on one storage array before you upgrade the files on other storage arrays.
- Review these precautions:



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.



If you are upgrading SANtricity OS on a StorageGRID appliance (for example, SG5612 or SG5760), you need to stop I/O activity by placing the appliance into maintenance mode before continuing with this procedure, or data could be lost. For detailed steps, see the installation and maintenance instructions for your StorageGRID appliance.

Step 1: Perform pre-upgrade health check

A health check runs as part of the upgrade process, but you also can run a health check separately before you begin. The health check assesses components of the storage array to make sure that the upgrade can proceed.

Steps

1. Open Unified Manager.
2. From the main view, select **Manage**, and then select **Upgrade Center** > **Pre-Upgrade Health Check**.

The Pre-Upgrade Health Check dialog box opens and lists all the discovered storage systems.

3. If needed, filter or sort the storage systems in the list, so you can view all systems that are not currently in the Optimal state.

4. Select the check boxes for the storage systems that you want to run through the health check.
5. Click **Start**.

The progress is shown in the dialog box while the health check is performed.

6. When the health check completes, you can click on the ellipses (...) to the right of each row to view more information and perform other tasks.



If any arrays fail the health check, you can skip that particular array and continue the upgrade for the others, or you can stop the entire process and troubleshoot the arrays that did not pass.

Step 2: Download software files from support site

In this step, you go to the NetApp Support site to save the new downloadable package (DLP) software files to your management host system.

Steps

1. If your storage array contains only one controller or a multipath driver is not in use, 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. From Unified Manager's main view, select **Manage**, and then select one or more storage arrays that you want to upgrade.
3. Select **Upgrade Center** > **Upgrade SANtricity OS Software**.

The Upgrade SANtricity OS software page appears.

4. Download the latest SANtricity OS software package from the NetApp support site to your local machine.
 - a. Click **Add new file to software repository**.
 - b. Click the link for finding the latest **SANtricity OS Downloads**.
 - c. Click the **Download Latest Release** link.
 - d. Follow the remaining instructions to download the SANtricity OS file and the NVSRAM file to your local machine.



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.

Step 3: Transfer software files to the controllers

You load the SANtricity OS software file and the NVSRAM file into the repository so it is accessible to the Unified Manager Upgrade Center.



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. From Unified Manager's main view, select **Manage**, and then select one or more storage arrays that you want to upgrade.

2. Select **Upgrade Center > Upgrade SANtricity OS Software**.

The Upgrade SANtricity OS software page appears.

3. Download the latest SANtricity OS software package from the NetApp support site to your local machine.

- a. Click **Add new file to software repository**.
- b. Click the link for finding the latest **SANtricity OS Downloads**.
- c. Click the **Download Latest Release** link.
- d. Follow the remaining instructions to download the SANtricity OS file and the NVSRAM file to your local machine.



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. Select the OS software file and the NVSRAM file that you want to use to upgrade the controllers:

- a. From the **Select a SANtricity OS software file** drop-down, select the OS file that you downloaded to your local machine.

If there are multiple files available, the files are sorted from newest date to oldest date.



The software repository lists all software files associated with the Web Services Proxy. If you do not see the file that you want to use, you can click the link, **Add new file to software repository**, to browse to the location where the OS file that you want to add resides.

- b. From the **Select an NVSRAM file** drop-down, select the controller file that you want to use.

If there are multiple files, the files are sorted from newest date to oldest date.

5. In the Compatible Storage Array table, review the storage arrays that are compatible with the OS software file that you selected, and then select the arrays you want to upgrade.

- The storage arrays that you selected in the Manage view and that are compatible with the selected firmware file are selected by default in the Compatible Storage Array table.
- The storage arrays that cannot be updated with the selected firmware file are not selectable in the Compatible Storage Array table as indicated by the status **Incompatible**.

6. (Optional) To transfer the software file to the storage arrays without activating them, select the **Transfer the OS software to the storage arrays, mark it as staged, and activate at a later time** check box.

7. Click **Start**.

8. Depending on whether you chose to activate now or later, do one of the following:

- Type **TRANSFER** to confirm that you want to transfer the proposed OS software versions on the arrays you selected to upgrade, and then click **Transfer**.

To activate the transferred software, select **Upgrade Center > Activate Staged OS Software**.

- Type **UPGRADE** to confirm that you want to transfer and activate the proposed OS software versions on the arrays you selected to upgrade, and then click **Upgrade**.

The system transfers the software file to each storage array you selected to upgrade and then activates

that file by initiating a reboot.

The following actions occur during the upgrade operation:

- 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 that the upgrade can proceed.
 - If any health check fails for a storage array, the upgrade stops. You can click the ellipsis (...) and select **Save Log** to review the errors. You can also choose to override the health check error and then click **Continue** to proceed with the upgrade.
 - You can cancel the upgrade operation after the pre-upgrade health check.
9. (Optional) Once the upgrade has completed, you can see a list of what was upgraded for a specific storage array by clicking the ellipsis (...) and then selecting **Save Log**.

The file is saved in the Downloads folder for your browser with the name `upgrade_log-<date>.json`.

Step 4: Activate staged software files (optional)

You can choose to activate the software file immediately or wait until a more convenient time. This procedure assumes you chose to activate the software file at a later time.



You cannot stop the activation process after it starts.

Steps

1. From Unified Manager's main view, select **Manage**. If necessary, click the Status column to sort all storage arrays with a status of "OS Upgrade (awaiting activation)."
2. Select one or more storage arrays that you want to activate software for, and then select **Upgrade Center > Activate Staged OS Software**.

The following actions occur during the upgrade operation:

- A pre-upgrade health check runs as part of the activate process. The pre-upgrade health check assesses all storage array components to make sure that the activation can proceed.
 - If any health check fails for a storage array, the activation stops. You can click the ellipsis (...) and select **Save Log** to review the errors. You can also choose to override the health check error and then click **Continue** to proceed with the activation.
 - You can cancel the activate operation after the pre-upgrade health check. 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) After the activation is complete, you can see a list of what was activated for a specific storage array by clicking the ellipsis (...) and then selecting **Save Log**.

The file is saved in the Downloads folder for your browser with the name `activate_log-<date>.json`.

What's next?

Your controller software upgrade is complete. You can resume normal operations.

Upgrade drive firmware

Follow this procedure to upgrade your drives' firmware, which ensures you have all the latest features and fixes.

Step 1: Download drive firmware files

In this step, you go to the NetApp Support site to download the drive firmware files to your management client.

Steps

1. In SANtricity System Manager, select **Support > Upgrade Center**.
2. Under Drive Firmware upgrade, click **NetApp Support** and log in to the NetApp Support site.
3. From the Support site, click the **Downloads** tab, and then select **Disk Drive & Firmware Matrix**.
4. Select **E-Series and EF-Series Disk Firmware**.
5. Follow the on-screen instructions to download the files.

Step 2: Begin drive firmware upgrade

In this step, you upgrade the drives' firmware.

Before you begin

- 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.
- Make sure the storage array has an Optimal status.
- Make sure all drives have an Optimal status.
- Make sure no configuration changes are running on the storage array.
- Understand that if the drives are capable of only an offline upgrade, I/O activity to all volumes associated with the drives is stopped.

Steps

1. From the System Manager Upgrade Center (**Support > Upgrade Center**), click **Begin Upgrade** from the "Drive Firmware upgrade" section.

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

2. Extract (unzip) the files you downloaded from the Support site.
3. 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.

4. 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.

5. 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.

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

7. 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.

8. (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`.

9. 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... |
|--|--|
| <ul style="list-style-type: none">• Failed assigned drives | <p>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.</p> <p>When replacing a drive, make sure that the replacement drive has a capacity equal to or greater than the failed drive you are replacing.</p> <p>You can replace the failed drive while the storage array is receiving I/O.</p> |

| If you encounter this firmware download error... | Then do the following... |
|---|--|
| Check storage array | <ul style="list-style-type: none"> • 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. |
| 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. |

| If you encounter this firmware download error... | Then do the following... |
|---|--|
| 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. |

What's next?

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

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