Upgrade systems

E-Series Systems

NetApp
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Upgrade controllers overview

You can upgrade your storage array through the replacement of existing controllers.

Controller components

A controller consists of a board, firmware, and software. It controls the drives, and also implements the management software functions.

When to use this procedure

You typically use this procedure when you want to upgrade all controllers to a different model or platform. This procedure involves replacing all controllers in a controller-drive tray.

You might also use this procedure in the following situations:

- When all controllers in a controller-drive tray encounter hardware failures and are no longer functional.
- To upgrade the dual inline memory modules (DIMMs) in your controller-drive tray by replacing both controllers with the same model of controllers, but with different DIMMs.

> The HIC upgrade scenarios are not covered within this procedure. Instead, refer to the HIC add, upgrade and replacement procedures for your E-Series system.

Upgrade considerations

Before you upgrade controllers, review the following considerations.

Hardware and firmware requirements

- **Duplex and simplex controller upgrades**

  For duplex controller-drive trays, you replace both controllers. For simplex controller-drive trays, you replace the one controller. In both cases, you must power off the controller-drive tray. As a result, you cannot access data on the storage array until you successfully complete the replacement.

- **Trays and shelves**

  Storage arrays with an E2800 or E5700 controller shelf are typically managed with the SANtricity System Manager user interface. You might also use the SANtricity Storage Manager interface to manage E2800 or E5700 controller shelves. All other controller-drive trays referenced in this procedure use SANtricity Storage Manager.

- **Controller batteries**

  A new controller is shipped without a battery installed. When possible, you should remove the battery from your old controller and then install that battery in the new controller. However, for some controller upgrades, the battery from the old controller is not compatible with the new controller. In those cases, you must order

a battery along with your new controller, and have that battery available before you begin these tasks.

- **Vendor Identification**

  Some controller upgrades result in the Vendor ID in SCSI Inquiry Data changing from `LSI` to `NETAPP`. When the Vendor ID changes from `LSI` to `NETAPP`, additional steps are required on the Windows, VMware, and AIX operating systems to reclaim devices. Steps for these operating systems are included in this upgrade procedure.

- **Synchronous Mirroring and Asynchronous Mirroring**

  If your storage array participates in Synchronous Mirroring, only iSCSI or Fibre Channel connections are supported between the primary site and the remote site. If the host interface card (HIC) configuration in your new controllers does not include iSCSI or Fibre Channel connections, Synchronous Mirroring will not be supported.

  For Asynchronous Mirroring, the local storage array and remote storage array can run different versions of firmware. The minimum firmware version supported is SANtricity firmware version 7.84.

- **Storage object limits**

  If you change your controllers from 5x00 models to 2x00 models, your new storage array configuration will support lower numbers of some storage objects (for example, volumes) in the storage management software than your old configuration. You must make sure that your old configuration does not exceed the storage object limits. See Hardware Universe for more information.

Upgrade to newer models

If you are replacing the controllers to upgrade to a new model, keep in mind that your current storage array might have premium features installed that the new model cannot support. For example, E2700 controllers do not support the legacy Snapshots premium feature.

If you replace E2600 controllers with E2700 controllers, and your storage array was using the legacy Snapshots feature, you must disable that feature and delete or convert all volumes (that is, snapshots, repositories) associated with that feature before you replace the controllers. You can convert legacy Snapshots to the updated Snapshots feature. Before you upgrade a controller-drive tray, you should disable any premium features used on your storage array that are not supported on the new controllers.

Upgrade compatibility

Review the supported upgrade paths for each storage array model.

From E2x00 to E2x00

- **Battery**: Reuse the old battery.
- **Vendor ID**: Additional steps required.
- **Feature support**: Legacy snapshots are not supported on the E2700.
- **SAS-2 shelves**: E2800 controllers must not be placed into SAS-2 shelves.

From E2x00 to E5x00

- **Battery**: Order a new battery.

- **Vendor ID**: Additional steps are required when upgrading from E2600 to E5500 or E5600, or when upgrading from E2700 to E5400.
- **Feature support**:
  - Legacy snapshots are not supported on the E5500 or E5600.
  - Legacy remote volume mirroring (RVM) is not supported on the E5500 or E5600 with iSCSI HICs.
  - Data Assurance is not supported on the E5500 or E5600 with iSCSI HICs.
  - E5700 controllers must not be placed into SAS-2 shelves.
- **SAS-3 shelves**: E5400, E5500, and E5600 controllers must not be placed into SAS-3 shelves.

From E5x00 to E2x00

- **Battery**: Order a new battery.
- **Vendor ID**: Additional steps are required when upgrading from E5500 or E5600 to E2600, or when upgrading from E5400 to E2700.
- **Feature support**: Legacy snapshots are not supported on the E2700.
- **SAS-3 shelves**: E5400, E5500, and E5600 controllers must not be placed into SAS-3 shelves.

From E5x00 to E5x00

- **Battery**: Reuse the old battery.
- **Vendor ID**: Additional steps required when upgrading from E5400 to E5500 or E5600.
- **Feature support**:
  - Legacy snapshots are not supported on the E5500 or E5600.
  - Legacy remote volume mirroring (RVM) is not supported on the E5400 or E5500 with iSCSI HICs.
  - Data Assurance is not supported on the E5400 or E5500 with iSCSI HICs.
  - E5700 controllers must not be placed into SAS-2 shelves.
- **SAS-3 shelves**: E5400, E5500, and E5600 controllers must not be placed into SAS-3 shelves.

From EF5x0 to EF5x0

- **Battery**: Reuse the old battery.
- **Vendor ID**: Additional steps required when upgrading from EF540 to EF550 or EF560.
- **Feature support**:
  - No Legacy Snapshots for EF550/EF560.
  - No Data Assurance for EF550/EF560 with iSCSI.
  - EF570 controllers must not be placed into SAS-3 shelves.
- **SAS-3 shelves**: EF540, EF550, and EF560 controllers must not be placed into SAS-3 shelves.

SAS enclosures

The E5700 supports DE5600 and DE6600 SAS-2 enclosures via head upgrade. When a E5700 controller is installed in SAS-2 enclosures, support for base host ports is disabled.

SAS-2 shelves	SAS-3 shelves
SAS-2 shelves include the following models: • DE1600, DE5600, and DE6600 drive trays • E5400, E5500, and E5600 controller-drive trays • EF540, EF550 and EF560 flash arrays • E2600 and E2700 controller-drive trays	SAS-3 shelves include the following models: • E2800 controller shelves • E5700 controller shelves • DE212C, DE224C, DE460C drive shelves

SAS-2 to SAS-3 investment protection

You can reconfigure your SAS-2 system to be used behind a new SAS-3 controller shelf (E57XX/EF570/E28XX).

This procedure requires a Feature Product Variance Request (FPVR). To file an FPVR, contact your sales team.

Prepare to upgrade controllers

Prepare to upgrade controllers by saving the Drive Security key (if used), recording the serial number, gathering support data, disabling certain features (if used), and taking the controller offline.

Gathering support data can temporarily impact performance on your storage array.

Steps

1. Make sure that the existing storage array is updated to the latest released operating system (controller firmware) version available for your current controllers. From SANtricity System Manager, go to **Support › Upgrade Center** to view your software and firmware inventory.

   If you are upgrading to controllers that support SANtricity OS version 8.50, you must install the latest versions of SANtricity OS and the latest NVSRAM after you install and power on the new controllers. If you do not perform this upgrade, you might not be able to configure the storage array for Automatic Load Balancing (ALB).

2. If you have secure-enabled drives installed and you plan to perform a complete controller replacement, refer to the following table to complete the appropriate steps for your security type (internal or external) and drive state. If you do **not** have secure-enabled drives installed, you can skip this step and go to step 3 below the table.

   Some steps in the table require command line interface (CLI) commands. For information about using these commands, see the Command Line Interface reference.

Security type and context	Steps
Internal key management, one or more drives locked	Export the internal security key file to a known location on the management client (the system with a browser used for accessing System Manager). Use the `export storageArray securityKey` CLI command. You must provide the pass phrase associated with the security key and specify the location where you want to save the key.
External key management, all drives locked, you are able to transition to internal key management temporarily for the controller replacement (recommended).	Perform the following steps, in order: a. Record the External KMS server address and port number. From System Manager, go to **Settings › System › Security Key Management › View/Edit Key Management Server Settings**. b. Ensure that the client and server certificates are available on your local host so the storage array and key management server can authenticate each other after the controller replacement is finished. Use the `save storageArray keyManagementCertificate` CLI command to save the certificates. Be sure to run the command twice, once with the `certificateType` parameter set to `client`, and the other with the parameter set to `server`. c. Transition to internal key management by running the `disable storageArray externalKeyManagement` CLI command. d. Export the internal security key file to a known location on the management client (the system with a browser used for accessing System Manager). Use the `export storageArray securityKey` CLI command. You must provide the pass phrase associated with the security key and specify the location where you want to save the key.

Security type and context	Steps
External key management, all drives locked, you are **not** able to transition to internal key management temporarily for the controller replacement.	Perform the following steps, in order: a. Record the External KMS server address and port number. From System Manager, go to **Settings › System › Security Key Management › View/Edit Key Management Server Settings**. b. Ensure that the client and server certificates are available on your local host so the storage array and key management server can authenticate each other after the controller replacement is finished. Use the `save storageArray keyManagementCertificate` CLI command to save the certificates. Be sure to run the command twice, once with the `certificateType` parameter set to `client`, and the other with the parameter set to `server`. c. Export the internal security key file to a known location on the management client (the system with a browser used for accessing System Manager). Use the `export storageArray securityKey` CLI command. You must provide the pass phrase associated with the security key and specify the location where you want to save the key.
External key management, partial drives locked	No additional steps are necessary.

Your storage array must be in an optimal state to retrieve client and server certificates. If the certificates are not retrievable, then you must create a new CSR, get the CSR signed, and download the server certificate from the external key management server (EKMS).

3. Record the serial number for your storage array:
   a. From System Manager, select **Support › Support Center › Support Resources tab**.
   b. Scroll down to **Launch detailed storage array information**, and then select **Storage Array Profile**.

      The Report appears on your screen.

   c. To locate the chassis serial number under the storage array profile, type **serial number** in the **Find** text box, and then click **Find**.

      All matching terms are highlighted. To scroll through all the results one at a time, continue to click **Find**.

   d. Make a record of the `Chassis Serial Number`.

      You need this serial number to perform the steps in Complete controller upgrade.

4. Gather support data about your storage array by using either the GUI or the CLI:

- Use either System Manager or the Array Management Window in Storage Manager to collect and save a support bundle of your storage array.
  - From System Manager, select **Support › Support Center › Diagnostics tab**. Then select **Collect Support Data** and click **Collect**.
  - From the Array Management Window toolbar, select **Monitor › Health › Collect Support Data Manually**. Then enter a name and specify a location on your system where you want to store the support bundle.

    The file is saved in the Downloads folder for your browser with the name `support-data.7z`.

    If your shelf contains drawers, the diagnostics data for that shelf is archived in a separate zipped file named `tray-component-state-capture.7z`.
- Use the CLI to run the `save storageArray supportData` command to gather comprehensive support data about the storage array.

5. Ensure that no I/O operations are occurring between the storage array and all connected hosts:
   a. Stop all processes that involve the LUNs mapped from the storage to the hosts.
   b. Ensure that no applications are writing data to any LUNs mapped from the storage to the hosts.
   c. Unmount all file systems associated with volumes on the array.

   The exact steps to stop host I/O operations depend on the host operating system and the configuration, which are beyond the scope of these instructions. If you are not sure how to stop host I/O operations in your environment, consider shutting down the host.

   Possible data loss — If you continue this procedure while I/O operations are occurring, you might lose data.

6. If the storage array participates in a mirroring relationship, stop all host I/O operations on the secondary storage array.
7. If you are using asynchronous or synchronous mirroring, delete any mirrored pairs and deactivate any mirroring relationships through the System Manager or the Array Management window.
8. If there is a thin provisioned volume that is reported to the host as a thin volume and the old array is running firmware (8.25 firmware or above) that supports the UNMAP feature, disable Write Back Caching for all thin volumes:
   a. From System Manager, select **Storage › Volumes**.
   b. Select any volume, and then select **More › Change cache settings**.

      The Change Cache Setting dialog box appears. All volumes on the storage array appear in this dialog box.

   c. Select the **Basic** tab and change the settings for read caching and write caching.
   d. Click **Save**.
   e. Wait five minutes to allow any data in cache memory to be flushed to disk.
9. If the Security Assertion Markup Language (SAML) is enabled on the controller, contact technical support to disable the SAML authentication.

After SAML is enabled, you cannot disable it through the SANtricity System Manager interface. To disable the SAML configuration, contact technical support for assistance.

10. Wait for all operations in progress to complete before continuing to the next step.
    a. From System Manager's **Home** page, select **View Operations in Progress**.
    b. Make sure all operations shown on the **Operations in Progress** window are complete before continuing.
11. Turn off power to the controller-drive tray.

    Wait for all of the LEDs on the controller-drive tray to go dark.
12. Turn off power to each drive tray that is connected to the controller-drive tray.

    Wait two minutes for all of the drives to spin down.

What's next?

Go to Remove controllers.

Remove controllers

After preparing for the upgrade, you can remove the controllers, and if necessary, remove the battery.

Step 1: Remove controller

Remove the controller canister so you can upgrade it with a new one. You must disconnect all cables and remove any SFP transceivers. Then, you can slide the controller canister out of the controller shelf.

What you'll need

- An ESD wristband or take other antistatic precautions.
- Labels to identify each cable that is connected to the controller canister.

About this task

Perform the following steps for each controller in the controller-drive tray.

If you are upgrading controllers in a duplex controller-drive tray, repeat all steps to remove the second controller canister.

Steps

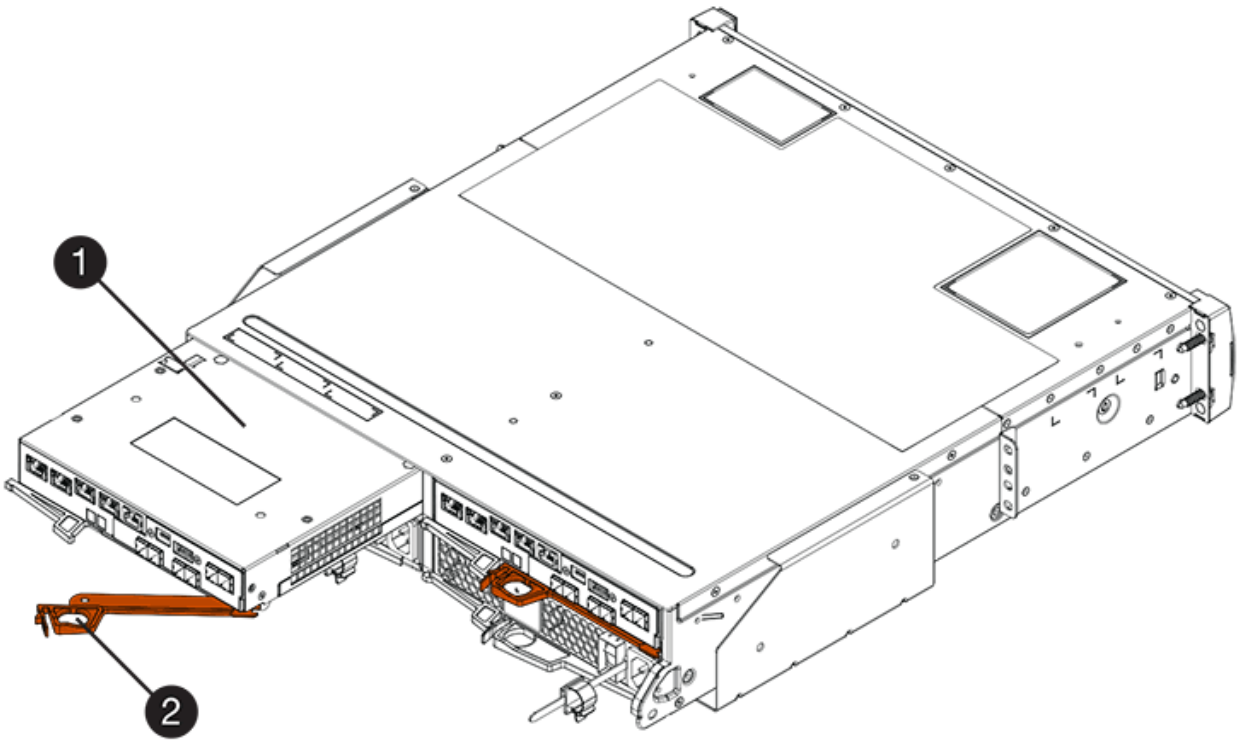
1. Put on an ESD wristband or take other antistatic precautions.
2. Label each cable that is attached to the old controller canister. Depending on the HIC configuration, you might be able to reconnect some cables after you replace the controller canister.
3. Disconnect all of the interface and Ethernet cables from the old controller canister.

   If fiber-optic cables are present, you can use the two release levers to partially remove the controller canister. Opening these release levers makes it easier to press down the fiber-optic cable release tab.

   To prevent degraded performance, do not twist, fold, pinch, or step on the cables.

4. If the old controller canister contains a Fibre Channel HIC or an InfiniBand HIC, remove the small form-factor pluggable (SFP+) transceivers (for Fibre Channel) or quad SFP (QSFP+) transceivers (for InfiniBand) from the HIC, and save them for possible reuse.
5. Remove controller A.
   a. Unlock and rotate the release handles out to release the controller canister.
   b. Using the release handles and your hands, pull the controller canister out of the controller-drive tray.

      The following figure is an example of the general location for the release handles on controller models. Controller shelves and controller-drive trays have a similar configuration for the release handles.



      (1) *Controller canister*

      (2) *Cam handle*

6. Set the old controller canister on a flat, static-free surface near the controller-drive tray with the release levers up. Position the controller canister so that you can access the top cover.
7. (Conditional) If you are upgrading controllers in a duplex controller-drive tray, repeat all steps to remove the second controller canister.

If you intend to use the battery from the old controller in the new controller, go to the next part of the section; otherwise go to Install new controllers.

Step 2: Remove battery

Remove the battery only if you intend to use the battery from the old controller canister in the new controller canister.

Steps

1. Press down on both of the top cover latch buttons on the old controller canister, and slide the top cover to the rear of the canister.
2. Perform one of the following options, depending on your model of controller-drive tray, to release the old battery:
   - For the E2600 or the E2700 controller-drive tray, unscrew the thumb screw that secures the battery to the controller canister.
   - For the E5400, EF540, E5500, EF550, E5600, or EF600 controller-drive tray, release the tab that secures the battery to the controller canister.
3. Remove the battery by sliding it towards the rear of the old controller canister.

What's next?

Go to Install new controllers.

Install new controllers

After you have removed the old controllers, you can install new controllers in the controller-drive tray.

About this task

Perform the following steps for each controller in the controller-drive tray. If you are upgrading controllers in a duplex controller-drive tray, repeat all steps to install the second controller canister.

What you'll need

- An ESD wristband or take other antistatic precautions.
- A battery from the original controller canister or a new battery that you ordered.
- The new controller canister.

Step 1: Install battery

Install the battery that you removed from the original controller canister or a new battery that you ordered.

Steps

1. Unpack the new controller canister, and set it on a flat, static-free surface so that the removable cover faces up.
2. Press down on the cover button, and slide the cover off.
3. Orient the controller canister so that the slot for the battery faces toward you.
4. Depending on your controller model, do one of the following:
   - For E2600 or E2700 controller models:
     a. Insert the battery circuit board by sliding it towards the front of the new controller canister.
     b. Tighten the thumbscrew to secure the battery circuit board in the new controller canister card.
     c. Reinstall the top cover on the new controller canister by sliding it forward until the top latch covers click.

        When the latch clicks into place, the bottom of the latch hooks into a metal slot on the chassis.
   - For other controller models:

a. Insert the battery into the new controller canister.

   Slide the battery into the canister, making sure it stays below the rivets on the wall of the new canister.

b. Keeping the locking handle at a 45-degree angle, align the connectors at the bottom of the battery with the connectors on the canister.

c. Push the battery down until you hear it click, and move the locking handle up to secure the controller battery to the controller canister.

   To make sure that the controller battery is seated correctly in an E5XX controller-drive tray, you might need to slide it out and insert it again. It is secure when you hear it click into place, and when the locking handle does not move out of its upright position when you wiggle it.

d. Reinstall the top cover on the new controller canister by sliding it forward until the top latch covers click.

   When the latch clicks into place, the bottom of the latch hooks into a metal slot on the chassis.

5. Turn the controller canister over to confirm that the battery is installed correctly.

Step 2: Install new controller canister

Install the new controller canister into the controller shelf.

Steps

1. Slide the new controller canister all the way into the controller-drive tray. Rotate the release levers towards the center of the controller canister to lock it into place.
2. If your new controller canister has a Fibre Channel HIC or an InfiniBand HIC, install the SFP+ transceivers (Fibre Channel) or QSFP+ transceiver (InfiniBand) into the controller canister and reconnect the host cables.

   Depending on the HICs involved in your upgrade, you might be able to reuse SFP+ transceiver or QSFP+ transceivers that you removed from your old controller canister.

3. Reconnect all of the cables between the controller-drive tray and the drive trays.

   If the drive cabling configuration is the same as it was with your old controllers, use the labels that you attached to the cables to reconnect the cables correctly.

   If you are upgrading to E2700 controllers from an earlier model, the drive cabling configuration might be different from the configuration used for the old controllers.

What's next?

If you are upgrading E2800 and E5700 controllers and the Drive Security feature is enabled, go to Unlock drives. Otherwise, go to Complete controller upgrade.

Unlock drives

If you are upgrading E2800 and E5700 controllers, the Drive Security feature for these

controllers will lock down the drives partially, externally, or internally. If the Drive Security feature is enabled, you must manually unlock these drives.

Follow the appropriate procedure for:

- Internal key management
- External key management

Internal key management

Follow these steps for internal key management when all drives are locked.

About this task

The newly swapped controllers will lock down with a seven-segment display code of **L5**. This lock-down occurs when no drives can perform autocode synchronization (ACS). After the security key is imported, ACS resumes and updates the new controllers.

> If you are not using management port 1, try with other default IP addresses:
> Ctrl A port 1: 192.168.128.101
> Ctrl A port 2: 192.168.128.102
> Ctrl B port 1: 192.168.129.101
> Ctrl B port 2: 192.168.129.102

Steps

1. Make a direct, private ethernet connection between the storage array and the SANtricity client's laptop or PC. To do this:
   a. Use an RJ45 ethernet cable to connect the laptop to management port 1 on controller A.
   b. To complete the connection, you might need to assign the laptop to an IP address in the same subnet as controller A. During controller lockdown, controller A defaults to a management address of 192.168.128.101. So you can assign the laptop to a subnet such as "192.168.128.201".
2. Using the IP address 192.168.128.101 with username **admin** and the password blank, import the internal key using the `import storageArray securityKey file` CLI command, with the security key saved from Prepare to upgrade controllers. For information about using this command, see the Command Line Interface reference.

   Example: `SMcli 192.168.128.101 -u admin -c "import storageArray securityKey file=\"Directory&FileName\" passPhrase=\"passPhraseString\";"`

   Alternatively, you can import the internal key via the Rest API through the following call: `/storage-systems/{system-id}/security-key/import`

Controllers will continue with the autocode synchronization process from the drives and reboot. After reboot the controllers will be accessible through the original IP configuration.

External key management

Follow these steps for external key management when all drives are locked.

About this task

The newly swapped controllers will lock down with a seven-segment display code of **L5**. This lock-down occurs

when no drives can perform autocode synchronization (ACS). After the security key is imported, ACS resumes and updates the new controllers.

> Your storage array must be in an optimal state to retrieve client and server certificates. If the certificates are not retrievable, then you must create a new certificate signing request (CSR) and then import the server certificate from the external key management server.

Steps

1. Make a direct, private ethernet connection between the storage array and the SANtricity client's laptop or PC. To do this:
   a. Use an RJ45 ethernet cable to connect the laptop to management port 1 on controller A.
   b. To complete the connection, you might need to assign the laptop to an IP address in the same subnet as controller A. During controller lockdown, controller A defaults to a management address of 192.168.128.101. So you can assign the laptop to a subnet such as "192.168.128.201".
2. Using default IP address 192.168.128.101 with username **admin** and the password blank, set up the external key management server using the `set storageArray externalKeyManagement` CLI command and provide the `serverAddress` and `serverPort` saved from Prepare to upgrade controllers. For information about using this command, see the Command Line Interface reference.

   Example: `SMcli 192.168.128.101 -u admin -c "set storageArray externalKeyManagement serverAddress=<ServerIPAddress> serverPort=<serverPort>;"`

   Alternatively, you can set up the external key management server via the Rest API through the following call: `/storage-systems/{system-id}/external-key-server`

3. Using the default IP address 192.168.128.101 with the username **admin** and the password remaining blank, import the certificates using the `storageArray keyManagementCertificate` CLI command: once for the client certificate and a second time for the server certificate.

   Example A: `SMcli 192.168.128.101 -u admin -c "download storageArray keyManagementCertificate certificateType=client file=\"Directory&FileName\";"`

   Example B: `SMcli 192.168.128.101 -u admin -c "download storageArray keyManagementCertificate certificateType=server file=\"Directory&FileName\";"`

   Alternatively, you can import the keyserver certificate via the Rest API through the following call: `/storage-systems/{system-id}/external-key-server/certificate`

4. Using the security key saved from Prepare to upgrade controllers, import the external key to IP address 192.168.128.101 with the username **admin** and the password remaining blank.

   Example: `SMcli 192.168.128.101 -u admin -c "import storageArray securityKey file=\"Directory&FileName\" passPhrase=\"passPhraseString\";"`

   Alternatively, you can import the external key via the Rest API through the following call: `/storage-systems/{system-id}/security-key/import`

Controllers will continue with the autocode synchronization process from the drives and reboot. After reboot the controllers will be accessible through the original IP configuration.

Complete controller upgrade

Complete the controller upgrade by powering on the controller shelf and validating the controller software version. Then, you can collect support data and resume operations.

If you are upgrading controllers in a duplex controller-drive tray, repeat all steps to complete the upgrade for the second controller.

Step 1: Power on controller

You must power on the controller shelf to confirm that it is working correctly.

Steps

1. Turn on the power switch on the rear of each drive tray that is connected to the controller-drive tray.
2. Wait two minutes for the drives to spin up.
3. Turn on the power switch on the rear of the controller-drive tray.
4. Wait three minutes for the power-up process to complete.
5. If you are performing a complete controller replacement for either E2800 or E5700 controllers, proceed to one of the following procedures based on your drive security scenario.

Complete controller replacement type	Procedure and prerequisites
All unsecured drives, neither External or Internal Key Management	Proceed to the next step.
Mix of secured and unsecured drives, Internal Key Management	You first must create an internal security key and then import the security key manually to unlock the secured drives. After the drives are unlocked, you can access the drives. a. Create internal security key b. Controller swap with internal key management and one or more drives secured
All secured drives, Internal Key Management	Controller swap with internal key management and one or more drives secured

Complete controller replacement type	Procedure and prerequisites
Mix of secured and unsecured drives, External Key Management	Proceed to the next step. After performing the controller replacement, the controllers will automatically resynchronize with the External Key Management Server and the drives will unlock and be accessible. If you receive a seven-segment display lock-down code of `L5` after performing a controller replacement of mixed secured drives with internal key management, contact technical support.
All secured drives, External Key Management, you have temporarily switched back to Internal Key Management for the controller replacement procedure	You must first unlock the secured drives using the Internal Key Management procedure. After the drives are unlocked, then you transition back to External Key Management by creating a new external security key for the storage array. a. Controller swap with internal key management and one or more drives secured b. Create external security key
All secured drives, External Key Management, you have not temporarily switched to Internal Key Management for the controller replacement procedure	Controller swap with external key management and all drives secured

Step 2: Check status of controllers and trays

You can use the LEDs and the storage management software to check the status of your controllers and trays.

Steps

1. Look at the LEDs on controller A to make sure that it is booting correctly.

   The Host Link Service Action Required LEDs turn green during the reboot. The seven-segment display shows the sequence OS+ Sd+ blank- to indicate that the controller is performing Start-of-day (SOD) processing.

   After the controller successfully completes rebooting, the seven-segment display shows the tray ID matching the seven-segment display on the second controller. You can then discover the new controller canister by using the storage management software.

2. If any of the controller-drive tray's Service Action Required LEDs are *on*, or if the Controller Service Action Required LED is *on*:

   a. Check that the controller canister has been installed correctly and that all of the cables are correctly seated. Reinstall the controller canister, if necessary.

b. Check the controller-drive tray's Service Action Required LEDs and the Controller Service Action Required LED again. If the problem is not corrected, contact technical support.

3. For a duplex configuration, repeat step 1 through step 2 for controller B.
4. Using the LEDs and the storage management software, check the status of all of the trays in the storage array. If any component has a Needs Attention status, use the Recovery Guru to troubleshoot. If the problem is not resolved, contact technical support.

Step 3: Validate controller software version

You must ensure that your new controllers are running with the correct operating system (controller firmware) level and NVSRAM.

Steps

1. Do one of the following:
   - If you are upgrading to controllers that do not support SANtricity 11.30 and controller firmware 8.30, make sure that the version running on the new controllers matches the version that was last running on the original controllers. Normally, this will be the most recent release supported by the old controllers. If necessary, install the appropriate version on the new controllers.
   - If you are upgrading to controllers that run SANtricity 11.30 and controller firmware 8.30, download and install the latest NVSRAM after you power on the new controllers.
2. If your controller upgrade involves a protocol change (for example, Fibre Channel to iSCSI), and you already have hosts defined for your storage array, associate the new host ports with your hosts:

   a. From System Manager, select **Storage › Hosts**.

   b. Select the host to which the ports will be associated, and then click **View/Edit Settings**.

      A dialog box appears that shows the current host settings.

   c. Click the **Host Ports** tab.

      The dialog box shows the current host port identifiers.

   d. To update the host port identifier information associated with each host, replace the host port IDs from the old host adapters with the new host port IDs for the new host adapter.

   e. Repeat step d for each host.

   f. Click **Save**.

   For information about compatible hardware, refer to the NetApp Interoperability Matrix and the NetApp Hardware Universe.

3. If Write Back Caching was disabled for all thin volumes in preparing for the headswap, re-enable Write Back Caching.

   a. From System Manager, select **Storage › Volumes**.

   b. Select any volume, and then select **More › Change cache settings**.

      The Change Cache Setting dialog box appears. All volumes on the storage array appear in this dialog box.

   c. Select the **Basic** tab and change the settings for read caching and write caching.

   d. Click **Save**.

4. If SAML was disabled in preparing for the headswap, re-enable SAML.
   a. From System Manager, select **Settings › Access Management**.
   b. Select the **SAML** tab, and then follow the instructions on the page.
5. Gather support data about your storage array by using either the GUI or the CLI:
   - Use either System Manager or Storage Manager's Array Management Window to collect and save a support bundle of your storage array.
     - From System Manager, select **Support › Support Center › Diagnostics tab**. Then select **Collect Support Data** and click **Collect**.
     - From the Array Management Window toolbar, select **Monitor › Health › Collect Support Data Manually**. Then enter a name and specify a location on your system where you want to store the support bundle.

       The file is saved in the Downloads folder for your browser with the name `support-data.7z`.

       If your shelf contains drawers, the diagnostics data for that shelf is archived in a separate zipped file named `tray-component-state-capture.7z`
   - Use the CLI to run the `save storageArray supportData` command to gather comprehensive support data about the storage array.

     Gathering support data can temporarily impact performance on your storage array.
6. Alert NetApp Technical Support to the changes that you made to the configuration of your storage array.
   a. Get the serial number of the controller-drive tray that you recorded in Prepare to upgrade controllers.
   b. Log in to the NetApp support site at mysupport.netapp.com/eservice/assistant.
   c. Select **Product Registration** from the drop-down list under **Category 1**.
   d. Enter the following text in the **Comments** text box, substituting the serial number of your controller-drive tray for serial number:

      ```
      Please create alert against Serial Number: serial number. The alert name
      should be "E-Series Upgrade". The alert text should read as follows:

      "Attention: The controllers in this system have been upgraded from the
      original configuration. Verify the controller configuration before ordering
      replacement controllers and notify dispatch that the system has been
      upgraded."
      ```

   e. Click the **Submit** button at the bottom of the form.

What's next?

If your controller upgrade results in changing the vendor ID from LSI to NETAPP, go to Remount volumes after changing the vendor from LSI to NETAPP; otherwise, your controller upgrade is complete and you can resume normal operations.

Remount volumes after changing the vendor from LSI to NETAPP

If your controller upgrade results in changing the vendor ID from LSI to NETAPP, follow the appropriate procedure for your host type:

- Remount volumes on an AIX host
- Remount volumes on a VMware host
- Remount volumes on a Windows host

Remount volumes on an AIX host

After you replace the controllers, you might observe that the host shows the new volumes on the storage array, but also shows the original volumes as failed.

Step

If failed volumes appear, run the `cfgmgr` command.

Remount volumes on a VMware host

After you replace the controllers, you might observe the following conditions:

- VMware shows new paths for the volumes on the storage array, but also shows the original paths as dead paths.
- The hosts still list the volumes on the storage array as having LSI vendor IDs. This might occur when the volumes were claimed by the LSI rule at the start and so continue to use the same LSI rule when the volumes come back on line.
- The Display Name does not reflect the change from LSI to NetApp. This might occur because the display name became free test after initial discovery. In this case, you can change the Display Name manually.

Steps

1. Perform a rescan on each host.
2. Halt all host I/O operations to this subsystem.
3. Reclaim the volumes under NetApp rule.
   a. Run the `esxcli storage core device list` command. Check the output from the command to identify volumes whose names have the form `aa.xxxx`.
   b. Run the command `do esxcli storage core claiming reclaim -d naa.xxxxx` to change the LSI vendor ID to NetApp.

Remount volumes on a Windows host

After you replace the controllers, you must remount volumes on a Windows host to enable attached hosts to perform I/O operations with the volumes located on the upgraded storage array.

Steps

1. In the **Device Manager**, select **Show Hidden Devices**.
2. For each NETAPP SCSI Disk Device listed in the **Device Manager**, right-click on the entry, and select **Uninstall**.

   If Windows displays a dialog box with a message indicating that you should reboot the host, finish uninstalling all of the volumes before you scan for hardware and reboot.
3. Right-click in the **Device Manager**, and then select **Scan for Hardware Changes**.
4. Reboot the host.

Reconfigure a SAS-2 system behind a new SAS-3 controller shelf

If necessary, you can reconfigure your SAS-2 system to be used behind a new SAS-3 controller shelf.

Approved SAS-2 arrays include the E2700, E550/EF5500, and E5600/EF560. Approved SAS-2 drive shelves include the DE1600, DE5600, and DE6600. Approved SAS-3 arrays include the E2800 and E5700/EF570. Approved SAS-3 drive shelves include DE212C, DE224C, and DE460C.

About this task

In this procedure, you convert the controller shelf in an approved SAS-2 array to a drive shelf, and then place that shelf behind a new approved SAS-3 array and drive shelves, without data preservation.

This procedure applies to IOM12 and IOM12B drive shelves.

IOM12B modules are only supported on SANtricity OS 11.70.2 onward. Ensure your controller's firmware has been updated before installing or upgrading to an IOM12B.

Before you begin

Due to the complexity of this procedure, the following is required:

- You must have a Feature Product Variance Request (FPVR). To file an FPVR, contact NetApp Professional Services.

  Failure to acquire an FPVR before attempting this procedure can result in drive failure and controller lock down.

- If you are able to back up your data, you can perform this procedure without assistance from NetApp Professional Services.
- If you cannot back up your data, contact NetApp Professional Services for assistance with this procedure.
- Make sure both of your arrays are prepared for the procedure:
  - **Existing array**: Existing array with SANtricity OS 8.25 or later that is powered up.
  - **New array**: New array unpacked and powered down.
- Record the serial number from the SAS-2 controller shelf that you will be converting to a drive shelf.

Step 1: Power down the controllers (non-data preservation)

All operations must be shut down before you can power down the controllers.

Steps

1. If the existing SAS-2 array is still accessible, delete all volume groups, power down both controllers, and remove all cables.
2. Record the serial number from the SAS-2 controller shelf that you will be converting to a drive shelf.
3. If drive security is in use for the existing array, ensure that the security key is available.

Step 2: Install the controllers (non-data preservation)

Upon successful shut down, you can replace the controllers in the array.

Steps

1. Replace both controllers in the existing array with IOMs or ESMs.
2. If possible, use the host cables and network cables from the existing array and connect them to the controllers in the new array.

   Depending on the host connections of your new array, different cables may be required.

3. Cable the drive shelves behind the controllers in the new array.

   The existing controller-drive tray and any attached drive trays become drive shelves and can be cabled to the controllers in the new array.

   Connecting SAS-2 to SAS-3 requires SAS HD to mini SAS cables. For more detailed cabling information for your particular controller and expansion shelf configuration, refer to Cabling or the E-Series Hardware Cabling Guide.

Step 3: Power on the controllers (non-data preservation)

After installation is complete, power on the controllers and submit your configuration changes to NetApp Technical Support.

Steps

1. Power up the new array including any attached drive shelves.
2. Configure the management port and the IP addresses by installing the SANtricity Quick Connect utility.
3. If drive security was in use on the existing array, import the security key.
4. If you were unable to delete the volume groups from your existing array before performing this procedure, you must set all foreign drives to appear as native. For detailed information on how to set drives to native, refer to the SANtricity Online Help.
5. Send your configuration changes to NetApp Technical Support.
   a. Get the serial number of the old controller-drive tray that you recorded in Step 2.
   b. Log in to the NetApp Support Site.
   c. From the drop-down list under **Feedback Category**, select **Installed products > Decommission Request**.
   d. Select **Create Case**. Enter the following text in the **Comments** text box, substituting the serial number of your controller-drive tray for serial number:

      ```
      Please decommission this serial number as the entitlement has been moved to
      another serial number in the system. Please reference this in the SN notes.
      ```

   e. Select **Submit**.

The completed SAS-2 to SAS-3 configuration changes are submitted to NetApp Technical Support.

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
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.	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

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	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.

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…
• 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.

What's next?

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

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