# Converting a Fibre Channel Host Interface Card to Fibre Channel-iSCSI Split Mode

You can apply a feature pack in SANtricity® Storage Manager to convert the protocol of the host interface cards (HIC) in an E-Series storage array or an EF-Series flash array from Fibre Channel to Fibre Channel-iSCSI split mode. You can convert the protocol of the HICs in a new array or in an array that has already been in use.

You can convert the protocol of the following E-Series or EF-Series systems, assuming they contain four-port Fibre Channel HICs:

- E5600 storage arrays, including the E5612, E5624, and E5660

- EF560 flash arrays

In *split mode*, ports 1 and 2 on both HICs operate as iSCSI ports, while ports 3 and 4 on both HICs operate as Fibre Channel ports. The following figure shows the rear view of the E5612 controller-drive tray with two four-port HICs installed.
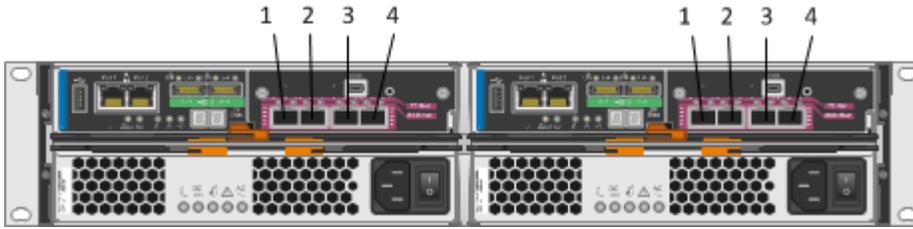
HIC port	Before the conversion	After the conversion
1	16 Gb Fibre Channel	10 Gb iSCSI
2	16 Gb Fibre Channel	10 Gb iSCSI
3	16 Gb Fibre Channel	16 Gb Fibre Channel
4	16 Gb Fibre Channel	16 Gb Fibre Channel

Considerations for this procedure

Before starting this procedure, be aware of the following:

- You must schedule a downtime maintenance window for this procedure, and you cannot access data on the storage array or flash array until you have successfully completed the conversion. You must take the system offline, and the controllers reboot when you apply the feature pack.

- You must use out-of-band management to perform this procedure. This procedure is not supported if you use in-band management.

- The exact steps for performing this procedure vary depending on your configuration. For example, it is easier and more straightforward to convert HIC ports in a new system than to convert ports in a system that has already been in use. If the system has been in use, you might need to re-cable host ports 1 and 2, change LUN mappings, or move or disable Data Assurance (DA) volumes.

- If you are using SAN Boot hosts that are connected to host ports 1 and 2, refer to the NetApp Interoperability Matrix Tool to ensure that the configuration is supported on iSCSI.

Note: If the configuration is not supported for iSCSI, and you want to continue using SAN Boot hosts, you must connect them to ports 3 or 4 before applying the feature pack.

- A HIC feature pack conversion changes the HIC protocol in SANtricity OS (controller firmware). The value set in SANtricity OS controls whether the ports on the HIC operate in Fibre Channel mode, iSCSI mode, or Fibre Channel-iSCSI split mode. If you need to replace the controller and HIC due to either controller or HIC failure after applying a HIC feature pack conversion, the new controller and HIC will automatically use whichever protocol you applied earlier with the feature pack.

- This document describes how to convert Fibre Channel HICs to Fibre Channel-iSCSI split mode; for instructions for performing other HIC feature pack conversions or for performing a HIC hardware upgrade, refer to the list of related documents at the end of this topic.

Before you begin

- You have obtained the necessary hardware for the conversion. For example, you might need replacement cables and SFP transceivers. Your NetApp Sales Representative can help you determine what hardware you need and help you order the correct parts. If your storage array currently uses unified SFPs that you purchased from NetApp, you do not need to replace these SFPs, unless you want to use 1 Gb iSCSI.

- SANtricity Storage Manager version 11.25 or later is installed.

- The storage array is running SANtricity OS (controller firmware) version 8.25 or later. To determine which firmware version you have, check the **Summary** tab in the Array Management Window. To download the latest firmware, go to the NetApp Downloads page and select **Downloads > Software**. Download the correct version of **E-Series/EF-Series SANtricity OS (Controller Firmware)** for your storage array.

- If you will be using a new host, you have installed SANtricity utilities (the SMutil package) including the Host Context Agent, which automatically creates a new host object and associated host ports on the storage for use with storage partitioning.

Steps

Related information

NetApp E-Series and EF-Series Systems Documentation Center
NetApp Downloads
NetApp Interoperability Matrix Tool
Converting a Fibre Channel Host Interface Card to iSCSI
Converting an iSCSI Host Interface Card to Fibre Channel
Converting an iSCSI Host Interface Card to Fibre Channel-iSCSI Split Mode
Converting a Host Interface Card from Fibre Channel-iSCSI Split Mode to Fibre Channel
Converting a Host Interface Card from Fibre Channel-iSCSI Split Mode to iSCSI
Upgrading Host Interface Cards in the E5600 or EF560

Considerations for the Data Assurance feature

The Data Assurance (DA) feature is not supported for iSCSI, so any DA-enabled volumes are automatically removed from the default partition when you convert a Fibre Channel HIC to Fibre Channel-iSCSI split mode. Before you apply the feature pack, you must consider how to handle any DA volumes in the default partition.

You can skip this topic if you are converting a new system that does not have hosts and volumes defined. These considerations apply only if you are converting a system that uses DA volumes.

When you create volumes in a Fibre Channel configuration, you have the option to enable or disable the Data Assurance (DA) feature. Because the default setting is to enable DA, the default partition might contain one or more DA-enabled volumes. If it does, be aware that when you convert a Fibre Channel HIC to split mode, the system automatically removes all DA volumes from the default partition. This is because the DA feature is not supported for iSCSI. As a result, any hosts assigned to the default partition might temporarily lose access to some of their data.

To ensure that data access remains uninterrupted, you must choose one of these options:

Option 1: Remap DA volumes, and then apply the feature pack

Before applying the feature pack, locate all DA volumes in the default partition and map them to Fibre Channel hosts that are assigned to ports 3 and 4.

> **Important:** This is the recommended approach, but it might require you to spend a significant amount of time manually defining new hosts and storage partitions, and locating and moving DA volumes from the default partition to the new partitions.

Option 2: Apply the feature pack, and then remap DA volumes

After applying the feature pack, locate any DA volumes that were automatically removed from the default partition and move them. You can either map them to storage partitions managed by Fibre Channel hosts or you can move them back into the default partition. If you attempt to move a DA volume back to the default partition, a warning is displayed indicating that DA will be automatically disabled for the volume. You must type **Yes** to proceed.

Option 3: Disable DA

Before applying the feature pack, disable DA on the volumes in the default partition. Option 3 ensures that these volumes are compatible with both Fibre Channel and iSCSI hosts; however, it prevents Fibre Channel hosts from being able to take advantage of the significant error detection and correction benefits provided by DA.

> **Note:** Once DA has been disabled on a volume, it cannot be reenabled.

For instructions on disabling the Data Assurance feature, refer to the online help for the Array Management Window.

If you choose option 1

If you have DA volumes and you choose option 1, refer to the following table to determine exactly which steps you need to perform.

Host type	Partition type	Steps
Manually defined using the Define Host Wizard	Default partition	1. Create one or more new storage partitions. 2. Update the manually defined host, and assign it to a new storage partition. 3. Locate and move all DA-enabled volumes from the default storage partition to a new storage partition.
	Any other storage partition	You do not need to move DA volumes from these other partitions. After you apply the feature pack, you can access these volumes with the manually defined Fibre Channel hosts. **Note:** If you currently have DA-enabled volumes assigned to the Fibre Channel hosts connected to ports 1 and 2, you must manually reconnect these hosts to ports 3 and 4 before converting the protocol. Otherwise, when you convert the HIC to Fibre Channel-iSCSI split mode, all DA-enabled volumes for these hosts are removed.
Not defined using the Define Host Wizard (that is, automatically defined by the system)	Default partition	1. Create one or more new storage partitions. 2. Manually define one or more new Fibre Channel hosts (and optionally new host groups) and assign them to the new storage partitions. 3. Locate and move any DA-enabled volumes from the default storage partition to the new storage partitions.

Managing mirroring relationships

If you currently use the Synchronous Mirroring feature (also known as RVM) or the Asynchronous Mirroring feature (also known as ARVM), you should not need to make any changes before applying the feature pack to convert a Fibre Channel host interface card (HIC) to Fibre Channel-iSCSI split mode. However, you should confirm that the secondary volumes are synchronized before applying the feature pack and test the link after applying the feature pack.

About this task

These considerations do not apply if you are converting a new system. They apply only if you are converting a system that uses mirroring relationships.

On a Fibre Channel array, mirroring operations occur over the last (highest numbered) port. That is, for Fibre Channel arrays with four-port HICs, mirroring operations occur over port 4. When you convert a Fibre Channel HIC to Fibre Channel-iSCSI split mode, ports 3 and 4 remain Fibre Channel, so any synchronous mirroring or asynchronous mirroring operations should be unaffected. However, you should review the following considerations when converting the protocol:

- You do not need to convert both the local array and the remote array to split mode as long as both arrays have at least one active Fibre Channel port after the conversion.

- If you use the Synchronous Mirroring feature, be aware that synchronous mirroring is not supported for iSCSI.

Steps

1. Confirm that all secondary volumes are synchronized. Refer to the online help for the Array Management Window if you have questions on how to do this.

2. Follow the instructions in this document to apply the feature pack to convert the Fibre Channel HIC to Fibre Channel-iSCSI split mode.

3. After applying the feature pack, use the **Test Communication Link** dialog box in the Array Management Window to ensure that the local and remote arrays are still communicating correctly. Refer to the online help for the Array Management Window.

Determining whether you have unified SFPs

You can use the Array Management Window in SANtricity Storage Manager to determine what type of SFPs you have. Unified SFPs support both 16 Gbps Fibre Channel and 10 Gbps iSCSI, so you can continue to use them after converting the HIC protocol.
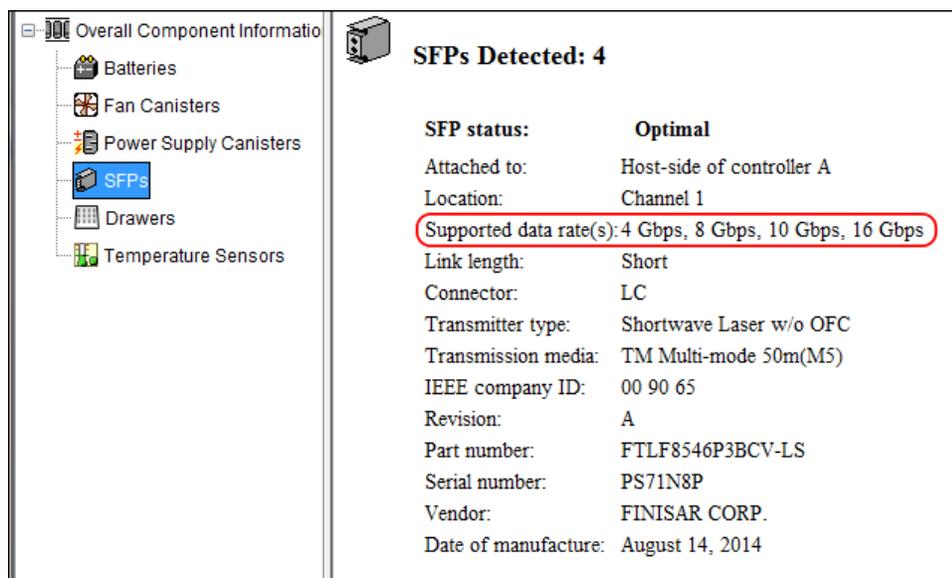
Before you begin

The array has been added to the Enterprise Management Window.

Steps

1. From the Array Management Window, select **Hardware > Tray > View/Edit > Controller/Drive components**.

2. From the **Overall Component Information** navigator on the left, click **SFPs**.

   The SFP status is displayed. The screen shot shows the supported data rates for unified SFPs.

3. Locate the **Supported data rate(s)** entry in the results.

Supported data rate	SFP type	Protocol
4 Gbps, 8 Gbps, 10 Gbps, 16 Gbps	Unified	• **Fibre Channel:** 4 Gbps, 8 Gbps, 16 Gbps • **iSCSI:** 10 Gbps
10 Gbps	10 Gbps	iSCSI only
4 Gbps, 8 Gbps, 16 Gbps	16 Gbps	Fibre Channel only
2 Gbps, 4 Gbps, 8 Gbps	8 Gbps	Fibre Channel only

4. Determine whether you can reuse the SFPs, as follows:

   • If you have unified SFPs, you can continue using them after you convert the protocol.

      Note: The unified SFPs do not support 1 Gb iSCSI. If you plan to use iSCSI remote mirroring, be aware that the unified SFPs support only a 10 Gb link to the remote site.

   • If you have 16 Gbps SFPs, and you are converting HIC ports to iSCSI, you must remove the SFPs from ports 1 and 2 and replace them with unified or 10 Gbps SFPs after converting the protocol. As needed, you can also use 10 Gbps iSCSI copper by using a special Twin-Ax cable with SFPs.

Stopping host I/O

You must stop all I/O operations from the host before converting the protocol of the host interface cards (HICs). You cannot access data on the storage array until you successfully complete the conversion.

Steps

1. Ensure that no I/O operations are occurring between the storage array and all connected hosts. For example, you can perform these steps:

   • Stop all processes that involve the LUNs mapped from the storage to the hosts.

   • Ensure that no applications are writing data to any LUNs mapped from the storage to the hosts.

   • Unmount all file systems associated with volumes on the array.

      Note: 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.

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

2. If the storage array participates in a mirroring relationship, stop all host I/O operations on the secondary storage array.

3. Wait for five minutes to allow any data in cache memory to be flushed to disk.

4. In the **Hardware** tab of the **Array Management Window**, select the graphic representation of the storage array, and then select **Monitor > Reports > Operations in Progress**.

5. Wait for all operations shown on the **Operations in Progress** window to complete before continuing with the next step.

Converting a Fibre Channel Host Interface Card to Fibre Channel-iSCSI Split Mode

Obtaining the feature pack key

You can apply a feature pack key in SANtricity Storage Manager to convert the protocol of the host interface card (HIC) from Fibre Channel to Fibre Channel-iSCSI split mode. To obtain the feature pack key, you need a Feature Activation Code, the serial number for your storage system enclosure, and the Feature Enable Identifier for your storage system.

Steps

1. From the following table, locate the Feature Activation Code that applies to your storage system and conversion path, and copy the value to a text file.

Storage system	Converting from Fibre Channel to Fibre Channel-iSCSI split mode
E5600	TGI-7MS-ZXC1E
EF560	SGS-DNS-Z48EQ

2. Locate the serial number for your storage system. You can look at the silver label affixed to the top of your system enclosure, or you can get the serial number from the software, as follows:

   a. From the Array Management Window, select the **Summary** tab, and click **View Storage Array Profile** in the Monitor area.

   b. On the Storage Array tab, locate the **Chassis Serial Number**.

   c. Copy and paste the value into a text file.

3. Locate and record the Feature Enable Identifier for your storage system:

   a. From the Array Management Window, select **Storage Array > Premium Features** to display the **Premium Features and Feature Pack Information** window.

      The 32-digit Feature Enable Identifier is displayed under **Storage Array Feature Information**.

   b. Copy and paste this 32-digit identifier into a text file.

4. Go to *NetApp License Activation: Storage Array Premium Feature Activation*, and enter the information required to obtain the feature pack.

   • Feature Activation Code from the table

   • Serial number for the storage system

   • Feature Enable Identifier

   Note: The Premium Feature Activation web site includes a link to "Premium Feature Activation Instructions." Do not attempt to use those instructions for this procedure.

5. Choose whether to receive the key file for the feature pack in an email or to download it directly from the site.

6. Save the key file for later use.

Applying the feature pack key

You can apply a feature pack key to change the HIC protocol.

About this task

This task describes how to apply a feature pack key to a single storage array. If you intend to use mirroring after the conversion, you might need to apply a key to the local storage array and to the remote storage array. Each array requires its own key.

Steps

1. From the Array Management Window, select **Storage Array > Premium Features**.

2. In the **Feature Pack** section at the bottom of the screen, click **Change**.

   Note: Do not click the **Use Key File** button in the **Enable a Premium Feature** section.

   The Select Feature Key File dialog opens, which lets you select the generated key file.

3. Select the folder in which you placed the generated key file.

4. Select the key file, and click **OK**.

5. Click **Close**.

   Both controllers automatically reboot twice as the new feature pack takes effect. Assuming the SFPs and cables are correct for the new protocol, the storage array returns to an optimal state after the reboot operations are complete.

6. Follow these steps to confirm that the protocol was changed:

   a. From the Array Management Window, re-select the **Hardware** tab.

      The information shown on the tab is refreshed.

   b. Scroll down to the **Host Interface Board** section and confirm that the value for **Type** is what you expect:

Value for Type	HIC protocol
iSCSI	iSCSI
Fibre channel	Fibre Channel
iSCSI, Fibre channel	Fibre Channel-iSCSI split mode

Modifying the configuration for Fibre Channel-iSCSI split mode

After applying the feature pack to convert a Fibre Channel HIC to Fibre Channel-iSCSI split mode, you might need to modify your existing configuration to support iSCSI.

You can use either of the following options to use the new iSCSI ports. The exact steps depend on your current and planned network topologies.

Note: If you converted a new system that was not using host ports 1 and 2 for Fibre Channel, download the Hardware Installation Guide for your storage array or flash array to learn how to install cables and SFPs. Then, follow the instructions in the appropriate SANtricity Express Guides for Fibre Channel and iSCSI to complete the setup for each protocol.

Option 1: Move Fibre Channel hosts, and then add new iSCSI hosts

Option 1 assumes that you want to attach new iSCSI hosts to the array. Follow these general steps:

1. Move any Fibre Channel hosts from ports 1 and 2 to ports 3 and 4.

   a. Remove any Fibre Channel cables and SFPs from ports 1 and 2.

   b. In a direct-attach topology, install the Fibre Channel cables and SFPs in ports 3 and 4, if available, or install a switch. In a switch topology, zone the switch to allow connectivity between these hosts and Fibre Channel ports 3 and 4.

2. Attach new iSCSI hosts to ports 1 and 2. In a direct-attach topology, insert iSCSI or unified SFPs and cables into ports 1 and 2. In a switch topology, zone the switch to allow connectivity between the new iSCSI hosts and iSCSI ports 1 and 2.

3. Configure iSCSI networking for the new hosts and ports. For instructions, refer to the iSCSI Express Guide for your operating system.

Option 2: Convert Fibre Channel hosts to iSCSI

Option 2 assumes that you want to convert the hosts connected to ports 1 and 2 from Fibre Channel to iSCSI. Follow these general steps:

1. Shut down the Fibre Channel hosts connected to ports 1 and 2.

2. Provide an iSCSI topology for ports 1 and 2. For example, convert any switches connected to those hosts from Fibre Channel to iSCSI.

3. If you are not already using unified SFPs, remove the Fibre Channel SFPs from ports 1 and 2, and replace them with iSCSI SFPs or unified SFPs.

4. Attach cables to the SFPs in ports 1 and 2, and confirm they are connected to the correct iSCSI switch or host.

5. Power on the hosts.

6. Use the NetApp Interoperability Matrix Tool to configure the iSCSI hosts.
   NetApp Interoperability Matrix Tool

7. After the iSCSI hosts reboot, use the applicable procedures on the hosts to register the volumes and to make them available to your operating system.

   • Depending on your operating system, two utilities are included with the storage management software (`hot_add` and `SMdevices`). These utilities help register the volumes with the hosts and also show the applicable device names for the volumes.

   • You might need to use specific tools and options that are provided with your operating system to make the volumes available (that is, assign drive letters, create mount points, and so on). Refer to your host operating system documentation for details.

8. From the Array Management Window, edit the host partition to add the iSCSI host port IDs, and remove the Fibre Channel host port IDs.

Related information

E5600 Controller-Drive Tray and Related Drive Trays Installation Guide
EF560 Flash Array and Related Trays Installation Guide
SANtricity Storage Manager 11.25 Express Guide for Linux and Fibre Channel
SANtricity Storage Manager 11.25 Express Guide for VMware and Fibre Channel
SANtricity Storage Manager 11.25 Express Guide for Windows and Fibre Channel
SANtricity Storage Manager 11.25 Express Guide for Linux and iSCSI
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