IBM System Storage N series
Gateway Implementation Guide for EMC CLARiiON Storage

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Table of Contents

Preface

About this guide

This guide provides information about how to set up your storage array to work with an IBM® N series gateway running Data ONTAP® software, including configuration guidelines and sample configurations. The information in this guide pertains to all supported gateway platforms.

Note

Data ONTAP software runs on multiple hardware platforms. This documentation might describe features that are not supported on your platform.

Attention

In this document, the term *gateway* describes IBM N series storage systems that have been ordered with gateway functionality. Gateways support various types of storage, and they are used with third-party disk storage systems—for example, disk storage systems from IBM, HP®, Hitachi Data Systems®, and EMC®. In this case, disk storage for customer data and the RAID controller functionality is provided by the back-end disk storage system. A gateway might also be used with disk storage expansion units specifically designed for the IBM N series storage systems.

The term *filer* describes IBM N series storage systems that either contain internal disk storage or attach to disk storage expansion units specifically designed for the IBM N series storage systems. Filer storage systems do not support using third-party disk storage systems.

Audience

This guide is for system administrators who are familiar with operating systems such as UNIX® and Windows® that run on the storage system's clients. This guide does not discuss basic system or network administration topics, such as IP addressing, routing, and network topology; it emphasizes the characteristics of the gateway.

Terminology

An HA pair is a pair of gateways configured to serve data for each other if one of the two systems becomes impaired. In gateway documentation, Data ONTAP documentation, and other information resources, HA pairs are sometimes also referred to as clusters or active/active configurations.

Relationship of this guide to other guides

This guide is intended to be used in conjunction with other information in the gateway and Data ONTAP libraries. The following table describes the relationships between this guide and other documentation.

Guide name	Information includes...
Installation Requirements and Reference Guide	◆ General guidelines for creating and making array LUNs available to gateways ◆ Quick start installation instructions for connecting devices together and for installing Data ONTAP on a gateway that uses only third-party storage ◆ Reference information ◆ Detailed background information including layout in aggregates and checksums
Implementation Guides	◆ Vendor-specific details about how to set up a storage array to work with gateways. ◆ More detailed configuration examples than are provided in the *Installation Requirements and Reference Guide*.
Implementation Guide for Native Disk Shelves	Information about setting up the storage on the native disk shelves connected to the gateway.
Gateway *Setup, Installation, and Management Guide* or the *Data ONTAP* software setup guides	Detailed steps for setting up the gateway, including information about installing Data ONTAP software for installations using only third-party storage. These guides are most helpful to installers new to Data ONTAP setup and installation.
Data ONTAP guides	Detailed information about all Data ONTAP features used by all systems running Data ONTAP, for example, storage features and data protection features.

See the gateway *Interoperability Matrix* for details about Data ONTAP releases that support the gateway, supported switches, supported firmware, capacity, and maximum array LUN count.

Supported features

IBM® System Storage™ N series products are driven by NetApp® Data ONTAP software. Some features described in the product software documentation are neither offered nor supported by IBM. Please contact your local IBM representative or reseller for further details. Information about supported features can also be found at the following Web site:

www.ibm.com/storage/support/nas/

A listing of currently available N series products and features can be found at the following Web site:

www.ibm.com/storage/nas/

Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your IBM N series product, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected properly.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.

Using the documentation

Information about the N series hardware products is available in printed documents and a documentation CD that comes with your system. The same documentation is available as PDF files on the IBM NAS support Web site:

www.ibm.com/storage/support/nas/

Web sites

IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates.

- For NAS product information, go to the following Web site:
  www.ibm.com/storage/nas/
- For NAS support information, go to the following Web site:
  www.ibm.com/storage/support/nas/

- For AutoSupport information, go to the following Web site:
  www.ibm.com/storage/support/nas/
- For the latest version of publications, go to the following Web site:
  www.ibm.com/storage/support/nas/

Accessing online technical support

For online Technical Support for your IBM N series product, visit the following Web site:

www.ibm.com/storage/support/nas/

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services. Visit the following Web site for support telephone numbers:

www.ibm.com/planetwide/

Supported servers and operating systems

IBM N series products attach to many servers and many operating systems. To determine the latest supported attachments, visit the following Web site:

www.ibm.com/storage/support/nas/

Firmware updates

As with all devices, it is recommended that you run the latest level of firmware. For information on firmware updates, visiting the following Web site:

www.ibm.com/storage/support/nas/

Verify that the latest level of firmware is installed on your machine before contacting IBM for technical support. See the *Gateway Upgrade Guide* for your version of Data ONTAP for more information on updating firmware.

Special messages

This guide contains special messages that are described as follows:

Note

A note contains important information that helps you install or operate the system efficiently.

Attention

Attention contains instructions that you must follow to avoid damage to the equipment, a system crash, or loss of data.

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- Exact publication title
- Form number (for example, GC26-1234-02)
- Page numbers to which you are referring

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Implementation Overview 1

About this chapter

This chapter provides an overview of how to integrate IBM® N series gateways with EMC® CX series storage arrays.

Note

IBM gateway models and filers with gateway functionality are both referred to as gateways.

Topics in this chapter

This chapter discusses the following topics:

Additional Information to read

This guide is intended to be used in conjunction with other information in the gateway and Data ONTAP libraries. In particular, refer to the additional documents in the following table.

For information about...	See...
Data ONTAP releases that support the gateway, supported switches, supported firmware, capacity, and maximum array LUN count	Gateway Interoperability Matrix at http://www.ibm.com/storage/nas/ **Note** The Interoperability Matrix is the final authority on the storage array models and license code and firmware controller versions that the gateway supports.
Creating LUNs for gateways on the storage array and setting up access (generic information for all vendors and arrays)	Gateway *Installation Requirements and Reference Guide*

For information about...	See...
How to configure the gateway	Gateway *Installation Requirements and Reference Guide* (quickstart procedure) Gateway *Setup, Installation, and Management Guide* or Data Ontap software setup guides (detailed procedures)
How the gateway operates and what you need to plan for a successful deployment with the gateway	Gateway *Installation Requirements and Reference Guide*

CX series terminology

metaLUN

A LUN that was expanded from its original size by adding another LUN or an entire physical disk. If you need a LUN that exceeds the maximum number of disks for a RAID type or if you need to expand the user capacity of an existing LUN, you can use the metaLUN feature. You can view all metaLUN components from Navisphere (that is, the original LUN and any added LUNs). However, you cannot divide a metaLUN into its original LUNs.

Navisphere software

Navisphere Manager is a Web-based user interface for managing and configuring CX series storage arrays.

shared storage system

A CX series storage array with the EMC Access Logix option. The Access Logix option provides data access control (Storage Groups) and configuration access control. A shared storage system is always a RAID Group storage system.

SP

Storage Processor.

Storage Group

A collection of one or more array LUNs and metaLUNs that you connect to one or more hosts. A host can access only the LUNs in the Storage Groups to which it is connected.

storage system

The term used by EMC to refer to the CX series systems. Gateway manuals use the term *storage array* to refer to the CX series storage systems.

In Data ONTAP documentation, storage system is a general term that describes all systems that run Data ONTAP software, including .

unshared storage system

A storage system without the EMC Access Logix option. In Data ONTAP documentation, storage system is a general term that describe all systems that run Data ONTAP software.

Supported CLARiiON storage arrays and firmware

Finding out which Data ONTAP release supports which storage arrays

This guide provides information about the storage arrays that the gateway supports at the time of publication. Not all models described in this guide are supported in all Data ONTAP releases. To determine which storage array models are supported in a particular Data ONTAP release, see the gateway *Interoperability Matrix*.

Note

The gateway *Interoperability Matrix* is the final authority about which Data ONTAP releases, storage arrays, firmware, switches, features, and so on that gateways support.

Supported storage array models

Gateways support the following EMC CLARiiON CX series storage arrays in the following families:

- Family 1
  - CX300, CX500, CX700
- Family 2
  - CX3-20, CX3-40, CX3-80
- Family 3
  - CX4-120, CX4-240, CX4-480, CX4-960

Note

In the context of this discussion, storage arrays in the same *family* share the same performance and failover characteristics. For example, members of the same family all perform active-active failover or they all perform active-passive failover. Storage arrays with 4-GB HBAs are not considered to be in the same family as storage arrays with 2-GB HBAs. (Setting up a Data ONTAP aggregate, and assigning array LUNs from different storage array families or different vendors to the same aggregate is not supported.)

Gateways that support CX series storage arrays

For information about the gateway models that support CX series storage arrays, see the gateway *Interoperability Matrix*.

Where to find information about supported CX series firmware

For information about the supported CX series firmware, see the gateway *Interoperability Matrix*.

Note

The gateway *Interoperability Matrix* is the final authority about which Data ONTAP releases, storage arrays, firmware, switches, features, and so on that gateways support.

Planning for using CX series Storage Groups

Storage Groups defined

CX series shared storage arrays use Storage Groups to control access to data. A Storage Group is one or more LUNs within the storage array that can be accessed only by the host or hosts that you associate with the array LUNs. Each host can see only the array LUNs in the Storage Group with which it is associated. Therefore, a host cannot access or modify data in array LUNs that are not part of its Storage Group. The Access Logix software, which runs on each CX series storage array, enforces the host-to-Storage Group permissions.

Note

Shared means that more than one host is allowed to access the storage on the storage array. Access control is used to prevent one host from overwriting the storage of another host.

Switch zoning cannot selectively control data access to LUNs on the storage array because each SP appears as a single Fibre Channel device to the switch fabric.

Maximum number of LUNs per Storage Group

On CX series storage arrays, the maximum number of LUNs per Storage Group is 256.

Note

Although there is limit of 256 LUNs per CX series Storage Group, performance is better if you create fewer larger array LUNs than a lot of smaller array LUNs. See the gateway *Installation Requirements and Reference Guide* for the best practice recommendations for the number of array LUNs to create.

Rules for use of Storage Groups with the gateway

If you are using Storage Groups on your CX series storage array, you must adhere to the following rules:

- For Data ONTAP releases 7.3 and later, the gateways supports more than one Storage Group per CX storage array. See "Multiple array LUN group requirements" on page 34 for more information.
- For Data ONTAP releases earlier than 7.3 the gateways supports only one Storage Group (per CX series storage array).

- All the gateways in the same neighborhood must be in the same Storage Group (because all the gateways in the neighborhood must be able to see the same array LUNs).
- The maximum number of LUNs per Storage Group is 256.

CX series configuration requirements

CX series configuration requirements to work with a gateway

When you manually register the gateway FC initiator port names as hosts, you set the parameters as shown in the following table.

Setting	Required value
Initiator Type	CLARiiON Open
Array Com Path	Enabled
Failover mode	1
Unit serial number	LUN
Host Name	If this section is available in the dialog box, specify `New Host`. To simplify management, it is recommended that you enter a host name and port number under in the host name fields, for example, **`gateway N7600 2866-G10-2b-0a`**.
IP address	Enter a unique fake IP address. Be sure that you have not entered this IP address anywhere else in the storage array configuration and that it is not an IP address that is present on the network.

Note

The Access Logix feature installed on a shared CX series storage array enables you to set up data access and create Storage Groups. If you are using Storage Groups, you need to manually register the gateway FC initiator ports as hosts in the storage array before you assign them to the gateway Storage Group.

RAID type restrictions

RAID types that the gateway supports with CX series

See the gateway Interoperability Matrix for information about RAID type restrictions for gateway storage on CX series storage arrays.

If array LUNs of a nonsupported RAID type are presented to the gateway

If the gateway does not support the RAID type of an array LUN presented to it, one of the following occurs:

- The gateway uses the LUN successfully initially, but failure occurs later, for example, when the gateway must fail over to the alternate path to a LUN.

  Note

  Examples of the types of circumstances that cause the gateway to fail over to the alternate path to a LUN are storage array controller reset, fabric reset, and partial fabric outage.

- The gateway marks the LUN as a failed device immediately.

Guidelines for array LUN sizing

Relationship of Data ONTAP and storage array units of measure

The size of the array LUNs that you can create on the storage array is limited by the minimum and maximum array LUN sizes that Data ONTAP supports. The Data ONTAP definition of a gigabyte (GB) might not match the definition of a GB for your storage array. When you determine the minimum and maximum array LUN sizes for your storage array, you need to consider whether the units of measure for your storage array are different from Data ONTAP units of measure.

The Data ONTAP definition of a GB is as follows:

One GB is equal to 1000 x 1024 x 1024 bytes.

See the gateway *Interoperability Matrix* for the general rule about Data ONTAP minimum and maximum array LUN sizes. Each gateway *Implementation Guide* contains specific information about the equivalent minimum and maximum limits according to the vendor's calculation of units of measure.

Minimum array LUN size for the root volume

The minimum array LUN size shown in this section does not apply to the array LUN for the root volume. It is strongly recommended that you do not set the size of a root volume below the minimum root volume size shown in the gateway *Interoperability Matrix*. The reason is that you want to ensure that there is sufficient space in the root volume for system files, log files, and core files. If a system problem occurs, you need to provide these files to technical support.

Minimum and maximum array LUN sizes with EMC CX series storage arrays

EMC calculates units of measure differently than Data ONTAP. The minimum and maximum usable values shown in this section are based on the assumption that the units of measurement for your storage array are calculated as follows.

Unit	Formula for calculating...
GB	1024 x 1024 x 1024 bytes
MB	1024 x 1024 bytes
KB	1024 bytes

If you plan to use a large-sized LUN that is close to the maximum capacity that Data ONTAP supports, ensure that the size you specify does not exceed the size shown in the "Maximum usable value" column in the following tables.

Note

Storage arrays vary as to how you can specify LUN size (that is, in GB, MB, or 512-byte blocks).

See the gateway *Installation Requirements and Reference Guide* for guidelines about the implications of different size array LUNs on Data ONTAP storage.

Values for Data ONTAP 7.2.4 and later:

If you are specifying in...	Minimum usable value	Maximum usable value
GB	2 GB	976 GB
MB	1,049 MB	975,000 MB
512-byte blocks	2,048,001 512-byte blocks	2,047,500,000 512-byte blocks

Values for Data ONTAP 7.2.3:

If you are specifying in...	Minimum usable value	Maximum usable value
GB	2 GB	732 GB
MB	1,049 MB	749,000 MB
512-byte blocks	2,048,001 512-byte blocks	1,535,500,000 512-byte blocks

Values for Data ONTAP 7.2.2 and earlier:

If you are specifying in...	Minimum usable value	Maximum usable value
GB	2 GB	488.281 GB
MB	1,049 MB	500,000 MB
512-byte blocks	2,048,001 512-byte blocks	1,024,000,000 512-byte blocks

Configurations Supported with CX Series Arrays 2

About this chapter

This chapter discusses the configurations supported with EMC CX series storage arrays that the gateway supports. Use the configurations in this chapter as guidelines when you connect your gateway to your storage array.

Note

The gateway *Interoperability Matrix* is the final authority about which configurations that gateways support.

Topics in this chapter

This chapter discusses the following topics:

Your guide to interpreting the illustrations

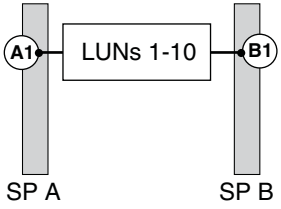
Number of ports shown

The minimum number of ports that you can use per configuration is shown in the illustrations. You might choose to use more ports than are shown.

How redundant paths and port pairs are shown

As you look through the illustrations, notice that on the gateway, connections from the gateway FC initiator ports are set up for redundancy.

Illustration of redundant paths and port pairs for storage arrays: In each illustration in this chapter, the port pairs on the storage array are shown in relation to the array LUNs on the port, with the ports on alternate Storage Processors (SPs). In the illustrations in this chapter, the labels A1 and A2 represent ports on SP A and the labels B1 and B2 represent ports on SP B.



See the gateway *Installation Requirements and Reference Guide* for rules for setting up redundant ports and examples of valid and invalid path setup.

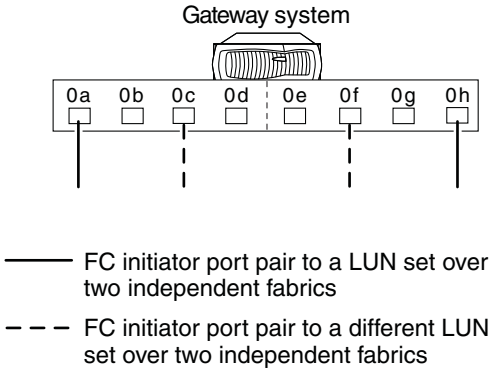
Illustration of redundant paths and port pairs for the gateways: On some gateway models, the FC initiator ports are on cards. On other models, the FC initiator ports are onboard ports and are labeled 0a, 0b, and so on.

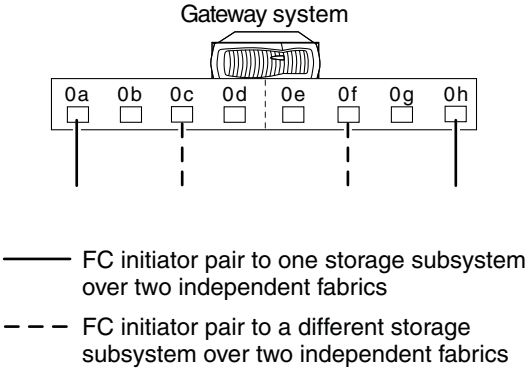
The following illustrations show a N7000 series model, which has both onboard FC initiator ports and cards. In this example, two different redundant port pairs are used. Redundancy is achieved on the gateway because each port in a pair is on a different bus. (For more information about selecting redundant ports on the different gateway models with onboard FC initiator ports, see the gateway *Installation Requirements and Reference Guide*.)

Relationship between gateway port pairs and array LUN groups: The following table shows configurations for redundant paths and port pairs for the gateway.

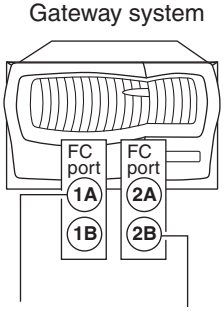
The illustrations in the following table show an N7000 series model, which has both onboard FC initiator ports and cards. These examples show the use of two different redundant port pairs. Redundancy is achieved on the gateway because each port in a pair is on a different bus.

See "Fabric-attached configuration that optimizes performance" on page 25 for examples of configurations with multiple port pairs and multiple array LUN groups.

Release	Supported configurations
7.3 and later	For any storage array, you can use multiple port pairs on a gateway to access array LUNs on the same storage array, if each gateway port pair is accessing a different group of array LUNs. To use multiple gateway port pairs as the illustration shows, each port in a gateway port pair must access a different fabric. 

Release	Supported configurations
Prior to 7.3	To use multiple V-Series port pairs with a CX storage array, each port in a V-Series port pair must access a different fabric, and each V-Series port pair on the same V-Series system must access LUNs on different storage array than any other port pair on that V-Series system. For an HA pair, one port pair from each V-Series system must be able to see the same LUNs. 

The following illustration shows a redundant port pair on a gateway that uses cards.



One port on each of two different cards is configured to ensure redundancy to the port pair on the storage array. Then, if one card fails, the port on the other card is used. You can use either port on a card.

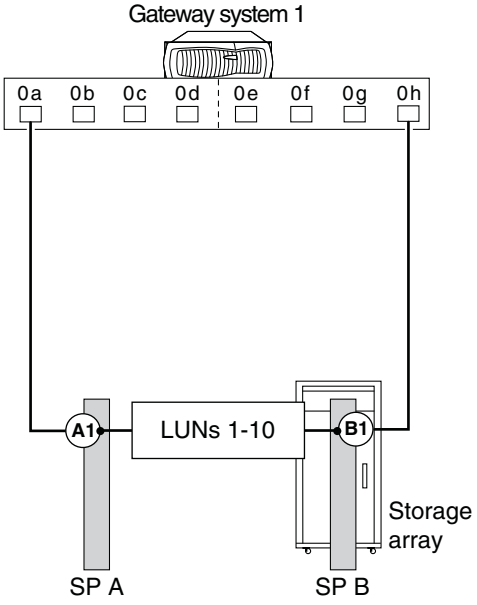
Note

The illustration shows two cards, one with FC ports 1A and 1B and the other with FC ports 2A and 2B. The number represents the slot.

Direct-attached configurations

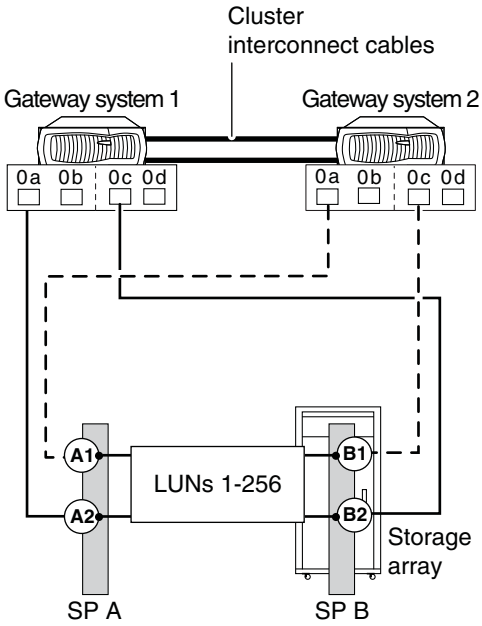
Direct-attached stand-alone configuration

The following illustration shows a direct-attached stand-alone configuration between a N7000 series gateway and an EMC CX series storage array with 10 array LUNs in the gateway Storage Group.



Direct-attached HA pair configuration

The following illustration shows a deployment with an N5000 series gateway HA pair that is directly connected to the storage array. The storage array in this example has allocated 256 array LUNs for the gateways, the maximum number allowed in a Storage Group.



In a direct-attached gateway HA pair, one port pair *per node* is required. You can avoid a single point of failure by creating a redundant port pair. Then, if one path from a gateway node fails, the other path from the node is used; takeover does not occur. (The way you create a redundant port pair differs according to gateway model. For models with adapters, choose one port from each adapter. For models with onboard ports, choose one port from each bus. See the gateway *Installation Requirements and Reference Guide* for more information.)

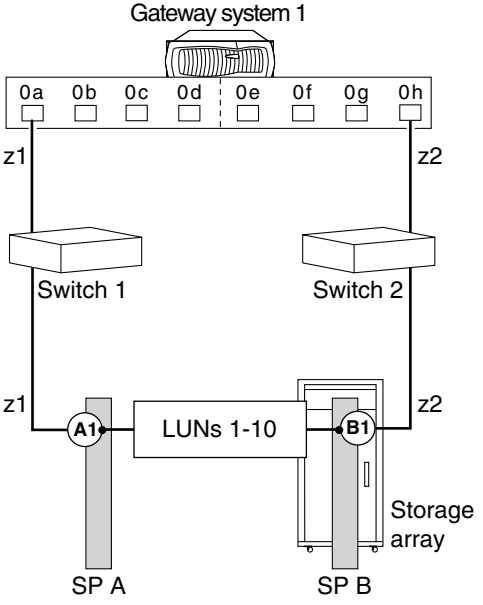
Fabric-attached configurations

Zoning recommendation

It is recommended that you use single-initiator zoning, which limits each zone to a single gateway FC initiator port and one SP. Single-initiator zoning improves discovery and boot time because the gateway FC initiators do not attempt to discover each other.

Fabric-attached stand-alone configuration

The following illustration shows a fabric-attached configuration for a stand-alone configuration between a N7000 series gateway and a CX series storage array. In this example, 10 array LUNs are allocated for the gateway

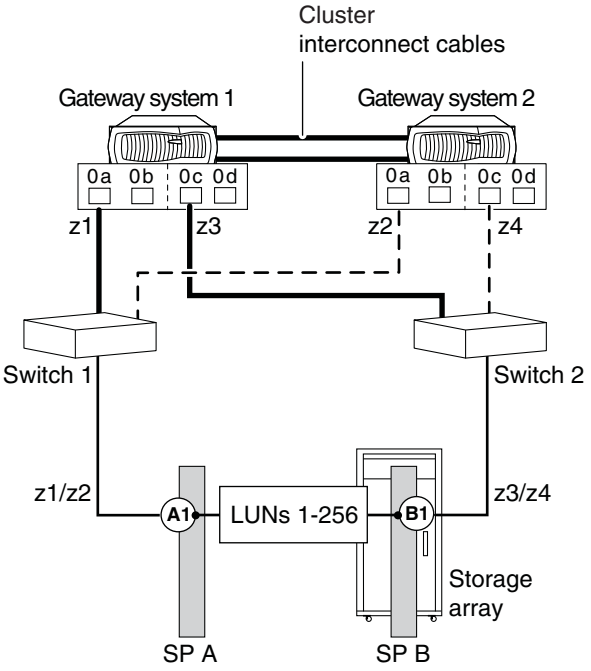


Zoning: The following table shows single-initiator zoning for this example with a N7000 series gateway. Single-initiator zoning is the recommended zoning strategy.

Zone	Switch	Gateway port	Storage array port
z1	1	0a	A1
z2	2	0h	B1

Fabric-attached HA pair configuration

The following illustration shows a deployment with an N5000 series gateway switched HA pair. The storage array in this example has allocated 256 array LUNs for the gateways, the maximum number allowed in a Storage Group.



You improve availability by having one connection from each adapter on each gateway in the HA pair. Then, if one path from a gateway node fails, the other path from the node is used; failover in the gateway HA pair does not occur.

Zoning: The following table shows single-initiator zoning for this example with an N5000 series gateway. Single-initiator zoning is the recommended zoning strategy.

Zone	Gateway port	Storage array port
Switch 1		
z1	Gateway 1, port 0a	A1
z2	Gateway 2, port 0a	A1
Switch 2		
z3	Gateway 1, port 0c	B1
z4	Gateway 2, port 0c	B1

Four ports accessed on a single storage array

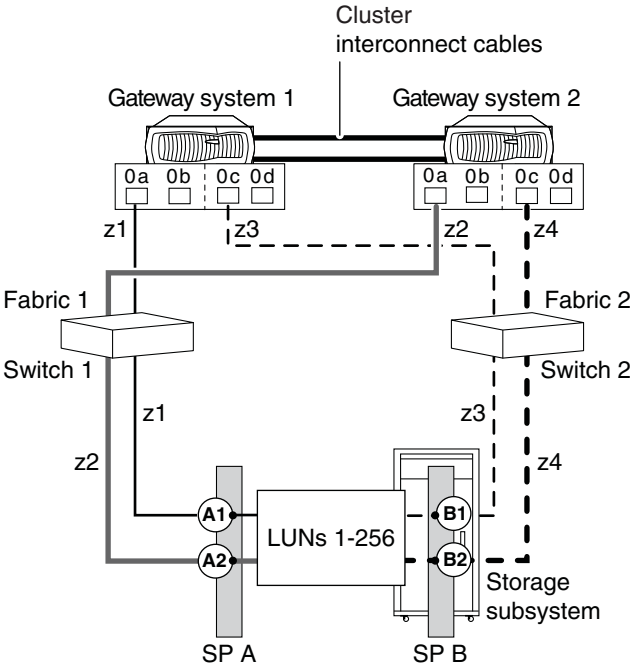
The following illustration shows a fabric-attached HA pair in which the gateway nodes access array LUNs through four (redundant) ports on the storage array. In this configuration, there is a straight connection from the storage array to the switch.

Utilization of devices: In the following configuration, the following occurs with device failure:

- If a switch fails, all traffic goes to the same SP.

  For example, if Switch 1 fails, the path from FC initiator port 0a on both gateways is unavailable. Therefore, all traffic goes from FC initiator port 0c to SP B. No traffic can go to SP A.
- If a controller fails, all traffic goes through the same switch.

  For example, if SP B fails, traffic goes from Gateway 1 port 0a and Gateway 2 port 0a through Switch 1. No traffic can go through Switch 2.


Cluster
interconnect cables
Gateway system 1
Gateway system 2
0a 0b 0c 0d
0a 0b 0c 0d
z1
z3
z2
z4
Fabric 1
Fabric 2
Switch 1
Switch 2
z1
z3
z2
z4
A1
A2
LUNs 1-256
B1
B2
Storage
subsystem
SP A
SP B

Zoning: The following table shows single-initiator zoning for the previous illustration with an N5000 series gateway HA pair. Single-initiator zoning is the recommended zoning strategy.

Zone	Gateway		Storage array	
Switch 1				
z1	Gateway 1	Port 0a	SP A	Port A1
z2	Gateway 2	Port 0a	SP A	Port A2
Switch 2				
z3	Gateway 1	Port 0c	SP B	Port B1
z4	Gateway 2	Port 0c	SP B	Port B2

Fabric-attached configuration that optimizes performance

How performance is optimized

The illustration in this section shows a configuration that enables you to optimize performance by spreading I/O across the RAID groups on the storage array. You set up your configuration so that different port pairs on a gateway access different groups of array LUNs on the storage array. The gateway sees any given array LUN over only two paths.

On the storage array, different array LUN groups are accessed through different ports. Each number used to identify a logical device must be unique on the same storage array, but numbers presented to hosts to identify array LUNs (external numbers) can be duplicated on different ports.

Attention

Starting with 7.3, Data ONTAP adds functionality to support this configuration on EMC CX storage arrays. Prior to Data ONTAP 7.3, using multiple gateway port pairs to access different array LUN groups on the same storage array results in more than two paths to an array LUN, which prevents the system from functioning properly.

Rules for implementing this type of configuration

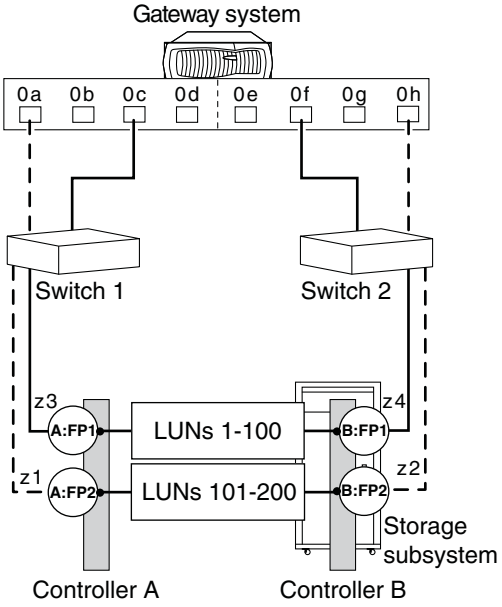
To implement this type of configuration, you need to do the following:

- On the storage array, use as many ports as possible to provide access to the array LUNs you allocated for the gateway.
- On the gateway, use multiple port pairs. Each port pair accesses a different group of array LUNs on the storage array through redundant paths.
- Create one big aggregate (in the Data ONTAP configuration), assigning array LUNs from multiple RAID groups to the aggregate. By doing so, I/O is spread across more disks.
- Use Access Logix software to restrict host access to array LUNs through the use of Storage Groups.

The combination of spreading I/O across the RAID groups and creating one large aggregate results in a significant performance boost.

Example with a stand-alone gateway

The following illustration shows a configuration with a stand-alone N7600 or N7800 gateway. One gateway port pair accesses array LUNs in one LUN group on the storage array and a different gateway port pair accesses array LUNs in a different array LUN group on the storage array.



Zoning for this configuration: The following table summarizes the zoning for this example. Single-initiator zoning is the recommended zoning strategy.

Zone	Gateway FC initiator port	Storage array port
Switch 1		
z1	Port 0a	Port A2
z3	Port 0c	Port A1
Switch 2		
z2	Port 0h	Port B2
z4	Port 0f	Port B1

CX Series Configuration Overview 3

About this chapter

This chapter provides an overview of configuring storage on a CX series storage array for gateways and setting up the gateways, switches (if applicable), and storage array to work together. It also includes a configuration overview for multiple array LUN groups. For details about how to configure CX series storage arrays, see your vendor documentation.

Topics in this chapter

This chapter contains the following topics:

Prerequisites and configuration overview

Prerequisites if you need to control access to array LUNs

The Access Logix feature enables you to control access to array LUNs on the CX series array by enabling the data access feature and creating Storage Groups. This configuration overview assumes that if you want to create Storage Groups you have already done the following on the a CX series storage array:

- Installed Access Logix software

  Access Logix must be installed on a shared CX series storage array before you can enable the CX series data access control feature.

- Enabled the data access control feature on the CX series storage array

  To be able to create Storage Groups on a shared CX series storage array, you must enable the data access control feature on the storage array.

Configuration overview

The following table provides the high-level steps for configuring a CX series storage array and setting up the storage array, switches, and gateways to communicate with each other.

Step	Action
1	Determine the storage capacity that you need for the gateways.
2	Plan the number and size of the array LUNs for the gateways. See "Guidelines for array LUN sizing" on page 10 and the gateway *Interoperability Matrix* for recommendations about array LUN size.
3	Confirm that the firmware on the CX series storage array meets the version level required by the gateway. **Note** See the gateway *Interoperability Matrix* for firmware version requirements.

Step	Action
4	In the Navisphere management software on the CX series storage array, create RAID groups if you have not already done so. You do not define the RAID type of the RAID group when you create it. The RAID group supports the RAID type of the first array LUN you bind on it. Any other array LUNs that you bind on it have the same RAID type. The number of disks that you select for a RAID group determines the RAID types it supports. **Attention** Ensure that the array LUNs you create for gateway storage conform to the RAID type restrictions described the *gateway Interoperability Matrix*.
5	Create the array LUNs for the gateways that you will bind to the RAID groups. When you bind a array LUN on a RAID Group, you specify how much of the RAID Group's user space (contiguous free space) you want the array LUN to use. The array LUN is distributed equally across all the disks in the RAID Group. **Note** Binding array LUNs may take several hours.

Step	Action
6	Install each gateway **a.** Rack mount the gateway. **b.** Make sure the power is connected to the gateway and that the console is set up. See the gateway *Installation Requirements and Reference Guide* for detailed instructions. **c.** Power on the gateway. **d.** Interrupt the boot process by pressing Ctrl-C when you see the following message on the console: `Starting Press CTRL-C for special boot menu` **e.** Select option “Maintenance mode boot,” on the boot menu. Do not proceed any further with gateway installation and setup at this time.
7	Install the Fibre Channel cables to connect the gateway to storage. ◆ For a fabric-attached configuration, connect the cables between the storage array and switches and between the switches and the gateways. ◆ For a direct-attached configuration, connect the cables between the storage array and the gateways.
8	If your deployment includes switches, zone the switches and verify that the communications between the storage array and the switch and the switch and the gateways are working. If you are setting up zoning using worldwide port names, the gateways and storage array must be powered on and running Data ONTAP (either in maintenance mode or in normal mode) for the worldwide port names (WWPNs) to be automatically discovered by the switch. Although you can obtain worldwide port names manually, automatic discovery of the WWPNs for the ports reduces the likelihood of errors. (See the gateway *Installation Requirements and Reference Guide* for information about how to obtain WWPNs manually.)

Step	Action
If you are NOT using Storage Groups	
9	Manually register the gateway FC initiator ports, as follows: **a.** Access the "Connectivity Status" right-click menu in the Navisphere management GUI. **b.** Select one gateway WWPN, apply the required parameters, create a new host name for the gateway, and then select OK. See "CX series configuration requirements" on page 8. **c.** Select each additional gateway WWPN, apply parameters, and add the WWPNs to the gateway host name you just created, and then select OK.
10	Add the array LUNs allocated for gateways. **Attention** If the storage array configuration automatically assigns LUN 0 as a Host ID, you must change array LUN 0 to another array LUN number. You can only map storage array LUNs to the gateway. See the gateway *Installation Requirements and Reference Guide* for constraints for mapping array LUN 0 to the gateway.
11	On the gateway, verify that all the array LUNs that were allocated for the gateways are visible to the gateway. **a.** Enter the following command: `disk show -v` **b.** Verify that all the array LUNs that were allocated for the gateways are displayed. If you do not see all the array LUNs you expect, wait a short time, then enter the command again. There can be a short delay before the array LUNs are visible over the network.
If you are using Storage Groups	

Step	Action
12	If your CX series storage array is shared by gateways and non gateways, create Storage Groups to control access to the array LUNs, including a Storage Group for the gateway. You can create only one Storage Group on the array for the gateways in the neighborhood. See "Planning for using CX series Storage Groups" on page 6. **Note** Access Logix software allows you to restrict host access to array LUNs through the use of Storage Groups. A host can access only the array LUNs in the Storage Group that you connect to the host. When you create a Storage Group, you select the array LUNs it contains. If both gateways and non gateway hosts are connected to a CX series storage system, you must connect them to different Storage Groups. It is recommended that you assign a name for your Storage Group that makes it easy to identify that the Storage Group is for the gateway.
13	Manually register the gateway FC initiator ports, as follows: **a.** Access the "Connectivity Status" right-click menu in the Navisphere management GUI. **b.** Select one gateway WWPN, apply the required parameters, create a new host name for the gateway, and then select OK. See "CX series configuration requirements" on page 8. **c.** Select each additional gateway WWPN, apply parameters, and add the WWPNs to the gateway host name you just created; then select OK. **Note** You can register all gateway FC initiator ports in the Storage Group at the same time.
14	Add the gateway host to the Storage Group.

Step	Action
15	Add the array LUNs allocated for gateways to the gateway Storage Group. **Attention** If the storage array configuration automatically assigns array LUN 0 as a Host ID, you must change array LUN 0 to another array LUN number. You can only map storage array LUNs to the gateway. See the gateway *Installation Requirements and Reference Guide* for constraints for mapping array LUN 0 to the gateway.
16	Assign (connect) the gateway hosts (FC initiator ports) to the Storage Group. (You might be able to assign the gateway host in the Connect Hosts option on the Storage Group menu.)
17	On the gateway, verify that all the array LUNs that were allocated for the gateways are visible to the gateway. **a.** Enter the following command: `disk show -v` **b.** Verify that all the array LUNs that were allocated for the gateways are displayed. If you do not see all the array LUNs you expect, wait a short time, then enter the command again. There can be a short delay before the array LUNs are visible over the network.

When you are ready to set up and configure Data ONTAP

You can begin Data ONTAP setup and configuration any time after assigning array LUNs to the gateways and connecting the storage array and the gateway. The gateway *Installation Requirements and Reference Guide* and the gateway software setup guides describe how to set up and configure Data ONTAP.

Configuration overview for multiple array LUN groups on CX series storage arrays

Multiple array LUN group requirements

The following are requirements to configure multiple array LUN groups:

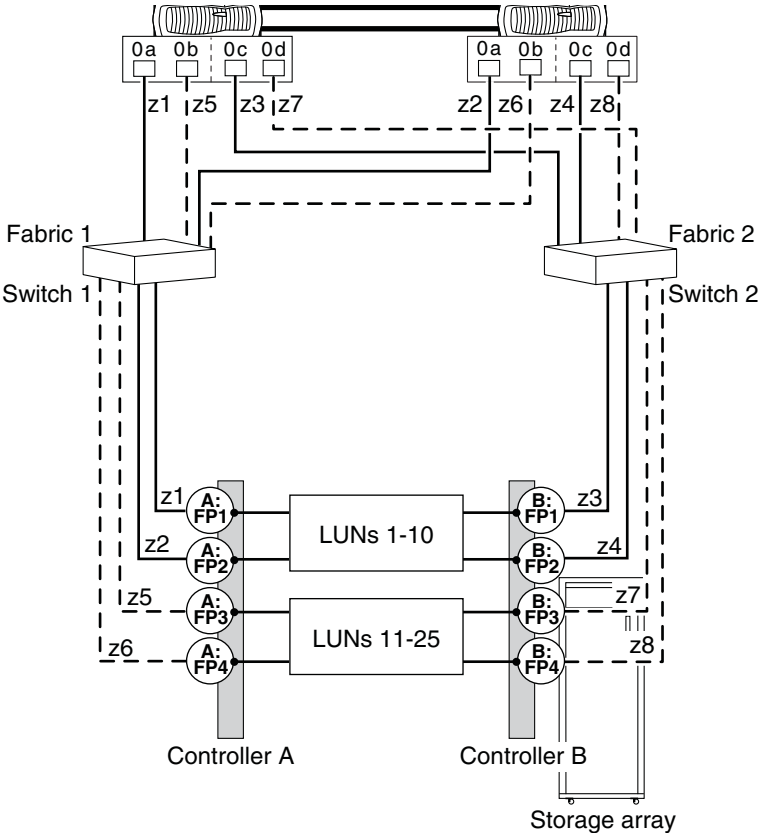
- Switch zoning must define which target ports the gateway initiator ports use to access each array LUN group.
- Use Access Logix software to restrict host access to array LUNs through the use of Storage Groups.
- Storage groups must define which array LUN groups are presented to each gateway initiator port.
- One initiator port pair on each gateway is required for each array LUN group.
- All target ports on a CX storage array accessing an individual array LUN group must be accessed through the same switch.

Multiple array LUN group configuration example

The following example shows a gateway HA pair with two 4-port array LUN groups on a CX series storage array.

Note

Using multiple gateway port pairs to access different array LUN groups on the same storage array is supported only in Data ONTAP 7.3 and later.



The following table summarizes the zoning for this configuration.

Zone	Gateway and port	Storage array	Storage port	Array LUN group
Switch 1				
z1	vs1-0a	SP A	A1	LUNs 1 - 10
z2	vs2-0a	SP A	A2	LUNs 1 - 10
z5	vs1-0b	SP A	A3	LUNs 11 - 25
z6	vs2-0b	SP A	A4	LUNs 11 - 25
Switch 2				
z3	vs1-0c	SP B	B1	LUNs 1 - 10
z4	vs2-0c	SP B	B2	LUNs 1 - 10
z7	vs1-0d	SP B	B3	LUNs 11 - 25
z8	vs2-0d	SP B	B4	LUNs 11 - 25

Tasks to create multiple array LUN groups

The following table summarizes the steps to create multiple array LUN groups on CX series storage arrays. If the array is not already set up and configured, see "Configuration overview" on page 28.

The array LUN groups (two 4-port array LUN groups in an HA pair) and port names used in these tasks correspond to the "Multiple array LUN group configuration example" on page 35.

Stage	Process
1	In the Navisphere Manager on the CX series storage array, create a RAID group for each array LUN group. In the example, there are two RAID groups and two array LUN groups. You do not define the RAID type of a RAID group when you create it. The RAID group supports the RAID type of the first array LUN you bind on it. Any other array LUNs that you bind on it have the same RAID type. The number of disks that you select for a RAID group determines the RAID types it supports. **Attention** Ensure that the array LUNs you create for gateway storage conform to the RAID type restrictions described the *gateway Interoperability Matrix*.
2	Create array LUNs from each RAID Group. In the example, LUNs 1 -10 are in the first RAID group and LUNs 11 - 25 are in the second RAID group.
3	Create one Storage Group with ports 0a and 0c from both gateways and all the array LUNs from the first RAID Group.
4	Create a second Storage Group with ports 0b and 0d from both gateways and all the array LUNs from the second RAID Group.
5	Configure switch zoning so that each gateways initiator accesses only single target port.

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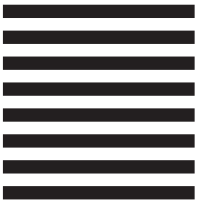

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