



**IBM System Storage N series  
Gateway Implementation Guide for EMC  
Symmetrix Storage**

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# Preface

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## 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 gateways.

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### Note

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

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### 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 models.

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.

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## 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.

## 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...
<i>Installation Requirements and Reference Guide</i>	<ul style="list-style-type: none"> <li>◆ General guidelines for creating and making array LUNs available to gateways.</li> <li>◆ Quick start installation instructions for connecting devices together and for installing Data ONTAP on a gateway that uses only third-party storage.</li> <li>◆ Reference information.</li> <li>◆ Detailed background information including layout in aggregates and checksums.</li> </ul>
<i>Implementation Guides</i>	<ul style="list-style-type: none"> <li>◆ Vendor-specific details about how to set up a storage array to work with gateways.</li> <li>◆ More detailed configuration examples than are provided in the <i>Installation Requirements and Reference Guide</i>.</li> </ul>
<i>Implementation Guide for Native Disk Shelves</i>	Information about setting up the storage on the native disk shelves connected to the gateway.
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 users who are 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/](http://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/](http://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/](http://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/](http://www.ibm.com/storage/nas/)
- ◆ For NAS support information, go to the following Web site:  
[www.ibm.com/storage/support/nas/](http://www.ibm.com/storage/support/nas/)
- ◆ For AutoSupport information, go to the following Web site:  
[www.ibm.com/storage/support/nas/](http://www.ibm.com/storage/support/nas/)
- ◆ For the latest version of publications, go to the following Web site:  
[www.ibm.com/storage/support/nas/](http://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/](http://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/](http://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/](http://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/](http://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:

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### Note

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

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### 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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**About this chapter** This chapter provides an overview of how to integrate IBM® N series gateways with supported EMC® Symmetrix® storage arrays.

**Topics in this chapter** This chapter discusses the following topics:

- ◆ “[Symmetrix specific terminology](#)” on page 2
- ◆ “[Supported Symmetrix storage arrays and firmware](#)” on page 6
- ◆ “[Required Symmetrix configuration settings](#)” on page 7
- ◆ “[Assignment of array LUNs to gateways](#)” on page 11
- ◆ “[Guidelines for array LUN sizing](#)” on page 13

**Generic storage allocation terms used to in this document** Terminology for the same entity varies in EMC Symmetrix documentation and configuration and management tools. The following generic terms are used in this document.

**array LUN:** This guide uses the term array LUN (logical unit number) to describe an area on the storage array that is available for a gateway system or a non gateway host to read data from or write data to. You might be accustomed to hearing a different term to describe this area; the term varies among vendors and sometimes among platforms for the same vendor. See the Gateway Implementation Guide for your storage array type for the specific term used for your platforms.

**HA pair:** Two storage systems (nodes) whose controllers are connected to each other either directly or through switches. In some versions of Data ONTAP, this configuration is referred to as an active/active configuration.

## Symmetrix specific terminology

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<b>channel director</b>	<p>The component in a Symmetrix storage array that interfaces between the host channels and data storage. It transfers data between the channel and global memory. The number of channel directors and total ports on each channel director varies on different Symmetrix storage array models.</p> <p>Some Symmetrix models use another term for this component—for example, <i>host director</i> or <i>channel adapter</i>.</p>
<b>director</b>	<p>See <i>host director</i>, <i>channel director</i>, and <i>disk director</i>.</p>
<b>disk director</b>	<p>The component in the Symmetrix storage array that interfaces between the global memory and the disk devices.</p>
<b>EMC ControlCenter (ECC)</b>	<p>An EMC application that can be used to monitor, configure, and control storage across platforms and environments.</p>
<b>EMC Symmetrix Management Console (SMC)</b>	<p>A browser-based graphical interface for managing multiple Symmetrix systems.</p>
<b>Enginuity</b>	<p>The operating environment for the EMC Symmetrix Enterprise Storage Platforms. Enginuity provides functional services for its host Symmetrix systems and for the EMX storage application software.</p>
<b>FEBE Board</b>	<p>(Front-End-Back-End Board) Contains up to 16 ports with 8 front-end host ports and 8 back-end disk ports. The FEBE Board is the interface between the Fibre Channel director front-end host ports and back-end disk ports. Each FEBE Board contains 2 channel directors, with 8 ports per channel director.</p>

**Fibre Channel director**

See *host director* and *channel director*.

**gatekeeper**

A logical device, accessible by a host, through which SYMAPI or the ControlCenter agent communicates with the Symmetrix storage array.

**host director**

A generic term for a component that manages host-facing I/O and provides the logical mapping to ports that makes storage available. Terms used to refer to this component vary among storage array models; they include channel director, Fibre Channel director, and director.

**Host Type Format**

Each logical device in a Symmetrix storage array is formatted using a specific format type. For logical devices that you intend to present to gateways, you must use the default format type for Open Systems, which is “Server” in the ECC GUI, when you create the logical device. (See “[Required Symmetrix configuration settings](#)” on page 7.)

**hypervolume**

A data unit on a single disk drive. Depending on its size, a physical disk can contain several hypervolumes. A RAID5 configuration, for example, is composed of four (3+1) or eight (7+1) hypervolumes.

You can combine multiple hypervolumes to create a *metavolume*.

**logical device**

A logical storage element that is configured on the storage array. Some Symmetrix documentation uses the term *logical volume* for this element. In the Symmetrix CLI, the term *SymmDev* is the equivalent term for logical device.

Logical devices cannot be accessed by hosts until after they have been mapped to a host-facing port on the storage array.

A logical device that has been mapped to an array host director port is often referred to as a *LUN*. The gateway documentation uses the term *array LUN* to refer to a mapped logical device.



<b>logical volume (LV)</b>	A user-defined storage device. A user can define a physical disk device as one-to-eight logical volumes (logical devices). (This document used the term <i>logical device</i> instead of logical volume.)
<b>logical unit number (LUN)</b>	An encoded identifier for the logical unit of a SCSI device.
<b>metavolume</b>	<p>A logical volume set created from individual physical disks to define logical volumes larger than the current Symmetrix maximum hypervolume size. Physically, a metavolume is two or more Symmetrix hypervolumes presented to a host as a single addressable device.</p> <p>For example, you can create a pool of equal-sized logical volumes in which each volume in the pool maps directly to a 72-GB metavolume. This 72-GB metavolume is composed of eight hypervolumes of 9 GB each.</p>
<b>Parity RAID, Parity RAID group</b>	<p>A Symmetrix feature that provides parity data protection on the disk device level using physical parity volumes. A Parity RAID (3+1) group consists of three data drives and one parity drive. A Parity RAID (7+1) group consists of seven data drives and one parity drive.</p> <p>In gateway documentation, the generic term <i>RAID group</i> is used as the equivalent term to <i>Parity RAID group</i>.</p>
<b>SymmDev</b>	In the CLI, the internal name for a logical device.
<b>UWN</b>	(Unique World Wide Name) In a Symmetrix storage array, each Fibre Channel port used for host connectivity has a unique WWN.
<b>volume (EMC)</b>	In a Symmetrix storage array, a general term referring to a storage device. A physical volume corresponds to a single disk device. A user can define a physical disk device as anywhere from one to eight logical volumes. (See also <i>logical volume</i> .)

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**Note**

EMC Symmetrix volumes are not the same as Data ONTAP volumes. A Data ONTAP volume is a logical entity that holds user data that is accessible through one or more of the access protocols supported by Data ONTAP, including Network File System (NFS), Common Internet File System (CIFS), HyperText Transfer Protocol (HTTP), Fibre Channel Protocol (FCP), and Internet SCSI (iSCSI). The gateway treats a Symmetrix volume (logical device), hypervolume, or metavolume as a disk.

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# Supported Symmetrix storage arrays and firmware

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## **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*.

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### **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.

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## **Supported storage arrays**

To determine which storage array platforms are supported and how they are organized into families, see the gateway *Interoperability Matrix*.

# Required Symmetrix configuration settings

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## Enginuity level required

Symmetrix Enginuity is the operating environment for Symmetrix systems. See the gateway *Interoperability Matrix* for the Enginuity level requirements.

## You must set both parameters related to SCSI-3

You must set two different parameters related to SCSI-3—one at the port level and one at the logical device (LUN) level. The two SCSI-3 flags that you need to set are as follows:

- ◆ SC3 Flag or SCSI-3 Flag. You must set this flag on each host (channel) director port to which the gateway connects.
- ◆ SCSI3\_persist\_reserv or PER Flag. You must set this flag on each logical device that the gateway will use.

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### Attention

Both SCSI-3 parameters are required for the gateway to work.

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The SCSI-3 flag enables the connecting port to understand the SCSI-3 “dialect” and semantics. In addition to the SCSI-3 flag being enabled, each LUN must have the ability to remember and enforce persistent reservations requested in the SCSI-3 “dialect”—the SCSI3\_persist\_reserv flag setting for each logical device enables each LUN to enforce the persistent reservations requests.

## Parameters to set on a host (channel) director port basis

Configure the following settings for each host (channel) director port to which the gateway connects.

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### Note

Parameter names might be different depending on whether they appear in the GUI or CLI.

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Parameter	Value to set	Comments
Common SN (Common Serial Number flag, also known as the C-bit Flag)	Enable this parameter so that each array LUN is presented across the various Fibre Channel director ports.	This parameter assigns a common serial number across the logical devices that are exposed through multiple target ports.  <b>Note</b> _____ Most multipathing software uses the LUN serial number to determine whether a LUN has multiple paths.           _____
PP Flag (Point-to-Point flag)	Enable this flag on the FA ports if the gateways and Symmetrix storage array are connected through switches.	Do not enable the PP Flag if the gateways and the storage array are directly connected.
SC3 Flag (SCSI-3)	Enable this flag.	Describes the command sets for block-oriented direct-access devices—for example, disk drives.  The gateway supports SCSI-3 command blocks.
SPC-2 Flag (SCS2_Protocol_version, SCSI Primary Command 2 flag, or “Allow inquiry data to be compiled to the standard”)	Enable this flag.	Contains the second-generation definition of the basic commands for all SCSI devices.  SPC-2 is used in conjunction with several standards for the specific device type, including SCSI-3 Block Commands (SBC-3).
UWN Flag (Unique World Wide Name flag)	Enable this flag for each target port so that each FA port that communicates with the gateway has a Unique World Wide Name.	—

**Parameters to set for each logical device for the gateway**

When you create a logical device that you intend to present to gateways, you must set the values of the parameters in the following table as shown.

Parameter	Value to set	Comments
Host Type Format	Default format type for Open Systems, which is “Server” in the EMC ControlCenter.	Each logical device in the storage array is formatted using a specific format type.
SCSI3_persist_reserv (Persistent Reservations flag or PER Flag)	Set this flag to On.	This flag, commonly known as SCSI-3 Persistent Reservations, is set to support hosts that require SCSI-3 persistent reservations.  The gateway uses the “Write Exclusive Registrants Only” persistent reservation type.

**Requirement for LUN access control**

To eliminate the possibility of a non gateway overwriting Symmetrix array LUNs owned by a gateway, or the reverse, you must present the logical devices through the host (channel) director ports in one of the following ways:

**Method 1:** Present only the Symmetrix logical devices for the gateway on specific Symmetrix host (channel) director ports that are dedicated to gateway use, and prevent the logical devices for the gateway from being mapped through other host (channel) director ports.

**Method 2:** Use the LUN masking capability to associate all Symmetrix logical devices to all host (channel) director ports, but allow only the gateway FC initiator ports to see the LUNs for the gateway.

If you are setting up a configuration in which you are using multiple array LUN groups for the gateway, you will set up a separate “host group” for each group of LUNs for the gateway (see [“Fabric-attached configurations that optimize performance”](#) on page 25 for an example of this type of configuration).

**Attention**

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If you use Method 2, do not present the VCMDB (Volume Configuration Management DataBase) to all hosts by default. Configure the global setting to restrict visibility to the VCMDB unless it has been specifically made visible to a particular host.

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The results of Method 2 are the same as Method 1. But the benefit is that masking is at the logical level (initiator port WWN) rather than at the physical or switch zone level.

**Recommendation  
regarding port  
sharing**

It is strongly recommended that you do not share Symmetrix array ports between gateway clients and non gateway clients. The reason is that there is great potential for incompatible port requirements when Symmetrix ports are shared between gateway clients and non gateway clients. Each host connecting to the Symmetrix storage array has different requirements for port attribute settings, which can result in a configuration that is impossible to implement. If the ports on the Symmetrix storage array cannot be dedicated to the gateway, confirm that the port requirements for all other clients using that port are compatible with gateway port requirements.

# Assignment of array LUNs to gateways

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## Maximum number of array LUNs you can allocate to the gateway

The maximum number of array LUNs on the Symmetrix system that you can allocate to the gateway is controlled by the following:

- ◆ The maximum LUN limit of the gateway model
- ◆ The Data ONTAP-imposed limit of the maximum number of LUNs per host group

Data ONTAP imposes a maximum limit of 256 array LUNs per host group. You cannot exceed the gateway neighborhood maximum array LUN limit for the models of the gateways in the neighborhood. The maximum number of array LUNs in a gateway neighborhood is calculated by adding the number of LUNs presented to the gateways in the neighborhood by all storage arrays. See the gateway *Interoperability Matrix* for information about the maximum neighborhood array LUN limit.

## Required number of paths to an array LUN

Gateways expect a storage array to provide access to a specific array LUN on only two of the storage array host (channel) director ports: one is the primary path and the other is the alternate (secondary) path. A given LUN is accessed through only one host (channel) director port at a time. (See the gateway *Installation Requirements and Reference Guide* for details about paths.)

When you map a logical device, you select the two host (channel) director ports that the gateway can use to access the LUN. Ensure that the two director ports that you select to access a given LUN are from alternate FEBE Boards to avoid a single point of failure (SPOF). A SPOF would occur if the two director ports you selected were on the same FEBE Board and the board failed.

## LUN numbers you can use with the gateway

Do not use a LUN with a LUN ID of 0.

## Requirements for matching LUN IDs

The LUN number used to map the array LUNs must be the same on each host director port in the port pair, or data corruption can occur. (*Port pair* refers to the two redundant storage array ports that are used to access the same LUN.)



**Format of Symmetrix LUN IDs**

Symmetrix LUN IDs are in hexadecimal format. Data ONTAP LUN IDs are in decimal format. To correlate Symmetrix LUN IDs and Data ONTAP LUN IDs, you must convert the hexadecimal numbers to decimal.

**Caution about using the VCMDB LUN**

For VCMDB (Volume Configuration Management DataBase) to be enabled, the VCMDB LUN must exist. The VCMDB LUN is a “command” type LUN, not a storage LUN. VCMDB is typically mapped to LUN 0. However, the VCMDB LUN can be an array LUN other than LUN 0.

If you map the VCMDB LUN to the gateway, the gateway periodically logs a message that the VCMDB LUN is less than the minimum size required, and it marks the VCMDB LUN as failed. The gateway continues to function normally after logging this error message.

**Caution about using a gatekeeper LUN**

If a gatekeeper logical device (LUN) is presented, do not map it to the gateway. A gateway cannot use a gatekeeper LUN. A gatekeeper LUN is smaller than gateway can handle. You cannot assign the gatekeeper LUN to the gateway with the `disk assign` command.

**Note**

---

A gatekeeper is a Symmetrix logical device, accessible by a host, through which SYMAPI or the ControlCenter agent communicates with the storage array.

---

# 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  $1000 \times 1024 \times 1024$  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 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 value usable with EMC Symmetrix

EMC Symmetrix calculates units of measure differently than Data ONTAP. The 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	$1024 \times 1024 \times 1024$ bytes
MB	$1024 \times 1024$ bytes
KB	1024 bytes

If you plan to use a large-sized array 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 array LUN size (that is, in GB, MB, or 512-byte blocks).

Do not create array LUNs that are smaller than the minimum LUN size shown in the gateway *Interoperability Matrix*.

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 7.3.3 and later in the 7.3 family and 8.0 and later in the 8.0 family:**

If you are specifying in...	Maximum usable value
GB	1,952 GB
MB	1,950,000 MB
512-byte blocks	4,095,000,000 512-byte blocks

**Values for Data ONTAP 7.2.4 and later in the 7.2.x family; and 7.3, 7.3.1, and 7.3.2 in the 7.3.x family:**

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

**Values for Data ONTAP 7.2.3:**

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

**Values for Data ONTAP 7.2.2 and earlier:**

<b>If you are specifying in...</b>	<b>Maximum usable value</b>
GB	488.281 GB
MB	500,000 MB
512-byte blocks	1,024,000,000 512-byte blocks

**Best practice  
logical device size  
recommendation**

Creating one large logical device or metavolume from multiple hypervolumes spanning multiple disks is recommended.



**About this chapter** This chapter discusses the supported configurations for all supported EMC Symmetrix storage arrays. Use the configurations in this chapter as guidelines for connecting your gateway to your storage array and setting up zoning.

**Topics in this chapter** This chapter discusses the following topics:

- ◆ [“Your guide to interpreting the illustrations”](#) on page 18
- ◆ [“Direct-attached configurations”](#) on page 20
- ◆ [“Simple fabric-attached configuration”](#) on page 23
- ◆ [“Fabric-attached configurations that optimize performance”](#) on page 25

**About the examples in this chapter** The examples in this chapter show Symmetrix DMX800 storage arrays. The number of host (channel) directors and director ports varies between different storage array models.

# Your guide to interpreting the illustrations

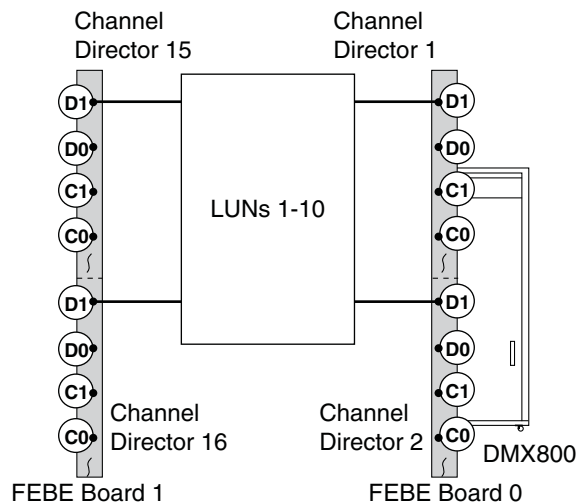
## How redundant paths and port pairs are shown

### 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 mapped to the port, with the ports on alternate channel directors and FEBE Boards.

#### Note

You might choose to use more host (channel) director ports than are shown in the illustrations in this chapter.



#### Note

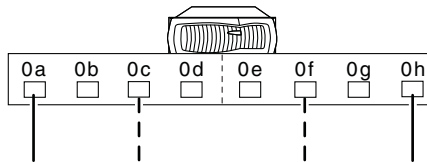
For simplicity, the following illustration does not show the back-end target ports A0, A1, B0, and B1.

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

**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. Redundancy is achieved on the gateway because each port in a pair is on a

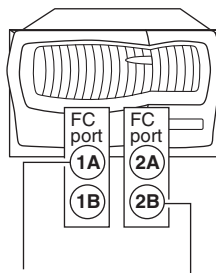
different bus or on a different card. (For more information about selecting redundant ports on the different gateway models with onboard FC initiator ports, see the gateway *Installation Requirements and Reference Guide*)

The following illustration shows a N7000 series model, which has both onboard FC initiator ports and cards. In this example, two different redundant port pairs are used on the gateway. To use multiple gateway port pairs to access LUNs on a storage array, as shown in the illustration, each port in a gateway port pair must access a different fabric.



- FC initiator port pair to a LUN set over two independent fabrics
- - - FC initiator port pair to a different LUN set over two independent fabrics

The following illustration shows a redundant port pair on a gateway model 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 initiator ports 1A and 1B and the other with FC initiator ports 2A and 2B. The number represents the slot.



## Direct-attached configurations

---

### Requirement for direct-attached configurations

In a direct-attached gateway HA pair, one port pair *per node* is required. You 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.

### Direct-attached with one 4-port LUN group

The following illustration shows a deployment with a gateway HA pair that is directly connected to a DMX800 storage array. The number of host (channel) directors and ports and their layout on the storage array might vary between storage array models.

In this configuration, four front-end target ports are used to connect to the gateways. The logical devices are mapped to the D1 port on Channel Directors 1, 2, 15, and 16.

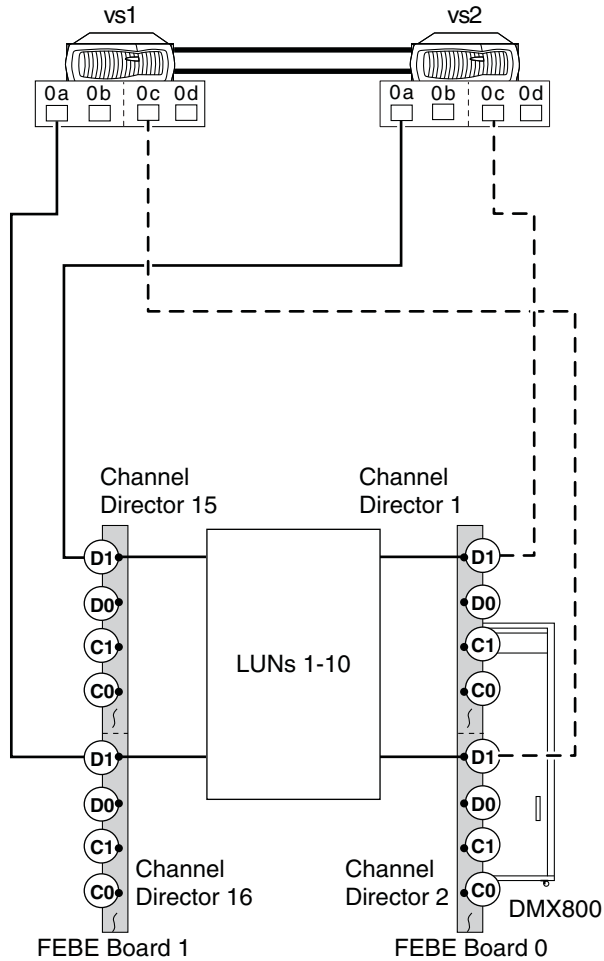
For redundancy, each gateway FC initiator port is connected to a separate target port, with each of the target ports on a different channel director (as this example shows). This is a best practice recommendation.

#### **Note**

---

For simplicity, the following illustration does not show the back-end target ports A0, A1, B0, and B1.

---



**Direct-attached with two 4-port LUN groups**

This direct-attached configuration example provides additional port bandwidth because it uses eight front-end target ports to connect to the gateways instead of the four ports shown in the previous configuration example.

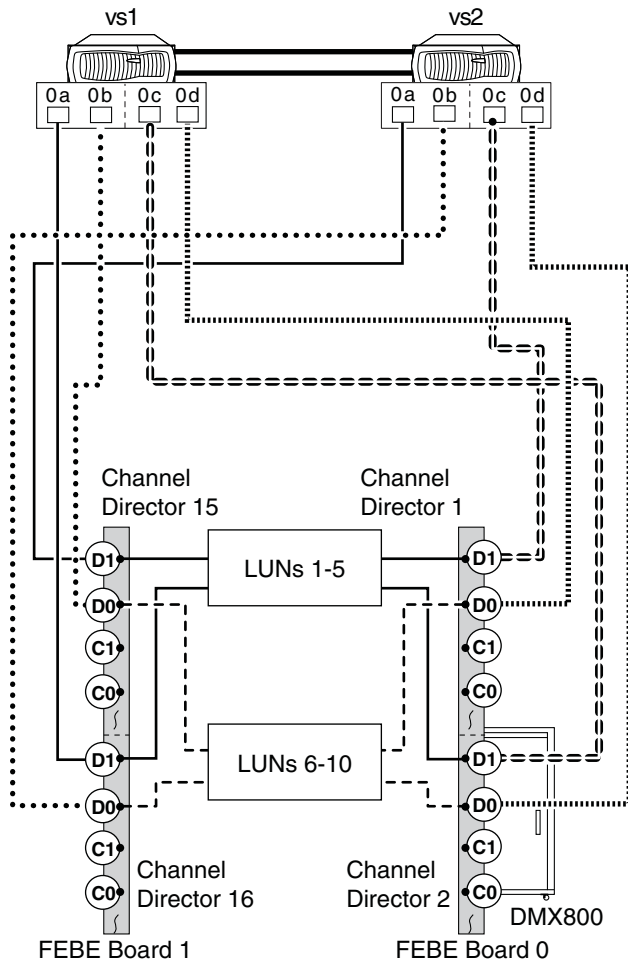
To implement this type of configuration, the logical devices are mapped as follows:

- ◆ Half of the logical devices for the gateways are mapped to four front-end target ports (D1), one on each of Channel Directors 1, 2, 15, and 16.

- ◆ The other half of the logical devices are mapped to four other front-end target ports (D0), one on each of Channel Directors 1, 2, 15, and 16.

**Attention**

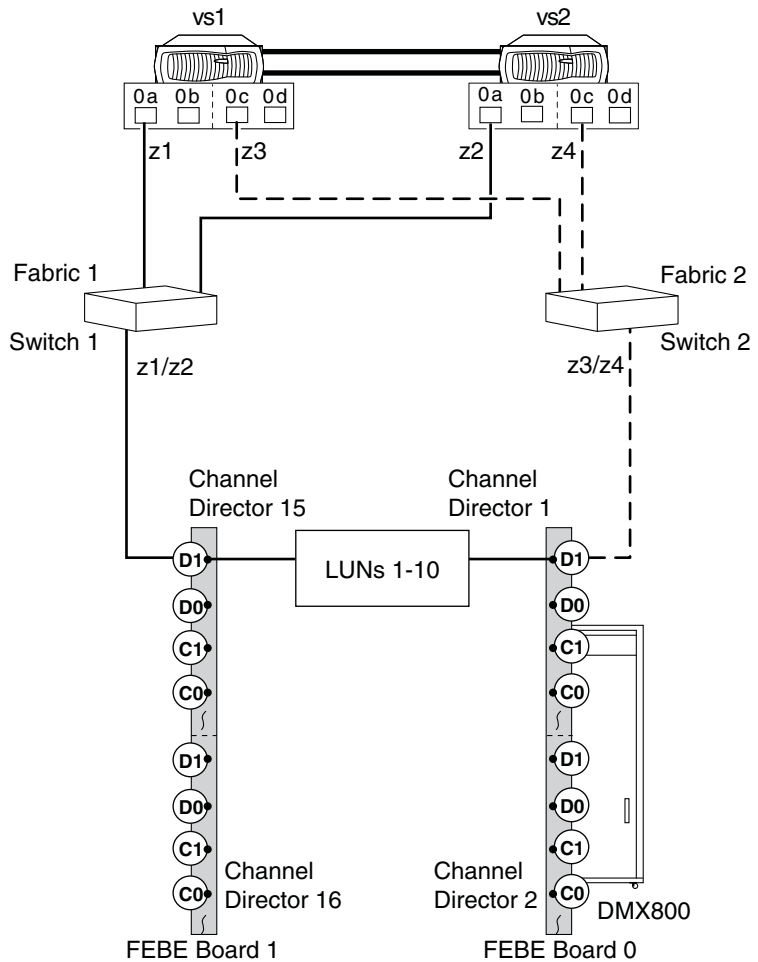
In this type of configuration, do not map all DMX logical devices to all connected target ports.



# Simple fabric-attached configuration

## HA pair with one 2-port LUN group

The following example shows a simple fabric-attached 2-port configuration—two front-end target ports are used on the storage array. To ensure availability, use a redundant port pair on each gateway (that is, a port from each bus or adapter). Then, if one path from a gateway node fails, the other path from the node is used; gateway controller takeover does not occur.



---

**Note**

Best practice recommendation is that you connect all the gateway FC initiator “0a” ports to Fabric 1 and all the gateway FC initiator “0c” ports to Fabric 2. It makes it easier to visualize the deployment if you connect the ports to the fabrics in this manner.

---

**Zoning:** The following table shows the single-initiator zoning for this example with an N5000 series gateway HA pair.

---

**Note**

Each pair of ports (the FC initiator port on the gateway and the channel director target port on the storage array) must be in its own fabric zone so that it cannot see other devices or ports.

---

Zone	Gateway		Storage array		
<b>Switch 1</b>					
z1	Gateway 1	Port 0a	FEBE Board 1	Channel Director 15	Port D1
z2	Gateway 2	Port 0a	FEBE Board 1	Channel Director 15	Port D1
<b>Switch 2</b>					
z3	Gateway 1	Port 0c	FEBE Board 0	Channel Director 1	Port D1
z4	Gateway 2	Port 0c	FEBE Board 0	Channel Director 1	Port D1

## Fabric-attached configurations that optimize performance

---

### How performance is optimized

As the examples in this section illustrate, you can optimize performance by spreading the I/O across the Parity RAID groups on the storage array. You set up your configuration so that different port pairs on a gateway access different groups of LUNs on the storage array.

Different port pairs on a gateway accessing different LUN groups on a Symmetrix storage array works because each port on a Symmetrix storage array has its own WWN and, on Symmetrix storage arrays, you map Symmetrix logical devices to ports. The gateway sees any given array LUN over only two paths because a given logical device is mapped to only two alternate ports on the storage array.

Different 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 LUNs (external numbers) can be duplicated on different ports.

---

### Attention

This configuration example of using two port pairs on a gateway to access two different device groups on the Symmetrix storage array does not work with all vendors' storage arrays. If the configuration is valid for a particular vendor's storage arrays, the gateway *Implementation Guide* for that vendor includes the configuration example.

---

In the examples in this section, two gateway port pairs and four target ports on the Symmetrix array are used. Each gateway port pair sees a different LUN group.

### 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 LUNs that you allocated for the gateway.

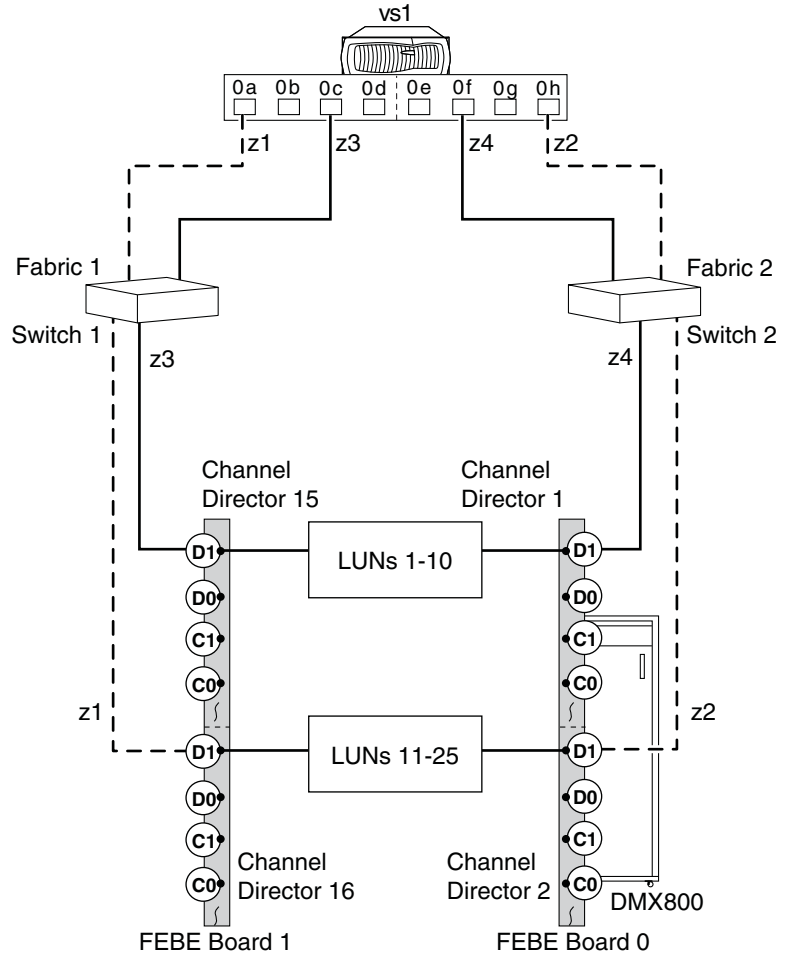
In this example, half of the Symmetrix logical devices for the gateway are mapped to two front-end target ports (D1) on redundant channel directors and the other half of the Symmetrix logical devices are mapped to two other Symmetrix front-end target ports (D1) on different redundant channel directors.

- ◆ On the gateway, use multiple port pairs. Each port pair accesses a different group of LUNs on the Symmetrix storage array through redundant paths.
- ◆ Create one big aggregate (in the Data ONTAP configuration), assigning the array LUNs from multiple Parity RAID groups to the aggregate. By doing so, the I/O is spread across more disks.

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

**Stand-alone with two 2-port LUN groups**

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



The relationship between the gateway port pairs, storage array port pairs, and LUN groups is summarized in the following table.



<b>Redundant gateway port pair</b>	<b>Redundant storage array port pair to which the Symmetrix logical devices are mapped</b>	<b>LUN group</b>
0a and 0h	Channel Director 16, port D1 Channel Director 2, port D1	LUNs 11-15
0c and 0f	Channel Director 15, port D1 Channel Director 1, port D1	LUNs 1-10

**Zoning for this stand-alone configuration:** The following table shows single-initiator zoning for this example with an N76xx or N78xx series standalone gateway.

**Note**

Each pair of ports (the FC initiator port on the gateway and the channel director target port on the storage array) must be in its own fabric zone so that it cannot see other devices or ports.

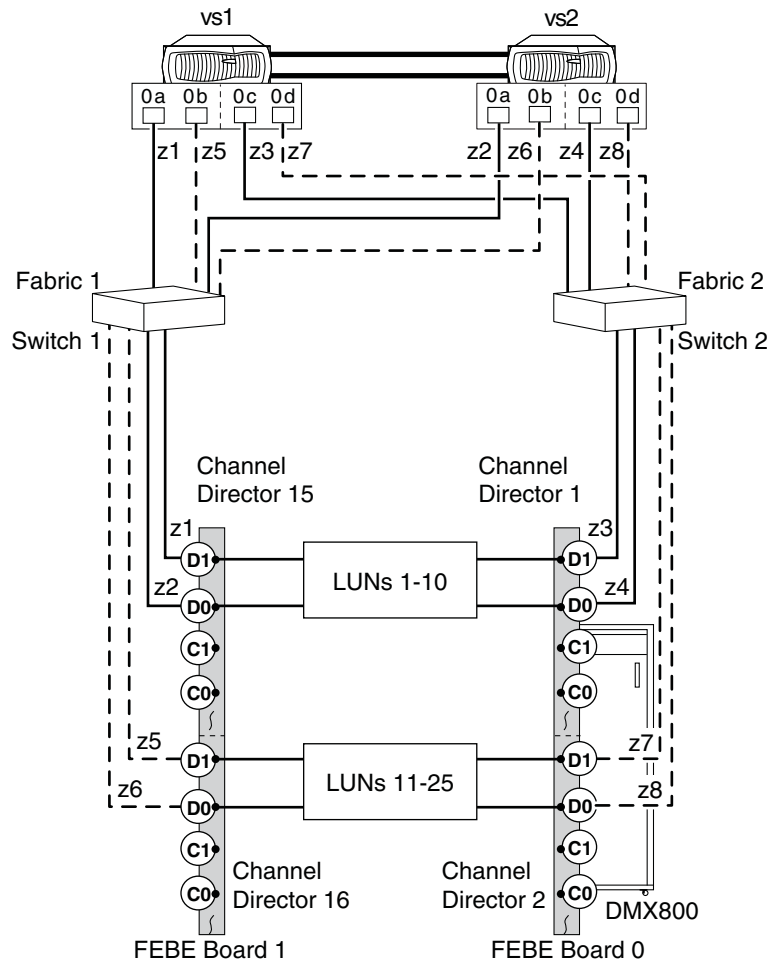
<b>Zone</b>	<b>Gateway port</b>	<b>Storage array</b>			
<b>Switch 1</b>					
z1	0a	FEBE Board 1	Channel Director 16	Port D1	LUNs 11 - 25
z3	0c	FEBE Board 0	Channel Director 15	Port D1	LUNs 1 - 10
<b>Switch 2</b>					
z2	0h	FEBE Board 0	Channel Director 2	Port D1	LUNs 11 - 25
z4	0f	FEBE Board 1	Channel Director 1	Port D1	LUNs 1-10

## HA pair with two 4-port LUN groups

The following illustration shows a configuration with a gateway HA pair with N5300, N5500, or N5600 gateways. On each gateway, two gateway port pairs are used to optimize performance. The gateway port pairs are as follows.

- ◆ 0a and 0c
- ◆ 0b and 0d

Each gateway port pair accesses a separate device group on the storage array.



The following table summarizes the zoning for this configuration.

Zone	Gateway and port	Storage array			
<b>Switch 1</b>					
z1	vs1-0a	FEBE Board 1	Channel Director 15	Port D1	LUNs 1 - 10
z2	vs2-0a	FEBE Board 1	Channel Director 15	Port D0	LUNs 1 - 10
z5	vs1-0b	FEBE Board 1	Channel Director 16	Port D1	LUNs 11 - 25
z6	vs2-0b	FEBE Board 1	Channel Director 16	Port D0	LUNs 11 - 25
<b>Switch 2</b>					
z3	vs1-0c	FEBE Board 0	Channel Director 1	Port D1	LUNs 1 - 10
z4	vs2-0c	FEBE Board 0	Channel Director 1	Port D0	LUNs 1 - 10
z7	vs1-0d	FEBE Board 0	Channel Director 2	Port D1	LUNs 11 - 25
z8	vs2-0d	FEBE Board 0	Channel Director 2	Port D0	LUNs 11 - 25

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