V-Series Systems
Implementation Guide for HP® XP Storage

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Preface

About this guide

This guide provides information about how to set up your storage array to work with a V-Series system running Data ONTAP® software, including configuration guidelines and sample configurations. The information in this guide pertains to all supported V-Series platforms.

Note

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

Audience

This guide is for system administrators who are familiar with operating systems such as UNIX® and Windows® and who will be installing V-Series systems. 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 V-Series system.

Relationship of this guide to other guides

This guide is intended to be used in conjunction with other information in the V-Series 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 V-Series systems. ◆ Quick start installation instructions for connecting devices together and for installing Data ONTAP on a V-Series system 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 V-Series systems. ◆ More detailed configuration examples than are provided in the *Installation Requirements and Reference Guide*.

Guide name	Information includes...
Implementation Guide for Native Disk Shelves	Information about setting up the storage on the native disk shelves connected to the V-Series system.
Data ONTAP Software Setup Guide	Detailed steps for setting up the V-Series system, including information about installing Data ONTAP software for installations using only third-party storage. This guide is most helpful to installers 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 V-Series *Support Matrix* for details about Data ONTAP releases that support V-Series, supported switches, supported firmware, capacity, and maximum array LUN count.

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.

Implementation Overview 1

About this chapter

This chapter provides an overview of how to integrate V-Series systems with HP® XP storage arrays.

Note

For information about integrating V-Series with HP EVA storage arrays, see the V-Series *Implementation Guide for HP EVA Storage*.

Topics in this chapter

This chapter discusses the following topics:

Generic storage allocation terms 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 V-Series system or a non V-Series 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 V-Series *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*.

Additional information to read

This guide is intended to be used in conjunction with the following additional documents:

- V-Series *Installation Requirements and Reference Guide*

  This guide contains general guidelines for setting up the storage array to work with the V-Series systems. When planning your deployment, first read this guide, then read the V-Series *Implementation Guide* for your storage array type. The *Implementation Guides* provide additional details that are specific to your vendor.

- V-Series *Support Matrix* at http://now.netapp.com

  This document provides information about Data ONTAP releases that support V-Series, supported switches, supported firmware, capacity, and maximum array LUN count.

  Note

  The *Support Matrix* is the final authority on the storage array models, storage array firmware, switches, and so on that V-Series supports.

HP XP specific terminology

array group	On the storage array, the arrangement of disks in the back-end that together form the defined RAID level.
channel adapter (CHA)	Includes the Client-Host Interface Processor (CHIP). The interface between the system and hosts or servers on an open system.
LDEV	Logical device: Unit of capacity, defined at format time, that is used as capacity placeholder until it is mapped as an array LUN.
mapping of port definitions	The task of assigned LDEVs, by address, to Fibre Channel ports.
parity group	A mode of disk operation and configuration. It is synonymous with the term RAID group.
port	The number of supported ports on an XP storage array is dependent upon the number of supported I/O slots and the number of ports available per I/O adapter. The XP family of storage arrays supports SCSI, Fibre Channel (FC/AL), and ESCON I/O interfaces. I/O support might vary among XP storage arrays. Ports are named based upon their port group and port letter. Examples of port names include CL1-A through CL1-R and CL2-A through CL2-R (letters I and O are skipped).

Supported storage arrays and microcodes

Finding out which Data ONTAP release supports which storage arrays

This guide provides information about all vendors and storage arrays that V-Series supports at the time of publication. Not all vendors and models described in this guide are supported in all Data ONTAP releases. See the V-Series *Support Matrix* at http://now.netapp.com to determine which vendors and storage array models are supported in a particular Data ONTAP release.

Note

The V-Series *Support Matrix* is the final authority about which storage arrays that V-Series systems support.

Supported HP XP storage arrays

At the time of publication of this guide, V-Series systems support the following HP StorageWorks XP Disk Array platforms, all of which are considered to be in the same HP XP family:

- XP24000
- XP20000
- XP12000
- XP10000
- XP1024
- XP512
- XP128
- XP48

These HP StorageWorks XP models are rebranded Hitachi models, with the same characteristics of the equivalent Hitachi models. For example, each XP storage array port has a unique World Wide Port Name (unlike the HP EVA models). For information about the Hitachi models that correspond to the HP XP models, see the V-Series *Installation Requirements and Reference Guide*. For information about integrating V-Series with HP EVA storage arrays, see the V-Series *Implementation Guide for HP EVA Storage*.

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. When you set up a Data ONTAP aggregate, you cannot assign array LUNs from different storage array families or different vendors to the same aggregate.

V-Series requirements for HP XP storage arrays

Required system parameters

The following table shows certain configuration settings that are critical to a successful upgrade or installation.

Platform	System parameter
XP24000, XP20000, XP12000, XP10000	No required parameters.
XP1024, XP128, XP512, XP48	System mode 254 on

See the V-Series *Support Matrix* for any updates to information about system parameters.

Host type setting for the XP24000 and XP20000 to work with V-Series: The host type setting for the XP24000 and XP20000 to work with V-Series is “standard” or “00.”

Requirements for using disks external to the XP24000, XP20000, XP12000, and XP10000

V-Series supports the same storage arrays behind the XP24000, XP20000, XP12000 and XP10000 that HP supports (that is, disks external to the XP24000, XP20000, XP12000, and XP10000). V-Series assumes that the configuration between the XP24000, XP20000, XP12000, or XP10000 and the storage arrays behind it is correct.

Restrictions and best practices recommendations for a deployment with the XP24000, XP20000, XP12000, and XP10000 using external disks are as follows:

- Do not mix array LUNs from external and internal disks in the same Data ONTAP aggregate.
- Do not mix SATA and FC drives in the same aggregate.
- All root volumes and spare LUNs for core files must be on the storage array (on internal disks).
- There cannot be more than two paths to an array LUN on the external disks from the V-Series system through the storage array to the external disks.
- For LUNs from drives internal to the storage array, you can specify either block checksum type (BCS) or zone checksum type (ZCS) when you assign them to a V-Series system. For LUNs from external drives behind the

storage array, you can specify only BCS when you assign the LUNs to a V-Series system.

Microcode versions

See the V-Series *Support Matrix* for information about supported microcode versions. The *Support Matrix* is the final authority on the microcode versions that V-Series supports.

Storage array port support by model

Array LUN support on storage array ports

The following table shows the type of array LUN support provided for ports and host groups, by storage array model. A host group is a property of a port.

Storage array model	Port support information
XP512, XP48	◆ Supports only up to a maximum of 256 array LUNs per port. ◆ Provides no support for host groups.
XP1024, XP128	◆ Supports 256 array LUNs per port. However, when LUN security is enabled on the port, a maximum of 512 array LUNs is supported on the port. ◆ To achieve the 512 array LUNs per port, create at least two host groups per port. All array LUNs can be divided among the host groups for the port. ◆ A maximum of 256 array LUNs per host group can be configured. ◆ A maximum of 128 host groups can be created for each port. ◆ Host groups are created within each port. The same V-Series system FC initiator port WWN cannot be registered within multiple host groups on a single port.
XP24000, XP20000, XP12000, XP10000	◆ Supports 1,024 array LUNs per port, with or without LUN security enabled. ◆ A maximum of 256 host groups can be created for each port. ◆ A maximum of 1,024 array LUNs per host group can be configured. However, if more than one host group exists in a port, the 1,024 array LUN limit for that port can be divided among those host groups.

Guidelines for configuring ports on your storage array

V-Series system sharing storage array ports with other hosts

If you are using the host storage domain support feature on your storage array, you can share the storage array ports among V-Series systems and non V-Series hosts.

V-Series system ports in a host group

The rules are as follows:

- You can create only one host group per port for the V-Series systems. When you create a host group, include all ports of the V-Series systems in the V-Series neighborhood in the host group.

  Note
  The same V-Series system FC initiator port WWN cannot be registered within multiple host groups on a single port.

- The number of array LUNs supported per port varies according to storage array model. (See "Storage array port support by model" on page 8 for more information.) You cannot increase the number of array LUNs by just adding another host group for the V-Series systems on the existing port.

Distribution of array LUNs over the port pairs

It is recommended that you distribute array LUNs equally over the redundant port pairs to reduce the possibility of one port being heavily loaded and the other being lightly loaded.

Preventing overwriting of data

To prevent overwriting of data, V-Series systems and non V-Series hosts must not share each other's array LUNs. You can prevent overwriting of data by other hosts by using the methods in the following table.

If...	Then...
The port is *not* shared among V-Series systems and non V-Series hosts	(Optional) You can use switch zoning alone.
The port *is* shared among V-Series systems and non V-Series hosts	You must use LUN access controls on the storage array and, optionally, switch zoning.

Guidelines for configuring storage array ports

After selecting the storage array port that you want to configure, use the following guidelines to set port options on the UI of your storage array.

Port parameter		Guideline
Port address		Any port address
Fibre Channel topology	Whether a fabric switch is used—Fabric ON or OFF	Select whether a fabric switch is used to connect the V-Series system to the storage array. If you use a fabric switch, select Fabric ON. If not, select Fabric OFF.
	Connection type—Fibre Channel or Point-to-Point	Select whether the connection type is Fibre Channel or Point-to-Point. If you use a fabric switch, select point-to-point. If not, that is, if the V-Series system is directly connected to the storage array, select Fibre Channel loop mode.
Host speed		Set the channel speed to *auto* or to the appropriate speed.

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 V-Series *Support Matrix* for the general rule about Data ONTAP minimum and maximum array LUN sizes. This V-Series *Implementation Guide* contains specific information about the equivalent minimum and maximum limits according to this 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 V-Series *Support 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 HP XP storage arrays

HP calculates units of measure for HP XP storage arrays 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 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).

Do not create array LUNs that are smaller than the minimum LUN size shown in the V-Series *Support Matrix*.

See the V-Series *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.x 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; 7.3, 7.3.1, and 7.3.2:

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:

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

Supported Configurations 2

About this chapter

This chapter provides examples of supported configurations. Use the configurations in this chapter as guidelines when you connect your V-Series system to your storage array. You can also refer to these configurations when you determine desired capacity usage, create array LUNs initially, and assign array LUNs to your V-Series system.

Note

The V-Series *Support Matrix* is the final authority about which configurations that V-Series systems support.

Topics in this chapter

This chapter discusses the following topics:

Rules for how port and LUN limits are determined

How the maximum number of supported LUNs is determined

The maximum number of array LUNs supported for a configuration is limited by one of the following factors—whichever is the *lowest* limit:

- The maximum number of array LUNs that a particular V-Series model supports
- The maximum number of array LUNs that a storage array model supports.

See the V-Series *Support Matrix* for information about the number of array LUNs supported by different V-Series models. See "Storage array port support by model" on page 8 for information about the number of array LUNs that different storage array models support.

Minimum number of ports required

The following table shows the minimum number of storage array ports required, depending on the storage array type, and the minimum number of V-Series ports required.

Limit	Rules
V-Series FC initiator ports	
Minimum number of V-Series ports required	You must use at least one redundant FC initiator port pair on a V-Series system. For an HA pair, a minimum of one redundant port pair *per V-Series node* is required. Then, if one path from a V-Series node fails, the other path from the node is used; takeover does not occur. **Note** The way you create a redundant port pair differs according to V-Series model. For models with adapters, choose one port from each adapter. For V-Series models with onboard ports, choose one port from each bus. See the *V-Series Installation Requirements and Reference Guide* for more information.

Limit	Rules
Storage array ports	
Data ONTAP requirement for minimum number of storage array ports	Data ONTAP requires you to use a minimum of one redundant storage array port pair on a storage array for V-Series LUNs so that there are two paths to a LUN.
Storage array requirement for the minimum number of storage array ports	The number of LUNs that are allowed per port or per host group per port differs between storage arrays. If the number of LUNs you want to use exceeds the storage array's per port or per host group per port limit, then you need to use more storage array port pairs. For example, assume that you want to use 336 LUNs for V-Series storage (and your V-Series system supports 336 LUNs). If your storage array is an XP1024 model that limits you to 256 LUNs per port, you cannot just add another host group on the existing storage array port to increase the number of V-Series LUNs. You must increase the number of storage array ports that you use. However, if your storage array is an XP12000, you could use just one port pair on the storage array to handle 336 LUNs—if the total of LUNs accessed through that port by the V-Series and any other hosts sharing the port does not exceed the storage array limitation.
Storage array ports shared with non V-Series hosts	If you are using the host storage domain support feature on your storage array, you can share the storage array ports among V-Series systems and non V-Series hosts. **Attention** If the port is not dedicated to V-Series LUNs, ensure that you configure LUN access controls to prevent overwriting of data by non V-Series hosts.

Your guide to interpreting the illustrations

Number of ports shown in the illustrations

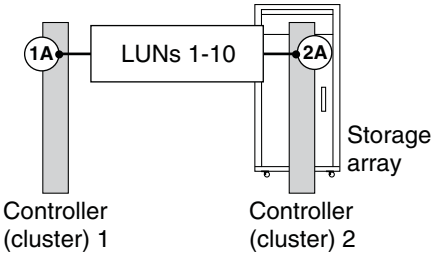
The illustrations in this chapter show the minimum number of ports that you can use per configuration. You might choose to use more ports than are shown.

Note

If your storage array model supports only 256 LUNs per host group per port or 256 LUNs per port, you must use multiple storage array port pairs. (See "Examples for storage arrays limited to 256 LUNs per host group or port" on page 28.)

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 LUNs on the port, with the ports on alternate controllers, clusters, or enclosures. (The hardware component on which host adapters and ports are located varies on different storage arrays.) Different storage array models, even those from the same vendor, might label the ports differently from those shown in the examples.

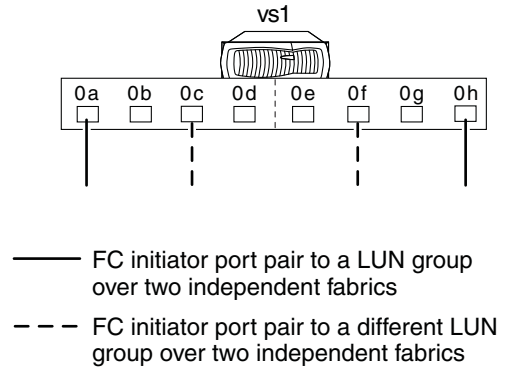


See the V-Series *Installation Requirements and Reference Guide* for rules for setting up redundant paths and for examples of configurations showing valid and invalid paths.

Illustration of redundant paths and port pairs for the V-Series systems

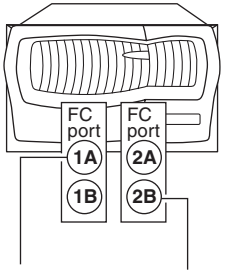
On some V-Series models, the FC initiator ports are on cards. On other models, the FC initiator ports are onboard ports and are labeled 0a, 0b, and so on. Redundancy is achieved on the V-Series system because each port in a pair is on a different bus. (For more information about selecting redundant ports on the different V-Series models with onboard FC initiator ports, see the V-Series *Installation Requirements and Reference Guide*.)

The following illustration shows a V6xxx model, which has both onboard FC initiator ports and cards. In this example, two different redundant port pairs are used.



To use multiple V-Series port pairs as the illustration shows, each port in a V-Series port pair must access a different fabric.

The following illustration shows a redundant port pair on a V-Series 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 ports 1A and 1B and the other with FC ports 2A and 2B. The number represents the slot.

For more information about selecting redundant ports on the different V-Series models with onboard FC initiator ports, see the V-Series *Installation Requirements and Reference Guide*.

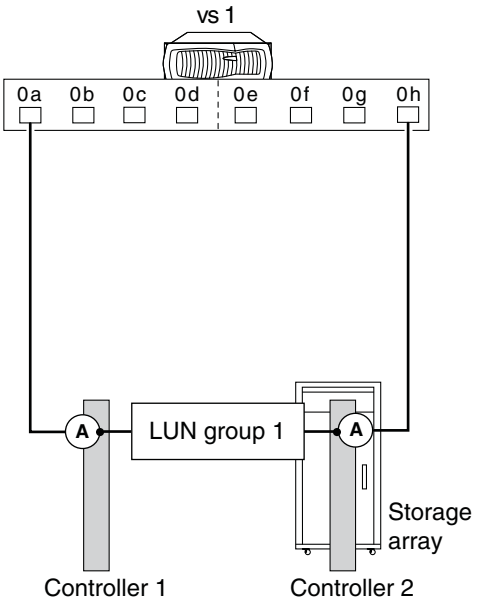
Direct-attached configurations

One 2-port array LUN group configuration, stand-alone

The following illustration shows an example of a direct-attached stand-alone configuration.

Note

If you are using more than 256 LUNs for the V-Series systems and your storage array model supports only 256 LUNs per host group per port or 256 LUNs per port, you must use multiple storage array port pairs. (See "Examples for storage arrays limited to 256 LUNs per host group or port" on page 28.)

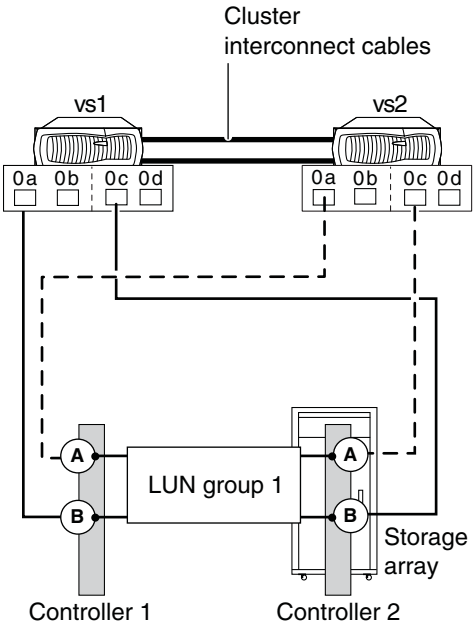


One 4-port array LUN configuration, HA pair

The following illustration shows a deployment with an HA pair that is directly connected to the storage array.

Note

If you are using more than 256 LUNs for the V-Series systems and your storage array model supports only 256 LUNs per host group per port or 256 LUNs per port, you must use multiple storage array port pairs. (See "Examples for storage arrays limited to 256 LUNs per host group or port" on page 28.)



In this illustration, the solid lines show the connections from V-Series system 1 and the dashed lines show the connections from V-Series system 2. For each V-Series system in a direct-attached configuration, you need one redundant port pair on the storage array to ensure that there are two paths to an array LUN. You use a total of four ports on the storage array for an HA pair, as shown in this example. Although four ports on the storage array are used to access the LUNs for V-Series, each V-Series system can see a particular LUN through only two redundant ports.

Use a redundant port pair on each V-Series node to ensure availability. (That is, on a V-Series model with cards, use one connection from each adapter. For a model with onboard ports, use one port from each bus.) Then, if one path from a V-Series node fails, the other path from the node is used; V-Series controller takeover does not occur.

Basic fabric-attached configurations

Examples in this section

This section includes the following examples:

- "Fabric-attached stand-alone basic configuration" on page 22
- "One 2-port array LUN group, fabric-attached configuration" on page 23

Note

If your V-Series model is a GF270c, see "Configurations with a GF270c" on page 40.

Zoning recommendation

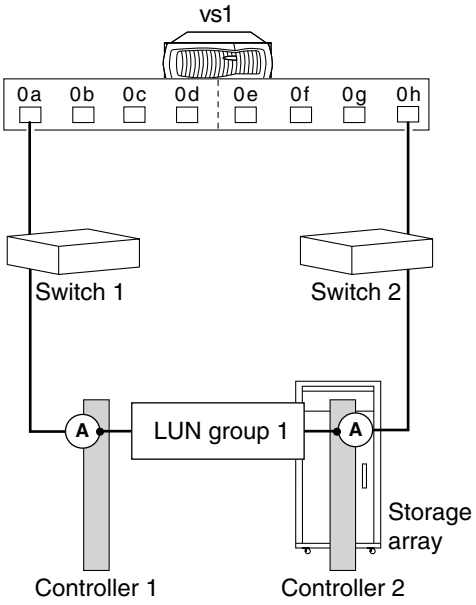
It is recommended that you use single-initiator zoning, which limits each zone to a single V-Series system FC initiator port and one storage array port. Single-initiator zoning improves discovery and boot time because the V-Series FC initiators do not attempt to discover each other.

Fabric-attached stand-alone basic configuration

The following illustration shows a fabric-attached configuration for a stand-alone V-Series system.

Note

If you are using more than 256 LUNs for the V-Series systems and your storage array model supports only 256 LUNs per host group per port or 256 LUNs per port, you must use multiple storage array port pairs. (See "Examples for storage arrays limited to 256 LUNs per host group or port" on page 28.)



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

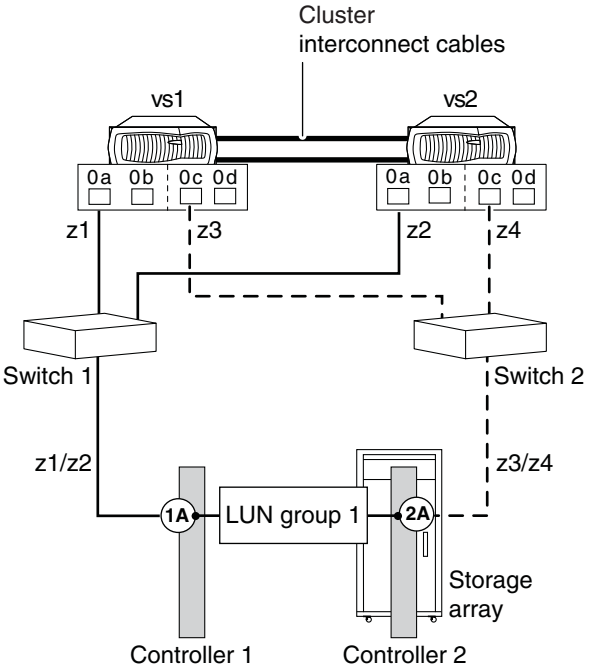
Zone	Switch	V-Series system port	Storage array	
z1	1	0a	Controller 1	Port A
z2	2	0h	Controller 2	Port A

One 2-port array LUN group, fabric-attached configuration

This is an example of a fabric-attached HA pair in which the nodes share the two (redundant) storage array ports. This configuration uses the fewest number of ports that are possible for V-Series. This configuration is useful if you are limited in the number of storage array ports or switch ports that you can use with V-Series.

Note

If you are using more than 256 LUNs for the V-Series systems and your storage array model supports only 256 LUNs per host group per port or 256 LUNs per port, you must use multiple storage array port pairs. (See "Examples for storage arrays limited to 256 LUNs per host group or port" on page 28.)



To ensure availability, use a redundant port pair on each V-Series system (that is, one connection from each adapter on a V-Series model with cards or a port from each bus for a model with onboard ports). Then, if one path from a V-Series node fails, the other path from the node is used; V-Series controller takeover does not occur.

Zoning: The following table shows single-initiator zoning for this example with a V30xx HA pair. Single-initiator zoning is the recommended zoning strategy.

Zone	V-Series system		Storage array	
Switch 1				
z1	vs1	Port 0a	Controller 1	Port 1A
z2	vs2	Port 0a	Controller 1	Port 1A
Switch 2				
z3	vs1	Port 0c	Controller 2	Port 2A
z4	vs2	Port 0c	Controller 2	Port 2A

Fabric-attached configuration that optimizes performance

How performance is optimized

This example shows a configuration that enables you to optimize performance by spreading the I/O across the RAID groups (parity groups) on the storage array. You set up your configuration so that different port pairs on a V-Series system access different groups of LUNs on the storage array. The V-Series system 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.

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 V-Series system to access two different LUN groups on the storage array does not work with all vendor's storage arrays. If the configuration is valid for a particular vendor's storage arrays, the V-Series system *Implementation Guide* for that vendor includes the configuration example.

Rules for implementing this type of configuration

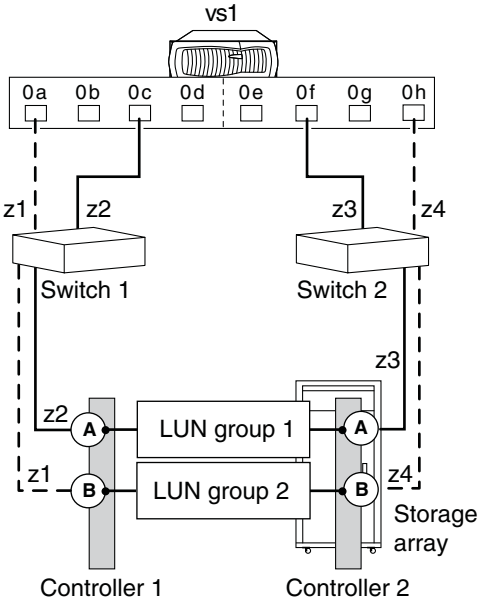
To implement this type of configuration, you need to do the following:

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

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

Stand-alone with two 2-port array LUN groups

The following illustration shows a configuration with a stand-alone V6xxx system. One V-Series port pair accesses LUNs in one LUN group on the storage array and a different V-Series port pair accesses LUNs in a different 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	V-Series system FC initiator port	Storage array	
Switch 1			
z1	Port 0a	Controller 1	Port B
z2	Port 0c	Controller 1	Port A
Switch 2			
z3	Port 0f	Controller 2	Port A
z4	Port 0h	Controller 2	Port B

Examples for storage arrays limited to 256 LUNs per host group or port

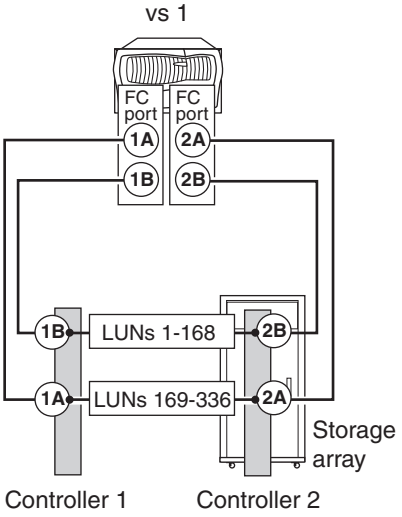
Configurations shown in this section

If your Hitachi-based storage array is limited to 256 LUNs per host group or 256 LUNs per host group per port, and you are using more than 256 LUNs for V-Series storage, you must use multiple storage array port pairs. This section contains the following configuration examples:

- Direct-attached configuration examples
  - "Direct-attached stand-alone configuration— 257 to 336 array LUNs" on page 29
  - "Direct-attached stand-alone configuration—more than 336 array LUNs" on page 29
  - "Direct-attached HA pair: 257 to 512 array LUNs" on page 30
  - "Direct-attached HA pair: 513 to 672 array LUNs" on page 31
  - "Direct-attached HA pair—more than 672 array LUNs" on page 33
- Fabric-attached configuration examples
  - "Fabric-attached stand-alone configuration—257 to 336 array LUNs per port" on page 34
  - "Fabric-attached stand-alone configuration—more than 336 array LUNs" on page 35
  - "Fabric-attached HA pair—257 to 512 array LUNs" on page 36
  - "Fabric-attached HA pair—513 to 672 array LUNs" on page 38
  - "Fabric-attached HA pair—more than 672 array LUNs" on page 38

Direct-attached stand-alone configuration—257 to 336 array LUNs

The following illustration is for a direct-attached stand-alone configuration of 257 array LUNs to 336 array LUNs.



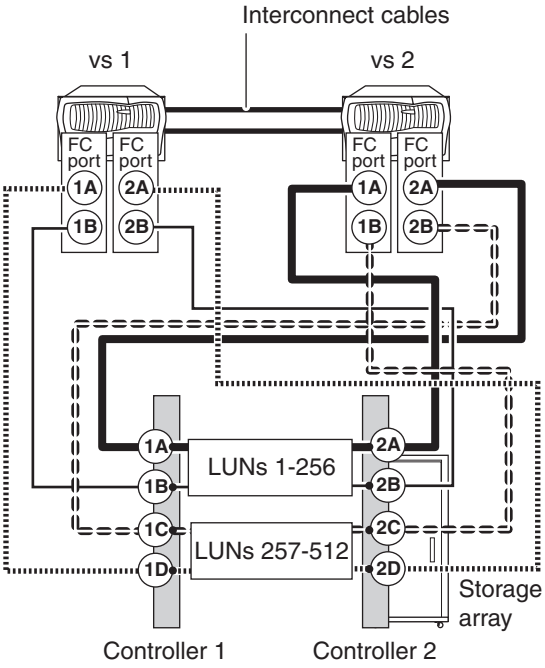
Assume for this example that 336 array LUNs were allocated on the storage array for the V-Series system and that the V-Series system can support 336 array LUNs. To handle 336 array LUNs, you must add a second port pair on a storage array that can handle only 256 array LUNs per host group per port or 256 array LUNs per port. You cannot just add another host group on the existing storage array port to increase the number of array LUNs that V-Series systems can access. (Compare this example with "One 2-port array LUN group configuration, stand-alone" on page 20.)

Direct-attached stand-alone configuration—more than 336 array LUNs

Newer V-Series models are supporting an increasingly larger number of array LUNs. (See the V-Series *Support Matrix* for the numbers of array LUNs supported per V-Series model.) On a storage array that can handle only 256 array LUNs per host group per port or 256 array LUNs per port, you must add an additional storage array port pair for each additional increment of up to 256 array LUNs. You cannot just add another host group on the existing storage array port to increase the number of V-Series LUNs.

Direct-attached HA pair: 257 to 512 array LUNs

Because this is an example of a storage array model that supports 256 array LUNs per host group per port or 256 array LUNs per port, you must add a second redundant port pair on the storage array to handle LUNs 257 to 512. You cannot just add another host group on the existing port for the V-Series system to increase the number of array LUNs.

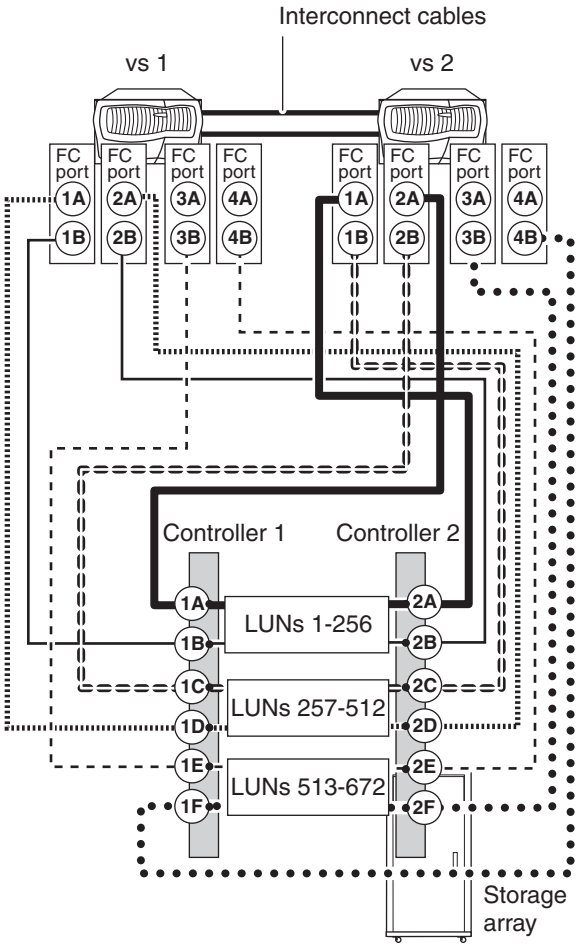


For each node in an HA pair, the same set of array LUNs must be visible on two adapters on the node for redundancy. Then, if one adapter fails, the array LUN group is still accessible from the other adapter on the same V-Series system. In the illustration, the port pair is represented by the same line type. The following table summarizes the redundant paths shown in the illustration for each array LUN group for each node in the HA pair.

V-Series FC initiator port	Storage array port	Connects to this array LUN group...
V-Series system vs 1		
1B	1B	1 to 256
2B	2B	
1A	1D	257 to 512
2A	2D	
V-Series system vs 2		
1A	2A	1 to 256
2A	1A	
1B	2C	257 to 512
2B	1C	

Direct-attached HA pair: 513 to 672 array LUNs

Because this is an example of a storage array model that supports 256 array LUNs per host group per port or 256 array LUNs per port, each V-Series node must have four adapters to be able to provide redundant paths for 513 to 672 array LUNs. You only need to use one port on the third adapter and one port on the fourth adapter, however.



For each node in the HA pair, the same set of array LUNs must be visible on two separate adapters on the node for redundancy. Then, if one adapter fails, the array LUN group is still accessible from the other adapter on the same V-Series system. The following table summarizes the redundant paths shown in the illustration for each array LUN group for each node in the HA pair.

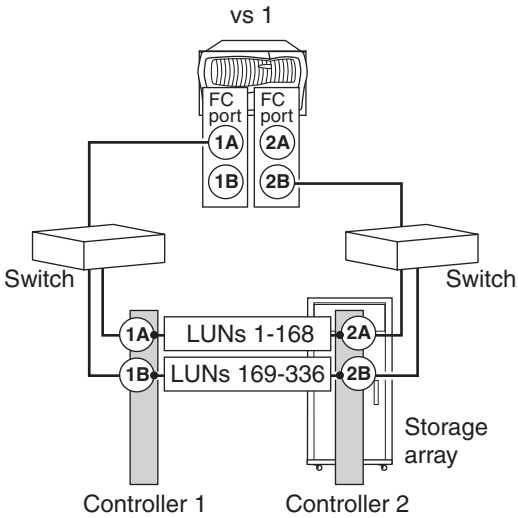
V-Series FC initiator port	Storage array port	Connects to this LUN group...
V-Series system vs1		
1B	1B	1 to 256
2B	2B	
1A	1D	257 to 512
2A	2D	
3B	1E	513 to 672
4B	2E	
V-Series system vs2		
1A	2A	1 to 256
2A	1A	
1B	2C	257 to 512
2B	1C	
3B	2F	513 to 672
4B	1F	

Direct-attached HA pair—more than 672 array LUNs

Newer V-Series models are supporting an increasingly larger number of array LUNs. (See the V-Series *Support Matrix* for the numbers of array LUNs supported per V-Series model.) On a storage array that can handle only 256 array LUNs per host group per port or 256 array LUNs per port, you must add an additional storage array port pair for each additional increment of up to 256 array LUNs. You cannot just add another host group on the existing storage array port to increase the number of V-Series LUNs.

Fabric-attached stand-alone configuration—257 to 336 array LUNs per port

The following illustration shows a fabric-attached stand-alone configuration of 257 to 336 array LUNs.



Assume that 336 array LUNs were allocated on the storage array for the V-Series systems and that the V-Series model can support 336 array LUNs. For storage arrays that support only 256 array LUNs per host group per port or 256 array LUNs per port, you must add a second port pair to handle from 257 and 336 array LUNs. You cannot just add another host group on the storage array port to increase the number of V-Series LUNs. The array LUNs are distributed equally over the port pairs.

Zoning: The following table shows single-initiator zoning for this example with a V-Series system with cards. Single-initiator zoning is the recommended zoning strategy.

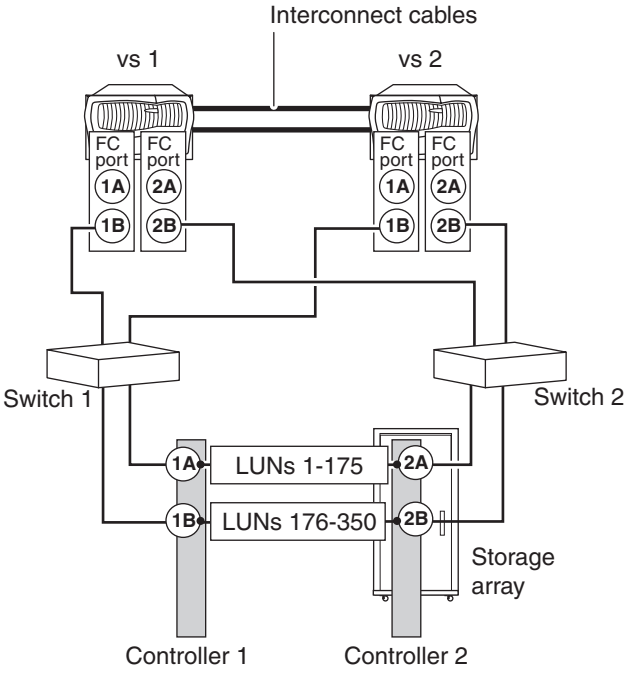
Zone	V-Series system port	Storage array port
Switch 1		
z1	1A	1A
z2	1A	1B
Switch 2		
z3	2B	2A
z4	2B	2B

Fabric-attached stand-alone configuration—more than 336 array LUNs

Newer V-Series models are supporting an increasingly larger number of array LUNs. (See the V-Series *Support Matrix* for the numbers of array LUNs supported per V-Series model.) On a storage array that can handle only 256 array LUNs per host group per port or 256 array LUNs per port, you must add an additional storage array port pair for each additional increment of up to 256 array LUNs. You cannot just add another host group on the existing storage array port to increase the number of V-Series LUNs.

Fabric-attached HA pair—257 to 512 array LUNs

The following illustration shows an example in which 350 array LUNs were created on the storage array for the V-Series systems. The array LUNs are distributed equally over the ports.



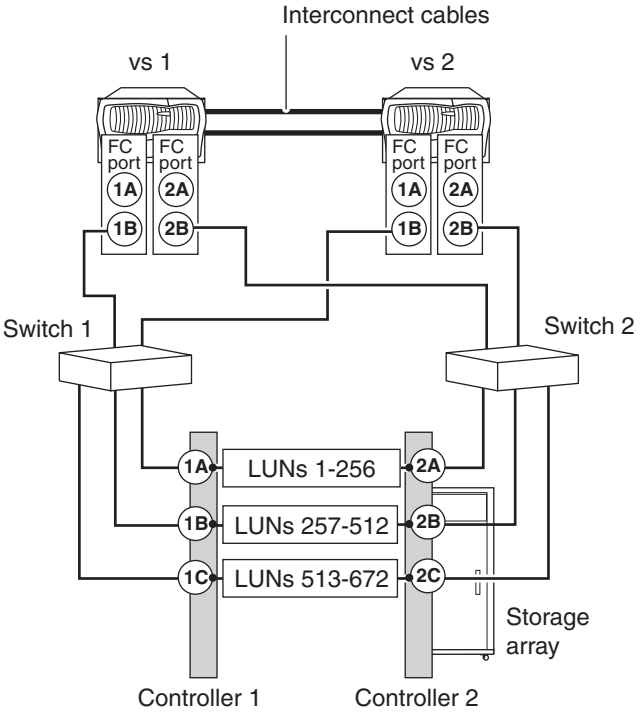
For storage array models that support 256 array LUNs per host group per port or 256 array LUNs per port, you must have at least two dedicated port pairs to handle 257 to 512 array LUNs. You cannot just add another host group on the existing port to increase the number of array LUNs for the V-Series system.

Zoning: The following table shows single-initiator zoning for this example with a V-Series system with cards. Single-initiator zoning is the recommended zoning strategy.

Zone	V-Series system and port		Storage array port
Switch 1			
z1	vs1	1B	1A
z2	vs1	1B	1B
z3	vs2	1B	1A
z4	vs2	1B	1B
Switch 2			
z5	vs1	2B	2A
z6	vs1	2B	2B
z7	vs2	2B	2A
z8	vs2	2B	2B

Fabric-attached HA pair—513 to 672 array LUNs

The following illustration shows an example in which 672 array LUNs were created on the storage array for the V-Series systems.



For storage arrays that support 256 array LUNs per host group per port or 256 array LUNs per port, you must have (at least) three port pairs to handle any number of array LUNs between 513 to 672.

Fabric-attached HA pair—more than 672 array LUNs

Newer V-Series models are supporting an increasingly larger number of array LUNs. (See the V-Series *Support Matrix* for the numbers of array LUNs supported per V-Series model.) On a storage array that can handle only 256 array LUNs per host group per port or 256 array LUNs per port, you must add an additional storage array port pair for each additional increment of up to 256 array LUNs. You cannot just add another host group on the existing storage array port to increase the number of V-Series LUNs.

MetroCluster configurations

See the V-Series *MetroCluster Guide* for detailed information about connecting and installing a V-Series system in a MetroCluster environment.

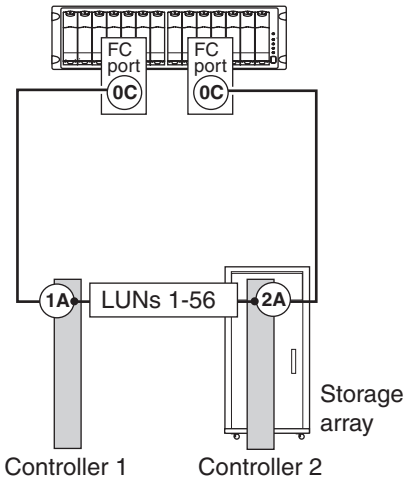
Note

Not all platforms, switches, storage arrays, or Data ONTAP versions are supported in MetroCluster configurations. Before configuring a MetroCluster configuration, see the V-Series *Support Matrix* at http://now.netapp.com to make sure your configuration is valid and supported.

Configurations with a GF270c

Direct-attached HA pair for a GF270c—4 to 56 LUNs

The following illustration shows a direct-attached HA pair for a GF270c. A GF270c supports only two FC initiator ports, and it supports fewer LUNs than other models (see the V-Series *Support Matrix* for the number of LUNs that the GF270c supports). For a GF270c, you must configure a minimum of four LUNs, two of which are spares.

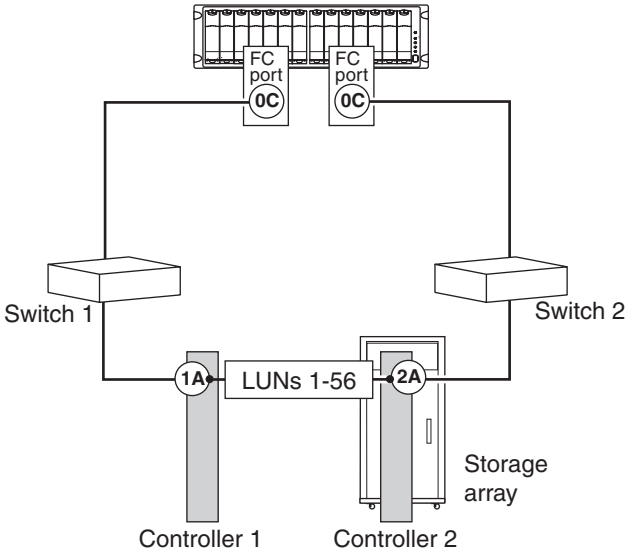


You can divide the LUNs in this configuration between the CPU modules (heads) on the GF270c if the maximum and minimum model-specific LUN counts per CPU module are met (see the V-Series *Support Matrix* for more information).

If one path fails, takeover occurs.

Fabric-attached HA pair with a GF270c—4 to 56 LUNs

The following illustration shows a fabric-attached HA pair configuration for a GF270c for storage arrays that support up to 256 LUNs per host group per port. A GF270c supports fewer LUNs than other models (see the V-Series *Support Matrix* for the number of LUNs that the GF270c supports). You must configure four LUNs for a GF270c, two of which are spares.



Only two ports are supported on the GF270c. Two switches are deployed for redundancy, in case one switch fails.

The LUNs in this configuration can be divided between the CPU modules (heads) on the GF270c if the maximum and minimum model-specific LUN counts per CPU module are met.

Zoning: The following table shows single-initiator zoning for this example with a V-Series system with cards. Single-initiator zoning is the recommended zoning strategy.

Zone	Switch	V-Series system port	Storage array port
z1	1	0c (CPU controller 1)	1A
z2	2	0c (CPU controller 2)	2A

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