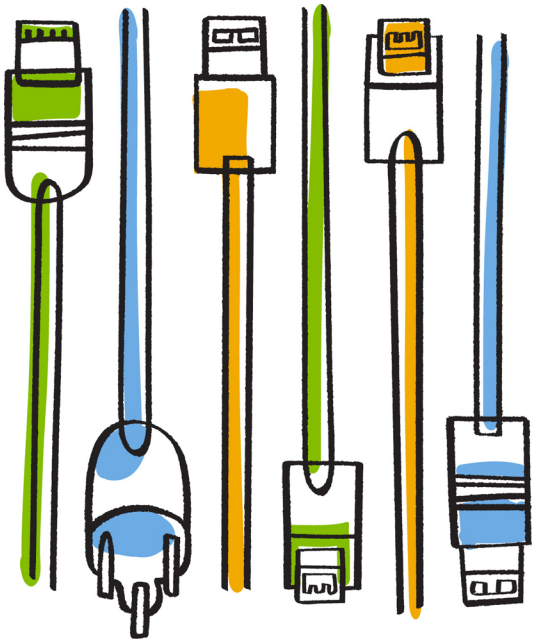
V-Series Systems

Implementation Guide for Third-Party Storage



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How this guide fits into your implementation planning

When planning a deployment with V-Series systems and storage arrays, it is important to review the general requirements for setting up all storage arrays to work with Data ONTAP and also the specific requirements for your vendor and storage array vendor, which are discussed in this guide.

V-Series systems can be deployed with a variety of storage arrays. Data ONTAP requirements for working with individual storage arrays can vary by vendor and storage array. This guide provides information about the storage arrays that Data ONTAP 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 Interoperability Matrix at *support.netapp.com*.

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

What to read before this guide

When planning for setting up your configuration to work with storage arrays, you should start by reading the *V-Series Installation Requirements and Reference Guide*, which provides the general requirements for setting up Data ONTAP to work with storage arrays. For example, it contains general guidelines about how to configure array LUNs to work with Data ONTAP and how to set up paths to array LUNs. After you understand the requirements that apply to all vendors, you should read this guide, which provides the additional information that is specific to your vendor.

How this guide is organized

The information in this guide is organized in separate chapters for each storage array vendor. Each chapter includes information about the following:

- The requirements for parameters that must be set for each supported storage array from your vendor to be able to work with Data ONTAP
- Additional configuration guidelines, such as restrictions specific to an aspect of your vendor's storage array configuration
- The configurations that are supported for the storage arrays from your vendor

  The supported configurations shown for a vendor might not apply to all storage array models from the vendor. Any exceptions for individual models from a vendor are shown in the Interoperability Matrix at *support.netapp.com*.

Where to find out about planning for and setting up Data ONTAP features

V-Series specific guides provide information about how to set up Data ONTAP to work with storage arrays and how to set up the storage arrays to work with Data ONTAP. You should also refer to the

Data ONTAP document library, which provides information about Data ONTAP features. The Data ONTAP guides also contain some procedures for installing and configuring your system to work with array LUNs.

Where to find V-Series interoperability and limits information

When planning your configuration, you need to check sources in addition to product documentation for interoperability details and limits information.

Tools available on the NetApp Support Site provide, in a central location, specific information about which features, configurations, and storage array models are supported in particular releases.

Interoperability information about support for storage arrays

Not all Data ONTAP releases support the same features, configurations, storage array models, and V-Series models. During your deployment planning, you need to check Data ONTAP support information to ensure that your deployment conforms to Data ONTAP hardware and software requirements for all systems in the deployment.

Previously all support information used to set up deployments with storage arrays was included in the V-Series Support Matrix. As of November 2012, the information is divided into two different tools, as shown in the following table:

For information about...	You should look here...
Data ONTAP working with devices, including the following: • Supported storage arrays and storage array firmware • Supported switches and switch firmware • Whether your storage array supports nondisruptive (live) upgrade of the storage array firmware • Whether a MetroCluster configuration is supported with your storage array	Interoperability Matrix at *support.netapp.com* **Note:** The *Interoperability Matrix* shows the Brocade and Cisco switches that are supported. You can find guides for configuring specific vendor switches on the NetApp Support Site at *support.netapp.com*.

For information about...	You should look here...
Data ONTAP limits for releases and platforms, including the following: • Minimum and maximum array LUN sizes, including the minimum array LUN size for the root volume and spare core array LUNs • Minimum aggregate size for aggregates with array LUNs • Supported block size • Minimum and maximum capacity • Neighborhood limits	*Hardware Universe* (formerly the *System Configuration Guide*) at *support.netapp.com/knowledge/docs/hardware/NetApp/syscfg/index.shtml*
Information about what is supported for specific arrays, including supported configurations.	*V-Series Implementation Guide for Third-Party Storage*

Limits information for configurations with storage arrays

The *Hardware Universe* (formerly the *System Configuration Guide*) at *support.netapp.com/knowledge/docs/hardware/NetApp/syscfg/index.shtml* contains information about limits that you need to consider when planning for a configuration with storage arrays.

The *Hardware Universe* includes the following limits that do not apply to native disks:

- Minimum and maximum array LUN size that Data ONTAP supports
- Minimum size for the array LUN for the root volume
- Spare core array LUN minimum size
- Limits for RAID groups with array LUNs
- Minimum aggregate size for an aggregate of array LUNs
- Maximum number of array LUNs and disks combined, per platform

The *Hardware Universe* also contains storage limits that are the same for native disks and array LUNs.

Note: Limits for V-Series systems were previously provided in the *V-Series Limits Reference for Third-Party Storage* and the V-Series Support Matrix.

EMC CLARiiON and VNX storage arrays

There are requirements that must be met when configuring storage arrays to work work with V-Series systems. These requirements include setting configuration parameters on storage arrays and deploying only supported configurations.

Required parameters for EMC CLARiiON and VNX storage arrays with V-Series systems

Certain parameter settings are required on the storage array for the storage array to work successfully with V-Series systems.

Host configuration parameters that must be set on the storage array are listed in the following table.

Parameter	Setting
`Initiator type`	Clariion Open or Clariion VNX
`Array Com Path`	Enabled
`Failover mode`	1
`Unit serial number`	LUN
`Host Name`	User-supplied host name and port number.
`IP address`	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.

General configuration guidelines

Information in this section includes cautions, restrictions, special requirements, and information about array characteristics that you might need to consider when configuring or using the storage array.

How EMC CLARiiON and VNX storage arrays control access to data

EMC CLARiiON and VNX 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. A host cannot access or modify data in array LUNs that are not part of its Storage Group.

Data ONTAP supports multiple Storage Groups if these rules are followed:

- Switch zoning must define which target ports the V-Series FC initiator ports use to access each array LUN group.
- LUN masking must be used to restrict host access to array LUNs.
- Storage Groups must define which array LUN groups are presented to each V-Series FC initiator port.
- One FC initiator port pair on each V-Series system is required for each array LUN group.
- All target ports on a storage array accessing an individual array LUN group must be accessed through the same switch.

If V-Series neighborhoods are used, the V-Series systems in the same neighborhood must be in the same Storage Group.

Limitation on array LUN numbering with EMC CLARiiON and VNX arrays

EMC CLARiiON (CX) and VNX storage arrays only support array LUN numbering from 0 through 255. Array LUNs that are numbered beyond that range are not visible to Data ONTAP.

Guidelines for enabling ALUA on EMC CLARiiON and VNX storage arrays

Starting with Data ONTAP 8.2, support has been added for ALUA (Asymmetric Logical Unit Access) with CLARiiON and VNX arrays.

By default, support for ALUA is enabled in Data ONTAP. But to use it, ALUA must be enabled on the storage array.

You should enable ALUA only on new configurations. You should not enable ALUA in an existing configuration.

If you are setting up ALUA on the storage array, you need to ensure that all hosts in a Storage Group are the same failover mode, either 4 (ALUA) or 1 (Active/Passive).

Requirement for 8 Gb array port initialization

In a typical FC fabric, storage array ports initialize as N-Ports (node ports) and their corresponding switch ports initialize as F-Ports (fabric ports). In some cases, N-Ports might go offline and resume operation as L-Ports (loop ports), resulting in fabric errors. This behavior is caused by topology auto-negotiation issues in the Brocade switch.

To ensure that switch ports always initialize as F-ports, you need to run the `portcfggport <portnumber> 1` command on Brocade switch ports in the configuration. You need to run this command when you start configuring the system to avoid this problem, or to fix the problem if it occurs.

To promote efficiency on the fabric as a whole, you can use this workaround on any Brocade ports attached to V-Series FC initiator ports.

EMC CLARiiON storage array families

Data ONTAP does not support mixing some types of storage in aggregates. To help you determine the array LUNs that can be mixed in an aggregate, the storage arrays from each vendor are grouped into families. When you create aggregates, you cannot mix array LUNs from different vendors and from different storage array families in the same aggregate.

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. More than one factor might be used to determine storage array families. For example, storage arrays with different architectures would be in different families even though other characteristics might be the same.

Note: CX storage arrays use active-active (ALUA) failover; they are not active-active storage arrays.

The following list shows CLARiiON storage arrays organized by family:

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

The storage arrays and families shown are current at the time of publication. The Interoperability Matrix at *support.netapp.com* is the final authority for which storage arrays are supported for each vendor.

EMC VNX storage array families

Data ONTAP does not support mixing some types of storage in aggregates. To help you determine the array LUNs that can be mixed in an aggregate, the storage arrays from each vendor are grouped into families. When you create aggregates, you cannot mix array LUNs from different vendors and from different storage array families in the same aggregate.

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. More than one factor might be used to determine storage array families. For

example, storage arrays with different architectures would be in different families even though other characteristics might be the same.

Note: VNX storage arrays use active-active (ALUA) failover; they are not active-active storage arrays.

The following list shows the supported storage arrays, which are all in the same family:

- Family 1
  - VNX5100
  - VNX5300
  - VNX5500
  - VNX5700
  - VNX7500

The storage arrays and families shown are current at the time of publication. The Interoperability Matrix at *support.netapp.com* is the final authority for which storage arrays are supported for each vendor.

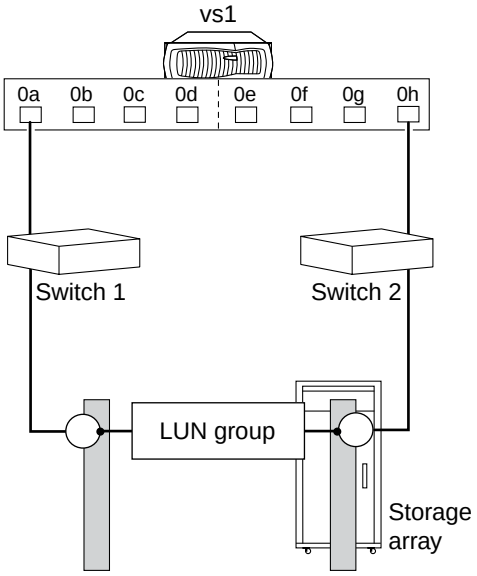
Supported configurations for EMC CLARiiON and VNX storage arrays

Only specific configurations of EMC CLARiiON and VNX storage arrays deployed with V-Series systems are supported.

Stand-alone basic configuration

The stand-alone basic V-Series system configuration is a simple fabric-attached configuration with a single port pair accessing a single LUN group.

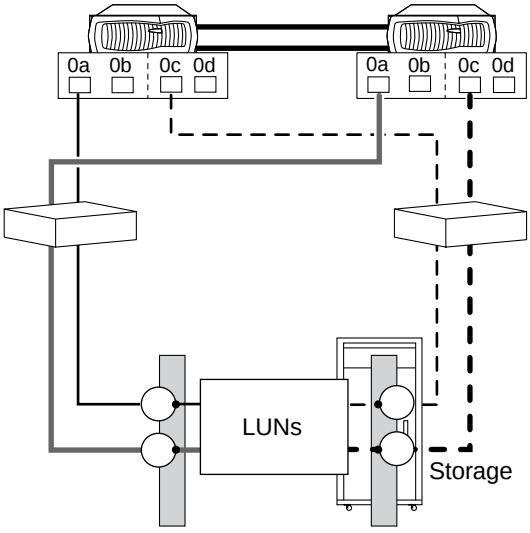
The following illustration shows this configuration.



Single 4-port array LUN group

This configuration contains a single 4-port LUN group with each target port accessed by a single V-Series FC initiator port from the HA pair. Zoning ensures that there are only two paths to a specific array LUN.

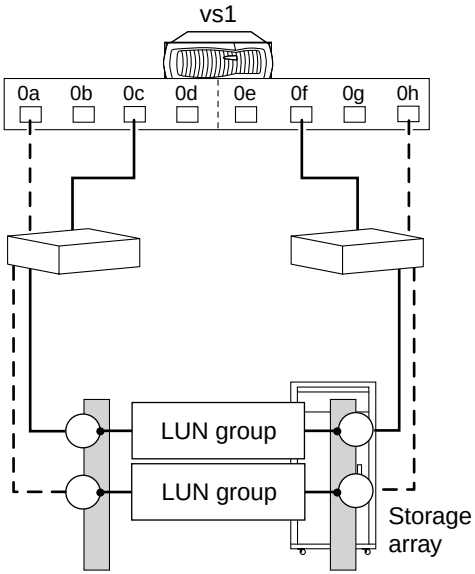
The following illustration shows this configuration.



Stand-alone with two 2-port LUN groups

This is a stand-alone V-Series system in a fabric-attached simple configuration. In this configuration, each FC initiator port pair accesses a separate array LUN group.

The following illustration shows this configuration.



V-Series FC initiator port attaching to multiple targets ports

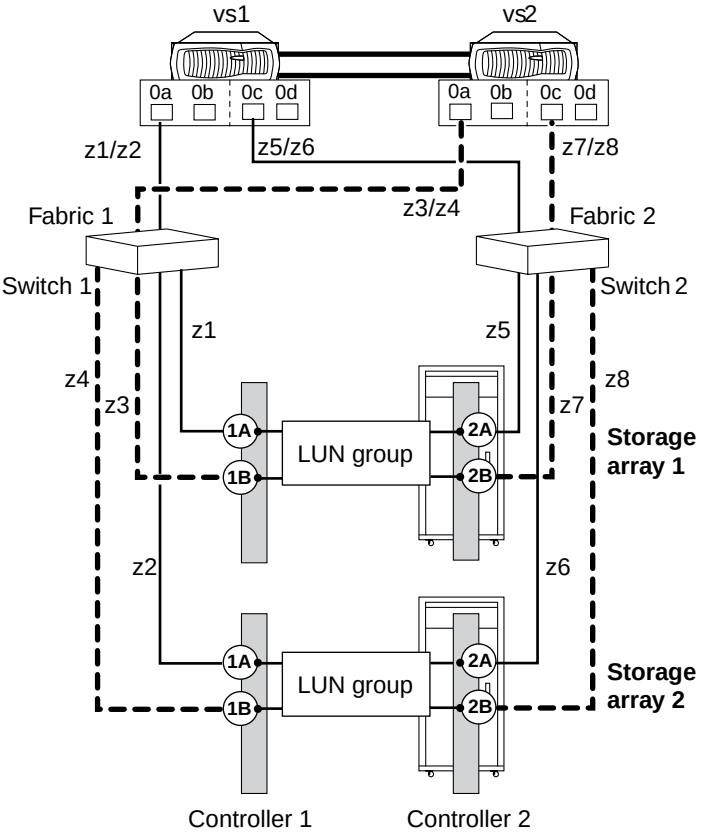
Starting in Data ONTAP 8.2, a V-Series FC initiator port can be attached to multiple target ports on separate storage arrays. The *V-Series Installation Requirements and Reference Guide* contains the rules for setting up this configuration. This configuration is not supported with MetroCluster configurations.

The following illustration shows a shared V-Series FC initiator port configuration with an HA pair. However, sharing an FC initiator port with multiple target ports is supported with both stand-alone systems and HA pairs.

For details about zoning, see the information in the *V-Series Installation Requirements and Reference Guide* about sharing an FC initiator port with multiple target ports.

One V-Series FC initiator port connecting to target ports on *separate* storage arrays

The following example shows an HA pair in which a single FC initiator port connects to multiple target ports on different storage arrays.


vs1
vs2
0a 0b 0c 0d
0a 0b 0c 0d
z1/z2
z5/z6
z7/z8
z3/z4
Fabric 1
Fabric 2
Switch 1
Switch 2
z1
z5
z4
z3
z8
z7
1A
1B
LUN group
2A
2B
Storage array 1
z2
z6
1A
1B
LUN group
2A
2B
Storage array 2
Controller 1
Controller 2

EMC Symmetrix storage arrays

There are requirements that must be met when configuring storage arrays to work with V-Series systems. These requirements include setting configuration parameters on storage arrays and deploying only supported configurations.

Required parameters for EMC Symmetrix storage arrays with V-Series systems

Certain parameter settings are required on the storage array for the storage array to work successfully with V-Series systems.

Required host channel director port configuration parameters

The host channel director port configuration parameters that must be set on the storage array are shown in the following table.

Parameter (names might differ between GUI and CLI)	Setting
`Common SN` (Common Serial Number or C-bit parameter)	Enable
`PP` (Point-to-Point parameter)	Enable
`SC3` (SCSI-3)	Enable
`SPC-2` (SCS2_Protocol_version, SCSI Primary Command 2 parameter, or "`Allow inquiry data to be compiled to the standard`")	Enable
`UWN` (Unique Worldwide Name)	Enable
`Volume Set Addressing`	Disable

The Volume Set Addressing parameter must be set the same way on all channel director ports to which the LUN is mapped. If the settings are different, Data ONTAP reports this as a LUN ID mismatch in `storage errors show` output and in an EMS message. See the *V-Series Installation Requirements and Reference Guide* for information about troubleshooting this error.

Required host configuration parameters

The settings for host configuration parameters are shown in the following table.

Parameter	Setting
`Host Type Format`	Server or Open systems
`SCSI3_persist_reserv (Persistent Reservations)`	On

General configuration guidelines

Information in this section includes cautions, restrictions, special requirements, and information about array characteristics that you might need to consider when configuring or using the storage array.

Requirements for implementing LUN security

You use LUN security to eliminate the possibility of a host writing data to a LUN that is not owned by that host.

To eliminate the possibility of a non Data ONTAP host overwriting DMX array LUNs owned by a V-Series system or vice versa, you must present the DMX logical devices through the host (channel) director ports in either of the following ways:

- Present only the DMX logical devices for V-Series on specific DMX host (channel) director ports that are dedicated to V-Series use.
- Use LUN masking to associate all DMX logical devices to all host (channel) director ports, but allow only the V-Series FC initiator ports to see the LUNs for V-Series.

  Attention: Do not present the VCMDB LUN 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.

  If you are setting up a configuration in which you are using multiple array LUN groups for V-Series, set up a separate “host group” for each group of LUNs for V-Series.

Caution about using the VCMDB LUN

For the 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. The VCMDB is typically mapped to LUN 0, but can be mapped to an array LUN other than LUN 0.

If the VCMDB LUN is mapped to a V-Series system, Data ONTAP periodically logs a message that the VCMDB LUN is less than the minimum size required, and it marks the VCMDB LUN as failed. The V-Series system continues to function normally after logging this error message, but it cannot use the LUN.

A VCMDB LUN should be unmapped from a V-Series system.

Caution about using the ACLX LUN

On VMAX arrays, the ACLX (Access Control Logix) LUN is created during initialization if the customer requests using ACLX. The ACLX LUN is not a storage LUN so it should not be mapped to Data ONTAP.

If the ACLX LUN is mapped to a V-Series system, Data ONTAP logs a message that the ACLX LUN is less than the minimum size required, and it marks the LUN as failed. The V-Series system continues to function normally after logging this error message, but it cannot use the LUN.

An ACLX LUN should be unmapped from the front-end director ports for a V-Series system .

Restriction on using a gatekeeper LUN

If a gatekeeper logical device (LUN) is presented, do not map it to the V-Series system. V-Series systems cannot use a gatekeeper LUN. A gatekeeper is a Symmetrix logical device through which SYMAPI or the ControlCenter agent communicates with the storage array.

EMC Symmetrix storage array families

Data ONTAP does not support mixing some types of storage in aggregates. To help you determine the array LUNs that can be mixed in an aggregate, the storage arrays from each vendor are grouped into families. When you create aggregates, you cannot mix array LUNs from different vendors and from different storage array families in the same aggregate.

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. More than one factor might be used to determine storage array families. For example, storage arrays with different architectures would be in different families even though other characteristics might be the same.

The following list shows the supported arrays organized by families:

- Family1
  - VMAX SE
  - VMAX 40k
  - VMAX/VMAX 20k
  - VMAXe/VMAX 10k
- Family 2
  - DMX 3
  - DMX 4

The storage arrays and families shown are current at the time of publication. The Interoperability Matrix at *support.netapp.com* is the final authority for which storage arrays are supported for each vendor.

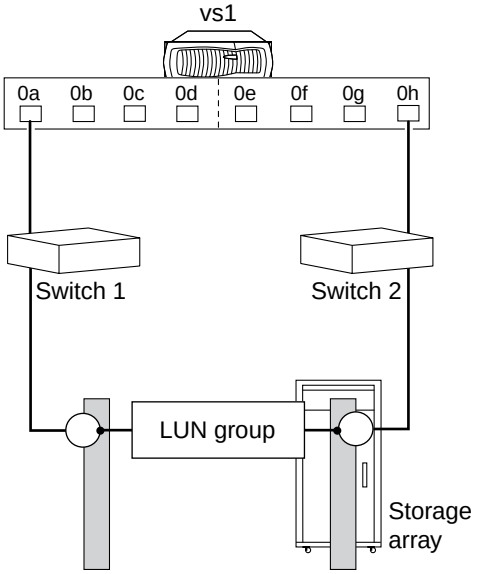
Supported configurations for EMC Symmetrix storage arrays

Only specific configurations of EMC Symmetrix storage arrays deployed with V-Series systems are supported.

Stand-alone basic configuration

The stand-alone basic V-Series system configuration is a simple fabric-attached configuration with a single port pair accessing a single LUN group.

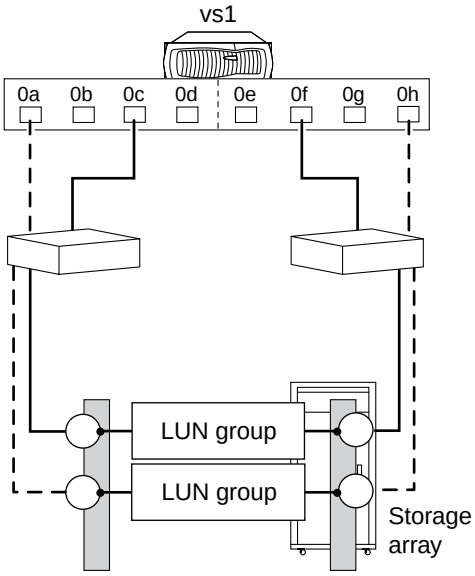
The following illustration shows this configuration.



Stand-alone with two 2-port LUN groups

This is a stand-alone V-Series system in a fabric-attached simple configuration. In this configuration, each FC initiator port pair accesses a separate array LUN group.

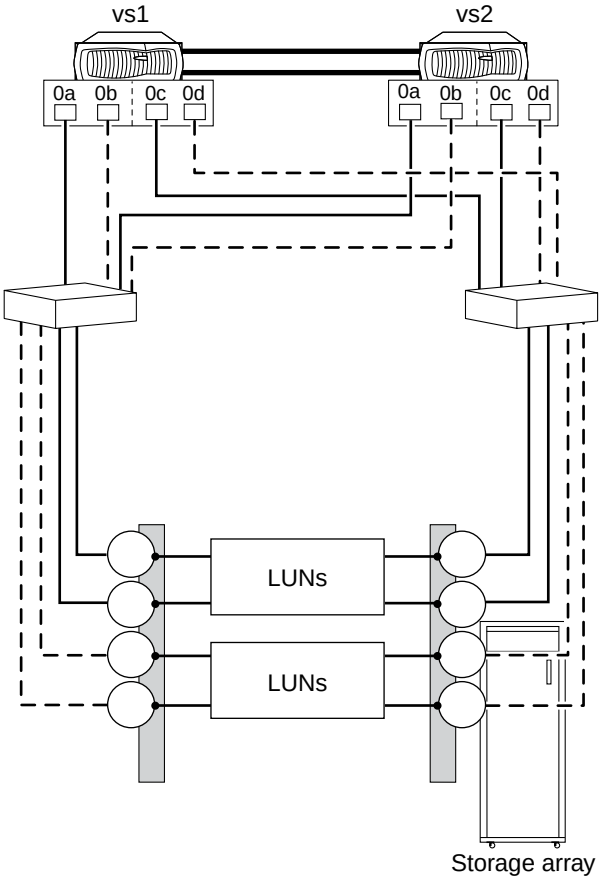
The following illustration shows this configuration.



Two 4-port array LUN groups

In this configuration, each V-Series port pair accesses a separate array LUN group. Zoning is single V-Series FC initiator to single array target port.

The following illustration shows a block diagram of this configuration.



V-Series FC initiator port attaching to multiple targets ports

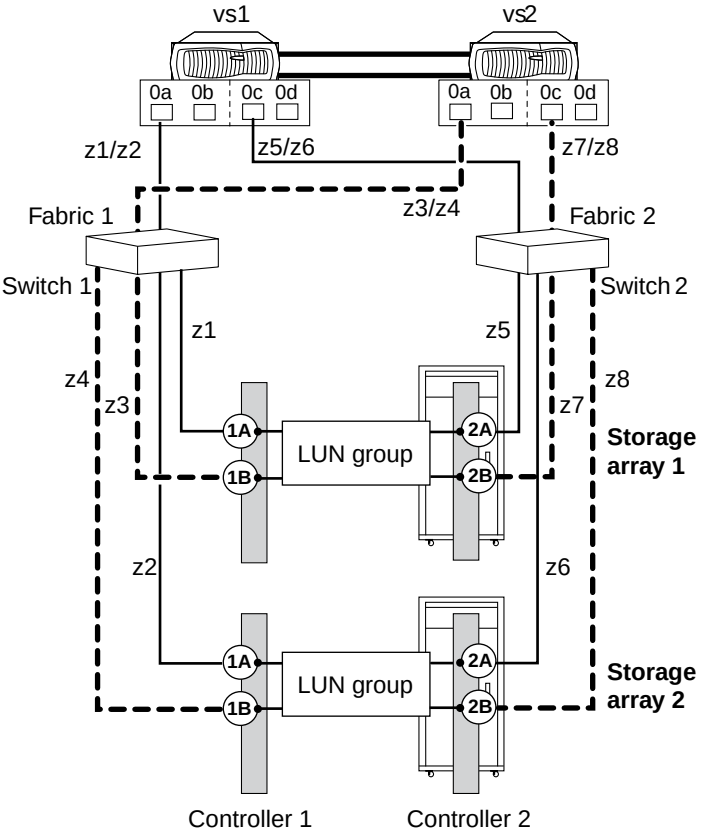
Starting in Data ONTAP 8.2, a V-Series FC initiator port can be attached to multiple target ports on separate storage arrays. The *V-Series Installation Requirements and Reference Guide* contains the rules for setting up this configuration. This configuration is not supported with MetroCluster configurations.

The following illustration shows a shared V-Series FC initiator port configuration with an HA pair. However, sharing an FC initiator port with multiple target ports is supported with both stand-alone systems and HA pairs.

For details about zoning, see the information in the *V-Series Installation Requirements and Reference Guide* about sharing an FC initiator port with multiple target ports.

One V-Series FC initiator port connecting to target ports on *separate* storage arrays

The following example shows an HA pair in which a single FC initiator port connects to multiple target ports on different storage arrays.


vs1
vs2
0a
0b
0c
0d
0a
0b
0c
0d
z1/z2
z5/z6
z7/z8
z3/z4
Fabric 1
Fabric 2
Switch 1
Switch 2
z1
z5
z4
z3
z8
z7
1A
1B
LUN group
2A
2B
Storage array 1
z2
z6
1A
1B
LUN group
2A
2B
Storage array 2
Controller 1
Controller 2

Fujitsu ETERNUS storage arrays

There are requirements that must be met when configuring storage arrays to work with V-Series systems. These requirements include setting configuration parameters on storage arrays and deploying only supported configurations.

Requirements for configuring Fujitsu ETERNUS storage arrays with V-Series systems

Certain parameter settings are required on the storage array for the storage array to work successfully with V-Series systems.

Host Response pattern requirement for Fujitsu storage arrays

For the V-Series system to work with Fujitsu storage arrays, you need to create a new Host Response pattern and set the parameters required by the V-Series system.

Fujitsu provides Host Response pattern #00, which is a read-only version of the specification that you edit to match the requirements of your storage array model.

Required host configuration parameters for Fujitsu DX8xxx storage arrays

Certain configuration parameters must be set for the storage array to be able to communicate with the V-Series system.

Host configuration parameters that must be set on the storage array are listed in the following table.

Parameter	Setting
`Host Response Name`	Name (V-Series system name)
`Command Time-out Interval`	Standard (25 seconds)
`Data Transfer Timer`	10 Seconds (default)
`Load Balance Response`	Unit Attention
`Byte-0 Inquiry Response`	No Conversions (default)
`Inquiry VPD ID Type`	Type1 + Type3 (default)
`Inquiry Standard Data Version`	Version 05 (default)
`Reservation Conflict Response for Test Unit Ready`	Normal Response (default)

Parameter	Setting
`Asymmetric / Symmetric Logical Unit Access`	Active/Active (default)
`Host Specific Mode`	Normal Mode (default)
`LUN Mapping Changes`	No Report (default)
`LUN Capacity Expansion`	No Report (default)
`Vendor Unique Sense Code`	No report (default)
`Sense Code Conversion Pattern`	No Conversion (default)

Required host configuration parameters for Fujitsu DX4xx storage arrays

Certain configuration parameters must be set for the storage array to be able to communicate with the V-Series system.

Host configuration parameters that must be set on the storage array are listed in the following table.

Parameter	Setting
`Host Response Name`	Name (V-Series system name)
`Byte-0 of Inquiry response`	No conversion (Default)
`Inquiry VPD ID Type`	Type 1 + Type 3
`Inquiry Standard Data Version`	Default (Version 05)
`Command Timeout Interval`	Default (25 sec)
`Load Balance Response`	Default (Unit Attention)
`Reservation Conflict Response for Test Unit Ready`	Default (Normal)
`Change Volume Mapping`	Default (No Report)
`Volume Capacity Expansion`	Default (No Report)
`Vendor Unique Sense Code`	Default (No Report)
`Host Specific Mode`	Default (Normal)
`Asymmetric/Symmetric Logical Unit Access`	Default (Active/Active)
`Sense Data Conversion`	Default (no conversion)

General configuration guidelines

Information in this section includes cautions, restrictions, special requirements, and information about array characteristics that you might need to consider when configuring or using the storage array.

Fujitsu ETERNUS storage array families

Data ONTAP does not support mixing some types of storage in aggregates. To help you determine the array LUNs that can be mixed in an aggregate, the storage arrays from each vendor are grouped into families. When you create aggregates, you cannot mix array LUNs from different vendors and from different storage array families in the same aggregate.

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. More than one factor might be used to determine storage array families. For example, storage arrays with different architectures would be in different families even though other characteristics might be the same.

The following list shows the storage arrays supported in various Data ONTAP 8.x releases organized by family

- DX Generation 1 family
  - DX8000 (DX8700, DX8400)
  - DX400 1st generation (DX410, DX440)
- DX Generation 2 family
  - DX400 S2 (DX410, DX440)
  - DX8000 S2 (DX8700)

The storage arrays and families shown are current at the time of publication. The Interoperability Matrix at *support.netapp.com* is the final authority for which storage arrays are supported for each vendor.

Note: This guide discusses only the Fujitsu storage arrays that are supported in the Data ONTAP 8.x releases. See the *Interoperability Matrix* for information about the ETERNUS family of storage arrays, which are supported in releases earlier than 8.x. The *V-Series Implementation Guide for Fujitsu ETERNUS Storage* provides information about setting up the ETERNUS family models to work with Data ONTAP.

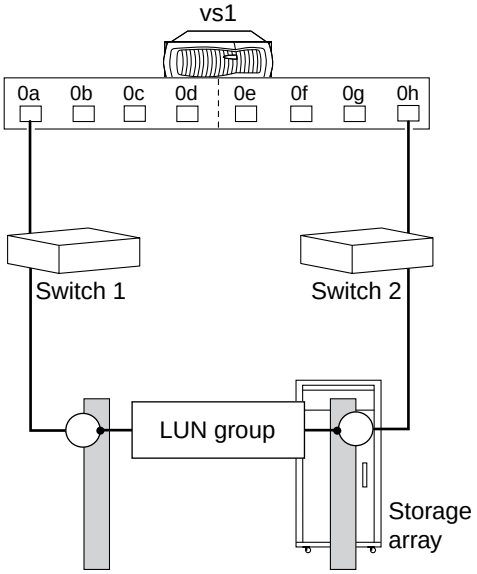
Supported configurations for Fujitsu ETERNUS storage arrays

Only specific configurations of Fujitsu ETERNUS storage arrays deployed with V-Series systems are supported.

Stand-alone basic configuration

The stand-alone basic V-Series system configuration is a simple fabric-attached configuration with a single port pair accessing a single LUN group.

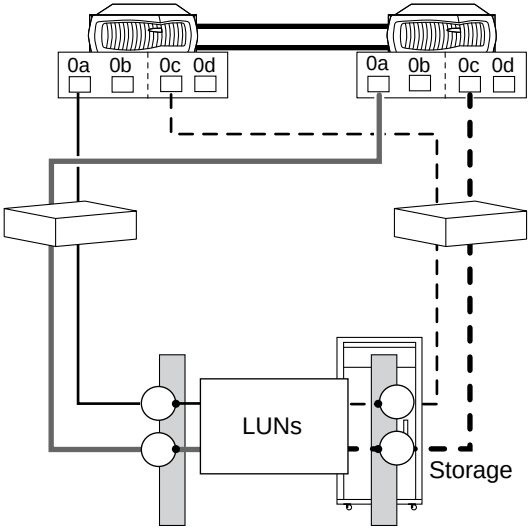
The following illustration shows this configuration.



Single 4-port array LUN group

This configuration contains a single 4-port LUN group with each target port accessed by a single V-Series FC initiator port from the HA pair. Zoning ensures that there are only two paths to a specific array LUN.

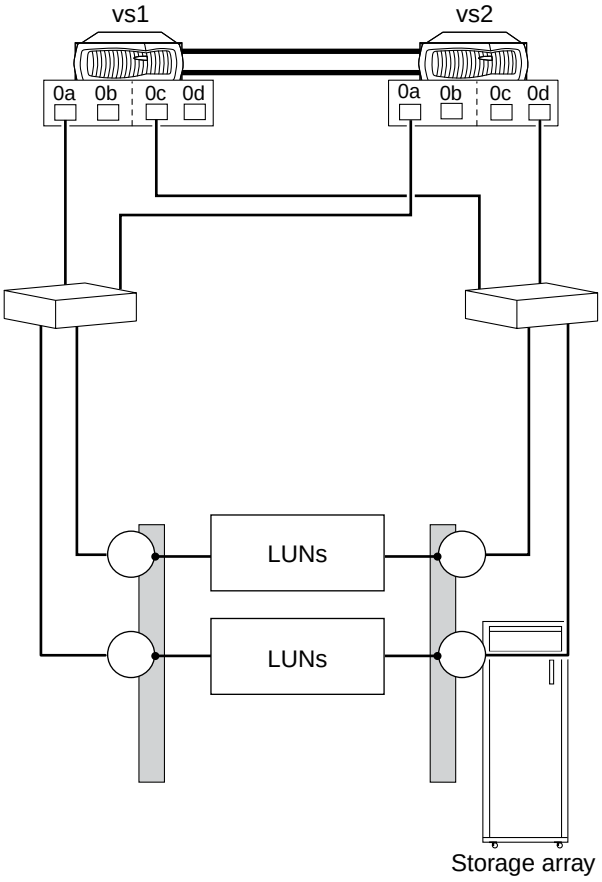
The following illustration shows this configuration.



Two 2-port array LUN groups

This configuration consists of a fabric-attached HA pair in which the V-Series system nodes access array LUNs through four ports on the storage array with each LUN group accessed through two ports.

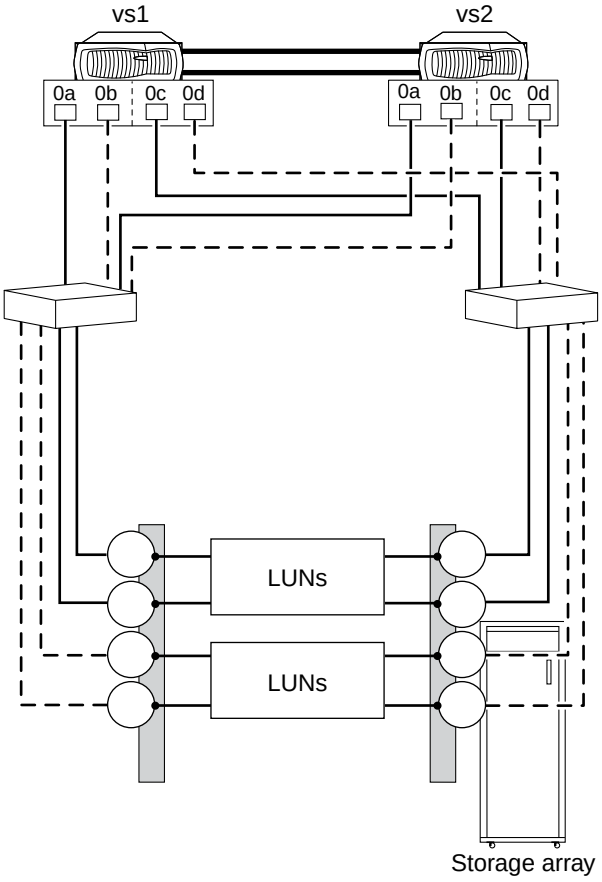
The following illustration shows this configuration.



Two 4-port array LUN groups

In this configuration, each V-Series port pair accesses a separate array LUN group. Zoning is single V-Series FC initiator to single array target port.

The following illustration shows a block diagram of this configuration.



V-Series FC initiator port attaching to multiple targets ports

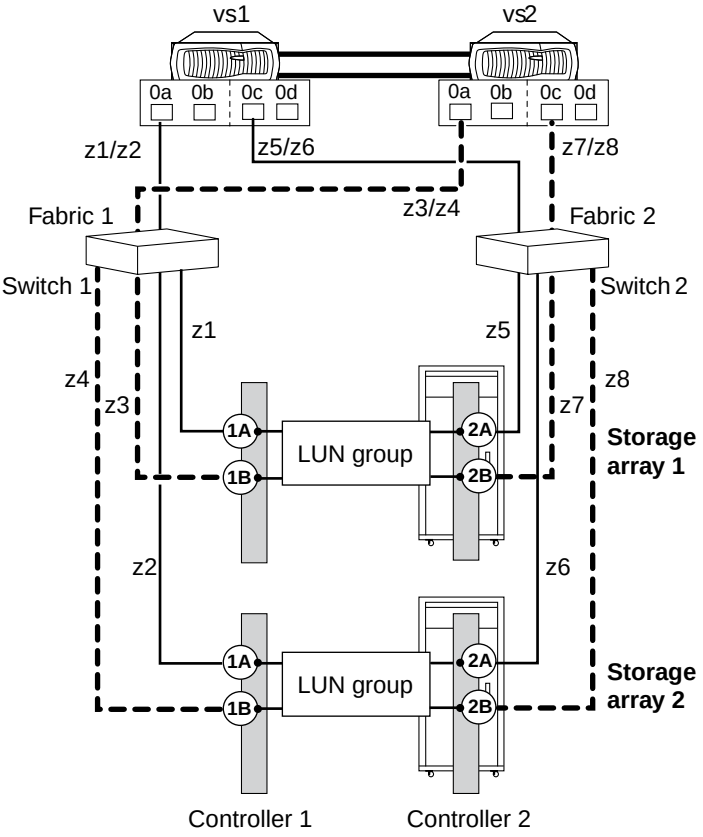
Starting in Data ONTAP 8.2, a V-Series FC initiator port can be attached to multiple target ports on separate storage arrays. The *V-Series Installation Requirements and Reference Guide* contains the rules for setting up this configuration. This configuration is not supported with MetroCluster configurations.

The following illustration shows a shared V-Series FC initiator port configuration with an HA pair. However, sharing an FC initiator port with multiple target ports is supported with both stand-alone systems and HA pairs.

For details about zoning, see the information in the *V-Series Installation Requirements and Reference Guide* about sharing an FC initiator port with multiple target ports.

One V-Series FC initiator port connecting to target ports on *separate* storage arrays

The following example shows an HA pair in which a single FC initiator port connects to multiple target ports on different storage arrays.


vs1
vs2
0a
0b
0c
0d
0a
0b
0c
0d
z1/z2
z5/z6
z7/z8
z3/z4
Fabric 1
Fabric 2
Switch 1
Switch 2
z1
z5
z4
z3
z8
z7
1A
1B
LUN group
2A
2B
Storage array 1
z2
z6
1A
1B
LUN group
2A
2B
Storage array 2
Controller 1
Controller 2

Hitachi storage arrays

There are requirements that must be met when configuring Hitachi storage arrays to work with V-Series systems. These requirements include setting configuration parameters on storage arrays and deploying only supported configurations.

Required parameters for Hitachi storage arrays with V-Series systems

Certain parameter settings are required on the storage array for the storage array to work successfully with V-Series systems.

Required system parameter for NSC55, USP, and VSP storage arrays

The required parameter setting is shown in the following table.

Parameter	Setting
`Host type`	standard or 00

Required system parameters for AMS and HUS storage arrays

The parameters that must be set are listed in the following table.

Parameter	Setting
`Mapping mode`	Enabled
`Host group security`	Enabled
`Product ID`	DF600F
`Platform`	Not specified
`Middleware`	Not specified

General configuration guidelines

Information in this section includes cautions, restrictions, special requirements, and information about array characteristics that you might need to consider when configuring or using the storage array.

Requirements for creating LUNs in dynamic pools

When creating LUNs in the dynamic pools, do not over-provision the pool capacity.

Requirements for formatting array LUNs on Hitachi arrays

There are different types of array LUN formatting that can be performed. Each type has an impact on the availability of LUNs or the entire storage array.

If you need to present a new LUN to the V-Series system immediately, it is recommended that you use quick formatting. If you plan to present LUNs to the V-Series system in the future, quick formatting is recommended but Online formatting is acceptable.

The reason for the recommendation for quick formatting is that Online and Offline formatting delay disk discovery until after the LUN formatting is complete, as described in the following list:

- Online formatting takes the array LUN that is being formatted completely offline, and the array LUN does not respond to any SCSI commands.

  Formatting is performed on one array LUN at a time until all array LUNs are formatted.
- Offline formatting takes the entire storage array offline and the storage array does not respond to any SCSI commands.

  The array LUNs are formatted six at a time per controller until the formatting is complete.

  The storage array does not respond until all formatting is complete.
- If you are creating array LUNs (for any host) after initial V-Series system setup and you are using Offline formatting, the V-Series system panics.

  Any array LUNs that are mapped to the V-Series system, including array LUNs in the root volume, become unavailable until formatting is complete.
- Online and quick formatting of LUNs for other hosts do not impact the V-Series system.

Requirements for using disks external to the storage array

Data ONTAP supports using the same disks behind the storage arrays that the vendor supports (that is, disks external to the storage array). Data ONTAP assumes that the configuration between the storage array and the external disks behind it is correct.

Restrictions and best practices recommendations for a deployment with storage arrays using external disks are provided in the following list:

- Root volumes and spare core LUNs are not supported on external disks.
- Array LUNs from external and internal disks should not be in the same Data ONTAP aggregate.

- Array LUNs from SATA drives and array LUNs from FC drives should not be in the same aggregate.
- Rules for the number of paths to array LUNs on external disks are the same as for array LUNs on disks on the storage array.

  In the case of external disks, the paths go from the V-Series system through the storage array to the external disks. See the *V-Series Installation Requirements and Reference Guide* for information about the number of paths supported for different Data ONTAP releases and modes.
- Only block checksum is supported for array LUNs on external disks.

Hitachi storage array families

Data ONTAP does not support mixing some types of storage in aggregates. To help you determine the array LUNs that can be mixed in an aggregate, the storage arrays from each vendor are grouped into families. When you create aggregates, you cannot mix array LUNs from different vendors and from different storage array families in the same aggregate.

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. More than one factor might be used to determine storage array families. For example, storage arrays with different architectures would be in different families even though other characteristics might be the same.

The following list shows the storage arrays organized by family:

- Family 1
  - USP-V
  - USP-VM
- Family 2
  - VSP
- Family 3
  - AMS 200
  - AMS 500
  - AMS 1000
- Family 4
  - AMS 2100
  - AMS 2300
  - AMS 2500
- Family 5
  - HUS 110
  - HUS 130
  - HUS 150
- Family 6
  - USP 1100

- USP 600
- USP 100
- NSC55

The storage arrays and families shown are current at the time of publication. The Interoperability Matrix at *support.netapp.com* is the final authority for which storage arrays are supported for each vendor.

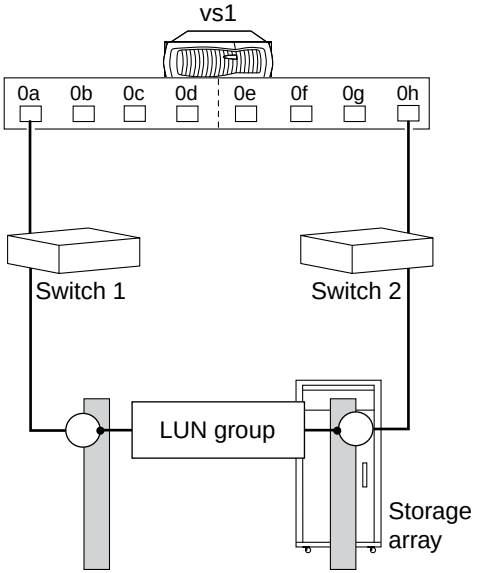
Supported configurations for Hitachi storage arrays

Only a specific number of configurations of Hitachi storage arrays deployed with V-Series systems are supported.

Stand-alone basic configuration

The stand-alone basic V-Series system configuration is a simple fabric-attached configuration with a single port pair accessing a single LUN group.

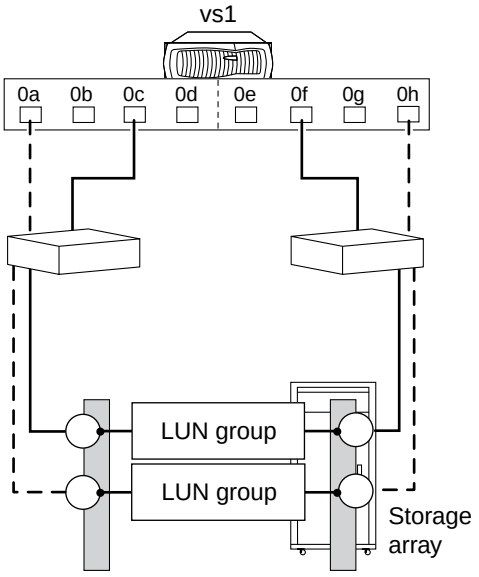
The following illustration shows this configuration.



Stand-alone with two 2-port LUN groups

This is a stand-alone V-Series system in a fabric-attached simple configuration. In this configuration, each FC initiator port pair accesses a separate array LUN group.

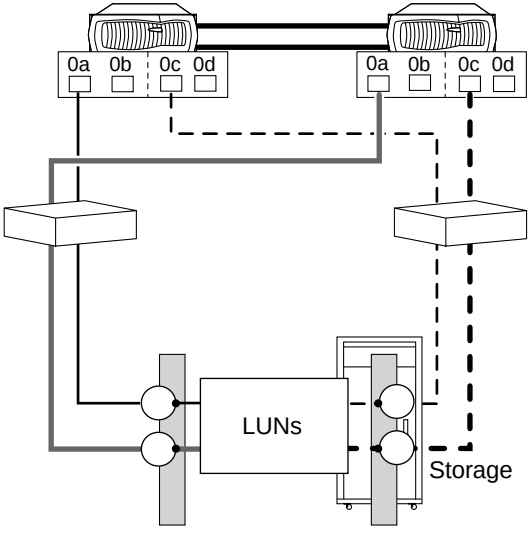
The following illustration shows this configuration.



Single 4-port array LUN group

This configuration contains a single 4-port LUN group with each target port accessed by a single V-Series FC initiator port from the HA pair. Zoning ensures that there are only two paths to a specific array LUN.

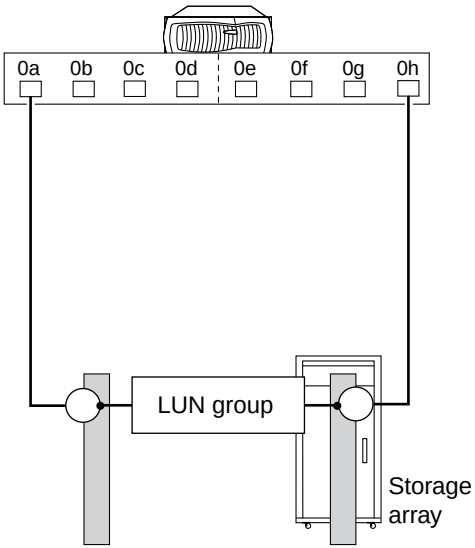
The following illustration shows this configuration.



Two-port direct-attached stand-alone configuration

Direct-attached configurations are no longer supported for new deployments. The Interoperability Matrix at *support.netapp.com* contains information about specific storage arrays and Data ONTAP releases for which direct-attached configurations are supported.

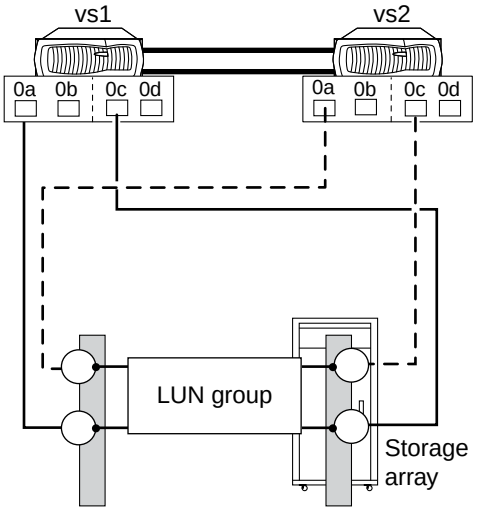
The following illustration is shown as a reference for configurations that might already exist in the field. Two V-Series FC initiator ports provide access to LUNs on the storage array.



Four-port direct-attached HA pair configuration

Direct-attached configurations are no longer supported for new deployments. The Interoperability Matrix at *support.netapp.com* contains information about specific storage arrays and Data ONTAP releases for which direct-attached configurations are supported.

The following illustration is shown as a reference for configurations that might already exist in the field. The illustration shows a direct-attached HA pair with four ports providing access to array LUNs on the storage array.



V-Series FC initiator port attaching to multiple targets ports

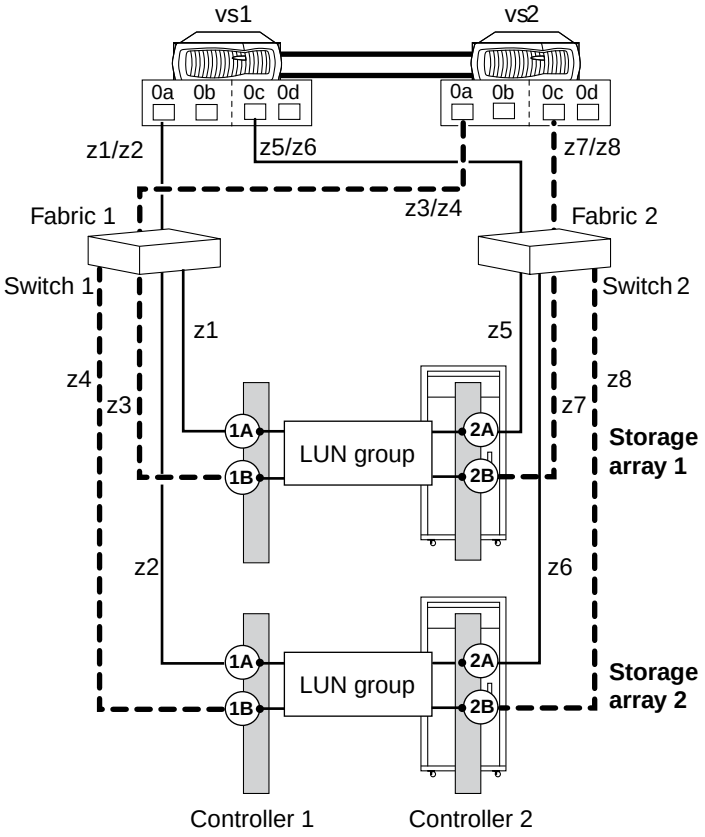
Starting in Data ONTAP 8.2, a V-Series FC initiator port can be attached to multiple target ports on separate storage arrays. The *V-Series Installation Requirements and Reference Guide* contains the rules for setting up this configuration. This configuration is not supported with MetroCluster configurations.

The following illustration shows a shared V-Series FC initiator port configuration with an HA pair. However, sharing an FC initiator port with multiple target ports is supported with both stand-alone systems and HA pairs.

For details about zoning, see the information in the *V-Series Installation Requirements and Reference Guide* about sharing an FC initiator port with multiple target ports.

One V-Series FC initiator port connecting to target ports on *separate* storage arrays

The following example shows an HA pair in which a single FC initiator port connects to multiple target ports on different storage arrays.


vs1
vs2
0a 0b 0c 0d
0a 0b 0c 0d
z1/z2
z5/z6
z7/z8
z3/z4
Fabric 1
Fabric 2
Switch 1
Switch 2
z1
z5
z4
z3
z8
z7
1A
1B
LUN group
2A
2B
Storage array 1
z2
z6
1A
1B
LUN group
2A
2B
Storage array 2
Controller 1
Controller 2

HP EVA storage arrays

There are requirements that must be met when configuring storage arrays to work with V-Series systems. These requirements include setting configuration parameters on storage arrays and deploying only supported configurations.

Required parameters for HP EVA arrays with V-Series systems

Certain parameter settings are required on the storage array for the storage array to work successfully with V-Series systems.

System parameter settings are provided in the following table:

Parameter	Setting
`Redundancy`	Any RAID level except VRAID0
`Preferred path/mode`	No preference (default)
`Host type`	SUN Solaris

General configuration guidelines

Information in this section includes cautions, restrictions, special requirements, and information about array characteristics that you might need to consider when configuring or using the storage array.

Requirements for configuring multiple LUN groups

The requirements for configuring multiple LUN groups for an HP EVA storage array are as follows:

- Switch zoning must define which target ports the V-Series system initiator ports use to access each array LUN group.
- Hosts must define which array LUN groups are presented to each V-Series system initiator port.
- Each array LUN group requires one initiator port pair for each V-Series system.

Requirements for configuring the HP EVA Storage Management Server

Sharing V-Series FC initiator ports and HP EVA Storage Management Server initiator ports with common EVA target ports causes compatibility issues.

The compatibility issues result from the different host settings for the V-Series and the EVA Storage Management Server initiator ports.

HP recommends that any HP EVA Storage Management Server that resides in a fabric be configured in a separate zone from all operating systems.

Preparing HP EVA storage arrays for NDU

HP EVA storage arrays have a tendency to bring target ports offline during a firmware upgrade. Starting in Data ONTAP 8.2, Data ONTAP provides commands that increase Data ONTAP resiliency so that the V-Series system is not disrupted if target ports go offline during the firmware upgrade. These commands can be used only with V-Series systems running clustered Data ONTAP.

About this task

You must follow the guidelines provided by HP for performing the firmware upgrade, including guidelines about the load recommendation (HP EVA). You can upgrade only to firmware that HP supports. This procedure pertains to the HP EVA firmware upgrade type *online upgrade*.

Note: During the firmware upgrade, both HP EVA controllers are rebooted.

This procedure instructs you to use Data ONTAP commands that increase Data ONTAP resiliency throughout the firmware upgrade. After the firmware upgrade is complete, you use the Data ONTAP commands again to return the ports to their normal operating mode.

Steps

1. On the V-Series system, set the privilege level of the command session to advanced:

   `set -privilege advanced`

2. Set the `is-upgrade-pendingis-upgrade-pending` parameter to `true` for the HP EVA storage array that will be undergoing a firmware upgrade:

   `storage array modify -name` *`array_name`* `-is-upgrade-pending true`

3. On the storage array, start the firmware upgrade.

4. After the firmware upgrade is complete, set the privilege level to advanced again, if necessary, and then on the V-Series system, set the `is-upgrade-pending` parameter to `false` to return the storage array ports to normal operation:

   `storage array modify -name` *`array_name`* `-is-upgrade-pending false`

   If you did not exit advanced mode in Step 2 you do not need to access it again.

   The `is-upgrade-pending` parameter contains the following features to ensure proper use of the command:

   - If you attempt to set `is-upgrade-pending` to `false` while the upgrade is in progress on the storage array, the command fails and an EMS message is returned.
   - If the `is-upgrade-pending` status is not returned to `false` within 60 minutes from the time it is set to `true`, EMS messages are logged hourly until `is-upgrade-pending` is returned to `false`.

HP EVA storage array families

Data ONTAP does not support mixing some types of storage in aggregates. To help you determine the array LUNs that can be mixed in an aggregate, the storage arrays from each vendor are grouped into families. When you create aggregates, you cannot mix array LUNs from different vendors and from different storage array families in the same aggregate.

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. More than one factor might be used to determine storage array families. For example, storage arrays with different architectures would be in different families even though other characteristics might be the same.

The following list shows the storage arrays organized by family:

- Family 1
  - P6300
  - P6350
  - P6500
  - P6550
- Family 2
  - EVA 4100
  - EVA 6100
  - EVA 8100
- Family 3
  - EVA 4000
  - EVA 6000
  - EVA 8000
- Family 4
  - EVA 4400
  - EVA 6400
  - EVA 8400

The storage arrays and families shown are current at the time of publication. The Interoperability Matrix at *support.netapp.com* is the final authority for which storage arrays are supported for each vendor.

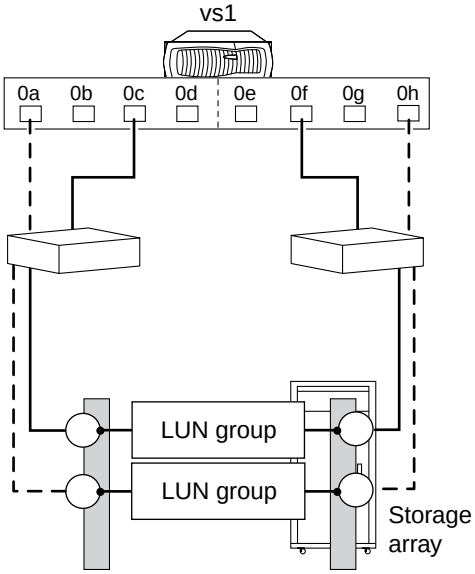
Supported configurations for HP EVA storage arrays

Only a specific number of configurations of HP EVA storage arrays deployed with V-Series systems are supported.

Stand-alone with two 2-port LUN groups

This is a stand-alone V-Series system in a fabric-attached simple configuration. In this configuration, each FC initiator port pair accesses a separate array LUN group.

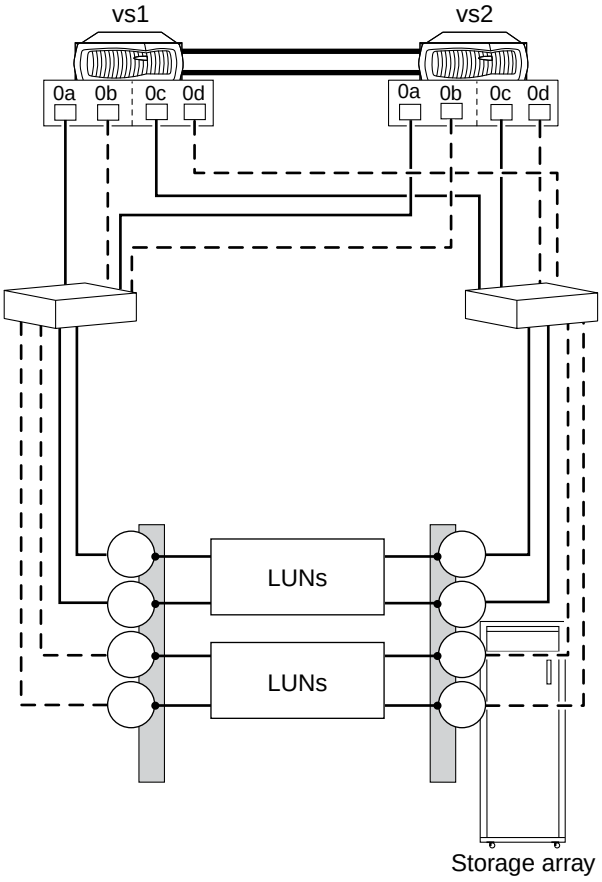
The following illustration shows this configuration.



Two 4-port array LUN groups

In this configuration, each V-Series port pair accesses a separate array LUN group. Zoning is single V-Series FC initiator to single array target port.

The following illustration shows a block diagram of this configuration.



V-Series FC initiator port attaching to multiple targets ports

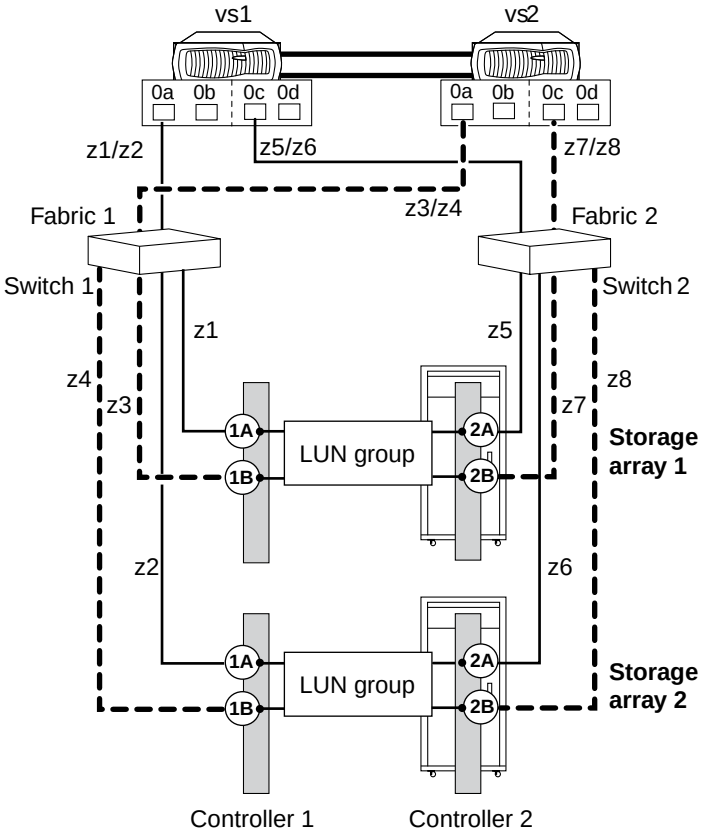
Starting in Data ONTAP 8.2, a V-Series FC initiator port can be attached to multiple target ports on separate storage arrays. The *V-Series Installation Requirements and Reference Guide* contains the rules for setting up this configuration. This configuration is not supported with MetroCluster configurations.

The following illustration shows a shared V-Series FC initiator port configuration with an HA pair. However, sharing an FC initiator port with multiple target ports is supported with both stand-alone systems and HA pairs.

For details about zoning, see the information in the *V-Series Installation Requirements and Reference Guide* about sharing an FC initiator port with multiple target ports.

One V-Series FC initiator port connecting to target ports on *separate* storage arrays

The following example shows an HA pair in which a single FC initiator port connects to multiple target ports on different storage arrays.


vs1
vs2
0a
0b
0c
0d
0a
0b
0c
0d
z1/z2
z5/z6
z7/z8
z3/z4
Fabric 1
Fabric 2
Switch 1
Switch 2
z1
z5
z4
z3
z8
z7
1A
1B
LUN group
2A
2B
Storage array 1
z2
z6
1A
1B
LUN group
2A
2B
Storage array 2
Controller 1
Controller 2

HP XP storage arrays

There are requirements that must be met when configuring storage arrays to work with V-Series systems. These requirements include setting configuration parameters on storage arrays and deploying only supported configurations.

Required parameters for HP XP arrays with V-Series systems

Certain parameter settings are required on the storage array for the storage array to work successfully with V-Series systems.

The required parameter setting is shown in the following table.

Parameter	Setting
`Host type`	standard or 00

General configuration guidelines

Information in this section includes cautions, restrictions, special requirements, and information about array characteristics that you might need to consider when configuring or using the storage array.

Requirements for using disks external to the storage array

Data ONTAP supports using the same disks behind the storage arrays that the vendor supports (that is, disks external to the storage array). Data ONTAP assumes that the configuration between the storage array and the external disks behind it is correct.

Restrictions and best practices recommendations for a deployment with storage arrays using external disks are provided in the following list:

- Root volumes and spare core LUNs are not supported on external disks.
- Array LUNs from external and internal disks should not be in the same Data ONTAP aggregate.
- Array LUNs from SATA drives and array LUNs from FC drives should not be in the same aggregate.
- Rules for the number of paths to array LUNs on external disks are the same as for array LUNs on disks on the storage array.

  In the case of external disks, the paths go from the V-Series system through the storage array to the external disks. See the *V-Series Installation Requirements and Reference Guide* for information about the number of paths supported for different Data ONTAP releases and modes.

- Only block checksum is supported for array LUNs on external disks.

Requirements for configuring ports on HP XP storage arrays

Certain requirements must be met when configuring ports on HP XP storage arrays.

The requirements for configuring ports on HP XP storage arrays are as follows:

- Only one host group per port is supported.
- A host group must include all FC initiator ports of the V-Series systems in a V-Series neighborhood.

HP XP storage array families

Data ONTAP does not support mixing some types of storage in aggregates. To help you determine the array LUNs that can be mixed in an aggregate, the storage arrays from each vendor are grouped into families. When you create aggregates, you cannot mix array LUNs from different vendors and from different storage array families in the same aggregate.

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. More than one factor might be used to determine storage array families. For example, storage arrays with different architectures would be in different families even though other characteristics might be the same.

The following list shows the storage arrays organized by family:

- Family 1
  - P9500
- Family 2
  - XP24000
  - XP20000
  - XP12000
  - XP10000

The storage arrays and families shown are current at the time of publication. The Interoperability Matrix at *support.netapp.com* is the final authority for which storage arrays are supported for each vendor.

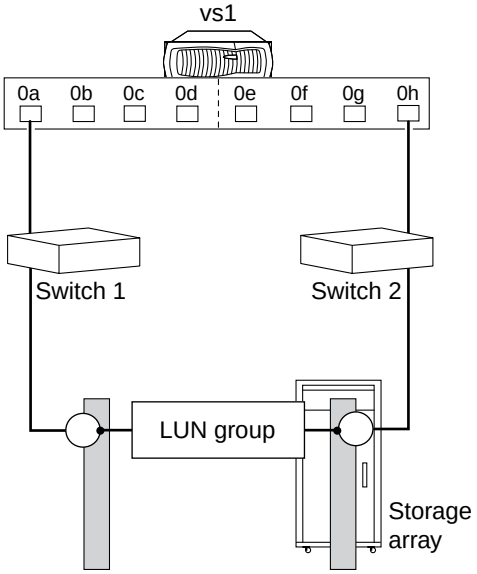
Supported configurations for HP XP storage arrays

Only a specific number of configurations of HP XP storage arrays deployed with V-Series systems are supported.

Stand-alone basic configuration

The stand-alone basic V-Series system configuration is a simple fabric-attached configuration with a single port pair accessing a single LUN group.

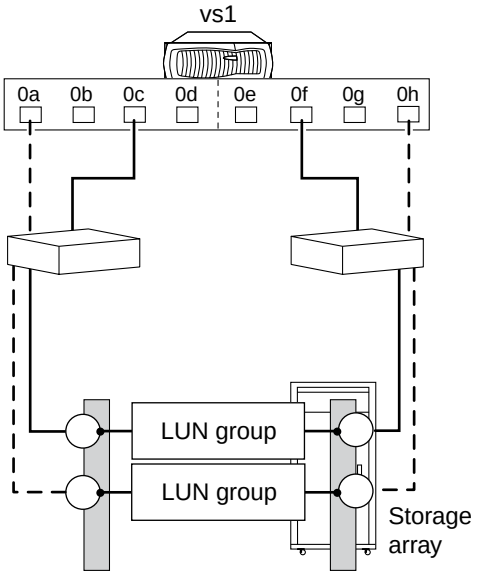
The following illustration shows this configuration.



Stand-alone with two 2-port LUN groups

This is a stand-alone V-Series system in a fabric-attached simple configuration. In this configuration, each FC initiator port pair accesses a separate array LUN group.

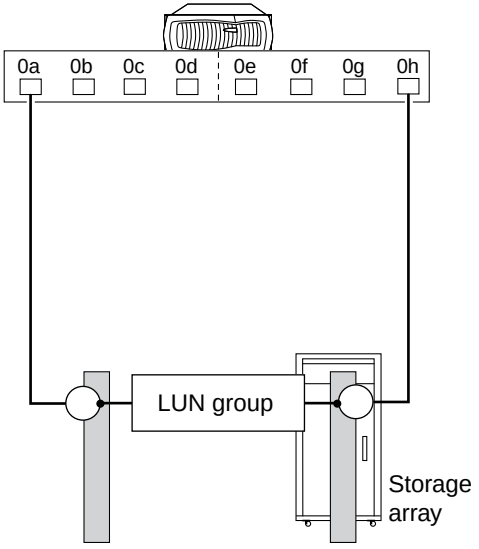
The following illustration shows this configuration.



Two-port direct-attached stand-alone configuration

Direct-attached configurations are no longer supported for new deployments. The Interoperability Matrix at *support.netapp.com* contains information about specific storage arrays and Data ONTAP releases for which direct-attached configurations are supported.

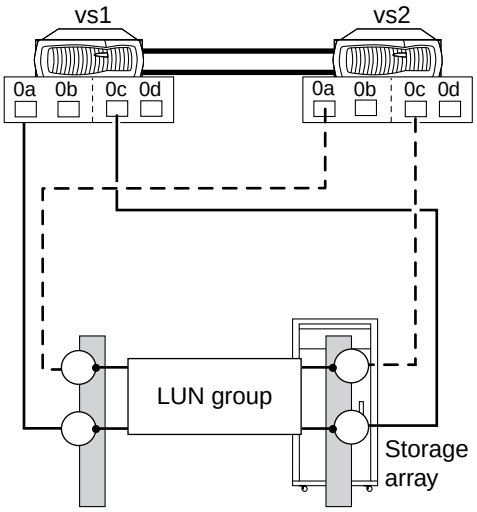
The following illustration is shown as a reference for configurations that might already exist in the field. Two V-Series FC initiator ports provide access to LUNs on the storage array.



Four-port direct-attached HA pair configuration

Direct-attached configurations are no longer supported for new deployments. The Interoperability Matrix at *support.netapp.com* contains information about specific storage arrays and Data ONTAP releases for which direct-attached configurations are supported.

The following illustration is shown as a reference for configurations that might already exist in the field. The illustration shows a direct-attached HA pair with four ports providing access to array LUNs on the storage array.



V-Series FC initiator port attaching to multiple targets ports

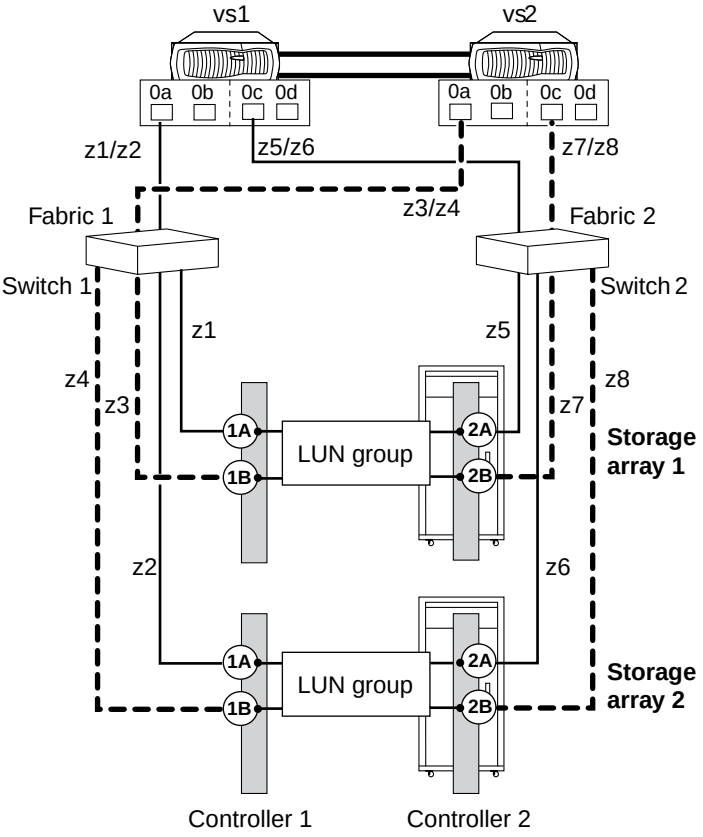
Starting in Data ONTAP 8.2, a V-Series FC initiator port can be attached to multiple target ports on separate storage arrays. The *V-Series Installation Requirements and Reference Guide* contains the rules for setting up this configuration. This configuration is not supported with MetroCluster configurations.

The following illustration shows a shared V-Series FC initiator port configuration with an HA pair. However, sharing an FC initiator port with multiple target ports is supported with both stand-alone systems and HA pairs.

For details about zoning, see the information in the *V-Series Installation Requirements and Reference Guide* about sharing an FC initiator port with multiple target ports.

One V-Series FC initiator port connecting to target ports on *separate* storage arrays

The following example shows an HA pair in which a single FC initiator port connects to multiple target ports on different storage arrays.


vs1
vs2
0a 0b 0c 0d
0a 0b 0c 0d
z1/z2
z5/z6
z7/z8
z3/z4
Fabric 1
Fabric 2
Switch 1
Switch 2
z1
z5
z4
z3
z8
z7
1A
1B
LUN group
2A
2B
Storage array 1
z2
z6
1A
1B
LUN group
2A
2B
Storage array 2
Controller 1
Controller 2

IBM DS storage arrays

There are requirements that must be met when configuring storage arrays to work with V-Series systems. These requirements include setting configuration parameters on storage arrays and deploying only supported configurations.

Required settings for IBM DS storage arrays with V-Series

Certain parameter settings are required on the storage array for the storage array to work successfully with V-Series systems.

Required host type for DS8xxx storage arrays

The required host type setting is shown in the following table.

Parameter	Setting
`Host type`	nseries

Required host type for DS3950, DS4xxx, and DS5xxx storage arrays

The required host type setting is shown in the following table.

Parameter	Setting
`Host type`	AIX

Requirements for configuring DS8300 9A2 LPAR models

When setting up the DS8300 9A2 LPAR (system logical partition) model to interact with V-Series systems, you must set up access to each array LUN so that the redundant paths are both accessing the same LPAR.

General configuration guidelines

Information in this section includes cautions, restrictions, special requirements, and information about array characteristics that you might need to consider when configuring or using the storage array.

Requirements for volume groups on DS8xxx storage arrays

There are limitations on the number of volume groups you can use with a LUN group when configuring DS8xxx arrays.

You must use a single volume group for each LUN group on a DS8xxx storage array to guarantee that the DS8xxx array LUNs are consistently presented to all V-Series FC initiators that access them.

Attention: If array LUNs are not presented consistently, there is a potential for data corruption.

Requirements for multiple LUN groups on all IBM DS arrays

There are requirements that must be met when configuring multiple LUN groups on IBM DS arrays.

These requirements are provided in the following list:

- Switch zoning must define which target ports the V-Series system FC initiator ports use to access each LUN group.
- Host groups (volume groups for DS8xxx storage arrays) must define which LUN groups are presented to each V-Series system initiator port.
- One FC initiator port pair for each V-Series system is required for each LUN group.

Requirements for direct-attached configurations with all IBM DS arrays

Direct-attached connections to IBM DS storage arrays, supported only for existing deployments, require specific configuration settings on the storage array.

The following list describes the requirements that must be met when configuring direct-attached IBM DS arrays.

- Host Attachment files for the array ports must be created.
- The Host Attachment Port type must be set to FcAL (Fibre Channel Arbitrated Loop).
- The Storage Image I/O port must be set to FcAL .

Note: Direct-attached configurations are not supported for new deployments. This information is provided as a reference for configurations that might already exist in the field.

IBM DS storage array families

Data ONTAP does not support mixing some types of storage in aggregates. To help you determine the array LUNs that can be mixed in an aggregate, the storage arrays from each vendor are grouped

into families. When you create aggregates, you cannot mix array LUNs from different vendors and from different storage array families in the same aggregate.

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. More than one factor might be used to determine storage array families. For example, storage arrays with different architectures would be in different families even though other characteristics might be the same.

The following list shows arrays organized by family:

- Family 1
  - DS4800
  - DS4700
  - DS4200
- Family 2
  - DS5100
  - DS5300
- Family 3
  - DS8300
  - DS8100
- Family 4
  - DS5020
  - DS3950
- Family 5
  - DS8800 model 951
- Family 6
  - DS8700 models 941, 94E

The storage arrays and families shown are current at the time of publication. The Interoperability Matrix at *support.netapp.com* is the final authority for which storage arrays are supported for each vendor.

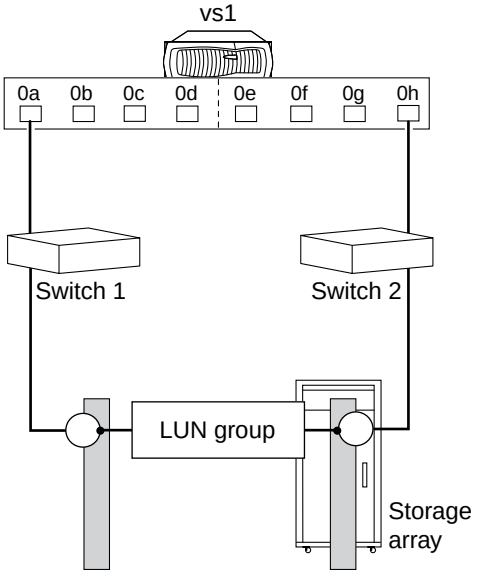
Supported configurations for IBM DS storage arrays

Only a specific number of configurations of IBM storage arrays deployed with V-Series systems are supported.

Stand-alone basic configuration

The stand-alone basic V-Series system configuration is a simple fabric-attached configuration with a single port pair accessing a single LUN group.

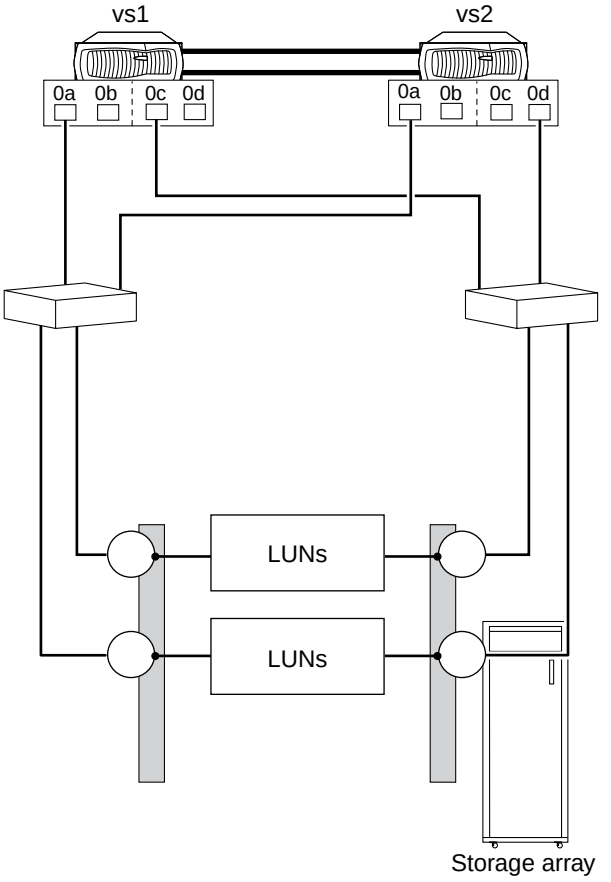
The following illustration shows this configuration.



Two 2-port array LUN groups

This configuration consists of a fabric-attached HA pair in which the V-Series system nodes access array LUNs through four ports on the storage array with each LUN group accessed through two ports.

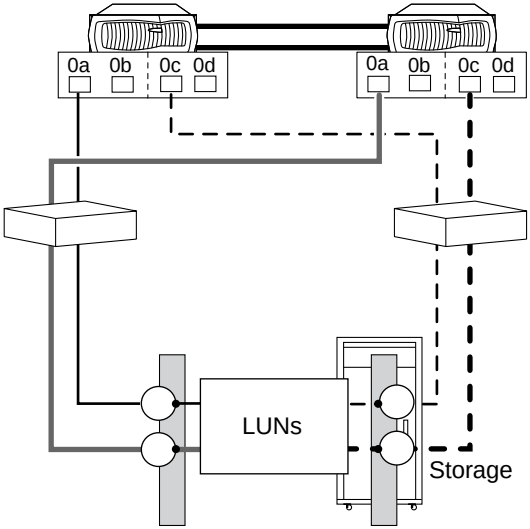
The following illustration shows this configuration.



Single 4-port array LUN group

This configuration contains a single 4-port LUN group with each target port accessed by a single V-Series FC initiator port from the HA pair. Zoning ensures that there are only two paths to a specific array LUN.

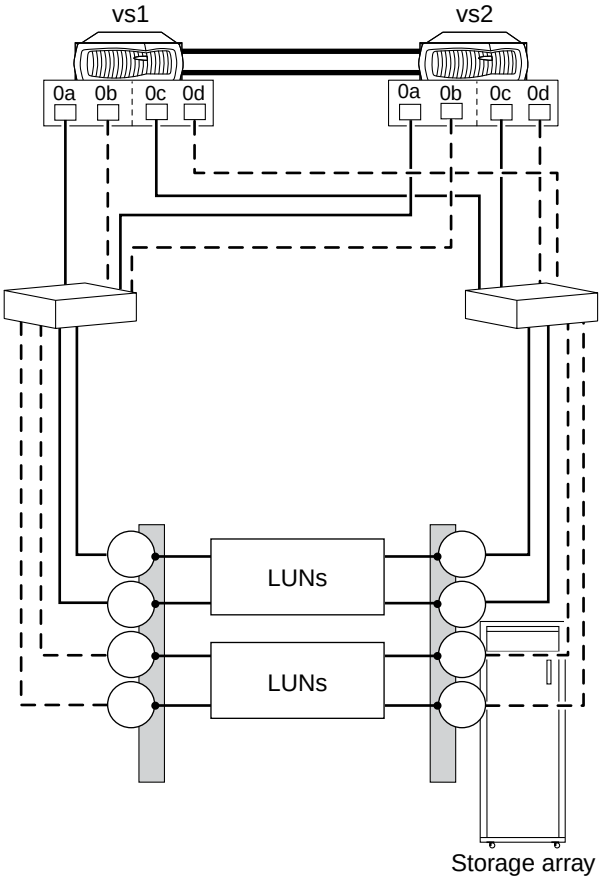
The following illustration shows this configuration.



Two 4-port array LUN groups

In this configuration, each V-Series port pair accesses a separate array LUN group. Zoning is single V-Series FC initiator to single array target port.

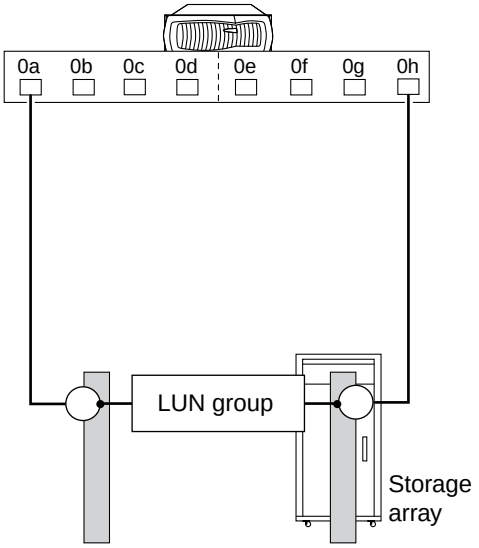
The following illustration shows a block diagram of this configuration.



Two-port direct-attached stand-alone configuration

Direct-attached configurations are no longer supported for new deployments. The Interoperability Matrix at *support.netapp.com* contains information about specific storage arrays and Data ONTAP releases for which direct-attached configurations are supported.

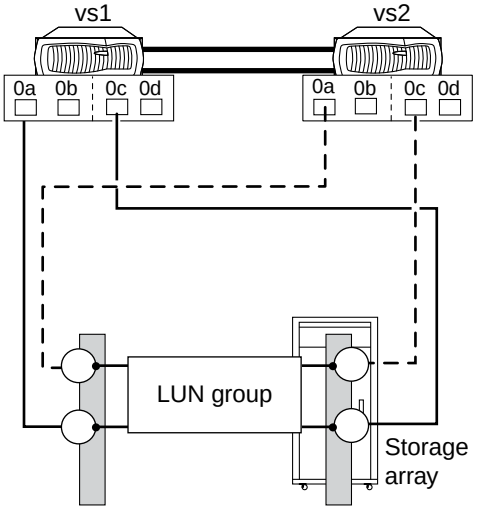
The following illustration is shown as a reference for configurations that might already exist in the field. Two V-Series FC initiator ports provide access to LUNs on the storage array.



Four-port direct-attached HA pair configuration

Direct-attached configurations are no longer supported for new deployments. The Interoperability Matrix at *support.netapp.com* contains information about specific storage arrays and Data ONTAP releases for which direct-attached configurations are supported.

The following illustration is shown as a reference for configurations that might already exist in the field. The illustration shows a direct-attached HA pair with four ports providing access to array LUNs on the storage array.



V-Series FC initiator port attaching to multiple targets ports

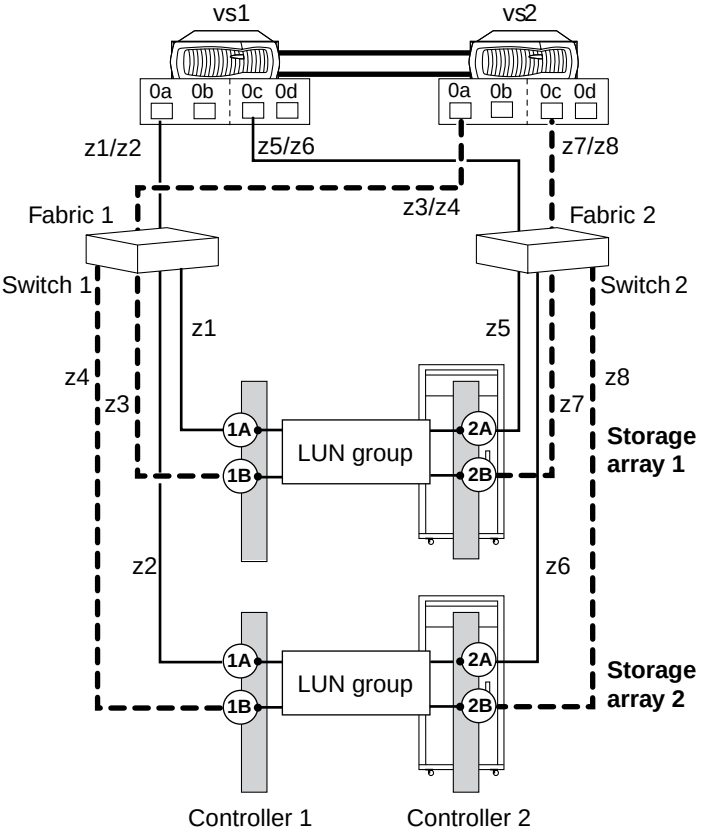
Starting in Data ONTAP 8.2, a V-Series FC initiator port can be attached to multiple target ports on separate storage arrays. The *V-Series Installation Requirements and Reference Guide* contains the rules for setting up this configuration. This configuration is not supported with MetroCluster configurations.

The following illustration shows a shared V-Series FC initiator port configuration with an HA pair. However, sharing an FC initiator port with multiple target ports is supported with both stand-alone systems and HA pairs.

For details about zoning, see the information in the *V-Series Installation Requirements and Reference Guide* about sharing an FC initiator port with multiple target ports.

One V-Series FC initiator port connecting to target ports on *separate* storage arrays

The following example shows an HA pair in which a single FC initiator port connects to multiple target ports on different storage arrays.



IBM XIV storage arrays

There are requirements that must be met when configuring storage arrays to work with V-Series systems. These requirements include setting configuration parameters on storage arrays and deploying only supported configurations.

Requirements for configuring IBM XIV arrays with V-Series systems

Certain parameter settings are required on the storage array for the storage array to work successfully with V-Series systems.

System parameter settings

System parameter settings for IBM XIV Gen2 and Gen3 arrays are provided in the following table.

Parameter	Setting
`Type`	Default
`Host`	User-supplied host name
`Cluster`	User-supplied cluster name

Multiple LUN group support

See the Interoperability Matrix at *support.netapp.com* for information about restrictions for using multiple LUN groups with XIV models.

IBM XIV storage array families

Data ONTAP does not support mixing some types of storage in aggregates. To help you determine the array LUNs that can be mixed in an aggregate, the storage arrays from each vendor are grouped into families. When you create aggregates, you cannot mix array LUNs from different vendors and from different storage array families in the same aggregate.

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. More than one factor might be used to determine storage array families. For example, storage arrays with different architectures would be in different families even though other characteristics might be the same.

The following list shows the storage arrays organized by family:

- IBM XIV Gen 2
  - 2810-A14
  - 2812-A14
- IBM XIV Gen 3
  - 2810-114
  - 2812-114

The storage arrays and families shown are current at the time of publication. The Interoperability Matrix at *support.netapp.com* is the final authority for which storage arrays are supported for each vendor.

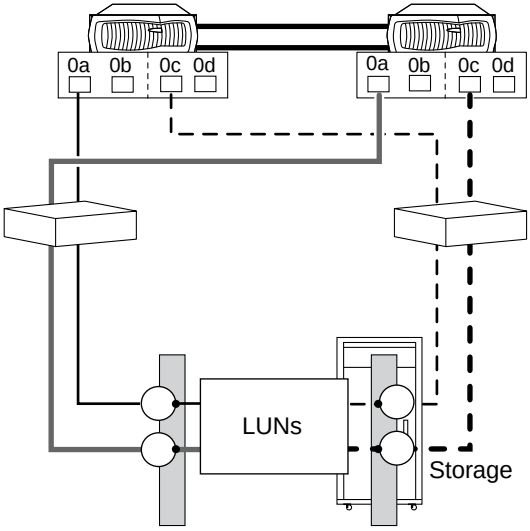
Supported configurations for IBM XIV storage arrays

Only a specific number of configurations of IBM XIV storage arrays deployed with V-Series systems is supported.

Single 4-port array LUN group

This configuration contains a single 4-port LUN group with each target port accessed by a single V-Series FC initiator port from the HA pair. Zoning ensures that there are only two paths to a specific array LUN.

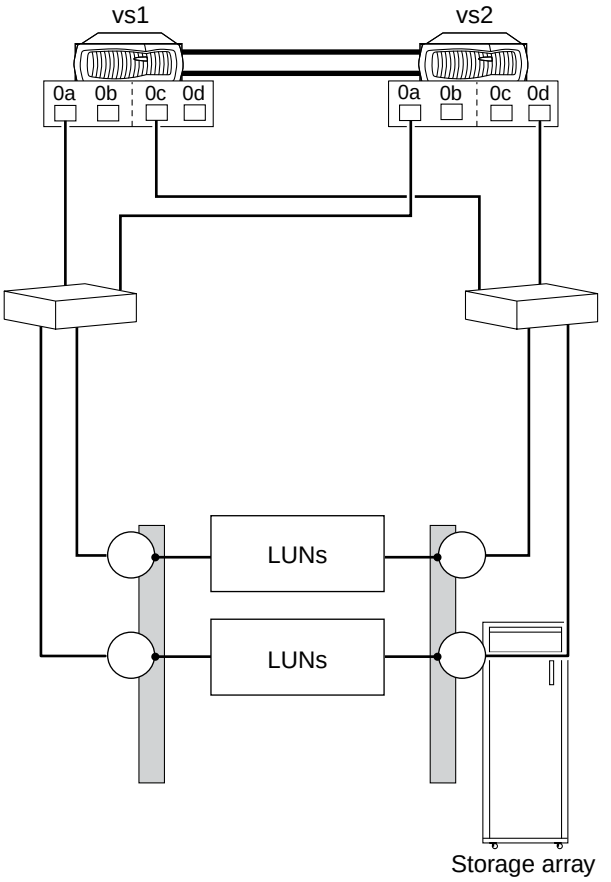
The following illustration shows this configuration.



Two 2-port array LUN groups

This configuration consists of a fabric-attached HA pair in which the V-Series system nodes access array LUNs through four ports on the storage array with each LUN group accessed through two ports.

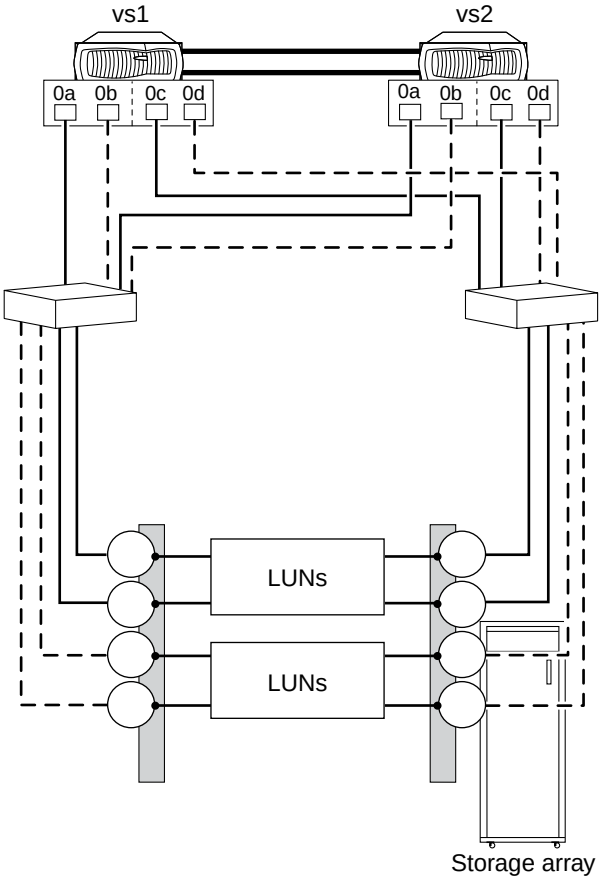
The following illustration shows this configuration.



Two 4-port array LUN groups

In this configuration, each V-Series port pair accesses a separate array LUN group. Zoning is single V-Series FC initiator to single array target port.

The following illustration shows a block diagram of this configuration.



V-Series FC initiator port attaching to multiple targets ports

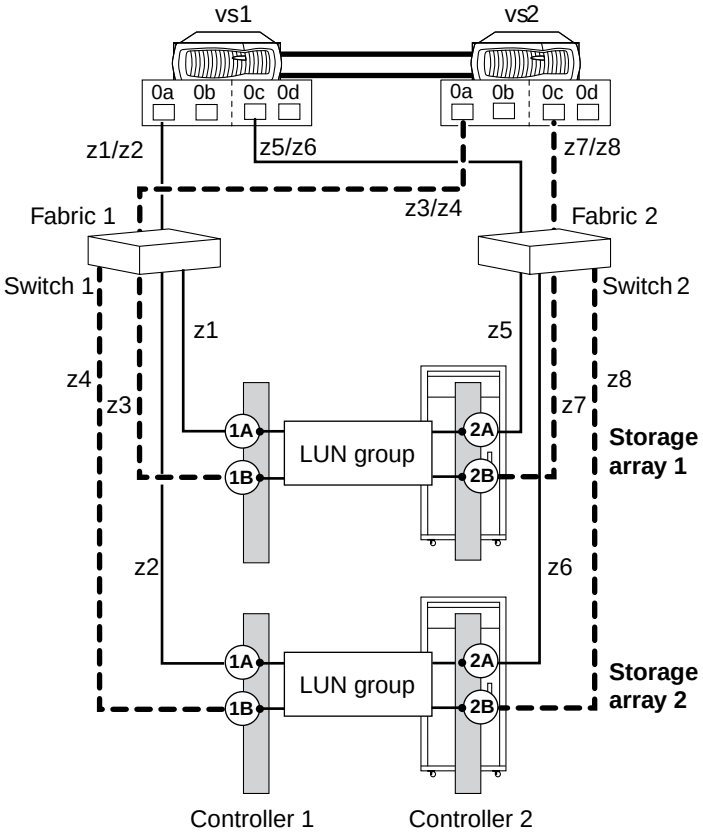
Starting in Data ONTAP 8.2, a V-Series FC initiator port can be attached to multiple target ports on separate storage arrays. The *V-Series Installation Requirements and Reference Guide* contains the rules for setting up this configuration. This configuration is not supported with MetroCluster configurations.

The following illustration shows a shared V-Series FC initiator port configuration with an HA pair. However, sharing an FC initiator port with multiple target ports is supported with both stand-alone systems and HA pairs.

For details about zoning, see the information in the *V-Series Installation Requirements and Reference Guide* about sharing an FC initiator port with multiple target ports.

One V-Series FC initiator port connecting to target ports on *separate* storage arrays

The following example shows an HA pair in which a single FC initiator port connects to multiple target ports on different storage arrays.


vs1
vs2
0a 0b 0c 0d
0a 0b 0c 0d
z1/z2
z5/z6
z7/z8
z3/z4
Fabric 1
Fabric 2
Switch 1
Switch 2
z1
z5
z4
z3
z8
z7
1A
1B
LUN group
2A
2B
Storage array 1
z2
z6
1A
1B
LUN group
2A
2B
Storage array 2
Controller 1
Controller 2

3PAR storage arrays

There are requirements that must be met when configuring storage arrays to work with V-Series systems. These requirements include setting configuration parameters on storage arrays and deploying only supported configurations.

Required parameters for 3PAR storage arrays with V-Series systems

Certain parameter settings are required on the storage array for the storage array to work successfully with V-Series systems.

Host and port persona settings

For 3PAR arrays with firmware 2.3.1 and later, the required host persona values must be set as shown in the following table.

Connection type	Host persona
Direct connect	10
Fabric attached	10

For 3PAR arrays with firmware 2.2.x, the required port persona values must be set as shown in the following table.

Connection type	Port persona
Direct connect	18
Fabric attached	19

Multiple LUN group support

See the Interoperability Matrix at *support.netapp.com* for information about restrictions for using multiple LUN groups with 3PAR models.

General configuration guidelines

Information in this section includes cautions, restrictions, special requirements, and information about array characteristics that you might need to consider when configuring or using the storage array.

3PAR storage array families

Data ONTAP does not support mixing some types of storage in aggregates. To help you determine the array LUNs that can be mixed in an aggregate, the storage arrays from each vendor are grouped into families. When you create aggregates, you cannot mix array LUNs from different vendors and from different storage array families in the same aggregate.

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. More than one factor might be used to determine storage array families. For example, storage arrays with different architectures would be in different families even though other characteristics might be the same.

The following list shows the storage arrays organized by family:

- Family 1
  - E200
- Family 2
  - S400
  - S800
- Family 3
  - T400
  - T800
- Family 4
  - F200
  - F400
- Family 5
  - P10000 - V400
  - P10000 - V800

The storage arrays and families shown are current at the time of publication. The Interoperability Matrix at *support.netapp.com* is the final authority for which storage arrays are supported for each vendor.

Supported configurations for 3PAR storage arrays

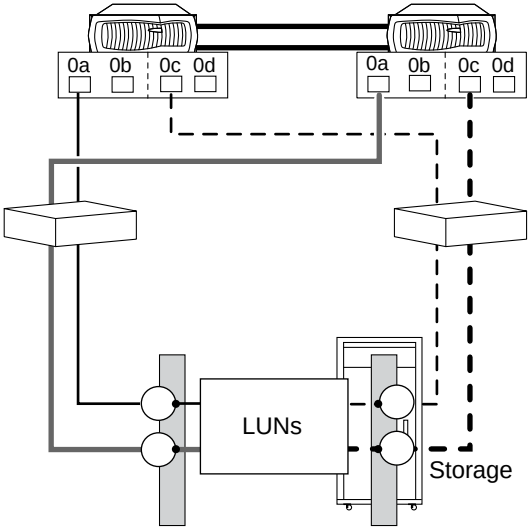
Only a specific number of configurations of 3PAR storage arrays deployed with V-Series systems are supported.

Note: Multiple LUN group configurations are only supported with V-class, T-class, and F-class storage arrays.

Single 4-port array LUN group

This configuration contains a single 4-port LUN group with each target port accessed by a single V-Series FC initiator port from the HA pair. Zoning ensures that there are only two paths to a specific array LUN.

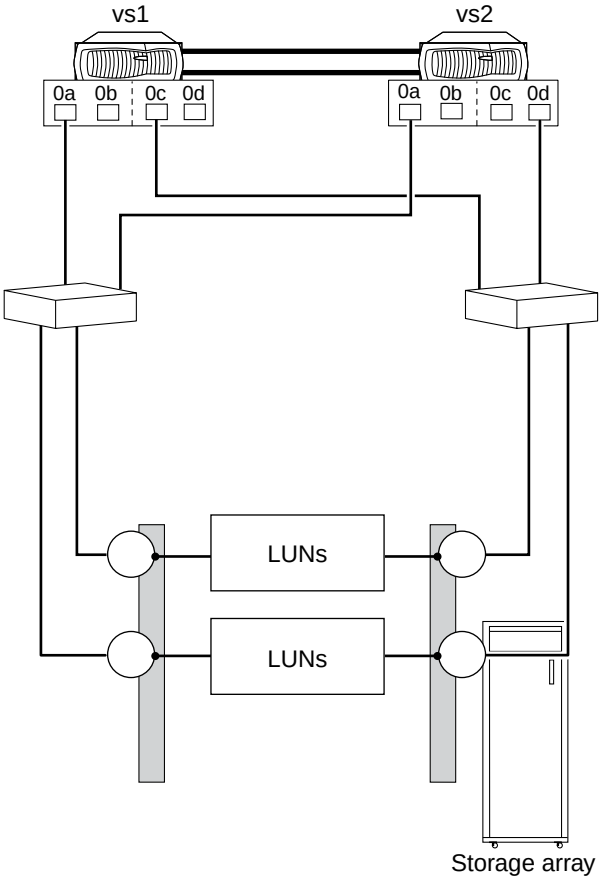
The following illustration shows this configuration.



Two 2-port array LUN groups

This configuration consists of a fabric-attached HA pair in which the V-Series system nodes access array LUNs through four ports on the storage array with each LUN group accessed through two ports.

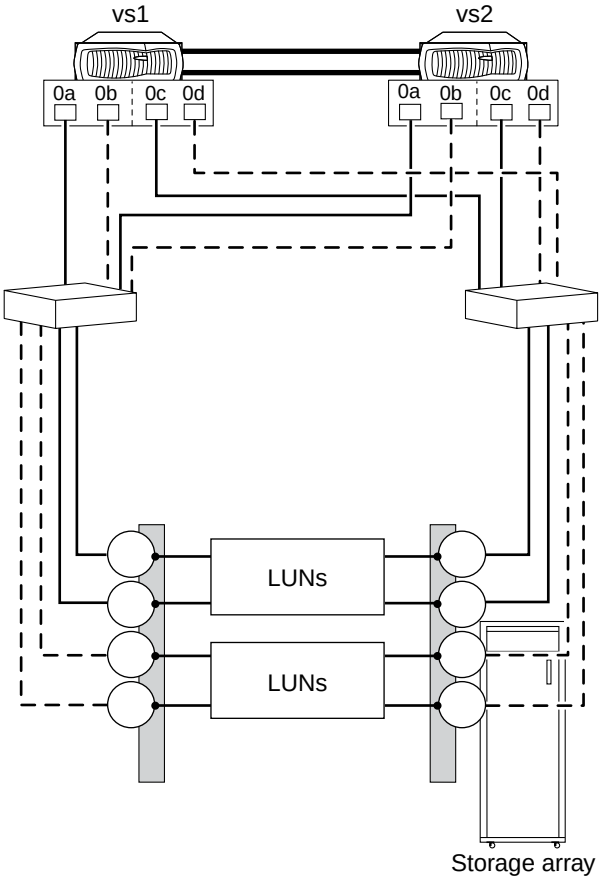
The following illustration shows this configuration.



Two 4-port array LUN groups

In this configuration, each V-Series port pair accesses a separate array LUN group. Zoning is single V-Series FC initiator to single array target port.

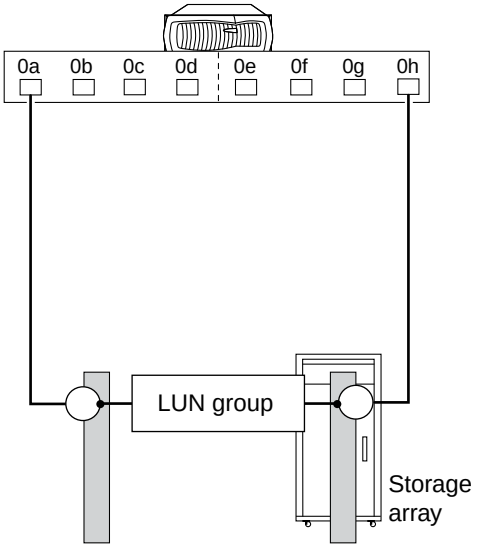
The following illustration shows a block diagram of this configuration.



Two-port direct-attached stand-alone configuration

Direct-attached configurations are no longer supported for new deployments. The Interoperability Matrix at *support.netapp.com* contains information about specific storage arrays and Data ONTAP releases for which direct-attached configurations are supported.

The following illustration is shown as a reference for configurations that might already exist in the field. Two V-Series FC initiator ports provide access to LUNs on the storage array.



V-Series FC initiator port attaching to multiple targets ports

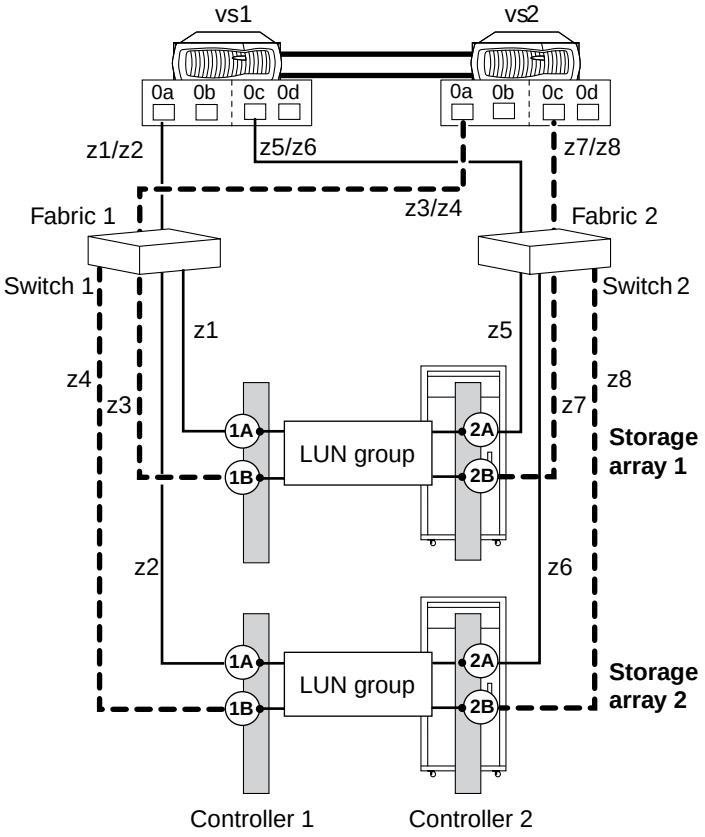
Starting in Data ONTAP 8.2, a V-Series FC initiator port can be attached to multiple target ports on separate storage arrays. The *V-Series Installation Requirements and Reference Guide* contains the rules for setting up this configuration. This configuration is not supported with MetroCluster configurations.

The following illustration shows a shared V-Series FC initiator port configuration with an HA pair. However, sharing an FC initiator port with multiple target ports is supported with both stand-alone systems and HA pairs.

For details about zoning, see the information in the *V-Series Installation Requirements and Reference Guide* about sharing an FC initiator port with multiple target ports.

One V-Series FC initiator port connecting to target ports on *separate* storage arrays

The following example shows an HA pair in which a single FC initiator port connects to multiple target ports on different storage arrays.


vs1
vs2
0a 0b 0c 0d
0a 0b 0c 0d
z1/z2
z5/z6
z7/z8
z3/z4
Fabric 1
Fabric 2
Switch 1
Switch 2
z1
z5
z4
z3
z8
z7
1A
1B
LUN group
2A
2B
Storage array 1
z2
z6
1A
1B
LUN group
2A
2B
Storage array 2
Controller 1
Controller 2

Terminology comparison between storage array vendors

Different vendors sometimes use different terms to describe the same things.

The following table provides a mapping between some common vendor terms.

Term	Vendor	Definition
host group	Hitachi, Sun	A configuration entity that enables you to specify host access to ports on the storage array. You identify the FC initiator port WWNs for the V-Series systems that you want to access the LUNs; the process differs according to vendor and sometimes differs for different storage array models of the same vendor.
	IBM DS4xxx/DS5xxx	
	EMC DMX	
	HP XP	
volume group	IBM DS8xxx	
Storage Group	EMC CX	
cluster	IBM XIV	
host affinity group	Fujitsu ETERNUS4000, ETERNUS6000, ETERNUS8000, ETERNUS DX8000, ETERNUS DX400	
host definition	3PAR	
host	3PAR, HP EVA	
—	IBM ESS	No concept of *host group*. You must create a host in the ESS user interface for each V-Series FC initiator port that you plan to connect to the storage array and map each host to a port.
parity group	IBM DS8xxx, IBM ESS, Hitachi, HP XP, Sun	The arrangement of disks in the back-end that together form the defined RAID level.
RAID group	Data ONTAP, EMC CX, Fujitsu ETERNUS	
array, RAID set	IBM DS4xxx/DS5xxx	

Term	Vendor	Definition
Parity RAID, Parity RAID group	EMC DMX	A DMX feature that provides parity data protection on the disk device level using physical parity volumes.
disk group	HP EVA	A set of physical disks that form storage pools from which you can create virtual disks.
parity set, RAID set	3PAR	A group of parity-protected *chunklets*. (A chunklet is a 256-MB block of contiguous space on a physical disk.)
cluster	Data ONTAP	In clustered Data ONTAP 8.x, a grouping of nodes that enables multiple nodes to pool their resources into a large virtual server and to distribute work across the cluster.
	Hitachi, HP XP, Sun	A hardware component on the storage arrays that contains the ports to which hosts attach.
	IBM XIV	An entity that groups multiple hosts together and assigns the same mapping to all the hosts.
controller	Data ONTAP	The component of a V-Series system that runs the Data ONTAP operating system and interacts with back-end storage arrays. Controllers are also sometimes called *heads* or *CPU modules*.
	Hitachi, HP EVA, HP XP, IBM	Hardware on the storage array on which the target ports are located.

Term	Vendor	Definition
interface module	IBM XIV	A hardware component on the storage arrays that contains the ports to which hosts attach.
node	3-PAR	
FEBE Board	EMC Symmetrix	
Storage processor (SP)	EMC CLARiiON	
Controller Module	Fujitsu ETERNUS	
LUN	Many storage arrays	A grouping of one or more disks or disk partitions into one span of disk storage space. In the Data ONTAP documentation, this is referred to as *array LUN.*
	Data ONTAP	The V-Series system can virtualize the storage attached to it and serve the storage up as LUNs to applications and clients outside the V-Series system (for example, through iSCSI and FC). Clients are unaware of where a front-end LUN is stored.
LUN, virtual disk	HP EVA	A virtual disk (called a “Vdisk” in the user interface) is a simulated disk drive created in a disk group. You can assign a combination of characteristics to a virtual disk, such as a name, redundancy level, and size. Presenting a virtual disk offers its storage to a host.
array LUN	Data ONTAP documentation, Data ONTAP storage management tools	The Data ONTAP documentation uses the term *array LUN* to distinguish LUNs on the storage arrays from front-end LUNs (Data ONTAP LUNs).

Term	Vendor	Definition
vLUN	3PAR	(volume-LUN) A pairing between a virtual volume and a logical unit number (LUN). For a host to see a virtual volume, the volume must be exported as a LUN by creating vLUNs on the storage array.
volume	IBM, IBM XIV	Equivalent to what other storage array vendors call a LUN.
	Data ONTAP	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 (FC), and Internet SCSI (iSCSI). The V-Series system treats an IBM volume as a disk.
	EMC DMX	A general term referring to a storage device. A physical volume corresponds to a single disk device.
virtual volume	3PAR	A virtual storage unit created by mapping data from one or more logical disks.

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