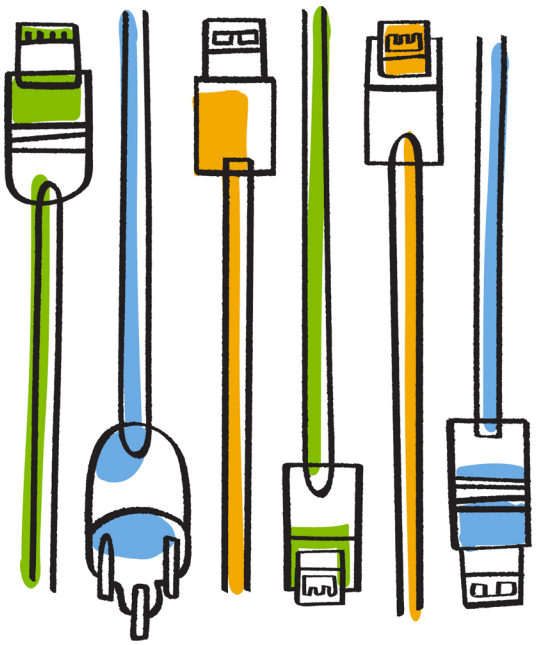
Updated for 8.3.2

FlexArray Virtualization

Implementation Guide for NetApp® E-Series Storage



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Understanding E-Series storage implementation with Data ONTAP

Data ONTAP systems can be deployed with E-Series storage arrays. The E-Series storage array has back-end configuration requirements and limits on the supported configurations.

Information about Data ONTAP support for E-Series storage arrays

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

Support information for deployments with E-Series storage arrays is included in the following documents:

Documents	Topics covered
Interoperability Matrix at *mysupport.netapp.com*	Data ONTAP working with back-end 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 **Note:** You can view information about advanced feature support for E-Series storage arrays with FlexArray Virtualization by referring to the appropriate notes on the *V-Series and FlexArray Virtualization for Back-end Storage* solution page of the Interoperability Matrix.
Hardware Universe at *hwu.netapp.com* **Note:** Limits for Data ONTAP systems were previously provided in the *V-Series Limits Reference for Third-Party Storage* and V-Series Support Matrix.	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 array LUNs • Minimum aggregate size for aggregates with array LUNs • Minimum and maximum capacity • Neighborhood limits

Documents	Topics covered
FlexArray Virtualization Installation Requirements and Reference Guide	Planning tasks for Data ONTAP implementation with E-Series, including: • Planning the implementation • Connecting the Data ONTAP system and the array • Verifying the installation
E-Series documentation	Information you may need when setting up the E-Series storage array could include the following: • Site preparation requirements • Cabling instructions • SANtricity software installation and configuration instructions

Related documentation

The following documentation can be found at *mysupport.netapp.com*.

- *Hardware Universe* (formerly the *System Configuration Guide*)
- *FlexArray Virtualization Installation Requirements and Reference Guide*
- Interoperability Matrix at *mysupport.netapp.com*
- *E-Series Storage Systems Site Preparation Guide*
- *E-Series Storage Systems Hardware Cabling Guide*
- *SANtricity ES Storage Manager documentation*

Data ONTAP systems that can use array LUNs on storage arrays

V-Series (“V”) systems and new FAS platforms released in Data ONTAP 8.2.1 and later can use array LUNs if the proper license is installed. In discussions in the Data ONTAP and FlexArray Virtualization documentation, these systems are collectively referred to as Data ONTAP systems when it is necessary to make it clear which information applies to them and what information applies to storage arrays.

Note: Starting with Data ONTAP 8.2.1, the capability of using LUNs on a storage array, formerly identified as V-Series functionality, has a new name—*Data ONTAP FlexArray Virtualization Software*. The capability of using array LUNs continues to be available as a licensed feature in Data ONTAP.

Systems prior to Data ONTAP 8.2.1 that can use array LUNs

The only systems released prior to Data ONTAP 8.2.1 that can use array LUNs are V-Series systems —systems with a “V” or “GF” prefix. A V-Series system is an open storage controller that virtualizes storage from storage array vendors, native disks, or both into a single heterogeneous storage pool.

Note: Almost all Data ONTAP platforms released prior to Data ONTAP 8.2.1 were released with FAS and V-Series equivalent models (for example, a FAS6280 and a V6280). (For a few systems, there were no “V” equivalent models.) Although both types of models could access native disks, only the V-Series systems (a “V” or “GF” prefix) could attach to storage arrays.

Systems in Data ONTAP 8.2.1 and later that can use array LUNs

Starting with Data ONTAP 8.2.1, the model for how platforms are released and the storage they can use changes. Attaching to storage arrays is no longer limited to V-Series systems.

Starting with Data ONTAP 8.2.1, all new platforms are released as a single hardware model. This single hardware model has a FAS prefix; there are no longer separate “V” and FAS models for new platforms. If the V_StorageAttach license package is installed on a new FAS model, it can attach to storage arrays. (This is the same license required on a V-Series system.)

Important: FAS systems released prior to Data ONTAP 8.2.1 cannot use LUNs on storage arrays, even if they are upgraded to Data ONTAP 8.2.1 or later; only the “V” equivalent of a platform can use array LUNs.

Requirements for configuring E-Series storage arrays

There are system parameters that you must set and considerations to keep in mind when configuring a storage array to work with a Data ONTAP system.

Required host type for E-Series storage arrays

You must set the appropriate `host type` option for the E-Series storage array to communicate with the Data ONTAP system. You can use SANtricity Storage Manager to set the host type.

For a given Data ONTAP release, you can set the required host type based on the version of the storage array firmware.

For Data ONTAP 8.3 and later, if your firmware version is 08.10.15.00 and later, then set the host type to *Data ONTAP (ALUA)*.

Note: The minimum supported version of SANtricity Storage Manager for firmware version 08.10.15.00 and later is 11.10.0G00.0026.

Supported fabric-attached configurations for E-Series storage arrays

Only certain fabric-attached configurations of E-Series storage arrays deployed with Data ONTAP system are supported.

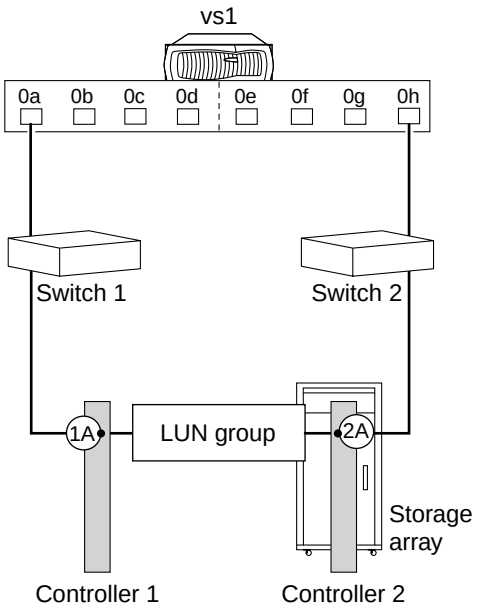
For additional information about specific array model configurations, see the Interoperability Matrix at *mysupport.netapp.com*.

Stand-alone basic configuration

The stand-alone basic configuration of a Data ONTAP system that uses array LUNs is a simple, fabric-attached configuration with a single FC initiator port pair accessing a single LUN group.

This configuration is supported for use with all storage arrays listed in the *Interoperability Matrix* as supported for the release and mode of Data ONTAP running on your system.

The following illustration shows this configuration:

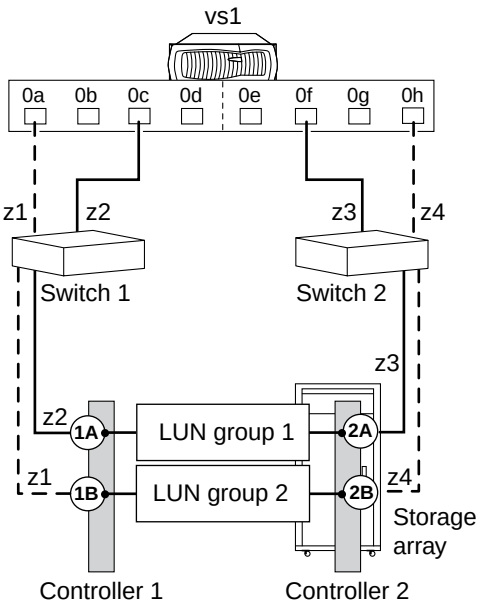


Stand-alone with two 2-port array LUN groups

In a stand-alone Data ONTAP system which is in a fabric-attached simple configuration, each FC initiator port pair present on the Data ONTAP system accesses a separate array LUN group.

This configuration is supported for use with all storage arrays listed in the *Interoperability Matrix* as supported for the release and mode of Data ONTAP running on your system.

The following illustration shows this configuration:

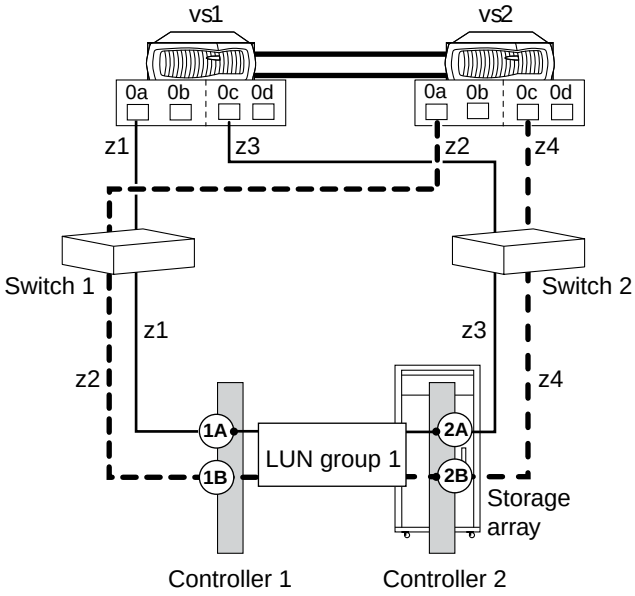


Single 4-port array LUN group

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

This configuration is supported for use with all storage arrays listed in the *Interoperability Matrix* as supported for the release and mode of Data ONTAP running on your system.

The following illustration shows this configuration:

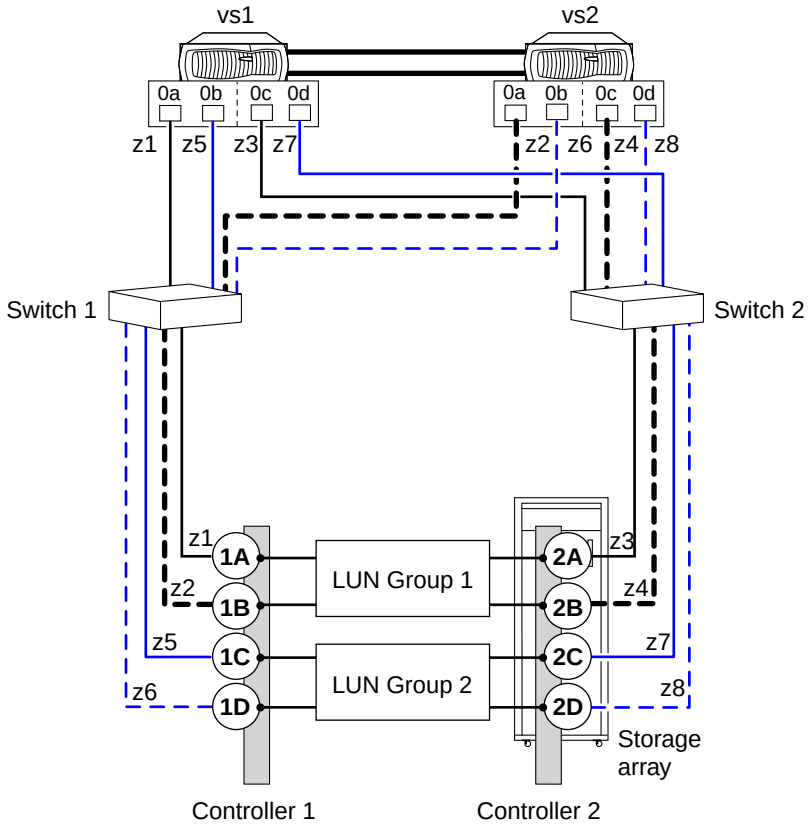


Two 4-port array LUN groups

In this configuration, each Data ONTAP FC initiator port pair accesses a separate array LUN group. The zoning is a single Data ONTAP FC initiator to a single array target port.

This configuration is supported for use with all storage arrays listed in the *Interoperability Matrix* as supported for the release and mode of Data ONTAP running on your system.

The following illustration shows a block diagram of this configuration:



Eight-port array LUN group configuration

Starting in Data ONTAP 8.2, an eight-port LUN group configuration is supported on clustered V-Series systems and, starting in Data ONTAP 8.2.1, also on Data ONTAP systems that can use array LUNs.

This configuration is supported for use with all storage arrays listed in the *Interoperability Matrix* as supported for the release and mode of Data ONTAP running on your system.

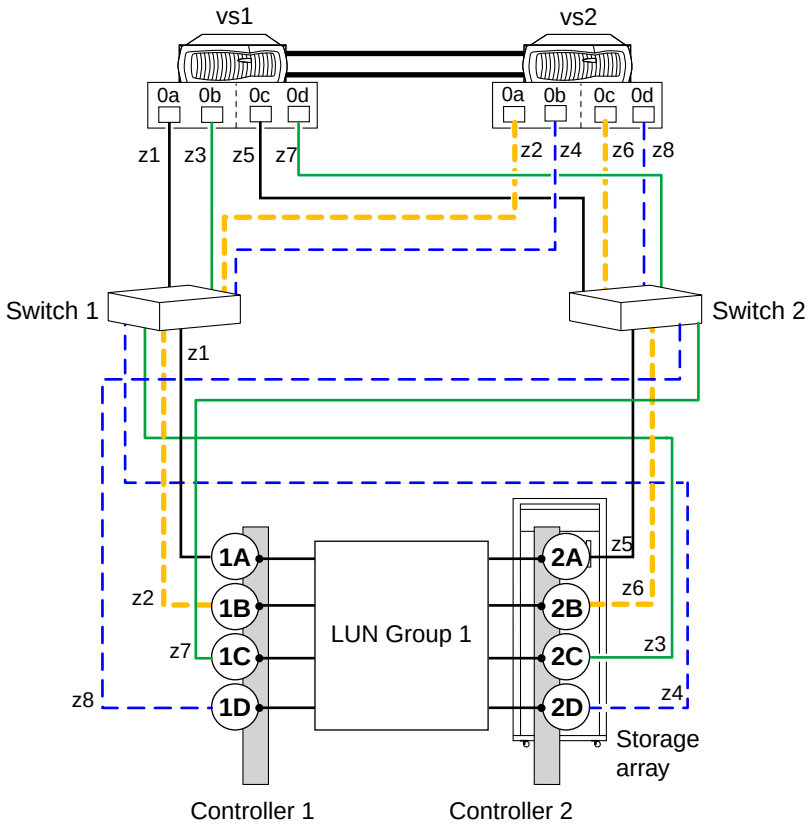
There are two ways of deploying this configuration: crossed and uncrossed back-end connections.

Crossed back-end connections

In this configuration with the back-end connections crossed, the FC connections from the same storage array controller go to both fabric switches (redundant).

In this illustration of crossed back-end connections, note how the nodes are attached to the switches and to the storage array. Vs1 uses switch 1 when attaching to the storage array Controller 1 port 1A and Controller 2 port 2C, and uses switch 2 when attaching to storage array Controller 2 ports 2A and

Controller 1 port 1C. This optimizes the use of switch ports and array ports, which reduces the impact of a switch or storage array controller failure.

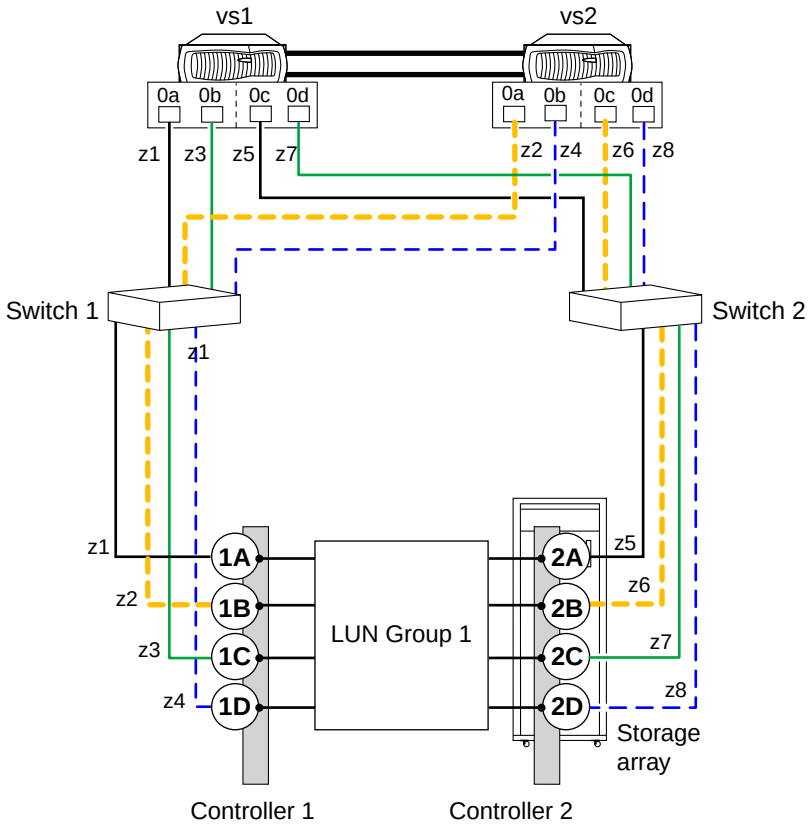


Note: The following problem can occur with Active-Passive storage arrays in crossed back-end connections: If one of the fabric switches is taken offline or goes down and a path failure from both Data ONTAP systems occurs, the Data ONTAP systems panic even though the alternate path from each system is still online. For example, if switch 2 is down and the “0b” paths on both vs1 and vs2 go down, vs1 and vs2 panic even though the “0a” paths are still online.

Back-end connections are not crossed

In this configuration in which the back-end connections are not crossed, the FC connections from the same storage array controller go to only one fabric switch.

The following illustration shows this configuration when the back-end connections are not crossed.



Data ONTAP FC initiator port attaching to multiple targets ports

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

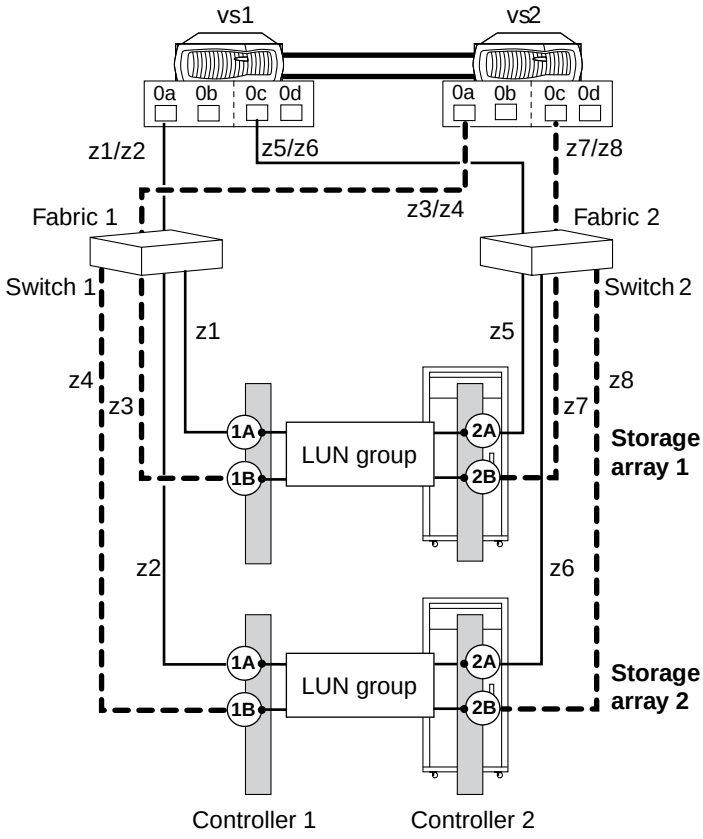
This configuration is supported for use with all storage arrays listed in the *Interoperability Matrix* as supported for the release and mode of Data ONTAP running on your system.

The following illustration shows a shared Data ONTAP 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 sharing an FC initiator port with multiple target ports and zoning, see the information in the *FlexArray Virtualization Installation Requirements and Reference Guide*.

One Data ONTAP FC initiator port connecting to target ports on *separate* storage arrays

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



Target port attaching to multiple FC initiator ports

Starting with Data ONTAP 8.3, a maximum of two Data ONTAP FC initiator ports across nodes can be attached to a single target port on the storage array. This configuration is not supported with MetroCluster configurations.

This configuration is supported for use with all storage arrays listed in the *Interoperability Matrix* as supported for the release and mode of Data ONTAP running on your system.

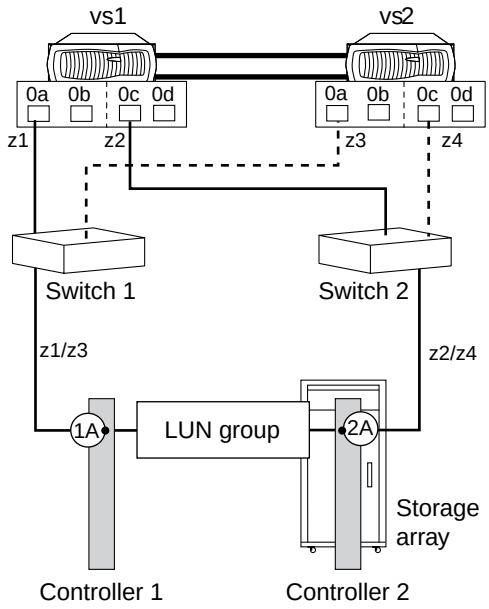
The *FlexArray Virtualization Installation Requirements and Reference Guide* contains the rules for setting up this configuration.

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

For details about sharing a target port with multiple FC initiator ports and zoning, see the *FlexArray Virtualization Installation Requirements and Reference Guide*.

Shared target port attached to FC initiator ports

The following example shows an HA pair in which a single target port connects to multiple FC initiator ports:



The initiator ports 0a of controllers vs1 and vs2 are connected to the storage array port 1A while ports 0c of the controllers are connected to the storage array port 2A.

Supported direct-attached configurations with E-Series storage arrays

Starting with Data ONTAP 8.2.1, you can connect Data ONTAP systems in direct-attached configurations with E-Series storage arrays. You must ensure redundancy in connections between the Data ONTAP systems and the storage arrays to avoid the possibility of a single point of failure.

The Interoperability Matrix contains information about the specific E-Series array models that are supported in direct-attached configurations with Data ONTAP systems.

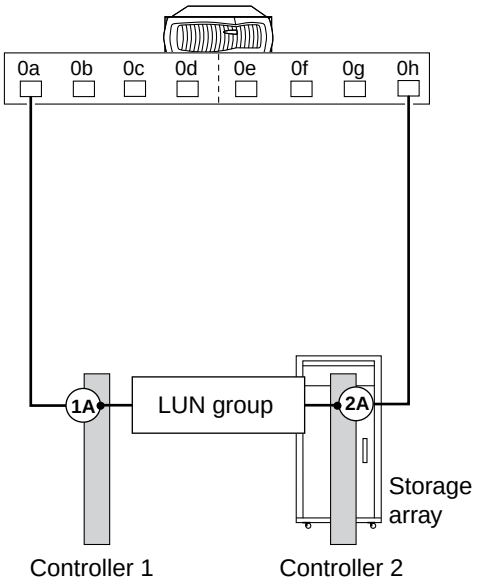
Data ONTAP supports the following direct-attached configurations with E-Series storage arrays:

- *Stand-alone basic configuration* on page 15
- *Four-port array LUN group* on page 15
- *Eight-port array LUN group* on page 17

Stand-alone basic configuration

In a stand-alone basic configuration, two FC initiator ports from the Data ONTAP system access the ports of a two-port array LUN group.

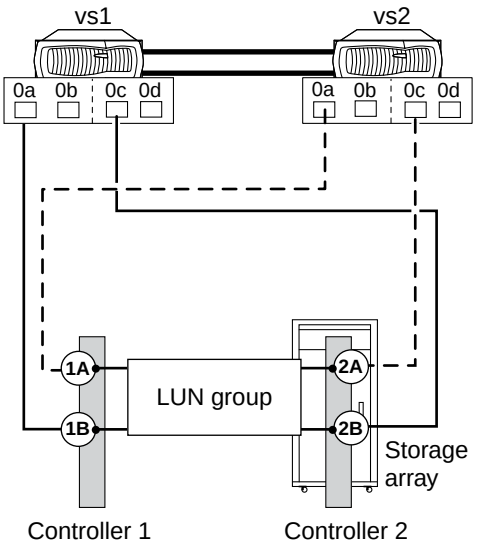
The following illustration shows a direct-attached configuration where the Data ONTAP FC initiator ports 0a and 0h access the target ports of a two-port array LUN group:



Four-port array LUN group

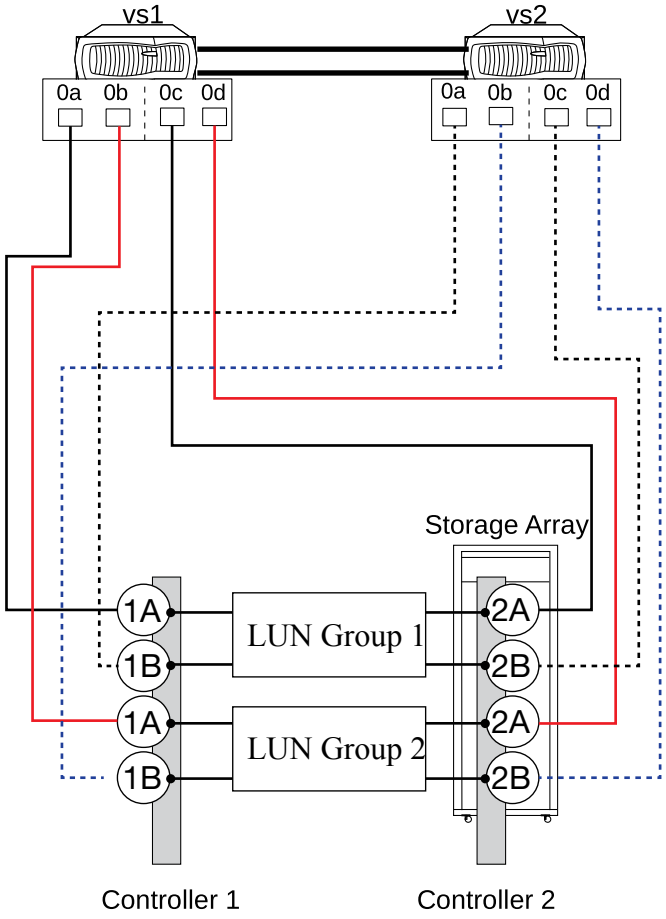
Two FC initiator ports from each Data ONTAP system in an HA pair access different storage array ports in a four-port array LUN group for redundancy in connections.

The following illustration shows a direct-attached configuration where the Data ONTAP FC initiator ports access the target ports of a four-port array LUN group.



You can also connect four FC initiator ports from each Data ONTAP system in the HA pair to two different four-port array LUN groups such that each FC initiator port in a port pair accesses the alternate LUN group.

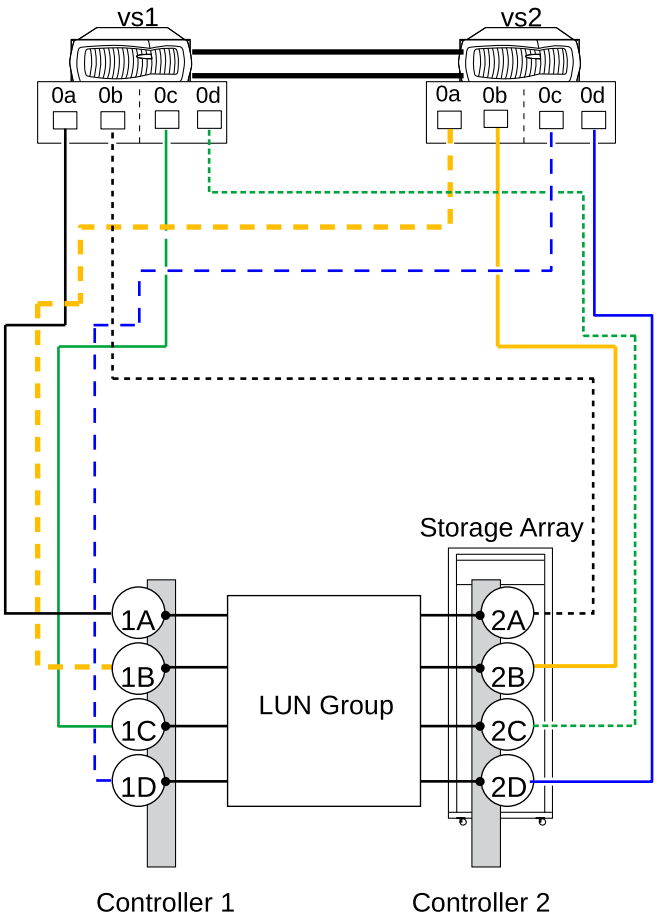
The following illustration shows a direct-attached configuration where the Data ONTAP FC initiator ports access the target ports of two four-port array LUN groups:



Eight-port array LUN group

Four FC initiator ports from each Data ONTAP system in an HA pair access different storage array ports in an eight-port array LUN group for redundancy in connections.

The following illustration shows a direct-attached configuration where the Data ONTAP FC initiator ports access the target ports of an eight-port array LUN group:



Glossary

host

A configuration entity that enables you to specify access to volumes through ports on the storage array.

host group

A collection of hosts that share access to storage array volumes. Host groups permit multiple hosts to access a single volume. The hosts manage this shared access.

host type or host operating system

Specifies the operating system associated with a host that is attached to the storage array.

Host types can be completely different operating systems, or can be variants of the same operating system. By specifying a host type, you define how the controllers in the storage array will work with the particular operating system on the hosts that are connected to it.

disk pool

A disk pool allows very large groups of drives to be conglomerated into a group that supports volume creation. The RAID level of a disk pool is automatically set at RAID6. Users cannot set or manipulate the RAID level of disk pools, or the volumes in the pools.

volume

A logical unit accessed by the host for data I/O operations.

volume group

A set of drives that is logically grouped and assigned a RAID level. Volumes reside within a volume group.

controller

A hardware component on the storage array that services requests from the hosts and manages the disk drives in the storage array.

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