Dell PowerVault MD Series Fibre Channel Storage Array
Configuring Fibre Channel With Dell MD3600f/3620f/MD3660f Series Storage Arrays

Notes, Cautions, and Warnings

NOTE: A NOTE indicates important information that helps you make better use of your computer.

CAUTION: A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

WARNING: A WARNING indicates a potential for property damage, personal injury, or death.

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This document provides information about configuring Fibre Channel communication between the host server and the storage array. For basic setup information such as racking, power cabling, and recommended handling procedures, see the *Getting Started Guide* for your Storage Array at **support.dell.com/manuals**.

NOTE: The cabling and configuration concepts shown in this document apply to both 2U- and 4U-based Dell fibre-channel storage arrays.

NOTE: The MD Series Dense storage arrays represent the Dell PowerVault MD3600f/3620f/MD3660f storage arrays.

Configuring Fibre Channel On Direct- and SAN-Attached Storage Arrays

You can cable the host server to the storage array in one of two ways:

- A direct host server-to-storage array connection using a supported Fibre Channel cable
- A storage array network (SAN) using supported Fibre Channel switch(es)

NOTE: For detailed information on supported Fibre Channel hardware, see the *Support Matrix* at **support.dell.com/manuals**.

Table 1 shows the order of configuration steps for both types of connections. These steps assume you are setting up a Fibre Channel storage for the first time.

NOTE: If you are adding an additional Fibre Channel storage array or if your host server is already configured to access Fibre Channel storage, some of the steps in Table 1 may not apply. Before proceeding, see the *Support Matrix* to confirm that your existing hardware components and host bus adapter (HBA) firmware and BIOS levels are supported.

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Table 1. Configuring Fibre Channel

Direct-Attached Storage Arrays	SAN-Attached Storage Arrays*
1. Install the supported HBAs on your host server.	1. Install the supported HBAs on your host server.
2. Cable the host server to the storage array. For more information, see Direct-Attached Cabling Examples.	2. Cable the host server to the Fibre Channel switches. For more information, see SAN-Attached Cabling Example and Remote Replication Cabling Example.
3. Install the required HBA drivers and firmware versions listed in the *Support Matrix.*	3. Install the required HBA drivers and firmware versions listed in the *Support Matrix*.
4. Install and configure the MD Storage Manager host software (included with your storage array) on your host server.	4. Install and configure the MD Storage Manager software (included with your storage array) on your host server.
5. Using MD Storage Manager (MDSM), configure the host servers, storage arrays, and virtual disks.	5. Cable the storage array to the Fibre Channel switches.
6. Activate and configure premium features (if applicable).	6. Configure zoning on all Fibre Channel switches. For more information, see Switch Zoning Requirements. **
	7. Using MDSM, configure the host servers, storage arrays, and virtual disks.
	8. Activate and configure premium features (if applicable).

* A SAN-attached configuration is required to use the Remote Replication premium feature. Remote Replication is not supported in direct-attached configurations. ** All equipment attached to the switch must be powered on before establishing zoning. For additional switch hardware requirements, see the manufacturer's documentation.

Other Information You May Need

In addition to this document, see the documentation provided with the HBA and Fibre Channel switch hardware for vendor-specific information required to complete Fibre-Channel setup on your storage array.

Installing Supported Fibre Channel HBAs

The storage array supports a specific set of Fibre Channel HBAs, each requiring a unique driver and firmware level. See the *Support Matrix* at **support.dell.com/manuals** for a list of supported HBAs with the software patches, knowledge bases, drivers, firmware, and BIOS versions.

If an HBA is already installed on your host server, verify that it is supported in the *Support Matrix* and is operating at the driver and/or firmware level specified. If the HBA is not listed in the *Support Matrix*, it should not be used to connect to the storage array.

> ⚠ CAUTION: Connecting the storage array to a non-supported host server HBA or installing non-qualified HBA drivers or firmware can cause instability or loss of access to your data.

Installing Fibre Channel HBA On Your Host Server

For instructions about physically installing an HBA in your host server and loading supported drivers and firmware, see the documentation supplied with your HBA hardware.

> 📝 NOTE: During installation you must enter the manufacturer-specific timeout and/or node time values. See the *Support Matrix* at **support.dell.com/manuals** for information related to your specific HBA.

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Using Fibre Channel Switch Zoning

A Fibre Channel switch allows you to connect multiple devices to the SAN without compromising bandwidth or data throughput. Switch zoning implemented on each Fibre Channel switch hardware component using the manufacturer's embedded utility, allows you to divide port traffic between the host server and storage array to maintain the highest level of redundancy

The following figure shows each connection to the host server routed to an individual logical zone on the SAN. Two physical switches provide an alternate (redundant) data path to the storage array. If a single HBA, switch or RAID controller fails, the host server can still access data on the storage array through one of the alternate paths provided by the switches.

> **NOTE:** For a list of supported Fibre Channel switches, see the Support Matrix at **support.dell.com/manuals**.
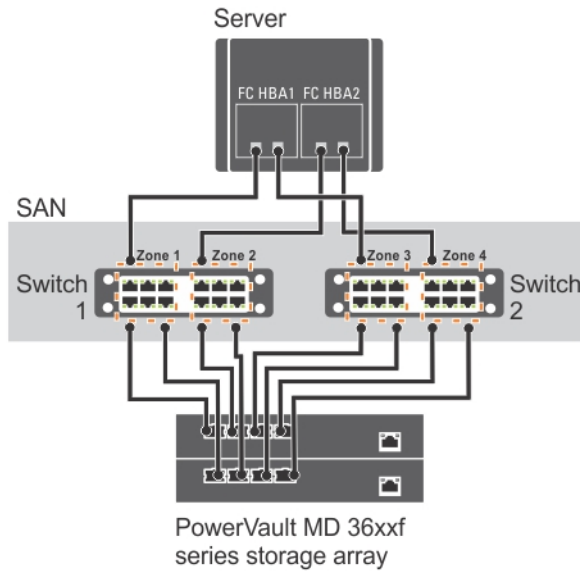

Figure 1. Example of Switch Zoning on SAN on an MD3600f-series Fibre-Channel Storage Array

World Wide Name Zoning

There are several different switch zoning techniques used across various SANs. When configuring zoning with your storage array, using a 64 bit World Wide Name (WWN) to uniquely identify each component in your Fibre Channel switch fabric is recommended. An advantage of using WWN port zoning (also called *soft zoning*) is that it allows you to remove and/or replace cabling to and from the fabric without reconfiguring the existing zone logic.

When implemented on the Fibre Channel switch, port WWN zoning causes the host server to query the World Wide Identifier (WWID) name of all attached physical disks and/or expansion enclosures each time it access the switch fabric. By zoning specific ports on the host server, switch and storage array together, the switch allows the host server to see only devices included in that zone, decreasing the amount of time it would otherwise take for the host server to query attached, but out-of-zone, devices.

Switch Zoning Guidelines

The storage array imposes specific requirements that must be followed when setting up Fibre Channel switch zoning:

- If a Fibre Channel switch is used to connect your host server and storage array, it must be zoned. Un-zoned or open switches cannot be used.
- WWN port zoning is recommended. While *hard zoning* (zoning by device ID) is supported, LUN masking uses the WWN identifier. You can mix WWN and hard-zoned ports in the same zone.
- Multi-port HBAs are supported. Each port in a multiple-port HBA represents one initiator. Each initiator must be connected to a single logical switch zone.
- No more than four paths (port-to-port segments) can be established from a single, physical host server to a single RAID controller.
- A zone can contain multiple targets and span multiple storage arrays (single initiator can point to multiple targets).
- If the Remote Replication premium feature is activated, a separate zone for each replication port is required. Only data traffic related to Remote Replication can move through that zone. For more details and requirements regarding Remote Replication, see the *Dell PowerVault MD3260/3260i/3660i/3660f/3060e Storage Arrays Administrator's Guide* at **support.dell.com/manuals**.

Setting Up Zoning On The Fibre Channel Switch Hardware

Setting up zoning on Fibre Channel switches varies greatly between manufacturers. For detailed information on how to set up zoning on your switch, see the manufacturer's product documentation or technical support website.

Cabling The Storage Array

Cabling the storage array depends on a number of factors such as:

- Direct- or SAN-attached storage array
- Required level of redundancy or throughput
- Number of host servers connected to the storage array
- Type of HBAs (dual- or single-port) used in the host server(s)
- Remote Replication premium feature (if applicable)

The cabling diagrams shown here do not represent every supported cabling scenario but the concepts of redundancy and switch logic can be used to build your own configuration.

Redundant And Non-Redundant Cabling

Non-redundant cabling configurations provide a single data path from a host server to the storage array. This type of configuration is only recommended for non-critical data storage. A path failure from a failed or removed cable, failed HBA, or failed or removed RAID controller module results in loss of host access to the storage array.

Redundant configurations establish separate data paths between the host server and storage array. Each path is connected to separate RAID controller modules in the storage array. Redundancy protects the host server from losing access to data in the event of a path failure since both RAID controller modules can independently access all the physical disks in the storage array.

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Direct-Attached Cabling

Direct-attached cabling configurations provide simple, non-switched connections between the host server and storage array. Redundancy is achieved in a direct-attached configuration if two RAID controllers are installed in the storage array and multiple paths between the host sever and storage array are established.

A single RAID controller, direct-attached configuration is supported, but is not recommended due to the low level of redundancy offered.

Single Controller Configurations

The following figures show two and four host servers, each connected to one RAID controller module. The host servers share storage space without redundant paths. If one path fails, the host server on that path is disconnected from the storage array.

> **NOTE:** The MD Series Dense storage arrays do not support single-controller (simplex) configurations.
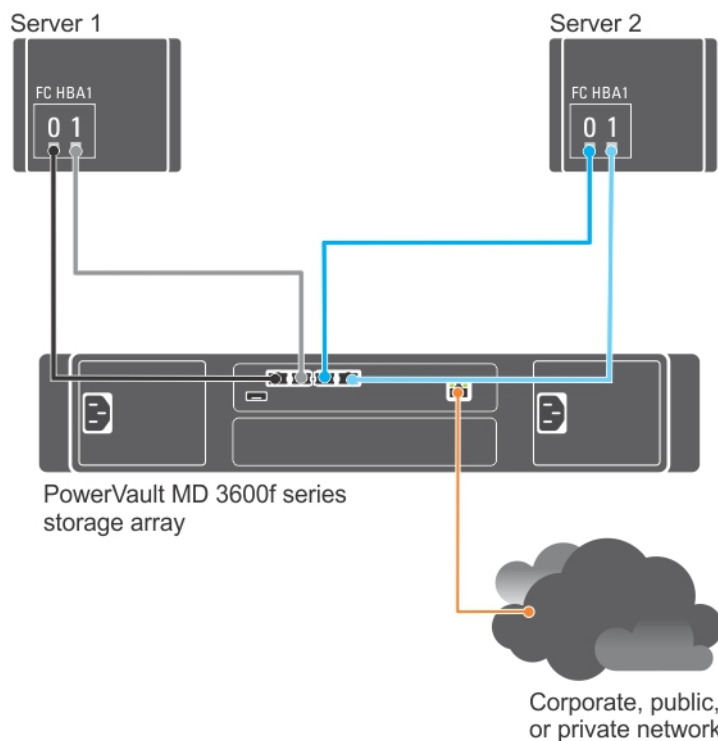

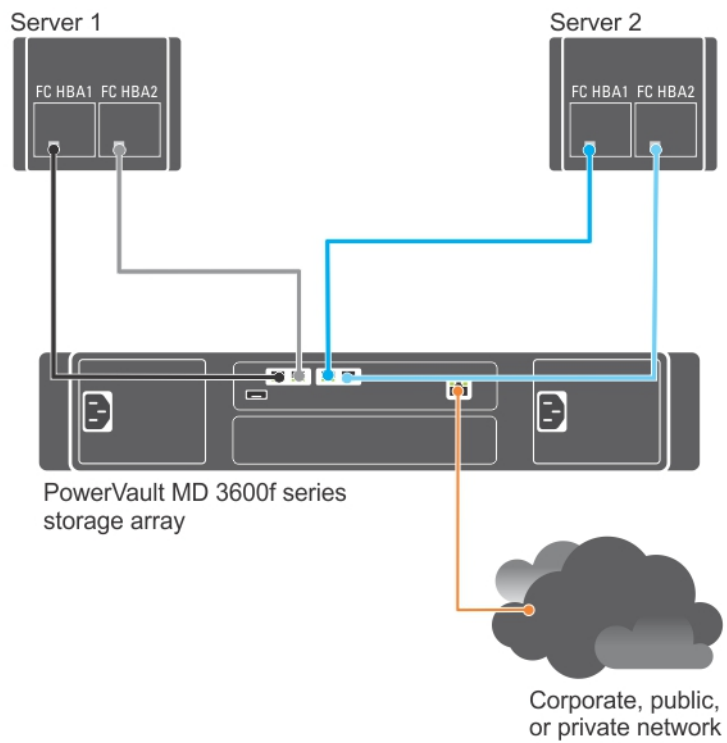Figure 2. Two Host Servers With Dual Port HBAs Connected to a Single-Controller Storage Array

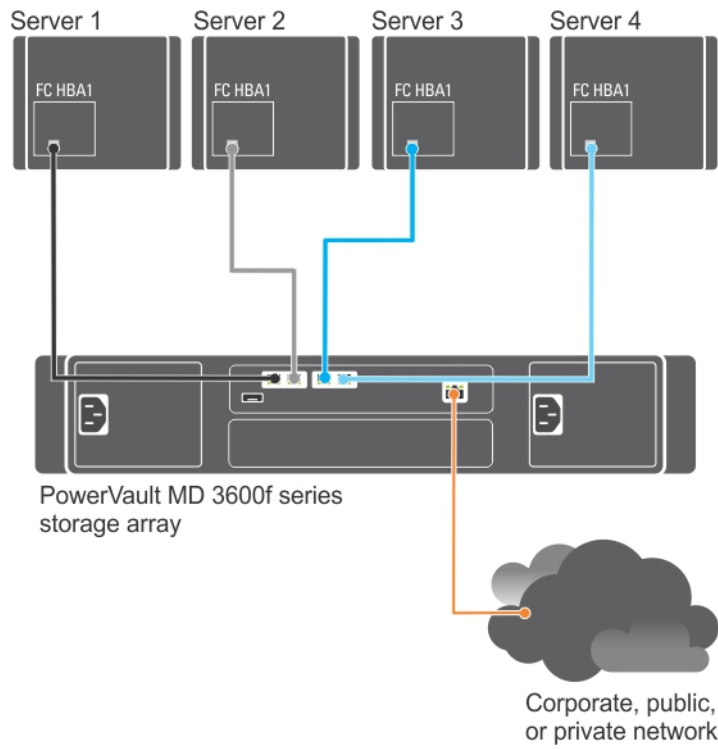**Figure 3. Two Host Servers With Two Single-Port HBAs Connected to a Single-Controller Storage Array**

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Figure 4. Four Host Servers With Single-Port HBAs Connected to a Single-Controller Storage Array

Dual Controller Configurations

Figure 5 through Figure 7 show two and four host servers, each connected to two RAID controller modules. Since each host server has redundant paths, loss of a single path allows access to the storage array through the alternate path.
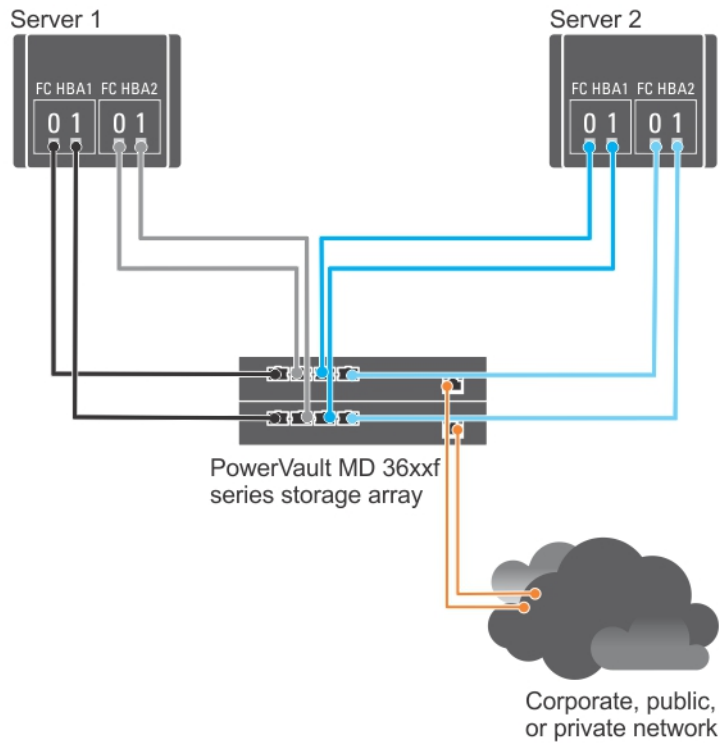
Figure 5. Two Host Servers With Two Dual-Port HBAs Connected to a Dual-Controller (Duplex) Storage Array
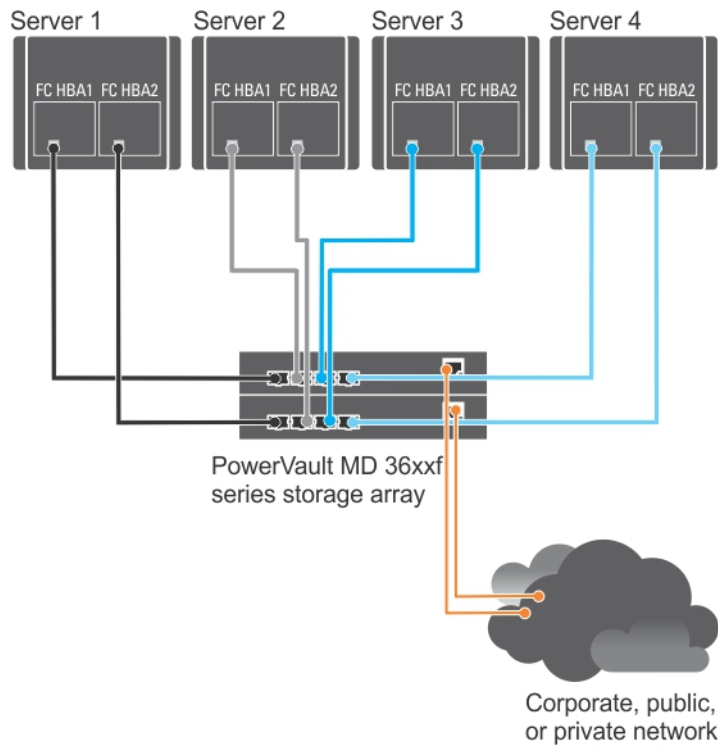
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Figure 6. Four Host Servers With Single-Port HBAs Connected to a Dual-Controller (Duplex) Storage Array
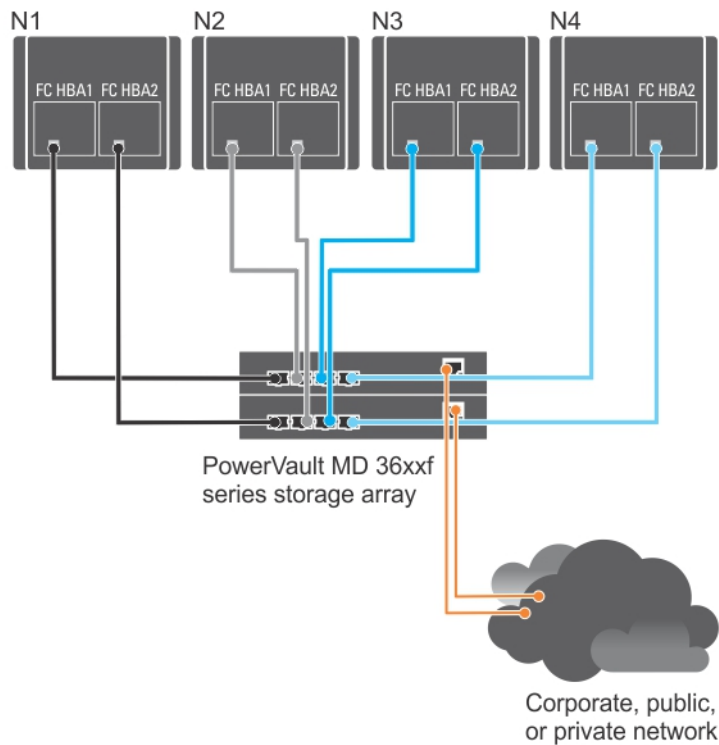
Figure 7. Four Host Servers With Single-Port HBAs Connected to a Dual-Controller (Duplex) Storage Array Using Cluster Cabling

Figure 7 shows a four-cluster node connected to two RAID controller modules. Since each cluster node has redundant paths, loss of a single path still allows access to the storage array through the alternate path.

SAN-Attached Cabling

SAN-attached cabling configurations provide the highest level of redundancy and alternate-path connectivity between the host server and storage array. A SAN configuration using a Fibre Channel compatible switch fabric allows you to establish multiple redundant paths to data on the storage array.

> NOTE: A SAN configuration using a supported Fibre Channel switch hardware is required if the Remote Replication premium feature is activated on the storage array. Remote Replication is not supported in a direct-attached configuration. For specific cabling requirements for Remote Replication, see Remote Replication Cabling Example.

SAN-Attached Cabling Example

The following figure shows a three-server, mixed HBA cabling configuration that uses two separate switch fabrics to establish multiple paths to the storage array. Port-to-port connections in each switch fabric/zone are detailed in the text boxes.
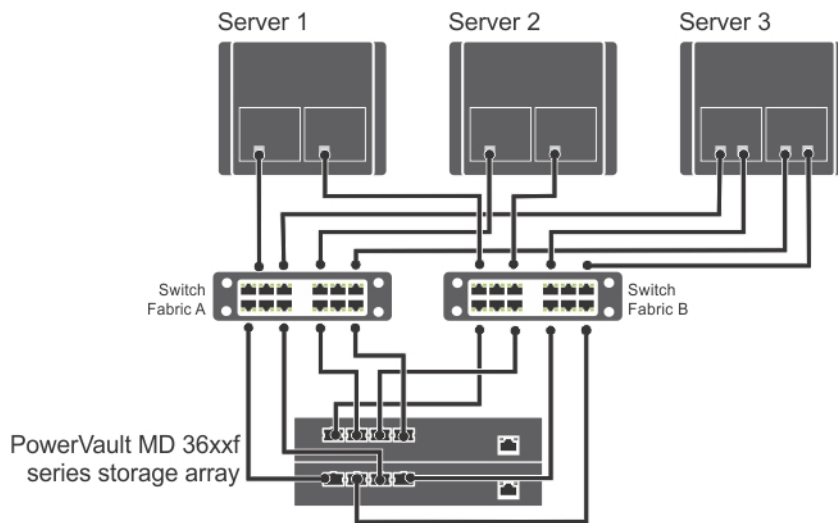
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Figure 8. Three SAN-Attached Host Servers Connected to a Storage Array Using Multiple Paths

Switch Fabric A	Switch Fabric B
Zone_1_Server_1_HBA_0	Zone_5_Server_1_HBA_1
Server1-HBA_0	Server1-HBA_1
Array_Ctrl-0-1	Array_Ctrl-0-0
Array_Ctrl-1-0	Array_Ctrl-1-1
Zone_2_Server_2_HBA_0	Zone_6_Server_2_HBA_1
Server2-HBA_0	Server2-HBA_1
Array_Ctrl-0-3	Array_Ctrl-0-2
Array_Ctrl-1-2	Array_Ctrl-1-3
Zone_3_Server_3_HBA_0-0	Zone_7_Server_3_HBA_0_1
Server3-HBA_0_0	Server3-HBA_0_1
Array_Ctrl-0-1	Array_Ctrl-0-0
Array_Ctrl-1-0	Array_Ctrl-1-1
Zone_4_Server_3_HBA_1_0	Zone_8_Server_3_HBA_1_1
Server3-HBA_1_0	Server3-HBA_1_1
Array_Ctrl-0-3	Array_Ctrl-0-2
Array_Ctrl-1-2	Array_Ctrl-1-3

Remote Replication Cabling Example

Remote Replication is a storage array premium feature that provides online, real-time replication of data between storage arrays. When this feature is activated, a dedicated port (port 3) on each RAID controller is reserved exclusively

for Remote Replication traffic. No other data traffic is allowed on that port until the Remote Replication feature is deactivated. A dedicated zone on each Fibre Channel switch is also required.
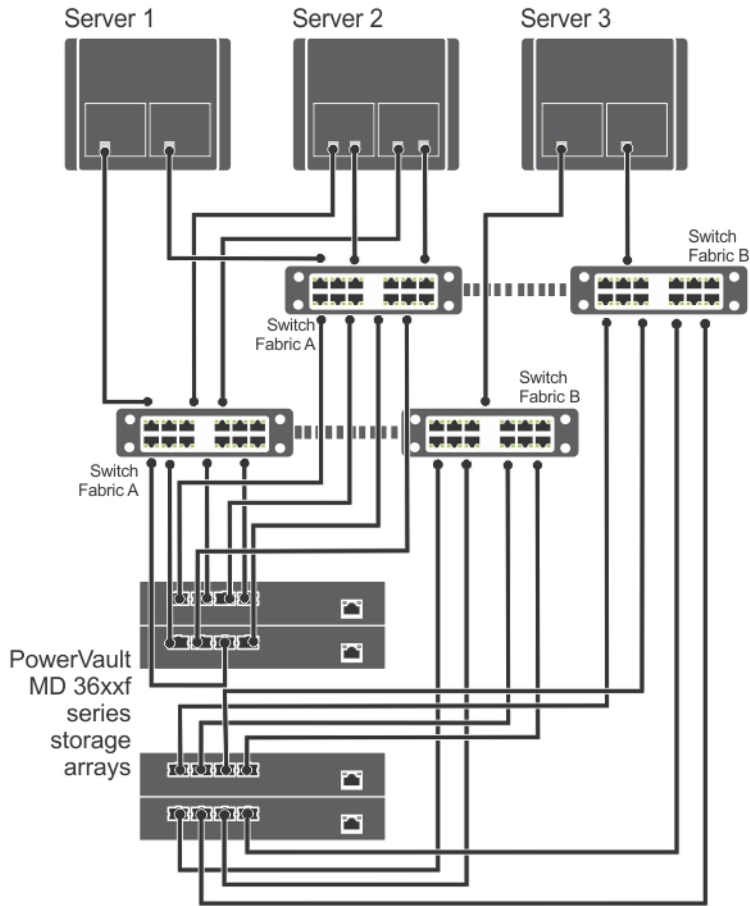

Figure 9. Remote Replication Cabling

Switch Fabric A	Switch Fabric B
Zone_1_Server_1_HBA_0	Zone_5_Server_1_HBA_1
Server-1-HBA_0	Server1-HBA_1
Array-1_Ctrl-0-1	Array-1_Ctrl-0-0
Array-1_Ctrl-1-0	Array-1_Ctrl-1-1
Zone_2_Server_2_HBA_0_0	Zone_6_Server_2_HBA_0_1
Server-2-HBA_0_0	Server2-HBA_0_1
Array-1_Ctrl-0-1	Array-1_Ctrl-0-2
Array-1_Ctrl-1-2	Array-1_Ctrl-1-1
Zone_3_Server_2_HBA_1-0	Zone_7_Server_2_HBA_1_1
Server-3-HBA_1_0	Server-2-HBA_1_1

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Switch Fabric A	Switch Fabric B
Array-1_Ctrl-0-1	Array-1_Ctrl-0-0
Array-1_Ctrl-1-0	Array-1_Ctrl-1-1
Zone_4_Server_3_HBA_0	**Zone_8_Server_3_HBA_1**
Server3-HBA_0	Server3-HBA_1
Array-2_Ctrl-0-1	Array-1_Ctrl-0-2
Array-2_Ctrl-1-2	Array-1_Ctrl-1-1
Replication_Zone_1	**Replication_Zone_2**
Array-1_Ctrl-0-3	Array-1_Ctrl-1-3
Array-2_Ctrl-0-3	Array-2_Ctrl-1-3

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