

# Huawei SAN Storage Host Connectivity Guide for VMware ESXi

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# **1** About This Document

#### Purpose

This document details the configuration methods and precautions for connecting Huawei SAN storage devices to VMware ESXi hosts.

#### **Intended Audience**

This document is intended for:

- Huawei technical support engineers
- Technical engineers of Huawei's partners
- Other personnel who are involved in interconnecting Huawei SAN and VMware ESXi hosts or who are interested in the interconnection.

Readers of this guide are expected to be familiar with the following topics:

- Huawei OceanStor V3, OceanStor V5, and Dorado V3
- VMware ESXi

#### **Related Documents**

For the hosts, host bus adapters (HBAs), and operating systems that are compatible with Huawei storage devices, go to support-open.huawei.com.

For the latest Huawei storage product documentation, go to support.huawei.com.

For VMware ESXi documents or support, go to www.vmware.com/support.

#### Conventions

#### **Symbol Conventions**

Symbol	Description
	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

Symbol	Description	
	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.	
	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.	
	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.	
D NOTE	Calls attention to important information, best practices and tips. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.	

#### **General Conventions**

Convention	Description
Times New Roman	Normal paragraphs are in Times New Roman.
Boldface	Names of files, directories, folders, and users are in <b>boldface</b> . For example, log in as user <b>root</b> .
Italic	Book titles are in <i>italics</i> .
Courier New	Examples of information displayed on the screen are in Courier New.

#### **Command Conventions**

Format	Description	
Boldface	The keywords of a command line are in <b>boldface</b> .	
Italic	Command arguments are in <i>italics</i> .	

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#### **Change History**

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

• Issue 01 (2015-12-30)

This issue is the first official release.

• Issue 02 (2016-03-30)

This issue is the second official release and includes the following changes:

Added the product models and versions.

• Issue 03 (2016-11-30)

This issue is the third official release and includes the following changes: Changed the document template.

Added the description about SAN Boot.

• Issue 04 (2017-03-30)

This issue is the fourth official release and includes the following changes:

Added the description that the host must be restarted after rules have been configured for VMware to chapter 7.

• Issue 05 (2018-01-30)

This issue is the fifth official release and includes the following changes:

Added the Fibre Channel networking diagram and description.

• Issue 06 (2018-04-10)

This issue is the sixth official release and includes the following changes: Added the description of the initiator parameters to chapter 7. Added the HyperMetro working modes to chapter 7.

# **2** Introduction

# 2.1 Introduction to VMware ESXi

## 2.1.1 VMware Infrastructure

Legacy x86 computers are designed merely for running a single operating system or application program. Therefore, most of these computers are under-utilized. To address the under-utilization, virtualization technologies are adopted, enabling an x86 physical machine to host multiple virtual machines (VMs) and allowing the multiple VMs to run different operating systems and applications. That is, virtualization allows resources on this physical machine to be shared among multiple environments, thereby improving x86 hardware utilization.

VMware virtualization technology (VMware Infrastructure) adds a condensed software layer on the computer hardware or in the host operating system. This software layer includes a VM monitor utility that allocates hardware resources in a dynamic and transparent way. Each operating system or application can access desired resources anytime as required.

As an outstanding software solution for x86 virtualization, VMware Infrastructure enables users to manage their virtualized environments in an effective and easy manner. As Figure 2-1 shows, a typical VMware Infrastructure datacenter consists of basic physical building blocks such as x86 computing servers, storage networks and arrays, IP networks, a management server, and desktop clients.



#### Figure 2-1 VMware Infrastructure datacenter

In a VMware Infrastructure storage architecture (as shown in Figure 2-2):

- A Virtual Machine File System (VMFS) volume contains one or more LUNs which belong to one or more storage arrays.
- Multiple ESX servers share one VMFS volume; virtual disks are created on the VMFS volume for use by VMs.



#### Figure 2-2 Storage architecture in VMware Infrastructure

VMware uses VMFS to centrally manage storage systems. VMFS is a shared cluster file system designed for VMs. This file system employs a distributed locking function to enable independent access to disks, ensuring that a VM is accessed by one physical host at a time. Raw Device Mapping (RDM) is a special file acting as the agent for raw devices on a VMFS volume.

## 2.1.2 File Systems in VMware

VMFS is a clustered file system that leverages shared storage to allow multiple physical hosts to read and write to the same storage simultaneously. It lays a solid foundation for the management of VMware clusters and dynamic resources.

#### Features of VMFS

- Automated maintenance directory structure
- File locking mechanism
- Distributed logical volume management
- Dynamic capacity expansion
- Clustered file system

- Journal logging
- Optimized VMs' file storage

#### Advantages of VMFS

- Improved storage utilization
- Simplified storage management
- ESX server clusters of enhanced performance and reliability

#### Architecture of VMFS

In the VMFS architecture shown in Figure 2-3, a LUN is formatted into a VMFS file system, whose storage space is shared by three ESX servers each carrying two VMs. Each VM has a Virtual Machine Disk (VMDK) file that is stored in a directory (named after a VM) automatically generated by VMFS. VMFS adds a lock for each VMDK to prevent a VMDK from being accessed by two VMs at the same time.





#### Structure of a VMFS Volume

Figure 2-4 shows the structure of a VMFS volume. A VMFS volume consists of one or more partitions that are arranged in lines. Only after the first partition is used out can the following partitions be used. The identity information about the VMFS volume is recorded in the first partition.



Figure 2-4 Structure of a VMFS volume

VMFS divides each extent into multiple blocks, each of which is then divided into smaller blocks. This block-based management is typically suitable for VMs. Files stored on VMs can be categorized as large files (such as VMDK files, snapshots, and memory swap files) and small files (such as log files, configuration files, and VM BIOS files). Large and small blocks are allocated to large and small files respectively. In this way, storage space is effectively utilized and the number of fragments in the file system is minimized, improving the storage performance of VMs.

The VMFS-3 file system supports four data block sizes: 1 MB, 2 MB, 4 MB, and 8 MB. Sizes of files and volumes supported by VMFS-3 file systems vary with a file system's block size.

The VMFS-5 file system uses a fixed data block size of 1 MB. Supporting VMFS-5, VMware ESXi 5.0/5.1 supports a maximum VMDK file size of 2 TB, and VMware ESXi 5.5/6.0/6.5 supports a maximum VMDK file size of 62 TB.

The VMFS-6 file system also uses a fixed data block size of 1 MB. Supporting VMFS-6, VMware ESXi 6.5 supports a maximum VMDK file size of 62 TB.

## 2.1.3 VMware RDM

VMware RDM enables VMs to directly access storage. As shown in Figure below, an RDM disk exists as an address mapping file on the VMFS volume. This mapping file can be considered as a symbolic link that maps a VM's access to an RDM disk to LUNs.

#### Figure 2-5 RDM mechanism



RDM provides two compatible modes, both of which supports vMotion, Distributed Resource Scheduler (DRS), and High Availability (HA)

- Virtual compatibility: fully simulates VMDK files and supports snapshots.
- Physical compatibility: directly accesses SCSI devices and does not support snapshots. RDMs are applicable in the following scenarios:
- Physical to Virtual (P2V): migrates services from a physical machine to a virtual machine.
- Virtual to Physical (V2P): migrates services from a virtual machine to a physical machine.
- Clustering physical machines and virtual machines.

# 2.2 Host-SAN Connectivity

### 2.2.1 FC Connectivity

A Fibre Channel (FC) SAN is a specialized high-speed network that connects host servers to storage systems. The FC SAN components include HBAs in the host servers, switches that help route storage traffic, cables, storage processors (SPs), and storage disk arrays.

To transfer traffic from host servers to shared storage, the FC SAN uses the Fibre Channel protocol that packages SCSI commands into Fibre Channel frames.

• Ports in FC SAN

Each node in the SAN, such as a host, a storage device, or a fabric component has one or more ports that connect it to the SAN. Ports are identified in a number of ways, such as by:

- World Wide Port Name (WWPN)

A globally unique identifier for a port that allows certain applications to access the port. The FC switches discover the WWPN of a device or host and assign a port address to the device.

Port\_ID (or port address)

Within a SAN, each port has a unique port ID that serves as the FC address for the port. This unique ID enables routing of data through the SAN to that port. The FC switches assign the port ID when the device logs in to the fabric. The port ID is valid only when the device is logged on.

• Zoning

Zoning provides access control in the SAN topology. Zoning defines which HBAs can connect to which targets. When you configure a SAN by using zoning, the devices outside a zone are not visible to the devices inside the zone.

Zoning has the following effects:

- Reduces the number of targets and LUNs presented to a host.
- Controls and isolates paths in a fabric.
- Prevents non-ESXi systems from accessing a specified storage system and protects VMFS data against damage.
- Separates different environments, for example, a test from a production environment.

VMware ESXi hosts support zone division on a per-initiator basis or on a per-initiator and per-target basis. Per-initiator per-target zone division is preferred, since this stricter zone division has more capabilities of preventing SAN faults or configuration errors.

### 2.2.2 iSCSI Connectivity

In computing, Internet Small Computer Systems Interface (iSCSI) is an IP-based storage networking standard for linking data storage systems.

By carrying SCSI commands over IP networks, iSCSI is used to access remote block devices in the SAN, providing hosts with the illusion of locally attached devices.

A single discoverable entity on the iSCSI SAN, such as an initiator or a target, represents an iSCSI node.

Each iSCSI node can be identified in a number of ways, such as by:

• IP address

Each iSCSI node can have an IP address associated with it so that routing and switching equipment on your network can establish the connection between the server and storage. This address is just like the IP address that you assign to your computer to get access to your company's network or the Internet.

• iSCSI name

A worldwide unique name for identifying the node. iSCSI uses the iSCSI Qualified Name (IQN) and Extended Unique Identifier (EUI).

By default, VMware ESXi generates unique iSCSI names for your iSCSI initiators, for example, iqn.1998-01.com.vmware:iscsitestox-68158ef2. Usually, you do not have to

change the default value, but if you do, make sure that the new iSCSI name you enter is worldwide unique.

# 2.2.3 Multipath Connectivity

#### 2.2.3.1 UltraPath

UltraPath is a Huawei-developed multipathing software. It can manage and process disk creation/deletion and I/O delivery of operating systems.

UltraPath provides the following functions:

• Masking of redundant LUNs

In a redundant storage network, an application server with no multipathing software detects a LUN on each path. Therefore, a LUN mapped through multiple paths is mistaken for two or more different LUNs. UltraPath installed on the application server masks redundant LUNs on the operating system driver layer to provide the application server with only one available LUN, the virtual LUN. In this case, the application server only needs to deliver data read and write operations to UltraPath that masks the redundant LUNs, and properly writes data into LUNs without damaging other data.

• Optimum path selection

In a multipath environment, the owning controller of the LUN on the storage system mapped to an application server is the prior controller. With UltraPath, an application server accesses the LUN on the storage system through the prior controller, thereby obtaining the highest I/O speed. The path to the prior controller is the optimum path.

- Failover and failback
  - Failover
    - When a path fails, UltraPath fails over its services to another functional path.
  - Failback

UltraPath automatically delivers I/Os to the first path again after the path recovers from the fault. There are two methods to recover a path:

• I/O Load balancing

UltraPath provides load balancing within a controller and across controllers.

- For load balancing within a controller, I/Os poll among all the paths of the controller.
- For load balancing across controllers, I/Os poll among the paths of all these controllers.
- Path test

UltraPath tests the following paths:

- Faulty paths

UltraPath tests faulty paths with a high frequency to detect the path recover as soon as possible.

- Idle paths

UltraPath tests idle paths to identify faulty paths in advance, preventing unnecessary I/O retires. The test frequency is kept low to minimize impact on service I/Os.

#### 2.2.3.2 VMware NMP

#### Overview

VMware ESXi has its own multipathing software Native Multipath Module (NMP), which is available without the need for extra configurations.

This section details the NMP multipathing software.

#### VMware PSA

#### Overview

VMware ESXi 4.0 incorporates a new module Pluggable Storage Architecture (PSA) that can be integrated with third-party Multipathing Plugin (MPP) or NMP to provide storage-specific plug-ins such as Storage Array Type Plug-in (SATP) and Path Selection Plugin (PSP), thereby enabling the optimal path selection and I/O performance.

Figure 2-6 VMware pluggable storage architecture



#### VMware NMP

NMP is the default multipathing module of VMware. This module provides two submodules to implement failover and load balancing.

- SATP: monitors path availability, reports path status to NMP, and implements failover.
- PSP: selects optimal I/O paths.

PSA is compatible with the following third-party multipathing plugins:

- Third-party SATP: Storage vendors can use the VMware API to customize SATPs for their storage features and optimize VMware path selection.
- Third-party PSP: Storage vendors or third-party software vendors can use the VMware API to develop more sophisticated I/O load balancing algorithms and achieve larger throughput from multiple paths.

#### VMware Path Selection Policy

• Built-in PSP

By default, the PSP of VMware ESXi 5.0 or later supports three I/O policies: Most Recently Use (MRU), Round Robin, and Fixed. VMware ESXi 4.1 supports an additional policy: Fixed AP.

• Third-Party software

Third-party MPP supports comprehensive fault tolerance and performance processing, and runs on the same layer as NMP. For some storage systems, Third-Party MPP can substitute NMP to implement path failover and load balancing.

#### **Functions and Features**

To manage storage multipathing, ESX/ESXi uses a special VMkernel layer, Pluggable Storage Architecture (PSA). The PSA is an open modular framework that coordinates the simultaneous operations of MPPs.

The VMkernel multipathing plugin that ESX/ESXi provides, by default, is VMware NMP. NMP is an extensible module that manages subplugins. There are two types of NMP plugins: SATPs and PSPs. Figure 2-7 shows the architecture of VMkernel.





If more multipathing functionality is required, a third party can also provide an MPP to run in addition to, or as a replacement for, the default NMP. When coordinating with the VMware NMP and any installed third-party MPPs, PSA performs the following tasks:

- Loads and unloads multipathing plug-ins.
- Hides virtual machine specifics from a particular plug-in.
- Routes I/O requests for a specific logical device to the MPP managing that device.
- Handles I/O queuing to the logical devices.
- Implements logical device bandwidth sharing between virtual machines.
- Handles I/O queuing to the physical storage HBAs.
- Handles physical path discovery and removal.
- Provides logical device and physical path I/O statistics.

#### VMware NMP Path Selection Policy

VMware supports the following path selection policies, as described in Table 2-1.

Policy/Controller	Active/Active	Active/Passive
Most Recently Used	Administrator action is required to fail back after path failure.	Administrator action is required to fail back after path failure.
Fixed	VMkernel resumes using the preferred path when connectivity is restored.	VMkernel attempts to resume using the preferred path. This can cause path thrashing or failure when another SP now owns the LUN.
Round Robin	The host uses automatic path selection algorithm to ensure that I/Os are delivered to all active paths in turn. It will not switch back even after the faulty path recovers.	The host uses automatic path selection algorithm to always select the next path in the RR scheduling queue, therefore ensuring that I/Os are delivered to all active paths in turn.
Fixed AP	For ALUA arrays, VMkernel picks the path set to be the preferred path. For both A/A, A/P, and ALUA arrays, VMkernel resumes using the preferred path, but only if the path-thrashing avoidance algorithm allows the failback. Fixed AP is available only in VMware ESX/ESXi 4.1.	

<b>Lable 2-1</b> 1 and selection policies	Table 2-1	Path	selection	policies
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The following details each policy.

#### • Most Recently Used (VMW\_PSP\_MRU)

The host selects the path that is used recently. When the path becomes unavailable, the host selects an alternative path. The host does not revert to the original path when the path becomes available again. There is no preferred path setting with the MRU policy. MRU is the default policy for active-passive storage devices.

**Working principle:** uses the most recently used path for I/O transfer. When the path fails, I/O is automatically switched to the last used path among the multiple available paths (if any). When the failed path recovers, I/O is not switched back to that path.

#### • Round Robin (VMW\_PSP\_RR)

The host uses an automatic path selection algorithm rotating through all available active paths to enable load balancing across the paths. Load balancing is a process to distribute host I/Os on all available paths. The purpose of load balancing is to achieve the optimal throughput performance (IPOS, MB/s, and response time).

Working principle: uses all available paths for I/O transfer.

• Fixed (VMW\_PSP\_FIXED)

The host always uses the preferred path to the disk when that path is available. If the host cannot access the disk through the preferred path, it tries the alternative paths. The default policy for active-active storage devices is Fixed. After the preferred path recovers from fault, VMkernel continues to use the preferred path. This attempt may results in path thrashing or failure because another SP now owns the LUN.

**Working principle:** uses the fixed path for I/O transfer. When the current path fails, I/O is automatically switched to a random path among the multiple available paths (if any). When the original path recovers, I/O will be switched back to the original path.

#### • Fixed AP (VMW\_PSP\_FIXED\_AP)

This policy is only supported by VMware ESX/ESXi 4.1.x and is incorporated to VMW\_PSP\_FIXED in later ESX versions.

Fixed AP extends the Fixed functionality to active-passive and ALUA mode arrays.

#### 2.2.3.3 ALUA

• ALUA definition:

Asymmetric Logical Unit Access (ALUA) is a multi-target port access model. In a multipathing state, the ALUA model provides a way of presenting active/passive LUNs to a host and offers a port status switching interface to switch over the working controller. For example, when a host multipathing program that supports ALUA detects a port status change (the port becomes unavailable) on a faulty controller, the program will automatically switch subsequent I/Os to the other controller.

• Support by Huawei storage:

Old-version Huawei storage supports ALUA only in two-controller configuration, but not in multi-controller or HyperMetro configuration.

New-version Huawei storage supports ALUA in two-controller, multi-controller, and HyperMetro configurations.

Table 2-2 defines old- and new-version Huawei storage.

Storage Type	Version	Remarks
Old-version Huawei storage (namely, storage that does not support multi-controller ALUA or ALUA HyperMetro)	T V1/T V2/18000 V1/V300R001/V300R002/V300 R003C00/V300R003C10/V300R 005/Dorado V300R001C00	-
New-version Huawei storage (namely, storage that supports multi-controller ALUA and ALUA HyperMetro)	V500R007C00 and later versions V300R003C20/V300R006C00/D orado V300R001C01	V300R003C20: refers to only V300R003C20SPC200 and later versions. V300R006C00: refers to only V300R006C00SPC100 and later versions. Dorado V300R001C01: refers to only V300R001C01SPC100 and

Table 2-2 Old- and new-version Huawei storage

Storage Type	Version	Remarks
		later versions.

• ALUA impacts

ALUA is mainly applicable to a storage system that has only one prior LUN controller. All host I/Os can be routed through different controllers to the working controller for execution. ALUA will instruct the hosts to deliver I/Os preferentially from the LUN working controller, thereby reducing the I/O routing-consumed resources on the non-working controllers.

If all I/O paths of the LUN working controller are disconnected, the host I/Os will be delivered only from a non-working controller and then routed to the working controller for execution.

• Suggestions for using ALUA on Huawei storage

To prevent I/Os from being delivered to a non-working controller, you are advised to ensure that:

- LUN home/working controllers are evenly distributed on storage systems so that host service I/Os are delivered to multiple controllers for load balancing.
- Hosts always try the best to select the optimal path to deliver I/Os even after an I/O path switchover.

#### 2.2.4 SAN Boot

SAN Boot is a network storage management system that stores data (including servers' operating systems) totally on storage systems. Specifically, operating systems are installed on and booted from SAN storage devices. SAN Boot is also called Remote Boot or boot from SAN.

SAN Boot can help to improve system integration, enable centralized management, and facilitate recovery.

- Server integration: Blade servers are used to integrate a large number of servers within a small space. There is no need to configure local disks.
- Centralized management: Boot disks of servers are centrally managed on a storage device. All advanced management functions of the storage device can be fully utilized. For example, the snapshot function can be used for backup. Devices of the same model can be quickly deployed using the snapshot function. In addition, the remote replication function can be used for disaster recovery.
- Quick recovery: Once a server that is booted from SAN fails, its boot volume can be quickly mapped to another server, achieving quick recovery.

# 2.3 Interoperability Query

When connecting a storage system to a VMware ESXi host, consider the interoperability of upper-layer applications and components (such as storage systems, VMware ESXi systems, HBAs, and switches) in the environment.

You can query the latest compatibility information by performing the following steps:

Step 1 Log in to the website support-open.huawei.com.

#### Step 2 On the home page, choose Interoperability Center > Storage Interoperability.

#### Figure 2-8 Interoperability query page



Then, the OceanStor Interoperability Navigator is displayed.

Step 3 Select the components to query and click Submit.

Figure 2-9 Query on OceanStor Interoperability Navigator

OceanStor Interoperability Navigator

Please click the <b>Q</b> icon, the can get the compatibility If you have any question	en double click the components which you need to query nformation after click the submit button. or opinion please feedback to IT-OPENLAB@huawei com	in the expanded panel, you
Search for a component		٩
Component Type	Component	c
Storage System	OceanStor 5300 V3	٩
Server Model		Q
Operating System		Q
Switch Model		٩
Host Bus Adapter		٩
MultiPathing Software		٩
Back-end arrays supported by SmartVirtualization		٩
SAN Backup Software		٩
IT Operations Management Software		٩
Other Feature/Componen	Antivirus Software  Add Submit	

----End

# **2.4 Specifications**

VMware specifications vary with VMware versions. Table 2-3 lists major VMware specifications.

Category	Specifications	Max. Value						
		4.0	4.1	5.0	5.1	5.5	6.0	6.5
iSCSI	LUNs per server	256 <sup>a</sup>	256	256	256	256	256	512
Physical	Paths to a LUN	8	8	8	8	8	8	8
	Number of total paths on a server	1024	1024	1024	1024	1024	1024	2048
Fibre	LUNs per host	256 <sup>a</sup>	256	256	256	256	256	512
Channel	LUN size	2 TB-51 2B	2 TB-512 B	-	64 TB	64 TB	64 TB	64 TB
	LUN ID	255	255	255	255	255	1023	16383
	Number of paths to a LUN	16	32	32	32	32	32	32
	Number of total paths on a server	1024	1024	1024	1024	1024	1024	2048
	Number of HBAs of any type	8	8	8	8	8	8	8
	HBA ports	16	16	16	16	16	16	16
	Targets per HBA	256	256	256	256	256	256	256
FCoE	Software FCoE adapters	-	-	4	4	4	4	4
NFS	Default NFS datastores	8	-	-	-	-	-	-
	NFS datastores	64 (requires changes to advanced settings)	_	-	-	-	-	-
VMFS	RDM size	2 TB-512 B	2 TB-512 B	-	-	-	-	-
	Volume size	64 TB-16 KB	64 TB	-	-	64 TB	64 TB	64 TB
	Volume per host	256	256	256	256	256	256	512
VMFS-2	Files per volume	256 + (64) x additional	-	-	-	-	-	-

 Table 2-3 Major specifications of VMware

		extents)						
	Block size	256 MB	-	-	-	-	-	-
VMFS-3	VMFS-3 volumes configured per host	256	-	-	-	-	-	-
	Files per volume	~30,720 <sup>b</sup>	~30,72 0 <sup>b</sup>	~30,720 b	~30,720	~30,720 b	~30,720	-
	Block size	8 MB	8 MB	8 MB	8 MB	8 MB	8 MB	-
	Volume size	-	-	64 TB <sup>c</sup>	64 TB <sup>c</sup>	-	64 TB <sup>c</sup>	-
VMFS-5	Volume size	-	-	64 TB <sup>d</sup>				
	Block size			1 MB				
	Files per volume	-	-	~13069 0	~13069 0	~13069 0	~13069 0	~13069 0
VMFS-6	Volume size	-	-	-	-	-	-	64 TB
	Block size	-	-	-	-	-	-	1 MB
	Files per volume	-	-	-	-	-	-	~13069 0

a. Local disks are included.

- b. The file quantity is sufficient to support the maximum number of VMs.
- c. If the block size supported by the file system is 1 MB, the maximum volume size is 50 TB.
- d. The volume size is also subject to RAID controllers or adapter drivers.

Table 2-3 lists only part of specifications. For more information, see:

- VMware vSphere Configuration Maximums (4.0)
- VMware vSphere Configuration Maximums (4.1)
- VMware vSphere Configuration Maximums (5.0)
- VMware vSphere Configuration Maximums (5.1)
- VMware vSphere Configuration Maximums (5.5)
- VMware vSphere Configuration Maximums (6.0)
- VMware vSphere Configuration Maximums (6.5)

# 2.5 Common VMware Commands

This chapter describes the commands commonly used in VMware.

#### Viewing the Version

Run the following commands to view the VMware version:

```
~ # vmware -1
VMware ESXi 5.1.0 GA
~ # vmware -v
VMware ESXi 5.1.0 build-799733
~ #
```

#### **Viewing Hardware Information**

Run the following commands to view hardware information including the ESX hardware and kernel:

```
esxcfg-info -a (Displays all related information.)
esxcfg-info -w (Displays ESX hardware information.)
```

#### **Obtaining Help Documentation**

Command syntax varies with host system versions. You can perform the following steps to obtain help documentation for different versions of host systems.

Step 1 Log in to the VMware official website.

http://www.vmware.com/support/developer/vcli/

Step 2 Select a VMware version.

Select the latest version of VMware and click **vSphere Command-Line Interface Reference**, as shown in Figure 2-10.





Then, you are navigated to the help page of the selected VMware version.

----End

# **3** Planning Connectivity

VMware hosts and storage systems can be connected based on different criteria. Table 3-1 describes the typical connection modes.

 Table 3-1 Connection modes

Criteria	Connection Mode
Interface module type	Fibre Channel connection/iSCSI connection
Whether switches are used	Direct connection (no switches are used)/Switch-based connection (switches are used)
Whether multiple paths exist	Single-path connection/Multi-path connection
Whether HyperMetro is configured	HyperMetro/Non-HyperMetro

Fibre Channel connections are the most widely used. To ensure service data security, both direct connections and switch-based connections require multiple paths.

The following details Fibre Channel and iSCSI connections in HyperMetro and non-HyperMetro scenarios.

# 3.1 HyperMetro Scenarios

For details about how to plan connectivity in HyperMetro scenarios, see the *BC&DR Solution Product Documentation (Active-Active Data Center).* 

# 3.2 Non-HyperMetro Scenarios

## 3.2.1 Direct FC Connections

Huawei provides two-controller and multi-controller storage systems, which directly connect to VMware ESXi hosts through FC multi-path connections in different ways.

#### **Two-Controller Storage**

The following uses Huawei OceanStor 5500 V3 as an example to explain how to directly connect a VMware ESXi host to a two-controller storage system through FC multi-path connections, as shown in Figure 3-2.

Figure 3-2 Direct FC multi-path connections (two-controller storage)



#### 

In this connection diagram, each of the two controllers is connected to a host HBA port with an optical fiber. The cable connections are detailed in Table 3-2.

Cable No.	Description
1	Connects Port P0 on the VMware ESXi host to Controller A on the storage system.
2	Connects Port P1 on the VMware ESXi host to Controller B on the storage system.

 Table 3-2 Cable connection description (two-controller storage)

#### Multi-Controller Storage

The following uses Huawei OceanStor 18800 V3 (four-controller) as an example to explain how to directly connect a VMware ESXi host to a multi-controller storage system through FC multi-path connections, as shown in Figure 3-2.



Figure 3-3 Direct FC multi-path connections (four-controller storage)

In this connection diagram, each of the four controllers is connected to a host HBA port with an optical fiber. The cable connections are detailed in Table 3-3.

Table 3-3	Cable connectio	n description	(four-control	ler storage)
-----------	-----------------	---------------	---------------	--------------

Cable No.	Description
1	Connects Port P0 on the VMware ESXi host to Controller A on the storage system.
2	Connects Port P1 on the VMware ESXi host to Controller B on the storage system.
3	Connects Port P2 on the VMware ESXi host to Controller C on the storage system.
4	Connects Port P3 on the VMware ESXi host to Controller D on the storage system.

## 3.2.2 Switch-Based FC Connections

Huawei provides two-controller and multi-controller storage systems, which connect to VMware ESXi hosts through FC multi-path connections using a switch in different ways.

#### **Two-Controller Storage**

The following uses Huawei OceanStor 5500 V3 as an example to explain how to connect a VMware ESXi host to a two-controller storage system through FC multi-path connections using a switch, as shown in Figure 3-3.



Figure 3-4 Switch-based FC multi-path connections (two-controller storage)

#### 

In this connection diagram, two controllers of the storage system and two ports of the VMware ESXi host are connected to the FC switch through optical fibers. On the FC switch, the ports connecting to the storage controllers and to the VMware ESXi host are grouped in a zone, ensuring connectivity between the host ports and the storage.

Zone Name	Zone Members	Zone Description
Zone001	Ports 1 and 2	Connects Port P0 on the VMware ESXi host to Controller A on the storage system.
Zone002	Ports 3 and 4	Connects Port P1 on the VMware ESXi host to Controller B on the storage system.
Zone003	Ports 1 and 4	Connects Port P0 on the VMware ESXi host to Controller B on the storage system.
Zone004	Ports 3 and 2	Connects Port P1 on the VMware ESXi host to Controller A on the storage system.

Table 3-4 Zone division on the FC switch (two-controller storage)

#### 

Zone division in this table is for reference only. Plan zones based on site requirements.

#### Multi-Controller Storage

The following uses Huawei OceanStor 18800 V3 (four-controller) as an example to explain how to connect a VMware ESXi host to a four-controller storage system through FC multi-path connections using a switch, as shown in Figure 3-4.



Figure 3-5 Switch-based FC multi-path connections (four-controller storage)

In this connection diagram, four controllers of the storage system and two ports of the VMware ESXi host are connected to the FC switch through optical fibers. On the FC switch, the ports connecting to the storage controllers and to the VMware ESXi host are grouped in a zone, ensuring connectivity between the host ports and the storage.

Zone Name	Zone Members	Zone Description
Zone001	Ports 1 and 3	Connects Port P0 on the VMware ESXi host to Controller A on the storage system.
Zone002	Ports 1 and 4	Connects Port P0 on the VMware ESXi host to Controller B on the storage system.
Zone003	Ports 1 and 5	Connects Port P0 on the VMware ESXi host to Controller C on the storage system.
Zone004	Ports 1 and 6	Connects Port P0 on the VMware ESXi host to Controller D on the storage system.
Zone005	Ports 2 and 3	Connects Port P1 on the VMware ESXi host to Controller A on the storage system.

 Table 3-5 Zone division on the FC switch (four-controller storage)

Zone Name	Zone Members	Zone Description
Zone006	Ports 2 and 4	Connects Port P1 on the VMware ESXi host to Controller B on the storage system.
Zone007	Ports 2 and 5	Connects Port P1 on the VMware ESXi host to Controller C on the storage system.
Zone008	Ports 2 and 6	Connects Port P1 on the VMware ESXi host to Controller D on the storage system.

Zone division in this table is for reference only. Plan zones based on site requirements.

# 3.2.3 Direct iSCSI Connections

Huawei provides two-controller and multi-controller storage systems, which directly connect to VMware ESXi hosts through iSCSI multi-path connections in different ways.

#### **Two-Controller Storage**

The following uses Huawei OceanStor 5500 V3 as an example to explain how to directly connect a VMware ESXi host to a two-controller storage system through iSCSI multi-path connections, as shown in Figure 3-5.

Figure 3-6 Direct iSCSI multi-path connections (two-controller storage)



#### 

In this connection diagram, each of the two controllers is connected to a port on the host network adapter with a network cable. The IP address plan is detailed in Table 3-6.

Table 3-6 IP address	plan for direct iSCS	I multi-path connections	(two-controller storage)
----------------------	----------------------	--------------------------	--------------------------

Port Name	Port Description	IP Address	Subnet Mask
Host.P0	Connects the VMware ESXi host to Controller A on the storage system.	192.168.5.5	255.255.255.0

Port Name	Port Description	IP Address	Subnet Mask
Host.P1	Connects the VMware ESXi host to Controller B on the storage system.	192.168.6.5	255.255.255.0
Storage.A.P0	Connects Controller A on the storage system to the VMware ESXi host.	192.168.5.6	255.255.255.0
Storage.B.P0	Connects Controller B on the storage system to the VMware ESXi host.	192.168.6.6	255.255.255.0

IP addresses in this table are for reference only. Plan IP addresses based on site requirements.

#### Multi-Controller Storage

The following uses Huawei OceanStor 18800 V3 (four-controller) as an example to explain how to directly connect a VMware ESXi host to a multi-controller storage system through iSCSI multi-path connections, as shown in Figure 3-6.

Figure 3-7 Direct iSCSI multi-path connections (four-controller storage)



#### 

In this connection diagram, each of the four controllers is connected to a port on host network adapters with a network cable. The IP address plan is detailed in Table 3-7.

Port Name	Port Description	IP Address	Subnet Mask
Host.P0	Connects the VMware ESXi host to Controller A on the storage system.	192.168.5.5	255.255.255.0
Host.P1	Connects the VMware ESXi host to Controller B on the storage system.	192.168.6.5	255.255.255.0
Host.P2	Connects the VMware ESXi host to Controller C on the storage system.	192.168.7.5	255.255.255.0
Host.P3	Connects the VMware ESXi host to Controller D on the storage system.	192.168.8.5	255.255.255.0
Storage.A.P0	Connects Controller A on the storage system to the VMware ESXi host.	192.168.5.6	255.255.255.0
Storage.B.P0	Connects Controller B on the storage system to the VMware ESXi host.	192.168.6.6	255.255.255.0
Storage.C.P0	Connects Controller C on the storage system to the VMware ESXi host.	192.168.7.6	255.255.255.0
Storage.D.P0	Connects Controller D on the storage system to the VMware ESXi host.	192.168.8.6	255.255.255.0

 Table 3-7 IP address plan for direct iSCSI multi-path connections (four-controller storage)

IP addresses in this table are for reference only. Plan IP addresses based on site requirements.

# 3.2.4 Switch-Based iSCSI Connections

Huawei provides two-controller and multi-controller storage systems, which connect to VMware ESXi hosts through Ethernet switches in different ways.

#### **Two-Controller Storage**

The following uses Huawei OceanStor 5500 V3 as an example to explain how to connect a VMware ESXi host to a two-controller storage system through iSCSI multi-path connections using an Ethernet switch, as shown in Figure 3-7.



Figure 3-8 Switch-based iSCSI multi-path connections (two-controller storage)

#### 

In this connection diagram, two controllers of the storage system and two ports of the VMware ESXi host network adapter are connected to the Ethernet switch through network cables. IP addresses of the ports on the storage and host are in the same subnet, ensuring connectivity between the host ports and the storage.

<b>Table 3-8</b> IP address plan for switch-based iSCSI multi-path connections (two-controller storage
--------------------------------------------------------------------------------------------------------

Port Name	Port Description	IP Address	Subnet Mask
Host.P0	Connects the VMware ESXi host to Controller A on the storage system.	192.168.5.5	255.255.255.0
Host.P1	Connects the VMware ESXi host to Controller B on the storage system.	192.168.6.5	255.255.255.0
Storage.A.P0	Connects Controller A on the storage system to the VMware ESXi host.	192.168.5.6	255.255.255.0
Storage.B.P0	Connects Controller B on the storage system to the VMware ESXi host.	192.168.6.6	255.255.255.0

## 

IP addresses in this table are for reference only. Plan IP addresses based on site requirements.

#### Multi-Controller Storage

The following uses Huawei OceanStor 18800 V3 (four-controller) as an example to explain how to connect a VMware ESXi host to a multi-controller storage system through iSCSI multi-path connections using an Ethernet switch, as shown in Figure 3-8.





#### 

In this connection diagram, four controllers of the storage system and four ports of the VMware ESXi host network adapters are connected to the Ethernet switch through network cables. IP addresses of the ports on the storage and host are in the same subnet, ensuring connectivity between the host ports and the storage.

Table 3-9 IP address plan for switch-based iSCSI multi-path connections (four-controller storage)

Port Name	Port Description	IP Address	Subnet Mask
Host.P0	Connects the VMware ESXi host to Controller A on the storage system.	192.168.5.5	255.255.255.0
Host.P1	Connects the VMware ESXi host to Controller B on the storage system.	192.168.6.5	255.255.255.0
Port Name	Port Description	IP Address	Subnet Mask
--------------	----------------------------------------------------------------------------	-------------	---------------
Host.P2	Connects the VMware ESXi host to Controller C on the storage system.	192.168.7.5	255.255.255.0
Host.P3	Connects the VMware ESXi host to Controller D on the storage system.	192.168.8.5	255.255.255.0
Storage.A.P0	Connects Controller A on the storage system to the VMware ESXi host.	192.168.5.6	255.255.255.0
Storage.B.P0	Connects Controller B on the storage system to the VMware ESXi host.	192.168.6.6	255.255.255.0
Storage.C.P0	Connects Controller C on the storage system to the VMware ESXi host.	192.168.7.6	255.255.255.0
Storage.D.P0	Connects Controller D on the storage system to the VMware ESXi host.	192.168.8.6	255.255.255.0

# 

IP addresses in this table are for reference only. Plan IP addresses based on site requirements.

# **4** Preparations Before Configuration

# 4.1 Switch

Ensure that the switches are running properly and their ports have the necessary licenses and transmit data normally. Figure 4-1 shows an example of a port failure due to lack of a license.

#### Figure 4-1 Switch port status

14(0×E)	0×010E00	port14	U-Port	N16	Disabled			
15(0xF)	0x010F00	port15	U.Deet	ыне	Dissblad			
16(0x10)	0x011000	port16	Port(s) Action Failed		<u>×</u>			
17(0x11)	0x011100	port17	Ever when each	Error when enabling/disabling port 14 - Port enable failed because of no license				
18(0x12)	0x011200	port18	Error when enab					
19(0x13)	0x011300	port19						
20(0x14)	0x011400	port20		OK				
21(0x15)	0x011500	port21						
22(0x16)	0x011600	port22						
23(0×17)	0x011700	port23	U-Port	N16	Disabled			

It is recommended that you obtain the product documentation of the switches for reference.

# 4.2 Storage System

Create disk domains, storage pools, LUNs, hosts, and mapping views on the storage system according to your service requirements. For details about these operations, see the *Basic Storage Service Configuration Guide* corresponding to your storage system.

# 4.3 Host

Before connecting a host to a storage system, you need to start the ESXi Shell and SSH services, verify that the host HBAs are identified and working correctly, and obtain the WWNs of HBA ports. The WWNs will be used in subsequent configuration on the storage system.

# 4.3.1 Enabling the Shell and SSH Services for the ESXi Hosts

Enable ESXi Shell and SSH respectively, as shown in Figure 4-2. If you do not need the Shell and SSH services any more, you can disable the services.

Getting Started Su	mmary Virtual Machines Performance Configuration Tasks & Events Alarms Permissions Maps Storage Views Hardware Status UltraPath 👍 Þ
Hardware	Services Properties
Processors Memory	Remote Access Refresh Properties2
Storage Networking Storage Adapter Network Adapte	By default, remote clents are prevented from accessing services on this host, and local clents are prevented from accessing services on remote hosts. Unless configured otherwise, daemons will start automatically.
Advanced Settin Power Managem	Label Daemon Annual Stream Ann
Software Licensed Feature Time Configurat DNS and Routing Authentication S Power Managem Virtual Machine S Virtual Machi	btd       Status       Stoped         ypsa       Stoped       Stoped         Status       Stoped       Status         Status       Stoped       Status         Status       Stoped       Status         Status       Status       Stoped         Status       Status       Status         Service Insolution       Status       Stop         Service:       Es       Status         Padage Information:       The       OK & Cancel         Help       Service       Help
Status	

# 4.3.2 Disabling ATS Heartbeat

VMware ESXi 5.5 Update 2, ESXi 6.0, and later versions support VAAI ATS Heartbeat, which may cause the host to lose connectivity to datastores under certain conditions. For details, see VMware KB ESXi host loses connectivity to a VMFS3 and VMFS5 datastore (2113956). Huawei recommends that you disable ATS Heartbeat on VMware ESXi 5.5 Update 2, ESXi 6.0, and later versions. Versions earlier than ESXi 5.5 Update 2 do not support this function and you can skip this operation.

To disable ATS Heartbeat, perform the following steps:

Step 1 Log in to the ESXi host using SSH and run the following command to disable ATS Heartbeat:

#esxcli system settings advanced set -i 0 -o /VMFS3/UseATSForHBOnVMFS5

Step 2 Verify the result. If ATS Heartbeat has been disabled, the value of /VMFS3/UseATSForHBOnVMFS5 is 0.

#esxcli system settings advanced list -o /VMFS3/UseATSForHBonVMFS5
Path: /VMFS3/UseATSForHBOnVMFS5
Type: integerInt Value: 0 <--- check this valueDefault
Int Value: 1
Min Value: 0
Max Value: 1
String Value: Default
String Value:
Valid Characters:Description: Use ATS for HB on ATS supported VMFS5 volumes</pre>

#### ----End

# 4.3.3 Identifying HBAs

After an HBA is installed on a host, view information about the HBA on the host. Go to the page for configuration management and choose **Storage Adapters** in the navigation tree. In the function pane, hardware devices on the host are displayed, as shown in Figure 4-3.

Figure 4-3 Viewing the HBA information



# 4.3.4 Querying HBA Priorities

After a host identifies a newly installed HBA, you can view properties of the HBA on the host.

The method of querying HBA information varies with operating system versions. The following details how to query HBA information on ESXi 5.5 and versions earlier than ESXi 5.5.

#### Versions Earlier than VMware ESXi 5.5

The command for viewing the HBA properties varies according to the HBA type. The details are as follows:

QLogic HBA

The command syntax is as follows:

cat /proc/scsi/qla2xxx/N

The command return provides information such as the HBA driver version, topology, WWN, and negotiated rate.

Emulex HBA

The command syntax is as follows:

cat /proc/scsi/lpfcxxx/N

The command return provides information such as HBA model and driver.

Brocade HBA

cat /proc/scsi/bfaxxx/N

#### VMware ESXi 5.5 and Later Versions

Since VMware ESXi 5.5, the /**proc/scsi**/ directory contains no content. Run the following commands to query HBA information:

~ # esxcli storage core	adapter list	
HBA Name Driver Lin	nk State UID	Description
vmhba0 ata_piix lin	uk-n/a sata.vmhba0	(0:0:31.2) Intel
Corporation ICH10 4 port	t SATA IDE Controller	
vmhbal hpsa link	k-n/a sas.5001438017531290	(0:5:0.0)
Hewlett-Packard Company	Smart Array P410i	
vmhba2 qlnativefc lin	nk-up fc.2000000e1e1aa2f0:2100000e1e	laa2f0 (0:11:0.0)
QLogic Corp 2600 Series	16Gb Fibre Channel to PCI Express HBA	
vmhba3 qlnativefc lin	nk-up fc.2000000elelaa2f1:2100000ele	laa2f1 (0:11:0.1)
QLogic Corp 2600 Series	16Gb Fibre Channel to PCI Express HBA	
vmhba32 bnx2i unbou	and iscsi.vmhba32	Broadcom iSCSI
Adapter		
vmhba33 bnx2i unbou	and iscsi.vmhba33	Broadcom iSCSI
Adapter		
vmhba34 bnx2i unbou	and iscsi.vmhba34	Broadcom iSCSI
Adapter		
vmhba35 bnx2i unbou	und iscsi.vmhba35	Broadcom iSCSI
Adapter		
vmhba36 ata_piix link-r	1/a sata.vmhba36	(0:0:31.2) Intel
Corporation ICH10 4 port	t SATA IDE Controller	

You can run the following command to obtain more HBA details:

# /usr/lib/vmware/vmkmgmt\_keyval/vmkmgmt\_keyval -a

For more information, visit:

http://kb.vmware.com/selfservice/microsites/search.do?language=en\_US&cmd=displayKC&e xternalId=1031534

For details about how to modify the HBA queue depth, visit:

http://kb.vmware.com/selfservice/microsites/search.do?language=en\_US&cmd=displayKC&e xternalId=1267



# 5.1 Establishing Fibre Channel Connections

# 5.1.1 Host Configuration

Query the HBA WWN. Figure 5-1 provides an example.

Figure 5-1 Querying the WWN of the host HBA

Health Status									Ad5	Remove	Refresh	1
Processors Memory Storage Networking Storage Adapters Network Adapters Advanced Settings Homer Hanagement Lucessel Patanes Tima Carliguistion DEG and Posting Extender Senters	Device 631458/6524581 DE Control © writeal © writeal © writeal © writeal © writeal De PIPE 6/6 Interpated © writeal	Type for Biod SCSI Biod SCSI and to PCI Express Pitre Channel Pitre Channel SCSI	WWW HEA 20:00:00:10:32:00:42:32 21 20:01:00:10:32:20:42:20:21	00.00:16:32.04/f2.2a /01.00:16:32.04/f2.2a					edd	Kemuvē	Katresh	
Visual Mischine Startup (Dubdown Vistual Mischine Swapfle Location Security Indfe Host Cache Configuration System Resource Allocation Agent VM Settings Advanced Settings	Details vmhba2 Node: 15P2432-based 42 WWV: 2010001:1b32404 Torgets: 1 Device Verse Televice Pathol	Fibre Channel to PCI 12:2a 21:00:00:1b:32 s: 8 Path	Express HBA Clarf2:2a s: 0									
	Name			Durdine Name	Countries Sala	TOW	Tupe	Drive Type	Transmor	e 1.	Canada	-
	HJAWEI Fibre Channel Disk (na	.63030371003030371	0006627500000007)	vmhba2:00:T0:L0	Mounted	0	disk	Non-SSD	Fibre Ch	annel 1	100.00 G	849
	HUAWEI Fibre Channel Disk (na	.63030371003030371	00:3747500000000)	vnihba2:00:10:L1	Mounted	1	disk.	Non-SSD	Fibre Chi	annel 8	90.00 GB	MP.
	HUAWEI Fibre Channel Disk (na	.63030371003030371	00:383d300000001)	vmhba2:00:T0:L2	Mounted	2	disk	Non-SSD	Fibre Chi	arnel 8	85.00 GB	MP.
	HUAWEI Fibre Channel Disk (na	.63030371003030371	000646760000003)	vmhba2:00:10:L3	Mounted	3	dsk.	Non-SSD	Fibre Chi	arnel 1	2 00.001	49
	HUAWEI Fibre Channel Disk (na	.63030371003030371	000640a600000004)	vmhba2:00:70:L4	Mounted	4	disk.	Non-SSD	Fibre Chi	arnel 1	100.00 G	44
	[1] COLUMN TO STATISTICS (1997)	6909097100909032	0004554600000053	vmbba2-c0:10:15	Mounted	5	disk	Non-SSD	Fibre Ch	wood 1		
	HUAWEI Fibre Channel Disk (na	100000000000000000000000000000000000000	~~~~~								100.00.6	**
	HUAWEI Fibre Channel Disk (na HUAWEI Fibre Channel Disk (na	.63030371003030371	0006561600000006)	vmhba2:00:T0:L6	Mounted	6	disk	Non-SSD	Fibre Chi	annel 1	100.00 G	MP

# 5.1.2 (Optional) Switch Configuration

# 5.1.2.1 Querying the Switch Model and Version

Perform the following steps to query the switch model and version:

**Step 1** Log in to the Brocade switch from a web page.

On the web page, enter the IP address of the Brocade switch. The **Web Tools** switch login dialog box is displayed. Enter the account and password. The default account and password are **admin** and **password**. The switch management page is displayed.

# 

Web Tools works correctly only when Java is installed on the host. Java 1.6 or later is recommended.

Step 2 On the switch management page that is displayed, click Switch Information. The switch information is displayed.

Sv	vitch Events Switch Information	1
	Last updated at	Tue June 05 2012 03:06:34 GMT+00:00
Ξ	Switch	
	Name	SW300_1
	Status	Healthy
	Fabric OS version	v6.4.1a
	Domain ID	1(0x1)
	WWN	10:00:00:05:1e:dd:d5:8a
	Туре	71.2
	Role	Principal
Ξ	Ethernet	
	Ethernet IPv4	129.22.4.167
	Ethernet IPv4 netmask	255.255.0.0
	Ethernet IPv4 gateway	129.22.0.1
	Ethernet IPv6	None
Đ	FC	
•	Zone	
	Effective configuration	SS
Đ	Other	
ŧ	RNID	

Figure 5-2 Switch information

Note the following parameters:

- **Fabric OS version**: indicates the switch version information. The interoperability between switches and storage systems varies with the switch version. Only switches of authenticated versions can interconnect correctly with storage systems.
- **Type**: This parameter is a decimal consisting of an integer and a decimal fraction. The integer indicates the switch model and the decimal fraction indicates the switch template version. You only need to pay attention to the switch model. Table 5-1 describes the switch model mappings.
- Ethernet IPv4: indicates the switch IP address.

• **Effective configuration**: indicates the currently effective configurations. This parameter is important and is related to zone configurations. In this example, the currently effective configuration is **ss**.

Switch Type	Switch Name	Switch Type	Switch Name
1	Brocade 1000 Switch	64	Brocade 5300 Switch
2,6	Brocade 2800 Switch	66	Brocade 5100 Switch
3	Brocade 2100, 2400 Switches	67	Brocade Encryption Switch
4	Brocade 20x0, 2010, 2040, 2050 Switches	69	Brocade 5410 Blade
5	Brocade 22x0, 2210, 2240, 2250 Switches	70	Brocade 5410 Embedded Switch
7	Brocade 2000 Switch	71	Brocade 300 Switch
9	Brocade 3800 Switch	72	Brocade 5480 Embedded Switch
10	Brocade 12000 Director	73	Brocade 5470 Embedded Switch
12	Brocade 3900 Switch	75	Brocade M5424 Embedded Switch
16	Brocade 3200 Switch	76	Brocade 8000 Switch
17	Brocade 3800VL	77	Brocade DCX-4S Backbone
18	Brocade 3000 Switch	83	Brocade 7800 Extension Switch
21	Brocade 24000 Director	86	Brocade 5450 Embedded Switch
22	Brocade 3016 Switch	87	Brocade 5460 Embedded Switch
26	Brocade 3850 Switch	90	Brocade 8470 Embedded Switch
27	Brocade 3250 Switch	92	Brocade VA-40FC Switch
29	Brocade 4012 Embedded Switch	95	Brocade VDX 6720-24 Data Center Switch
32	Brocade 4100 Switch	96	Brocade VDX 6730-32 Data Center Switch
33	Brocade 3014 Switch	97	Brocade VDX 6720-60 Data Center Switch
34	Brocade 200E Switch	98	Brocade VDX 6730-76 Data

Table 5-1 Mapping between switch types and names

Switch Type	Switch Name	Switch Type	Switch Name
			Center Switch
37	Brocade 4020 Embedded Switch	108	Dell M8428-k FCoE Embedded Switch
38	Brocade 7420 SAN Router	109	Brocade 6510 Switch
40	Fibre Channel Routing (FCR) Front Domain	116	Brocade VDX 6710 Data Center Switch
41	Fibre Channel Routing, (FCR) Xlate Domain	117	Brocade 6547 Embedded Switch
42	Brocade 48000 Director	118	Brocade 6505 Switch
43	Brocade 4024 Embedded Switch	120	Brocade DCX 8510-8 Backbone
44	Brocade 4900 Switch	121	Brocade DCX 8510-4 Backbone
45	Brocade 4016 Embedded Switch	124	Brocade 5430 Switch
46	Brocade 7500 Switch	125	Brocade 5431 Switch
51	Brocade 4018 Embedded Switch	129	Brocade 6548 Switch
55.2	Brocade 7600 Switch	130	Brocade M6505 Switch
58	Brocade 5000 Switch	133	Brocade 6520 Switch
61	Brocade 4424 Embedded Switch	134	Brocade 5432 Switch
62	Brocade DCX Backbone	148	Brocade 7840 Switch

----End

# 5.1.2.2 Configuring Zones

Skip this section if you use direct connections.

Zone configuration is important for Fibre Channel switches. The configurations differ with the switch vendor, model, and version. For details, refer to the specific switch's *Configuration Guide*. The following explains the zone configuration procedure by using the Brocade 6510 switch as an example.

Step 1 Log in to the Brocade switch on a web browser.

On the web browser, enter the IP address of the Brocade switch and press **Enter**. The **Web Tools** switch login dialog box is displayed. Enter the account and password (**admin** and **password** by default) to log in.

#### Step 2 Check the port status on the switch.

In normal conditions, port indicators on the switch are steady green after the corresponding ports have been connected to hosts and storage arrays using optical fibers. This example uses ports 0, 1, 4, and 5, as shown in Figure 5-3.

#### Figure 5-3 Port status

Brocade 6510				
2 📑	4 5	20 30 60 70	8 9 10 11 0 12 0 13 0 19 0 15 0	16 0 1 20 0
	FF		FFUU	U
e 10101	FF		F/E U U U e	• U

#### Step 3 Go to the Zone Admin page.

Choose **Configure** > **Zone Admin** from the main menu of **Web Tools**.

#### Figure 5-4 Zone Admin page

<u>M</u> anage <u>V</u> iew	<u>Configure</u> Monitor <u>R</u> epo	orts <u>T</u> ools	
A Status	Switch Admin	A For	LogicalS
	Zone Admin		Logical 3
Switch View	V Switch Status Policy		
Fabric Tree	4 Swi	tch View	

Step 4 Check whether the switch has identified hosts and storage systems.

On the **Zone Admin** page, click the **Zone** tab. In **Member Selection List**, check whether all related ports have been identified, as shown in Figure 5-5.

Figure 5-5 Identified ports

t <u>E</u> dit <u></u>	View Zoning Actions
New	🔹 Resource View 👻 🍫 Refresh 💌 Enable Config 🛛 Save Config 🛛 Clear All
s Zo	ne Zone Config
me MCC	11 Vew Zone Delete Rename Clone
- Lorenza	
mber Se	lection List
E 🥥	1(SNS2248)(48 Ports)
E	1,0(port0, F-Port, PID: 010000)
10000	Emulex Corporation 20:00:00:10:9b:1c:82:f8
	Emulex Corporation 10:00:00:10:9b:1c:82:f8
E	1,1(port1,F-Port,PID: 010100)
1.000	Emulex Corporation 20:00:00:10:9b:1c:82:f9
	Emulex Corporation 10:00:00:10:9b:1c:82:f9
	1,2(port2,U-Port,PID: 010200)
-	
E	1,4(port4,F-Port,PID: 010400)
	E 🕼 [28] "HUAWEI XSG1 4303" 21:00:38:4c:4f:25:98:f7
	⊡ ④
E	1,5(port5,F-Port,PID: 010500)
1000	E 🚯 [28] "HUAWEI XSG1 4303" 21:00:38:4c:4f:25:98:f7
	⊡ 😧 🖲 [28] "HUAWEI XSG1 4303" 20:10:38:4c:4f:25:98:f7
-	1,6(port6,U-Port,PID: 010600)
	1 7(port7 II-Port PID: 010700)

In this example, the hosts use ports 0 and 1, while the storage systems use ports 4 and 5. The display indicates that the switch has correctly identified the devices connected by the four ports.

Step 5 Create a zone.

On the **Zone** tab page, click **New Zone** and enter a name (**Zone001** in this example). Add port 0 (connecting to port P0 of a host) and port 4 (connecting to controller A of a storage system) to this zone, as shown in Figure 5-6.

Figure 5-6 Creating a zone



Use the same method to create **Zone002** to **Zone004**. Add ports 1 and 5 to **Zone0002**, ports 0 and 5 to **Zone003**, and ports 1 and 4 to **Zone004**.

Step 6 Add the new zones to the configuration file and activate them.

On the Switch View tab page, identify the effective configuration file, as shown in Figure 5-7.

Figure 5-7 Effective configuration file

Manage ⊻iew <u>C</u> onfigure Monitor	Reports Tools	Interval 45 seconds Refre
Switch View Port Admin Nam Fabric Tree View by: Name Fabric SNS2248 Segmented Switches	e Server ≰ Switch View	
	Switch Events, Information Switch Events Switch Information Last updated at	ion 星期三十月 18 2017 13:30:21 G
	<ul> <li>★ Switch</li> <li>★ Ethernet</li> <li>★ FC</li> <li>★ Zone Effective configuration</li> <li>↓ Other</li> </ul>	New_config

On the **Zone Admin** page, click the **Zone Config** tab. In the **Name** drop-down list, choose the effective configuration file **New\_config**.

In **Member Selection List**, select **Zone001** to **Zone004** and add them to the configuration file.

Click **Save Config** to save the configuration and then click **Enable Config** for the configuration to take effect.

Figure 5-8 shows the configuration on the GUI.





Step 7 Verify that the configuration has taken effect.

On the **Name Server** tab page, verify that the ports have been added to the zones and the zones have taken effect (marked \* in the upper right corner), as shown in Figure 5-9.

Figure 5-9 Verifying the configuration

Manage	⊻iew	<u>C</u> onfigu	re M <u>o</u> nitor	<u>Reports</u> Tools				_		_			_	
A Sta	atus	🔿 Tem	p 🛆 Pow	er 🛆 Fan		Auto	Refresh Interva	45	seconds R	efresh Now	Lo	gical Switch 128 -	SNS2248 🔻	
Switch	View	Port Ad	min Name :	Server										
														Number of Devices: 6
nain	User	Port #	Port ID	Device Node			. WWN Compa	Port T.	Device Port	Device Name	C	F NPIV(or)Virtu	Host vs. Tar	Member Of Zones
x1)	0		0x010000	20:00:00:10:.			Emulex Corp	N	10:00:00:10:	Emulex LPe1	NS	Physical	Initiator	MCCI1, fyc1, Zone003*, Zone001
x1)	4		0x010400	21:00:38:4c:.				N	20:00:38:4c:	HUAWEI XS	NS	Physical	Initiator+Target	fyc5, Zone004*, Zone001*
x1)	8		0x010800	20:01:00:1b:.			QLogic Corp	N	21:01:00:1b:		NS	Physical	Initiator	MCCI3, MCCI5
x1)	1		0x010100	20:00:00:10:.			Emulex Corp	N	10:00:00:10:	Emulex LPe1	NS	Physical	Initiator	fyc2 Zone004*, Zone002*
x1)	9		0x010900	20:00:00:1b:.			QLogic Corp	N	21:00:00:1b:		NS	Physical	Initiator	MCCI4, MCCI6
x1)	5		0x010500	21:00:38:4c:.				N	20:10:38:4c:	HUAWEI XS	NS	Physical	Initiator+Target	MCCI3, fyc6, Zone003*, Zone002*

----End

# 5.1.3 Storage System Configuration

This section details how to add initiators to the hosts on the storage system. For other storage configurations, see the *Basic Storage Service Configuration Guide* corresponding to your storage system.

Step 1 Log in to the storage system on a web browser.

After you have configured the zones on the switch, log in to DeviceManager of the storage system and choose **Provisioning** > **Host** > **Initiator**. On the page that is displayed, select **FC** from the **Initiator Type** drop-down list. Check whether the host initiators have been discovered.

As shown in Figure 5-10, the host initiators have been discovered and are online.

#### Figure 5-10 Viewing initiators

쌢   OceanStor D	eviceManager			🝓 🔹 Alarms: [ 🔕	Critical 0 👩 Major 17 🔒 Warning
Huawei.Storage > P	rovisioning > Host				
Host Host Grou	p Initiator				
Initiator Type: FC					
Create Delete	Properties Associate Host Ca	ncel Host Association Refresh		WWPN/IQN + Enter	a keyword Search Advance
Type	Alias	WWPN/IGN	Status	Associated Host	Associated Host Name
E FC		10008c7cff166900	Online	No	
E FC		21000024ff02eb80	Online	No	
FC FC		21000024ff200e9f	Online	No	
FC FC		21000024#372000	Online	No	
FC FC		21000024#53332c	Online	No	
FC FC		21000024#53332d	Online	No	

Step 2 Click the Host tab, select the host that was created on the storage system, and click Add Initiator.

Figure 5-11 Add Initiator dialog box



Step 3 Select FC from the Initiator Type drop-down list and find the host initiators' WWNs.

#### Figure 5-12 Selecting initiators

dd Initiator to Host esxi	3
elect initiators that you want to add to the host. You can also c	reate, delete, or modify initiators.
variable initiators	
Initiator Type: FC 💌	WWPN/IQN - Enter a keyword Search
Type WWPN/IQN	Status 💝
FC 2100024#02eb80	Online
FC 21000024ff200e9f	Online
FC 21000024ff372000	Online
FC 21000024ff53332c	Online
1/1 P Entries, 0 Selected	
¥ [	Create Delete Properties
elected Initiators	Create Delete Properties
elected Initiators	Create Delete Properties
elected Initiators	Create Delete Properties
elected Initiators           Type         WWPN/IQN           No da	Create Delete Properties
elected Initiators           Type         WWPN/IGN           No date           11/1         >           0 Entries, 0 Selected	Create Delete Properties

Step 4 Select the host initiators and add them to Selected Initiators.

Figure 5-13 Adding initiators

Initiator Type: FC	•	WWPN/IQN - Enter a keyword	Search
Type	WWPN/IQN	Status	
FC FC	10008c7cff166900	Online	
FC	21000024ff02eb80	Online	
FC FC	21000024ff533332c	Online	
FC FC	21000024ff53332d	Online	
< 1/1 ·	> 7 Entries, 0 Selected		
elected Initiator:	S	Create Delete Pri	operties
elected Initiators	S	Create Delete Pr	operties Search
elected Initiators	s WWPNJON	Create Delete Pro	operties Search
elected Initiators	S VWVPN/ION 21000024ff200e9f	Create Delete Pro	sperties Search
ielected Initiators Type FC FC FC	5 VWVPN/IQN 21000024ff200e9f 21000024ff372000	Create Delete Pr	Search
ielected Initiator: Type FC FC	5 VWVPNJQN 21000024ff372000	Create Delete Pr	Search
Type     FC     FC	5 VWVPNJQN 21000024#372000	Create Delete Pr	Search

Step 5 Verify that the initiators have been added to the host correctly.

Figure 5-14 Verifying the configuration

	Manager			🍓 * Alarma	c 🚺 Critical O	OM	ajór 17
<ul> <li>Huawei.Storage &gt; Provision</li> </ul>	ing > Host						
Host Host Group	nitiator						
🕻 Automatic scanning for hosts	is Disabled . You can click Parameter	r Settings to modify the settings.					
Create + Delete Pr	operties Add Initiator Rem	nove Initiator Refresh			Name *	Enite	rr a keywo
📝   Name	Status	OS	IP Address	Added to Host Group			Nu
📝 esxi	Normal	VMware ESX		Yes			
( 1/1 + )) 1 Entrie	is, 1 Selected		8				
Initiator Mapped LUNs	is, 1 Selected Mapped Snapshots Pa	th	a				
Initiator Mapped LUNs Remove Properties	is, 1 Selected Mapped Snapshots Pa Refresh	th	8		WWPMION		Enter a k
Initiator     Mapped LUks       Remove     Properties       Type	is, 1 Selected Mapped Snapshots Pa Refresh	មា	ex WWPMDN	s	WWPMON atus		Entèr a è
Initiator     Mapped LUNs       Remove     Properties       Type     FC	is, 1 Selected Mapped Snapshots Pa Refresh	th	CX VAVIPADON 21000024f200e9f	51	WWPMON stus	•	Enter a k

As shown in Figure 5-14, the initiators have been added to the host successfully. The initiator properties depend on the operating system and multipathing software used by the hosts. For details, see the storage-side configuration in the multipathing configuration section. After the initiators have been configured, you can scan for LUNs on the hosts to discover storage resources.

----End

# 5.2 Establishing iSCSI Connections

Before establishing an iSCSI connection between a host and a storage system, you need to configure the host and storage accordingly.

# 5.2.1 Host Configuration

# 5.2.1.1 Configuring Service IP Addresses

On VMware ESXi hosts, you can configure services IP addresses on a VMware host by adding virtual networks.

#### For vSphere Client

For vSphere Client, perform the following steps to configure services IP addresses:

- Step 1 In vSphere Client, choose Network > Add Network.
- Step 2 In Add Network Wizard that is displayed, select VMkernel, as shown in Figure 5-15

Figure 5-15 Adding VMkernel

Add Network Wizard		- 🗆
Connection Type Networking hardware	an be partitioned to accommodate each service that requires connectivity.	
Connection Type Network Access Connection Settings Summary	Connection Types Virtual Machine Add a labeled network to handle virtual machine network traffic. Virkernel The Virkernel TCP/IP stack handles traffic for the following ESX services: vSphere vMotion, ISCSI, NPS, and host management.	
Help	< Berk, Next > Can	icel

- Step 3 Click Next.
- Step 4 Select the iSCSI service network port, as shown in Figure 5-16

Figure 5-16 Creating a vSphere standard switch

etwork Access	Select which vSphere standard switch will handle vSphere standard switch using the unclaimed ne	the network tr twork adapters	affic for this connection. You may also create listed below.	a new
onnection Settings ummary	• Create a vSphere standard switch	Speed	Networks	
	Broadcom Corporation Broadcom N	etXtreme II E	CM5708 1000Base-T	
	vmnic1	1000 Full	100.115.0.1-100.115.255.254	
	Intel Corporation 82571EB Gigabit	Ethernet Cont	roller (Copper)	
	vmnic2	Down	None	
	vmnic3	Down	None	
	vmnic4	Down	None	
	Vmnic5	1000 Full	0.0.0.1-255.255.255.254	
	C Use vSwitch0	Speed	Networks	
	Preview:			
	-VMkemel 👳	Physical Adapters		

Step 5 Specify the network label, as shown in Figure 5-17

Figure 5-17 Specifying the network label

🛃 Add Network Wizard			_ 🗆 🗵
VMkernel - Connection S Use network labels to id	<b>iettings</b> dentify VMkernel connections while i	nanaging your hosts and datacenters.	
Connection Type Network Access Connection Settings IP Settings Summary	Port Group Properties	Writemel       None (0)       Use this port group for Vilotion       Use this port group for Fault Tolerance logging       Use this port group for management traffic	
	Network Type: Preview: VMikernel Port	P (Cefauk)	
Help		< Back Next >	Cancel

Step 6 Enter the iSCSI service IP address, as shown in Figure 5-18

🛃 Add Network Wizard			_ 🗆 ×
YMkernel - IP Connecti Specify VMkernel IP s	ion Settings ettings		
Connection Type Naturot: Access Connection Settings IP Settings Summary	C Obtain IP settings automatically C Use the following IP settings: IP Address: Subnet Mask: VMiernel Default Gateway:	20     .20     .21       255     .255     .0     .0       100     .115     .0     .1	Edk
	VMkernel Q. 20.20.20.21	Physical Adapters	
Help		< Back	Next > Cancel

Figure 5-18 Entering the iSCSI service IP address

Step 7 Confirm the information that you have configured, as shown in Figure 5-19

Figure 5-19	Information	summary
-------------	-------------	---------

🛃 Add Network Wizard	
Ready to Complete Verify that all new and mo	dified vSphere standard switches are configured appropriately.
Connection Type Network Access	Host networking will include the following new and modified standard switches: Preview:
(B) <u>Connection Settings</u> Summary	Vfflernel 20.20.20.21
Help	< Back Finish Cancel

- **Step 8** For a single-path network, the configuration is completed. For a multi-path network, proceed with the next step.
- Step 9 Repeat steps 1 to 6 to create another virtual network.

Figure 5-20 shows the configuration completed for a multi-path network.

Figure 5-20 iSCSI multi-path network with dual adapters

Getting Started 🔪 Summary 🔪 Virtual Mac	hines 🔍 Resource Allocation 🔪 Performance 🤇	Configuration Local Users & Groups Events Permissions
Hardware	View: vSphere Standard Switch	
Health Status	Networking	
Processors		
Memory	Standard Switch: vSwitch0	Remove Properties
Storage	Virtual Machine Port Group	Durrical Adapters
<ul> <li>Networking</li> </ul>	VM Network 😏	🖡 🖕 📲 vmnic0 1000 Full 🔛
Storage Adapters	<ul> <li>1 virtual machine(s)</li> </ul>	
Network Adapters	oel 🚹	
Advanced Settings	-VMkemel Port	
Power Management	🖓 Management Network 🧕	<b>↓</b> ↓
	vmk0 : 100.115.1.1	
Software	fe80::21e:4fff:fe1c:3a06	
Licensed Features		
Time Configuration	Standard Switch: vSwitch1	Remove Properties
DNS and Routing	Utilianal Dat	Dhurical Adaptor
Authentication Services	VMkernel 😡	missia Adaptes
Virtual Machine Startup/Shutdown	vmk1 : 20.20.20.21	
Virtual Machine Swapfile Location		
Security Profile		
Host Cache Configuration	Standard Switch: vSwitch2	Remove Properties
System Resource Allocation	-VMkernel Port	Physical Adapters
Agent VM Settings	🖓 VMkernel 2 🧕	🔸 🖕 💀 vmnic2 1000 Full 🖓
Advanced Settings	vmk2:10.10.10.21	

----End

#### For vSphere Web Client

For vSphere Web Client, perform the following steps to configure services IP addresses:

Step 1 In vSphere Web Client, click Hosts and Clusters on the Home page.

Figure 5-21 Home page on vSphere Web Client

<b>m</b> ware <sup>,</sup> vSphere Web Cl	ient <b>n</b> ≘						
Navigator 🗸	付 Home						
🔹 History 💽 🕑	Home						
ሰ Home	Inventories						
Venter Inventory Lists					Q		
Storage     Networking	VCenter Inventory Lists	Hosts and Clusters	VMs and Templates	Storage	Networking	Content Libraries	F
Policies and Profiles	S S					E.	
VRealize Orchestrator	Task Console	Event Console	vRealize Operations Manager	Host Profiles	VM Storage Policies	Customization Specification Manager	
😨 Tasks 🔂 Log Browser	Administration	_					
Tags	- 🌮	Funtam		Customer			
Q New Search	Roles	Configuration	Licensing	Experience			

Step 2 Select the target host, click the Manage tab, and then click the Networking tab.

Figure 5-22 Navigating to the Networking tab page

vmware <sup>®</sup> vSphere Web Cli	ent <b>f</b> i≣		
Navigator I	🚺 100.115.4.186 Actions 👻		
Home 🕨 🔊	Getting Started Summary Mo	nitor Manage Related Objects	
VC60.certification.com	Settings Networking Storage	Alarm Definitions Tags Permissions	
↓ Datacenter     ↓ Datacenter     ↓ Uniter     ↓	••	Virtual switches	
on 100.115.4.186 👌	Virtual switches	92 😥 🐺 🕾 🥒 🗙 🚯	
100.115.4.188	VMkernel adapters	Switch	Discovered Issues
<ul> <li>Analypeng</li> <li>Analypeng</li> <li>Interview (121) Virtual Machines</li> </ul>	Physical adapters	1 vSwitch0	
	TCP/IP configuration	1 vSwitch1	
🎒 redhat_5vm (disconne	Advanced	VSwitch2	
局新建虚拟机 (disconne			
▼ 100.115.77.44 (disconne		Standard switch: vSwitch0 (Management Network)	

Step 3 Add VMkernel adapters.

Figure 5-23 Adding VMkernel adapters

/m/ware <sup>,</sup> vSphere Web Client							
Navigator I	😺 100.115.4.186 Actions 👻						
( Home ) 🔊	Getting Started Summary Monitor Manage Related Objects						
Image: Construction         Image: Construction           ✓         Image: Construction	Settings Networking Storage Aam Definitions Tags Permissions  Virtual switches						
100.115.4.188 Anappend	VMkernel adapters Device Network Label Switch IP Address						
<ul> <li>(121) Virtual Machines</li> <li>100.115.130.78 (not resp</li> </ul>	Physical adapters         Image: Management Netw         Image: Man						

**Step 4** In the displayed Add Networking page, select the VMkernel Network Adapter option in the 1 Select connection type.

Figure 5-24 Selecting the connection type

100.115.4.186 - Add Networkin	g (?
1 Select connection type 2 Select target device	Select connection type Select a connection type to create.
3 Connection settings 3a Port properties 3b IPv4 settings	<ul> <li>VMIkernel Network Adapter The VMIkernel TCP/IP stack handles traffic for ESXI services such as vSphere vMotion, ISCSI, NFS, FCoE, Fault Tolerance, Virtual SAN and host management.</li> </ul>
4 Ready to complete	<ul> <li>Physical Network Adapter</li> <li>A physical network adapter handles the network traffic to other hosts on the network.</li> </ul>
	A port group handles the virtual machine traffic on standard switch.
	Back Next Finish Cancel

Step 5 In 2 Select target device, select the New standard switch option and click Next.

#### Figure 5-25 Selecting the target device

100.115.4.186 - Add Networking	(?
<ul> <li>1 Select connection type</li> <li>2 Select target device</li> </ul>	Select target device Select a target device for the new connection.
2 Select target device 3 Create a Standard Switch 4 Connection settings 4 a Port properties 4 b IPv4 settings 5 Ready to complete	Select an existing standard switch Browse New standard switch
	Back Next Finish Cancel

Step 6 In 3 Create a Standard Switch, add physical adapters and click Next.

Figure 5-26 Adding a	physical	adapter
----------------------	----------	---------

100.115.4.186 - Add Networking					?
1 Select connection type	Create a Standard Swit Assign free physical net	ch work adapters to the new s	witch.		
2 Select target device     3 Create a Standard Switch     4 Connection settings     4a Port properties     4b IPv4 settings     5 Ready to complete	Assigned adapters: Active adapters Standby adapters Unused adapters	Add Physical Adapters t Failover order group: ( Network Adapters:	o the Switch       Active adapters       Image: All properties       CDP       Adapter	LDP Broadcom Corporation	
			Name Location Driver	OK Cancel	
			Bac	k Next Finish	Cancel

Step 7 Set port properties and click Next.

#### Figure 5-27 Setting port properties

1 Select connection type     2 Select target device	Port properties Specify \%&emei port settin	ngs.
<ul> <li>3 Create a Standard Switch</li> <li>4 Connection settings</li> <li>4a Port properties</li> <li>4b IPv4 settings</li> <li>5 Ready to complete</li> </ul>	VMkernel port settings Network label: VLAN ID: IP settings: TCP/IP stack: Available services	Villiamel None (0) • IPv4 • Default •
	Enable senices:	VARIon traffic   Fault Tolerance logging   Management traffic   Vinual SAN traffic

Step 8 Specify the service IP address and click Next.

1 Select connection type 2 Select target device	IPv4 settings Specify \Mkemel IPv4 settings.		
3 Create a Standard Switch 4 Connection settings 4a Port properties	<ul> <li>Obtain IPv4 settings automative</li> <li>Use static IPv4 settings</li> </ul>	cally	
4b IPv4 settings	IFV4 address.	100 . 115 . 202 . 80	
5 Ready to complete	Subnet masic	255.255.0.0	
	Detault gateway for IPv4:	100,115.0.1	

Figure 5-28 Specifying the service IP address

Step 9 Confirm the information and click Finish.

Figure 5-29 Checking the settings

🔋 100.115.4.186 - Add Networking	0					(?
1 Select connection type     2 Select target device     3 Create a Standard Switch	Ready to complete Review your settings selections I	before finishing the wizard.				
4 Connection settings 4 a Port properties 4 b) IP-4 settings 5 Rendy to complete	Vers samodo smot. Assiped adapters: New port group: VLAVID: TCP/IP stack: VLAVID: TCP/IP stack: VLAVID: Fault Tolerance logging: Management traffic: IPV4 settings IPV4 address: Subnet mask:	viminta viminta Vitivimel None (0) Default Disabled Disabled Disabled Disabled 100,115,202,80 (static) 265,255.0.0				
			Back	Next	Finish	Cancel

Step 10 Confirm the information that you have configured, as shown in Figure 5-30.

🕜 Add Network Wizard	
Ready to Complete Verify that all new and n	nodified vSphere standard switches are configured appropriately.
Connection Type Network Access	Host networking will include the following new and modified standard switches: Preview:
Summary	Villemail Part Willemail 20.20.20.21
Help	< Back Finish Cancel

- **Step 11** If you only need to configure one path, the configuration is complete and you do not need to perform the next step. To configure multiple paths, proceed with the next step.
- **Step 12** Repeat the preceding steps to create another virtual network. Figure 5-31 shows a multi-path networking configuration.

Figure 5-31 Multi-path networking

	New York Contractory Contractory	_							
Navigator ¥	100.115.4.186 Actions -								
Home > 🕤	Getting Started Summary Mo	onitor Mana	ge Related Objects						
VC80.certification.com Datacenter Uluster Uluster	Settings Networking Storage	Aarm Defni	tions Tags Permissions dapters	]					
100.115.4.188	VMkernel adapters Physical adapters	Device	Network Label	Seitch	IP Address	TCP/IP Stade	vMotion Traffic		
<ul> <li>Inangpeng</li> <li>Inangpeng</li> <li>Inangpeng</li> </ul>		vmk0	9 Management Netw	1 vSwitch0	100.115.4.186	Default	Disabled		
<ul> <li>I 100 115 130 78 (not resp</li> </ul>	TCP/IP configuration	with	👤 villotion	Switch1	100.100.4.185	Default	Enabled		
🗿 redhat_5vm (disconne	Advanced	M vmk2	9 ISCSI1	1 vSwitch1	95.95.95.186	Default	Disabled		
曲 新建组织机 (disconne		💌 vmk5	👤 iscsi97	む vSwitch0	97.97.97.186	Default	Disabled		
<ul> <li>I00 115 77 44 (disconne</li> <li>RHEL-6 5 (disconnect)</li> </ul>		🕅 vmk3	🙎 VMkernel	看 vSwitch3	100.115.202.80	Default	Disabled		
di vm1 (disconnected)		4							

----End

# 5.2.1.2 Configuring Host Initiators

Host initiator configuration includes creating host initiators, binding initiators to virtual networks created in section 5.2.1.1 Configuring Service IP Addresses, and discovering targets.

In VMware ESX 4.1 and earlier versions, storage adapters have iSCSI adapters. You only need to enable those adapters. In VMware ESXi 5.0 and later versions, you need to manually add iSCSI initiators.

#### VMware ESXi 5.0

This section uses VMware ESXi 5.0 as an example to explain how to configure host initiators.

Step 1 Choose Storage Adapters and right-click the function pane, as shown in Figure 5-32

Figure 5-32 Adding storage adapters

tting Started 🔍 Summary 🔧 Virtual Mach	ines 🔍 Resource Allocation 🔍 Performa	ance Configuration	Local Users & Groups Events Perm	nissions				1
ardware	Storage Adapters							
Health Status Processors Memory Storage Networking • Storage Adapters Network Adapters Advanced Settings	Device 631kESP/632xESB IDE Controll withba0 ISP2432-based 4Gb Fibre Chan withba2 withba2 Dell PERC 6/1 Integrated withba1	Type er Block SCSI Block SCSI anel to PCI Express Fibre Channel Fibre Channel SCSI	WWN HBA 20:00:00:1b:32:0af2:2a 21:00:00:1b:3 20:01:00:1b:32:2af2:2a 21:01:00:1b:3	32:0a:f2:2a 32:2a:f2:2a				
Software Licensed Features Time Configuration DNS and Routing Authentication Services Virtual Machine Startup/Shutdown Virtual Machine Startup/Shutdown		Add Software ISO Add Software FC	CSI Adapter					
Security Profile Host Cache Configuration System Resource Allocation Agent VM Settings Advanced Settings	Details View: Devices Paths							
	Name		Ru	ntime Name	Operational State	LUN	Туре	Drive

Step 2 Choose Add Software iSCSI Adapter from the shortcut menu. On the dialog box that is displayed, click OK, as shown in Figure 5-33

Figure 5-33 Adding iSCSI initiators

rdware	Storage Adapters			
Health Status	Device	Туре	WWN	
Processors	631xESB/632xESB IDE Contr	oller		
Memory	📀 vmhba0	Block SCSI		
terrore	O vmhba32	Block SCSI		
turaye	ISP2432-based 4Gb Fibre Ch	annel to PCI Express	HBA	
etworking	O vmhba2	Fibre Channel	20:00:00:1b:32:0a:f2:2a 21:00:00:1b:32:0a:f2:2a	
torage Adapters	📀 vmhba3	Fibre Channel	20:01:00:1b:32:2a:f2:2a 21:01:00:1b:32:2a:f2:2a	
letwork Adapters	Dell PERC 6/i Integrated			
Advanced Settings	📀 vmhba1	SCSI		
Power Management				
tware				
icensed Features				
Time Configuration				
DNS and Routing				
Authentication Services		Software iSCSI	Adapter	×
Virtual Machine Startup/Shutdown				
Virtual Machine Swapfile Location		🛕 A nev	v software iSCSI adapter will be added to the Storage	
Security Profile	Details	Adapl Adapl	ters list. After it has been added, select the software iSCSI	
Host Cache Configuration		config	juration.	
System Resource Allocation				
Agent VM Settings				
Advanced Settings			OK Cance	
	View: Devices Paths			
	Mamo		Duptime Name	Operational State 111N

The newly added iSCSI initiators are displayed, as shown in Figure 5-34

Figure 5-34 iSCSI Software Adapter

lware	Storage Adapters			
lealth Status	Device	Туре	WWN	
Processors	iSCSI Software Adapter			
Annon	📀 vmhba33	iSCSI	ign.1998-01.com.vmware:localhost-64692dc9:	1
ternory	631xE5B/632xE5B IDE Con	troller		-
orage	🕥 vmhba0	Block SCSI		
stwonang	📀 vmhba32	Block SCSI		
orage Adapters	ISP2432-based 4Gb Fibre	Channel to PCI Express	HBA	
etwork Adapters	S vmhba2	Fibre Channel	20:00:00:1b:32:0a:f2:2a 21:00:00:1b:32:0a:f2:2a	
dvanced Settings	🕥 vmhba3	Fibre Channel	20:01:00:1b:32:2a:f2:2a 21:01:00:1b:32:2a:f2:2a	
ower Management	Dell PERC 6/i Integrated			
vare	🕝 vmhba1	SCSI		
censed Features				
me Configuration				
IS and Routing				
uthentication Services				
irtual Machine Startup/Shutdown				
rtual Machine Swapfile Location				
curity Profile	Details			
st Cache Configuration				
stem Resource Allocation	vmhba33			
gent VM Settings	Model: iSC:	5I Software Adapter		
dvanced Settings	iSCSI Name: ign.	1998-01.com.vmware:loca	lhost-64692dc9	
	Gopperted Targetc: 0	Devices: 0	Pathe: 0	
	Connected rangets: 0	Dovices, U	100.01	
	View: Devices Paths			
	Name		Duntime Name	Operational State UUN

Step 3 Right-click a newly created iSCSI initiator and choose **Properties** from the shortcut menu, as shown in Figure 5-35

Figure 5-35 Initiator properties

Getting Started Summary Virtual Machin	nes Resource Allocation Perform	nance Configuration	Local Users & Groups Events Perm	issions			
Hardware	Storage Adapters						
Health Status Processors Memory Storage Networking • Storage Adapters Network Adapters Advanced Settings	Device ISCSI Software Adapter whba33 631xESB/632xESB IDE Cor whba32 ISP2432-based 4Gb Fibre Eha whba32 ISP2432-based 4Gb Fibre Eha whba3	Type Rescan Properties Remove ninel to PCI Express Fibre Channel Fibre Channel	WWN ign.1998-01.com.vmware.localhost-646 HBA 20:00:00:1b:32:0a/f2:2a 21:00:00:1b: 20:01:00:1b:32:2a/f2:2a 21:00:00:1b:	92dc9: 32:0a:f2:2a 32:2a:f2:2a			
Vower Inshagement Software Licensed Peatures Time Configuration DNS and Routing Authentication Services Virtual Machine Startup/Shutdown Virtual Machine Svarfile Location	Dell PERE 6/1 Integrated	SCSI					
Security Profile	Details						
Host Cache Configuration System Resource Allocation Agent VM Settings Advanced Settings	wmhba33           Model:         ISCST 5.           ISCST Name:         Isp. 199           ISCST Alas:         Connected Targets:         0           View:         Devices         Paths           Name         Image: Name         Image: Name	oftware Adapter 18-01.com.vmware:loca Devices: 0	host-64692dk9 Paths: 0 Ru	ntime Name	Operational State	LUN	Туре

Step 4 On the dialog box that is displayed, click the Network Configuration tab and click Add, as shown in Figure 5-36

Figure 5-36 iSCSI initiator properties

	Storage Adapters				
	Device	Туре	WWN		
	iSCSI Software Adap	ter			
	🕥 vmhba33 🚺	🚰 iSCSI Initiator (vmhba33)	Properties		
	631xESB/632xESB	General Network Configuratio	Dynamic Discovery   Static Di	scoverv	
	S vmhba0	unders all parts the design	1-0000000000000000000000000000000000000		1
	Vmhba32	vinkernei Port bindings:			
	ISP2432-Dased 4G	Port Group	VMkernel Adapter   Port	Group Policy   Path Status	
	ymhuaz				
	Dell PERC 6/i Integ				
	O vmhba1				
	l i i i i i i i i i i i i i i i i i i i				
				Add Remov	re l
		Williams I Dark Rinding Dataila			
		whiter her Port binding Details.			
hutdown					
.ocation					
	Details				
1	vmbba33				
on	Model:				
	iSCSI Name:				
	iSCSI Alias:				
	Connected Larger				
	View: Devices				
	Name				UIN Type
	Nume				Low Type
		I			
				Close	Help
	-				111
	•				

Step 5 Select a virtual network that you have created in section 5.2.1.1 Configuring Service IP Addresses and click **OK**, as shown in Figure 5-37.

Figure 5-37 Binding with a new VMkernel network adapter

evice	Type	WWN		
CSI Software Adan	er			tal
🜖 vmhba33 🛛 📕	🛃 Bind with VMkernel Ne	twork Adapter		
31×E5B/632×E5B wmhba0 wmhba32 5P2432-based 4G wmhba2 wmhba3	Only VMkernel adapte physical adapters are If a targeted VMkerne its effective teaming Select VMkernel adapter to	rs compatible with the iSCSI port bi listed. el adapter is not listed, go to Host > policy. bind with the iSCSI adapter:	inding requirements and available Configuration > Networking to updat	e
ell PERC 6/i Integ	Mapagement Network	(uSwitch0) umk0	Physical Adapter	
ovmhba1	Management Network     Mkernel (vSwitch1)	k (+5W(chb) +Wkb	vanice (1000, Full)	
	VMkernel 2 (vSwitch)	2) vmk2	vmnic2 (1000, Full)	
		-	vmnic4	
		-	vmnic3	-
	•			
	Network Adapters Details:			_
otaile	Virtual Network Adapt	er		
	VMkernel:	vmk1		
vmhba33	Switch:	vSwitch1		
Model:	Port Group:	VMkernel		
iSCSI Alias:	IP Address:	20.20.20.21		
Connected Targel	Subnet Mask:	255.255.0.0		
	IPv6 Address:	fe80::250:56ff:fe66:6b58/64		
view: Devices	Physical Network Adap	pter		
Name	Name:	vmnic5		LUN
	Device:	Intel Corporation 82571EB Gig	abit Ethernet Controller (Copper)	
	Link Status:	Connected		
	Configured Speed:	1000 Mbps (Full Duplex)		
	,	OK	Cancel Help	

Figure 5-38 shows the properties of an initiator bound to the virtual network.

#### Figure 5-38 Initiator properties after virtual network binding

Step 6 In the dialog box for configuring initiator properties, click the Dynamic Discovery tab, click Add, and enter the target IP address (service IP address of the storage system), as shown in Figure 5-39

Figure 5-39 Adding send target server

tware Ada	iter
iba33	🚰 iSCSI Initiator (vmhba33) Properties 📃 🗵 🗙
/632xESB	General Network Configuration Dynamic Discovery Static Discovery
iba0	deneral metwork connigatedon = 7/ministence ( ) [Static Discovery ]
ıba32	Send Targets
-based 4G	Discover iSCSI targets dynamically from the following locations (IPv4, IPv6, host name):
ıba2	
iba3	ISCSI Server Location
: 6/i Integ	
ıbal	
	🚱 Add Send Target Server 🛛 🔀
	iSCSI Server: 20.20.20.2
	Port: 3260
	Parent:
	Authentication may need to be configured before a session can
	<ul> <li>De established wich any discovered targets.</li> </ul>
133	CHAP Advanced
Name:	
Alias:	
scted Targel	
Devices	
Derices	
	Hod Kemove Dettings
	due l sub-
	Help



#### vSphere Web Client

On vSphere Web Client, perform the following steps to configure the host initiator:

e Ada orer 🛃 iSCSI Initiator (vmhba33) Pr \_ 🗆 🗙 ÆSB General Network Configuration Dynamic Discovery Static Discovery VMkernel Port Bindings: VMkernel Adapter | Port Group Policy d 4Gi Port Group Path Status VMkernel (vSwitch1) vmk1 vmk2 Compliant Not Use <u>©</u> VMkernel 2 (vSwitch2) nte F Add.. Remove VMkernel Port Binding Details Virtual Network Adapter VMkernel: vmk1 vSwitch1 VMkernel © Compliant Switch: Port Group: Port Group Policy: 20.20.20.21 255.255.0.0 IP Address Subnet Mask: Fargel IPv6 Address: fe80::250:56ff;fe66:6b58/64 es hysical Netwo 10 Name: vmnic5 Device: Intel Corporation 82571EB Gigabit Ethernet Controller (Copper) Link Status Connected 1000 Mbps (Full Duplex) Configured Speed: Close Help

Step 1 On vSphere Web Client, click the Manage tab and then the Storage tab to check the storage adapter.



vmware <sup>®</sup> vSphere Web Clie	ent <b>n</b> ≣					
Navigator I	3 100.115.161.27 Actions -					
Home 🕨 🕲	Getting Started Summary Mor	nitor Manage Related Objects				
VC60.certification.com	Settings Networking Storage	Alarm Definitions Tags Permissio	ns			
		Storage Adapters				
0.115.4.186	Storage Adapters	+ 🖬 🛯 🖾 🐚 -				
<b>1</b> 00.115.4.188	Storage Devices	Adapter	Туре	Status		
<ul> <li>Znangpeng</li> <li>Image: Image and Ima</li></ul>	Host Cache Configuration	🚱 vmhba3	Fibre Cha	Unknown		
100.115.130.78 (not resp	Protocol Endpoints	Dell PERC H700 Integrated				
🕨 🥉 100.115.161.27 (rebo 👂		🔄 vmhba0	SCSI	Unknown		
100.115.77.44 (disconne		iSCSI Software Adapter				

Step 2 Add a storage adapter. In the displayed Add Software iSCSI Adapter dialog box, click OK.

Figure 5-41 Adding a storage adapter

100.115.160.64 Actions -	🗍 100.115.160.64 Actions 👻								
Getting Started Summary Mo	onitor Manage Related Objects								
Settings Networking Storage	Alarm Definitions Tags Permissio	ons							
	Storage Adapters								
Storage Adapters	<b>∔</b> 🕫 🕴 🖉 🕒 -								
Storage Devices	Adapter	100.11	15.160.64 - Add Software iSCSI Adapter						
Host Cache Configuration	2600 Series 16Gb Fibre Channel	A new software ISCSI adapter will be added to the list. After it has been added, select the adapter and use the Adapter Details section to complete the configuration.							
Protocol Endpoints	🚱 vmhba2								
	🚱 vmhba3		OK Cancel						
	Dell PERC H700 Integrated								
	🚱 vmhba0	SCSI	Unknown	2					
	Adapter Details								
	Properties Devices Paths								

Step 3 Check the created iSCSI adapter.

Figure 5-42 Checking the created iSCSI adapter

3 100.115.160.64 Actions -								
Getting Started Summary Monitor Manage Related Objects								
Settings Networking Storage Alarm Definitions Tags Permissions								
	4 Storage Adapters							
Storage Adapters	Storage Adapters 🕂 🛃 🧕 🧕 🌆 -							
Storage Devices	Adapter	Туре	Status	Identifier	Targets			
Host Cache Configuration	🚱 vmhba3	Fibre Cha	Unknown	20:00:00:0e:1e:1a:a2:f1 21:00:00:0e:1e:1a:a2:f1	0			
Protocol Endpoints	Dell PERC H700 Integrated							
	🚱 vmhba0	SCSI	Unknown		2			
	iSCSI Software Adapter							
	🚱 vmhba33	iSCSI	Online	iqn.1998-01.com.vmware:58f86d87-87df-2bcd-a662-842b2	0			
	Adapter Details							
	Properties Devices Paths	Targets Net	work Port Bind	ing Advanced Options				
	Adapter Status							

Step 4 In the Adapter Details area, click the Network Port Binding tab and click the + icon.

Figure 5-43	Initiator	properties
-------------	-----------	------------

ettings Networking Storage	Narm Definitions   Tags   Permis	isions					
•	Storage Adapters						
Storage Adapters	+ 6 1 0 0-						
Storage Devices	Adapter	Type	Status.	Identifier		Targets	
Host Cache Configuration Protocol Endpoints	🙆 vmhba3	Fibre Cha.	Unknown	20:00:00:0e:1e	1a a2 f1 21 00 00:0e 1e 1a a2 f1	0	
	Dell PERC H700 Integrated						
	🐼 vmhba0	SCSI	Unknown			2	
	ISCSI Software Adapter						
	🔯 vmhba33	ISCSI	Online	ign:1998-01.co	m.vmware 58t86d87-87df-2bcd-a662-842b2	0	
	Adapter Details				ini l		
		-		den Advanced	Ontons		
	Properties Devices Paths	Targets Ne	INVOLK NOLT BHI	ding Hovanceo	okaona		
	Properties Devices Paths	i Targets Ne	INVOLK INVOLT BIII	ding Advanced	okania		
	Properties Devices Paths	Nerral Ad. Port G	Invest Policy	Path Statut	Physical Network Adapter		
	Properties Devices Paths	Net Targets Net	noork Port Ben Iroup Policy No VMicemel n	Path Statur etwork adapters a	Physical Network Adapter re-bound to this ISCSI host bus adapter.		

Step 5 Select a virtual network and bind it to the initiator.

#### Figure 5-44 Binding a virtual network to the initiator

100.115.160.64 - Bind vmhba33 with VMkernel Adapter					
Akernel network adapter					
nly VMkernel adapters compatible with the iS	CSI port binding requirements and a	available physical network adapters are listed.			
Port Group	VMkernel Adapter	Physical Network Adapter			
🛽 🧕 Management Network (vSwitch0)	📖 vmk0	对 vmnic0 (1 Gbit/s, Full)			
-	-	ymnic1 (1 Gbit/s, Full)			
-		vmnic2 (1 Gbit/s, Full)			
] -	-	Minimic3 (1 Gbit/s, Full)			
For group poincy.	ompirant				

After the binding, the adapter properties are shown as follows:

Figure 5-45 After VMkernal port binding



Step 6 In the Adapter Details area, click the Targets tab. Click the Dynamic Discovery button and click Add.

#### Figure 5-46 Dynamic discovery

Getting Started Summary Mo	nitor Manage Related Objects							
Settings Networking Storage	Alarm Definitions   Tags   Permissio	ns						
**	Storage Adapters							
Storage Adapters	+ 둲 🛄   🗕 🖿-							
Storage Devices	Adapter	Туре	Status	Identifier	Та			
Host Cache Configuration	🚱 vmhba3	Fibre Cha	Unknown	20:00:00:0e:1e:1a:a2:f1 21:00:00:0e:1e:1a:a2:f1	0			
Protocol Endpoints	Dell PERC H700 Integrated							
	🚱 vmhba0	SCSI	Unknown		2			
	iSCSI Software Adapter	iSCSI Software Adapter						
	🐼 vmhba33	ISCSI	Online	iqn.1998-01.com.vmware:58f86d87-87df-2bcd-a662-842b2.	0			
				=				
	Adapter Details							
	Properties Devices Paths	Targets Net	work Port Bind	ling Advanced Options				
	Dynamic Discovery Static Discovery							
	iSCSI server							
				This list is empty.				

Step 7 Enter the target's IP address (storage's service IP address) and click OK.

#### Figure 5-47 Adding a target

vmhba33 - Add Send Target Server			
iSCSI Server:	192.168.1.5	1	
Port:	3260		
Authentication	Settings		
🖌 Inherit settin	js from parent		



The host initiator configuration is complete.

```
----End
```

# 5.2.1.3 (Optional) Configuring CHAP Authentication

If Challenge Handshake Authentication Protocol (CHAP) authentication is required between a storage system and a host, perform the following steps to configure CHAP authentication.

#### Prerequisites

- The initiator has been added to the virtual host.
- CHAP has been enabled for the initiator on the storage system.
- No LUN has been mapped to the virtual host that corresponds to the application server.

### vSphere Client

On vSphere Client, perform the following steps to configure CHAP authentication:

**Step 1** In the dialog box for configuring iSCSI initiator properties, click the **General** tab and click **CHAP...** in the left lower corner, as shown in Figure 5-48.

Figure 5-48 General tab page

ter 🖁 iSCSI Initiator (vmhba33)	Properties	
General Network Configuratio	n Dynamic Discovery Static Discovery	
-iSCSI Properties		
Name:	iqn.1998-01.com.vmware:localhost-64692d	c9
Alias:		
Target discovery methods:	Send Targets, Static Target	
Software Initiator Properties		
Status:	Enabled	
CHAP Advanced		Configure
		Close Help

- Step 2 In the CHAP Credentials dialog box that is displayed, choose Use CHAP from the Select option drop-down list.
- Step 3 Enter the CHAP user name and password configured on the storage system, as shown in Figure 5-49.



#### Figure 5-49 CHAP credentials dialog box

Step 4 Click OK.

----End

#### vSphere Web Client

On vSphere Web Client, perform the following steps to configure CHAP authentication:

Step 1 In the Adapter Details area, click the Properties tab. On the tab page, click Edit following Authentication.

- gale e e e Balang maaater aaaren euror parameter settings
-------------------------------------------------------------

Setting Started Summary Mo	nitor Manage Related Objects						
orang orange	manage reclaied objecto						
Settings Networking Storage	Alarm Definitions Tags Permissi	ons					
••	Storage Adapters						
Storage Adapters	+ 🔂 🛄 🔯 🐚 -					Q Fi	Iter
Storage Devices	Adapter	Туре	Status	Identifier	Targets	Devices	Paths
Host Cache Configuration	2 port SATA IDE Controller (ICH9)						
Protocol Endpoints	🔄 vmhba32	Block SCSI	Unknown		0	0	0
	🐼 vmhba1	Block SCSI	Unknown		1	1	1
	2600 Series 16Gb Fibre Channel	o PCI Express	HBA				
	I vmhba2	Fibre Cha	Unknown	20:00:00:0e:1e:1a:a2:f0 21:00:00:0e:1e:1a:a2:f0	0	0	0
	1778 LL A					-	<u>^</u>
	Adapter Details						
	Properties Devices Paths	Targets Ne	twork Port Bin	ting Advanced Ontions			
		Targoto Ito					
	ISCSI Allas						
	Target Discovery Send Targ	iets, Static Targ	jets				_
	Authentication						Edit
	Method None						-

Step 2 In the displayed Edit Authentication dialog box, select Use Unidirectional CHAP (for example) as Authentication Method.

Figure 5-51 Selecting an authentication method

🔄 vmhb	a33 - Edit Auther	ntication		?
The initi specific	ator uses these s target settings. M	ettings for authentication for a ake sure that these paramete	all targets unless otherwise ove rs match on the storage side.	rriden by the
Authenti	ication Method:	None		•
		None		
Outgoin	g CHAP Credentia	Use unidirectional CHAP if r	equired by target	
Name:	🗌 Use initiator	Use unidirectional CHAP un	less prohibited by target	
		Use unidirectional CHAP		
Secret		Use bidirectional CHAP		
000101.				
Incomin	g CHAP Credenti	als (initiator authenticates th	e target)	
Name:	Use initiator	name		
Cocret				
			ок	Cancel

Step 3 Enter the storage system's CHAP name and secret, and click OK.

Figure 5-52 Setting	CHAP authentication	parameters
---------------------	---------------------	------------

🚱 vmhba33 - Edit Authentication	?
The initiator uses these settings for authentication for all targets unless otherwise overri specific target settings. Make sure that these parameters match on the storage side.	den by the
Authentication Method: Use unidirectional CHAP	•
Outgoing CHAP Credentials (target authenticates the initiator)	
Name: 🔲 Use initiator name	
Secret:	
Incoming CHAP Credentials (initiator authenticates the target)	
Name: 🔲 Use initiator name	
Secret:	
ОК	Cancel

----End

# 5.2.2 (Optional) Switch Configuration

This section describes how to configure Ethernet switches, including configuring VLANs and binding ports. Skip this section if you use direct connections.

#### **Configuring VLANs**

On an Ethernet network to which many hosts are connected, a large number of broadcast packets are generated during the host communication. Broadcast packets sent from one host will be received by all other hosts on the network, consuming more bandwidth. Moreover, all hosts on the network can access each other, resulting data security risks.

To save bandwidth and prevent security risks, hosts on an Ethernet network are divided into multiple logical groups. Each logical group is a VLAN. The following uses Huawei Quidway 2700 Ethernet switch as an example to explain how to configure VLANs.

In the following example, two VLANs (VLAN 1000 and VLAN 2000) are created. VLAN 1000 contains ports GE 1/0/1 to 1/0/16. VLAN 2000 contains ports GE 1/0/20 to 1/0/24.

**Step 1** Go to the system view.

```
<Quidway>system-view
System View: return to User View with Ctrl+Z.
```
Step 2 Create VLAN 1000 and add ports to it.

[Quidway]**VLAN 1000** [Quidway-vlan1000]**port GigabitEthernet 1/0/1 to GigabitEthernet 1/0/16** 

Step 3 Configure an IP address for VLAN 1000.

[Quidway-vlan1000]interface VLAN 1000 [Quidway-Vlan-interface1000]ip address 1.0.0.1 255.255.255.0

Step 4 Create VLAN 2000, add ports, and configure an IP address.

```
[Quidway]VLAN 2000
[Quidway-vlan2000]port GigabitEthernet 1/0/20 to GigabitEthernet 1/0/24
[Quidway-vlan2000]interface VLAN 2000
[Quidway-Vlan-interface2000]ip address 2.0.0.1 255.255.255.0
```

----End

#### **Binding Ports**

When storage systems and hosts are connected in point-to-point mode, existing bandwidth may be insufficient for storage data transmission. Moreover, devices cannot be redundantly connected in point-to-point mode. To address these problems, ports are bound (link aggregation) to improve bandwidth and balance load among multiple links.

Three Ethernet link aggregation modes are available:

• Manual aggregation

Ports are added to an aggregation group by running a command manually. Ports added to the aggregation group must have the same link type.

Static aggregation

Ports are added to an aggregation group by running a command manually. Ports added to the aggregation group must have the same link type and LACP enabled.

• Dynamic aggregation

The protocol dynamically adds ports to an aggregation group. Ports added in this way must have LACP enabled and the same speed, duplex mode, and link type.

Table 5-2 compares these aggregation modes.

Link Aggregation Mode	Packet Exchange	Port Detection	CPU Usage
Manual aggregation	No	No	Low
Static aggregation	Yes	Yes	High
Dynamic aggregation	Yes	Yes	High

Table 5-2 Comparison among link aggregation modes

Huawei OceanStor storage devices support 802.3ad link aggregation (dynamic aggregation). In this link aggregation mode, multiple network ports are in an active aggregation group and work in duplex mode and at the same speed. After binding iSCSI host ports on a storage

device, enable aggregation for their peer ports on the switch. Otherwise, links are unavailable between the storage device and the switch.

This section uses switch ports GE 1/0/1 and GE 1/0/2 and the storage system's ports P2 and P3 as an example to explain how to bind ports.

The port binding method differs with the OceanStor system version. For details, refer to the specific storage product documentation. The following steps use OceanStor V3 V300R003 as an example.

- Step 1 Log in to DeviceManager and choose Provisioning > Port.
- Step 2 Bind ports.
  - 1. Select the ports that you want to bind and choose **More** > **Bond Ports**.

The **Bond Port** dialog box is displayed.

- 2. Enter a **Bond Name**, select the target ports, and click **OK**.
- 3. In the security alert dialog box that is displayed, select I have read and understand the consequences associated with performing this operation and click OK.

After the storage system ports are bound, configure link aggregation on the switch using the following command:

```
<Quidway>system-view
System View: return to User View with Ctrl+Z.
[Quidway-Switch]interface GigabitEthernet 1/0/1
[Quidway-Switch-GigabitEthernet1/0/1]lacp enable
LACP is already enabled on the port!
[Quidway-Switch-GigabitEthernet1/0/1]quit
[Quidway-Switch-GigabitEthernet1/0/2]lacp enable
LACP is already enabled on the port!
[Quidway-Switch-GigabitEthernet1/0/2]lacp enable
```

After the command is executed, LACP is enabled for ports GE 1/0/1 and GE 1/0/2. Then the ports can be automatically detected and added to an aggregation group.

```
----End
```

# 5.2.3 Storage System Configuration

The supported IP protocol stack differs with the storage system version. You need to select the desired IP protocol based on your storage system version and project situations.

#### **Configuring Port IP Addresses**

Configure Ethernet port parameters to ensure proper communication between the storage system and application server.

Note the following items when setting the properties of an Ethernet port:

• The default internal heartbeat IP addresses of a two-controller storage system are **127.127.10** and **127.127.127.11**, and those of a four-controller storage system are **127.127.127.10**, **127.127.127.11**, **127.127.127.12**, and **127.127.127.13**. Therefore, the IP address of the router must not be in the 127.127.127.127.XXX segment and the gateway address must not be **127.127.127.10**, **127.127.127.11**, **127.127.127.12**, or **127.127.127.13**. Otherwise, routing will fail. Internal heartbeat links are established between controllers

for these controllers to detect each other's working status. You do not need to separately connect cables. In addition, internal heartbeat IP addresses have been assigned before delivery, and you cannot change these IP addresses.

- The IP address of the Ethernet port cannot be in the same network segment as that of a management network port.
- The IP address of the Ethernet port cannot be in the same network segment as that of a maintenance network port.
- If the Ethernet port connects to an application server, the IP address of the Ethernet port must be in the same network segment as that of the service network port on the application server. If the Ethernet port connects to another storage device, the IP address of the Ethernet port must be in the same network segment as that of the Ethernet port on the other storage device. Add routes if available IP addresses in the desired segment are insufficient.

Changing the IP address of a host port may interrupt services on this host port.

Configurations vary on different storage systems. The following uses OceanStor V3/Dorado V3 as examples to describe how to configure an IP address for an Ethernet port:

#### Step 1 Go to the Ethernet Port dialog box.

- 1. In the basic information area of the function pane, click the device icon.
- 2. In the middle function pane, click the cabinet whose Ethernet ports you want to view.
- 3. Click the controller enclosure where the desired Ethernet ports reside. The controller enclosure view is displayed.
- 4. Click to switch to the rear view.
- 5. Click the Ethernet port whose information you want to modify.
  - The **Ethernet Port** dialog box is displayed.
- 6. Click **Modify**.

Step 2 Modify the Ethernet port, as shown in Figure 5-53.

- 1. In IPv4 Address or IPv6 Address, enter an IP address for the Ethernet port.
- 2. In Subnet Mask or Prefix, enter a subnet mask or prefix for the Ethernet port.
- 3. In **MTU** (**Byte**), enter the maximum size of data packet that can be transferred between the Ethernet port and the host. The value is an integer ranging from 1500 to 9216.

Figure 5-53	Configuring	an IP address
-------------	-------------	---------------

hernet Port	
Location:	CTE0.A.IOM1.P1
Health Status:	Normal
Running Status:	Link up
Working Rate (Gbit/s):	1
Max. Working Rate (Gbit/	/s): 1
IPv4 Address:	192.168.5.6
Subnet Mask:	255.255.255.0
IPv6 Address:	
Prefix:	
MAC Address:	90:17:ac:ba:86:bc
Port Switch:	Enable
MTU (Byte):	1500 💠

Step 3 Confirm the Ethernet port modification.

1. Click Apply.

The **Danger** dialog box is displayed.

- 2. Confirm the information in the dialog box and select I have read and understand the consequences associated with performing this operation.
- 3. Click OK.

The Success dialog box is displayed, indicating that the operation is successful.

- 4. Click **OK**.
- ----End

#### (Optional) Adding Routes

If iSCSI networking is used and data needs to be transmitted across network segments, you need to configure routes.

- Step 1 Log in to DeviceManager.
- **Step 2** Choose **Provisioning** > **Port** > **Ethernet Ports**.
- Step 3 Select the Ethernet port for which you want to add a route and click Route Management.

The Route Management dialog box is displayed.

- Step 4 Configure the route information for the Ethernet port.
  - 1. In **IP** Address, select the IP address of the Ethernet port.
  - 2. Click Add.

The Add Route dialog box is displayed.

3. In **Type**, select the type of the route to be added.

There are three route options:

Default route

Data is forwarded through this route by default if no preferred route is available. The destination address field and the target mask field (IPv4) or prefix (IPv6) of the default route are automatically set to 0. To use this option, you only need to add a gateway.

- Host route

A route to an individual host. The destination mask (IPv4: 255.255.255.255) or prefix (IPv6: 128) of the host route is automatically set. To use this option, add the destination address and a gateway.

Network segment route

A route to a network segment. You need to add the destination address, destination address mask (IPv4) or prefix (IPv6), and gateway. For example, the destination address is 172.17.0.0, destination address mask is 255.255.0.0, and gateway is 172.16.0.1.

4. Set **Destination Address**.

Set **Destination Address** to the IPv4 or IPv6 (depending on which one you use) address or network segment of the application server's service network port or that of the other storage system's Ethernet port.

- 5. Set Destination Mask (IPv4) or Prefix (IPv6).
  - If an IPv4 address is used, this parameter specifies the subnet mask of the IP address for the service network port on the application server or the other storage device.
  - If an IPv6 address is used, this parameter specifies the prefix of the IPv6 address for the application server's service network port or that of the other storage system's Ethernet port.
- 6. In Gateway, enter the gateway of the local storage system's Ethernet port IP address.
- Step 5 Click OK. The route information is added to the route list.

A security alert dialog box is displayed.

- Step 6 Confirm the information in the dialog box and select I have read and understand the consequences associated with performing this operation.
- Step 7 Click OK.

The Success dialog box is displayed, indicating that the operation is successful.

To remove a route, select it and click **Remove**.

Step 8 Click Close.

----End

#### Adding an Initiator to a Host

This section details how to add initiators to the hosts on the storage system. For other storage configurations, see the *Basic Storage Service Configuration Guide* corresponding to your storage system.

**Step 1** Log in to DeviceManager.



Step 3 Select the target host and click Add Initiator.

#### Figure 5-54 Selecting a host

Huawei.Storage > Provisioning > Host							
Host Host Group Initiator							
I Automatic scan for hosts is Enabled . You can click Parameter Settings to modify the settings.							
Create   Delete Properties	Add Initiator Remo	ve Initiator Refresh					
Name	Status	OS					
Iw_CentOS2017	Normal	Linux					
openVMS	Normal	OpenVMS					
localhost.localdomain	Normal	Linux					
Host0119	Normal	Solaris					
Uw_2018	Normal	Linux					
HOST_15fed3b0577_0	Normal	Windows					
HOST_15fedbd6455_1	Normal	Windows					
HOST_15fedbeda62_2	Normal	Windows					
Redhat_test	Normal	Linux					

**Step 4** Select the initiator and click to add it to **Selected Initiators**.

#### Figure 5-55 Adding an initiator

Add Initiator to Host Redhat_test	×
Select initiators that you want to add to the host. You can also create, o Available Initiators	delete, or modify initiators.
Initiator Type: ISCSI 💌	WWPN/IQN - Enter a keyword Search
Type WWPN/IQN	Status 🕹
iSCSI iqn.1994-05.com.redhat.d0104b56adc6	Offline
< 1/1 > 1 Entries, 0 Selected	¥
	Create Dalata Madify
Selected Initiators	Create
	WWPN/IQN - Enter a keyword Search
Type WWPN/IQN	Status 🕹
iSCSI iqn.1996-04.de.suse:01:1fe172a469b1	Online
< 1/1 <p>I Entries, 0 Selected</p>	OK Cancel Help

#### Step 5 Click OK.

#### ----End

The initiator properties depend on the operating system and multipathing software used by the hosts. For details, see the storage-side configuration in the multipathing configuration section. After the initiators have been configured, you can scan for LUNs on the hosts to discover storage resources.

# 6 Mapping and Using LUNs

# 6.1 Scanning for LUNs on a Host

After LUNs are mapped on a storage system, scan for the mapped LUNs on the host.

• vSphere Client

Figure 6-1 Scanning for the mapped LUNs

Getting Started 🔪 Summary 🔪 Virtual Machin	es Resource Allocation Performa	nce Configuration	Local Users & Groups	Events Permission	15			
Hardware	Storage Adapters							
Health Status Processors	Device iSCSI Software Adapter S vmhba33	Type ISCSI	WWN iqn. 1998-01.com.vm	ware:localhost-64692dc!	9:			
Storage Networking • Storage Adapters	631xESB/632xESB IDE Controlle wmbba0 wmbba32 ISP2432-based 4Gb Fibre Chan	er Block SCSI Block SCSI Block SCSI	HRA					
Network Adapters	ymbha2	Eibre Channel	20:00:00:1b:32:0	2,2,21,00,00,16,22,0,	1£2:2a			
Advanced Settings	🕜 vmhba3	Fibre Channel	20:01:00:1b:32:2	Rescan	f2:2a			
Power Management	Dell PERC 6/i Integrated			Properties				
Software	🌀 vmhba1	SCSI		Remove				
Licensed Features Time Configuration DNS and Routing Authentication Services Virtual Machine Starthyp/Shutdown Virtual Machine Swapfile Location Security Profile Host Cache Configuration System Resource Allocation Agent VM Settings Advanced Settings	Details vmhba2 Model: ISP2432-based 4Gb WWN: 20:00:00:1b:32:0af Targets: 1 Devices View: Devices Paths	Fibre Channel to PCI 2:2a 21:00:00:1b:32 : 8 Path	Express HBA :0a:f2:2a s: 8					
	Name			Runtime	Name	Operational State	LUN	Type
	HUAWEI Fibre Channel Disk (naa	6303037100303037	000b627500000007)	vmhba2	:C0:T0:L0	Mounted	0	disk
	HUAWEI Fibre Channel Disk (naa	6303037100303037	00c3747500000000)	vmhba2	:C0:T0:L1	Mounted	1	disk
	HUAWEI Fibre Channel Disk (naa	.6303037100303037	00c383d30000001)	vmhba2	:C0:T0:L2	Mounted	2	disk
	HUAWEI Fibre Channel Disk (naa	.6303037100303037	0006487600000003)	vmhba2	:C0:T0:L3	Mounted	3	disk
	HUAWEI Fibre Channel Disk (naa	6303037100303037	UUUD48a800000004)	vmhba2	:C0:T0:L4	Mounted	4	disk
	HUAWEL Fibre Channel Disk (naa	.6303037100303037	000656160000006)	vmnba2 vmhba2	:C0:T0:L5	Mounted	5 6	disk

• vSphere Web Client

Figure 6-2 Scanning for the mapped LUNs (on vSphere Web Client)

100.115.4.186 Actions -								
etting Started Summary Mo	nitor Manage	Related Objects						
Settings Networking Storage	Alarm Definitions	Tags Permission	ns					
4	Storage Adapte	ITS						
Storage Adapters	+ 🖬 💷	o D					Q Fi	lter
Storage Devices	Adapter	Rescans all stora	ade adanters	on the bost t	o Itifier	Targets	Devices	Path:
Host Cache Configuration	LPe11000 4Gt	discover newly a	dded storag	e devices				
Protocol Endpoints	🔯 vmhba4	and/or VMFS volu	umes.		00:00:00:c9:d9:35:8b 10:00:00:c9:d9:35:8b	1	13	13
	🔄 vmhba3		Fibre Cha	Online	20:00:00:00:c9:d9:35:8a 10:00:00:00:c9:d9:35:8a	1	13	13
	MegaRAID SA	S Invader Controller						
	🛇 vmhba2		SCSI	Unknown		3	3	3
		010 / 11						
	Adapter Details							
	Properties	Devices Paths						
	General							
	Name	vmhba4						
	Model	LPe11000 4Gb Fibre	Channel Hos	t Adapter				
	WWNN	20:00:00:00:c9:d9:35	i:8b					
	WWPN	10:00:00:00:c9:d9:35	i 8h					

# 6.2 Using the Mapped LUNs

After the mapped LUNs are detected on a host, you can directly use the raw devices to configure services or use the LUNs after creating a file system.

# 6.2.1 Raw Device Mapping (RDM)

RDM uses raw devices as disks for VMs. Perform the following steps to map raw devices.

#### vSphere Client

On vSphere Client, perform the following steps to configure RDM:

Step 1 Right-click a VM and choose Edit Settings from the shortcut menu, as shown in Figure 6-3.

🛃 oel - Virtual Machine Properti
Image: Structure Machine Property       Mardware     Options       Resources        Mardware        Cruss        Wide card        Mard disk 1        Mardwark dapter 1        Network dapter 1        Mardwark dapter 2        Floppy drive 1

Figure 6-3 Editing host settings

Step 2 On the Hardware tab page, click Add. In the Add Hardware dialog box that is displayed, choose Hard Disk in Device Type and click Next, as shown in Figure 6-4.

Figure 6-4 Adding disks

🛃 oel - Virtual Machine Properti	25	
Hardware Options Resources		Virtual Machine Version: 8
Add Hardware Device Type What sort of device do	you wish to add to your virtual machine: Choose the type of device you with Serial Port (unavailable) Propy Pravilei Port (unavailable) Cr()/VVD trive (unavailable) Cr()/VVD trive (unavailable) Secondary USB Controller USB Controller USB Device (unavailable) Device (unavailab	temory Configuration
Help	1	< Back Next > Cancel
Help		OK Cancel

#### Step 3 Select disks.

You can create a new virtual disk, use an existing virtual disk, or use raw disk mappings, as shown in Figure 6-5.

#### Figure 6-5 Selecting disks

🛃 oel - Virtual Machine Properti	es _OX
Hardware Options Resources	Virtual Machine Version: 8
County   results         County   results         Select a Disk       Select a Disk       Select a Disk       Compatibility Mode       Advanced Options       Ready to Complete	A virtual disk is composed of one or more files on the host file system. Together these files appear as a angle hard disk to the guest operating system. Select the type of disk to use.  Disk  C Create a new virtual disk  C Use an existing virtual disk  Reuse a previously configured virtual disk.  C Raw Device Mappings Give your virtual machine direct access to SAN. This option allows you to use existing SAN commands to manage the storage and continue to access it using a detectore.
Help	<back next=""> Cancel</back>
Help	OKCancel

- Step 4 Select Raw Device Mappings and click Next.
- Step 5 Select a target LUN and click Next, as shown in Figure 6-6.

Figure 6-6 Selecting a target LUN

ing Starte	d Summary Resource Alloc	ation Performance Events Console	Permissions		
🛃 oel	- Virtual Machine Propertie:	5			>
1: Hardw	vare Options Resources			Vi	irtual Machine Version: 8
i 🗖 –	-	r Memo	ry Configuration ——		1
a 📩 🕻	Add Hardware				×
р На	Select and Configure a Ra	W LUN			
° 🔳	Which LUN would you like	to use for this raw disk?			
	Device Type	Name, Identifier, Path ID, LUN or	Capacity contains: -		Clear
. C	Select a Disk	Name	Path ID	LUN	Capacity Harc
E	Select Target LUN Select Datastore	HI JAWET Fibre Channel Dick (page 63	vmbba2:C0:T0:L3	3	100.00 Supr
L 🞴	Compatibility Mode	HUAWEI Fibre Channel Disk (naa.63	vmbba2:C0:T0:L7	7	110.00 Supr
	Advanced Options	HIAWEI Fibre Channel Disk (naa.63	vmhba2:C0:T0:L5	5	100.00 Supr
	Ready to Complete	HUAWEI Fibre Channel Disk (naa.63	vmhba2:C0:T0:L0	0	100.00 Supp
녙		HUAWEI Fibre Channel Disk (naa.63	vmhba2:C0:T0:L4	4	100.00 Supp
s		HUAWEI Fibre Channel Disk (naa.63	vmhba2:C0:T0:L6	6	100.00 Supp
					<u> </u>
	Help		< Back	Next >	Cancel
-					
H	Help			<u></u> ОК	Cancel

Step 6 Select a datastore. The default datastore is under the same directory as the VM storage. Click Next, as shown in Figure 6-7.

Figure 6-7 Selecting a datastore



#### Step 7 Select a compatibility mode.

Select a compatibility mode based on site requirements and click **Next**, as shown in Figure 6-8.

Figure 6-8 Selecting a compatibility mode

	🛃 oel - '	Virtual Machine Properties	
٧h	Hardwar	e Options Resources	Virtual Machine Version: 8
<ul> <li>viiiny:</li> <li>ipp</li> <li>nac</li> <li>ec</li> <li>envi</li> <li>vori</li> <li>on:</li> <li>vori</li> <li>on:</li> <li>invi</li> <li>invi</li></ul>		Add Hardware Select Compatibility Mode Which compability mode Select Torge Select Torge Select Torget Select Torget Compatibility Mode Advanced Options Ready to Complete	A promory Configuration     X      by you want this virtual disk to use?     The compatibility mode you choose will apply only to this virtual disk and will not affect any other disk using this LUN mapping.     Compatibility     Alow the guest operating system to access the hardware directly. Taking a snapshot of this virtual machine will not include this disk.     Virtual Adow the virtual machine to use VMware snapshots and other advanced functionality.
		Help	< Back Next > Cancel
	Hel	p	Cancel

**Step 8** In **Advanced Options**, keep the default virtual device node unchanged, as shown in Figure 6-9.

#### Figure 6-9 Selecting a virtual device node

g startes			
🛃 oel	- Virtual Machine Properties	5	
Hardw	are Options Resources	Virtual Machine Versi	ion: 8
_		Memory Configuration	1
	Add Hardware	٢	<
Ha	Advanced Ontions		
30	These advanced options of	do not usually need to be changed.	
		-	
Ê	Device Type	Specify the advanced options for this virtual disk. These options do not normally need	
	<u>Select a Disk</u>	to be changed.	
E	Select Target LUN Select Datastore	- Virtual Device Node	
2	Compatibility Mode	SCSI (0:1)	
-	Advanced Options		
-	Ready to Complete		
6			
1.1			
	Help	< Back Next > Cancel	
<u> </u>		· · · · · · · · · · · · · · · · · · ·	
H	telp	OK Cancel	
			111

Step 9 In Ready to Complete, confirm the information about the disk to be added, as shown in Figure 6-10.

Figure 6-10 Confirming the information about the disk to be added

🖁 oel - Virtual Machine Propertie	s 💶
Hardware Options Resources	Virtual Machine Version: 4
	Memory Configuration
Add Hardware	×
Ha Ready to Complete Review the selected optic	ons and click Finish to add the bardware
ē	
E Device Type	Options:
Select Target LUN	Hardware type: Hard Disk
Select Datastore	Create disk: Use mapped system LUN
Compatibility Mode	Disk mode: Persistent
Advanced Options  Ready to Complete	Target LUN: HUAWEI Fibre Channel Disk (naa.6303037100303037000b487600000
E Keddy to complete	Compatibility mode: Physical Manned datastore: Store with VM
1	
Help	< Back Finish Cancel
Help	OK Cancel

**Step 10** Click **Finish**. The system starts to add disks, as shown in Figure 6-11.

----End

Figure 6-11 Adding raw disk mappings

<u> </u>	· · ·	<u>، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ، </u>
🚱 oel - Virtual Machine Propertie	S	
Hardware Options Resources		Virtual Machine Version: 8
		Physical LUN and Datastore Mapping File
I Show All Devices	Add Remove	/vmfs/devices/disks/naa.6303037100303037000b487600000
Hardware	Summary	
Memory	2048 MB	
CPUs	1	
Video card	Video card	Virtual Device Node
WMCI device	Restricted	SCSI (0:1)
SCSI controller 0	LSI Logic Parallel	
Hard disk 1	Virtual Disk	Compatibility Mode
CD/DVD drive 1	Client Device	C Virtual C Physical
Network adapter 1	VM Network	
Network adapter 2	VM Network	
🛃 Floppy drive 1	Client Device	
New Hard Disk (adding)	Mapped Raw LUN	
		Manage Paths
•		
Help		OK Cancel
		11

**Step 1** After a raw disk is mapped, the type of the newly created disk is **Mapped Raw LUN**.

----End

#### vSphere Web Client

On vSphere Web Client, perform the following steps to configure RDM:

Step 1 On the Related Objects tab page, click the Virtual Machines tab. On the left pane of the tab page, select the to-be-added host, right-click it, and choose Edit Settings from the shortcut menu.

<b>Figure 0-12</b> Editing nost settings	Figure	6-12	Editing	host	settings
------------------------------------------	--------	------	---------	------	----------

Getting Started Summary Monitor Mar	nage Related O	bjects				
Virtual Machines VM Templates in Folders	Networks Distr	ibuted Switches	Datastores			
19 19 19 19 1 10 18	🚳 Actions 👻					
Name 1	State	Status	Provisioned Space	Used Space	Host CPU	Host Mem
(error)161.90_eSpaceIVS_Server_su	Powered Off	🥑 Normal	508.47 GB	24.31 GB	0 MHz	0 MB
0 VC6012 117 3	Powered On	📀 Normal	70.13 GB	42.66 GB	2,202 MHz	10,170 MB
10 laa Actions - 10 laaSWeb_117.19		🧿 Normal	57.22 GB	29.06 GB	0 MHz	0 MB
Power 11 laat Cuast OD		🥑 Normal	44.32 GB	15.49 GB	0 MHz	0 MB
12 DEI Spanshote		🥑 Normal	44.32 GB	14.11 GB	0 MHz	0 MB
13 Rec 🔊 Open Console		Normal	50.26 GB	5.25 GB	0 MHz	0 MB
14 VCE		Normal	44.99 GB	15.75 GB	0 MHz	0 MB
160.7_ Close		Normal	502.11 GB	246.27 GB	23 MHz	821 MB
160.7_ Template		🥑 Normal	502.32 GB	16.78 GB	0 MHz	0 MB
161.90		Normal	533.86 GB	25.84 GB	0 MHz	0 MB
Fault Folerance	•	🥑 Normal	157.86 GB	53.54 GB	0 MHz	0 MB
Dicies VM Policies	•	🥝 Normal	551.97 GB	211.16 GB	0 MHz	0 MB
a 2.205 Compatibility	•	🥝 Normal	545.54 GB	35.41 GB	0 MHz	0 MB
Export System Logs		🥝 Normal	551.55 GB	45.75 GB	0 MHz	0 MB
a 2.210 Edit Resource Settings		🥝 Normal	528.45 GB	29.48 GB	0 MHz	0 MB
2.211 Edit Settings		Normal	608.79 GB	179.43 GB	0 MHz	0 MB
M						
Move To						

Step 2 In the displayed Edit Settings dialog box, click the Virtual Hardware tab. On the tab page, select RDM Disk from the New Device option list at the bottom.

🔂 10 laaSWeb_117.19	- Edit Settings	(?) ))
Virtual Hardware VM C	Options SDRS Rules vApp Options	
F 🔲 CPU	4 <b>v 0</b>	
▶ III Memory	New Hard Disk	
🕨 🛄 Hard disk 1	Existing Hard Disk GB 💌	
▶ 🛃 SCSI controller 0	🛟 RDM Disk	
🕨 飅 Network adapter 1	Connect	
▶ i CD/DVD drive 1	Connect	
Floppy drive 1	CD/DVD Drive	
Video card	Floppy Drive	
WICI device		
<ul> <li>Other Devices</li> </ul>	Di Serial Port	
	Host USB Device	
	USB Controller	
	SCSI Device	
	PCI Device	
	SCSI Controller	
	SATA Controller	
New device:	Select Add	
Compatibility: ESXi 5.5 an	od later (VM version 10) OK	Cancel

Figure 6-13 Adding RDM disks

Step 3 Click Add to add the target disk.

Figure 6-14 Selecting disks to add

		- 3-								
ſem	plates in Folders	Netw	10 laaSWeb_117.19	- Edit Settings					(? ▶	
	- G 🗛	<u>کې چې</u>	Virtual Hardware VM O	ptions SDRS	Rules vApp	Options				📡 🍱 🔍 F
	1 🔺	State	▶ 🔲 CPU	4	- 0	)				
ace	VS_Server_su	Pow	▶ IIII Memory	8192		IB 🚽				
19		Pow	▶ 🚍 Hard disk 1	40	÷ (	B  -				
7.2 21	Select Target LU	N	-							×
_1	Name				Identifier	Path ID	LUN	Capacity	Drive Type	Hardware Accelerati
	HUAWEI ISCSI E	Disk (n	aa.60022a11000d28f118b	614f300000015)	/vmfs/de	v /vmfs/dev.	0	500.00 GB	Non-flash	Supported
cat	HUAWEI ISCSI D	Disk (n	aa.60022a11000d28f1013	97a560000001f)	/vmfs/de	v /vmfs/dev.	. 5	500.00 GB	Non-flash	Supported
ati	HUAWEI ISCSI Disk (naa.60022a11000d28f1013968390000001e) /vmfs/dev /vmfs/dev 4 500.00 GB Non-flasi									Supported
5_S	HUAWEI ISCSI E	El iSCSI Disk (naa.60022a11000d28f118b6185300000018) /vmfs/dev /vmfs/dev 3 500.00 GB Non-flas								Supported
t-bi	HUAWEI ISCSI E	HUAWEI ISCSI Disk (naa.60022a11000d28f118b6172c00000017) /vmfs/dev /vmfs/dev 2 500.00 GB Non-flash								Supported
nde	HUAWEI ISCSI E	Disk (n	aa.60022a11000d28f118b	6160600000016)	) /vmfs/de	v /vmfs/dev.	1	500.00 GB	Non-flash	Supported
ana ana									(	Cancel
ente	er1_Win2008R2	Pow								
/3R	3C10_Win200	Pow								
	_									_
St	atus									
			New device:	8	RDM Disk		Add			
			Compatibility: ESXi 5.5 an	d later (VM versio	on 10)			ок	Cancel	

Step 4 Verify the disk information and click OK.

Figure 6-15 Completing the disk addition operation

🔂 10 laaSWeb_117.19	- Edit Settings	? »
Virtual Hardware VM C	Options SDRS Rules vApp Options	
CPU	(4 <b>v</b> ) <b>0</b>	
• 🌃 Memory	8192 <b>•</b> MB <b>•</b>	
🕨 🛄 Hard disk 1	40 A GB V	
🕨 🛃 SCSI controller 0	LSI Logic SAS	
🕨 🧱 Network adapter 1	VM Network 🛛 🗸 Connect	
▶ <ul> <li>▶ OD/DVD drive 1</li> </ul>	Client Device	
Floppy drive 1	Client Device	
Video card	Specify custom settings	
VMCI device		
<ul> <li>Other Devices</li> </ul>		
🕨 🛄 New Hard disk	500 A GB V	
New device:	RDM Disk 🖌 Add	
Compatibility: ESXi 5.5 an	d later (VM version 10) OK	Cancel

Step 5 Navigate to the Edit Settings tab page again to check whether the target disk is added successfully.

10 laasvveb_1	17.19 -	Ealt Se	ttings			_				(P)
Virtual Hardware	VM O	ptions	SDRS Rules	VA	pp Optio	ns				
CPU		4		-	0					
Memory		8192		•	МВ	-				
Hard disk 1		40		*	GB	-				
🖌 🛄 Hard disk 2		500		*	GB	-				
🛛 🛃 SCSI controll	er O	LSI Log	jic SAS					J		
🕨 🥅 Network adap	oter 1	VM Ne	twork			-	$\checkmark$	Connect		
🛛 🍥 CD/DVD drive	91	Client	Device			-		Connect		
Floppy drive 1	1	Client	Device			-		Connect		
Video card		Specif	y custom setting	s		-				
MCI device										
• Other Devices										
New de	evice:		Select			-		Add		
			(14							

Figure 6-16 Checking whether the disk is successfully added

----End

# **6.2.2** Creating Datastores

Create a file system before creating a virtual disk. A file system can be created using the file system disks in datastores.

This section details how to create a datastore.

## vSphere Client

On vSphere Client, perform the following steps to create a datastore:

**Step 1** On the **Configuration** tab page, choose **Storage** in the navigation tree. On the **Datastores** tab page that is displayed, click **Add Storage**, as shown in Figure 6-17.

#### Figure 6-17 Adding storage

							Devices	View: Datastores	Hardware
Delete Ad	Refresh D							Datastores	Health Status
		Hardware Acceleration	Last Update	Free Type	Capacity	Drive Type	> Device	Identification	Processors
		Not supported	2014/1/24 0:47:36	90.05 G8 V14F55	131.00 GB	Non-SSD	Local DELL Disk (	datastore1	Memory
		Supported	2014/1/24 0:47:36	7.70 G8 VMF35	79.75 GB	Non-55D	HUAWEI Fibre Ch	l knux	<ul> <li>Storage</li> </ul>
		Supported.	2014/1/24 0:47:36	8.79 GB 114F55	84.75 GB	Non-55D	HJAWEI Fibre Ch	B windows	Networking
									Storage Adapters
									Network Adapters
									Advanced Settings
									Power Management
									Software
									Licensed Features
									Time Configuration
									DNS and Routing
									Authentication Services
									Virtual Machine Startup/Shutdown
									Virtual Machine Swaphile Location
								- Construction	Security Profile
								Datastore Details	Host Cache Configuration
								Datastore Details	Host Cache Configuration System Resource Allocation
								Datastore Details	Security Profile Host Cache Configuration System Resource Allocation Agent VM Settemas

Step 2 Select a storage type and click Next, as shown in Figure 6-18.

Figure 6-18 Selecting a storage type

abilitation Device	Drive Tupe	Capacity	Eren Turn	a Lact Undata	Hardware Accelor
Add Storage					
Select Storage Type Specify if you want to fo	rmat a new volume or use a sh	ared folder over the	network.		
<ul> <li>Disk/LUN</li> <li>Select Disk/LN</li> <li>File System Version</li> <li>Current Disk Layout</li> <li>Properties</li> <li>Formating</li> <li>Ready to Complete</li> </ul>	Storage Type  Disk/LUN Create a datasto	re on a Fibre Channi s <b>tem</b> n if you want to cre- re on Fibre Channel edia.	el, ISCSI, or loca ate a Network Fi	I SCSI disk, or mount an exit le System. this datastore to all hosts t	iting VMFS volume.
Help				< Back Next >	Cancel

Step 3 On the Select Disk/LUN page that is displayed, select a desired disk and click Next, as shown in Figure 6-19.

Figure 6-19 Select a disk/LUN

entification	, Davica	Drive Type Canadi	Free Tune	lac	t I Indata	Hardwara Acce
Select Disk Select a	= c/LUN a LUN to create a d	atastore or expand the current one				
E <u>Disk/LUN</u> Select D	Disk/LUN	Name, Identifier, Path ID, LUN, Capac	ity, Expandable or VMF:	5 Label c	•	Clear
File Syste	em Version	Name	Path ID	LUN 🗠	Drive Type	Capacity
Current I	Disk Layout	HUAWEI Fibre Channel Disk (naa.63	vmhba2:C0:T0:L0	0	Non-SSD	100.00 GB
Propertie Economication	15	HUAWEI Fibre Channel Disk (naa.63	vmhba2:C0:T0:L4	4	Non-SSD	100.00 GB
Ready to Cor	ng molete	HUAWEI Fibre Channel Disk (naa.63	vmhba2:C0:T0:L5	5	Non-SSD	100.00 GB
Keady to Co	mpiece	HUAWEI Fibre Channel Disk (naa.63	vmhba2:C0:T0:L6	6	Non-SSD	100.00 GB
		HUAWEI Fibre Channel Disk (naa.63	vmhba2:C0:T0:L7	7	Non-SSD	110.00 GB
		5				L
Help	1			< Back	Next >	Cancel
	1		_			·



Figure 6-20 Selecting a file system version

Identification	<ul> <li>Davica</li> </ul>	Drive Type	Canacity	Free	Tune	Lact Undata	Hardware Occeje
Genetic address     G	Powerson     NY Constraints     NY Constraints	File System Version File System Version <b>VHFS-5</b> Select this option <b>VHFS-3</b> Select this option	n to enable additions	i capabilities ch an ESX vi	s, such as	2TB+ support. et han 5.0.	
Help					< B.	ack Next >	Cancel

Step 5 View the current disk layout and device information, as shown in Figure 6-21.

Figure 6-21 Viewing the current disk layout

Idan	tification A	Device	Driva Tuna	Canacity	Fraa	Tune	Lact Lindata	Hardwara Acca
	Add Storage Current Disk Layo You can partitic	out on and format t	he entire device, all free sp.	ace, or a single	e block of free	space.		
a	Disk/UM Select Disk/UNN Ele System Version Currient Disk Layout Properties Formatting Ready to Complete		Review the current disk lay Device HUAWEI Fibre Channel Location J-mrt/sidevices/disks/nai Partition Format Unknown There is only one layout co	rout: Disk (n N a.6303037100 Th nfiguration av	rive Type on-SSD 303037000b4 ie hard disk is ailable. Use th	Capacity 100.00 GE 18a80000000 blank. ne Next buttor	Available 100.00 GB	LUN 4
	Нер		pages. A partition will be c	reated and t	used	< Back	Next >	Cancel

**Step 6** Enter the name of a datastore, as shown in Figure 6-22.

Figure 6-22 E	ntering a	datastore	name
---------------	-----------	-----------	------

Id	antification > Device	l Driva Tuna	Canacity	Free Tune	Lact Undate	Hardware Accelery
Ē	🛃 Add Storage					
E	Properties					
E.	Speary the properties for the	ne datatore				
	E Disk/LUN	Enter a datastore nar	ne			
	Select Disk/LUN File System Version	los				
	Current Disk Layout	lost				
	Properties					
	Formatting Ready to Complete					
						-
a						
	Help			< E	ack Next >	Cancel

**Step 7** Specify a disk capacity. Normally, **Maximum available space** is selected. If you want to test LUN expansion, customize a capacity, as shown in Figure 6-23.

Figure 6-23 Specifying a capacity

Identification	- Device	Drive Tone	Canacity	Free Tune	l art Undata	Hardware Annele
Add Storag	e - Formatting					
E Specif	y the maximum file si:	e and capacity of the datas	store			
E Disk/LUN Select D File Syst Current Properti	isk/LUN eem Version Disk Lavout es	Capacity Maximum available : C Custom space setti	space			
Formal Ready to Co	: <b>ting</b> omplete	100.00 30 40	01 100.00 GD GValia	ne share		
Da						
Help	]			<	Back Next >	Cancel



Figure 6-24 Confirming the disk layout

antification	/ Device	Drive Tune	Canacity	Free T	ne I set i Indate	Hardware Occejera
🔐 Add Storage	:					
Ready to C Review	omplete the disk layout and	click Finish to add storage				
Disk/LUN		Disk layout:				
Ready to Lt	in piece	Device HUAWEI Fibre Cha Location /vmfs/devices/disk Partition Format GPT Primary Partition VMFS (HUAWEI Fib	nnel Disk (naa ;/naa.6303037100 <b>s</b> re Channel Disk	Drive Type Non-55D 303037000b48a8 Capa 100.00	Capacity 100.00 GB 000000004 city 1 GB	LUN 4
		File system: Properties Datastore name: Formatting File system: Block size: Maximum file size:	O5 vmfs-5 1 MB 2.00 TB			
Help				1	< Back Fi	nish Cancel

----End

## vSphere Web Client

On vSphere Web Client, perform the following steps to create a datastore:

Step 1 On the Related Objects tab page, click the Datastores tab.

Figure 6-25	Checking the	datastores
-------------	--------------	------------

Getting Started Summary	Monitor Manage Rela	ited Objects			
Virtual Machines VM Templa	tes in Folders Networks	Distributed Switches Datastores	٦		
1월 📑 🗟 🧟 🔁 🗟	🕽 🛛 🔯 Actions 👻				
Name	1 🛦 Status	Туре		Datastore Cluster	Datastore Cluster Capacity
E Cert_add	Normal	VMFS5			423.75 GB
🗐 Cert_Infra_1	<ul> <li>Normal</li> </ul>	VMFS5			499.75 GB
🗐 Cert_Infra_10	<ul> <li>Normal</li> </ul>	VMFS5			499.75 GB
🗐 Cert_Infra_11	<ul> <li>Normal</li> </ul>	VMFS5			499.75 GB
🗐 Cert_Infra_2	<ul> <li>Normal</li> </ul>	VMFS5			499.75 GB
🗐 Cert_Infra_3	<ul> <li>Normal</li> </ul>	VMFS5			999.75 GB
🗐 Cert_Infra_4	<ul> <li>Normal</li> </ul>	VMFS5			999.75 GB
🗐 Cert_Infra_5	<ul> <li>Normal</li> </ul>	VMFS5			499.75 GB
🗐 Cert_Infra_6	<ul> <li>Normal</li> </ul>	VMFS5			499.75 GB
🗐 Cert_Infra_8	<ul> <li>Normal</li> </ul>	VMFS5			499.75 GB
🗐 Cert_Infra_9	<ul> <li>Normal</li> </ul>	VMFS5			499.75 GB
datastore1 (5)	Normal	VMFS5			550.25 GB
🗐 Local_ds4186	<ul> <li>Normal</li> </ul>	VMFS5			29.1 TB
S5500t-Cert-1	Normal	VMFS5			499.75 GB

Step 2 Click is to open the New Datastore page. On this page, select VMFS as Type, and click Next.

#### Figure 6-26 Creating the datastore type

Virtual Machines	VM Templates in Folders Networks	Distributed Switches Datastores	
0 0 0	New Datastore		3
Cert_undd     Cert_unda_i     Stooto-cert-     S	<ul> <li>1 Type</li> <li>2 Name and device selection</li> <li>3 Partition configuration</li> <li>4 Ready to complete</li> </ul>	Type • VMFS Create a VMFS datastore on a disKLUFI. • NFS Create an NFS datastore on an NFS share over the network.	

Step 3 Specify the datastore name, select the disks, and click Next.

New Datastore						?
1 Type	Datastore name: teststore					
2 Name and device selection				(	<b>\</b> Filter	
3 VMFS version	Name	LUN	Capacity	Hardware Acceler	Drive Type	Snapshot Vo.
4 Partition configuration	HUAWEI ISCSI Disk (naa.60022a11000d28f118b61	4f3 0	500.00 GB	Supported	HDD	
5 Ready to complete	HUAWEI ISCSI Disk (naa.60022a11000d28f101396	839 4	500.00 GB	Supported	HDD	
	HUAWEI ISCSI Disk (naa.60022a11000d28f118b61	853 3	500.00 GB	Supported	HDD	
	HUAWEI ISCSI Disk (naa.60022a11000d28f118b61	72c 2	500.00 GB	Supported	HDD	
	HUAWEI ISCSI Disk (naa.60022a11000d28f118b61	606 1	500.00 GB	Supported	HDD	
	00					5 itom
	(m)					5 item

Figure 6-27 Specifying the datastore name and selecting disks

Step 4 Select the file system version (VMFS 5, for example), and click Next.

Figure 6-28 Selecting the file system version

New Datastore		(?)
<ul> <li>1 Type</li> <li>2 Name and device selection</li> <li>3 VMFS version</li> <li>4 Partition configuration</li> <li>5 Ready to complete</li> </ul>	<ul> <li>● VMFS 5</li> <li>PMFS 5 enables 2+TB LUN support.</li> <li>● VMFS 3</li> <li>WMFS 3 allows the datastore to be accessed by ESX/ESXi hosts of version earlier than 5.0.</li> </ul>	
	Back Next Fit	nish Cancel

Step 5 Configure datastore partition and click Next.

Figure 6-29 Configuring the partition layout

1 New Datastore				• ?
✓ 1 Type	Partition Layout	Datastore Details		
<ul> <li>2 Name and device selection</li> </ul>		Partition Configuration	Use all available partitions	
✓ 3 VMFS version		Datastore Size	500.00 🗘 GB	
4 Partition configuration				
5 Ready to complete				
	Datastore			
	Capacity: 500.00 G	В		
	Free Space: 500.00 G	В		
			Rock Next Sinish	Cancal
			Dack Next Finish	Cancel

Step 6 Verify the datastore configurations and click Finish.

省 New Datastore		(	) H
✓ 1 Type	General:		
<ul> <li>2 Name and device selection</li> </ul>	Name	teststore	
<ul> <li>3 VMFS version</li> </ul>	Туре	VMFS	
<ul> <li>4 Partition configuration</li> </ul>	Datastore size	500.00 GB	
5 Ready to complete	Device and Format	ting:	
	Disk/LUN	HUAWEI ISCSI Disk (naa.60022a11000d28f118b614f300000015)	
	Partition Format	GPT	
	VMFS Version	VMFS 5	
		Back Next Finish Cance	əl j

Figure 6-30 Verifying the datastore configurations



#### Figure 6-31 Checking for the datastore

Getting Started Summary Monitor Manage Related Objects								
Virtual Machines VM Templates in	Folders Network	s Distributed Switches	Datastores					
2   P Q C B Q   QActions -								
Name 1 🛦	Status	Туре	D	atastore Cluster	Capacity	Free		
Cert_Infra_2	📀 Normal	VMFS5			499.75 GB	128.04 GB		
Cert_Infra_3	Normal	VMFS5			999.75 GB	164.12 GB		
E Cert_Infra_4	📀 Normal	VMFS5			999.75 GB	15.24 GB		
Cert_Infra_5	<ul> <li>Normal</li> </ul>	VMFS5			499.75 GB	176.87 GB		
Cert_Infra_6	<ul> <li>Normal</li> </ul>	VMFS5			499.75 GB	123.61 GB		
Cert_Infra_8	<ul> <li>Normal</li> </ul>	VMFS5			499.75 GB	67.33 GB		
Cert_Infra_9	<ul> <li>Normal</li> </ul>	VMFS5			499.75 GB	205.33 GB		
datastore1 (5)	Normal	VMFS5			550.25 GB	291.71 GB		
Local_ds4186	<ul> <li>Normal</li> </ul>	VMFS5			29.1 TB	27.71 TB		
S5500t-Cert-1	Normal	VMFS5			499.75 GB	33.44 GB		
S5500t-Cert-2	<ul> <li>Normal</li> </ul>	VMFS5			499.75 GB	165.74 GB		
S5500t-Cert-3	🕗 Normal	VMFS5			479.75 GB	204.17 GB		
E teststore	📀 Normal	VMFS5			499.75 GB	498.8 GB		
VCloud-1	📀 Normal	VMFS5			299.75 GB	194.07 GB		
VCloud-2	Normal	VMFS5			299.75 GB	77.6 GB		

----End

# 6.2.3 Creating Virtual Disks

This section describes how to add LUNs to VMs as virtual disks.

#### vSphere Client

On vSphere Client, perform the following steps to create virtual disks:

Step 1 Right-click a VM and choose Edit Settings from the shortcut menu, as shown in Figure 6-32.

Figure 6-32 Editing VM settings

ardware Options Resources		Mornovu Confi	Virtual Machine Version: 8
Show All Devices	Add Remove		Memory Size: 27 GB
lardware	Summary	512 GB	
Memory	2048 MB		Maximum recommended for this duest OS: 1011 GB.
CPUs	1	256 GB -	Maximum recommended for best
Video card	Video card	128 GB -	<ul> <li>performance: 4092 MB.</li> </ul>
VMCI device	Restricted	64 GB-	Default recommended for this
SCSI controller 0	LSI Logic Parallel	22.00	<ul> <li>guest OS: 2 GB.</li> </ul>
Hard disk 1	Virtual Disk	32 GD-	Minimum recommended for this
Hard disk 2	Mapped Raw LUN	16 GB-	<ul> <li>guest OS: 256 MB.</li> </ul>
Network adapter 1	VM Network	8 GB -	
Network adapter 1	VM Network	100	
Elonny drive 1	Client Device	4 GB	
a rioppy arrest		2 GB 🚽	
		1 GB	
		E10 MD	
		212 MD	
		256 MB 🔫	
		128 MB	
		CA MD	
		04110	
		32 MB	
		16 MB	
		0 640	
		O MD H	
		4 MB	

Step 2 Click Add, select Hard Disk and click Next, as shown in Figure 6-33.

Figure 6-33 Adding disks

Joel - Virtual Machine Proper       Iardware       Options       Resources       Image: Add Hardware       Device Type       What sort of device de	ites	virtual Machine Version: 8 vrtual Machine Version: 8 vy Configuration
Device Type     Select a Disk     Croste a Disk     Advanced Options     Ready to Complete	Choose the type of device you wish to Serial Port (unavailable) Parallel Port (unavailable) Choose Drive (unavailable) USB Controller USB Controller El USB Controller El USB Controller El USB Controller El Serie (unavailable) Ethernet Adopter Ethernet Adopter SCSI Device	add. formation
Help		<back next=""> Cancel</back>
Help		OK Cancel

Step 3 In Select a Disk, select Create a new virtual disk, as shown in Figure 6-34.

Figure 6-34 Creating a new virtual disk

Hardware   Options   Resources	Virtual Machine Version: 8
His Select a Disk	A virtual disk is composed of one or more files on the host file system. Together these files appear as a single hard disk to the guest operating system. Select the type of disk to use. Disk Create a new virtual disk Cuese an existing virtual disk Ruuse a previously configured virtual disk. C Raw Device Mapping G Raw Device Mapping G Raw Device Mapping distance in the storage and continue to access it using a datasture.
Help	_ < Back _ Niext > _ Cancel

Step 4 Specify the disk capacity based on site requirements, as shown in Figure 6-35.

Figure 6-35 Specifying the disk capacity

itif	<b>2</b> o	oel - Virtual Machine Propertie	s III X	Accele
(	Han	rdware Options Resources	Virtual Machine Version: 8	ted
() () () () () () () () () () () () () (		Create a Disk     Specify the virtual disk si      Denotes Type     Select a Disk     Create a Disk     Create a Disk     Ready to Complete		
		Help	<pre></pre>	

Step 5 Select a datastore. In this example, the datastore is **disk1** and the file system type is **VMFS-5**, as shown in Figure 6-36.

Figure 6-36 Selecting a datastore

Select a da Select a datas	the units of disk size, and tastore or datastore fore or datastore cluste	l provisionina policu 2 cluster 1:			
Name	Drive Type	Capacity Pr	rovisioned Free	е Туре	Thin Provisioning
🔋 datasto	re1 Non-SSD	131.00 GB 45	5.23 GB 87.96 G	B VMFS5	Supported
🔋 linux	Non-SSD	79.75 GB 72	2.05 GB 7.70 G	B VMFS5	Supported
i window	s Non-SSD	84.75 GB 75	5.96 GB 8.79 G	B VMFS5	Supported
Disable 5	corage DRS for this virtu	ual machine			
Disable 5 Select a data	corage DRS for this virtu store: Drive Type	ual machine	sioned Firee	Туре	Thin Provisioning

**Step 6** Select a virtual device node. If there are no special requirements, keep the default virtual device node unchanged, as shown in Figure 6-37.

Figure 6-37 Selecting a virtual device node

ardware   Options   Resources	A Configuration
Add Hardware	is do not usually need to be changed.
Device Type Select a Disk Create a Disk Advanced Options Ready to Complete	Specify the advanced options for this virtual disk. These options do not normally need to be changed.  Virtual Device Node  ScSI (0:2)  Mode  Mo
Help	Kext > Cancel

**Step 7** View the basic information about the virtual disk, as shown in Figure 6-38.

Figure 6-38 Viewing virtual disk information

oel - Virtual Machine Properties		
Show All Devices	Add Remove	Disk File
ardware       Memory       CPUs       Video card       Video card       Video card       SciSt controller 0       Hard disk 1       Hard disk 1       OUVD drive 1       Network adapter 1       Network adapter 2       Floppy drive 1       Network adapter 2       Ploppy drive 1       Network adapter 1       Network adapter 2       Ploppy drive 1       Network adapter 1	Summary 2018 MB 1 Video card Restricted LSI Logic Parallel Virtual Disk Mapped Raw LUN Client Device VM Network VM Network Client Device Virtual Disk	Disk Provisioning         Type:       Thick Provision Lazy Zeroed         Provisioned Size:       90       0       Image: Comparison Lazy Zeroed         Maximum Size (GB):       N/A         Witual Device Node       SCSI (0:2)       Image: Comparison Lazy Zeroed         Mode       Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed         Mode       Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed         Mode       Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed         Mode       Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed         Mode       Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed         Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed         Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed         Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed         Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed         Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed       Image: Comparison Lazy Zeroed       Image: Comparison Laz

As shown in the preceding figure, hard disk 1 that you have added is a virtual disk.

----End

#### vSphere Web Client

On vSphere Web Client, perform the following steps to create virtual disks:

**Step 1** On the **Related Objects** tab page, click the **Virtual Machines** tab. On the tab page, select the host for which you need to create virtual disks, right-click the host, and choose **Edit Settings** from the shortcut menu.

Figure 6-39 Editing the host settings

Virtual Machines VM Te	mplates in Folders	Networks	Distributed Switches	Datastores			
10 10 10 10		Actions	•				
Name	1 🔺	State	Status	Provisioned Space	Used Space	Host CPU	Host Mem
局 (error)161.90 eSnar	elVS Server su	Powered C	off 🥑 Normal	508.47 GB	24.31 GB	0 MHz	0 MB
Actions - (error)161.9	_eSpaceIVS_Server_s	use rered C	)n 🥑 Normal	70.13 GB	42.66 GB	694 MHz	10,190 M
Power		rered C	off 🥑 Normal	557.22 GB	529.06 GB	0 MHz	0 MB
Guest US Spanshote		rered C	off 🥑 Normal	44.32 GB	15.49 GB	0 MHz	0 MB
Onen Console		rered C	off 🥑 Normal	44.32 GB	14.11 GB	0 MHz	0 MB
		rered C	off 🥑 Normal	50.26 GB	5.25 GB	0 MHz	0 MB
Migrate		ered C	off 🥑 Normal	44.99 GB	15.75 GB	0 MHz	0 MB
Tomplato		rered C	n 🥑 Normal	502.11 GB	246.27 GB	23 MHz	822 MB
Template		rered C	off 🥑 Normal	502.32 GB	16.78 GB	0 MHz	0 MB
Fault Tolerance		rered C	off 🥥 Normal	533.86 GB	25.84 GB	0 MHz	0 MB
VM Policies		• rered C	off 🥥 Normal	157.86 GB	53.54 GB	0 MHz	0 MB
Compatibility		▶ rered C	off 🥥 Normal	551.97 GB	211.16 GB	0 MHz	0 MB
Export System Log	3	rered C	off 🥥 Normal	545.54 GB	35.41 GB	0 MHz	0 MB
. Edit Basauraa Satti	220	pende	d 🥑 Normal	551.55 GB	45.75 GB	0 MHz	0 MB
Edit Settings	nys	vered C	off 🥑 Normal	528.45 GB	29.48 GB	0 MHz	0 MB
Luit octuings		ered C	off 🥥 Normal	608.79 GB	179.43 GB	0 MHz	0 MB
Move To Rename							



Virtual Hardware VM C	ptions SDRS Rules vA	pp Options
F 🔲 CPU	8	0
▶ IIII Memory	🛋 New Hard Disk	MB
🕨 🛄 Hard disk 1	🔜 Existing Hard Disk	GB 👻
▶ 🛃 SCSI controller 0	😤 RDM Disk	
Metwork adapter 1	Network	Connect
▶ <ul> <li>▶ CD/DVD drive 1</li> </ul>		Connect
Floppy drive 1	i CD/DVD Drive	Connect
Video card	Floppy Drive	
► iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	Serial Port	
<ul> <li>Other Devices</li> </ul>	Parallel Port	
	Host USB Device	
	🔫 USB Controller	
	SCSI Davica	
	PCI Device	
	SCSI Controller	
	SATA Controller	
New device:	Select	- Add
Compatibility: ESXi 5.5 an	d later (VM version 10)	OK Cancel

Figure 6-40 Selecting to add a hard disk

Step 3 Click Add and check the information of the added disk.

Figure 6-41 Checking the information of the added disk

Virtual Hardware VM Options	SDRS Rules VApp Options
▶ 🔲 CPU	8 🖉 🛈
▶ 🏧 Memory	8192 <b>M</b> B <b>v</b>
▶ 🛄 Hard disk 1	500 GB V
SCSI controller 0	LSI Logic Parallel
Network adapter 1	VM Network
▶ <ul> <li>▶ OD/DVD drive 1</li> </ul>	Datastore ISO File
Floppy drive 1	Client Device
Video card	Specify custom settings
▶ ∰ VMCI device	
<ul> <li>Other Devices</li> </ul>	
▶ 🛄 New Hard disk	16 GB V
New device:	Add
Compatibility: ESXi 5.5 and later (	VM version 10) OK Cancel

Step 4 To modify any disk properties, expand New Hard disk by clicking the arrow icon on its left.

#### Figure 6-42 Modifying disk properties

Virtual Hardware	VM Options	SDRS Rules	vApp Optio	ons		
▶ () CD/DVD drive	1	Datastore ISO	File		Connect	
Floppy drive 1		Client Device			Connect	
▶ 🛄 Video card		Specify custon	n settings		)	
▶ 0 VMCI device						
<ul> <li>Other Devices</li> </ul>						
👻 🛄 New Hard disl	k	16	* *	GB -		⊗
Maximum Size	e	27.71 TB				
VM storage po	licy	Datastore Defa	ault		• 0	
Location		Store with the	virtual mach	iine 🗸	)	
Disk Provision	ning	<ul> <li>Thick provisi</li> <li>Thick provisi</li> </ul>	on lazy zero on eager ze	ed roed		
		Thin provisio	n			
Sharing		Unspecified				
Shares		Normal		1000	]	
Limit - IOPs		Unlimited	•			
Virtual flash re	ad cache	0	GB 🔻	Advanced	1	
Virtual Device	Node	SCSI controlle	r 0 🛛 🕶	SCSI(0:1)	•	
Disk Mode		Dependent	•	0		-
New de	vice:	🚐 New Hard	IDisk	•	Add	
Compatibility: ESXi 5	5.5 and later (\	/M version 10)			ОК	Cancel

----End

# **7** Configuring Multipathing in HyperMetro Scenarios

This chapter describes the multipathing software configurations on the hosts and storage systems. For details about how to configure HyperMetro services, see the *HyperMetro Feature Guide*.

# 7.1 UltraPath

# 7.1.1 Storage System Configuration

If you use UltraPath, retain the default initiator settings. Do not select **Uses third-party multipath software**.

Figure 7-1 Initiator setting when UltraPath is used

Huawei.Storage > Provisioning > Host		
Host Host Group Initiator		
Automatic scan for hosts is Disabled . You can c	lick Parameter Settings to modify the settings.	
Create  Delete Properties Ad	d Initiator Remove Initiator Refresh	
Name	Status	OS I I
W_CentOS2017	Normal	Linux
oel	Normal	Linux
RHEL_AS3.9	Normal	Linux
Redhat_test	Normal	Linux
xen_host	Normal	XenServer
solaris	Modify Initiator	×
autohost72_1		
🗌 Ix-host	Type: FC	
aix_lw	Alias:	
< 1/1   Entries 28, Selected 1	71103.	
	Uses third-party multipath software	eveloped by other venders, coloct
Initiator Mapped LUNs Mapped S	this option.	eveloped by other vehiclors, select
Remove Modify Refresh		
Type		
FC FC		
□ FC		
	ОК	Cancel Help

# 7.1.2 Host Configuration

#### 7.1.2.1 Installing UltraPath

In active-active data center solutions, you can configure UltraPath to increase the I/O performance and decrease the read/write delay.

For details on how to install UltraPath, refer to instructions in the OceanStor UltraPath for Linux User Guide.

#### 7.1.2.2 Configuring UltraPath

#### Prerequisites

- In UltraPath, set the HyperMetro working mode to preferred storage array mode. In this mode, the local storage array is preferred in processing host services. The remote storage array is used only when the local array is faulty. This improves the service response speed and reduces the access latency.
- This configuration must be performed separately on all hosts.
- When UltraPath is configured, retain the Uses the third-party multipath software option unselected.

#### 

For details on how to disable the third-party multipath software function, refer to section 7.2.2 Storage System Configuration.

#### Procedure

Step 1 Run a command to set the HyperMetro working mode.

Table 7-1 lists the command for setting the HyperMetro working mode.

	a		
Table 7-1	Setting the	e HynerMetro	working mode
I uble / I	beams and	rippennicuo	working mode

Operating System	Command	Example
vSphere	set hypermetro workingmode -m <i>mode</i> -p primary_array_id	esxcli upadm set hypermetro workingmode -m priority -p 0
<b>NOTE</b> In vSphere, <b>esxcli upadm</b> is add	ed in this command for navigating to	the OceanSto UltraPath CLI.

Table 7-2 describes the parameters in the **set hypermetro workingmode** command.

Parameter	Description	Default Value
-m mode	<ul> <li>HyperMetro working mode.</li> <li>priority: preferred storage array mode</li> <li>balance: load balancing mode</li> <li>NOTE</li> <li>If you set the HyperMetro working mode for a specific virtual LUN first and then the global HyperMetro working mode for the storage system, the working mode for the virtual LUN remains unchanged.</li> </ul>	<b>priority</b> <b>priority</b> is recommended. <b>balance</b> is applicable when two active-active data centers are in the same building.
-p primary_array_id	<ul> <li>ID of the preferred storage array.</li> <li>ID of the preferred storage array.</li> <li>The ID is allocated by UltraPath.</li> <li>The storage array that is in the same data center as the application hosts reside is preferred.</li> <li>Run the esxcli upadm show diskarray command to obtain the storage array ID.</li> <li>NOTE <ul> <li>In priority mode, this parameter indicates the storage array to which I/Os are preferentially delivered.</li> <li>In balance mode, this parameter indicates the storage array where the first slice section resides.</li> </ul> </li> </ul>	<ul> <li>None</li> <li>NOTE</li> <li>Mapping relationship between application hosts and storage arrays:</li> <li>Storage array A is the preferred array for all application hosts in data center A.</li> <li>Storage array B is the preferred array for all application hosts in data center B.</li> </ul>

Table 7-2 Parameter description

- Step 2 Run the esxcli upadm show upconfig command to query whether the working mode setting is successful.

In vSphere, you can add esxcli upadm before a command to enter the OceanStor UltraPath CLI.

If the command returns information as follows (vSphere, for example), it indicates that the working mode setting is successful.

HyperMetro WorkingMode : read write within primary array

Figure 7-2 Querying the UltraPath settings

```
[root@localhost:~] esxcli upadm show upconfig
UltraPath Configuration
Basic Configuration
   Working Mode : load balancing within controller
   LoadBalance Mode : min-queue-depth
   Loadbanlance io threshold : 1
   LUN Trespass : on
Advanced Configuration
    Io Retry Times : 10
    Io Retry Delay : 0
    Faulty path check interval : 10
   Idle path check interval : 60
    Failback Delay Time : 600
   Max io retry timeout : 1800
Path reliability configuration
   Timeout degraded statistical time : 600
   Timeout degraded threshold : 1
   Timeout degraded path recovery time : 1800
   Intermittent IO error degraded statistical time : 300
   Min. I/Os for intermittent IO error degraded statistical : 5000
   Intermittent IO error degraded threshold : 20
    Intermittent IO error degraded path recovery time : 1800
    Intermittent fault degraded statistical time : 1800
    Intermittent fault degraded threshold : 3
    Intermittent fault degraded path recovery time : 3600
   High latency degraded statistical time : 300
   High latency degraded threshold : 1000
   High latency degraded path recovery time : 3600
   Sensitive delayed degraded threshold : 30000
   Sensitive delayed degraded recovery time : 120
APDtoPDL configuration
    APD to PDL Mode : off
    APD to PDL Timeout : 10
HyperMetro configuration
   HyperMetro Primary Array SN : 210235982510EA000016
   HyperMetro WorkingMode : read write within primary array
   Hypermetro split size : 128mb
```

Step 3 Set timeout parameters.

For FC networking, there is no need for extra configurations.

For iSCSI networking, run the following commands:

esxcli iscsi adapter param set -A **vmhba35** -k NoopOutInterval -v 3 esxcli iscsi adapter param set -A **vmhba35** -k NoopOutTimeout -v 10 esxcli iscsi adapter param set -A **vmhba35** -k RecoveryTimeout -v 3

#### 🛄 ΝΟΤΕ

- The preceding commands can be used only in VMware 5.0 and later versions. For the detailed HyperMetro-supported VMware versions, see <a href="http://support-open.huawei.com/ready/pages/user/compatibility/support-matrix.jsf">http://support-open.huawei.com/ready/pages/user/compatibility/support-matrix.jsf</a>.
- The field in italic and bold (vmhba35, in this example) indicates the iSCSI adapter. You need to change this value according to your site.
- The settings will not take effect until you restart the host.
- Without the preceding command executions, the default ESXi settings might result in an up-to-35s path switchover time. The preceding command executions can shorten the path switchover time to about 16s.

#### Step 4 (Optional) Enable APD to PDL for the VMware ESXi hosts.

#### 

If VMware ESXi hosts are deployed in a cluster and their connected OceanStor V3 is V300R006C00SPC100 or later, you do not need to enable the APD to PDL function; however, you need to enable the APD to PDL function if OceanStor V3 is earlier than V300R006C00SPC100.

- 1. Run the esxcli upadm set apdtopdl -m on command.
- 2. Run the **esxcli show upconfig** command to query the configuration result.

If APD to PDL Mode is on, the APD to PDL function is successfully configured.

```
vSphere Security documentation for more information
~ # esxcli upadm show upconfig
Configuration
Working Mode : load balancing within controller
LoadBanlance Mode : min-queue-depth
Loadbanlance io threshold : 1
LUN Trespass : on
Advanced Configuration
Io Retry Times : 10
Io Retry Delay : 0
Faulty path check interval : 10
Idle path check interval : 60
Failback Delay Time : 600
Max io retry timeout : 1800
Path reliability configuration
Timeout degraded statistical time : 600
Timeout degraded threshold : 1
Timeout degraded path recovery time : 1800
Intermittent IO error degraded statistical time : 300
Min. I/Os for intermittent IO error degraded statistical : 5000 Intermittent IO error
derraded threshold : 20
Intermittent IO error derraded path recovery time : 1800
Intermittent fault degraded statistical time : 1800
Intermittent fault degraded threshold : 3
Intermittent fault degraded path recovery time : 3600
```

```
High latency degraded statistical time : 300
High latency degraded threshold : 1000
High latency degraded path recovery time : 3600
APDtoPDL configuration
APD to PDL Mode : on
APD to PDL Timeout : 10
```

----End

#### **Configuring a VMware Cluster**

If you want to configure VMware clusters, see the BC&DR Solution Product Documentation (Active-Active Data Center). See section "Virtualization Platform Configuration" in this document. The contents in this section are as follows.

#### **Mandatory Configuration Items:**

- Deploy ESXi hosts across data centers in a HA cluster and configure the cluster with HA advanced parameter **das.maskCleanShutdownEnabled** = **True** for VMware vSphere 5.0 u1, 5.1, and 5.5 versions.
- A VM service network requires L2 interworking between data centers for VM migration between data centers without affecting VM services.
- For VMware vSphere 5.0 u1, later 5.0 versions, and 5.1 versions, log in to the CLI of each ESXi host using SSH and add **Disk.terminateVMOnPDLDefault = True** in the /etc/vmware/settings file.
- For VMware vSphere 5.5, 6.0 u1, and versions between them, log in to the host using the vSphere Client.
  - Set **VMkernel.Boot.terminateVMOnPDL** = **True**. The parameter forcibly powers off VMs on a datastore when the datastore enters the PDL state.

Figure 7-3 Boot parameter settings



Set Disk.AutoremoveOnPDL = 0. The parameter forcibly removes datastores in PDL state.

#### Figure 7-4 Disk parameter settings

User User VBLOB	Maximum number of VMs expected to use a given device Min: 0 Max: 2147483647		
- VPLASH - VMPS - VMPS3 - VMernel - Noot	Millionnel, Boot, terminater/MCH/CK. Terminate virtual machine on permanent loss of storage	ų	
- VSAN XvMoton	Merrel Boot ImerEnglieACPI	P	
- For VMware vSphere 6.0 u2 and later versions:
  - After connecting to vCenter through the Web Client, enter the cluster HA configuration. The configuration requirements are as follows.

Sphere DRS	Turn on vSphere HA							
Sphere HA	Host Monitoring							
	ESX/ESXI hosts in this cluster might cause isolation respon	rexchan ses	ge network heartbeats. Disabl	e this feature when p				
	Host Monitoring							
	Host Hardware Monitoring - 1	/M Com	ponent Protection					
	ESX/ESX/ hosts have the cap could deem them unusable 0	ESWESX hosts have the capability to detect various failures that do not necessarily cause						
	Protect against Storage Co	onnectivi	ity Loss					
	Virtual Machine Monitoring							
	VM Monitoring restarts individ restarts individual VMs if their	ual VMs	if their VMware Tools heartbea t application beartbeats are po	ts are not received w				
	Disabled		application nearlocats are no	Liecened within a se				
	Ealburg conditions and VM							
	response	2						
	Failure	Failure Respo		Details				
	Hostfallure	Host failure Resta		Restart V				
	Host Isolation	Host Isolation Disab		VMs on is on.				
	Datastore with Permanent Device Loss	nt Power off and restart VMs		Datastore to restart				
	Datastore with All Paths Down	Powe	r off and restart VMs	Datastore to restart				
	Guest not heartbeating	Disab	bled VM					
	VM restart priority		Medium					
			When Disabled is select failure. In addition, they n	ted, virtual machines emain Protected whe				
	Response for Host Isolati	on	Disabled	*				
	Response for Datastore v Permanent Device Loss (	Response for Datastore with Permanent Device Loss (PDL) Response for Datastore with All Paths Down (APD)						
	Response for Datastore v Paths Down (APD)			aggressive) 🔹				
	Dating for UM failoung for Al	Delay for VM failover for APD						
	Denay for visi failover for Pa	A	and the second second					

#### Figure 7-5 vSphere 6.0 cluster configuration

• For VMware vSphere 6.5:

When using HyperMetro with VMware ESXi, note the following precautions:

- When using HyperMetro with VMware ESXi, note the following precautions: The two LUNs in a HyperMetro pair must use the same LUN ID when being mapped to a VMware ESXi host (ESXi 6.5.0 GA build 4564106 or a follow-up version earleir than ESXi 6.5 U1 build 5969303). You can query the host LUN ID mapped to the ESXi host in the Mapping View of OceanStor DeviceManager, as shown in Figure 7-6.
- Before modifying the **Host LUN ID**, read the following warnings carefully since misoperations may cause service interruption. To modify the host LUN ID for a

LUN, right-click the LUN and choose **Change host LUN ID** from the shortcut menu. In the displayed dialog box, set the same **Host LUN ID** value for the two storage devices in the HyperMetro pair and then click **OK**. For details, see Figure 7-7.

# 

Changing the host LUN ID with an incorrect procedure may cause service interruption.

- If no datastore has been created on either LUN in the HyperMetro pair, you can directly change the host LUN ID for the LUNs. Wait for about 5 to 15 minutes after the modification is complete, and then run the **Rescan** command in the ESXi host CLI to check whether the LUNs in the HyperMetro pair have been restored and been online.
- If a datastore has been created on either LUN in the HyperMetro pair and a service has been deployed in the datastore, change the host LUN ID using only the following two methods (otherwise, changing the host LUN ID for either LUN will cause the LUN to enter the PDL state and consequently interrupt services):
- Method 1: You do not need to restart the ESXi host. Migrate all VMs in the datastore deployed on the LUNs in the HyperMetro pair to another datastore, and then change the host LUN ID on the OceanStor DeviceManager. Wait for about 5 to 15 minutes after the modification is complete, and then run the **Rescan** command in the ESXi host CLI to verify that the LUNs in the HyperMetro pair have been restored and been online. Then, migrate the VMs back to the datastore deployed on the LUNs in the HyperMetro pair.
- Method 2: You need to restart the ESXi host. Power off all VMs in the datastore deployed on the LUNs in the HyperMetro pair to ensure that no service is running on the LUNs. Then, modify the host LUN ID on the OceanStor DeviceManager. Then, restart the ESXi host to make the modification take effect. After restarting the ESXi host, check whether the LUNs in the HyperMetro pair have been restored and been online.

Me OceanStor De	eviceManager					\varTheta * Alarm	s: O Critical 0	Major 0 🥠	Warning 0 【開稿中	¢1 ⊡ ®.
• \$0rado6000V3R1C21	-L2 > Provisioning	> Mapping View							?	
Create Delete	Properties	odify Mapping Object	Refresh				Name + 1	Enter a keyword	Search	
Name				1D					\$	4
VDI01				0						ស
VD102				1						Home
VD103				2						
VDI04				3					-	
€ 1/1 + [5]	8 Entries, 1 Selected									System
LUN Group Hos	t Group Port C	Group		u						() Provisioning
EUN Group: VDIU1	horitin	Ubject type.	LUN *		Alama	-	or in himself of	Reserve	Advanced Courts	-
Name	HostLUNID	Use Type	Health Status	Running Status	1.000.00	Capacity	Owning Storage	P.: WWN	*	Data Protectio
VDI01-0000	39	Internal	Normal	Online		4 000 TB	VMwareVDI	5446a	2e100313cd	Cata Protecto
VDI01-0001	2	(ediam al	Normal	Online		4.000 TB	VMwareVDI	6446a	2e100313cd	4
VDI01-0002	3 Propert	tes	Normal	Online		4.000 TB	VMwareVDI	5446a	2e100313cd	Monitor
VDI01-0003	4	e nost Lone (D	Normal	Online		4.000 TB	VMwareVDI	6446a	2e100313cd	

Figure 7-6 Changing the host LUN ID (1)

#### Figure 7-7 Changing the host LUN ID (2)

orado6000V3R	1C21-L2 > Pro	wisioning > Mapping View							?	
Create Delet	e Propertie	s Modify Mapping Object	Refresh				Name + E	nter a keyword	Bearch	
Name				ID ID					\$	44
VDI01				0					÷.	63
VD102				1						Home
VD/03				2						
VDI04				2						
1/1 *	E Entries, 1	I Selected								System
				0						(da
LUN Group	Host Group	Port Group								.OI
LUN Group: VDID	12	Object Tv	LUN -							Provisioning
Properties C	hange host LUN	ID Refresh			Nama	+ Eri	ter a keyword	Search Advar	nced Gearch-G	
Name	HostLU	NID Use Type	Health Status	Running Status		Capacity	Owning Storage F	S. WWN	8	Data Protectio
VDI01-0000	39	internal	Normal	Online		4 000 TB	VMwareVDI	6446a2e100	0313cd	
VDI01-0001	2	tetamat	Normal	Online		4.000 TB	VMwareVDI	6446a2e100	0313cd	
VDI01-0002	3	Properties	Normal	Online		4.000 TB	VMwareVDI	6446aZe100	031 3cd	Monitor
10002-0002		Change nost LUN ID	Rideman	Contras.		4 000 TR	100-000	6448+2+440	and and	

For OceanStor V3 V300R003C20SPC200, a single array with ALUA enabled can have a maximum of 8 controllers; two active-active arrays with ALUA enabled also cannot have more than 8 controllers.

VMware ESXi 6.0 U2 and later versions support HyperMetro configuration. Versions earlier than VMware ESXi 6.0 U2 have their defects.

Dorado V3 must be V300R001C01SPC100 and later versions, supporting multi-controller and HyperMetro ALUA.

- HyperMetro pairs' LUN mappings on two active-active storage arrays must be consistent. That is, the two LUNs in a HyperMetro pair must use the same LUN ID when being mapped to a host. On the storage arrays, you can run the show host lun host\_id=xx command to query all LUNs mapped to the host. In this command, xx indicates the host ID. If you want to modify the ID information, run the change mapping\_view\_mid=x host\_lun\_id\_list=Lun ID:Host Lun ID command.
- After connecting to vCenter through the Web Client, enter the cluster HA configuration. The configuration requirements are as follows.

Figure 7-8 vSphere 6.5 cluster configuration-1

UK UA B OK	tions +			· ·
Getting Started Summary Monitor	Configure Permissions H	osto VMs Ostastores Netw	orks Update Manager	
+ - Senaces	Sphere Availability • Sphere IVA in Termini OFT Paradome Information for vSpher Prosection IVA inTernet OFF	e 19. iz istoriet under "diptere	99 Manifesting	() Eat.
Gene 🚺 FC - Edit Cluster Settings				(2).00
Data vSphere DRS Fault Sphere DRS Care Sphere Analodiery Insur 1952 and Responses 1952 and Responses 1955 Advension Control	vSphere Availability vSphere Availability Turm ON vSphere Turm on Proact	tomprised of vibphere HA and Pr te HA ve HA	pactive HA. To enable Proactive HA you must also enable DRS on the cluster.	
· Cont Heartbeat Datastores	Falure	Response	Details	
Gene Advanced Options	Host failure	Restart Was	Restart VMs using VM restart priority ordering.	
Lice	Proactive HA	Disabled	Proactive HA is not enabled.	

vSphere DRS	Talure conditions and responses				
Sphere Availability					
Failures and Responses	You can configure how uSphere HA isolation, VM component protection	responds to the failure conditions on t (datastore with PDL and APD), VM and	this cluster, 1 d application	The following failure conditions are supported: host, host	
Proactive HA Failures and Responses	Enable Host Monitoring 0				
Admission Control	+ Host Failure Response	Restart VMs			
Heartbeat Datastores Advanced Options	+ Response for Host Isolation	Disabled			
	<ul> <li>Datastore with PDL</li> </ul>	Power of and restart VMs			
	+ Dataslore with APD				
	All Paths Down (APD) Failure Response	Allows you to configure the cluster Disabled No action will be taken on the Issue events No action will be taken on the Power off and restart VMs - Co All affected VMs will be power connectivity to the datastice Power off and restart VMs - Log All affected VMs will be power	r to respond affected VMs affected VMs nservative re id off and vS pressive rest id off and vS	to APD Datastore failures Events will be generated start policy phere HA will attempt to restart VMs, if another host has lart policy	
	Response recovery	Reset VMs • •	o inites O		

Figure 7-9 vSphere 6.5 cluster configuration-2



For VMware vSphere 5.1 to 5.5 versions, restart hosts for the configuration to take effect.

For VMware vSphere 6.0 U2 to 6.5 versions, re-enable the HA cluster to make the configuration take effect without restarting hosts.

#### **Recommended Configuration Items**

- The vMotion network, service network, and management network are configured with different VLAN IDs to avoid network interference.
- The management network includes the vCenter Server management node and ESXi hosts that are not accessible to external applications.
- The service network is divided into VLANs based on service requirements to ensure logical isolation and control broadcast domains.
- In a single cluster, the number of hosts does not exceed 16. If a cluster has more than 16 hosts, you are advised to use the hosts to create multiple clusters across data centers.
- A DRS group is configured to ensure that VMs can be recovered first in the local data center in the event of the breakdown of a single host.

# 7.1.3 Verification

On vSphere, run the esxcli upadm show upconfig command.

#### 

In vSphere, esxcli upadm in this command is added for navigating to the OceanStor UltraPath CLI.

If the command output contains the following information, the configuration is successful.

HyperMetro WorkingMode : read write within primary array

Figure 7-10 provides an example.

Figure 7-10 Verifying the HyperMetro working mode



# 7.2 OS Native Multipathing Software

This section describes the concepts that may be used in configuring OS native multipathing software.

# 7.2.1 HyperMetro Working Modes

# Introduction to HyperMetro Working Modes

Typically, HyperMetro works in load balancing mode or local preferred mode. The typical working modes are valid only when both the storage system and host use ALUA. It is advised to set the host's path selection policy to round-robin. If HyperMetro works in load balancing mode, the host's path selection policy must be round-robin.

HyperMetro storage arrays can be classified into a local and a remote array by their distance to the host. The one closer to the host is the local array and the other one is the remote array.

Table 7-3 describes the configuration methods and application scenarios of the typical working modes.

Working Mode	Configuration Method	Application Scenario
Load balancing mode	Enable ALUA on the host and set the path selection policy to round-robin. Configure a switchover mode that supports ALUA for both HyperMetro storage arrays' initiators that are added to the host. Set the path type for both storage arrays' initiators to the optimal path.	The distance between both HyperMetro storage arrays is less than 1 km. For example, they are in the same equipment room or on the same floor.
Local preferred mode	Enable ALUA on the host. It is advised to set the path selection policy to round-robin. Configure a switchover mode that supports ALUA for both HyperMetro storage arrays' initiators that are added to the host. Set the path type for the local storage array's initiators to the optimal path and that for the remote storage array's initiators to the non-optimal path.	The distance between both HyperMetro storage arrays is greater than 1 km. For example, they are in different locations or data centers.

 Table 7-3 HyperMetro working modes

## Working Principles and Failover

When ALUA works, the host multipathing software divides the physical paths to disks into Active Optimized (AO) and Active Non-optimized (AN) paths. The host delivers services to the storage system via the AO paths preferentially.

- An AO path is the optimal I/O access path and is between the host and a working controller.
- An AN path is the suboptimal I/O access path and is between the host and a non-working controller.

When HyperMetro works in load balancing mode, the host multipathing software selects the paths to the working controllers on both HyperMetro storage arrays as the AO paths, and those to the other controllers as the AN paths. The host accesses the storage arrays via the AO

paths. If an AO path fails, the host delivers I/Os to another AO path. If the working controller of a storage array fails, the system switches the other controller to the working mode and maintains load balancing.



When HyperMetro works in local preferred mode, the host multipathing software selects the paths to the working controller on the local storage array as the AO paths. This ensures that the host delivers I/Os only to the working controller on the local storage array, reducing link consumption. If all AO paths fail, the host delivers I/Os to the AN paths on the non-working controller. If the working controller of the local storage array fails, the system switches the other controller to the working mode and maintains the local preferred mode.

Figure 7-12 Local preferred mode



# 7.2.2 Storage System Configuration

#### **Initiator Modes**

Table 7-4 describes the initiator parameters.

Parameter	Description	Example
Uses third-party multipath software	This parameter is displayed only after an initiator has been added to the host. If LUNs have been mapped to the host before you enable or disable this parameter, restart the host after you configure this parameter. You do not need to enable this parameter on a host	Enabled

Table 7-	4 Initiator	parameters
	- minuteror	parameters

Parameter	Description	Example
	with UltraPath.	
Switchover Mode	Path switchover mode	
	<ul> <li>Early-version ALUA: default value of Switchover Mode for an upgrade from an earlier version to the current version. Detailed requirements are as follows:</li> </ul>	
	<ul> <li>The storage system must be upgraded from V300R003C10 or an earlier version to V300R003C20, V300R006C00SPC100, or a version later than V300R006C00SPC100; from V300R005 to V300R006C00SPC100 or a later version; from Dorado V300R001C00 to Dorado V300R001C01SPC100 or a later version.</li> </ul>	
	<ul> <li>Before the upgrade, the storage system must have a single or dual controllers and has enabled ALUA.</li> </ul>	
	• <b>Common ALUA</b> : Detailed requirements are as follows:	
	<ul> <li>The storage system version must be V500R007C00 and later, V300R003C20 and later, V300R006C00SPC100 and later, or Dorado V300R001C01SPC100 and later.</li> </ul>	
	<ul> <li>The OS of the host that connects to the storage system must be VMware ESXi, Red Hat 6.X, Windows Server 2012 (using Emulex HBAs), Windows Server 2008 (using Emulex HBAs), or HP-UX 11i V3.</li> </ul>	
	• ALUA not used: does not support ALUA or HyperMetro. This mode is used when a host such as HP-UX 11i V2 does not support ALUA or ALUA is not needed.	
	• <b>Special mode</b> : supports ALUA and has multiple values. It is used by host operating systems that are not supported by the <b>common</b> <b>ALUA</b> mode. Detailed requirements are as follows:	
	<ul> <li>The storage system version must be V500R007C00 and later, V300R003C20 and later, V300R006C00SPC100 and later, or Dorado V300R001C01SPC100 and later.</li> </ul>	
	<ul> <li>The OS of the host that connects to the storage system must be VMware, AIX, Red Hat 7.X, Windows Server 2012 (using QLogic HBAs), or Windows Server 2008 (using QLogic HBAs).</li> </ul>	
Special mode	Special modes support ALUA and apply to	Mode 0

Parameter	Description	Example
type	V500R007C00 and later, V300R003C20 and later, V300R006C00SPC100 and later, or Dorado V300R001C01SPC100 and later. The detailed requirements are as follows:	
	• Mode 0:	
	<ul> <li>The host and storage system must be connected using a Fibre Channel network.</li> </ul>	
	<ul> <li>The OS of the host that connects to the storage system is Red Hat 7.X, Windows Server 2012 (using QLogic HBAs), or Windows Server 2008 (using QLogic HBAs).</li> </ul>	
	• Mode 1:	
	<ul> <li>The OS of the host that connects to the storage system is AIX or VMware.</li> </ul>	
	- HyperMetro works in load balancing mode.	
	• Mode 2:	
	<ul> <li>The OS of the host that connects to the storage system is AIX or VMware.</li> </ul>	
	- HyperMetro works in local preferred mode.	
Path Type	The value can be either <b>Optimal Path</b> or <b>Non-Optimal Path</b> .	Optimal Path
	• When HyperMetro works in load balancing mode, set the <b>Path Type</b> for the initiators of both the local and remote storage arrays to <b>Optimal Path</b> . Enable ALUA on both the host and storage arrays. If the host uses the round-robin multipathing policy, it delivers I/Os to both storage arrays in round-robin mode.	
	• When HyperMetro works in local preferred mode, set the <b>Path Type</b> for the initiator of the local storage array to <b>Optimal Path</b> , and that of the remote storage array to <b>Non-Optimal Path</b> . Enable ALUA on both the host and storage arrays. The host delivers I/Os to the local storage array preferentially.	

Configure the initiators according to the requirements of each OS. The initiators that are added to the same host must be configured with the same switchover mode. Otherwise, host services may be interrupted.

If a LUN has been mapped to the host, you must restart the host for the configuration to take effect after you modify the initiator parameters. If you configure the initiator for the first time, restart is not needed.

## **Configuring the Initiators**

If you want to configure the initiator mode, perform the following operations.

**Step 1** Go to the host configuration page.

Open OceanStor DeviceManager. In the right navigation tree, click **Provisioning** and then click **Host**, as shown in the following figure.

Figure 7-13 Going to the host configuration page



Step 2 Select an initiator of which information you want to modify.

On the **Host** tab page, select a host you want to modify. Then select the initiator (on the host) you want to modify. Click **Modify**.

Figure 7-14 Selecting an initiator of which information you want to modify

· oronotococritoces	- Contracting - Contract									
Host Host Group	Initiator									
💡 Automatic scan for host	s is Enabled . You can click Param	eter Settings to modify the	settings.							~
Create + Delete	Properties Add Initiator	Remove Initiator	Refresh			Name •	Enter a ke	word	Search	ڻڻ Homo
Name	Status	OS		IP Address	Added to F	Host Group		Number of In	itiators (S	riome
Host001	Normal	Windows			Yes				1.*	E
Host002	Normal	Linux		192 168 5 4	Yes				0	System
										Provisioning
< 1/1 × 2 E	Entries 2, Selected 1									<u>∨</u> ₩ ∨M
≤ 1/1 × 2 E	Intries 2, Selected 1	s Path	c	3						VM VM vstore
Initiator Mapped	Entries 2, Selected 1 LUNs Mapped Snapshot	s Path	c	3		WWPN/QN	4 👻 Ente	a keyword	Search	VM Store
C 1/1 + D E Initiator Mapped Remove Modify	Entries 2, Selected 1 LUNs Mapped Snapshot Refresh	s Path	c	a WWPN/QN		WWPN/IQN Status	4 💌 Enter	a keyword	+ (Search)	VM VM VStore
C 1/1 + D E Initiator Mapped Rimovi Modily Type FC	Entries 2, Selected 1 LUNs Mapped Snapshot Refresh   Alit 12	s Path	c	WWPNION 1212121212121212		WWPN/IQN Status Online	i 💌 Enter	a keyword	Search	VM VM vStore Data Protectio
1/1      V      E  Intiator Mapped  Remove Moduly  Type  PC	Entries 2, Selected 1 LUNs Mapped Snapshot Refesh   Alta 12	s Path	c	WWFNION 1212121212121212		WWPN/IQN Status Online	4 👻 Enter	a keyword	v Search Search	VM VStore Data Protectik Monitor
C 1/1 + 2 E Initiator Mapped Remove Modify Type FC	Entries 2, Selected 1 LUNs Mapped Snapshot Refresh Alit 12	s Path 19	c	WWPNION 1212121212121212		WWPM/ON Status Online	4 👻 Ente	a keyword	Search	VM VStore Vstore Data Protectik Monitor

**Step 3** Modify the initiator information.

In the **Modify Initiator** dialog box that is displayed, modify the initiator information based on the requirements of your operating system. The following figure shows the initiator information modification page.

Figure 7-15 Modifying initiator information

Modify Initiator			×
Type: FC VWVPN: 21000024ff5439 Alias:	54		
Uses third-party multip	path software	ad by ather vendore, cales	+
this option.	iatti soitivare uevelopi	ed by other vehicles, selec	L
Switchover Mode:	common ALUA	-	
Path Type:	Optimal Path	-	
	ОК	Cancel Help	$\supset$

Step 4 Repeat the preceding operations to modify the information about other initiators on the host.

Step 5 Restart the host to enable the configuration to take effect.

----End

## **Recommended VMware NMP Configuration**

This section provides recommended VMware NMP configurations for HyperMetro configuration with different ESXi versions' VMware NMP.

Table 7-5 lists the storage array configurations.

Table 7-5 Configuration on HyperMetro OceanStor V3/OceanStor V5/Dorado V3 storage when	1
interconnected with VMware ESXi	

OS	Storage Array Configuration						
	HyperMetro Working Mode	Storage	OS	OS Native Multipathing Software	Switchover Mode	Special Mode Type	Path Type
VMware ESXi	Load balancing	Local storage array	VMware ESXi	Enabled	Special mode	Mode 1	Optimal path
		Remote storage array	VMware ESXi	Enabled	Special mode	Mode 1	Optimal path

Local preferred	Local storage array	VMware ESXi	Enabled	Special mode	Mode 2	Optimal path	
		Remote storage array	VMware ESXi	Enabled	Special mode	Mode 2	Non-optim al path

For details about the VMware ESXi versions, see the compatibility list:

http://support-open.huawei.com/ready/pages/user/compatibility/support-matrix.jsf

# 

If a LUN has been mapped to the host, you must restart the host for the configuration to take effect after you modify the initiator parameters. If you configure the initiator for the first time, restart is not needed.

In OceanStor V3 V300R003C20, mode 1 and mode 2 are disabled by default. For details about how to enable them, see the *OceanStor 5300 V3&5500 V3&5600 V3&5800 V3&6800 V3 Storage System V300R003C20 Restricted Command Reference* or *OceanStor 18500 V3&18800 V3 Storage System V300R003C20 Restricted Command Reference*. Contact Huawei technical support engineers to obtain the documents.

In OceanStor V5 V500R007C00, OceanStor V3 V300R006C00SPC100, Dorado V3 V300R001C01SPC100, and later versions, you can configure mode 1 and mode 2 on DeviceManager directly.

Figure 7-16 Querying the special mode type

Modify Initiator			×
Type: FC WWPN: 21000024ff5342f4 Alias: Vses third-party multipat	h software		•
If the host uses multipath provider, select this optic	n software not develope in.	ed by the device	
Switchover Mode:	Special mode	•	
Special mode type:	Mode O	<b>*</b>	
Path Type:	Mode O		
	Mode 1		-
		ancel Help	
	21000024#624266		

# 7.2.3 Host Configuration

# 7.2.3.1 Installing Multipathing Software

VMware NMP is ESXi native multipathing software and therefore does not need to be installed separately.

# 7.2.3.2 Configuring Multipathing

# **Recommended VMware NMP Configuration**

Storage Device	Number of Controllers	ALUA Enabled or Not	VM Cluster	Recommended SATP Type	Recommended PSP Type	Remarks
VMware ESXi			·			
Dorado V3 Series, OceanStor V3/OceanStor V5/18000 V3 series V300R003C20	N/A	Y	N/A	VMW_SATP_ ALUA	VMW_PSP_RR	See notes 1, 2, and 3

 Table 7-6 Recommended VMware NMP configuration for OceanStor V3/OceanStor V5/Dorado

 V3 HyperMetro configuration

and later					
-----------	--	--	--	--	--

1. For the MSCS and WSFC clusters deployed on VMware ESXi 5.1 or earlier VMs, you cannot set the RDM LUN to Round Robin, but can set it to FIXED. For details, see section 9.1 How To Query and Modify the Path Selection Policy? or *VMware KB1036189*.

2. When using All-Flash Array, it is advised to set **IO Operation Limit** to **1** on ESXi. For ESXi5.x, 6.x, the command is as follows:

esxcli storage nmp psp roundrobin deviceconfig set --device=device\_NAA\*\* --iops=1 --type iops

You need to change the preceding information in bold based on your actual situation.

3. Dorado V3 systems must be V300R001C01SPC100 or later versions, with multi-controller ALUA and HyperMetro ALUA supported.

For supported ESXi versions, see:

http://support-open.huawei.com/ready/pages/user/compatibility/support-matrix.jsf

#### Precautions

When using HyperMetro with VMware ESXi, note the following precautions:

- The two LUNs in a HyperMetro pair must use the same LUN ID when being mapped to a VMware ESXi host (ESXi 6.5.0 GA build 4564106 or a follow-up version earleir than ESXi 6.5 U1 build 5969303).
  - You can query the host LUN ID mapped to the ESXi host in the Mapping View of OceanStor DeviceManager, as shown in Figure 7-17.
  - Before modifying the Host LUN ID, read the following warnings carefully since misoperations may cause service interruption. To modify the host LUN ID for a LUN, right-click the LUN and choose Change host LUN ID from the shortcut menu. In the displayed dialog box, set the same Host LUN ID value for the two storage devices in the HyperMetro pair and then click OK. For details, see Figure 7-18.

# 

Changing the host LUN ID with an incorrect procedure may cause service interruption.

If no datastore has been created on either LUN in the HyperMetro pair, you can directly change the host LUN ID for the LUNs. Wait for about 5 to 15 minutes after the modification is complete, and then run the **Rescan** command in the ESXi host CLI to check whether the LUNs in the HyperMetro pair have been restored and been online.

If a datastore has been created on either LUN in the HyperMetro pair and a service has been deployed in the datastore, change the host LUN ID using only the following two methods (otherwise, changing the host LUN ID for either LUN will cause the LUN to enter the PDL state and consequently interrupt services):

- Method 1: You do not need to restart the ESXi host. Migrate all VMs in the datastore deployed on the LUNs in the HyperMetro pair to another datastore, and then change the host LUN ID on the OceanStor DeviceManager. Wait for about 5 to 15 minutes after the modification is complete, and then run the **Rescan** command in the ESXi host CLI to verify that the LUNs in the HyperMetro pair have been restored and been online. Then, migrate the VMs back to the datastore deployed on the LUNs in the HyperMetro pair.
- Method 2: You need to restart the ESXi host. Power off all VMs in the datastore deployed on the LUNs in the HyperMetro pair to ensure that no service is running on the LUNs. Then, modify the host LUN ID on the OceanStor DeviceManager. Then, restart the ESXi host to make the modification take effect. After restarting the ESXi host, check whether the LUNs in the HyperMetro pair have been restored and been online.

🜺   OceanSte	or DeviceManage	r			1	larmis: 🙆 Critical 0 🌾	🧿 Major 0 – 🚹 Warning 0 - [開修=	Þ¤I ⊡ @,
Dorado6000V3R	R1C21-L2 > Provisionin	g > Mapping View					?	
Create Delet	e Properties	Modify Mapping Object	Refresh			Name + E	Enter a keyword (Search )	
Name				D ID			*	~
VDI01				0				ŝ
VDI02				.1				Home
VDI03				2				Ē
VDI04				3				
C 1/1 +	8 Entries, 1 Select	ed						System
LUN Group	Host Group Por	t Group	a	0				رچ Provisioning
Pronorting	hanne hort LUNID	Object Type	LUN +		Name	Enter a keepend	Saarrh Advanced Search	-
Name	Host LUN ID	Use Type	Health Status	Running Status	Capa	ity Owning Storage I	P. WWN S	Data Brotection
VDI01-0000	39	Internal	Normal	Online	4.000	TB VMwareVDI	6446a2e100313cd	Data Protection
VDI01-0001	2	Internal	Normal	Online	4.000	TB VMwareVDI	6446a2e100313cd	
VDI01-0002	3 Prop	erties	Normal	Online	4.00	TB VMwareVDI	6446a2e100313cd	Monitor
VDI01-0003	4 Cha	nge host LON ID	Normal	Online	4.001	TR UMwaraUDI	5445a2a100213rd	

#### Figure 7-17 Changing the host LUN ID (1)

#### Figure 7-18 Changing the host LUN ID (2)

🜺   OceanStor DeviceManager				🍓 🔹 Alarms: (	Critical 0 (	Major 0 🜖 Warning 0 【潮谷	中文) 🕞 🔍,
Oorado6000V3R1C21-L2 > Provisioning > Mapping View							2
Create Delete Properties Modify Mapping Object	Refresh			Name	e 👻 Ent	ior a keyword (Search	
Name		ID				1	
VDI01		0					ŝ
VDI02		1					Home
VDI03		2					E
YDI04		3					
1/1 + B Entries, 1 Selected							System
LUN Group Host Group Port Group		8					رچ Provisioning
LUN Group: VDI01 Object Type: Properties Change bost I UN ID Refresh	LUN +		Name	· Enter a ke	www.	Search Advanced Search	
Name Host LUN ID Use Type	Health Status	Running Status	[ rions	Capacity Ow	ning Storage P.	. WWN 3	Data Destaction
VDI01-0000 39 Internal	Normal	Online		4.000 TB VM	wareVIDI	6446a2e100313cd	Data Protectio
VDI01-0001 2 Internal	Normal	Online		4.000 TB VM	ware//DI	6446a2e100313cd	-
VDI01-0002 3 Properties	Normal	Online		4.000 TB VM	wareVDI	6446a2e100313cd	Monitor
VDI01-0003 4	Normal	Online		4.000 TB VM	ware//DI	6446a2e100313cd	

- For OceanStor V3 V300R003C20SPC200, a single array with ALUA enabled can have a maximum of 8 controllers; two active-active arrays with ALUA enabled also cannot have more than 8 controllers.
- VMware ESXi 6.0 U2 and later versions support HyperMetro configuration. Versions earlier than VMware ESXi 6.0 U2 have their defects.
- Dorado V3 must be V300R001C01SPC100 and later versions, supporting multi-controller and HyperMetro ALUA.

Before deploying HyperMetro solution based on VMware ESXi NMP, you need to consider the compatibility between components (such as storage system, operating system, HBAs, and switches) and the application software.

Check the interoperability matrix before deployment: http://support-open.huawei.com/ready/.

This document provides the configuration methods only for HyperMetro interoperability-related components. For specific interoperability configuration scenarios, you must check the corresponding HyperMetro interoperability matrix.

## **Configuring the Host**

For HyperMetro storage, perform the following configuration steps.

#### Setting the VMware NMP Multipathing Rules

Run the following command on the host:

esxcli storage nmp satp rule add -V **HUAWEI**-M **XSG1** -s VMW\_SATP\_ALUA -P VMW\_PSP\_RR -c tpgs\_on

In these commands, HUAWEI is an example of storage Vendor and XSG1 is an example of storage Model. You need to change the two values based on your actual storage configurations. Table 7-7 provides the vendor and model information of Huawei mainstream storage devices.

Storage Device	Vendor	Model
S2200T/S2600T/S5500T/S5 600T/S5800T/S6800T	HUAWEI/SYMANTEC/HU ASY	S2200T/S2600T/S5500T/S5 600T/S5800T/S6800T
Dorado2100 G2	HUAWEI/SYMANTEC/HU ASY	Dorado2100\G2
Dorado5100	HUAWEI/SYMANTEC/HU ASY	Dorado5100
18500	HUAWEI	HVS85T
18800/18800F	HUAWEI	HVS88T
V5 series V3 series 18000 V3 series 18000 V5 series Dorado V3 Series	HUAWEI	XSG1

Table 7-7 Huawei Storage vendor and model information

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• After the command is executed, the new rule will immediately take effect for the newly mapped LUN, but will not take effect for previously mapped LUNs unless ESXi is restarted.

• Restart the host for the configuration to take effect. For details, see: https://pubs.vmware.com/vsphere-60/index.jsp#com.vmware.vsphere.storage.doc/GUID-D10F7E66 -9DF1-4CB7-AAE8-6F3F1F450B42.html.

Set FC timeout parameters as follows:

- For FC networking, no configuration is required.
- For iSCSI networking, execute the following commands on ESXi hosts:

esxcli iscsi adapter param set -A vmhba35 -k NoopOutInterval -v 3

esxcli iscsi adapter param set -A vmhba35 -k NoopOutTimeout -v 10

esxcli iscsi adapter param set -A vmhba35 -k RecoveryTimeout -v 3

#### 

1. All the preceding commands are available only in VMware 5.0 and later versions. For HyperMetro-supported VMware versions, see:

http://support-open.huawei.com/ready/pages/user/compatibility/support-matrix.jsf

2. The field in italic (vmhba35 in this example) indicates the iSCSI initiator. You need to change it according to your own hosts.

3. The configurations will not take effect unless the host restarts.

4. If you do not perform the preceding configurations but only retain the ESXi host settings, the path switchover time may reach up to 35s. However, the preceding configurations can shorten the path switchover time to about 16s.

#### **Configuring a VMware Cluster**

If you want to configure VMware clusters, see the BC&DR Solution Product Documentation (Active-Active Data Center). See section "Virtualization Platform Configuration" in this document. The contents in this section are as follows.

#### **Mandatory Configuration Items:**

- Deploy ESXi hosts across data centers in a HA cluster and configure the cluster with HA advanced parameter das.maskCleanShutdownEnabled = True for VMware vSphere 5.0 u1, 5.1, and 5.5 versions.
- A VM service network requires L2 interworking between data centers for VM migration between data centers without affecting VM services.
- For VMware vSphere 5.0 u1, later 5.0 versions, and 5.1 versions, log in to the CLI of each ESXi host using SSH and add **Disk.terminateVMOnPDLDefault = True** in the /etc/vmware/settings file.
- For VMware vSphere 5.5 and its update versions, log in to the host using the vSphere Client.
  - Set **VMkernel.Boot.terminateVMOnPDL = True**. The parameter forcibly powers off VMs on a datastore when the datastore enters the PDL state.

Figure 7-19 Boot parameter settings

IX- Syslog User UserVans VBLOB	Maximum number of VHs expected to use a given device Min: 0 Max: 2147463647		
- VRLASH - VHPS - VHPS3 (=) VHRemel - Boot	Meanel.Boot.terminater/MC/PCK. Terminate virtual machine on permanent loss of storage	p	
VSAN XvMotion	Where Boot the English Off	2	-

- Set **Disk.AutoremoveOnPDL** = **0**. This setting ensures that datastores in the PDL state will not be automatically removed.

Figure 7-20 Disk para	meter settings
-----------------------	----------------

Advanced Settings		
- Annotations	Bisk.AutoremoveOnPDL	1 -
- CERC - Config - COW	Autoremove paths to a disk that is in PDL (Permanent Device Loss) Min: 0 Max: 1	
- Cpu - DataMover - DCUI - Digest - DirentryCache	Disk.BandwidthCap cap on disk.bandwidth (KI)(s) usage New 10 May 4704047304	4294967294

- For VMware vSphere 6.0 u2 and later versions:
  - After connecting to vCenter through the Web Client, enter the cluster HA configuration. The configuration requirements are as follows.

Figure 7-21 vSphere 6.0 cluster configuration

vSphere DRS	Turn on vSphere HA							
/Sphere HA	Host Monitoring	Host Monitoring						
	ESXESX hosts in this cluster might cause isolation respon	ESVESX hosts in this cluster exchange network heartbeats. Disable this feature when per might cause isolation responses.						
	Host Monitoring							
	Host Hardware Monitoring -	VM Com	ponent Protection					
	ESXESX hosts have the cap could deem them unusable (	ability to for exam	detect various failures that do not necess ple, losing network/disk communication)	arity ca	use			
	Protect against Storage C	onnectiv	ity Loss					
	Virtual Machine Monitoring							
	VM Monitoring restarts individ restarts individual VMs if their	ual VMs in-ques	if their VMware Tools heartbeats are not r t application heartbeats are not received v	eceived within a	l wi			
	Disabled	•						
	Failure conditions and VM	0						
	Failure	Resp	unse //		Details			
	Hostfailure	Rest	art VMs		Restart VI			
	Host Isolation	Disat	bled		VMs on iso			
	Datastore with Permanent Device Loss	Datastore with Permanent Power off and restart VMs Device Loss Power off and restart VMs Datastore with All Paths Power off and restart VMs		Datast to rest				
	Datastore with All Paths Down			Datast to rest	tore art			
	Guest not heartbeating	Disak	oled	VM and a				
	VM restart priority		Medium					
			A When Disabled is selected, virtual machines failure. In addition, they remain Protected who					
	Response for Host Isolat	ion :	Disabled	•				
	Response for Datastore v Permanent Device Loss (	vith PDL)	Power off and restart VMs					
		140 1 10 10	Dower off and restart Vite (anorasis)		1			
	Response for Datastore v Paths Down (APD)	with All	Power on and restart vws (aggressive)		1			
	Response for Datastore v Paths Down (APD) Delay for VM failover for AF	PD	3 minutes		)			

- For VMware vSphere 6.5:
  - After connecting to vCenter through the Web Client, enter the cluster HA configuration. The configuration requirements are as follows.

Figure 7-22 vSphere 6.5 cluster configuration-1



#### Figure 7-23 vSphere 6.5 cluster configuration-2

FC - Edit Cluster Settings			(U)
vSphere DRS vSphere Availability Failures and Responses Proactive HA Failures and Responses	Tailure coeditions and responses Tou can configure how uSphere HA isolation, VM component protection M Enable Host Monitoring	responds to the failure conditions on this cluster. The following failure conditions are supported, host, hos (datastore with PCL, and APC), Vill and application.	
Admission Control	+ Host Failure Response	Restart VMs ·	
Heartbeat Datastores	+ Response for Host Isolation	Disabled	
	<ul> <li>Datastore with PDL</li> </ul>	Power of and restart VMs	
	+ Datastore with APD		
	Al Paths Down (APD) Failure Response	Allows you to configure the cluster to respond to APD Datastore failures           Disabled         No action will be taken on the affected VMs.         Issue events           No action will be taken on the affected VMs.         Issue events         No action will be taken on the affected VMs.           No action will be taken on the affected VMs.         Issue events         No action will be taken on the affected VMs.           No action will be taken on the affected VMs.         Issue events         No action will be taken on the affected VMs.           All affected VMs will be powered off and vSphere HA will attempt to restart VMs. If another host has connectivity to the datastore.         No	
	Response receively	Power off and restart VMs - Aggressive restart policy All affected VMs will be powered off and vSphere HA will always attempt to restart VMs.      Reset VMs     •       Reset VMs     •       Response delay:     3	



For VMware vSphere 5.1 to 5.5 versions, restart hosts for the configuration to take effect.

For VMware vSphere 6.0 U2 to 6.5 versions, re-enable the HA cluster to make the configuration take effect without restarting hosts.

#### **Recommended Configuration Items**

- The vMotion network, service network, and management network are configured with different VLAN IDs to avoid network interference.
- The management network includes the vCenter Server management node and ESXi hosts that are not accessible to external applications.
- The service network is divided into VLANs based on service requirements to ensure logical isolation and control broadcast domains.
- In a single cluster, the number of hosts does not exceed 16. If a cluster has more than 16 hosts, you are advised to use the hosts to create multiple clusters across data centers.
- A DRS group is configured to ensure that VMs can be recovered first in the local data center in the event of the breakdown of a single host.

# 7.2.4 Verification

Log in to the vSphere Client or vSphere Web Client to check whether the LUNs' VMware NMP configurations have taken effect.

Figure 7-24 Verifying the multipathing configuration

Path Selection:		Round Robin (VMware)						- Cha	nge
Storage Array Ty	/pe:	VMW_SATP_ALUA							
aths									
Runtime Name	Targ	et	11	JN	Statu	JS	$\nabla$	Preferred	
vmhba3:C0:T4:L)	21:0	0:84:ad:58:93:36:ae 24:03:84:ad:58:93:36:ae	e 1		٠	Active (	I/O)		
vmhba2:C0:T0:L1	21:0	0:84:ad:58:93:36:ae 24:03:84:ad:58:93:36:ae	e 1		٠	Active (	I/O)		
vmhba3:C0:T3:L1	21:0	0:84:ad:58:93:36:ae 24:1a:84:ad:58:93:36:ae	e 1		•	Active			
vmhba2:C0:T1:L1	21:0	0:84:ad:58:93:36:ae 24:1a:84:ad:58:93:36:ae	e 1		•	Active			
								R	efrest
Name: Runtime Name:	fc.20000 vmhba3:	024ff5333b7:21000024ff5333b7-fc.210084ac C0:T3:L1	1589336ae:24	41a84ao	1589336	jae-naa.(	584ad	 581009336ae	00e3.
Name: Runtime Name: Fibre Channel	fc.20000 vmhba3:	024ff5333b7:21000024ff5333b7-fc.210084ac C0:T3:L1	1589336ae:24	41a84ac	1589336	iae-naa.(	584ad	 581009336ae	00e3.
Name: Runtime Name: <b>Fibre Channel</b> Adapter:	fc.20000 vmhba3: 20:00:00	024ff5333b7:21000024ff5333b7-fc.210084ac C0:T3:L1 :24:ff:53:33:b7 21:00:00:24:ff:53:33:b7	1589336ae:24	41a84ac	1589336	iae-naa.(	584ad	581009336ae	D0e3.
Name: Runtime Name: <b>Fibre Channel</b> Adapter: Target:	fc.20000 vmhba3: 20:00:00 21:00:84	024ff5333b7;21000024ff5333b7-fc.210084ac C0;T3;L1 ;24;ff:53;33;b7 21;00;00;24;ff:53;33;b7 ;ad;58;93;36;ae 24;1a;84;ad;58;93;36;ae	1589336ae:24	41a84ac	1589336	jae-naa.t	584ad	581009336ae	D0e3.

# 8 Configuring Multipathing in Non-HyperMetro Scenarios

# 8.1 UltraPath

# 8.1.1 Storage System Configuration

If you use UltraPath, retain the default initiator settings. Do not select **Uses third-party multipath software**.

Huawei.Storage > Provisioning > Host			
Host Host Group Initiator			
Automatic scan for hosts is Disabled . You can cl	ick Parameter Settings to modify the settings.		
Create - Delete Properties Add	d Initiator Remove Initiator Refresh	1)	
Name	Status	OS	
Iw_CentOS2017	Normal	Linux	
🗌 oel	Normal	Linux	
RHEL_AS3.9	Normal	Linux	
Redhat_test	Normal	Linux	
xen_host	Normal	XenServer	
solaris	Modify Initiator	2	×
autohost72_1	-		
Ix-host	Type: FC		
aix_lw	WWPN: 1000001090108218		
<     1/1       Entries 28, Selected 1	Alias:		
	Uses third-party multipath software		-
Initiator Mapped LUNs Mapped S	n If the hosts use multipath software this option.	developed by other vendors, select	
Remove Modify Refresh			
🔳   Туре			1.1
FC FC			
FC FC			
	ОК	Cancel Help	)

Figure 8-1 Initiator setting when UltraPath is used

# 8.1.2 Host Configuration

Install and configure UltraPath by following instructions in the OceanStor UltraPath for Linux User Guide.

# 8.2 OS Native Multipathing Software

Different OS versions support different VMware NMP policies.

This chapter describes the VMware NMP policy recommended by HUAWEI for establishing connections between VMware ESXi and HUAWEI storage systems:

**New-version Huawei storage (namely, storage that supports multi-controller ALUA and ALUA HyperMetro)**: OceanStor V5 series V500R07C00 and later, OceanStor V3/18000 V3 series V300R003C20 (V300R003C20SPC200 and later)/V300R006C00 (V300R006C00SPC100 and later), Dorado V3 V300R001C01 (V300R001C01SPC100 and later)

**Old-version Huawei storage (namely, storage that does not support multi-controller ALUA or ALUA HyperMetro**): OceanStor T V1/T V2/18000 V1/V300R001/V300R002/V300R003C00/V300R003C10/V300R005, Dorado V300R001C01

# 8.2.1 New-Version Huawei Storage

# 8.2.1.1 Recommended NMP Configurations

Table 8-1 provides the recommended NMP configurations when different ESX/ESXi versions interconnect with HUAWEI storage.



The recommended NMP configuration is a universal configuration, but may be not the best configuration in your storage environments.

For example, VMW\_PSP\_RR has better performance than VMW\_PSP\_FIXED, but VMW\_PSP\_RR has some use restrictions: for the MSCS and WSFC clusters deployed on VMs, you can set the RDM LUN to PSP\_RR only in VMware ESXi 5.5 and later versions. For details, see VMware KB 2147662.

If you want to configure an optimal path policy, contact local Huawei support.

**Table 8-1** Recommended NMP configurations when different ESXi versions interconnect withOceanStor V3/OceanStor V5/Dorado V3

Storage Device	ALUA Enable d or Not	VM Clust er	Recomm ended SATP Type	Recom mended PSP Type	Remarks
ESXi 5.0.*					
OceanStor	Yes	N/A	VMW_S	VMW_P	See Notes 1, 2, 3, and 6.

Storage Device	ALUA Enable d or Not	VM Clust er	Recomm ended SATP Type	Recom mended PSP Type	Remarks
V5/18000 V5 OceanStor V3/18000 V3 V300R003C20 and later versions Dorado V3			ATP_AL UA	SP_FIX ED	
ESXi 5.1.*					
OceanStor V5/18000 V5 OceanStor	Yes	Yes	VMW_S ATP_AL UA	VMW_P SP_FIX ED	See Notes 1, 2, 3, and 6.
V3/18000 V3 V300R003C20 and later versions Dorado V3		No	VMW_S ATP_AL UA	VMW_P SP_RR	See Notes 1, 2, 3, 4, 5, and 6.
ESXi 5.5.*, 6.0.*, 6.5	5.*				
OceanStor V5/18000 V5 OceanStor V3/18000 V3 V300R003C20 and later versions Dorado V3	Y	N/A	VMW_S ATP_AL UA	VMW_P SP_RR	See Notes 1, 2, 3, 4, 5, and 6.

1. Failback is supported upon recovery from a path fault.

2. On the VMware command line interface, run the following commands to add rules:

esxcli storage nmp satp rule add -V HUAWEI -M XSG1 -s VMW\_SATP\_ALUA -P VMW\_PSP\_RR -c tpgs\_on.

You need to change the preceding information in bold based on your actual situation. For details, see 7.2.3.2 Configuring Multipathing.

After the command is executed, the new rule will immediately take effect for the newly mapped LUN, but will not take effect for previously mapped LUNs unless ESXi is restarted.

3. This configuration is recommended for ALUA-enabled storage.

4. For the MSCS and WSFC clusters deployed on VMware ESXi 5.1 and earlier versions, you cannot set the RDM LUN to Round Robin, but can set it to FIXED. For details, see section 9.1 How To Query and Modify the Path Selection Policy? or *VMware KB1036189*.

5. When using All-Flash Array, it is advised to set *IO Operation Limit* to 1 on ESXi. For ESXi5.x, 6.x, run the command:

esxcli storage nmp psp roundrobin deviceconfig set --device=device\_NAA\*\* --iops=1 --type iops

You need to change the preceding information in bold based on your actual situation.

6. Dorado V3 storage must be V300R001C01SPC100 or later versions, supporting multi-controller ALUA and HyperMetro ALUA.

For supported ESXi versions, see:

http://support-open.huawei.com/ready/pages/user/compatibility/support-matrix.jsf

# 8.2.1.2 Storage System Configuration

## **Configuring the ALUA Mode**

For non-HyperMetro configuration, use the configuration listed in Table 8-2.

Table 8-2 Configuration on non-HyperMetro OceanStor	r V5/OceanStor V3/Dorado V3 storag	е
when interconnected with VMware ESXi		

Operating	Configuration on the Storage Array							
System	Storage	Operating System	Third-Part y Multipath Software	Switchove r Mode	Special Mode	Path Type		
ESXi 5.0.x, ESXi 5.1.x,	Two-contr oller, multi-cont roller	VMware ESX	Enable	Special mode	Mode 1	Optimal Path		
ESXI 5.5.x, ESXi 6.0.x, ESXi 6.5.x								

#### 

For supported ESXi versions, see: http://support-open.huawei.com/ready/pages/user/compatibility/support-matrix.jsf.

# 

If a LUN has been mapped to the host, you must restart the host for the configuration to take effect after you modify the initiator parameters. If you configure the initiator for the first time, restart is not needed.

In OceanStor V3 V300R003C20, mode 1 and mode 2 are disabled by default. For details about how to enable them, see the *OceanStor 5300 V3&5500 V3&5600 V3&5800 V3&6800 V3 Storage System V300R003C20 Restricted Command Reference* or *OceanStor 18500 V3&18800 V3 Storage System V300R003C20 Restricted Command Reference*. Contact Huawei technical support engineers to obtain the documents.

In OceanStor V5 V500R007C00, OceanStor V3 V300R006C00SPC100, Dorado V3 V300R001C01SPC100, and later versions, you can configure mode 1 and mode 2 on DeviceManager directly.

Figure 8-2 Querying the special mode type

Modify Initiator				×
Type: FC WWPN: 21000024ff5342f4 Alias:	th software			•
If the host uses multipati provider, select this optic	n software not develo )n.	ped by:	the device	
Switchover Mode:	Special mode	•		
Special mode type:	Mode O	-		
Path Type:	Mode O			
	Mode 1			-
		Cancel	Help	
	2400002466234266			

# Configuring the AA Mode

Configure the AA mode for the host initiator on the storage as follows:

- Select Uses third-party multipath software.
- Set Switchover Mode to ALUA not used.
- Set Path Type to Optimal Path.

Figure 8-3 Configuring the AA mode for the host initiator

WWPN: 10000425c5a64	2ca		
Alias:			
🛃 Uses third-party multi	path software		
If the host uses multij select this option.	oath software not dev	eloped by the devic	e provider,
Switchover Mode:	ALUA not used	•	
Path Type:	Optimal Path	•	

# 8.2.1.3 Host Configuration

## Configuring the ALUA Mode

For non-HyperMetro configuration, perform the following steps to configure VMware NMP.

After enabling ALUA on Huawei storage, perform the following steps to add multipathing rule on the ESXi hosts:

Step 1 Check the vendor and model information of the storage systems.

Use the SSH tool to log in to the ESXi Shell, and run the **esxcli storage core device list** to view **Vendor** and **Model** information of the storage system.

```
[root@localhost:~] esxcli storage core device list
naa.630d17e100b3020708d125f60000026
Display Name: HUAWEI Fibre Channel Disk (naa.630d17e100b3020708d125f60000026)
Has Settable Display Name: true
Size: 15360
Device Type: Direct-Access
Multipath Plugin: NMP
Devfs Path: /vmfs/devices/disks/naa.630d17e100b3020708d125f60000026
Vendor: HUAWEI
Model: XSG1
Revision: 4303
SCSI Level: 6
Is Pseudo: false
Status: on
```

#### Step 2 Add multipathing rules.

Run different configuration commands for the two different multipathing modes:

• VMW\_PSP\_Fixed:

esxcli storage nmp satp rule add -V *HUA*WEI -M **XSG1** -s VMW\_SATP\_ALUA -P VMW\_PSP\_FIXED -c tpgs\_on

• VMW\_PSP\_RR:

```
esxcli storage nmp satp rule add -V HUAWEI -M XSG1 -s VMW_SATP_ALUA -P VMW_PSP_RR -c tpgs_on
```

In these commands, HUAWEI is an example of storage Vendor and XSG1 is an example of storage Model. You need to change the two values based on your actual storage configurations. Table 8-3 provides the vendor and model information of Huawei mainstream storage devices.

Storage Device	Vendor	Model
S2200T/S2600T/S5500T/S5 600T/S5800T/S6800T	HUAWEI/SYMANTEC/HU ASY	S2200T/S2600T/S5500T/S5 600T/S5800T/S6800T
Dorado2100 G2	HUAWEI/SYMANTEC/HU ASY	Dorado2100\G2
Dorado5100	HUAWEI/SYMANTEC/HU ASY	Dorado5100

#### Table 8-3 Huawei Storage vendor and model information

Storage Device	Vendor	Model
18500	HUAWEI	HVS85T
18800/18800F	HUAWEI	HVS88T
V5 series	HUAWEI	XSG1
18000 V5 series		
V3 series		
18000 V3 series		
Dorado V3 Series		

To delete existing multipathing configuration rules, replace [path policy] with the configured path mode (for example, VMW\_PSP\_Fixed) and then run the following command:

esxcli storage nmp satp rule remove -V HUAWEI -M XSG1 -s VMW\_SATP\_ALUA -P [path policy] -c tpgs\_on

**Step 3** Confirm that the rule is added successfully:

esxcli storage nmp satp rule list | grep HUAWEI

----End



After the command is executed, the new rule will immediately take effect for the newly mapped LUN, but will not take effect for previously mapped LUNs unless ESXi is restarted.

## Configuring the AA Mode

Select one path of the storage system as its preferred path, as shown in Figure 8-4. For a storage device that has a preferred path selected, first set another path as the preferred path and then set original path to the preferred path again.

laic		View: D	Datastores Dev	ices								
ocessors	1	Devices							R	efresh	Rescan /	All
emory		Name					Runtime	Vame	Operation	al State	LUN	
orage		HUAWEI	iSCSI Disk (naa.	60022a11000d28f11	18b614f30000	0015)	vmhba34	:C0:T0:L0	Mounted		0	
tworking	I	ATA Seria	ial Attached SCSI	I Disk (naa.5000c500	)3591e26e)		vmhba2:(	CO:TO:LO	Mounted		0	
orage Adapters		HUAWEI	iSCSI Disk (naa.	60022a11000d28f11	18b618530000	0018)	vmhba34	:C0:T0:L3	Mounted		3	-
twork Adapters		HUAWEI	iSCSI Disk (naa.	60022a11000d28f11	18b6172c0000	0017)	vmhba34	:C0:T0:L2	Mounted		2	
vanced Seti 🛃 HUAWEI	I iSCSI Disk (n	naa.60022	2a11000d28f1	1861853000001	18) Manage I	Paths				$\mathbf{X}$	1	
wer Manage Policy										_		
Path Se	ection:	Fixed	(Uthuara)					-	hanna			
are	accion.	Inter	(vivware)						nange			
ensed Feati Storage	e Array Type:	VMW_	SATP_DEFAULT	_AA								
ne Configura										_		
IS and Routi	Name T	Target				UIN State	×	Droforrad	_	1		
thentication	Augoral a	raryet				con stat	15	Freieneu				
Vmhba3	49CH213213 10		here here here a second second		a Jack	· ·	A - 11 - 1					
wer manage	4.00.70.10	iqn.2006-08	3.com.huawei:oc	eanstor:21000022a1	I0d28f1:	3	Active			M	lanage Pat	hs2
tual Machine	4:C0:T2:L3 in	ign.2006-08 ign.2006-08	3.com.huawei:oc 3.com.huawei:oc	eanstor:21000022a1 eanstor:21000022a1	0d28f1:	3 🔶 3 🍐	Active Active		5	M	lanage Pat	:hs2
tual Machine wmbba3 tual Machine wmbba3 tual Machine wmbba3	4:C0:T2:L3 in 4:C1:T0:L3 in 4:C1:T1:L3 in	iqn.2006-08 iqn.2006-08 iqn.2006-08	3.com.huawei:oo 3.com.huawei:oo 3.com.huawei:oo 3.com.huawei:oo	eanstor:21000022a1 eanstor:21000022a1 eanstor:21000022a1 eanstor:21000022a1	0d28f1:	3 🔶 3 🍐 able	Active Active		5	000	lanage Pat	:hs2
tual Machine vmbba3 tual Machine vmbba3 tual Machine vmbba3 curity Profile vmbba3	4:C0:T0:L3 in 4:C1:T0:L3 in 4:C1:T1:L3 in 4:C0:T0:L3 in	ign.2006-08 ign.2006-08 ign.2006-08 ign.2006-08 ign.2006-08	3.com.huawei:oc 3.com.huawei:oc 3.com.huawei:oc 3.com.huawei:oc 3.com.huawei:oc	eanstor:21000022a1 eanstor:21000022a1 eanstor:21000022a1 eanstor:21000022a1 eanstor:21000022a1	0d28f1:	3  3 3 ble ferred 4	Active Active	•	3	000	lanage Pat	:hs2
tual Machine wmhba3e tual Machine wmhba3e tual Machine wmhba3e curity Profile wmhba3e st Cache Cc wmhba3e	4:C1:T2:L3 in 4:C1:T0:L3 in 4:C1:T1:L3 in 4:C0:T0:L3 in 4:C0:T1:L3 in	ign.2006-08 ign.2006-08 ign.2006-08 ign.2006-08 ign.2006-08	3.com.huawei:oc 3.com.huawei:oc 3.com.huawei:oc 3.com.huawei:oc 3.com.huawei:oc 3.com.huawei:oc	eanstor:21000022a1 eanstor:21000022a1 eanstor:21000022a1 eanstor:21000022a1 eanstor:21000022a1 eanstor:21000022a1	0d28f1: 10d28f1: 10d Disa 10d Pref 10d Con	3  3 3 ble ferred 4 w path to clipboa	Active Active Active (0)	•	3	000	lanage Pat	:hs2
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Figure 8-4 Setting the preferred path for a storage device

# 8.2.1.4 Verification

After the configuration, run the following command to confirm that the multipathing software configuration is correct.

esxcli storage nmp satp rule list | grep -i huawei

The following figure shows the command output.

#### Figure 8-5 Command output

[root@localhost:"]	esxcli storage nmp	satp rule	list grep -i huawe	1		A	1041 000 00
MW_SAIP_ALUA	PSUAWE1	2291			user	tpgs_on	VMW_PSP_KK
[root@localhost:~]							

Run the following command to check whether the path information takes effect.

esxcli storage nmp device list -d=naa.6xxxxxx.

The following figure shows the command output.

#### Figure 8-6 VMware path information



The path information is displayed in the unit of port group rather than in the unit of a single path.

# 8.2.2 Old-Version Huawei Storage

# 8.2.2.1 Recommended NMP Configurations

Table 8-4 provides the recommended NMP configurations when different ESX/ESXi versions interconnect with HUAWEI storage.

# 

The recommended NMP configuration is a universal configuration, but may be not the best configuration in your storage environments.

For example, VMW\_PSP\_RR has better performance than VMW\_PSP\_FIXED, but VMW\_PSP\_RR has some use restrictions: for the MSCS and WSFC clusters deployed on VMs, you can set the RDM LUN to PSP\_RR only in VMware ESXi 5.5 and later versions. For details, see VMware KB 2147662.

If you want to configure an optimal path policy, contact local Huawei support.

Table 8-4 Recommended NMP configurations when different ESXi versions interconnect with Huawei old-version
storage

Storage Device	Number of Controlle rs	ALUA Enabled or Not	VM Cluster	Recommend ed SATP Type	Recommen ded PSP Type	Remarks
ESX 4.0.*						
S2600, S5000 series T V1 series,	2	N	N/A	VMW_SATP _DEFAULT_ AA	VMW_PSP_ FIXED	See notes 1, 2, and 5.
Dorado5100 Dorado2100 G2, T V2 series 18000 V1 series V3 series	4 or more	N	N/A	VMW_SATP _DEFAULT_ AA	VMW_PSP_ FIXED	See notes 1, 2, and 5.
ESXi 4.1.*	·	·	·	·	·	
S2600, S5000 series	2	Y	N/A	VMW_SATP _ALUA	VMW_PSP_ FIXED_AP	See notes 2, 3, and 4.
T V1 series, Dorado5100 Dorado2100	4 or more	N	N/A	VMW_SATP _DEFAULT_ AA	VMW_PSP_ FIXED	See notes 1, 2, and 5.

Storage Device	Number of Controlle rs	ALUA Enabled or Not	VM Cluster	Recommend ed SATP Type	Recommen ded PSP Type	Remarks
G2						
T V2 series						
18000 V1						
V3 series						
FSXi 5.0 *						
ESAI 5.0.	_					
S2600, S5000 series	2	N	N/A	VMW_SATP _DEFAULT_ AA	VMW_PSP_ FIXED	See notes 1, 2, and 5.
T V1 series, Dorado5100	2	Y	N/A	VMW_SATP _ALUA	VMW_PSP_ FIXED	See notes 2, 3, and 4.
Dorado2100 G2 T V2 series	4 or more	N	N/A	VMW_SATP _DEFAULT_ AA	VMW_PSP_ FIXED	See notes 1, 2, 5, and 7.
1 V2 series						
series						
V3 series						
ESXi 5.1.*						
S2600, S5000 series	2	Ν	N/A	VMW_SATP _DEFAULT_ AA	VMW_PSP_ FIXED	See notes 1, 2, and 5.
T V1 series, Dorado5100	2	Y	Y	VMW_SATP _ALUA	VMW_PSP_ FIXED	See notes 2, 3, and 4.
Dorado2100 G2			N	VMW_SATP _ALUA	VMW_PSP_ RR	See notes 2, 3, 5, and 6.
T V2 series 18000 V1 series V3 series	4 or more	N	VMW_S ATP_DE FAULT_ AA	VMW_PSP_F IXED	See notes 1, 2,	5, and 7.
ESXi 5.5.*, 6.0	).*, 6.5.*					
S2600, S5000 series	2	N	N/A	VMW_SATP _DEFAULT_ AA	VMW_PSP_ FIXED	See notes 1, 2, and 5.
T V1 series, Dorado5100	2	Y	N/A	VMW_SATP _ALUA	VMW_PSP_ RR	See notes 2, 3, and 4.
Dorado2100 G2, T V2 series	4 or more	Ν	N/A	VMW_SATP _DEFAULT_ AA	VMW_PSP_ FIXED	See notes 1, 2, 5, and 7.

Storage Device	Number of Controlle rs	ALUA Enabled or Not	VM Cluster	Recommend ed SATP Type	Recommen ded PSP Type	Remarks
18000 V1 series V3 series						

- 1. You need to manually set the primary path for each LUN on the vSphere Client. For the default preferred LUN, you can set a non-preferred path and then set the preferred path.
- 2. A switchback is supported upon recovery from a path fault.
- 3. On the VMware command line interface, run the following commands to add rules: For ESX/ESXi 4.x:

esxcli nmp satp addrule -V HUAWEI -M XSG1 -s VMW\_SATP\_ALUA -o tpgs\_on esxcli nmp satp setdefaultpsp -s VMW\_SATP\_ALUA -P VMW\_PSP\_FIXED For ESXi 5.0 and later:

esxcli storage nmp satp rule add -V HUAWEI -M XSG1 -s VMW\_SATP\_ALUA -P VMW\_PSP\_RR -c tpgs\_on

You need to change the preceding information in bold based on your actual situation. After the command is executed, the new rule will immediately take effect for the newly mapped

- LUN, but will not take effect for previously mapped LUNs unless ESXi is restarted.
- 4. This configuration is recommended for ALUA-enabled storage.
- 5. This configuration is recommended for ALUA-disabled storage.
- 6. For the MSCS and WSFC clusters deployed on VMware ESXi 5.1 and earlier versions, you cannot set the RDM LUN to Round Robin, but can set it to FIXED. For details, see section 9.1 How To Query and Modify the Path Selection Policy? or *VMware KB1036189*.
- 7. For any future controller expansion purpose, you are advised to disable ALUA and configure VMW\_SATP\_DEFAULT\_AA.

# 

- To avoid the Ping-Pong effect in VMware ESX 4.0 clusters, you are advised to disable ALUA.
- If a path policy or preferred path is set on the VMware page before or after rules are added, this setting prevails. The newly added rule will not take effect to any LUN that has been configured with a path policy or preferred path.
- For a LUN already configured with a preferred path, first switch to the non-preferred path and then set back to the preferred path, thereby ensuring normal switchback upon recovery from the fault.

OceanStor 18000/T V2/V3 supports two or more controllers.

When the storage systems have two controllers, they support ALUA and A/A.

When the storage systems have more than two controllers, they support only A/A but not ALUA (as of the release of this document).

To facilitate future capacity expansion, you are advised to disable ALUA on the OceanStor 18000/T V2/V3 and its host.

# 8.2.2.2 Storage System Configuration

## **Configuring the ALUA Mode**

#### • T Series V100R005/Dorado2100/Dorado5100/Dorado2100 G2

Use the Huawei OceanStor storage management system to enable ALUA for all the host initiators, as shown in Figure 8-7.

Figure 8-7 Enabling ALUA for T series V100R005/Dorado2100/Dorado5100/Dorado2100 G2

Create	Modify	Delete	Mapping 🔻	Command E	)evice 🔻	Initiator	Configuration	2		
ltems:10	Selecte	d:1	Initiator Co	nfiguration					×	<
Items:10 Host_V Host_T Host_C Host_C Host_C Host_C Host_C Name: ID: OS:	Selecte Name CS_XZH SSX VS194 DS_ISCSI 03785513718 Mapped LU	d:1 9 1 59071179 JNS W Host_1 1 Linux	Initiator Co Following an new initiator, Items:4	nfiguration e the initiators the modify an exist Selected:1 Nias tor002 500 tor000 Modify tor000 Hos HBA Iden Initia	Initiato Identific Identific Identific Identific Identific Initiator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator Initator I	een added t r, or remove sr 159ef FC 59ef FC 50001442 FC 50001442 Yes	o the host Host e an initiator from HBA Type T T 8059ef13 or002 7 © canc Add	E TES m the	T. You can add a host. nable ALUA $\diamond$ $>$ 3 × Help v 4 Remove	¢
							C	lose	<u>H</u> elp	

#### • T Series V200R002/18000 Series/V3 Series/18000 V3 Series

Use the Huawei OceanStor storage management system to enable ALUA for all the host initiators, as shown in Figure 8-8.

			_
Huawei.storage > Provisioning > Host			
Host Group			
You can click Parar	neter Settings. to modify the	settings.	
Create  Delete Properties	dd Initiator Remove Ini	itiator Refresh	
Name	Status	08	
vplex	Normal	Linux	
nutao hutao	Normal	Linux	
Host_TEST	Normal	Linux	1
WJH VVJH	Modify Initiator		×
	Alias: Enable ALUA If you want to check I	WO priorities of multiple paths, enable ALUA.	
Initiator Mapped LUNs Mapped Sna	A To ensure the storage CHAP authors the storage CHAP authentication	ntration ge system access security, you are advised to config n to control the access to the storage system.	jure
Remove Modify? Refresh Type ISCSI			
iscsi 2		OK Cancel Help	

Figure 8-8 Enabling ALUA for T series V200R002/18000 series/V3 series/18000 V3 series

If there are more than two controllers and ALUA is disabled by default, the ALUA status cannot be changed.

# Configuring the AA Mode

On the storage, the host initiator default setting is the AA mode, and therefore no manual configuration is required.



If a LUN has been mapped to the host, you must restart the host for the configuration to take effect after you modify the initiator parameters. If you configure the initiator for the first time, restart is not needed.

# 8.2.2.3 Host Configuration

## Configuring the ALUA Mode

The same as "Configuring the ALUA Mode" under section 8.2.1.3 Host Configuration.

## Configuring the AA Mode

Select one path of the storage system as its preferred path, as shown in Figure 8-9. For a storage device that has a preferred path selected, first set another path as the preferred path and then set original path to the preferred path again.

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Figure 8-9 Setting the preferred path for a storage device

# 8.2.2.4 Verification

After the configuration, run the following command to confirm that the multipathing software configuration is correct.

esxcli storage nmp satp rule list|grep -i huawei

The following figure shows the command output.

#### Figure 8-10 Command output

[root@localhost:"] escoli storage mmp satp rule list|grep -i huswei] VMM\_ENTP\_ALUA MUAMEI XSGI User tpgs\_on VMM\_RSP\_RR [root@localhost:"]

Run the following command to check whether the path information takes effect.

esxcli storage nmp device list -d=naa.6xxxxxxx.

The following figure shows the command output.

#### Figure 8-11 VMware path information



The path information is displayed in the unit of port group rather than in the unit of a single path.
# 9 FAQs

### 9.1 How To Query and Modify the Path Selection Policy?

You can check and modify a path policy by running command lines.

This section describes how to use commands to check and modify the path policy.

### Querying the Path Policy of a Single LUN

• ESX/ESXi 4.0

The following is an example command for querying a path policy:

```
[root@e4 ~]# esxcli nmp device list -d naa.6666666100666650092f5330000045
naa.6666666100666650092f5330000045
Device Display Name: HUASY iSCSI Disk (naa.666666661006666650092f5330000045)
Storage Array Type: VMW_SATP_DEFAULT_AA
Storage Array Type Device Config:
Path Selection Policy: VMW_PSP_FIXED
Path Selection Policy Device Config:
{preferred=vmhba33:C0:T1:L0;current=vmhba33:C0:T0:L0}
Working Paths: vmhba33:C0:T0:L0
[root@e4 ~]#
```

The following is an example command for querying a path policy:

```
[root@localhost ~]# esxcli corestorage device list
naa.60022a11000416611b2a9d18000000a
Display Name: HUASY Fibre Channel Disk (naa.60022a11000416611b2a9d18000000a)
Size: 56320
Device Type: Direct-Access
Multipath Plugin: NMP
Devfs Path: /vmfs/devices/disks/naa.60022a11000416611b2a9d18000000a
Vendor: HUASY
Model: S5600T
Revision: 2105
SCSI Level: 4
Is Pseudo: false
Status: on
Is RDM Capable: true
Is Local: false
```

```
Is Removable: false
Attached Filters:
VAAI Status: unknown
Other UIDs: vml.020001000060022a11000416611b2a9d18000000a533536303054
[root@localhost ~]# esxcli nmp device list
naa.60022a11000416611b2a9d18000000a
Device Display Name: HUASY Fibre Channel Disk
(naa.60022a11000416611b2a9d18000000a)
Storage Array Type: VMW_SATP_ALUA
Storage Array Type Device Config: {implicit_support=on;explicit_support=on;
explicit_allow=on;alua_followover=on;{TPG_id=2,TPG_state=A0}}
Path Selection Policy: VMW_PSP_FIXED
Path Selection Policy Device Config: Current Path=vmhbal:C0:T0:L1
Working Paths: vmhbal:C0:T0:L1
```

esxcli corestorage device list is used to display existing disks.

esxcli nmp device list is used to display disk paths.

• ESXi 5.0 and later

The following is an example command for querying a path policy:

```
~ # esxcli storage nmp device list
naa.666666610066666502b85d9200000014
Device Display Name: HUASY iSCSI Disk (naa.6666666610066666502b85d9200000014)
Storage Array Type: VMW_SATP_ALUA
Storage Array Type Device Config: {implicit_support=on;explicit_support=on;
explicit_allow=on;alua_followover=on;{TPG_id=1,TPG_state=AO}{TPG_id=2,TPG_state=AN
O}}
Path Selection Policy: VMW_PSP_RR
Path Selection Policy Device Config: Current Path=vmhba39:C0:T0:L2
Path Selection Policy Device Custom Config:
Working Paths: vmhba39:C0:T0:L2
```

#### Modifying the Path Policy for a Single LUN

You can run the following command to modify the PSP path policy of a LUN:

• VMware ESXi/ESX 4.1

```
# esxcli nmp device setpolicy -d naa.6006016055711d00cff95e65664ee011
--psp=VMW_PSP_FIXED
```

• VMware ESXi 5.0 and later

```
# esxcli storage nmp device set -d naa.6006016055711d00cff95e65664ee011
--psp=VMW_PSP_FIXED
```

Run the following command to check the modification result:

VMware ESXi/ESX 4.1

# esxcli nmp device list -d naa.6006016055711d00cff95e65664ee011 |grep PSP naa.6006016055711d00cff95e65664ee011

• VMware ESXi 5.0 and later

```
# esxcli storage nmp device list -d naa.6006016055711d00cff95e65664ee011 |grep PSP
naa.6006016055711d00cff95e65664ee011
```

### 9.2 VMware APD and PDL

For details about All-Paths-Down (APD) and Permanent Device Loss (PDL) in the VMware ESXi system, see the VMware Knowledge Base:

https://kb.vmware.com/selfservice/microsites/search.do?language=en\_US&cmd=displayKC& externalId=2004684

## 9.3 How Can I Select a Fixed Preferred Path for a Storage Device with Active-Active Controllers?

Determine which path is preferred based on the performance optimization principle and load balance principle.

- Select the path connected to the working controller of the LUN.
- If there are multipath paths connected to the working controller of the LUN, distribute the preferred paths evenly to the multiple paths.

# 9.4 How Can I Determine Which Controller a Path Is Connected to?

A path can be located using the initiator (host port) and the target (storage device port). Figure 9-1 illustrates how to obtain the path information about a storage device.

- Determine a path connected to a Fibre Channel storage device by the initiator name's former part (for example **vmhba4:C0**) and the target name. Then based on the target name's latter part (for example **20:08:f8:4a:bf:57:af:b7**), determine the storage device's Fibre Channel port that corresponds to the WWPN. The previous information can be combined to determine which controller the path connects to.
- Determine the IPv4 address of an iSCSI storage device's Ethernet port by the target name's latter part (for example **97.97.97.201:3260**). Then you can determine which controller the path connects to.

#### Figure 9-1 Port information about a path



## 9.5 Precautions for Configuring iSCSI Multipathing

### 9.5.1 When Is Port Binding Needed?

Port binding is needed when multiple VMkernel ports are available on a VMware ESXi host and all these ports are in the same IP subnet and broadcast domain.

An example is shown as follows:





In this example, the networking configurations on the ESXi host are as follows:





For port binding details, see the VMware knowledge base: https://kb.vmware.com/selfservice/microsites/search.do?language=en\_US&cmd=displayKC& externalId=2045040.

### 9.5.2 When Is Port Binding Not Needed?

Port binding is not needed if:

- In the array, the target iSCSI ports are in different broadcast domains or IP subnets.
- The VM kernel ports for iSCSI connections are in different broadcast domains, IP subnets, or vSwitches.

• Connections can only be routed to the iSCSI array.

An example is shown as follows.

Figure 9-4 Example wherein port binding is not required



In this example, the networking configurations on the ESXi host are as follows:

Figure 9-5 Example network configurations where port binding is not required

Standard Switch: vSwitch3	Remove Properties
VMkernel Port VMkernel Q vmk1 : 192.168.1.1	Physical Adapters
Standard Switch: vSwitch4	Remove Properties

For port binding details, see the VMware knowledge base:

https://kb.vmware.com/selfservice/microsites/search.do?language=en\_US&cmd=displayKC& externalId=2045040.

# **10** Acronyms and Abbreviations

Acronyms and Abbreviations	Full Spelling
Α	
ALUA	Asymmetric logical unit number
AN	Active Optimized
AO	Active Non-optimized
APD	All-Paths-Down
С	
СНАР	Challenge Handshake Authentication Protocol
CLI	Command Line Interface
D	
DRS	Distributed Resource Scheduler
Ε	
EQI	Extended Unique Identifier
F	
FC	Fiber Channel
FCR	Fibrer Channel Routing
G	

Acronyms and Abbreviations	Full Spelling
GE	Gigabit Ethernet
Н	
НА	High Availability
НВА	Host Bus Adapter
Ι	
IP	Internet Protocol
IQN	iSCSI Qualified Name
iSCSI	Internet Small Computer Systems Interface
L	
LACP	Link Aggregation Control Protocol
LUN	Logical Unit Number
Μ	
MB	Megabyte
MRU	Most Resently Use
Ν	
NFS	Network File System
NMP	Native Multipath Module
Р	
PDC	Permanent Device Loss
PSA	Pluggable Storage Architecture
PSP	Path Selection Plugin
P2V	Physical to Virtual
R	

Acronyms and Abbreviations	Full Spelling
RAID	Redundant Array of Independent Disks
RDM	Raw Device Mapping
S	
SAN	Storage Area Network
SATP	Storage Array Type Plugin
SP	Storage Processor
V	
VLAN	Virtual Local Area Network
VM	Virtual Machine
VMDK	Virtual Machine Disk
VMFS	Virtual Machine File System
V2P	Virtual to Physical
W	
WWN	World Wide Name
WWPN	World Wide Port Name