



OceanStor UltraPath for Linux
V100R008C50

User Guide

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Huawei Technologies Co., Ltd.

Address: Huawei Industrial Base
Bantian, Longgang
Shenzhen 518129
People's Republic of China

Website: <http://e.huawei.com>

About This Document

Intended Audience

This document explains how to install and configure the UltraPath software on a Linux operating system and describes commonly used commands, alarm handling, and troubleshooting.

This document is intended for:

- Technical support engineers
- Maintenance engineers

Conventions

As part of an effort to improve and enhance the product performance and capabilities, Huawei periodically releases revisions of the hardware and software. Therefore, some functions described in this document may not be supported by all versions of the software or hardware currently in use. For the most up-to-date information about product features, refer to the product release notes.

If a product does not function as described in this document, contact Huawei technical support engineers.

To obtain the Open Source Software Notice, go to the following website: <http://support.huawei.com/enterprise/>.

Change History

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

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This issue is the third official release.

Optimized the document structure and the description of software functions.

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This issue is the second official release.

Added description of software functions.

Issue 01 (2016-05-20)

The first official release.

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1 About the UltraPath

About This Chapter

The UltraPath is a piece of multipathing software developed based on the Linux kernel. The UltraPath is installed on an application server to control the application server's access to a storage system by selecting and managing paths between the application server and the storage system.

[1.1 Introduction](#)

The UltraPath improves data transfer reliability, ensures security of paths between an application server and a storage system, and provides customers with an easy-to-use and highly efficient path management solution to bring the performance of application servers and storage systems into full play, maximizing return on investment (ROI).

[1.2 Application Scenarios](#)

The UltraPath provides mature multipathing management functions for cluster and non-cluster environments deployed by enterprises. In addition, the UltraPath supports a direct connection or switch-based connection between an application server and a storage system.

[1.3 UltraPath Security Feature](#)

This chapter describes UltraPath security feature.

1.1 Introduction

The UltraPath improves data transfer reliability, ensures security of paths between an application server and a storage system, and provides customers with an easy-to-use and highly efficient path management solution to bring the performance of application servers and storage systems into full play, maximizing return on investment (ROI).

Risks Faced When the UltraPath Is Not in Use

For the purpose of improving data transfer reliability, an application server is typically connected to a storage system by using multiple paths. However, if the UltraPath is not installed on an application server, this connection mode results in many problems, including the following:

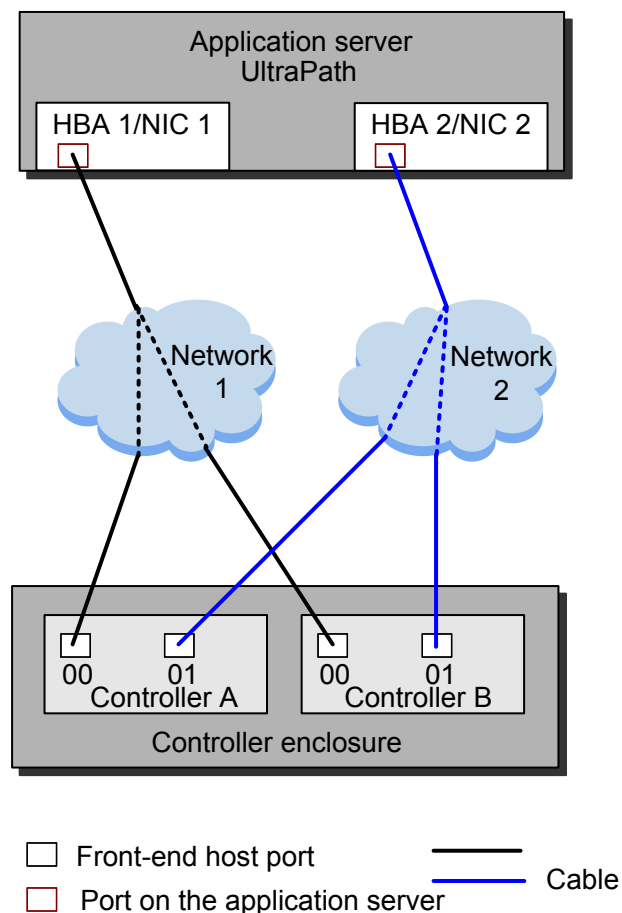
- Multiple redundant physical disks
If a LUN on a storage system is mapped to an application server that has multiple paths destined for the storage system, multiple redundant physical disks are displayed on the application server. This misleads users.
- Failure to leverage advantages of path redundancy
The operating system running on an application server that has multiple paths destined for a storage system does not know when and how to use those paths. As a result, advantages of path redundancy are not brought into play.
- Compromised data security
The operating system running on an application server cannot distinguish between redundant mapped disks. In this case, storing data on disks may overwrite the existing data or cause I/O errors.

You can resolve the preceding problems by installing the UltraPath.

Description of the UltraPath

The UltraPath applies to a network environment composed of application servers and storage systems. It provides a multipathing solution for an application server to access a storage system, enhancing security, reliability, and maintainability of enterprise data storage. [Figure 1-1](#) and [Figure 1-2](#) show the typical networking modes.

Figure 1-1 Typical networking mode 1



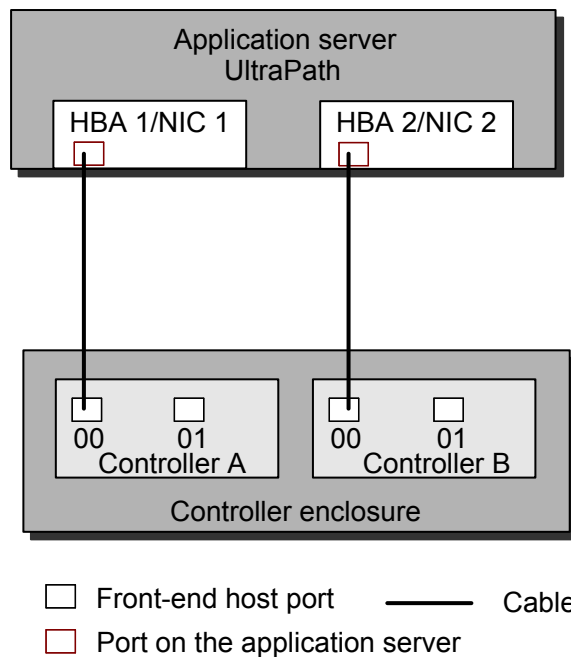
NOTE

- HBA: Host Bus Adapter
- NIC: Network Interface Card

In **Figure 1-1**:

- When Fibre Channel switches are used for networking, networks 1 and 2 indicate Fibre Channel switches.
- When Ethernet switches are used for networking, networks 1 and 2 indicate subnets. A subnet can be composed of one Ethernet switch or a cascading of two or more Ethernet switches.

Figure 1-2 Typical networking mode 2



Functions and Features of the UltraPath

The UltraPath has the following functions and features:

- Selection of paths between an application server and a storage system

The UltraPath is loaded to a Linux operating system as a kernel module and registered as a virtual device internally. The UltraPath enables an application server and a storage system to communicate with each other over the optimal path.

- Failover

A failover is a service trespass upon a failure. Multiple paths can be set up between an application server and a storage system to ensure highly reliable data transfer. When the primary path fails, the failover function enables the UltraPath to automatically switch services to a secondary path, preventing service interruption caused by a single point of failure.

NOTE

An owning controller is assigned to each LUN created on a storage system. In the event that a LUN is mapped to an application server, the path between the application server and the owning controller of the LUN is the primary path, and other redundant paths are secondary paths. Using the primary path as the working path maximizes the I/O performance.

- Failback

Upon the failure of the primary path, I/Os are switched from the primary path to a secondary path. Upon the recovery of the primary path, the failback function enables the UltraPath to automatically switch I/Os from the secondary path back to the primary path.

- I/O load balancing

I/O load balancing is implemented to share network traffic or expand the bandwidth, enabling I/O traffic to be transferred over multiple paths to the same destination. When there are at least two paths between an application server and the same controller of a

storage system, the UltraPath sends I/O data packets over multiple accessible paths to the controller to achieve load balancing. When there are multiple paths between an application server and the dual controllers of a storage system, the UltraPath sends I/O data packets over multiple accessible paths to the controllers to achieve load balancing between controllers.

- I/O suspension

If I/Os cannot be sent for a certain reason such as a link failure, I/O commands are temporarily stored in a multipathing queue. Upon the fault recovery, I/Os are sent again to ensure service continuity.

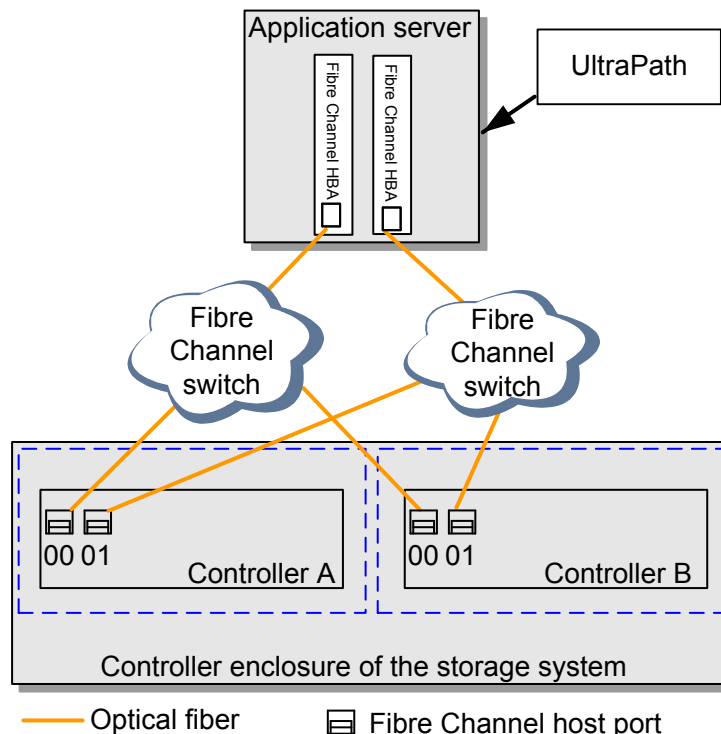
1.2 Application Scenarios

The UltraPath provides mature multipathing management functions for cluster and non-cluster environments deployed by enterprises. In addition, the UltraPath supports a direct connection or switch-based connection between an application server and a storage system.

Non-Cluster Environment

In an application environment where cluster software is not deployed, the UltraPath enables an application server to access a storage system through multiple paths. This provides robust data transfer availability and reliability, ensuring front-end service continuity. **Figure 1-3** shows the topology of a non-cluster environment where the UltraPath is deployed. This section uses the switch-based connection mode as an example.

Figure 1-3 Topology of a non-cluster environment where the UltraPath is deployed



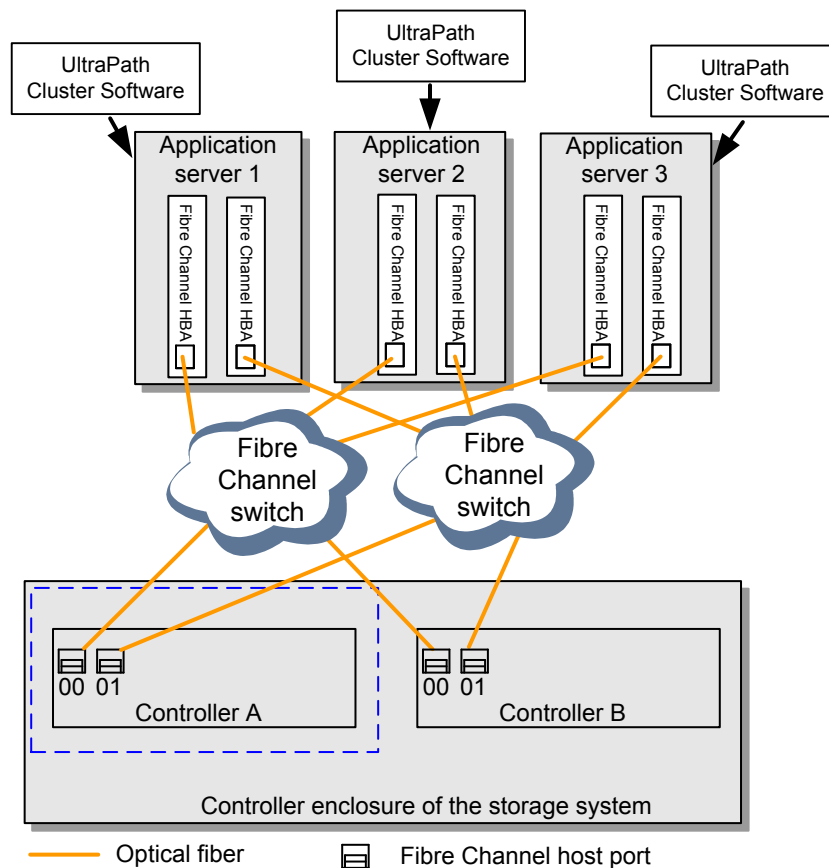
NOTE

As shown in **Figure 1-3**, each HBA of an application server has two links destined for the storage system.

Cluster Environment

In an application environment where cluster software is to be deployed or has already been deployed, the UltraPath works seamlessly with the cluster environment, providing better data transfer channels to enhance the disaster defense capability of the cluster environment. **Figure 1-4** shows the topology of a cluster environment where the UltraPath is deployed.

Figure 1-4 Topology of a cluster environment where the UltraPath is deployed



NOTE

- As shown in **Figure 1-4**, each HBA of an application server has four links destined for the storage system.
- Cluster software supported by the UltraPath includes Veritas Cluster Server (VCS) 5.1 and later.

1.3 UltraPath Security Feature

This chapter describes UltraPath security feature.

- Only user **root** can operate UltraPath.
- All non-query operations are recorded in logs. These logs can be accessed by user **root** only.
- The inputs of all users are verified to prevent unauthorized inputs.
- Interaction data of arrays are verified to prevent attacks.
- Ports are not listened and personnel data and sensitive data are not accessed.

2 UltraPath Configuration Process

Before installing and using the UltraPath, learn about the installation precautions and configuration process. This helps you correctly install, configure, and use the UltraPath.

Precautions

- The controller enclosure of the storage system must be equipped with Fibre Channel and iSCSI interface modules.
- The Fibre Channel host ports on the storage system must be correctly connected to the HBAs of the application server.
- UltraPath V100R008 supports common Fibre Channel networking mode and iSCSI networking mode.

Configuration Process

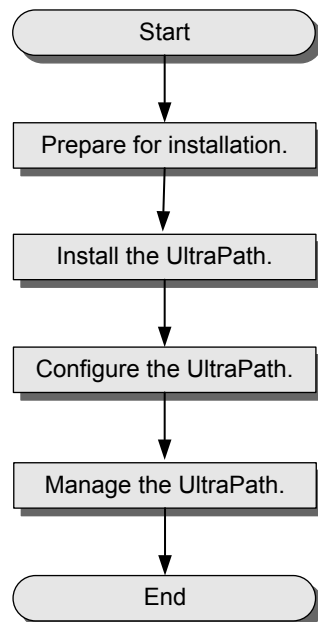


Table 2-1 Configuration process description

Key Step	Reference Section	Remarks
Prepare for installation.	3 Preparing for Installation	Before installing the UltraPath, you must check whether the storage system, application server, and HBAs meet the UltraPath installation requirements.
Install and configure the UltraPath (boot from local).	4.1 Installing the UltraPath (Boot from Local)	This step applies to the scenario where you install the UltraPath for the first time or upgrade the UltraPath in boot from local mode.
Install and configure the UltraPath (boot from SAN).	4.2 Installing UltraPath (Boot from SAN)	This step applies to the scenario where you install the UltraPath for the first time or upgrade the UltraPath in boot from SAN mode.
Manage the UltraPath.	A Commonly Used CLI Management Commands	Describes the commonly used command-line interface (CLI) management commands of the UltraPath.

3 Preparing for Installation

About This Chapter

To ensure smooth UltraPath installation, make preparations before installing UltraPath.



NOTICE

When you deploy the UltraPath on VMs, if LUNs are allocated to a VM in Raw Device Mapping (RDM) mode or **pass-through** mode, the VM does not support the UltraPath.

[3.1 Application Server](#)

This section introduces requirements for HBAs and available memory of application servers.

[3.2 Introduction to SAN Boot](#)

SAN Boot is a network storage management system that stores data including a server's operating system on a storage system. That is, the operating system is installed on and booted from a SAN storage system. Therefore, SAN Boot is also called remote boot or boot from SAN.

3.1 Application Server

This section introduces requirements for HBAs and available memory of application servers.

HBA

UltraPath supports FCoE/Fibre Channel HBAs, IB HCAs, and iSCSI initiators. A LUN cannot be mapped to different hosts through HBAs or iSCSI initiators that are from different vendors and with different models and firmware versions.

Before installing the UltraPath, make sure that the HBA or the HCA, and its driver program have been correctly installed. If the HBA driver program supports failover, you must set its mode to **Non-Failover**.

NOTE

- For details about how to install HBAs or the HCAs, and their drivers on application servers, contact your HBA or HCA suppliers.
- InfiniBand HCAs support 64-bit Red Hat Enterprise Linux 6.1, Red Hat Enterprise Linux 6.3, and SUSE 11 SP3.
- In an IB networking scenario, hosts running UltraPath can impelment automatic file system mouting. To impelment this fucntion, a host must run 64-bit Red Hat Enterprise Linux 6.1 or Red Hat Enterprise Linux 6.3, and the host must be directly connected to the storage system.

Available Memory of an Application Server

The recommended available memory of an application server is equal to or larger than 600 MB.

NOTE

For a 32-bit operating system, run the `cat /proc/meminfo` command. If the value of the **LowFree** parameter is smaller than 600 MB and the value of the **MemFree** parameter is larger than 16 GB, you are advised to replace the 32-bit operating system with a 64-bit operating system.

3.2 Introduction to SAN Boot

SAN Boot is a network storage management system that stores data including a server's operating system on a storage system. That is, the operating system is installed on and booted from a SAN storage system. Therefore, SAN Boot is also called remote boot or boot from SAN.

Advantages of SAN Boot

SAN Boot benefits system integration and centralized management. Advantages of SAN Boot are as follows:

- **Server integration:** A blade server is used to run a lot of operating systems. Local hard disks are not needed.
- **Centralized management:** Boot disks of servers are centrally managed by the storage system, fully leveraging various advanced management functions provided by the storage system. For example, the volume replication function of the storage system can be used to backup a server's data and quickly deploy servers of the same model. In

addition, disaster recovery can be implemented based on the remote mirror function of the storage system.

- Quick fault recovery: In the event that a SAN Boot server failed, its boot volumes are immediately mapped to another server to implement quick fault recovery.

Boot Modes Supported by the UltraPath

- Boot from Local: Install the operating systems on the local disks of an application server and start the application server from local disks.
- Boot from SAN: Install the operating systems on SAN storage devices and start the application server from the SAN storage devices.

UltraPath V100R008 supports the preceding two boot modes, and **install.sh** provides the two modes for you to select during the UltraPath installation.



NOTICE

In SAN Boot scenarios, do not map the LUN that houses the host's operating system to two or more hosts. Otherwise, operating system data may be inconsistent. Besides, the virtual LUN running the host operating system must be a common virtual LUN.

4 Installing UltraPath

About This Chapter

UltraPath supports two boot modes: boot from Local and boot from SAN. You can select a desired mode when using **install.sh** for installation.

- Boot from Local: Install the operating systems on the local disks of an application server and start the application server from local disks.
- Boot from SAN: Install the operating systems on SAN storage devices and start the application server from the SAN storage devices.



NOTICE

- In SAN Boot scenarios, do not map the LUN that houses the host's operating system to two or more hosts. Otherwise, operating system data may be inconsistent. Besides, the virtual LUN running the host operating system must be a common virtual LUN.
- When mounting a file system to a virtual disk such as sda or sdb that is generated by UltraPath, you are advised to use the UUID of the virtual disk to mount the file system to prevent impact of drive letter changes.

[4.1 Installing the UltraPath \(Boot from Local\)](#)

When the operating systems are installed on the local disks of the application server, install UltraPath in Boot from Local mode.

[4.2 Installing UltraPath \(Boot from SAN\)](#)

When the operating systems are installed on SAN storage devices, install UltraPath in Boot from SAN mode.

4.1 Installing the UltraPath (Boot from Local)

When the operating systems are installed on the local disks of the application server, install UltraPath in Boot from Local mode.

4.1.1 Silent Installation

Install UltraPath in silent installation mode. Before installing UltraPath, you must configure the parameters of the configuration file used for silent installation. The UltraPath installation process does not involve user interactions, enabling one-click installation.

Procedure

- Step 1** Select an UltraPath software package according to the system information. **Table 4-1** lists the operating systems for UltraPath software packages (V100R008 as an example).

Table 4-1 Operating systems for UltraPath software packages (V100R008 as an example)

UltraPath Software Package	Operating System
OceanStor UltraPath V100R008CXXSPCXXX_RHEL.zip	Red Hat, CentOS, and Oracle Linux
OceanStor UltraPath V100R008CXXSPCXXX_SLES.zip	SUSE
OceanStor UltraPath V100R008CXXSPCXXX_LinuxOther.zip	Red Flag Linux, LINX-TECH, Kylin, NeoShine, and Deepin

 **NOTE**

UltraPath software packages that you obtain from a CD-ROM are not compressed. The packages that you obtain from other channels are compressed.

- Step 2** Use a digital signature verification tool to verify integrity of the software package.

 **NOTE**

Download the digital signature verification tool from <http://support.huawei.com/enterprise/> to verify integrity of the software package. If the verification fails, contact technical support engineers to obtain the correct and secure software package.

- Step 3** Upload the UltraPath software package to the application server.

Decompress the UltraPath software package on a Windows-based server and upload the package to a directory (such as /home) of the application server.

 **NOTE**

The software package path cannot contain a space.

- Step 4** Log in to the application server as user **root**, go to the software package directory (SUSE as an example), and check whether the configuration file for silent installation exists.

```
suse11-67:/home/SLES # ls unattend_install.conf
unattend_install.conf
suse11-67:/home/SLES #
```

- Step 5** Set the `unattend_install.conf` configuration item of the configuration file. Set the value of **boot_type** to **1** and set the value of **restart** based on onsite requirements. [Table 4-2](#) describes the related parameters.

Table 4-2 Parameters of the configuration item

Parameter	Description	Value
boot_type	Startup mode of UltraPath.	[Value range] <ul style="list-style-type: none"> ● 1: Boot from local ● 2: Boot from SAN [Default value] 1
restart	This parameter is used to determine whether the host is restarted after UltraPath is installed.	[Value range] <ul style="list-style-type: none"> ● y: The host is restarted after the installation. ● n: The host is not restarted after the installation. NOTE If IB cards such as HCA, QLogic, or Emulex HBA cards are used to connect to the storage array, you are advised to set the value to n. [Default value] n

- Step 6** Run the `install.sh -f /any-directory/unattend_install.conf` command to start silent installation.

```
suse11-67:/home/SLES # chmod +x install.sh
suse11-67:/home/SLES # ./install.sh -f unattend_install.conf
```

- The installation tool automatically checks the environment.


```
complete iscsi checking.
complete FC checking.
Verify the UltraPath existence.
The UltraPath is not installed.
```
- Modify adapters' configuration parameters.


```
Modify system configuration.[file:/etc/iscsi/
iscsid.conf,item:node.startup,value: automatic]
Modify system configuration.[file:/etc/iscsi/
iscsid.conf,item:node.session.timeo.replacement_timeout,value: 1]
Modify system configuration.[file:/etc/
modprobe.conf.local,module:qla2xxx,item:qlport_down_retry,value:5]
Modify system configuration.[file:/etc/
modprobe.conf.local,module:lpfc,item:lpfc_nodev_tmo,value:5]
```

[Table 4-3](#) describes the configuration parameters of adapters.

 **NOTE**

The following adapter parameters will be automatically modified when UltraPath is installed. You do not need to manually configure them.

Table 4-3 Adapter parameters

Adapter Type	Configuration File	Parameter
Linux-iscsi	/etc/iscsi.conf	Multipath=portal ConnFailTimeout=1
open-iscsi	/etc/iscsi/iscsid.conf	node.startup = automatic node.session.timeo.replacement_timeout=1
Qlogic	SUSE: /etc/ modprobe.conf.local Red Hat 4/Red Hat 5: /etc/modprobe.conf Red Hat 6/Red Hat 7: /etc/modprobe.d/ nxupmodules.conf	options qla2xxx qlport_down_retry=5 options qla2xxx ql2xfailover=0
Emulex	SUSE: /etc/ modprobe.conf.local Red Hat 4/Red Hat 5: /etc/modprobe.conf Red Hat 6/Red Hat 7: /etc/modprobe.d/ nxupmodules.conf	Options lpfc lpfc_nodev_tmo=5

When you perform the preceding operations, the following cases lead to alarms:

- The operating system version and the kernel version do not match. As a result, the installed UltraPath software may fail to take effect.
- The version of the host adapter driver has defects. As a result, it is incompatible with the UltraPath software.

Alarm Scenario	Information Description	Information Description
The operating system version and the kernel version do not match.	The OS version XXX does not match the kernel version. If the kernel has been updated or patched, please confirm the compatibility.	Check whether the release file in the /etc/ directory has been modified. If the file is modified, restore it and install the UltraPath software again. If the file is not modified, check whether the system is upgraded.

Alarm Scenario	Information Description	Information Description
The version of the host adapter driver has defects.	There are some defects of the iSCSI Initiator provided by SLES9 SP3. Therefore, you need to update the iSCSI Initiator.	Update the iSCSI initiator.
	The open-iscsi version is too low, Please update the iSCSI driver to the version 2.0-870.3.	Upgrade open-iscsi to 2.0-870.3.
	The default Qlogic driver in Red Hat AS4 and Asianux2 has a defect (Using upRescan command provided by the UltraPath.Please update it to qla2xxx-v8.02.23).	Download qla2xxx-v8.02.23 from http://driverdownloads.qlogic.com/QLogicDriverDownloads_UI/default.aspx (QLogic official website) and upgrade it.

- The default timeout parameter is modified using **Systemd**.

```
Modify system configuration.[file:/etc/systemd/system.conf,item:
DefaultTimeoutStartSec ,value: 600s]
```

Table 4-4 Systemd default timeout parameter

Systemd default timeout parameter	Configuration File	Parameter
Systemd	/etc/systemd/system.conf	DefaultTimeoutStartSec=600s

- Select the desired system boot mode <1>. 1 is automatically typed and the installation continues.

```
If the operating system is installed on a local drive of the server, you are
advised
to choose boot from local; if the operating system is installed on a SAN
storage
system, you must choose boot from san. Please choose the boot type of your
system:
<1>--boot-from-Local
<2>--boot-from-SAN
please input your select:1
Unattend install configuration item 'boot_type' set to '1'. Unattend
installation will continue.
Preparing... #####
UltraPath #####
User configuration is saved successfully.
The boot service is installed successfully.
The running service is installed successfully.
*****Attention*****
***
* UltraPath would modify some parameters of HBA cards for better performace.
```



```
If *
* UltraPath is installed for the first time, you may need to update the
initrd *
* image before system reboot to make the modification take
effect. *
*****
***
*****
***
* UltraPath will use the system hostname for alarm generation and automatic
host*
* registration. Make sure that the system hostname is correctly
configured.. *
*****
***
The installation is complete. Whether to restart the system now?
<Y|N>:n
Unattend install configuration item 'restart' set to 'n'. The system will not
be restarted after the unattend installation.
suse11-67:/home/SLES #
```

- If HCA cards of the IB type are used to connect to the storage array, run the **upLinux config ib** command to configure the IB driver service. In this way, the disks of the storage array will be reported to the host for a takeover.
- If the QLogic or Emulex HBAs are used to connect the storage system, you are advised to run the **upLinux updateImage** command to update mirrors. In this way, modifications to the configuration of the QLogic or Emulex driver during the installation can take effect.

 **NOTE**

The modifications to the configuration parameters of the drive can take effect only after the host is restarted.

Step 7 Optional: If the **restart** item in the `unattend_install.conf` configuration file is set to `n`, you can use the following two methods to enable UltraPath to take effect after the installation.

- Restart the host. (This is the typical practice.)
- Start the `nxup` service.

Before starting the `nxup` service, the system asks you whether to process the existing disks that the UltraPath software can take over. To enable the `nxup` service to successfully start, you must delete these disks. Before deleting these disks, ensure that they do not have services, volume management software, clusters, file systems, and other applications.

The operation procedure is as follows:

Run the **service nxup start** or **/etc/init.d/nxup start** command.

 **NOTE**

For UltraPath in SUSE 12 series and Deepin operating systems, run the **/etc/init.d/nxup start** command.

The **service nxup start** command is used as an example.

```
#service nxup start
this kernel is 2.6.39-200.24.1.el6uek.x86_64
begin load nxup
Begin to delete LUNs whose mappings do not exist
Begin to delete LUNs whose mappings are changed.
begin scan host0
begin scan host1
begin scan host2
begin scan host3
begin scan host4
begin scan host5
begin scan host6
```

```
The device scanning is complete.
start upservice
The UltraPath starts successfully.
```

NOTICE

- After a kernel mode switchover, for example, a switchover from the default mode to xen mode, perform the following operations:
 1. Run the **upLinux updateImage** command to update images.
 2. Restart the host.
- If you cannot log in to the operating system after UltraPath is installed in boot from local mode, see [10.2 Failed to Restart the SANBOOT System After the UltraPath Is Installed by Using the boot from local Mode](#) to solve the problem.

---End

4.1.2 Non-Silent Installation

Install UltraPath in non-silent installation mode. In the UltraPath installation process, you must perform operations according to the prompt information.

Procedure

- Step 1** Select the corresponding UltraPath software package based on your operating system. [Table 4-5](#) lists UltraPath software packages and their corresponding operating systems (V100R008 as an example).

Table 4-5 UltraPath software packages and their corresponding operating systems (V100R008 as an example)

UltraPath Software Package	Operating System
OceanStor UltraPath V100R008CXXSPCXXX_RHEL.zip	Red Hat, CentOS, and Oracle Linux
OceanStor UltraPath V100R008CXXSPCXXX_SLES.zip	SUSE
OceanStor UltraPath V100R008CXXSPCXXX_LinuxOther.zip	Red Flag Linux, LINX-TECH, Kylin, NeoShine, and Deepin

NOTE

UltraPath software packages that you obtain from a CD-ROM are not compressed. The packages that you obtain from other channels are compressed.

- Step 2** Use a digital signature verification tool to verify integrity of the software package.

NOTE

Download the digital signature verification tool from <http://support.huawei.com/enterprise/> to verify integrity of the software package. If the verification fails, contact technical support engineers to obtain the correct and secure software package.

Step 3 Upload the UltraPath software package to an application server.

Decompress the UltraPath software package on a Windows-based server and upload the package to a directory (such as /home) of the application server.

 **NOTE**

The software package path cannot contain a space.

Step 4 Log in to the application server as user **root**, go to the software package directory (SUSE as an example), and run installation tool `install.sh` to install the software.

```
linux-8beo:/home/SLES # chmod +x install.sh
linux-8beo:/home/SLES # ./install.sh
```

- The installation tool automatically checks the environment.

```
complete iscsi checking.
complete FC checking.
Verify the UltraPath existence.
The UltraPath is not installed.
```

- Modify all adapter configuration parameters.

```
Modify system configuration.[file:/etc/iscsi/
iscsid.conf,item:node.startup,value: automatic]
Modify system configuration.[file:/etc/iscsi/
iscsid.conf,item:node.session.timeo.replacement_timeout,value: 1]
Modify system configuration.[file:/etc/
modprobe.conf.local,module:qla2xxx,item:qlport_down_retry,value:5]
Modify system configuration.[file:/etc/
modprobe.conf.local,module:lpfc,item:lpfc_nodev_tmo,value:5]
```

Table 4-6 describes the adapter parameters.

 **NOTE**

The following adapter parameters will be automatically modified during UltraPath installation. No manual configuration is required.

Table 4-6 Adapter parameters

Adapter Type	Configuration File	Parameter
Linux-iscsi	/etc/iscsi.conf	Multipath=portal ConnFailTimeout=1
open-iscsi	/etc/iscsi/iscsid.conf	node.startup = automatic node.session.timeo.replacement_timeout=1
QLogic	SUSE: /etc/ modprobe.conf.local Red Hat 4/Red Hat 5: /etc/modprobe.conf Red Hat 6/Red Hat 7: /etc/modprobe.d/ nxupmodules.conf	options qla2xxx qlport_down_retry=5 options qla2xxx ql2xfailover=0

Adapter Type	Configuration File	Parameter
Emulex	SUSE: /etc/ modprobe.conf.local Red Hat 4/Red Hat 5: /etc/modprobe.conf Red Hat 6/Red Hat 7: /etc/modprobe.d/ nxupmodules.conf	Options lpfc lpfc_nODEV_tmo = 5

When you perform the preceding operations, the following cases generate alarms:

- The operating system version and the kernel version do not match. As a result, the installed UltraPath may fail to take effect.
- The version of the host adapter driver has defects. As a result, it is incompatible with the UltraPath.

Alarm Scenario	Information Description	Suggestion
The operating system version and the kernel version do not match.	The OS version XXX does not match the kernel version. If the kernel has been updated or patched, please confirm the compatibility.	Check whether the release file in the /etc/ directory has been modified. If yes, restore it before installing the UltraPath. If no, confirm whether a system upgrade is needed.
The version of the host adapter driver has defects.	There are some defects of the iSCSI Initiator provided by SLES9 SP3. Therefore, you need to update the iSCSI Initiator.	Update the iSCSI initiator.
	The open-iscsi version is too low, Please update the iSCSI driver to the version 2.0-870.3.	The open-iscsi version is outdated. You need to upgrade it to 2.0-870.3.
	The default QLogic driver in Red Hat AS4 and Asianux2 has a defect for using upRescan command provided by the UltraPath. Please update it to qla2xxx-v8.02.23.	Download qla2xxx-v8.02.23 from the official QLogic website: http://driverdownloads.qlogic.com/QLogicDriverDownloads_UI/default.aspx .

- **Modify the default timeout parameter in the system that uses Systemd.**

```
Modify system configuration. [file:/etc/systemd/system.conf,item:
DefaultTimeoutStartSec ,value: 600s]
```

Table 4-7 Default Systemd Timeout Parameter

Default Systemd Timeout Parameter	Configuration File	Parameter
Systemd	/etc/systemd/system.conf	DefaultTimeoutStartSec=600s

- Select the desired system boot mode. Select <1> to install the software.

```
If the operating system is installed on a local drive of the server, you are
advised to choose boot from local; if the operating system is installed on a
SAN storage system, you must choose boot from san. Please choose the boot
type of your system:
<1>--boot-from-Local
<2>--boot-from-SAN
please input your select:1
Preparing... #####
UltraPath #####
User configuration is saved successfully.
The boot service is installed successfull.
The running service is installed successfully.
*****Attention*****
***
* UltraPath would modify some parameters of HBA cards for better performace.
If *
* UltraPath is installed for the first time, you may need to update the
initrd *
* image before system reboot to make the modification take
effect. *
*****
***
* UltraPath will use the system hostname for alarm generation and automatic
host*
* registration. Make sure that the system hostname is correctly
configured.. *
*****
***
The installation is complete. Whether to restart the system now?
<Y|N>:
```

- If the InfiniBand HCAs are used to connect the storage system, you are advised to type **N** and run the **upLinux config ib** command to configure the InfiniBand service. In this way, disk arrays connected to InfiniBand interface modules are reported to the host for takeover automatically.
- If the QLogic or Emulex HBAs are used to connect the storage system, you are advised to type **N** and run the **upLinux updateImage** command to update mirrors. In this way, modifications to the configuration of the QLogic or Emulex driver during the installation can take effect.

 **NOTE**

The modifications to the configuration parameters of the drive can take effect only after the host is restarted.

Step 5 Enable the UltraPath to take effect in either of the following ways:

- Restart the host. (This is the typical practice.)
- Start the **nxup** service to start UltraPath.

Before you start the **nxup** service, the system asks you whether to process the existing disks that the UltraPath can take over. To enable the **nxup** service to successfully start, you must delete these disks. Before deleting these disks, ensure that they do not have services, volume management software, clusters, file systems, and other applications.

The operations are as follows:

Run **service nxup start** or **/etc/init.d/nxup start**.

 **NOTE**

For UltraPath in SUSE 12 series and Deepin operating systems, run the **/etc/init.d/nxup start** command.

The following uses **service nxup start** as an example.

```
#service nxup start
this kernel is 2.6.39-200.24.1.el6uek.x86_64
begin load nxup
Begin to delete LUNs whose mappings do not exist
Begin to delete LUNs whose mappings are changed.
begin scan host0
begin scan host1
begin scan host2
begin scan host3
begin scan host4
begin scan host5
begin scan host6
The device scanning is complete.
start upservice
The UltraPath starts successfully.
```



NOTICE

- After switching the kernel mode, for example from **default** mode to **xen** mode, perform the following operations:
 1. Run the **upLinux updateImage** command to update the mirror.
 2. Restart the host.
- If you have incorrectly selected the boot from local mode on a SANBOOT system, the operating system cannot be loaded after you install the UltraPath. In this case, see [10.2 Failed to Restart the SANBOOT System After the UltraPath Is Installed by Using the boot from local Mode](#) to rectify the fault.

----End

4.2 Installing UltraPath (Boot from SAN)

When the operating systems are installed on SAN storage devices, install UltraPath in Boot from SAN mode.

4.2.1 Silent Installation

Install UltraPath in silent installation mode. Before installing UltraPath, you must configure the parameters of the configuration file used for silent installation. The UltraPath installation process does not involve user interactions, enabling one-click installation.

Precautions

The rocky system does not support silent installation if the SAN Boot mode is used.

Procedure

- Step 1** Select an UltraPath software package according to the system information. [Table 4-8](#) lists the operating systems for UltraPath software packages (V100R008 as an example).

Table 4-8 Operating systems for UltraPath software packages (V100R008 as an example)

UltraPath Software Package	Operating System
OceanStor UltraPath V100R008CXXSPCXXX_RHEL.zip	Red Hat, CentOS, and Oracle Linux
OceanStor UltraPath V100R008CXXSPCXXX_SLES.zip	SUSE
OceanStor UltraPath V100R008CXXSPCXXX_LinuxOther.zip	Red Flag Linux, LINX-TECH, Kylin, NeoShine, and Deepin

 **NOTE**

UltraPath software packages that you obtain from a CD-ROM are not compressed. The packages that you obtain from other channels are compressed.

- Step 2** Use a digital signature verification tool to verify integrity of the software package.

 **NOTE**

Download the digital signature verification tool from <http://support.huawei.com/enterprise/> to verify integrity of the software package. If the verification fails, contact technical support engineers to obtain the correct and secure software package.

- Step 3** Upload the UltraPath software package to the application server.

Decompress the UltraPath software package on a Windows-based server and upload the package to a directory (such as /home) of the application server.

 **NOTE**

The software package path cannot contain a space.

- Step 4** Log in to the application server as user **root**, go to the software package directory (SUSE as an example), and check whether the configuration file for silent installation exists.

```
suse11-67:/home/SLES # ls unattend_install.conf
unattend_install.conf
suse11-67:/home/SLES #
```

- Step 5** Set the unattend_install.conf configuration item of the configuration file. Set the value of **boot_type** to **2** and set the value of **restart** based on onsite requirements. [Table 4-9](#) describes the related parameters.

Table 4-9 Parameters of the configuration item

Parameter	Description	Value
boot_type	Startup mode of UltraPath.	[Value range] <ul style="list-style-type: none"> ● 1: Boot from local ● 2: Boot from SAN [Default value] 1
restart	This parameter is used to determine whether the host is restarted after UltraPath is installed.	[Value range] <ul style="list-style-type: none"> ● y: The host is restarted after the installation. ● n: The host is not restarted after the installation. NOTE If IB cards such as HCA cards are used to connect to the storage array, you are advised to set the value to n. [Default value] n

Step 6 Run the `install.sh -f /any-directory/unattend_install.conf` command to start silent installation.

```
linux-8beo:/home/SLES # chmod +x install.sh
linux-8beo:/home/SLES # ./install.sh -f unattend_install.conf
```

- The installation tool automatically checks the environment.

```
complete iscsi checking.
complete FC checking.
Verify the UltraPath existence.
The UltraPath is not installed.
```

- Modify adapters' configuration parameters.

```
Modify system configuration.[file:/etc/iscsi/
iscsid.conf,item:node.startup,value: automatic]
Modify system configuration.[file:/etc/iscsi/
iscsid.conf,item:node.session.timeo.replacement_timeout,value: 1]
Modify system configuration.[file:/etc/
modprobe.conf.local,module:qla2xxx,item:qlport_down_retry,value:5]
Modify system configuration.[file:/etc/
modprobe.conf.local,module:lpfc,item:lpfc_nodev_tmo,value:5]
```

Table 4-10 describes the configuration parameters of adapters.

 **NOTE**

The following adapter parameters will be automatically modified when UltraPath is installed. You do not need to manually configure them.

Table 4-10 Adapter parameters

Adapter Type	Configuration File	Parameter
Linux-iscsi	/etc/iscsi.conf	Multipath=portal ConnFailTimeout=1
open-iscsi	/etc/iscsi/iscsid.conf	node.startup = automatic node.session.timeo.replacement_timeout=1
Qlogic	SUSE: /etc/ modprobe.conf.local Red Hat 4/Red Hat 5: /etc/modprobe.conf Red Hat 6/Red Hat 7: /etc/modprobe.d/ nxupmodules.conf	options qla2xxx qlport_down_retry=5 options qla2xxx ql2xfailover=0
Emulex	SUSE: /etc/ modprobe.conf.local Red Hat 4/Red Hat 5: /etc/modprobe.conf Red Hat 6/Red Hat 7: /etc/modprobe.d/ nxupmodules.conf	Options lpfc lpfc_nodev_tmo=5

When you perform the preceding operations, the following cases lead to alarms:

- The operating system version and the kernel version do not match. As a result, the installed UltraPath software may fail to take effect.
- The version of the host adapter driver has defects. As a result, it is incompatible with the UltraPath software.

Alarm Scenario	Information Description	Information Description
The operating system version and the kernel version do not match.	The OS version XXX does not match the kernel version. If the kernel has been updated or patched, please confirm the compatibility.	Check whether the release file in the /etc/ directory has been modified. If the file is modified, restore it and install the UltraPath software again. If the file is not modified, check whether the system is upgraded.

Alarm Scenario	Information Description	Information Description
The version of the host adapter driver has defects.	There are some defects of the iSCSI Initiator provided by SLES9 SP3. Therefore, you need to update the iSCSI Initiator.	Update the iSCSI initiator.
	The open-iscsi version is too low, Please update the iSCSI driver to the version 2.0-870.3.	Upgrade open-iscsi to 2.0-870.3.
	The default Qlogic driver in Red Hat AS4 and Asianux2 has a defect (Using upRescan command provided by the UltraPath.Please update it to qla2xxx-v8.02.23).	Download qla2xxx-v8.02.23 from http://driverdownloads.qlogic.com/QLogicDriverDownloads_UI/default.aspx (QLogic official website) and upgrade it.

- The default timeout parameter is modified using **Systemd**.

```
Modify system configuration.[file:/etc/systemd/system.conf,item:
DefaultTimeoutStartSec ,value: 600s]
```

Table 4-11 Systemd default timeout parameter

Systemd default timeout parameter	Configuration File	Parameter
Systemd	/etc/systemd/system.conf	DefaultTimeoutStartSec=600s

- Select the desired system boot mode <2>. 2 is automatically typed and the installation continues.

```
If the operating system is installed on a local drive of the server, you are
advised
to choose boot from local; if the operating system is installed on a SAN
storage
system, you must choose boot from san. Please choose the boot type of your
system:
<1>--boot-from-Local
<2>--boot-from-SAN
please input your select:2
Unattend install configuration item 'boot_type' set to '2'. Unattend
installation will continue.
Preparing... #####
UltraPath #####
User configuration is saved successfully.
The UltraPath start items are added successfully.
The mirror is updated successfully.
append UltraPath title to bootloader successfully.[/boot/grub/menu.lst]
The running service is installed successfully.
*****
```

```
***
* UltraPath will use the system hostname for alarm generation and automatic
host*
* registration. Make sure that the system hostname is correctly
configured.. *
*****
***
The installation is complete. Whether to restart the system now?
<Y|N>:n
Unattend install configuration item 'restart' set to 'n'. The system will not
be restarted after the unattend installation.
suse11-67:/home/SLES #
```

If HCA cards of the IB type are used to connect to the storage array, run the **upLinux config ib** command to configure the IB driver service. In this way, the disks of the storage array will be reported to the host for a takeover.

- After the UltraPath software is installed in this mode, a multipath image and a link that points to the image are generated in the **/boot** directory.

```
# cd /boot
# ls
System.map-2.6.16.60-0.85.1-smp      message
backup_mbr                          nxup-2.6.16.60-0.85.1-smp.img
ultrapath-2.6.16.60-0.85.1-smp.img
```

- If your operating system supports multiple boot modes, select a mode that takes effect as instructed by the UltraPath software. Modify the **/boot/grub/menu.lst**, **/etc/elilo.conf**, or **/etc/lilo.conf** configuration file. Add the UltraPath option and configure it as a default item. For example:

```
# cat /boot/grub/menu.lst
default 2
timeout 8
...
title Linux with ultrapath
    root (hd0,2)
    kernel /boot/vmlinuz-2.6.16.60-0.85.1-smp root=/dev/sda2..
    initrd /boot/ultrapath-2.6.16.60-0.85.1-smp.img.
```

- Step 7 Optional:** If the **restart** item in the **unattend_install.conf** configuration file is set to **n**, restrap the host to enable UltraPath to take effect after the installation.



NOTICE

If you cannot log in to the operating system after UltraPath is installed in boot from local mode, see [10.2 Failed to Restart the SANBOOT System After the UltraPath Is Installed by Using the boot from local Mode](#) to solve the problem.

----End

4.2.2 Non-Silent Installation

Install UltraPath in non-silent installation mode. In the UltraPath installation process, you must perform operations according to the prompt information.

Procedure

- Step 1** Select the corresponding UltraPath software package based on your operating system. [Table 4-12](#) lists UltraPath software packages and their corresponding operating systems (V100R008 as an example).

Table 4-12 UltraPath software packages and their corresponding operating systems (V100R008 as an example)

UltraPath Software Package	Operating System
OceanStor UltraPath V100R008CXXSPCXXX_RHEL.zip	Red Hat, CentOS, and Oracle Linux
OceanStor UltraPath V100R008CXXSPCXXX_SLES.zip	SUSE
OceanStor UltraPath V100R008CXXSPCXXX_LinuxOther.zip	Red Flag Linux, LINX-TECH, Kylin, NeoShine, and Deepin

 **NOTE**

UltraPath software packages that you obtain from a CD-ROM are not compressed. The packages that you obtain from other channels are compressed.

Step 2 Use a digital signature verification tool to verify integrity of the software package.

 **NOTE**

Download the digital signature verification tool from <http://support.huawei.com/enterprise/> to verify integrity of the software package. If the verification fails, contact technical support engineers to obtain the correct and secure software package.

Step 3 Upload the UltraPath software package to an application server.

Decompress the UltraPath software package on a Windows-based server and upload the package to a directory (such as /home) of the application server.

 **NOTE**

The software package path cannot contain a space.

Step 4 Log in to the application server as user **root**, go to the software package directory (SUSE as an example), and run installation tool `install.sh` to install the software.

```
linux-8beo:/home/SLES # chmod +x install.sh
linux-8beo:/home/SLES # ./install.sh
```

- The installation tool automatically checks the environment.

```
complete iscsi checking.
complete FC checking.
Verify the UltraPath existence.
The UltraPath is not installed.
```

- Modify all adapter configuration parameters.

```
Modify system configuration.[file:/etc/iscsi/
iscsid.conf,item:node.startup,value: automatic]
Modify system configuration.[file:/etc/iscsi/
iscsid.conf,item:node.session.timeo.replacement_timeout,value: 1]
Modify system configuration.[file:/etc/
modprobe.conf.local,module:qla2xxx,item:qlport_down_retry,value:5]
Modify system configuration.[file:/etc/
modprobe.conf.local,module:lpfc,item:lpfc_nodev_tmo,value:5]
```

Table 4-13 describes the adapter parameters.

 **NOTE**

The following adapter parameters will be automatically modified during UltraPath installation. No manual configuration is required.

Table 4-13 Adapter parameters

Adapter Type	Configuration File	Suggestion
Linux-iscsi	/etc/iscsi.conf	Multipath=portal ConnFailTimeout=1
open-iscsi	/etc/iscsi/iscsid.conf	node.startup = automatic node.session.timeo.replacement_timeout=1
Qlogic	SUSE: /etc/ modprobe.conf.local Red Hat 4/Red Hat 5: /etc/modprobe.conf Red Hat 6/Red Hat 7: /etc/modprobe.d/ nxupmodules.conf	options qla2xxx qlport_down_retry=5 options qla2xxx ql2xfailover=0
Emulex	SUSE: /etc/ modprobe.conf.local Red Hat 4/Red Hat 5: /etc/modprobe.conf Red Hat 6/Red Hat 7: /etc/modprobe.d/ nxupmodules.conf	Options lpfc lpfc_nodev_tmo = 5

When you perform the preceding operations, the following cases generate alarms:

- The operating system version and the kernel version do not match. As a result, the installed UltraPath may fail to take effect.
- The version of the host adapter driver has defects. As a result, it is incompatible with the UltraPath.

Alarm Scenario	Information Description	Information Description
The operating system version and the kernel version do not match.	The OS version XXX does not match the kernel version. If the kernel has been updated or patched, please confirm the compatibility.	Check whether the release file in the /etc/ directory has been modified. If yes, restore it before installing the UltraPath. If no, confirm whether a system upgrade is needed.
The version of the host adapter driver has defects.	There are some defects of the iSCSI Initiator provided by SLES9 SP3. Therefore, you need to update the iSCSI Initiator.	Update the iSCSI initiator.

Alarm Scenario	Information Description	Information Description
	The open-iscsi version is too low. Please update the iSCSI driver to the version 2.0-870.3.	The open-iscsi version is outdated. You need to upgrade it to 2.0-870.3.
	The default QLogic driver in Red Hat AS4 and Asianux2 has a defect for using upRescan command provided by the UltraPath. Please update it to qla2xxx-v8.02.23.	Download qla2xxx-v8.02.23 from the official QLogic website: http://driverdownloads.qlogic.com/QLogicDriverDownloads_UI/default.aspx .

- Modify the default timeout parameter in the system that uses **Systemd**.

```
Modify system configuration.[file:/etc/systemd/system.conf,item:
DefaultTimeoutStartSec ,value: 600s]
```

Table 4-14 Default **Systemd** Timeout Parameter

Default Systemd Timeout Parameter	Configuration File	Parameter
Systemd	/etc/systemd/system.conf	DefaultTimeoutStartSec=600s

- Select the desired operating system boot mode. In this scenario, select <2> to perform a SANBOOT installation.

```
If the operating system is installed on a local drive of the server, you are
advised to choose boot from local; if the operating system is installed on a
SAN storage system, you must choose boot from san. Please choose the boot
type of your system:
<1>--boot-from-Local
<2>--boot-from-SAN
please input your select:2
Preparing... #####
UltraPath #####
User configuration is saved successfully.
The boot service is installed successfull.
The running service is installed successfully.
*****Attention*****
***
* UltraPath would modify some parameters of HBA cards for better performace.
If *
* UltraPath is installed for the first time, you may need to update the
initrd *
* image before system reboot to make the modification take
effect. *
*****
***
*****
***
* UltraPath will use the system hostname for alarm generation and automatic
host*
* registration. Make sure that the system hostname is correctly
```

```
configured. . *
*****
***
The installation is complete. Whether to restart the system now?
<Y|N>:
```

If the InfiniBand HCAs are used to connect the storage system, you are advised to type **N** and run the **upLinux config ib** command to configure the InfiniBand service. In this way, disk arrays connected to InfiniBand interface modules are reported to the host for takeover automatically.

- After the installation, a multipathing mirror and a link to the mirror are generated in the **/boot** directory.

```
# cd /boot
# ls
System.map-2.6.16.60-0.85.1-smp      message
backup_mbr                          nxup-2.6.16.60-0.85.1-smp.img
ultrapath-2.6.16.60-0.85.1-smp.img
```

- If the operating system has multiple loading modes, read the message of the UltraPath and select the currently effective loading mode to boot the system. An UltraPath-related option will be added to the boot configuration file (for example, **/boot/grub/menu.lst**, **etc/elilo.conf**, or **/etc/lilo.conf**). Keep the default value of the option. The following shows an example:

```
# cat /boot/grub/menu.lst
default 2
timeout 8
...
title Linux with ultrapath
    root (hd0,2)
    kernel /boot/vmlinuz-2.6.16.60-0.85.1-smp root=/dev/sda2..
    initrd /boot/ultrapath-2.6.16.60-0.85.1-smp.img.
```

Step 5 After installing the UltraPath, restart the host.

NOTICE

If you have incorrectly selected the boot from local mode on a SANBOOT system, the operating system cannot be loaded after you install the UltraPath. In this case, refer to [10.2 Failed to Restart the SANBOOT System After the UltraPath Is Installed by Using the boot from local Mode](#) to rectify the fault.

----End

5 Deploying UltraPath in Batch in a FusionSphere OpenStack Environment

This section describes how to deploy UltraPath in batch in a FusionSphere OpenStack environment.

Procedure

- Step 1** Select an UltraPath software package applicable to FusionSphere products. [Table 5-1](#) lists the operating systems for UltraPath software packages (V100R008 as an example).

Table 5-1 UltraPath software packages applicable to FusionSphere products (V100R008 as an example)

UltraPath Software Package	Operating System
OceanStor UltraPath V100R008CXXSPCXXX_FusionSphere.zip	UVP

- Step 2** Use a digital signature verification tool to verify integrity of the software package.

 **NOTE**

Download the digital signature verification tool from <http://support.huawei.com/enterprise/> to verify integrity of the software package. If the verification fails, contact technical support engineers to obtain the correct and secure software package.

- Step 3** Import the UltraPath installation package on the FusionSphere installation tool interface.

 **NOTE**

- The UltraPath installation package is saved in the FusionSphere OpenStack directory of the UltraPath software package.
- If you want to know details about how to install FusionSphere OpenStack, see the *FusionSphere Installation Guide (NFV)* specific to your software version.

For example, if FusionSphere OpenStack V100R006C00 is used, select and import ULTRAPATH_V100R008C50_FSO6U0.tar.gz on the installation tool interface (in the red square in the following figure).

Install FusionSphere

Prepare

System Language :
 中文 English

Select Package :
 Install

Select the package of FusionSphere	<input type="text"/>	...	Select the package of FusionManager (optional)	<input type="text"/>	...
Select the file of Hostname (optional)	<input type="text"/>	...	Select the package of UltraPath (optional)	<input type="text"/>	...
Select the package of F8000 (optional)	<input type="text"/>	...	Select the folder of Backup Data (optional)	<input type="text"/>	...
Select the OpenStack package of Patch (optional)	<input type="text"/>	...			

Reinstall

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----End

6 Updating UltraPath

Upgrade UltraPath software when UltraPath need to upgrade to new version, according to this section.

For details about how to perform UltraPath for Linux upgrade, see *Upgrade Guide* of UltraPath. Obtaining method is as follows:

Log in to Huawei technical support website (<http://support.huawei.com/enterprise/>), choose **Support > Downloads > IT > Storage > Unified Storage > UltraPath**, and view the *Upgrade Guide* specific to the UltraPath version.

7 Uninstalling the UltraPath

This section explains how to uninstall the UltraPath.

Procedure

Step 1 Run `rpm -e UltraPath` or `dpkg -r UltraPath` to uninstall the UltraPath software. The following uses `rpm -e UltraPath` as an example.

```
#rpm -e UltraPath
The running service is deleted successfully.
The boot service is removed successfully.
The UltraPath files are deleted successfully.
UltraPath driver package has been successfully removed from your system.
Restart the system.
```

Step 2 Run the `reboot` command to reboot the system.

```
#reboot
```

----End

8 Upgrading the Operating System Kernel (UltraPath Is Not Reinstalled)

After UltraPath is installed successfully, upgrade the operating system kernel. You do not need to reinstall UltraPath.

Prerequisites

- After the kernel is upgraded, you do not need to reinstall the following operating systems.

Operating System	Version
SUSE	SUSE 10 SPX series, SUSE 11 SPX series, and SUSE 12 SPX series
Oracle	Oracle 5.X series, Oracle 6.X series, and Oracle 7.X series
RHEL	RHEL 5.X series, RHEL 6.X series, and RHEL 7.X series
Centos	Centos 5.X series, Centos 6.X series, and Centos 7.X series

- The operating systems do not support cross-large version kernel upgrade (for example, SUSE 10 SP1 is upgraded to SUSE 10 SP2, SUSE 10 SP1 to SUSE 11 SP1, RHEL 5.X to RHEL 6.X, or Oracle 5.X to Oracle 6.X).
- Before upgrade the kernel or a kernel patch, ensure that the kernel or kernel path is compatible with UltraPath. For details about the compatibility, contact Huawei technical support.
- The kernel of the Oracle operating system must be a standard kernel version supported by UltraPath.

Procedure

Step 1 Upgrade the kernel of the operating system. Do not restart the operating system.

Step 2 Run the `cat /etc/UltraPath.packages.info` command to check the `t140s_solutionType` field.

```
[root@localhost RHEL]# cat /etc/UltraPath.packages.info
g10s_OSVersion=RHEL7
g10s_kernelType=normal
g30s_isSanBoot=0
t140s_solutionType=service
f20_solution=createSolution
g10s_sysbit=x86_64
t290s_runServType=redhatService
#####first install###end#####20160225033249#####
```

- If the value of the `t140s_solutionType` parameter is `service`, UltraPath is installed in boot from local mode. go to [Step 6](#).
- If the value of the `t140s_solutionType` parameter is `mkinitrd`, UltraPath is installed in boot from SAN mode. go to [Step 3](#).

Step 3 **Optional:** Run the `upLinux updateForNewKernel` command.

- If the following output is displayed, go to [Step 6](#).

```
[root@localhost RHEL]# upLinux updateForNewKernel
The new kernel is 2.6.32-220.el6.x86_64.
The running service is deleted successfully.
The UltraPath startup guide items are deleted successfully.
remove nxup from dracut.
The UltraPath files are deleted successfully.
User configuration is saved successfully.
append nxup to dracut.
The mirror is updated successfully.
append UltraPath title to bootloader successfully. [/boot/grub/menu.lst]
The running service is installed successfully.
The system kernel is updated successfully in UltraPath. Please reboot.
```

- If the following output is displayed, go to [Step 4](#).

```
[root@localhost RHEL]# upLinux updateForNewKernel
*****
*****
*
Notice
*****
*****
*UltraPath detects that the default startup item of BootLoader do not point
to the upgraded *
*new
kernel.
*
*The BootLoader type is grub.
*<Step> Edit /boot/grub/menu.lst and make the entry that contains the
initramfs image without *
*the ultraPath modules as the default
entry.
*For more information, see the UltraPath User
Guide.
*Chapter in [Upgrading Kernel Without Re-Installing
UltraPath]
*****
*****
Whether to go on?
<Y|N>:
```

Step 4 **Optional:** Manually modify the BootLoader startup item of the operating system. **NOTE**

Select the startup modification mode according to **The BootLoader type is grub** in the preceding command output. For example, **The BootLoader type is grub** indicates that the operating system is started in grub mode.

- Start the operating system in grub mode.

- a. Run the **vi** command to open `/boot/grub/menu.lst`.

 **NOTE**

In the command output, each **title** item corresponds to an operating system kernel and the location of each **title** item is related to the value of **default**. For example, the value of **default** that corresponds to the first **title** item is 0 and the value of **default** that corresponds to the second **title** item is 1.

```
Linux-coder:~ # vi /boot/grub/menu.lst
# Modified by YaST2. Last modification on Thu Mar  3 09:01:44 CST 2016
default 0
timeout 8
##YaST - generic_mbr
gfxmenu (hd0,1)/boot/message
##YaST - activate

###Don't change this comment - YaST2 identifier: Original name: linux###
title Xen -- SUSE Linux Enterprise Server 11 SP1 - 2.6.32.12-0.7
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.32.12-0.7-xen root=/dev/disk/by-id/ata-
QEMU_HARDDISK_QM00001-part2 resume=/dev/disk/by-id/ata-QEMU_HARDDISK_QM00001-part1
splash=silent crashkernel=256M-:128M showopts vga=0x314
    initrd /boot/initrd-2.6.32.12-0.7-xen

###Don't change this comment - YaST2 identifier: Original name: linux###
title SUSE Linux Enterprise Server 11 SP1 - 2.6.32.12-0.7
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.32.12-0.7-default root=/dev/disk/by-id/ata-
QEMU_HARDDISK_QM00001-part2 resume=/dev/disk/by-id/ata-QEMU_HARDDISK_QM00001-part1
splash=silent crashkernel=256M-:128M showopts vga=0x314 ide_core.noprobe=0.0
    initrd /boot/initrd-2.6.32.12-0.7-default

###Don't change this comment - YaST2 identifier: Original name: failsafe###
title Failsafe -- SUSE Linux Enterprise Server 11 SP1 - 2.6.32.12-0.7
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.32.12-0.7-default root=/dev/disk/by-id/ata-
QEMU_HARDDISK_QM00001-part2 showopts ide=nodma apm=off noresume edd=off
powersaved=off nohz=off highres=off processor.max_cstate=1 nomodeset x11failsafe
vga=0x314
    initrd /boot/initrd-2.6.32.12-0.7-default
```

- b. Modify the value of **default**. The new kernel (**title SUSE Linux Enterprise Server 11 SP1 - 2.6.32.12-0.7**) is used as an example.

 **NOTE**

title SUSE Linux Enterprise Server 11 SP1 - 2.6.32.12-0.7 is the second **title** item. The value of **default** is 1.

```
Linux-coder:~ # vi /boot/grub/menu.lst
# Modified by YaST2. Last modification on Thu Mar 3 09:01:44 CST 2016
default 1
timeout 8
##YaST - generic_mbr
gfxmenu (hd0,1)/boot/message
##YaST - activate

###Don't change this comment - YaST2 identifier: Original name: linux###
title Xen -- SUSE Linux Enterprise Server 11 SP1 - 2.6.32.12-0.7
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.32.12-0.7-xen root=/dev/disk/by-id/ata-
QEMU_HARDDISK_QM00001-part2 resume=/dev/disk/by-id/ata-QEMU_HARDDISK_QM00001-part1
splash=silent crashkernel=256M-:128M showopts vga=0x314
    initrd /boot/initrd-2.6.32.12-0.7-xen

###Don't change this comment - YaST2 identifier: Original name: linux###
title SUSE Linux Enterprise Server 11 SP1 - 2.6.32.12-0.7
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.32.12-0.7-default root=/dev/disk/by-id/ata-
QEMU_HARDDISK_QM00001-part2 resume=/dev/disk/by-id/ata-QEMU_HARDDISK_QM00001-part1
splash=silent crashkernel=256M-:128M showopts vga=0x314 ide_core.noprobe=0.0
    initrd /boot/initrd-2.6.32.12-0.7-default

###Don't change this comment - YaST2 identifier: Original name: failsafe###
title Failsafe -- SUSE Linux Enterprise Server 11 SP1 - 2.6.32.12-0.7
    root (hd0,1)
    kernel /boot/vmlinuz-2.6.32.12-0.7-default root=/dev/disk/by-id/ata-
QEMU_HARDDISK_QM00001-part2 showopts ide=nodma apm=off noresume edd=off
powersaved=off nohz=off highres=off processor.max_cstate=1 nomodeset x11failsafe
vga=0x314
    initrd /boot/initrd-2.6.32.12-0.7-default
```

- c. Type **:wq** and press **Enter** to save the modification and exit.
- Start the operating system in grub2 mode.
 - a. Run the **vi** command to open **/boot/grub2/grub.cfg**.

 **NOTE**

Each **menuentry** item corresponds to an operating system kernel.

```
[root@localhost ~]# vi /boot/grub2/grub.cfg
...
menuentry 'Red Hat Enterprise Linux Server, with Linux 3.10.0-123.el7.x86_64' --
class red --class gnu-linux --class gnu --class os --unrestricted
$menuentry_id_option 'gnulinux-3.10.0-123.el7.x86_64-advanced-1670818d-dfab-4ab6-
8e62-4bd80d3f51fd' {
    load_video
    set gfxpayload=keep
    insmod gzio
    insmod part_msdos
    insmod xfs
    set root='hd0,msdos1'
    if [ x$feature_platform_search_hint = xy ]; then
        search --no-floppy --fs-uuid --set=root --hint-bios=hd0,msdos1 --hint-
efi=hd0,msdos1 --hint-baremetal=ahci0,msdos1 --hint='hd0,msdos1' 844afc06-cd4d-
48e8-bedd-40dcc4b75f77
    else
        search --no-floppy --fs-uuid --set=root 844afc06-cd4d-48e8-bedd-40dcc4b75f77
    fi
    linux16 /vmlinuz-3.10.0-123.el7.x86_64 root=UUID=1670818d-dfab-4ab6-8e62-
4bd80d3f51fd ro rd.lvm.lv=rhel/root crashkernel=auto rd.lvm.lv=rhel/swap
vconsole.font=latacyrheb-sun16 vconsole.keymap=us rhgb quiet
    initrd16 /initramfs-3.10.0-123.el7.x86_64.img
}
menuentry 'Red Hat Enterprise Linux Server, with Linux 0-rescue-
0a835e632e914232b163662a1afb387' --class red --class gnu-linux --class gnu --class
os --unrestricted $menuentry_id_option 'gnulinux-0-rescue-
0a835e632e914232b163662a1afb387-advanced-1670818d-dfab-4ab6-8e62-4bd80d3f51fd' {
    load_video
    insmod gzio
    insmod part_msdos
    insmod xfs
    set root='hd0,msdos1'
    if [ x$feature_platform_search_hint = xy ]; then
        search --no-floppy --fs-uuid --set=root --hint-bios=hd0,msdos1 --hint-
efi=hd0,msdos1 --hint-baremetal=ahci0,msdos1 --hint='hd0,msdos1' 844afc06-cd4d-
48e8-bedd-40dcc4b75f77
```

- b. Run the **grub2-set-default** *new kernel version* command. The new kernel (**Red Hat Enterprise Linux Server, with Linux 3.10.0-123.el7.x86_64**) is used as an example.

```
[root@localhost ~]# grub2-set-default 'Red Hat Enterprise Linux Server,
with Linux 3.10.0-123.el7.x86_64'
```

- Start the operating system in lilo mode.
 - a. Run the **vi** command to open `/etc/lilo.conf`.

 **NOTE**

Each **label** item corresponds to an operating system kernel.


```
suse10sp3-85:~ # vi /etc/lilo.conf
# Modified by YaST2. Last modification on Tue Jul 14 01:24:14 CST 2015
menu-scheme = Wb:kw:Wb:Wb
timeout = 80
lba32
change-rules
reset
read-only
default= Failsafe_--
message = /boot/message
boot = /dev/sda2
image = /boot/vmlinuz-2.6.16.60-0.54.5-smp
###Don't change this comment - YaST2 identifier: Original name: linux###
  label = SUSE_Linux
  append = "resume=/dev/sda1 splash=silent showopts"
  initrd = /boot/initrd-2.6.16.60-0.54.5-smp
  root = /dev/sda2
image = /boot/vmlinuz-2.6.16.60-0.54.5-smp
###Don't change this comment - YaST2 identifier: Original name: failsafe###
  label = Failsafe_--
  append = "showopts ide=nodma apm=off acpi=off noresume nosmp noapic maxcpus=0
edd=off 3 crashkernel=128M@16M"
  initrd = /boot/initrd-2.6.16.60-0.54.5-smp
  root = /dev/sda2
```

- b. Modify the value of **default** to the default value of the new kernel. The new kernel (**SUSE_Linux**) is used as an example.

```
# Modified by YaST2. Last modification on Tue Jul 14 01:24:14 CST 2015
menu-scheme = Wb:kw:Wb:Wb
timeout = 80
lba32
change-rules
reset
read-only
default=SUSE_Linux
message = /boot/message
boot = /dev/sda2
image = /boot/vmlinuz-2.6.16.60-0.54.5-smp
###Don't change this comment - YaST2 identifier: Original name: linux###
  label = SUSE_Linux
  append = "resume=/dev/sda1 splash=silent showopts"
  initrd = /boot/initrd-2.6.16.60-0.54.5-smp
  root = /dev/sda2
image = /boot/vmlinuz-2.6.16.60-0.54.5-smp
###Don't change this comment - YaST2 identifier: Original name: failsafe###
  label = Failsafe_--
  append = "showopts ide=nodma apm=off acpi=off noresume nosmp noapic maxcpus=0
edd=off 3 crashkernel=128M@16M"
  initrd = /boot/initrd-2.6.16.60-0.54.5-smp
  root = /dev/sda2
```

- c. Type **:wq** and press **Enter** to save the modification and exit.
- Start the operating system in elilo mode.
 - a. Run the **vi** command to open **/etc/elilo.conf**.

- b. For details about other operations, see step 2 and step 3 in "Start the operating system in lilo mode."
- Start the operating system in egrub mode.
 - a. Run the **vi** command to `/etc/grub.conf`.
 - b. For details about other operations, see step 2 and step 3 in "Start the operating system in grub mode."

Step 5 In the command output, type **y**, as shown in the following:

```
[root@localhost RHEL]# upLinux updateForNewKernel
*****
*****
*
Notice
*****
*****
*UltraPath detects that the default startup item of BootLoader do not point to
the upgraded
*new
kernel.
*
*The BootLoader type is grub.
*<Step> Edit /boot/grub/menu.lst and make the entry that contains the initramfs
image without
*the ultraPath modules as the default
entry.
*For more information, see the UltraPath User
Guide.
*Chapter in [Upgrading Kernel Without Re-Installing
UltraPath]
*****
*****
Whether to go on?
<Y|N>:y
```

Step 6 Restart the operating system.

----End

9 FAQs

About This Chapter

This chapter provides answers to frequently asked questions about UltraPath for Windows configuration or management. You can refer to this chapter when troubleshooting similar problems.

[9.1 How to Correctly Change a LUN Mapping View on a Storage Array?](#)

[9.2 How can I configure the fstab file in the deepin 15 operating system to enable file systems on a storage device to be automatically mounted to the operating system?](#)

9.1 How to Correctly Change a LUN Mapping View on a Storage Array?

Question

How to correctly change a LUN mapping view on a storage array?

Answer

If you remove a LUN mapping on an array and add the LUN to the host again in a different mapping sequence, the corresponding **Host LUN ID** will change and a series of exceptions will be caused.

To rectify this fault, you must comply with the following steps to change the LUN mapping view.

Solution

1. Before removing the LUN mappings on the array, ask the administrator to stop the services running on the disk, namely, the LUN.
2. Delete the LUN mapping view on the GUI management page (ISM or DeviceManager) of the array.
3. Run **upRescan** command of UltraPath to rescan disks.
4. Add the LUN mapping view on the GUI management page (ISM or DeviceManager) of the array.
5. Run **upRescan** command of UltraPath to scan and detect disks.
6. Contact the administrator to start services.

9.2 How can I configure the fstab file in the deepin 15 operating system to enable file systems on a storage device to be automatically mounted to the operating system?

Question

How can I configure the fstab file in the deepin 15 operating system to enable file systems on a storage device to be automatically mounted to the operating system?

Answer

When configuring automatic file system mounting so that the file systems on a storage system can be automatically mounted to the operating system, use the `nofail` option in `/etc/fstab`. An example is as follows:

```
/dev/disk/by-uuid/15f80c92-4be8-4e4f-8d8c-bce1db64141c /mnt/sdx ext3 nofail  
0 2
```

10 Troubleshooting Common Faults

About This Chapter

Faults may occur during the installation, configuration, and use of the UltraPath for windows. This chapter helps you troubleshoot common faults.

[10.1 Preventing Ping-Pong Effect](#)

Ping-Pong Effect indicates that in the cluster networking the trespass of LUN working controller goes ceaseless.

[10.2 Failed to Restart the SANBOOT System After the UltraPath Is Installed by Using the boot from local Mode](#)

[10.3 Service I/Os Stop for a Long Time](#)

10.1 Preventing Ping-Pong Effect

Ping-Pong Effect indicates that in the cluster networking the trespass of LUN working controller goes ceaseless.

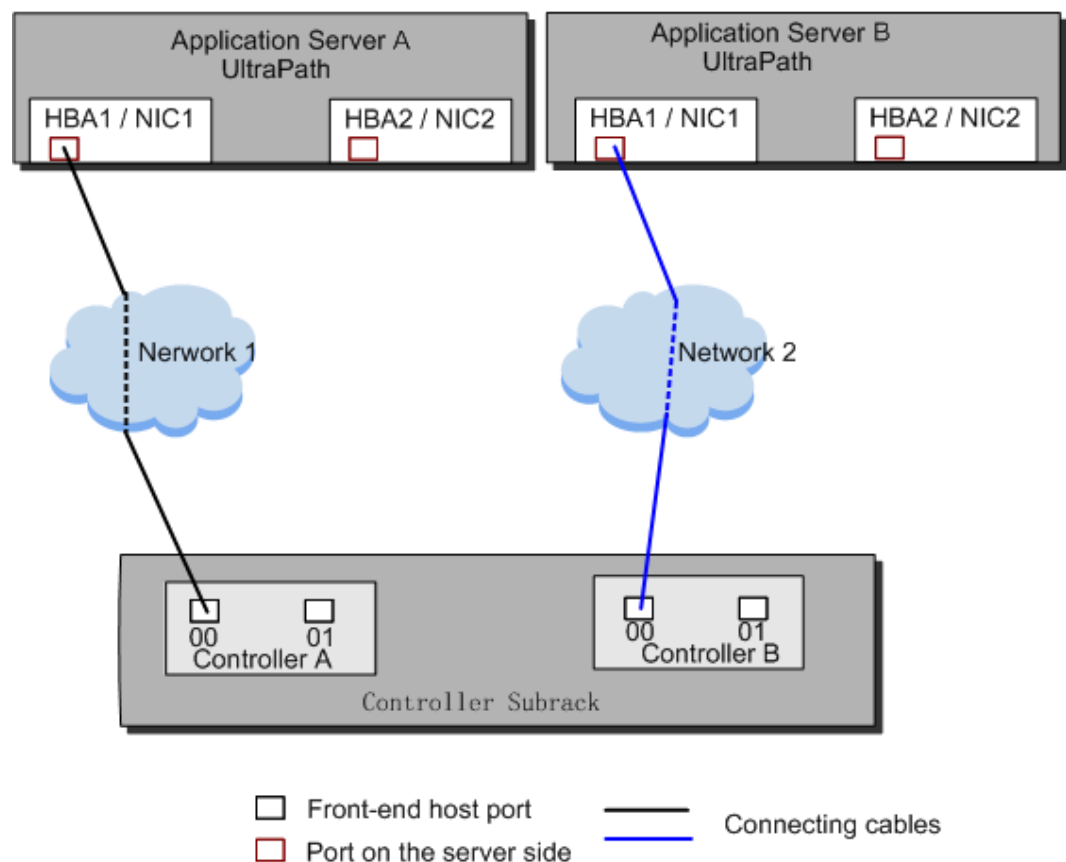
Symptom

For S5000 series and S2600 series Storage System, in the double switch cluster networking, after disconnecting a node to array controller's cable. The trespass of LUN working controller goes ceaseless, thus causes to performance influence.

Possible Causes

By default, the UltraPath opens the trespass between operating and owning controllers of the LUN. That is, when all the paths of the prior controller are faulty, the UltraPath sends the I/O to the owning controller, and use the owning controller of the LUN to replace the working controller. But in some cluster networking. For example, the cluster networking that uses load balancing: Two application servers are connected to two controllers of a storage system respectively and can access the same LUN, as shown in [Figure 10-1](#).

Figure 10-1 Cluster networking that uses load balancing



In this cluster networking, the UltraPath on AS A tries to use controller A as the working controller of the LUN, whereas the UltraPath on AS B tries to use controller B as the working

controller of the LUN. As a result, the trespass of working controller goes ceaseless between controller A and controller B.

Procedure

- Method One: Restore the disconnecting cables as soon as possible and ensure that there is cable each node to each controller of array.
- Method Two: Disable the trespass between operating and owning controllers of the LUN. Please see [A.3.9 Setting the Working Controller Trespass Policy for a LUN](#).

----End

10.2 Failed to Restart the SANBOOT System After the UltraPath Is Installed by Using the boot from local Mode

Symptom

After the **boot from local** command is executed to install the UltraPath, the operating system fails to be restarted.

Possible Causes

The root file system is installed on a disk mapped by the storage array. The **boot from local** mode is used to install the UltraPath. During the startup of the operating system, the HBA is loaded prior to the UltraPath. When the UltraPath is loaded, the disk where the root file system is installed is deleted so that the UltraPath can take over the array disks. Therefore, the operating system fails to be restarted.

Procedure

- Restart the operating system. When the startup menu is displayed, press **e** to edit the startup parameters and enter **NoUltraPath**. The UltraPath is not loaded during the startup, as shown in [Figure 10-2](#).

Figure 10-2 Startup Menu



- After the operating system is started successfully, uninstall the current UltraPath and install the UltraPath by **boot from SAN** mode.

----End

10.3 Service I/Os Stop for a Long Time

Symptom

The **boot-from-local** mode is executed to install the UltraPath. During the service running process, a cable is removed. Upper-layer service I/Os stop for a long time, or the database is restarted.

Possible Causes

When the **boot-from-local** mode is executed to install the UltraPath for the first time, and the Fibre Channel is used, the Qlogic or Emulex driver parameters are modified. If the modification does not take effect, the driver retries the failed I/Os in the path where a cable is removed. After a timeout, I/Os return. As for the upper-layer services, I/Os stop for a long time.

Procedure

Step 1 Run the **upLinux updateImage** command to update images.

Step 2 Restart the host.

----End

A Commonly Used CLI Management Commands

The commonly used CLI management commands of UltraPath include basic operation commands, UltraPath management commands, and LUN management commands. General CLI commands used in operating systems are provided in this document as well.

This document describes commands used by customers when they use Huawei products to deploy and maintain a network.

Some advanced commands are used to implement a project or locate faults. Improper use of those commands may cause device exceptions or service interruptions. This document does not provide the advanced commands. If you need such commands, contact Huawei for help.

Some arrays do not support query of some information. Such information is displayed as -- in UltraPath.

[A.1 Command Conventions](#)

You are required to follow the format conventions when you use the CLI commands.

[A.2 Basic Operation Commands](#)

Basic operation commands are used to query details about commands, and about how to log in to or log out of the UltraPath management module.

[A.3 System Management Commands](#)

The UltraPath system management commands include common management commands and commands for advanced parameter settings.

[A.4 LUN Management Commands](#)

LUN management commands include commands for viewing storage system information and virtual disk information.

[A.5 Other UltraPath Commands](#)

This section describes UltraPath commands that are not included in the preceding command categories.

A.1 Command Conventions

You are required to follow the format conventions when you use the CLI commands.

Table A-1 lists the format conventions.

Table A-1 Command conventions

Convention	Description
Boldface	The keywords of a command line are in boldface . This part should stay unchanged and need to be entered as it is.
<i>Italic</i>	Command arguments are in <i>italics</i> . This part needs to be replaced with an actual value.
[]	Items (keywords or arguments) in brackets [] are optional.
{ x y ... }	Optional items are grouped in braces and separated by vertical bars. One item is selected.
[x y ...]	Optional items are grouped in brackets and separated by vertical bars. One item is selected or no item is selected.
{ x y ... }*	Optional items are grouped in braces and separated by vertical bars. A minimum of one item or a maximum of all items can be selected.
[x y ...]*	Optional items are grouped in brackets and separated by vertical bars. Several items or no item can be selected.

NOTE

If the name of the disk array or LUN is in Chinese and the encoding format of the login tool is incorrect, garbled characters are displayed after the multipathing command is executed. Set the encoding format of the login tool.

A.2 Basic Operation Commands

Basic operation commands are used to query details about commands, and about how to log in to or log out of the UltraPath management module.

A.2.1 Logging in to the CLI

Function

If you need to manage the UltraPath or query its status, run the **upadmin** command to log in to the CLI.

Format

upadmin

Parameters

None

Level

User **root**

Usage Guidelines

The following uses **show version** as an example to show how to use **upadmin** commands.

- Log in to the CLI and show the version of UltraPath.

```
# upadmin
UltraPath CLI #0 >show version
Software Version : 8.06.007
Driver Version : 8.06.007
```

- Run the **upadmin show version** command to view the version of UltraPath.

```
# upadmin show version
Software Version : 8.06.007
Driver Version : 8.06.007
```

Example

Log in to the UltraPath CLI.

```
# upadmin
UltraPath CLI #0 >
```

System Response

None

A.2.2 Exiting the CLI

Function

The **quit** command is used to exit the UltraPath CLI.

Format

quit

Parameters

None

Level

User **root**

Usage Guidelines

None

Example

Run the **quit** command to exit the CLI.

```
UltraPath CLI #3 >quit  
~ #
```

System Response

None

A.2.3 Help

Function

The **help** command is used to query all UltraPath commands and their formats and details.

Format

help
?

Parameters

None

Level

User **root**

Usage Guidelines

After logging in to the UltraPath CLI, you can run the **help** command to query UltraPath CLI commands.

Example

Run **help** to query all UltraPath commands. The following figure shows some commands.

```
UltraPath CLI #0 >help  
Usage: [OPTION]  
help [command] [subcommand]      -- Print help message.  
? [command] [subcommand]         -- Print help message.  
quit                               -- Quit UltraPath command line.  
show version                       -- Print version.  
... ..
```

System Response

None

A.3 System Management Commands

The UltraPath system management commands include common management commands and commands for advanced parameter settings.

A.3.1 Querying the Version of UltraPath

Function

The **show version** command is used to query the version of UltraPath.

Format

show version [verbose]

Parameters

Parameter	Description	Default Value
verbose	Used to query the UltraPath version information.	None

Level

User **root**

Usage Guidelines

The version of UltraPath can be queried only after the software is installed successfully.

- Run the **show version** command to query the information about UltraPath version and driver version.
- Run the **show version verbose** command to query the information about UltraPath version, driver version, and product version.

Example

- Run the **show version** command to query the information about UltraPath version and driver version.

```
UltraPath CLI #0 >show version
Software Version : 8.06.007
Driver Version : 8.06.007
```

- Run the **show version verbose** command to query the information about UltraPath version, driver version, and product version.

```
UltraPath CLI #0 >show version verbose
Software Version : 8.06.007
Driver Version : 8.06.007
Product Version : V100R008C50
```

System Response

None

A.3.2 Querying Configuration File Information

Function

The **show upconfig** command is used to query the configuration of UltraPath, including the working mode, load balancing policy, and LUN trespass function.

Format

```
show upconfig [ array_id=ID | vlun_id=ID ]
```

Parameters

Keyword and Parameter	Description	Default Value
array_id = <i>ID</i>	ID of a storage system. You can run show array without an ID to display all storage system IDs.	None
vlun_id = <i>ID</i>	ID of a virtual LUN. You can run show vlun type=all to display all virtual LUN IDs.	None

Level

User **root**

Usage Guidelines

- Run **show upconfig** to display all configuration information about UltraPath.
- Run **show upconfig array_id=*ID*** to check UltraPath configuration information about a specified storage system.
- Run the **show upconfig vlun_id=*ID*** command to check UltraPath configuration information about a specified virtual LUN.

Example

- Query all configuration information about UltraPath.

```
UltraPath CLI #2 >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
  Io Suspension Time : 60
  Max io retry timeout : 1800

Path reliability configuration
  Timeout degraded statistical time : 600
  Timeout degraded threshold : 1
  Timeout degraded path recovery time : 1800
  Intermittent I/O error degraded statistical time : 300
  Min. I/Os for intermittent I/O error degraded statistical : 5000
  Intermittent I/O error degraded threshold : 20
  Intermittent I/O 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

HyperMetro configuration
  HyperMetro Primary Array SN : Not configured
  HyperMetro WorkingMode : read write within primary array
  HyperMetro Split Size : 128MB

```

- Query UltraPath configuration information about a specified storage system.

```

UltraPath CLI #0 >show upconfig array_id=0
=====
UltraPath Configuration
=====
Working Mode : load balancing within controller
LoadBalance Mode : round-robin
Loadbanlance io threshold : 1
LUN Trespass : on
Io Suspension Time : 60
Max io retry timeout : 1800

```

- Query UltraPath configuration information about a specified virtual LUN.

The virtual LUN whose ID is **1** is a common virtual LUN. The virtual LUN whose ID is **2** is a virtual HyperMetro LUN.

```

UltraPath CLI #0 >show upconfig vlun_id=1
=====
UltraPath Configuration
=====
Working Mode : load balancing within controller
LoadBalance Mode : round-robin
Loadbanlance io threshold : 1
LUN Trespass : on
Io Suspension Time : 60
Max io retry timeout : 1800
UltraPath CLI #3 >show upconfig vlun_id=2
=====
UltraPath Configuration
=====
Working Mode : load balancing within controller
LoadBalance Mode : min-task
Loadbanlance io threshold : 1
LUN Trespass : on
Io Suspension Time : 0

```

```
Max io retry timeout : 1800
HyperMetro Primary Array SN : 210235980510E8000015
HyperMetro WorkingMode : read write between both arrays
HyperMetro Split Size : 4KB
```

System Response

None

A.3.3 Querying Physical Path Information

Function

The **show path** command is used to query information about a specified or all physical paths, including the working status, owning storage system, owning controller, and owning HBA.

Format

```
show path [ id=ID1,ID2,... | array_id=ID ]
```

Parameters

Keyword and Parameter	Description	Default Value
id=ID1,ID2,...	ID of a physical path. You can run show path without an ID to display all physical path IDs. NOTE You can query a maximum of eight physical paths' performance statistics at a time. Use comas (,) to separate physical path IDs.	None
array_id=ID	ID of a storage system. You can run show array without an ID to display all storage system IDs.	None

Level

User **root**

Usage Guidelines

- Run the **show path** command to check the working status of all physical paths.

 **NOTE**

When the **show path** command is executed, you can only view the information about a maximum of eight paths on one controller.

- Run the **show path array_id=ID** command to check the working status of a specified storage system's physical paths.
- Run the **show path id=ID1,ID2,...** command to check the working status of a specified physical path.

Example

- Check the working status and path IDs of all physical paths.

```
UltraPath CLI #0 >show path
-----
Path ID      Initiator Port      Array Name      Controller      Target Port
Path State   Check State         Port Type      Port ID
  0          2100001b32053e20   Huawei.Storage48  0B              20184846fb8ca15f
Normal      --                  FC              --
  1          2100001b32053e20   Huawei.Storage48  0A              200b4846fb8ca15f
Normal      --                  FC              --
  4          2100001b32055f20   Huawei.Storage48  0B              20194846fb8ca15f
Normal      --                  FC              --
  5          2100001b32055f20   Huawei.Storage48  0A              20084846fb8ca15f
Normal      --                  FC              --
-----
Path ID      Initiator Port      Array Name      Controller      Target Port
Path State   Check State         Port Type      Port ID
  2          2100001b32053e20   Huawei.Storage46  0B              24103400a30d9c5f
Normal      --                  FC              --
  3          2100001b32053e20   Huawei.Storage46  0A              24003400a30d9c5f
Normal      --                  FC              --
  6          2100001b32055f20   Huawei.Storage46  0B              24113400a30d9c5f
Normal      --                  FC              --
  7          2100001b32055f20   Huawei.Storage46  0A              24013400a30d9c5f
Normal      --                  FC              --
-----
```

- Check the physical paths of the storage system whose ID is 0.

```
UltraPath CLI #0 >show path array_id=0
-----
Path ID      Initiator Port      Array Name      Controller      Target Port
Path State   Check State         Port Type      Port ID
  0          2100001b32053e20   Huawei.Storage48  0B              20184846fb8ca15f
Normal      --                  FC              --
  1          2100001b32053e20   Huawei.Storage48  0A              200b4846fb8ca15f
Normal      --                  FC              --
  4          2100001b32055f20   Huawei.Storage48  0B              20194846fb8ca15f
Normal      --                  FC              --
  5          2100001b32055f20   Huawei.Storage48  0A              20084846fb8ca15f
Normal      --                  FC              --
-----
```

- Check the working status of the physical path whose ID is 0.

```
UltraPath CLI #0 >show path id=0
=====
Path#0 Information
=====
Initiator Port : 2100001b32053e20
Array Name     : Huawei.Storage48
Controller     : 0B
Target Port    : 20184846fb8ca15f
Path State     : Normal
Check State    : --
Port Type      : FC
```

```

I/O Retry count : 0
Path Fault count: 0
Latency-Low(ms) : 0
Latency-High(ms) : 2
Latency-avg(ms) : 0
Port ID         : --
=====
    
```

System Response

The following table explains some parameters in the command output:

Parameter	Description	Default Value
Path ID	ID of the physical path.	None
Initiator Port	Port of the initiator. NOTE For some arrays such as the S2600 and S5500, the initiator ports are displayed as the initiator port IDs in the SCSI address.	None
Target Port	Port of the target. NOTE For some arrays such as the S2600 and S5500, the initiator ports are displayed as the initiator port IDs in the SCSI address.	None
Controller	Name of a controller. NOTE If the controller name is followed by Remote information, the controller is a remote controller.	None

Parameter	Description	Default Value
Path State	<p>State of the physical path. Possible values are as follows:</p> <ul style="list-style-type: none"> ● Normal: The path is normal. ● Fault: The path is faulty. ● I/O discrete error degradation: The path is degraded due to discrete I/O errors. ● Intermittent failure degradation: The path is degraded due to intermittent failures. ● I/O timeout degradation: The path is degraded due to I/O timeout. ● High latency degradation: The path is degraded due to high latency. ● Disable: The path is disabled. 	None
Check State	<p>State check of a path. Possible values are as follows:</p> <ul style="list-style-type: none"> ● Checking: The path is being checked. ● Waiting: The path is waiting to be checked. ● Succeed: The path status check succeeded. ● Fail: The path status check failed. ● Ignore: The path status check is ignored. ● --: The path is not checked. 	None
I/O Retry Count	Number of I/O retry attempts.	None
Path Fault Count	Number of times for which a path becomes faulty.	None
Port ID	Location of the port.	None

A.3.4 Resetting the Status of a Physical Path

Function

The **set phyathnormal** command is used to restore the working status of a degraded path to normal.

Format

```
set phyathnormal path_id=ID
```

Parameters

Keyword and Parameter	Description	Default Value
path_id = <i>ID</i>	ID of the physical path. You can run show phyath without an ID to display all physical path IDs.	None

Level

User **root**

Usage Guidelines

NOTE

You can perform the following operations to recover an unstable path degraded and isolated by UltraPath if the maintenance personnel have replaced the fault components and eliminated link faults. After the path is recovered, UltraPath will deliver I/Os to it. If you are not sure whether all link faults have been cleared, run the **start pathcheck** command to check the health status of the path. If the path passes the check, reset the path to normal.

Run the **set phyathnormal path_id=*ID*** command to restore specified degraded physical paths.

Example

Restore the working status of the path whose ID is **1** to normal.

```
UltraPath CLI #2 >set phyathnormal path_id=1
Please check whether the fault has been rectified. If the fault persists and you
forcibly recover the path, the performance may be decreased.
Are you sure you want to continue? [y,n]: y
Succeeded in executing the command.
```

System Response

None

A.3.5 Setting a Controller's Paths

Function

The **set tpgstate** command is used to enable or disable the paths of a specified controller.

Format

```
set tpgstate={ enable | disable } array_id=ID tpg_id=ID
```

Parameters

Keyword and Parameter	Description	Default Value
<i>enable disable</i>	Enabling or disabling a controller's path. Possible values are enable or disable. <ul style="list-style-type: none"> ● enable: enables a controller's paths. ● disable: disables a controller's paths. 	enable
array_id=ID	ID of a storage system. You can run show array without an ID to display all storage system IDs.	None
tpg_id=ID	ID of a controller.	None

Level

User **root**

Usage Guidelines



NOTICE

- Once the command is run, UltraPath will not choose this path to deliver I/O.
- After the replacement or maintenance, you can run the command again to enable the paths of the controller, increasing redundancy and balancing controller workload.

When changing the controller of a storage system or before powering off the controller for maintenance, you can run this command to disable paths of the controller. After the paths are disabled, UltraPath smoothly switches I/Os over to other controller's paths, preventing I/O latency caused by failback.

Example

Enable the paths of controller **0A** of the storage system whose ID is **0**.

```
UltraPath CLI #12 >set tpgstate=enable array_id=0 tpg_id=0A
Succeeded in executing the command.
```

System Response

None

A.3.6 Setting the Status of a Physical Path

Function

The **set pathstate** command is used to enable or disable a specified physical path.

Format

set pathstate={ *enable* | *disable* } **path_id**=*ID*

Parameters

Keyword and Parameter	Description	Default Value
{ <i>enable</i> <i>disable</i> }	Enabling or disabling a physical path. The value is either enable or disable. <ul style="list-style-type: none"> ● enable: enables a physical path. ● disable: disables a physical path. 	enable
path_id = <i>ID</i>	ID of a physical path. You can run show path without an ID to display all physical path IDs.	None

Level

User **root**

Usage Guidelines



NOTICE

- Once the command is run, UltraPath will not choose this path to deliver I/O.
 - Only OceanStor T series V100R005 or later storage systems using Fibre Channel networks support this command.
 - If a controller module is disabled by running the **set tpgstate** command, you cannot run the **set pathstate** command to change the status of the controller's path.
-
- When you replace an HBA, run the **set pathstate=disable path_id=ID** command to disable the designated physical path. UltraPath will switch I/Os smoothly to other physical paths.
 - When the HBA is replaced, run the **set pathstate=enable path_id=ID** command to enable the physical path mentioned earlier.

Example

Enable the physical path whose ID is 0.

```
UltraPath CLI #3 >set pathstate=enable path_id=0  
Succeeded in executing the command.
```

System Response

None

A.3.7 Setting Working Mode for UltraPath

Function

The **set workingmode** is used to set cross-controller or intra-controller load balancing of UltraPath.

Format

```
set workingmode={0|1} [ array_id=ID | vlun_id={ ID | ID1,ID2... | ID1-ID2 } ]
```

Parameters

Keyword and Parameter	Description	Default Value
workingmode ={0 1}	Load balancing mode of UltraPath. The value can be 0 or 1 . <ul style="list-style-type: none"> ● 0: indicates that I/Os are delivered through paths of the current working controller. ● 1: load balancing within a controller indicates that I/Os are delivered through paths of the current working controller. 	1
array_id =ID	ID of a storage system. You can run show array without an ID to display all storage system IDs.	None
vlun_id ={ ID ID1,ID2... ID1-ID2 }	ID of a virtual LUN. You can run show vlun type=all to display all virtual LUN IDs.	None

Level

User **root**

Usage Guidelines

NOTE

If cross-controller load balancing mode is used, UltraPath does not distinguish between preferred and non-preferred working controllers of a LUN and uses all paths to deliver I/Os. For an OceanStor storage system with asymmetric active-active controllers, I/Os are forwarded between controllers, increasing I/O processing latency. Therefore, cross-controller load balancing is recommended only when the performance bottleneck lies in the transfer paths between a host and the storage system.

- Run **set workingmode**={0|1} to set working mode for all storage systems.
- Run **set workingmode**={0|1} **array_id**=ID to set a working mode for a specified storage system.
- **set workingmode**={0|1} **vlun_id**={ ID | ID1,ID2... | ID1-ID2 } to set a working mode for a specified virtual LUN.

 NOTE

- **vlun_id=ID**: ID of a single virtual LUN.
- **vlun_id=ID1,ID2...**: IDs of multiple virtual LUNs which are not necessarily related.
- **vlun_id=ID1-ID2**: IDs of all the virtual LUNs from ID1 to ID2.

Example

- Set the working mode of the storage system whose ID is **0** to **Cross-controller load balancing**.

```
UltraPath CLI #2 >set workingmode=0 array_id=0
```

```
The current configuration will overwrite the configuration of all VLUNs in this array.
```

```
Are you sure you want to continue? [y,n]: y
```

```
Succeeded in executing the command.
```

- Set the working mode of the LUN whose ID is **0** to **Cross-controller load balancing**.

```
UltraPath CLI #3 >set workingmode=0 vlun_id=0
```

```
Succeeded in executing the command.
```

System Response

None

A.3.8 Setting a Load Balancing Mode

Function

The **set loadbalancemode** command is used to set a load balancing mode for UltraPath.

Format

```
set loadbalancemode={ round-robin | min-queue-depth | min-task } [ array_id=ID | vlun_id={ ID | ID1,ID2... | ID1-ID2 } ]
```

Parameters

Keyword and Parameter	Description	Default Value
<i>round-robin</i> <i>min-queue-depth</i> <i>min-task</i> }	Load balancing mode. <ul style="list-style-type: none"> ● round-robin: round-robin load balancing ● min-queue-depth: minimum queue depth load balancing ● min-task: minimum task load balancing 	min-queue-depth

Keyword and Parameter	Description	Default Value
array_id=ID	ID of a storage system. You can run show array without an ID to display all storage system IDs.	None
vlun_id={ ID ID1,ID2... ID1-ID2 }	ID of a virtual LUN. You can run show vlun type=all to display all virtual LUN IDs.	None

Level

User **root**

Usage Guidelines

- Before resetting the load balancing mode, you are advised to run the **show upconfig** command to query the current load balancing mode. The load balancing modes are described as follows:
 - To set the load balancing mode to minimum task, run the **set loadbalancemode round-robin** command to set the load balancing mode to **round-robin**. When an application server delivers I/Os to a storage system, UltraPath sends the first set of I/Os through path 1 and second set of I/Os through path 2, and so on. Paths are used in turn to ensure that each path is fully utilized. When an application server delivers I/Os to a storage system, the minimum I/O queue takes precedence over other queues in I/O sending.
 - To set the load balancing mode to minimum task, run the **set loadbalancemode min-queue-depth** command to set the load balancing policy to **min-queuedepth**. In this mode, UltraPath for Linux calculates the number of waiting I/Os on each path in real time, and then delivers new I/Os to the path with the minimum waiting I/Os.
 - To set the load balancing mode to minimum task, run the **set loadbalancemode min-task** command to set the load balancing policy to **min-task**. In this mode, UltraPath for Linux calculates the number of waiting I/Os on each path and the data block size of each I/O in real time. Then UltraPath for Linux delivers new I/Os to the path with the lightest load. Before resetting the load balancing mode, you are advised to run the **show upconfig** command to query the current load balancing mode.
- Run **set loadbalancemode={ round-robin | min-queue-depth | min-task } array_id=ID** to set a load balancing mode for a specified storage system.
- Run **set loadbalancemode={ round-robin | min-queue-depth | min-task } vlun_id={ ID | ID1,ID2... | ID1-ID2 }** to set a load balancing mode for a specified virtual LUN.

NOTE

- **vlun_id=ID**: ID of a single virtual LUN.
- **vlun_id=ID1,ID2...**: IDs of multiple virtual LUNs which are not necessarily related.
- **vlun_id=ID1-ID2**: IDs of all the virtual LUNs from ID1 to ID2.

Example

Set the load balancing mode of the storage system whose ID is **0** to **round-robin**.

```
UltraPath CLI #3 >set loadbalancemode=round-robin array_id=0

The current configuration will overwrite the configuration of all VLUNs in this array.
Are you sure you want to continue? [y,n]: y

Succeeded in executing the command.
```

System Response

None

A.3.9 Setting the Working Controller Trespass Policy for a LUN

Function

The **set luntrespass** command is used to set the working controller trespass policy for a LUN.

Format

```
set luntrespass={ on | off } [ array_id=ID | vlun_id={ ID | ID1,ID2... | ID1-ID2 } ]
```

Parameters

Keyword and Parameter	Description	Default Value
<i>on off</i>	Working controller trespass policy of a LUN. The value is either on or off . <ul style="list-style-type: none"> ● on: Enables working controller trespass for a LUN. ● off: Disables working controller trespass for a LUN. 	on
<i>array_id= ID</i>	ID of a storage system. You can run show array without an ID to display all storage system IDs.	None
vlun_id ={ <i>ID ID1,ID2... ID1-ID2</i> }	ID of a virtual LUN. You can run show vlun type=all to display all virtual LUN IDs.	None

Level

User **root**

Usage Guidelines

NOTE

For an OceanStor storage system with asymmetric active-active controllers, UltraPath for Linux switches the working controller of a LUN when switching links, ensuring that I/Os are directly delivered to the working controller. However, when multiple hosts (for example, an active-active host cluster) access the same LUN of an OceanStor S5000 series storage system, the hosts may contend for the working controller and result in frequent working controller trespass (or "ping pong" trespass). Ping-pong trespass severely decreases performance. To prevent this problem, you are advised to disable the working controller trespass function in this case.

- Run the **set luntrespass={ on | off }** command to set all storage system LUN switches.
- Run **set luntrespass={ on | off } array_id=ID** to set the LUN switches of a specified storage system.
- Run **set luntrespass={ on | off } vlun_id={ ID | ID1,ID2... | ID1-ID2 }** to set the LUN switches of a specified virtual LUN.

NOTE

- **vlun_id=ID**: ID of a single virtual LUN.
- **vlun_id=ID1,ID2...**: IDs of multiple virtual LUNs which are not necessarily related.
- **vlun_id=ID1-ID2**: IDs of all the virtual LUNs from ID1 to ID2.

Example

Set the LUN working controller trespass of the storage system whose ID is **0** to **on**.

```
UltraPath CLI #3 >set luntrespass=on array_id=0
```

```
The current configuration will overwrite the configuration of all VLUNs in this array.
```

```
Are you sure you want to continue? [y,n]: y
```

```
Succeeded in executing the command.
```

System Response

None

A.3.10 Setting Failback Delay

Function

The **set failbackdelaytime** command is used to set failback delay.

Format

```
set failbackdelaytime=time
```

Parameters

Keyword and Parameter	Description	Default Value
<i>time</i>	Failback delay. The value ranges from 0 to 3600, expressed in seconds.	600

Level

User **root**

Usage Guidelines

NOTE

To prevent intermittent communication interruption between links and service instability, UltraPath does not immediately implement failback upon detecting the recovery of a faulty path. Instead, UltraPath continues to monitor the path and implements failback if the path remains normal to improve system reliability. The failback delay may cause slight performance drop, but it is for the balance between reliability and performance.

Example

Set failback delay to 600 seconds.

```
UltraPath CLI #2 >set failbackdelaytime=600
Succeeded in executing the command.
```

System Response

None

A.3.11 Querying I/O Count Information

Function

The **show io_count** command is used to query the I/O count of all virtual LUNs or on logical paths of the specified virtual LUNs. The I/O count information includes the error I/O count, queue I/O count, error command count, and queue command count.

Format

```
show io_count [ vlun_id=ID1,ID2,...]
```

Parameters

Parameter	Description	Default Value
vlun_id=ID1,ID2,...	<p>ID of a virtual LUN</p> <p>If you run show vlun without specifying any parameters, all virtual LUN IDs can be obtained. Then you can run show io_count with this parameter to query the I/O count on the logical paths of these virtual LUNs.</p> <p>NOTE</p> <p>You can query a maximum of eight virtual LUNs at a time. Use commas (,) to separate IDs of the virtual LUNs.</p>	None

Level

User **root**

Usage Guidelines

- Run **show io_count** to obtain the I/O count information of all virtual LUNs.
- Run **show io_count vlun_id=ID1,ID2,...** to query the I/O count information on logical paths of the specified virtual LUNs.

Example

- Query the I/O count information of all virtual LUNs.

```
UltraPath CLI #3 >show io_count
-----
Vlun ID      Disk Name      Error I/O Count  Queue I/O Count  Error Command
Count  Queue Command Count
  2      AIX198Lun_001      2              0
4      0
  3      AIX198Lun_002      0              0
0      0
-----
```

- Query the I/O count information on logical paths of the specified virtual LUNs.

```
UltraPath CLI #3 >show io_count vlun_id=2
-----
Vlun ID      Disk Name      Path ID  Error I/O Count  Queue I/O Count  Error
Command Count  Queue Command Count
  2      AIX198Lun_001      0              1              0
2      0
  2      AIX198Lun_001      1              1              0
2      0
-----
```

System Response

None

A.3.12 Clearing I/O Count Information

Function

The **clear io_count** command is used to clear I/O count information.

Format

```
clear io_count
```

Parameters

None

Level

User **root**

Usage Guidelines

None

Example

Clear I/O count information.

```
UltraPath CLI #3 >clear io_count  
Succeeded in executing the command.
```

System Response

None

A.3.13 Querying I/O Latency Information

Function

The **show io_latency** command is used to query the latest I/O latency, max I/O latency, and average I/O latency of all virtual LUNs or on the logical paths of the specific virtual LUNs.

Format

```
show io_latency [ vlun_id=ID1,ID2,...]
```

Parameters

Parameter	Description	Default Value
vlun_id = <i>ID1,ID2</i> ,...	<p>ID of a virtual LUN</p> <p>If you run show vlun without specifying any parameters, all virtual LUN IDs can be obtained. Then you can run show io_latency with this parameter to query the I/O latency on the logical paths of these virtual LUNs.</p> <p>NOTE</p> <p>You can query a maximum of eight virtual LUNs at a time. Use commas (,) to separate IDs of the virtual LUNs.</p>	None

Level

User **root**

Usage Guidelines

- Run **show io_latency** to obtain the I/O latency information of all virtual LUNs.
- Run **show io_latency vlun_id=ID1,ID2**,... to query the I/O count information on the logical paths of the specified virtual LUNs.

Example

- Query the I/O latency information of all virtual LUNs.

```
UltraPath CLI #3 >show io_latency
-----
Vlun ID      Disk Name      Latest I/O Latency  Max I/O Latency  Average I/O
Latency
  2          AIX198Lun_001      0                   10
0
  3          AIX198Lun_002      0                   100
0
-----
```

- Query the I/O latency information on the logical paths of the specific virtual LUNs.

```
UltraPath CLI #3 >show io_latency vlun_id=2
-----
Vlun ID      Disk Name      Path ID  Latest I/O Latency  Max I/O Latency
Average I/O Latency
  2          AIX198Lun_001      0         0
10
  2          AIX198Lun_001      1         0
10
-----
```


System Response

None

A.3.14 Setting I/O Latency Threshold

Function

The **set io_latency_threshold** command is used to set the I/O latency threshold. If the average I/O latency in one minute exceeds this threshold, a critical event about long I/O latency will be recorded.

Format

set io_latency_threshold=*time*

Parameters

Parameter	Description	Default Value
<i>time</i>	I/O latency threshold The value ranges from 0 to 120000, expressed in milliseconds.	20

Level

User **root**

Usage Guidelines

None

Example

Set the I/O latency threshold to 30 milliseconds.

```
UltraPath CLI #3 >set io_latency_threshold=30
Succeeded in executing the command.
```

System Response

None

A.3.15 Querying I/O Latency Threshold

Function

The **show io_latency_threshold** command is used to query the I/O latency threshold.

Format

show io_latency_threshold

Parameters

None

Level

User **root**

Usage Guidelines

None

Example

Query the I/O latency threshold.

```
UltraPath CLI #3 >show io_latency_threshold
io_latency_threshold : 20
```

System Response

None

A.3.16 Setting I/O Retry Times and Interval

Function

The **set ioretry** command is used to set the number of I/O retries and an I/O retry interval.

Format

set ioretry=*number* ioretrydelay=*time*

Parameters

Keyword and Parameter	Description	Default Value
ioretry=<i>number</i>	Number of I/O retry times. The value ranges from 0 to 60.	10
ioretrydelay=<i>time</i>	Interval of I/O retry. The value ranges from 0 to 10, expressed in seconds.	0

Level

User **root**

Usage Guidelines

NOTE

Increasing I/O retry times and retry interval can reduce the service interruption rate when intermittent path disconnection occurs, but it also prolongs service blockage. Therefore, set the two parameters based your service needs.

Example

Set the I/O retry times to 3 and retry interval to 10 seconds.

```
UltraPath CLI #8 >set ioretry=3 ioretrydelay=10
Succeeded in executing the command.
```

System Response

None

A.3.17 Setting the I/O Suspension Time

Function

The **set ioholdontime** command is used to set the I/O suspension time.

Format

```
set iosuspensiontime=time [ array_id=ID | vlun_id={ ID | ID1,ID2... | ID1-ID2 } ]
```

Parameters

Keyword and Parameter	Description	Default Value
iosuspensiontime=time	I/O suspension time. The value ranges from 0 to 2,592,000, expressed in seconds.	60
array_id=ID	ID of a storage system. You can run show array without an ID to display all storage system IDs.	None
vlun_id={ ID ID1,ID2... ID1-ID2 }	ID of a virtual LUN. You can run show vlun type=all to display all virtual LUN IDs.	None

Level

User **root**

Usage Guidelines

- Runset **iosuspensiontime=time** to set the I/O suspension time for all storage systems.
- Runset **iosuspensiontime=time array_id=ID** to set the I/O suspension time for a specified storage system.
- Runset **iosuspensiontime=time vlun_id={ ID | ID1,ID2... | ID1-ID2 }** to set the I/O suspension time for a specified virtual LUN.

NOTE

- **vlun_id=ID**: ID of a single virtual LUN.
- **vlun_id=ID1,ID2...**: IDs of multiple virtual LUNs which are not necessarily related.
- **vlun_id=ID1-ID2**: IDs of all the virtual LUNs from ID1 to ID2.

Example

On the CLI, run **upadmin** to go to the command management page. Then set the I/O suspension time of all storage systems to 60 seconds.

```
UltraPath CLI #8 >set iosuspensiontime=60
Succeeded in executing the command.
```

System Response

None

A.3.18 Checking a Physical Path's Status

Function

The **start pathcheck** command is used to check the working status of a specified physical path.

Format

start pathcheck path_id=ID1,ID2,...

Parameters

Keyword and Parameter	Description	Default Value
path_id=ID1,ID2,...	ID of a physical path. You can run show path without an ID to display all physical path IDs.	None

Level

User **root**

Usage Guidelines

If you are not sure whether all link faults have been cleared, run the **start pathcheck** command to check the health status of the path. If the path passes the check, reset the path to normal.

Example

Check the working status of the physical path whose ID is **0**.

```
UltraPath CLI #1 >start pathcheck path_id=0

The path check will last about 3 minutes and will consume some bandwidth
resources.
Are you sure you want to continue? [y,n]: y

Check path command send on all pathes successfully, use "show path"command to
investigate the check result.
```

System Response

None

A.3.19 Setting a Time Window for I/O Timeout Isolation

Function

The **set tod_time** command is used to set a time window for path degradation and isolation upon an I/O timeout.

Format

set tod_time=*time*

Parameters

Keyword and Parameter	Description	Default Value
<i>time</i>	Time window for path degradation and isolation upon an I/O timeout. The value ranges from 60 to 2,592,000, expressed in seconds.	600

Level

User **root**

Usage Guidelines

None

Example

Set the time window for path degradation and isolation upon an I/O timeout to 600 seconds.

```
UltraPath CLI #1 >set tod_time=600
Succeeded in executing the command.
```

System Response

None

A.3.20 Setting a Timeout Threshold for Path Degradation and Isolation

Function

The **set tod_threshold** command is used to set a timeout threshold for path degradation and isolation.

Format

set tod_threshold=*number*

Parameters

Keyword and Parameter	Description	Default Value
<i>number</i>	I/O timeout threshold for path degradation and isolation upon an I/O timeout. The value ranges from 0 to 65,535.	1

Level

User **root**

Usage Guidelines

None

Example

Set the I/O timeout threshold for path degradation and isolation to 3.

```
UltraPath CLI #1 >set tod_threshold=3  
Succeeded in executing the command.
```

System Response

None

A.3.21 Setting the Recovery Time of a Degraded Path

Function

The `set tod_recovery_time` command is used to set the recovery time of a degraded path.

Format

```
set tod_recovery_time=time
```

Parameters

Keyword and Parameter	Description	Default Value
<i>time</i>	Recovery timeout of a degraded path. The value ranges from 1,800 to 2,592,000, expressed in seconds.	1800

Level

User **root**

Usage Guidelines

None

Example

Set the recovery time of a degraded path to 1800 seconds.

```
UltraPath CLI #1 >set tod_recovery_time=1800  
Succeeded in executing the command.
```

System Response

None

A.3.22 Setting a Time Window for Calculating Discrete I/O Errors

Function

The **set ied_time** command is used to set a time window for calculating discrete I/O errors.

Format

set ied_time=*time*

Parameters

Keyword and Parameter	Description	Default Value
<i>time</i>	Time window for collecting discrete I/O errors. The value ranges from 60 to 2,592,000, expressed in seconds.	300

Level

User **root**

Usage Guidelines

None

Example

Set the time window for calculating discrete I/O errors to 300 seconds.

```
UltraPath CLI #1 >set ied_time=300
Succeeded in executing the command.
```

System Response

None

A.3.23 Setting a Rate Threshold for Discrete I/O Error Isolation

Function

The **set ied_threshold** command is used to set a rate threshold for discrete I/O error isolation.

Format

set ied_threshold=*ratio*

Parameters

Keyword and Parameter	Description	Default Value
<i>ratio</i>	Rate threshold for discrete I/O error isolation. The value ranges from 0% to 100%.	20

Level

User **root**

Usage Guidelines

None

Example

Set the rate threshold for discrete I/O error isolation to 20%.

```
UltraPath CLI #1 >set ied_threshold=20
Succeeded in executing the command.
```

System Response

None

A.3.24 Setting the minimum number of I/Os for the I/O discrete error isolation mechanism

Function

The **set iedminio** command is used to set the minimum number of I/Os for the I/O discrete error isolation mechanism.

Format

```
set ied_min_io=number
```

Parameters

Keyword and Parameter	Description	Default Value
number	The minimum number of I/Os for the I/O discrete error isolation mechanism. The value ranges from 5,000 to 65,535.	5000

Level

User **root**

Usage Guidelines

None

Example

Set the minimum number of I/Os for the I/O discrete error isolation mechanism to 5000.

```
UltraPath CLI #1 >set ied_min_io=5000  
Succeeded in executing the command.
```

System Response

None

A.3.25 Setting the Recovery Time of a Path with Discrete I/O Errors

Function

The **set ied_recovery_time** command is used to set the recovery time of a path with discrete I/O errors.

Format

```
set ied_recovery_time=time
```

Parameters

Keyword and Parameter	Description	Default Value
<i>time</i>	Recovery time of a path with discrete I/O errors. The value ranges from 1800 to 2,592,000, expressed in seconds.	1800

Level

User **root**

Usage Guidelines

None

Example

Set the recovery time of a path with discrete I/O errors to 1800 seconds.

```
UltraPath CLI #1 >set ied_recovery_time=1800
Succeeded in executing the command.
```

System Response

None

A.3.26 Setting a Time Window for Collecting Intermittent Path Errors

Function

The **set ifd_time** command is used to set the recovery time of a path with intermittent I/O errors.

Format

set ifd_time=*time*

Parameters

Keyword and Parameter	Description	Default Value
<i>time</i>	Time window for collecting intermittent path errors. The value ranges from 60 to 2,592,000, expressed in seconds.	1800

Level

User **root**

Usage Guidelines

None

Example

Set the time window for collecting intermittent path errors to 1800 seconds.

```
UltraPath CLI #1 >set ifd_time=1800
Succeeded in executing the command.
```

System Response

None

A.3.27 Setting an Intermittent Path Error Threshold for Path Isolation

Function

The **set ifd_threshold** command is used to set an intermittent path error threshold for path isolation.

Format

set ifd_threshold=number

Parameters

Keyword and Parameter	Description	Default Value
<i>number</i>	Intermittent path error threshold for path isolation. The value ranges from 0 to 65,535.	3

Level

User **root**

Usage Guidelines

None

Example

Set the intermittent path error threshold for path isolation to 3.

```
UltraPath CLI #1 >set ifd_threshold=3  
Succeeded in executing the command.
```

System Response

None

A.3.28 Setting the Recovery Time of a Path with Intermittent Errors

Function

The **set ifd_recovery_time** command is used to set the recovery time of a path with intermittent errors.

Format

`set ifd_recovery_time=time`

Parameters

Keyword and Parameter	Description	Default Value
<i>time</i>	Recovery time of a path with intermittent errors. The value ranges from 60 to 2,592,000, expressed in seconds.	3600

Level

User **root**

Usage Guidelines

None

Example

Set the recovery time of a path with intermittent errors to 3600 seconds.

```
UltraPath CLI #1 >set ifd_recovery_time=3600  
Succeeded in executing the command.
```

System Response

None

A.3.29 Setting a Time Window for Determining a High-latency Path

Function

The `set hld_time` command is used to set a time window for determining a high-latency path.

Format

`set hld_time=time`

Parameters

Keyword and Parameter	Description	Default Value
<i>time</i>	Time window for determining a high-latency path. The value ranges from 60 to 18,000, expressed in seconds.	300

Level

User **root**

Usage Guidelines

None

Example

Set the time window for determining a high-latency path to 300 seconds.

```
UltraPath CLI #1 >set hld_time=300
Succeeded in executing the command.
```

System Response

None

A.3.30 Setting a Latency Threshold for High-latency Path Isolation

Function

The **set hld_threshold** command is used to set a latency threshold for high-latency path isolation.

Format

set hld_threshold=*time*

Parameters

Keyword and Parameter	Description	Default Value
<i>time</i>	Latency threshold for high-latency path isolation. The value ranges from 0 to 65,535, expressed in milliseconds.	1000

Level

User **root**

Usage Guidelines

None

Example

Set the latency threshold for high-latency path isolation to 1000 ms.

```
UltraPath CLI #1 >set hld_threshold=1000
Succeeded in executing the command.
```

System Response

None

A.3.31 Setting the Recover Time of a High-latency Path

Function

The `set hld_recovery_time` command is used to set the recovery time of a high-latency path.

Format

`set hld_recovery_time=time`

Parameters

Keyword and Parameter	Description	Default Value
<i>time</i>	Recover time of a high-latency path. The value ranges from 60 to 2,592,000, expressed in seconds.	3600

Level

User **root**

Usage Guidelines

None

Example

Set the recovery time of a high-latency path to 3600 seconds.

```
UltraPath CLI #1 >set hld_recovery_time=3600  
Succeeded in executing the command.
```

System Response

None

A.3.32 Setting the Threshold of Switching a Latency-sensitive Path

Function

set sdd_threshold is used to set the threshold of switching a latency-sensitive path.

Format

set sdd_threshold=*time*

Parameters

Parameter	Description	Default Value
<i>time</i>	Threshold of switching a latency-sensitive path The value ranges from 100 to 60,000, expressed in milliseconds.	30000

Level

User **root**

Usage Guidelines

None

Example

This example shows how to set the threshold of switching a latency-sensitive path to 1000 milliseconds.

```
UltraPath CLI #1 >set sdd_threshold=1000
Succeeded in executing the command.
```

System Response

None

A.3.33 Setting the Recovery Time of a Latency-sensitive Path

Function

`set sdd_recovery_time` is used to set the recovery time of a latency-sensitive path.

Format

`set sdd_recovery_time=time`

Parameters

Parameter	Description	Default Value
<i>time</i>	Recovery time of a latency-sensitive path The value ranges from 1 to 2,592,000, expressed in seconds.	120

Level

User **root**

Usage Guidelines

None

Example

This example shows how to set the recovery time of a latency-sensitive path to 600 seconds.

```
UltraPath CLI #1 >set sdd_recovery_time=600
Succeeded in executing the command.
```

System Response

None

A.3.34 Setting an Interval for Routine Detection of Faulty Paths

Function

The **set faulty_path_check_interval** command is used to set an interval for routine detection of faulty paths.

Format

```
set faulty_path_check_interval=time
```

Parameters

Keyword and Parameter	Description	Default Value
<i>time</i>	Interval for routine inspection of faulty paths. The value ranges from 1 to 2,592,000, expressed in seconds.	10

Level

User **root**

Usage Guidelines

None

Example

Set the interval for routine detection of faulty paths to 10 seconds.

```
UltraPath CLI #1 >set faulty_path_check_interval=10  
Succeeded in executing the command.
```

System Response

None

A.3.35 Setting an Interval for Routine Inspection of Idle Paths

Function

The **set idle_path_check_interval** command is used to set an interval for routine inspection of idle paths.

Format

```
set idle_path_check_interval=time
```

Parameters

Keyword and Parameter	Description	Default Value
<i>time</i>	Interval for routine inspection of idle paths. The value ranges from 1 to 2,592,000, expressed in seconds.	60

Level

User **root**

Usage Guidelines

None

Example

Set the interval for routine detection of idle paths to 60 seconds.

```
UltraPath CLI #1 >set idle_path_check_interval=60
Succeeded in executing the command.
```

System Response

None

A.3.36 Setting I/O Retry Timeout

Function

The **set max_io_retry_timeout** command is used to set the timeout period for I/O retry on UltraPath.

Format

```
set max_io_retry_timeout=time [ array_id=ID | vlun_id={ ID | ID1,ID2... | ID1-ID2 } ]
```

Parameters

Keyword and Parameter	Description	Default Value
<i>time</i>	Timeout period for I/O retry on UltraPath. The value ranges from 1 to 2,592,000, expressed in seconds.	1800

Keyword and Parameter	Description	Default Value
array_id=ID	ID of a storage system. You can run show array without an ID to display all storage system IDs.	None
vlun_id={ ID ID1,ID2... ID1-ID2 }	ID of a virtual LUN. You can run show vlun type=all to display all virtual LUN IDs.	None

Level

User **root**

Usage Guidelines

NOTE

In some cases, I/Os are not successfully processed (for example, due to fully-loaded HBAs) even if no clear faults occur on paths. UltraPath will retry to avoid I/O failure. However, if the I/Os are not returned for a long time, the impact on some upper-layer applications may be worse than an I/O failure. In this case, you can set the timeout period for I/O retry to prevent such an impact.

- Run **set max_io_retry_timeout=time** to set the I/O retry timeout of all storage systems.
- Run **set max_io_retry_timeout=time array_id=ID** to set the I/O retry timeout of a specified storage system.
- Run **set max_io_retry_timeout=time vlun_id={ ID | ID1,ID2... | ID1-ID2 }** to set the I/O retry timeout of a specified virtual LUN.

NOTE

- **vlun_id=ID**: ID of a single virtual LUN.
- **vlun_id=ID1,ID2...**: IDs of multiple virtual LUNs which are not necessarily related.
- **vlun_id=ID1-ID2**: IDs of all the virtual LUNs from ID1 to ID2.

Example

Set the timeout period for I/O retry on UltraPath to 1800 seconds.

```
UltraPath CLI #1 >set max_io_retry_timeout=1800
Succeeded in executing the command.
```

System Response

None

A.3.37 Setting the Number of Consecutive I/Os on a Path

Function

The **set lb_io_threshold** command is used to set the number of consecutive I/Os on a path in load balancing mode.

Format

set lb_io_threshold= number [**array_id**=*ID* | **vlun_id**= { *ID* | *ID1*,*ID2*... | *ID1-ID2* }]

Parameters

Keyword and Parameter	Description	Default Value
<i>number</i>	Number of consecutive I/Os on a path. The value ranges from 1 to 10,000.	100
array_id = <i>ID</i>	ID of a storage system. You can run show array without an ID to display all storage system IDs.	None
vlun_id = { <i>ID</i> <i>ID1</i> , <i>ID2</i> ... <i>ID1-ID2</i> }	ID of a virtual LUN. You can run show vlun type=all to display all virtual LUN IDs.	None

Level

User **root**

Usage Guidelines

- Run **set lb_io_threshold=number** to set the number of consecutive I/Os on a path in load balancing mode for all storage systems.
- Run **set lb_io_threshold=number array_id=ID** to set the number of consecutive I/Os on a path in load balancing mode for a specified storage system.
- Run **set lb_io_threshold=number vlun_id={ ID | ID1,ID2... | ID1-ID2 }** to set the number of consecutive I/Os on a path in load balancing mode for a specified virtual LUN.

NOTE

- **vlun_id=ID**: ID of a single virtual LUN
- **vlun_id=ID1,ID2...**: IDs of multiple virtual LUNs which are not necessarily related
- **vlun_id=ID1-ID2**: IDs of all the virtual LUNs from ID1 to ID2

 **NOTE**

Increasing the consecutive I/Os of a path can improve the efficiency of processing sequential I/Os. However, it does not apply to discrete I/Os, and an extra-large number of consecutive I/Os causes path blockage for short periods of time. Therefore, set an appropriate value based on the service I/O model to improve performance.

Example

Set the number of consecutive I/Os on a path in load balancing mode to 1.

```
UltraPath CLI #1 >set lb_io_threshold=1
Succeeded in executing the command.
```

System Response

None

A.3.38 Setting the Remote Controller of a VIS Storage System

Function

The **set remote_controller** command is used to set the remote controller of a VIS storage system so that host I/Os are delivered preferentially from the local VIS node, therefore shortening latency.

Format

```
set remote_controller array_id=ID tpg_id=ID1,ID2... [ remote | local ]
```

Parameters

Keyword and Parameter	Description	Default Value
array_id = <i>ID</i>	ID of a storage system allocated by UltraPath. You can run show array without an ID to display all storage system IDs.	None
tpg_id = <i>ID1,ID2...</i>	ID of a controller. NOTE You can specify multiple controllers at the same time.	None
<i>remote</i> <i>local</i>	Status of a remote controller. The value can be local or remote . ● local: local controller ● remote: remote controller	remote

Level

User **root**

Usage Guidelines

NOTE

UltraPath supports remote active-active VIS storage systems. In this mode, the I/O processing latency on the local VIS node is much smaller than that on the remote one. Therefore, UltraPath prefers the local VIS node for delivering I/Os. The remote VIS node is used only if the local node experiences a path fault.

Example

Set remote controller 0 of the storage system whose ID is **0** as a local node.

```
UltraPath CLI #1 >set remote_controller array_id=0 tpg_id=0 local
Succeeded in executing the command.
```

System Response

None

A.3.39 Clearing Configuration Information

Function

The **clear upconfig** command is used to clear the configuration information about a virtual LUN or storage system to recover them to default factory settings.

Format

clear upconfig={ **vlun_id**=*ID* | **array_id**=*ID* }

Parameters

Keyword and Parameter	Description	Default Value
array_id = <i>ID</i>	ID of a storage system. You can run show array without an ID to display all storage system IDs.	None
vlun_id = <i>ID</i>	ID of a virtual LUN. You can run show vlun type=all to display all virtual LUN IDs.	None

Level

User **root**

Usage Guidelines

- Run **clear upconfig array_id=ID** to clear the configuration information about a specified storage system.
- Run **clear upconfig vlun_id=ID** to clear the configuration information about a specified virtual LUN.

Example

- Clear the configuration information about the storage system whose ID is **0**.
UltraPath CLI #1 >clear upconfig array_id=0
Succeeded in executing the command.
- Clear the configuration information about the virtual LUN whose ID is **1**.
UltraPath CLI #1 >clear upconfig vlun_id=0
Succeeded in executing the command.

System Response

None

A.3.40 Deleting Obsolete Physical Path Information

Function

The **clear obsolete_path** command is used to delete obsolete physical path information.

Format

clear obsolete_path path_id=ID

Parameters

Keyword and Parameter	Description	Default Value
path_id=ID	ID of a physical path. You can run show path without an ID to display all physical path IDs.	None

Level

User **root**

Usage Guidelines

NOTE

- If a storage system administrator changes the path network (for example, changes the Fibre Channel port connected to the storage system), some paths managed by UltraPath may enter faulty state, interfering the administrator's detection of faulty paths. In this case, run the command to delete the paths from UltraPath.
- On an operating system that does not support hot swap or when an iSCSI software initiator is used, changing path ports does not trigger SCSI device deletion on the corresponding host. The path information cannot be deleted, either. In this case, you need run the command provided by the operating system to refresh devices.

Example

Delete the information about the obsolete physical path whose ID is 1.

```
UltraPath CLI #1 >clear obsolete_path path_id=1  
Succeeded in executing the command.
```

System Response

None

A.3.41 Checking the Status of UltraPath

Function

The **check status** command is used to check UltraPath, including the check of exceptions, software integrity, and environment configuration.

Format

check status

Parameters

None

Level

User **root**

Usage Guidelines

The configuration of the UltraPath can be queried only after it is successfully installed.

Example

Check the status of UltraPath.

```
UltraPath CLI #1 >check status
```

```
-----  
Checking path status:  
Pass  
-----
```

```

Checking envirment and config:
Pass
-----
Checking HBA Information:
[WARNING] iscsi is not installed.
complete FC checking.
Host Adapters from different supported vendors co-exists on your system.
-----

```

System Response

None

A.3.42 Viewing Critical Events

Function

The **show event** command is used to view critical events about UltraPath.

Format

show event [**count=number**]

Parameters

Keyword and Parameter	Description	Default Value
count=number	Printing number of critical events. The value ranges from 1 to 10,000.	1000

Level

User **root**

Usage Guidelines

None

Example

View critical events of UltraPath that occurred on the current day.

```

UltraPath CLI #1 >show event
=====
=====
      SN          Array          Type          Time
Serverity      Description
  1  210235G6ED10D8000006  Add path to disk 2013-11-27 08:21:47:902655 info Add a
path to disk: LUN name {fan0000}, Host Lun ID {1}.
.....
4793 210235G6ED10D8000006  Add path to disk 2013-11-27 08:21:47:289423 info Add a

```


Level

User **root**

Usage Guidelines



If a LUN's working controller settings are not optimum (for example, the working controller differs from the initially configured owning controller, resulting load imbalance), you can use this command to manually check the working controller and update the settings.

Example

On the CLI, run **upadm** to go to the command management interface. Then manually update the working controller.

```
UltraPath CLI #1 >start rebalancelun  
Succeeded in executing the command.
```

System Response

None

A.3.44 Querying and Exporting Performance Statistics

Function

The **show iostat** command is used to display and export the performance statistics (IOPS, bandwidth and response time) about storage systems and virtual LUNs.

Format

Run the following command to query and export performance statistics of specified arrays:

```
show iostat array_id=ID1,ID2,... [ interval=time ] [ file_name=file_name ]  
[ archive_time=archive_time ] [ duration=duration ] ]
```

Run the following command to query and export performance statistics of specified virtual LUNs:

```
show iostat vlun_id=ID1,ID2,... [ type={ all | hypermetro | migration } ] [ interval=time ]  
[ file_name=file_name [ archive_time=archive_time ] [ duration=duration ] ]
```

Parameters

Parameter	Description	Default Value
array_id = <i>ID1,ID2,...</i>	<p>Specifies IDs of storage systems.</p> <p>You can run show array to obtain all storage system IDs.</p> <p>NOTE You can query a maximum of eight storage systems' performance statistics at a time. Use comas (,) to separate storage systems.</p>	None
vlun_id = <i>ID1,ID2,...</i>	<p>Specifies IDs of virtual LUNs.</p> <p>You can run show vlun type=all to obtain all virtual LUN IDs.</p> <p>NOTE You can query a maximum of eight virtual LUNs' performance statistics at a time. Use comas (,) to separate virtual LUN IDs.</p>	None
type = <i>{ all hypermetro migration }</i>	<p>View the virtual LUN information of a specific type. If the type parameter is not specified, common virtual LUN information will be queried.</p> <p>Possible values are all, hypermetro, and migration, where:</p> <ul style="list-style-type: none"> ● all: all the virtual LUNs ● hypermetro: virtual HyperMetro LUNs ● migration: virtual migration LUNs 	None
interval = <i>time</i>	<p>Specifies an interval for performance statistics collection.</p> <p>The value ranges from 1 to 60, expressed in seconds.</p>	1

Parameter	Description	Default Value
file_name = <i>file_name</i>	Specifies the saving path and name of the performance statistics report. NOTE You are not required to specify the saving path but must specify the name of the performance report. The system automatically adds suffix .CSV to the name. If a saving path is not specified, the report is saved in the perf_log file folder of the UltraPath log directory.	/opt/UltraPath/log/perf_log/
archive_time = <i>archive_time</i>	Specifies an interval for performance statistics collection. The value can be 5, 60, 120, 300, 1800, and 3600, expressed in seconds. NOTE This parameter is valid only when file_name is specified. The system writes performance data to the report at the specified time interval.	60
duration = <i>duration</i>	Statistics duration The value ranges from 60 to 259,200, expressed in seconds. NOTE This parameter is valid only when file_name is specified. The system stops performance statistics after the specified duration.	900

Level

User **root**

Usage Guidelines

- When performance statistics is being collected, you can press **Ctrl+C** to end the collection.
- If a performance report with the specified name exists in the path, the function of performance statistics is not supported. Delete the existing report or enter a new name. Then export the report.

- If the remaining space of the directory to save the report is smaller than 180 MB, the performance report cannot be exported.

Example

- View performance statistics of the storage system whose ID is **0** at an interval of **30** seconds.

```
UltraPath CLI #3 >show iostat array_id=0 interval=30
=====
Information
=====
=====
time (ms)                IOPS                KB/S                response
      Total  |Read  |Write  Total  |Read  |Write  Total  |
Read  |Write
Array 0    0  | 0    | 0     0     | 0    | 0     0     |
0        |0
Controller 1
Phypath 0 :0  | 0    | 0     0     | 0    | 0     0     |
0        |0
Phypath 1 :0  | 0    | 0     0     | 0    | 0     0     |
0        |0
=====
=====
```

- View performance statistics of the virtual LUNs whose IDs are **0, 1, 2, and 3** at an interval of **30** seconds.

```
UltraPath CLI #4 >show iostat vlun_id=0,1,2,3 interval=30
=====
Information
=====
=====
time (ms)                IOPS                KB/S                response
      Total  |Read  |Write  Total  |Read  |Write  Total  |
Read  |Write
VLUN 0    0  | 0    | 0     0     | 0    | 0     0     |
0        |0
Controller 0B
Path 0    :0  | 0    | 0     0     | 0    | 0     0     |
0        |0
Path 1    :0  | 0    | 0     0     | 0    | 0     0     |
0        |0
=====
=====
VLUN 1    0  | 0    | 0     0     | 0    | 0     0     |
0        |0
Controller 0B
Path 0    :0  | 0    | 0     0     | 0    | 0     0     |
0        |0
=====
=====
VLUN 2    0  | 0    | 0     0     | 0    | 0     0     |
0        |0
Controller 0B
Path 0    :0  | 0    | 0     0     | 0    | 0     0     |
0        |0
=====
=====
VLUN 3    0  | 0    | 0     0     | 0    | 0     0     |
0        |0
Controller 0B
```

```
Path 0      :0      |0      |0      |0      |0      |0      |0      |
0          |0
=====
=====
```

- Query performance statistics about HyperMetro virtual LUN 4.

```
UltraPath CLI #4 >show iostat vlun_id=4 type=hypermetro
=====
=====
IO Performance
Information
=====
=====
IOPS                                KB/S                                response
time (ms)
  Total |Read  |Write  Total |Read  |Write  Total |
Read   |Write
VLUN 4  0    |0     |0     0    |0     |0     0    |
0      |0
Lun Array 210235G6GSZ0C5000004
Controller 0A
Path 1   :0    |0     |0     0    |0     |0     0    |
0      |0
Controller 0B
Path 0   :0    |0     |0     0    |0     |0     0    |
0      |0
Lun Array 210235G6GSZ0C2000008
Controller 0A
Path 2   :0    |0     |0     0    |0     |0     0    |
0      |0
Controller 0B
Path 3   :0    |0     |0     0    |0     |0     0    |
0      |0
=====
=====
```

- Query performance statistics about virtual LUN 0 and export the data to the default path.

```
UltraPath CLI #1 >show iostat vlun_id=0 file_name=perfLogFile
=====
=====
IO Performance Information
=====
=====
IOPS                                KB/S                                response
time (ms)
  Total |Read  |Write  Total |Read  |Write  Total |
Read   |Write
VLUN 0 9389 |9389  |0     38457 |38457 |0     0    |
0      |0
Controller 0A
Path 1  :9389 |9389  |0     38457 |38457 |0     0    |
0      |0
Controller 0B
Path 0  :0     |0     |0     0     |0     |0     0    |
0      |0
=====
=====
```

- Query performance statistics about virtual LUN 0 and export the data to the specified path. Specify the statistics interval to 5s and duration to 1000s.

```
UltraPath CLI #1 >show iostat vlun_id=0 file_name="/home/perfLog/perfLogFile"
archive_time=5 duration=1000
=====
=====
IO Performance Information
=====
=====
IOPS                                KB/S                                response
time (ms)
  Total |Read  |Write  Total |Read  |Write  Total |
```



```

Read      |Write
VLUN 0    9559 |9559 |0    39153 |39153 |0    0    |
0         |0
Controller 0A
Path 1    :9559 |9559 |0    39153 |39153 |0    0    |
0         |0
Controller 0B
Path 0    :0    |0    |0    0    |0    |0    0    |
0         |0
=====
=====

```

System Response

The system generates a performance report with suffix `.CSV` in the specified or default path.

A.4 LUN Management Commands

LUN management commands include commands for viewing storage system information and virtual disk information.

NOTE

If the storage array name or LUN name on the storage array is Chinese and the encoding format of the login tool does not support Chinese characters, UltraPath will display marbled characters after command execution. If this occurs, change the encoding format of the login tool so that Chinese characters are supported.

A.4.1 Querying Storage System Information

Function

The **show array** command is used to query information about a specified or all storage systems connected to the application server.

Format

```
show array [ id=ID1,ID2,... [ verbose ] ]
```

Parameters

Keyword and Parameter	Description	Default Value
id=ID1,ID2,...	ID of a storage system. You can run show array without an ID to display all storage system IDs.	None

Keyword and Parameter	Description	Default Value
verbose	Viewing details configuration information about a specified storage system. NOTE Parameter verbose can display details configuration information about a specified storage system only when it is used with parameter id .	None

Level

User **root**

Usage Guidelines

- Run **show array** to view information about all storage systems connected to the application server.
- Run **show array id=ID1,ID2...** to view information about a specified storage system.
- Run **show array id=ID1,ID2... verbose** to view details configuration information about the storage system.

Example

- Run the following command to query information about all storage systems connected to the application server:

```
UltraPath CLI #9 >show array
```

```
-----
Array ID          Name                Array SN           Vendor Name
Product Name
0                 S5300              2102315401Z083000004  HUAWEI
S5300
1                 SN_210235G6EDZ0C2000001  210235G6EDZ0C2000001  HUASY
S5600T
-----
```

- Run the following command to view information about the storage system whose ID is **1**:

```
UltraPath CLI #10 >show array id=1
```

```
=====
                        Array#1 Information
=====
Name          : SN_210235G6EDZ0C2000001
Array SN      : 210235G6EDZ0C2000001
Vendor Name   : HUASY
Product Name  : S5600T
Controller 0A
  Status      : Enable
  LunCount    : 4
  PathInfo:
    Path1     : Normal
Controller 0B
```

```
Status : Enable
LunCount: 4
PathInfo:
      Path0: Normal
=====
```

- Run the following command to view details configuration information about the storage system whose ID is 0.

```
UltraPath CLI #2 >show array id=0 verbose
=====
                        Array#0 Information
=====
Name          : HUAWAIS5500T
Array SN      : 210235G6GRZ0C4000008
Vendor Name   : HUASY
Product Name  : S5500T
Controller 0A
  Status      : Enable
  LunCount    : 2
  PathInfo:
        Path0: Normal
Working Mode  : load balancing within controller
LUN Trespass  : on
LoadBalance Mode      : min-queue-depth
Loadbanlance io threshold : 1
Io Suspension Time    : 60
Max io retry timeout  : 1800
=====
```

System Response

The following table explains some parameters in the command output:

Parameter	Description	Default Value
Name	Name of the storage system.	None
Array SN	Serial No. of the storage system.	None
Vendor Name	Vendor of the storage system.	None
Product Name	Model of the storage system.	None
Controller	Name of the controller. NOTE <ul style="list-style-type: none"> ● If Remote information is displayed after the controller name, the controller is a remote controller. ● You can only view the information about a maximum of eight paths on one controller. 	None

A.4.2 Viewing Virtual LUN Information

Function

The **show vlun** command is used to query information about a specified LUN or all LUNs mapped from a storage system to an application server.

Format

```
show vlun [ array_id=ID1,ID2,... ] [ type={ all | hypermetro | migration } ]
```

```
show vlun id=ID1,ID2... [ type={ all | hypermetro | migration } ] [ verbose ]
```

Parameters

Keyword and Parameter	Description	Default Value
array_id=ID1,ID2,...	ID of a storage system. You can run show array without an ID to display all storage system IDs. NOTE You can query a maximum of eight storage systems' performance statistics at a time. Use comas (,) to separate storage systems.	None
id=ID1,ID2...	ID of a virtual LUN. You can run show vlun type=all to display all virtual LUN IDs. NOTE You can query a maximum of eight virtual LUNs' performance statistics at a time. Use comas (,) to separate virtual LUN IDs.	None
verbose	Viewing details configuration information about a virtual LUN. NOTE Parameter verbose views details configuration information about a virtual LUN only when it is used with parameter id .	None

Keyword and Parameter	Description	Default Value
type = <i>{ all hypermetro migration }</i>	View the virtual LUN information of a specific type. If the type parameter is not specified, common virtual LUN information will be queried. Possible values are all, hypermetro, and migration, where: <ul style="list-style-type: none"> ● all: all virtual LUNs ● hypermetro: virtual HyperMetro LUNs ● migration: virtual migration LUNs 	None

Level

User **root**

Usage Guidelines

- Run **show vlun** to query information about all common virtual LUNs mounted on the application server.
- Run **show vlun array_id=ID1,ID2,...** to view common virtual LUN information about a specified storage system.
- Run **show vlun id=ID1,ID2...** to view information about a specified common virtual LUN.
- Run **show vlun id=ID1,ID2...verbose** to view details configuration information about a common virtual LUN.
- Run **show vlun type=all** to query information about all virtual LUNs mounted on the application server.
- Run **show vlun array_id=ID1,ID2,... type=all** to view all virtual LUN information about a specified storage system.
- Run **show vlun type=hypermetro** to query information about all virtual HyperMetro LUNs mounted on the application server.
- Run **show vlun id=ID1,ID2... type=all** to view information about a specified virtual LUN.
- Run **show vlun id=ID1,ID2... type=hypermetro** to view information about a specified virtual HyperMetro LUN.

Example

- View information about all common virtual LUNs.

```
UltraPath CLI #0 >show vlun
```

```
-----  
-----
```

```

Vlun ID      Disk      Name      Lun WWN
Status Capacity Ctrl (Own/Work)      Array Name      Dev Lun ID
0           sdb      hl_luntest 630d17e100b33e3900135b9900000024
Normal 1.00GB 0A/0B      Huawei.Storage 36
1           sdc      hl_luntest_2 630d17e100b33e3909eae968000000f2
Normal 1.00GB 0A/0B      Huawei.Storage 242
-----

```

- View common virtual LUN information about the storage system whose ID is 0.

```
UltraPath CLI #0 >show vlun array_id=0
```

```

-----
Vlun ID      Disk      Name      Lun WWN
Status Capacity Ctrl (Own/Work)      Array Name      Dev Lun ID
0           sdb      hl_luntest 630d17e100b33e3900135b9900000024
Normal 1.00GB 0A/0B      Huawei.Storage 36
1           sdc      hl_luntest_2 630d17e100b33e3909eae968000000f2
Normal 1.00GB 0A/0B      Huawei.Storage 242
-----

```

- View details about the common virtual LUN whose ID is 1.

```
UltraPath CLI #2 >show vlun id=1
```

```

=====
VLUN#1 Information
=====
Disk           : sdc
Name           : hl_luntest_2
Status        : Normal
Capacity      : 1.00GB
Driver        : Vendor-specific (DEFAULT)
Product Name   : XSG1
Vendor Name    : HUAWEI
Owning Controller : 0A
Working Controller: 0B
Num of Paths   : 1
LUN WWN       : 630d17e100b33e3909eae968000000f2
Array Name     : Huawei.Storage
Controller 0B
Path 0 [1:0:0:2] (up-1) : Normal
Dev Lun ID    : 242
Manual IO Suspension : Off
-----

```

- View details configuration information about a common virtual LUN whose ID is 1.

```
UltraPath CLI #2 >show vlun id=1 verbose
```

```

=====
VLUN#1 Information
=====
Disk           : sdc
Name           : hl_luntest_2
Status        : Normal
Capacity      : 1.00GB
Driver        : Vendor-specific (DEFAULT)
Product Name   : XSG1
Vendor Name    : HUAWEI
Owning Controller : 0A
Working Controller: 0B
Num of Paths   : 1
LUN WWN       : 630d17e100b33e3909eae968000000f2
Array Name     : Huawei.Storage
Controller 0B
Path 0 [1:0:0:2] (up-1) : Normal
Working Mode   : load balancing within controller
LUN Trespass  : on
LoadBalance Mode : min-queue-depth
Loadbanlance io threshold : 1
Io Suspension Time : 60
Max io retry timeout : 1800
-----

```

```
Dev Lun ID      : 242
Manual IO Suspension : Off
```

- View information about all virtual LUNs.

```
UltraPath CLI #0 >show vlun type=all
```

```
-----
Vlun ID   Disk Name           Lun WWN           Status
Capacity  Ctrl(Own/Work)      Array Name        Dev Lun ID
0          sdb hl_luntest       630d17e100b33e3900135b9900000024  Normal
1.00GB    0A/0B              Huawei.Storage    36
1          sdc hl_luntest_2    630d17e100b33e3909eae968000000f2  Normal
1.00GB    0A/0B              Huawei.Storage    242
2          sdd shuanghuo_A     630d17e100b33e390912496800000031  Normal
1.00GB    0A/0B              Huawei.Storage    12
2          sdd shuanghuo_B     630d17e100b33e390912496800000031  Normal
1.00GB    0A/0B              Huawei.Storage    12
-----
```

- View all virtual LUN information about the storage system whose ID is 0.

```
UltraPath CLI #7 >show vlun array_id=0 type=all
```

```
-----
Vlun ID   Disk Name           Lun WWN           Status
Capacity  Ctrl(Own/Work)      Array Name        Dev Lun ID
0          sdb remote0000     63400a31000d9c5f01415fb500000008  Fault
0.00KB    0B/0B              Huawei.Storage48  --
1          sdc remote0001     63400a31000d9c5f01415fd700000009  Fault
0.00KB    0A/0A              Huawei.Storage48  --
2          sdd remote0002     63400a31000d9c5f0141600b0000000a  Fault
0.00KB    0B/0B              Huawei.Storage48  --
3          sde remote0003     63400a31000d9c5f014160330000000b  Fault
0.00KB    0A/0A              Huawei.Storage48  --
4          sdf test20002      64846fb1008ca15f08c0007000000042  Normal
1.00GB    0A/0A              Huawei.Storage48  --
5          sdg test20003     64846fb1008ca15f08c00097000000043  Normal
1.00GB    0B/0B              Huawei.Storage48  --
-----
```

- View information about all virtual HyperMetro LUNs.

```
UltraPath CLI #0 >show vlun type=hypermetro
```

```
-----
Vlun ID   Disk Name           Lun WWN           Status
Capacity  Ctrl(Own/Work)      Array Name        Dev Lun ID
2          sdd shuanghuo_A     630d17e100b33e390912496800000031  Normal
1.00GB    0A/0B              Huawei.Storage    12
2          sdd shuanghuo_B     630d17e100b33e390912496800000031  Normal
1.00GB    0A/0B              Huawei.Storage    12
-----
```

- View details about the virtual LUN whose ID is 0.

```
UltraPath CLI #10 >show vlun id=0 type=all
```

```
=====
VLUN#0 Information
=====
Disk                : sdb
Manual IO Suspension : Off
Aggregation Type    : Hyper Metro
Aggregation Specific Attribution
  WorkingMode       : read write between both arrays
  Primary Array SN  : 210235980510E8000015
Aggregation Member#0 Infomation
  Name              : local0000
  Status            : Normal
```

```

Capacity          : 2.00GB
Aggregation Specific Attribution : N/A
LUN WWN          : 63400a31000d9c5f01415fb500000008
Array Name       : Huawei.Storage46
Array SN         : 210235980510E8000015
Driver           : Vendor-specific(DEFAULT)
Product Name     : XSG1
Vendor Name      : HUAWEI
Owning Controller : 0A
Working Controller: 0A
Num of Paths     : 4
Controller 0A
Path 3 [3:0:3:1] (up-12) : Normal
Path 7 [4:0:3:1] (up-28) : Normal
Controller 0B
Path 2 [3:0:2:1] (up-8)  : Normal
Path 6 [4:0:2:1] (up-24) : Normal
Aggregation Member#1 Infomation
Name              : remote0000
Status            : Fault
Capacity          : 0.00KB
Aggregation Specific Attribution : N/A
LUN WWN          : 63400a31000d9c5f01415fb500000008
Array Name       : Huawei.Storage48
Array SN         : SN987654321076543210
Driver           : Vendor-specific(DEFAULT)
Product Name     : XSG1
Vendor Name      : HUAWEI
Owning Controller : 0B
Working Controller: 0B
Num of Paths     : 4
Controller 0A
Path 1 [3:0:1:1] (up-4)  : Fault
Path 5 [4:0:1:1] (up-20) : Fault
Controller 0B
Path 0 [3:0:0:1] (up-0)  : Fault
Path 4 [4:0:0:1] (up-16) : Fault
-----

```

- View details about the virtual HyperMetro LUN whose ID is 2.

```

UltraPath CLI #0 >show vlun id=2 type=hypermetro
=====
                        VLUN#2 Information
=====
Disk                    : sdd
Manual IO Suspension   : Off
Aggregation Type       : Hyper Metro
Aggregation Specific Attribution
  WorkingMode           : read write between both arrays
  Primary Array SN      : 210235G6GSZ0C5000004
Aggregation Member#0 Infomation
Name                    : shuangh_A
Status                  : Normal
Capacity                : 1.00GB
Aggregation Specific Attribution : N/A
LUN WWN                 : 630d17e100b33e390912496800000031
Array Name              : Array8.1
Array SN                : 210235G6GSZ0C5000004
Driver                  : Vendor-specific(DEFAULT)
Product Name            : S5500T
Vendor Name             : HUASY
Reservation              : 0
Queued I/O              : 0
Owning Controller      : 0A
Working Controller      : 0A
Num of Paths            : 2
Controller 0A
Path 1 [5:0:0:2] (up-5) : Normal
Controller 0B
Path 0 [4:0:0:2] (up-2) : Normal

```



```

Aggregation Member#1 Infomation
Name           : shuangh_B
Status        : Normal
Capacity      : 1.00GB
Aggregation Specific Attribution : N/A
LUN WWN       : 630d17e100b33e390912496800000031
Array Name    : SN_210235G6GSZ0C2000008
Array SN     : 210235G6GSZ0C2000008
Driver       : Vendor-specific(DEFAULT)
Product Name  : S5500T
Vendor Name   : HUASY
Reservation   : 0
Queued I/O    : 0
Owning Controller : 0B
Working Controller: 0A
Num of Paths  : 2
Controller 0A
Path 2 [3:0:0:0] (up-6) : Normal
Controller 0B
Path 3 [7:0:0:0] (up-7) : Normal
-----
    
```

System Response

The following table explains some parameters in the command output:

Parameter	Description	Default Value
Disk	Name of the disk that corresponds to the virtual LUN on an host.	None
Name	Name of the virtual LUN NOTE The name is specified when the LUN is created on its storage array.	None

Parameter	Description	Default Value
Status	<p>Status of the virtual LUN. Possible values are as follows:</p> <ul style="list-style-type: none"> ● Normal: The virtual LUN is normal. ● Fault: The virtual LUN is faulty. ● Degraded: The virtual LUN is degraded. ● Unavailable: The virtual LUN is unavailable. <p>NOTE</p> <ul style="list-style-type: none"> ● If the LUN on the array is in Fault state while the virtual LUN on the host is in Available state (viewed by using UltraPath), the virtual LUN can be accessed by the host. ● If you remap a LUN from the storage array to a host but do not rescan LUNs on the host, the mapping between the LUN on the storage array and the virtual LUN changes and the status of the virtual LUN is Unavailable. 	None
Capacity	Capacity of the virtual LUN	None
Product Name	Model of the storage system	None
Vendor Name	Vendor of the storage system	None
Num of Paths	<p>Number of logical paths</p> <p>NOTE You can only view the information about a maximum of eight paths on one controller.</p>	None
LUN WWN	WWN of the virtual LUN	None
Dev Lun ID	ID of the storage system LUN corresponding to the virtual LUN	None
Manual IO Suspension	Manual I/O suspension time of the virtual LUN.	None

Parameter	Description	Default Value
Aggregation Type	Type of the aggregation LUN. Possible values are as follows: <ul style="list-style-type: none"> ● Hyper Metro: virtual HyperMetro LUNs ● Migration: virtual migration LUNs. 	None
Aggregation Specific Attribution	Attribution of the aggregation LUN. For virtual HyperMetro LUNs: <ul style="list-style-type: none"> ● WorkingMode: working mode for virtual HyperMetro LUNs. ● Primary Array SN: SN of the primary array. For migration virtual LUNs: <ul style="list-style-type: none"> ● IO Direction: switch I/O to the target array or source array. ● Rollback: enable or disable automatic I/O switchback. 	None

A.4.3 Setting the Size of a HyperMetro Fragment

Function

The **set hypermetro split_size** command is used to set the fragment size when HyperMetro cross-array load balancing is applied.

Format

```
set hypermetro split_size=size [ vlun_id={ ID | ID1,ID2... | ID1-ID2 } ]
```

Parameters

Parameter	Description	Default Value
split_size = <i>size</i>	Fragment size. The value ranges from 512 bytes to 1 GB. The unit is byte. NOTE The value must be an integer multiple of 512 and a power of 2.	128 MB
vlun_id = <i>{ ID ID1,ID2... ID1-ID2 }</i>	ID of an virtual HyperMetro LUN. Run the show vlun type=hypermetro command to obtain the IDs of the virtual HyperMetro LUNs.	None

Level

User **root**

Usage Guidelines

- Run the **set hypermetro split_size=size** command to set the HyperMetro fragment size for all storage systems.
- Run the **set hypermetro split_size=size vlun_id={ ID | ID1,ID2... | ID1-ID2 }** command to set the HyperMetro fragment size of the virtual LUNs.

NOTE

- **vlun_id=ID**: ID of a single virtual LUN.
- **vlun_id=ID1,ID2...**: IDs of multiple virtual LUNs which are not necessarily related.
- **vlun_id=ID1-ID2**: IDs of all the virtual LUNs from ID1 to ID2.

Example

- Set the HyperMetro fragment size to 128 MB for all storage systems.

```
UltraPath CLI #2 >set hypermetro split_size=128M
Succeeded in executing the command.
```

- Set the HyperMetro fragment size of the virtual LUNs whose ID is 0 to 128 MB.

```
UltraPath CLI #3 >set hypermetro split_size=128M vlun_id=0
Succeeded in executing the command.
```

System Response

None

A.4.4 Setting the HyperMetro Working Mode

Function

The **set hypermetro workingmode** command is used to set the HyperMetro working mode.

Format

```
set hypermetro workingmode={ priority | balance } primary_array_id=ID [ vlun_id={ ID | ID1,ID2... | ID1-ID2 } ]
```

Parameters

Parameter	Description	Default Value
workingmode ={ <i>priority</i> <i>balance</i> }	HyperMetro working mode. Possible values are priority and balance, where: <ul style="list-style-type: none"> ● priority: primary array mode ● balance: load balance mode 	priority
primary_array_id = <i>ID</i>	ID of the primary array. You can run show array to display all array IDs. NOTE <ul style="list-style-type: none"> ● In priority mode, the primary array indicates the array that delivers I/O first. ● In balance mode, the primary array indicates the array where the first fragment range resides. ● If an array is connected to multiple hosts, the array ID varies on different hosts. Use the array SN to determine whether the arrays queried on different hosts are the same. 	None
vlun_id ={ <i>ID</i> <i>ID1</i> , <i>ID2</i> ... <i>ID1-ID2</i> }	ID of an virtual HyperMetro LUN. Run the show vlun type=hypermetro command to obtain the IDs of the virtual HyperMetro LUNs.	None

Level

User **root**

Usage Guidelines

NOTE

Setting the HyperMetro working mode of a specified virtual LUN with a higher priority than that of storage systems. If the HyperMetro working mode of a virtual LUN has been set, its working mode remains unchanged after the HyperMetro working mode of storage systems is set.

- When the working mode is set to primary array mode, UltraPath delivers I/Os to the priority array. UltraPath will deliver I/Os to non-priority arrays only when the primary array encounters a fault.
- When the working mode is set to load balance mode, UltraPath chooses to deliver a specific array based on the start address of I/Os, fragment size, and priority array.
For example, if the fragment size is 128 MB, then the I/Os with start addresses from 0 MB to 128 MB are delivered to the priority array, and the I/Os with start addresses from 128 MB to 256 MB are delivered to non-priority arrays.
- Run the **set hypermetro workingmode={ *priority* | *balance* } primary_array_id** command to set the HyperMetro working mode for all storage systems.
- Run the **set hypermetro workingmode={ *priority* | *balance* } primary_array_id=ID vlun_id={ *ID* | *ID1, ID2...* | *ID1-ID2* }** command to set the HyperMetro working mode of a specific virtual LUN.

NOTE

- **vlun_id=ID**: ID of a single virtual LUN.
- **vlun_id=ID1, ID2...**: IDs of multiple virtual LUNs which are not necessarily related.
- **vlun_id=ID1-ID2**: IDs of all the virtual LUNs from ID1 to ID2.

Example

- Set the HyperMetro working mode to **primary array mode** for all storage systems, and set the storage systems whose ID is **0**, to the primary array.

```
UltraPath CLI #2 >set hypermetro workingmode=priority primary_array_id=0  
Succeeded in executing the command.
```

- Set the HyperMetro working mode of the virtual LUNs whose ID is **0**, to **primary array mode**, and set the storage systems whose ID is **0**, to the primary array.

```
UltraPath CLI #3 > set hypermetro workingmode=priority primary_array_id=0  
vlun_id=0  
Succeeded in executing the command.
```

System Response

None

A.4.5 Configuring I/O Switchover

Function

The **start migration** is used to switch over I/Os to the target array or the source array.

Format

start migration vlun_id=ID direction={ *source* | *target* } rollback={ *enable* | *disable* }

Parameters

Parameter	Description	Default Value
vlun_id = <i>ID</i>	ID of a virtual LUN. Run the show vlun command to obtain the ID of a virtual LUN.	None
direction ={ <i>source</i> <i>target</i> }	Switch I/O to the target array or source array. Possible values are source and target, where: <ul style="list-style-type: none"> ● source: switch I/O to the source array. ● target: switch I/O to the target array. 	None
rollback ={ <i>enable</i> <i>disable</i> }	Enable or disable automatic I/O switchback. Possible values are enable or disable, where: <ul style="list-style-type: none"> ● enable: automatic I/O switchback is enabled. If an online migration fails, I/Os can be switched back to the source array. <p>NOTE This value can be used only when direction equals <i>target</i>.</p> <ul style="list-style-type: none"> ● disable: automatic I/O switchback is disabled. If an online migration fails, I/Os cannot be switched back to the source array. 	None

Level

User **root**

Usage Guidelines

None

Example

Switch over the I/Os of the LUN whose ID is **0** to the target array and enable automatic switchback.

```
UltraPath CLI #3 >start migration vlun_id=0 direction=target rollback=enable
Succeeded in executing the command.
```

System Response

None

A.4.6 Suspending I/Os of a Virtual LUN

Function

The **start iosuspension** command is used to suspend I/Os of a specific LUN.

Format

```
start iosuspension vlun_id=ID timeout=value
```

Parameters

Parameter	Description	Default Value
vlun_id=ID	ID of a virtual LUN. Run the show vlun command to obtain the ID of a virtual LUN.	None
timeout=value	I/O suspension timeout period. The value ranges from 1 to 2,592,000, expressed in seconds. You are advised to set the value to 20 seconds.	None

Level

User **root**

Usage Guidelines

start iosuspension is a blocking command. It runs only when all I/Os of a specific LUN return to UltraPath.

Example

Set the I/O suspension time of the LUN whose ID is **0** to 20 seconds.

```
UltraPath CLI #3 >start iosuspension vlun_id=0 timeout=20
Succeeded in executing the command.
```


System Response

None

A.4.7 Stopping I/O Suspension of a Virtual LUN

Function

The **start iosuspension** command is used to stop I/O suspension of the a specific LUN.

Format

stop iosuspension vlun_id=ID

Parameters

Parameter	Description	Default Value
vlun_id=ID	IDs of the virtual LUNs. Run the show vlun command to obtain the ID of a virtual LUN.	None

Level

User **root**

Usage Guidelines

None

Example

Stop I/O suspension of the virtual LUN whose ID is **0**.

```
UltraPath CLI #3 >stop iosuspension vlun_id=0
Succeeded in executing the command.
```

System Response

None

A.5 Other UltraPath Commands

This section describes UltraPath commands that are not included in the preceding command categories.

Except the CLI management commands of upadmin, UltraPath V100R008 also supports part commandsof upadm, [Table A-2](#) lists the upadm commands. For the details please see *UltraPath for Linux User Guide V100R003*.

Table A-2 upadm commands

Command name	Command Function
upadm help	Displaying the brief help information of upadm
upadm show path	Displaying the path information
upTools -S	
upadm show array	Display the information about all storage systems managed by the UltraPath
upTools -a	
upadm show option	Display the current value of each parameter of the UltraPath
upadm show version	Display the UltraPath version
upTools -V	
upadm show connectarray	Display the information about all storage systems connected to the server
upadm show lun array=array_id {dev=lun_id}	Display the information about the specified storage system managed by the UltraPath
upadm show iostat array=array_id {lun=lun_id interval=seconds}	Display the I/O performance statistics
upadm start hotscan	Identify the LUN dynamically
upadm start updateimage	Update the system configuration.
upadm set lbcontroller={on off}	Set whether to enable load balancing between controllers
upadm set failover={on off}	Set whether to enable the switchover between operating and owning controllers of the LUN
upadm set failback_interval=seconds	Set the failback latency
upadm set iopolicy	Set the load balancing algorithm
upadm set holdio={0 1} [timeout=seconds]	Set the type and time-out period of the I/O hang function for the current application server

A.5.1 Updating the System Image File

Function

Updates the system image file.

Format

upLinux updateImage

Parameters

None

Level

User **root**

Usage Guidelines

After this parameter is used, a new system image file is generated in the **/boot** directory. When the UltraPath is installed using the SAN Boot method, you must first update the system image file before you save the changes to the parameters of UltraPath. When the UltraPath is installed using the boot from Local method first time, you must run this command to make the HBA parameters setting effect.

Example

None

System Response

None

A.5.2 Upgrading the Operating System Kernel (UltraPath Is Not Reinstalled)

Function

The **upLinux updateForNewKernel** command applies to scenarios where the operating system kernel is upgraded in boot from SAN mode and UltraPath is not reinstalled.

Format

upLinux updateForNewKernel

Parameters

None

Level

User **root**

Usage Guidelines

After the command is executed, the kernel will be obtained from the default BootLoader startup item in system boot mode. UltraPath loads its kernel module to the system kernel that

is obtained, generates a new system image, and modifies the system startup item. The modifications take effect after the operating system is restarted.

Example

```
[root@localhost RHEL]# upLinux updateForNewKernel
The new kernel is 2.6.32-220.el6.x86_64.
The running service is deleted successfully.
The UltraPath startup guide items are deleted successfully.
remove nxup from dracut.
The UltraPath files are deleted successfully.
User configuration is saved successfully.
append nxup to dracut.
The mirror is updated successfully.
append UltraPath title to bootloader successfully. [/boot/grub/menu.lst]
The running service is installed successfully.
The system kernel is updated successfully in UltraPath. Please reboot.
```

System Response

None

A.5.3 Updating LUN Information

The Linux operating system cannot automatically detect mapping changes made on the storage side. To help users manage storage devices more easily and efficiently, the UltraPath provides the **upRescan** command for users to update LUN information.

Function

The **upRescan** command is used to update LUN information.

Format

upRescan

Parameters

None

Level

User **root**

Usage Guidelines

Updating LUN information includes the following aspects:

- Increasing or reducing LUN mappings
- Changing LUN mappings
- Increasing or reducing the number of paths
- Increasing or reducing disk arrays

NOTE

The **hot_add** command is an **upRescan** link that is compatible with the old version's command used to scan for LUNs.

Example

Run the **upRescan** command.

```
#upRescan
Begin deleting non-existent luns.
Begin deleting Luns which have been changed.
Begin scan [host3]
Begin scan [host4]
rescan complete.
```

System Response

None

A.5.4 Generating a Random Number

Function

The **genprkey** command is used to generate a random 19-digit number.

Format

genprkey

Parameters

None

Level

User **root**

Usage Guidelines

Run the command once when UltraPath is being installed. The random 19-digit number will be written to the configuration file to make the UltraPath work in a SCSI-2 cluster environment.

Example

Run the **upadmin** command to log in to the CLI. Then run the **genprkey** command to generate a random 19-digit number.

```
UltraPath CLI #1 >genprkey
1688015227050849615
```

System Response

None

A.5.5 Query the Timeout Period of a SCSI Device

Function

The **upLinux show scsi_timeout** command is used to query the timeout period of a SCSI device that is taken over by UltraPath.

Format

upLinux show scsi_timeout

Parameters

None

Level

User **root**

Usage Guidelines

After the command is executed, the timeout period of a SCSI device that is taken over by UltraPath will be read and displayed. If the timeout period of the SCSI device is different from that in the udev file of UltraPath, the device information will be displayed.

 **NOTE**

SUSE 9 and Red Hat 4 do not support the command.

Example

Run the **upLinux show scsi_timeout** command.

```
#upLinux show scsi_timeout  
scsi timeout:30
```

System Response

None

A.5.6 Modify the Timeout Period of a SCSI Device

Function

The **upLinux set scsi_timeout** command is used to modify the timeout period of a SCSI device that is taken over by UltraPath.

Format

upLinux set scsi_timeout=*num*

Parameters

Parameter	Description	Default Value
<i>num</i>	Timeout period that has been set. It is expressed in seconds. The value ranges from 1 to 600.	30

Level

User **root**

Usage Guidelines

After the command is executed, the timeout period in the udev file of UltraPath will be modified and the value of this parameter will be synchronized to the SCSI device that is taken over by UltraPath.

NOTE

- If third-party udev rules are used to modify the timeout period of the SCSI device, the command cannot be used to modify the timeout period of the SCSI device that is taken over by UltraPath.
- SUSE 9 and Red Hat 4 do not support the command.

Example

Run the **upLinux set scsi_timeout** command.

```
#upLinux set scsi_timeout=30
Succeeded in changing the value of the timeout parameter in the 99-
ultrapath.rules to 30.
Succeeded in modifying the timeout parameter of the SCSI devices managed by
UltraPath.
```

System Response

None

A.5.7 Configuring Automatic Startup of InfiniBand Drivers

Function

The **upLinux config ib** command is used to configure automatic startup of InfiniBand drivers.

Format

upLinux config ib

Parameters

None

Level

User **root**

Usage Guidelines

- This command only supports a direct-connection network between a host with InfiniBand HCAs and the storage system.
- Running this command adds the subnet management (**opensm**) and link management (**run_srp_daemon**) configurations of InfiniBand drivers to host system services and automatically reports disk arrays connected to InfiniBand interface modules to the host for takeover.

Example

Configure automatic startup of InfiniBand drivers.

```
# upLinux config ib
Warning: This command can only be used in direct connection mode, verify the
networking environment before running this command. Do you want to go?
<Y|N>:y
Config ib successfully.
```

System Response

None

A.5.8 Querying InfiniBand Driver Configurations

Function

The **upLinux show ib_config** command is used to query InfiniBand driver configurations.

Format

upLinux show ib_config

Parameters

None

Level

User **root**

Usage Guidelines

You can run this command to query whether automatic startup of InfiniBand drivers has been added to system services and whether the subnet management (**opensm**) and link management (**run_srp_daemon**) have been configured for each port on the InfiniBand interface module. If subnet management and link management are configured for the InfiniBand ports, **normal** is displayed. Otherwise, **abnormal** is displayed.

Example

Query InfiniBand driver configurations.

```
# upLinux show ib_config
UltraPath IB service is configured.
IB port information:
mlx4_0:port1  normal
mlx4_0:port2  normal
```

System Response

None

A.5.9 Clearing InfiniBand Driver Configurations

Function

The **upLinux unconfig ib** command is used to clear InfiniBand driver configurations.

Format

upLinux unconfig ib

Parameters

None

Level

User **root**

Usage Guidelines

You can run this command to clear the subnet management (**opensm**) and link management (**run_srp_daemon**) from system services, and cancel automatic startup configurations of InfiniBand drivers.

Example

Clear InfiniBand driver configurations.

```
# upLinux unconfig ib
Warning: The operation will clear up the configuration of ib. Do you want to go
on?
<Y|N>:y
Unconfig ib successfully.
Warning: The operation will stop opensm and run_srp_daemon of all ib ports. Do
you want to go on?
<Y|N>:y
Stop opensm and run_srp_daemon successfully.
```

System Response

None

A.5.10 Timeout Parameter Settings upon a Link Interruption Failure

Function

upLinux set linkdown_tmo is used to set the timeout interval for the HBA to return the **linkdown** error code after a link is down.

Format

upLinux set linkdown_tmo=timeout

Parameters

Parameter	Description	Default Value
<i>timeout</i>	Timeout interval The value ranges from 1 to 60, expressed in seconds.	None

Level

User **root**

Usage Guidelines

- If this parameter is modified, the time required by the system to delete disks upon a link interruption failure is changed. A smaller value indicates that less time is required for deleting disks.
- This command modifies driver parameters and applies to all storage device links on the host.

Example

This example shows how to set link interruption timeout to 5 seconds.

```
# upLinux set linkdown_tmo=5
Warning: This command will modify the driver's parameters, which affects the time
taken to delete a disk when a link is down. This modification also has an impact
on all storage ports that connect to the host. Are you sure you want to modify
the parameters?
<Y|N>:y
The linkdown tmo is set to 5.
```

System Response

None

A.5.11 Querying Timeout Parameter Settings upon a Link Interruption Failure

Function

upLinux show linkdown_tmo is used to query timeout interval upon a link interruption failure.

Format

upLinux show linkdown_tmo

Parameters

None

Level

User **root**

Usage Guidelines

None

Example

This command shows how to query timeout interval upon a link interruption failure.

```
# upLinux show linkdown_tmo  
linkdown tmo:5.
```

System Response

None

A.5.12 Clearing Timeout Parameter Settings upon a Link Interruption Failure

Function

upLinux unset linkdown_tmo is used to clear timeout parameter settings upon a link interruption failure.

Format

upLinux unset linkdown_tmo

Parameters

None

Level

User **root**

Usage Guidelines

This command clears timeout parameter settings upon a link interruption failure and restores the parameter to the value before modification.

Example

This example shows how to clear timeout parameter settings upon a link interruption failure.

```
# upLinux unset linkdown_tmo
Unset the linkdown tmo successfully.
```

System Response

None

A.5.13 Updating the Status of Virtual LUNs

Function

Updates the status of virtual LUNs to check for the changes of LUN mappings. **hot_add** is a symbolic link file of **upRescan**. This command provides the same function as the **upRescan** command does.

Format

```
hot_add [ -m | -q | -f | -force ]
```

Parameters

Keyword and Parameter	Description	Default Value
-m	Delete Luns which had not been managed by UltraPath without mutual information.	None
-q	Delete Luns which had not been managed by UltraPath with mutual information.	None
-f	Delete no-mapped virtual disks.	None
-force	Delete virtual disks that do not have physical paths.	None

Level

User **root**

Usage Guidelines

The LUN information needs to be updated under the following conditions:

- LUN mappings have been added or deleted.
- LUN mappings have been changed.
- Paths have been added or deleted.
- Storage arrays have been added or deleted.

Example

None

System Response

None

A.5.14 Showing Array Models Supported by the UltraPath

Function

The **show supportarraylist** command is used to show all disk array models supported by the UltraPath.

Format

show supportarraylist

Parameters

None

Level

User **root**

Usage Guidelines

None

Example

Show all disk array models supported by the UltraPath.

```
UltraPath CLI #0 >show supportarraylist
Vendor   Product
-----
HUAWEI   S6800E
```

```

HUAWEI V1500
HUAWEI V1500N
HUAWEI V1800
HUAWEI S2100
HUAWEI S2300
HUAWEI S2300E
HUAWEI S2600
HUAWEI S2900
HUAWEI S5300
HUAWEI S5100
HUAWEI S5500
HUAWEI S5600
HUAWEI S8000-I
HUAWEI V1600N
HUAWEI S3900
HUAWEI S6900
HUAWEI S2200T
HUAWEI S2600T
HUAWEI S5500T
HUAWEI S5600T
HUAWEI S5800T
HUAWEI S6800T
HUAWEI S3900-M200
HUAWEI S3900-M300
HUAWEI S5900-M100
HUAWEI S5900-M200
HUAWEI S6900-M100
HUAWEI Dorado2100
HUAWEI Dorado5100
HUASY S2600T
HUASY S3900
HUASY S5300
HUASY S2200T
HUASY S6900
HUASY S5500T
HUASY S5600T
HUASY S5800T
HUASY S6800T
HUASY S3900-M200
HUASY S3900-M300
HUASY S5900-M100
HUASY S5900-M200
HUASY S6900-M100
HUASY S8000-I
HUASY Dorado2100
HUASY Dorado5100
HUAWEI VIS6000
HS VIS6000
HUAWEI VIS6000T
HS VIS6000T
HS V1500
HS V1500N
HS V1800
HS S2100
HS S2300
HS S2300E
HS S2600
HS S2600T
HS S5100
HS S5300
HS S5500
HS S5600
HS S6800E
HS V1600N
HS S8000-I
HS S8000
HUAWEI S8000
HUAWEI Dorado2100 G2
HUAWEI HVS85T

```

```
HUAWEI HVS88T
HUAWEI XSG1
Marstor XSG1
UDsafe XSG1
SanM XSG1
AnyStor XSG1
SUGON XSG1
NETPOSA XSG1
-----
```

System Response

None

A.5.15 Adding a Disk Array Model Supported by the UltraPath

Function

The **add supportarraylist** command is used to add a disk array model supported by the UltraPath.

Format

```
add supportarraylist vendor=<vendor_id> product=<product_id>
[ driver=<driver_type> ]
```

Parameters

Keyword and Parameter	Description	Default Value
vendor =<vendor_id>	Vendor ID of a disk array. NOTE The ID contains a maximum of 8 characters. The space at the beginning and end of the ID are omitted. It is recommended that double quotation marks (") are used to mark a vendor ID. If a vendor ID contains spaces, it must be marked with double quotation marks. The number of characters is a value ranging from 32 to 126 (32 ≤ ASCII code ≤ 126). The following characters are not supported: #^&= \;><,"	None

Keyword and Parameter	Description	Default Value
product =<product_id>	Product ID of a disk array. NOTE The ID contains a maximum of 16 characters. The space at the beginning and end of the ID are omitted. It is recommended that double quotation marks (") are used to mark a vendor ID. If a vendor ID contains spaces, it must be marked with double quotation marks. The number of characters is a value ranging from 32 to 126 (32 ≤ ASCII code ≤ 126). The following characters are not supported: #^&= \\;><,"	None
driver =<driver_type>	Driver type of a disk array. The value is default . NOTE It is recommended that double quotation marks (") are used to mark the driver type of a disk array.	None

Level

User **root**

Usage Guidelines

Run this command when the related disk array is mapped to the host. If you want the UltraPath to manage an LUN mapped to the host after this command is executed, map the LUN to the host again after deleting the mapping.

NOTE

This command is inapplicable to UVP SAN Boot scenarios.

Example

Add a disk array model supported by the UltraPath.

```
UltraPath CLI #0 >add supportarraylist vendor="HUAWEI" product="S2600T"
driver="default"
```

Execute this command may affect the stability of the application you're running or even result in more serious consequences.

You will add the array's information: vendor="HUAWEI" product="S2600T" driver="default".

Are you sure still want to execute it [y,n]: y

Command executed successfully.

System Response

None

A.5.16 Deleting a Disk Array Model Supported by the UltraPath

Function

The **del supportarraylist** command is used to delete a disk array model supported by the UltraPath.

Format

```
del supportarraylist vendor=<vendor_id> product=<product_id>
```

Parameters

Keyword and Parameter	Description	Default Value
vendor =<vendor_id>	Vendor ID of a disk array. NOTE The ID contains a maximum of 8 characters. The space at the beginning and end of the ID are omitted. It is recommended that double quotation marks (") are used to mark a vendor ID. If a vendor ID contains spaces, it must be marked with double quotation marks. The number of characters is a value ranging from 32 to 126 (32 ≤ ASCII code ≤ 126). The following characters are not supported: #^&= \;><,"	None
product =<product_id>	Product ID of a disk array. NOTE The ID contains a maximum of 16 characters. The space at the beginning and end of the ID are omitted. It is recommended that double quotation marks (") are used to mark a vendor ID. If a vendor ID contains spaces, it must be marked with double quotation marks. The number of characters is a value ranging from 32 to 126 (32 ≤ ASCII code ≤ 126). The following characters are not supported: #^&= \;><,"	None

Level

User **root**

Usage Guidelines

- In Linux, a mapped disk array model can be deleted.
- Run this command when the related disk array is mapped to the host. If you want the UltraPath not to manage an LUN mapped to the host after this command is executed, delete the mapping. If you want to enable another multipathing software or host to take over an LUN, map the LUN to the host again.

NOTE

This command is inapplicable to UVP SAN Boot scenarios.

Example

Delete a disk array model supported by the UltraPath.

```
# upadmin del supportarraylist vendor="HUAWEI" product="S2600T"

Execute this command may affect the stability of the application you're running
or even result in more serious consequences.
You will delete the array's information: vendor="HUAWEI" product="S2600T".

Are you sure still want to execute it [y,n]: y

Command executed successfully.
```

System Response

None

A.5.17 Performing Read Operations on Security

Function

Security reads disks.

Format

updd if=xx,xx

Parameters

Keyword and Parameter	Description	Default Value
if=xx,xx	Indicates the name of a virtual disk.	None

Level

User **root**

Usage Guidelines

None

Example

Perform read operations on `/dev/sdc`. Enter `updd if=/dev/sdc`.

After data is read for a certain period, press **Ctrl+C** to terminate the `updd` command.

```
# updd if=/dev/sdc
1146081+0 records in.
1146080+0 records out.
```

System Response

None

A.5.18 Executing a Non-disruptive Upgrade of UltraPath

Function

The `install.sh` command is used to execute a non-disruptive upgrade of UltraPath.

Format

```
install.sh -ndu [ ndu_free_mem_size=xxx ] [ ndu_used_cpu_percent=yyy ]
[ ndu_free_disk_space=zzz ]
```

Parameters

Keyword and Parameter	Description	Default Value
<code>-ndu</code>	Checks whether a non-disruptive upgrade can be implemented.	None
<code>ndu_free_mem_size</code>	Set the minimum system memory for a non-disruptive upgrade. The unit is MB.	200
<code>ndu_used_cpu_percent</code>	Set the maximum CPU usage for a non-disruptive upgrade. The value ranges from 0 to 100.	80
<code>ndu_free_disk_space</code>	Set the minimum system disk capacity for a non-disruptive upgrade. The unit is MB.	200

Level

User **root**

Usage Guidelines

Run the command to execute a non-disruptive upgrade of UltraPath.

Example

None

System Response

None

A.5.19 Disabling the Host Restart Notification Function

Function

Disables the host restart notification function.

Format

stop_up_restart_warn

Parameters

None

Level

User **root**

Usage Guidelines

None

Example

None

System Response

None

A.5.20 Viewing the Status of the Host Alarm Push Switch

Function

show alarmentable is used to view the status of the host alarm push switch.

Format

show alarmentable

Parameters

None

Level

User **root**

Usage Guidelines

None

Example

View the alarm push switch for UltraPath:

```
UltraPath CLI #0 >show alarmentable
alarmentable: on
```

System Response

None

A.5.21 Setting the Switch of Host Alarm Push

Function

set alarmentable is used to set the switch of host alarm push.

Format

set alarmentable={ *on* | *off* }

Parameters

Parameter	Description	Default Value
alarmentable ={ <i>on</i> <i>off</i> }	Alarm push switch for UltraPath. The value can be on or off , where: <ul style="list-style-type: none"> ● on: Enables the alarm push switch. ● off: Disables the alarm push switch. 	on

Level

User **root**

Usage Guidelines

- When the alarm push switch is enabled, UltraPath will detect the single-controller connectivity, link down, and link degrade, and send the link status to the storage system through alarms.
- When the alarm push switch is disabled, the alarms reported by UltraPath to arrays cannot be cleared on the arrays. Therefore, disable the switch cautiously.

Example

Disable the alarm push switch for UltraPath:

```
UltraPath CLI #0 >set alarmentable=off
If you close alarm enable, the host would not push alarm to the array, and the
alarm in array will not be cleared.
Are you sure you want to continue? [y,n]: y

Succeeded in executing the command.
Please clear the alarm in the array manually, thanks.
```

System Response

None

A.5.22 Viewing the Status of the UltraPath Link Degrade Switch

Function

show path_reliability_enable is used to view the status of the UltraPath link degrade switch.

Format

show path_reliability_enable

Parameters

None

Level

User **root**

Usage Guidelines

None

Example

View the status of the UltraPath link degrade switch:

```
UltraPath CLI #0 >show path_reliability_enable
path_reliabilityenable: on
```

System Response

None

A.5.23 Setting the Switch for UltraPath Link Degrad

Function

`set path_reliability_enable` is used to set the switch for UltraPath link degrade.

Format

`set path_reliability_enable={ on | off }`

Parameters

Parameter	Description	Default Value
<code>path_reliability_enable={ on off }</code>	<p>Link degrade switch for UltraPath.</p> <p>The value can be on or off, where:</p> <ul style="list-style-type: none"> ● on: Enables the link degrade switch. ● off: Disables the link degrade switch. 	on

Level

User **root**

Usage Guidelines

- When the link degrade switch is enabled, UltraPath will detect and isolate degraded links.
- When the link degrade switch is disabled, some faults cannot be isolated by UltraPath, which results in the deterioration of the host performance. Therefore, disable the switch cautiously.

Example

Disable the link degrade switch for UltraPath:

```
UltraPath CLI #0 >set path_reliability_enable=off
```

```
If you close reliability enable, this would abandon the path reliability check
and may infect the performance.
```

```
Are you sure you want to continue? [y,n]: y
```

```
Succeeded in executing the command.
```

System Response

None

A.5.24 Cancelling I/O Suspension of the Disk

Function

The **upadmin set stop_iosuspension** command is used to cancel I/O suspension of the disk that corresponds to specific **scsi_disk**.

Format

```
upadmin set stop_iosuspension disk_id
```

Parameters

Keyword and Parameter	Description	Default Value
<i>disk_id</i>	ID of a physical disk	None

Level

User **root**

Usage Guidelines

This command is used to cancel I/O suspension of a specific disk only when disks are deleted within UltraPath. In other scenarios, running this command may disable the I/O suspension function. Therefore, run this command cautiously.

Example

Run the command to cancel I/O suspension of the disk that corresponds to **scsi_disk**.

```
linux:~ # upadmin set stop_iosuspension 3  
linux:~ #
```

System Response

None

A.5.25 Clearing Inactive Drivers in Online Upgrade Process

Function

The **ouc** command is used to clear drivers that do not take effect during an online upgrade.

Format

ouc -r

Parameters

Parameter	Description	Default Value
-r	Clear drivers that do not take effect during an online upgrade.	None

Level

User **root**

Usage Guidelines

Use CLI to switch to the **/UltraPath/install/otherTools** directory where UltraPath for Linux is installed and run the **ouc -r** command.

Run **ouc -r** to clear drivers that do not take effect during an online upgrade.

Example

Clear drivers that do not take effect during the online upgrade.

```
# ./ouc -r
Clear invalid nxup driver success
```

System Response

None

A.5.26 Preparing the UVP SAN Boot Environment

Function

The **fs_sanboot_env_update** command is used to prepare the UVP SAN Boot environment.

Format

fs_sanboot_env_update

Parameters

None

Level

User **root**

Usage Guidelines

In UVP SAN Boot scenarios, after UltraPath is installed, you can run this command to prepare the environment for UltraPath to support SAN Boot.

Example

None

System Response

None

A.5.27 Viewing the Running Status of the UltraPath Working Thread

Function

The **show workerstate** command is used to view the running status of the UltraPath working thread.

Format

show workerstate

Parameters

None

Level

User **root**

Usage Guidelines

This command is used to show the status of the UltraPath working thread. Administrators can view last refresh time and present time to determine whether the working thread is blocked and calculated the block duration.

Example

View the status of the UltraPath working thread.

```
UltraPath CLI #0 > show workerstate
worker name: USIImmediateWkq_1      last refresh time: 2016-07-26 08:13:07
present time: 2016-07-26 08:13:07
worker name: USIDefererdWkq_1      last refresh time: 2016-07-26 08:13:07
present time: 2016-07-26 08:13:07
worker name: KLSWriteLogWorkQueue_1 last refresh time: 2016-07-26 08:13:07
present time: 2016-07-26 08:13:07
worker name: VLMVLunNotifyWkq_1    last refresh time: 2016-07-26 08:13:06
present time: 2016-07-26 08:13:07
worker name: CodeStreamWorkQueue_1 last refresh time: 2016-07-26 08:13:07
present time: 2016-07-26 08:13:07
worker name: LPMSyncCmdPost_1      last refresh time: 2016-07-26 08:13:06
```

```

present time: 2016-07-26 08:13:07
worker name: LPMPATHMgrWkq_1      last refresh time: 2016-07-26 08:13:07
present time: 2016-07-26 08:13:07
worker name: PingSpecialWorkQueue_1  last refresh time: 2016-07-26 08:13:07
present time: 2016-07-26 08:13:07
worker name: PingWorkQueue_1        last refresh time: 2016-07-26 08:13:07
present time: 2016-07-26 08:13:07
worker name: PcmCmdWorkQueue_0_1    last refresh time: 2016-07-26 08:13:07
present time: 2016-07-26 08:13:07
worker name: PcmCmdWorkQueue_1_1    last refresh time: 2016-07-26 08:13:07
present time: 2016-07-26 08:13:07
worker name: PcmCmdWorkQueue_2_1    last refresh time: 2016-07-26 08:13:07
present time: 2016-07-26 08:13:07
worker name: PcmCmdWorkQueue_3_1    last refresh time: 2016-07-26 08:13:07
present time: 2016-07-26 08:13:07
worker name: PcmCmdWorkQueue_4_1    last refresh time: 2016-07-26 08:13:07
present time: 2016-07-26 08:13:07
worker name: PCM_AttachCmdWkQueue_1 last refresh time: 2016-07-26 08:13:07
present time: 2016-07-26 08:13:07

```

System Response

Parameter	Description	Default Value
worker name	Working thread name.	None
last refresh time	Last refresh time of the working thread.	None
present time	Current system time, that is, execution time of the command.	None

B Files Related to the UltraPath

After UltraPath is correctly installed on a Linux operating system, UltraPath adds or modifies certain files in the following table to ensure proper operation. Files to be added or modified vary depending on the operating system. Do not modify or delete these files unnecessarily.

Files Added to the UltraPath

Name	File path	Description
nxup.ko nxupext_a.ko nxupext_b.ko	/lib/modules/xxx/kernel/ drivers/scsi or /UltraPath/ install/kernelModules/xxx	UltraPath driver file
up.conf user_cfg.xml	/etc/up.conf /etc/user_cfg.xml	UltraPath configuration file
upadmin	/usr/sbin/upadmin	UltraPath R8 CLI tool
upadm	/usr/sbin/upadm	CLI tool compatible with UltraPath R3
UltraPath	/opt/UltraPath	UltraPath backup and log directory
ultrath-* .img	/boot/ ultrath-* .img	Start image file generated when the UltraPath uses the boot from SAN method for installation
nxup-* .img	/boot/nxup-* .img	Soft link that points to /boot/ ultrath-* .img
UltraPath	/UltraPath	Installation file directory of the UltraPath
nxup	/etc/init.d/nxup	Script for starting the UltraPath service

Name	File path	Description
up.conf.save_R8 user_cfg.xml.old	/etc/up.conf.save_R8/etc/ user_cfg.xml.old	Backup configuration file after UltraPath uninstallation
UltraPath.packages.info	/etc/UltraPath.packages.info	UltraPath installation information file
upRescan	/sbin/upRescan	UltraPath R8 LUN-scanning file
hot_add	/usr/sbin/hot_add	UltraPath R3 LUN-scanning file
upLinux	/usr/sbin/upLinux	UltraPath R8 restricted commands
upTools	/usr/sbin/upTools	UltraPath R3 CLI tool
56-nxup.rules	/etc/udev/rules.d/56- nxup.rules	udev rule file generated after the UltraPath is installed
up.hostinfo	/etc/up.hostinfo	UltraPath host information file
systemd-nxup.service	/etc/systemd/system/ sysinit.target.wants or /lib/ systemd/system	Script for starting the UltraPath system service when systemd startup mode is used
systemd-nxup.service	/usr/lib/systemd/system	Soft link that points to the script for starting the UltraPath system service when systemd startup mode is used
systemd-nxup.service	/usr/lib/systemd/system/ sysinit.target.wants or /lib/ systemd/system/ sysinit.target.wants/	Soft link that points to the script for starting the UltraPath system service when systemd startup mode is used
nxup.service	/usr/lib/systemd/system or /lib/systemd/system	Script for starting the UltraPath service when systemd startup mode is used
nxup.service	/etc/systemd/system	Soft link that points to the script for starting the UltraPath service when systemd startup mode is used

Name	File path	Description
nxup.service	/etc/systemd/system/multi-user.target.wants	Soft link that points to the script for starting the UltraPath service when systemd startup mode is used
nxupBoot	/usr/sbin	Script for executing the UltraPath system service when systemd startup mode is used
nxupServBoot	/usr/sbin	Script for executing the UltraPath system service when systemd startup mode is used
stop_up_restart_warn	/sbin/stop_up_restart_warn	Script for stopping the warning restart service of the UltraPath.
boot.010LoadNxup	/etc/init.d/boot.010LoadNxup	Script for starting the UltraPath system service
90nxup	/usr/lib/dracut/modules.d/90nxup or /usr/share/dracut/modules.d/90nxup	Configuration directory for the UltraPath to start the mirroring function in Red Hat 6 or Red Hat 7.

File Modified by the UltraPath

When the **boot fromSAN** command is used to install the UltraPath, you may need to modify the following file.

1. Modify the **/boot/grub/menu.lst**, **/etc/ elilo.conf**, or **/etc/ lilo.conf** configuration file. Add the UltraPath option and configure it as a default item. The following is an example:

```
*cat /boot/grub/menu.lst
default 2
timeout 8
...
title Linux with ultrapath
root (hd0,2)
kernel /boot/vmlinuz-2.6.16.60-0.85.1-smp root=/dev/sda2..
initrd /boot/ultrapath-2.6.16.60-0.85.1-smp.img.
```

2. Modify the **/etc/sysconfig/kernel** configuration file. Add the UltraPath configuration parameters. The following is an example:

```
Cat /etc/sysconfig/kernel
...
###UltraPath-tl80s-kernel begin,don't change this!###
if [ `echo "${initrd_image}" | grep -E -c "(/nxup|ultrapath)"` -ne 0 ]
then
    INITRD_MODULES="${INITRD_MODULES} "
    INITRD_MODULES=" ${INITRD_MODULES} "
    INITRD_MODULES="${INITRD_MODULES// nxupext_a / }"
    INITRD_MODULES="${INITRD_MODULES// nxup / }"
    INITRD_MODULES="${INITRD_MODULES// scsi_mod / }"
    INITRD_MODULES="${INITRD_MODULES// sd_mod / }"
```

```
INITRD_MODULES="${INITRD_MODULES// sg / }"
INITRD_MODULES="scsi_mod sd_mod sg nxup nxupext_a ${INITRD_MODULES}"
INITRD_MODULES=$(echo ${INITRD_MODULES})
echo "UltraPath--[INITRD_MODULES=${INITRD_MODULES}]"
fi
###UltraPath-t180s-kernel end,don't change this!###
...
```

C How to Obtain Help

If a problem persists in routine maintenance or troubleshooting, contact Huawei for technical support.

[C.1 Preparations for Contacting Huawei](#)

To better solve the problem, you need to collect troubleshooting information and make debugging preparations before contacting Huawei.

[C.2 How to Use the Document](#)

Huawei provides guide documents shipped with the device. The guide documents can be used to handle the common problems occurring in daily maintenance or troubleshooting.

[C.3 How to Obtain Help from Website](#)

Huawei provides users with timely and efficient technical support through the regional offices, secondary technical support system, telephone technical support, remote technical support, and on-site technical support.

[C.4 Ways to Contact Huawei](#)

Huawei Technologies Co., Ltd. provides customers with comprehensive technical support and service. For any assistance, contact our local office or company headquarters.

C.1 Preparations for Contacting Huawei

To better solve the problem, you need to collect troubleshooting information and make debugging preparations before contacting Huawei.

C.1.1 Collecting Troubleshooting Information

You need to collect troubleshooting information before troubleshoot.

You need to collect the following information:

- Name and address of the customer
- Contact person and telephone number
- Time when the fault occurred
- Description of the fault phenomena
- Device type and software version
- Measures taken after the fault occurs and the relevant results
- Troubleshooting level and required solution deadline

C.1.2 Making Debugging Preparations

When you contact Huawei for help, the technical support engineer of Huawei might help you do certain operations to collect information about the fault or rectify the fault directly.

Before contacting Huawei for help, you need to prepare the boards, port modules, screwdrivers, screws, cables for serial ports, network cables, and other required materials.

C.2 How to Use the Document

Huawei provides guide documents shipped with the device. The guide documents can be used to handle the common problems occurring in daily maintenance or troubleshooting.

To better solve the problems, use the documents before you contact Huawei for technical support.

C.3 How to Obtain Help from Website

Huawei provides users with timely and efficient technical support through the regional offices, secondary technical support system, telephone technical support, remote technical support, and on-site technical support.

Contents of the Huawei technical support system are as follows:

- Huawei headquarters technical support department
- Regional office technical support center
- Customer service center
- Technical support website: <http://enterprise.huawei.com>

You can query how to contact the regional offices at <http://enterprise.huawei.com>.

C.4 Ways to Contact Huawei

Huawei Technologies Co., Ltd. provides customers with comprehensive technical support and service. For any assistance, contact our local office or company headquarters.

Huawei Technologies Co., Ltd.

Address: Huawei Industrial Base Bantian, Longgang Shenzhen 518129 People's Republic of China

Website: <http://support.huawei.com/enterprise/>

D Glossary

A

- AC power module** The module that transfers the external AC power supply into the power supply for internal use.
- Application server** A service processing node (a computer device) in the network. Application programs of data services are run on the application server.
- Asynchronous remote replication** A kind of remote replication. When the data on the primary site is updated, the data does not need to be updated on the mirroring site synchronously to finish the update. In this way, performance is not reduced due to data mirroring.

B

- Backup** A periodic operation performed on the data stored in the database for the purposes of database recovery in case that the database is faulty. The backup also refers to data synchronization between active and standby boards.
- Bandwidth** A range of transmission frequencies a transmission line or channel can carry in a network. In fact, the bandwidth is the difference between the highest and lowest frequencies in the transmission line or channel. The greater the bandwidth, the faster the data transfer rate.
- Baud rate** The number of times per second the signal can change on a transmission line. Commonly, the transmission line uses only two signal states, making the baud rate equal to the number of bits per second that can be transferred. The underlying transmission technique may use some of the bandwidth, so it may not be the case that user data transfers at the line's specified bit rate.
- Bit error** An incompatibility between a bit in a transmitted digital signal and the corresponding bit in the received digital signal.
- Bit error rate** Ratio of received bits that contain errors. BER is an important index used to measure the communications quality of a network.

Bonding	Bonding can bind multiple independent physical network ports into a logical port, which ensures the high availability of server network connections and improving network performance.
Boundary scan	A test methodology that uses shift registers in the output connections of integrated circuits. One IC often is connected to the next. A data pattern is passed through the chain and the observed returned data stream affected by the circuit conditions gives an indication of any faults present. The system is defined under IEEE standard 1149.1 and is also often known as JTAG (Joint Test Action Group).
Browser/Server	An architecture that defines the roles of browser and server, where the browser is the service request party and the server is the service provider.
C	
Cache hit ratio	The ratio of directly accessed I/O from Cache to all the I/O operation during the read operation.
Cache prefetch strategy	According to the operation in which data has been read or is being read, the required data is read from a disk into the cache in advance.
Captive Screw	After the screw is loosened, screw caps and bolts are not disconnected from the main body.
Cascading	Connect the storage system to more disk enclosures through connection cables, thus expanding the capacity of the storage system.
CHAP	A method to periodically verify the identity of the peer using a 3-way handshake. During the establishment of a link, the authenticator sends a "challenge" message to the peer. The peer responds with a value calculated using a "one-way hash" function. The authenticator checks the response against its own calculation of the expected hash value. If the values match, the authentication is acknowledged. CHAP provides protection against playback attack.
Clone	A snapshot technology. The source data is completely copied to generate a data duplicate; therefore the duplicate needs the storage space as the same size as the source data. It is also called clone. In the VIS system, it is also called third-mirror break-off snapshot.
Cluster	A mechanism adopted to improve the system performance. Several devices of the same type form a cluster. The exterior of a cluster is some like a kind of equipment. In the interior of a cluster, the nodes share the load.
Coffer	A technology for ensuring data security and integrity in a storage system. It is used to store the mission-critical data of the system.
Coffer disk	Disks that build up the coffer.
Command device	A special LUN through which the host can send inband commands to storage devices.

Constant prefetch	A cache prefetch strategy. The size of the data to be prefetched is the size as set. This strategy applies to the applications that require reading data of a fixed size in a certain order. An example is the streaming media demanded by multiple subscribers who use the same bit rate.
Controller	The core module that processes services in a storage system. It contains physical components such as system-level CPUs and memory.
Controller enclosure	An enclosure that accommodates controllers and provides storage services. It is the core component of a storage system, and generally consists of components such as controllers, power supplies, and fans.
Copyback	The process of copying the data from the hot spare disk back to the previous disk when the faulty member disk is restored or replaced by a new one.
Copying	A state of pair. The state indicates that the source LUN data is being synchronized to the target LUN.
Coordinator Point Server	A server can provide the arbitration service. The server can provide arbitration service for cluster system or HyperCluster, to avoid resource conflict access from different application servers.
Continued Mirror	After storage controller became fault, a method of data in the LUN to write mirror into other storage controller, while ensure data integrity and uninterrupted operation host services.
D	
Data compression	Encoding data to take up less storage space and less bandwidth for transmission.
Data deduplication	A specialized data compression technique for eliminating coarse-grained redundant data, typically to improve storage utilization. In the deduplication process, duplicate data is deleted, leaving only one copy of the data to be stored, along with references to the unique copy of data. Deduplication is able to reduce the required storage capacity since only the unique data is stored.
Data flow	A process that involves processing the data extracted from the source system, such as filtering, integration, calculation, and summary, finding and solving data inconsistency, and deleting invalid data so that the processed data meets the requirements of the destination system for the input data.
Data migration	It is the process to cleanse and transform history data, and then load them to the new system.
Data source	A system, database, or file that can make BOs persistent. A data source can be a database instance or a database user.
Data switch	A data switch used for interconnections between controllers.

Dirty data	The data that is stored temporarily on cache and has not been written onto disks.
Disaster recovery	A system deployment solution aiming at reducing loss in disasters. A set of disaster recovery system that is the same as the production system is deployed as a backup to store the production data when a fault occurs in the production system. The applications are switched over to the disaster recovery system before the production system recovers. After the production system recovers, the applications are switched back to the production system.
Disk array	A set of disks from one or more commonly accessible disk subsystem. These disks are combined and controlled by the control software. The control software provides the storage capacity of these disks for hosts as one or more virtual disks.
Disk Domain	A combination of disks. A disk domain consists of the same type or different types of disks. Disk domains are isolated from each other. Therefore, services carried by different disk domains do not affect each other in terms of performance and faults (if any).
Disk location	The process of locating a hard disk, that is, determining the enclosure ID and slot ID of the hard disk in the storage system.
Disk enclosure	It consists of the following parts in redundancy: expansion module, hard disk, power module, and fan module. System capacity can be expanded by cascading multiple disk enclosures.
Disk utilization	The percentage of used capacity in the total available capacity.

E

eDevLUN (external device LUN)	Logic space created by third-party storage systems.
Engine	Two controllers in one enclosure are called Engine.
Expansion	Connecting a storage system to more disk enclosures through connection cables, thus expanding the capacity of the storage system.
Expander module	A component used for expanding.

F

Failover	The automatic substitution of a functionally equivalent system component for a failed one. The term failover is most often applied to intelligent controllers connected to the same storage devices and host computers. If one of the controllers fails, failover occurs, and the survivor takes over its I/O load.
-----------------	---

Field replaceable unit	A unit that can function as a circuit board, part, or component of an electronic device. It can be quickly and easily removed from a personal computer or other electronic devices. If an FRU becomes faulty, users can replace it with a new one instead of sending the entire product or system for maintenance.
File Engine	The component in a unified storage systems that provides file-level service.
Firmware	The programmable software part in a hardware component. A firmware is a part of hardware, but is scalable as software.
Front-end host port	The port that connects the controller enclosure to the service side and transfers service data. There are three types of front-end host ports: SAS, FC, and iSCSI.
G	
Gateway	A device that connects two network segments using different protocols. It is used to translate the data in the two network segments.
Global system for mobile communications	The second-generation mobile networking standard defined by European Telecommunications Standards Institute (ETSI). It is aimed at designing a standard for global mobile phone networks. The standard allows a subscriber to use a phone globally. GSM consists of three main parts: mobile switching subsystem (MSS), base station subsystem (BSS), and mobile station (MS).
H	
Hard disk	A non-volatile storage device that stores digitally encoded data on rapidly rotating platters with magnetic surfaces. Hard disks generally offer more storage and quicker access to data than floppy disks do.
Hard disk tray	The tray that bears the hard disk.
Hard quota	The value to limit the space used in quota configuration. If the space used arrives hard quota, file operation is not allowed to continue.
Heartbeat	Heartbeats are the packets, requiring no acknowledgement, transmitted between two devices. The device can judge the validity status of the peer device. Heartbeat supports node communication, fault diagnosis, and event triggering.
Hit ratio	The ratio of directly accessed I/Os from cache to all I/Os.
Hot swap	A technology used to replace system components without shutting down the system, which improves the reliability and maintainability of a system.
HyperVault	A self-protective property of the data built in storage device.

HyperCluster	A value-added service of storage system. The HyperCluster refers to provide storage services with two datasets on two storage array as one dataset, to achieve the applications load balancing and transferring without interruption when there is a fault.
I	
I/O	Data movement process between memory and peripheral devices in the computer system. I/O is a collective name, indicating the operations reading data into the memory and writing data to other places from computer memory.
Inband management	Inband management means that the management control information of the network and the carrier service information of the user network are transferred through the same logical channel. Inband management enables users to manage storage arrays through commands. Management commands are sent through service channels, that is, I/O write and read channels. The advantages of inband management include high speed, stable transfer, and no additional management network ports required.
Initiator	A system component that can initiate an I/O operation on an I/O bus or on a network.
Intelligent prefetch	A cache prefetch strategy. The system software calculates a proper size of prefetched data. This strategy applies to a read application involving a single bit stream or to the situations where you do not know whether the data is read in a certain order. An example is reading or writing a file.
Interface module	A field replaceable module that accommodates the service or management ports.
L	
Load balance	A method of adjusting the system, application components and data to averagely distribute the applied I/O or computing requests for physical resources of the system.
Load the file system in mini mode	A method of restoring the user data in an offline file system.
Logical unit	The entity is located inside the SCSI object, and can execute I/O commands. After a SCSI I/O command is sent to an object, the logic unit inside the object executes this command. Usually, each SCSI physical disk has one logic unit. A tape drive and array controller may have multiple logic units, which process different I/O commands. Each logic unit inside an array controller corresponds to a virtual disk.
Logical unit number	The number of a logical disk that the host can access.

LUN formatting	The process of writing 0 bits in the data area on the logical drive and generating related parity bits so that the logical drive can be in the ready state.
LUN mapping	The storage system maps LUNs to ASs so that the ASs can access the storage reorganization.
LUN migration	A method for the data in the LUN to migrate between different physical storage space while ensuring data integrity and uninterrupted operation host services.
LUN copy	The function of copying the original LUN data to one or multiple target LUNs.
M	
Maintenance terminal	The computer that is connected through a serial port or management network port and maintains the storage system.
Management network	An entity that provides a means to transmit and process the information related to network management.
Management network port	The network port on the controller enclosure that is connected to the maintenance terminal. It is provided for the remote maintenance terminal.
N	
Node	A managed device in the network. For a device with a single frame, one node stands for one device. For a device with multiple frames, one node stands for one frame of the device.
O	
Out-of-band management	A management mode used during out-of-band networking. In the out-of-band management mode, the management and control information of the network and the bearer service information of the user network are transmitted through different logical channels.
Owning controller	The controller that can prior access a certain LUN.
P	
Power failure protection	When the external power failure occurs, the AC PEM depends on the battery for power supply, which ensures the integrity of the dirty data in cache.
Pre-copy	When the system monitors that a member disk in a RAID group is to fail, the system copies the data on the disk to a hot spare disk in advance. This technology is called pre-copy.

Primary backup	A kind of backup mode for file system, means that create a copy (snapshot) for filesystem.
Primary restore	A kind of restore mode for file system, means that restore a copy (snapshot) to filesystem.
Primary storage controller	The controller that plays a leading role in controlling the management is the primary storage controller. It can perform relevant management operations on the controller enclosure.
Primary/Secondary switchover	A process for the conversion of the primary/secondary relationship.
Prior controller	For the application server LUN, prior controller means that the working controller is the owner controller of the corresponding array LUN.
Q	
Quota tree	A first-level directory of file system that can be managed with quota.
R	
RAID level	The application of different redundant types to a logical drive. A RAID level improves the fault tolerance or performance of the logical drive but reduces the available capacity of the logical drive. You must specify a RAID level for each logical drive.
Reconstruction	The process of restoring the data saved on a faulty member disk in a RAID group.
Redundancy	The scheme to add more than one channels, elements or parts that have the same functions with the counterparts in the system or device at a critical place. When a fault occurs, the system or device can work well, and the reliability is then improved.
Remote replication	A core technology for disaster recovery and a foundation that implements remote data synchronization and disaster recovery. This technology remotely maintains a set of data mirror through the remote data connection function of the storage devices that are separated in different places. Even when a disaster occurs, the data backup on the remote storage device is not affected. Remote replication can be divided into synchronous remote replication and asynchronous remote replication by whether the host that requires mirrors needs the confirmation information of the remote replication site.
Reverse synchronizing	The process of restoring data from the redundancy machine (RM) when the services of the production machine (PM) are recovering.
Route	The path that network traffic takes from its source to its destination. In a TCP/IP network, each IP packet is routed independently. Routes can change dynamically.

S

Script	A collection of data statements used to perform an operation.
Secondary backup	A kind of backup mode for file system, means that backup the data of the primary file system to the remote file system on the secondary array.
Secondary restore	A kind of restore mode for file system, means that restore the data of the secondary file system to the primary file system on the secondary array.
Secondary controller	(1) A controller that backs up service and management data of the primary controller in a clustered system. When the primary controller fails, the secondary controller is upgraded to the primary controller and takes over the management and services of the controller enclosure. (2) A controller that backs up the management data of the primary controller in a block-level array. When the primary controller fails, the secondary controller is upgraded to the primary controller and takes over the management of the system.
Serial port	An input/output location (channel) that sends and receives data to and from a computer's CPU or a communications device one bit at a time. Serial ports are used for serial data communication and as interfaces with some peripheral devices, such as mice and printers.
Service data	The user and/or network information required for the normal functioning of services.
Service network port	The network port that is used to store services.
SFP optical transceiver	A component that can make data conversion between optical signals and electrical signals and that can receive and transfer data.
Simple network management protocol	A network management protocol of TCP/IP. It enables remote users to view and modify the management information of a network element. This protocol ensures the transmission of management information between any two points. The polling mechanism is adopted to provide basic function sets. According to SNMP, agents, which can be hardware as well as software, can monitor the activities of various devices on the network and report these activities to the network console workstation. Control information about each device is maintained by a management information block.
Single point of failure	A type of failure. Data transmission over a network is stopped and cannot be recovered automatically if a single point failure occurs. The point can be an interface, a board, a device, or a link.
Small computer system interface	A set of standards for physically connecting and transferring data between computers and peripheral devices. SCSI is most commonly used for hard disks and tape drives, but it can connect a wide range of other devices, including scanners, and optical drive.

Smart tenancy	A feature of Huawei storage system. With Smart Tenancy, multiple virtual storage systems can be created in one physical storage system, which allows tenants to share the same storage system hardware resource without affecting data security and privacy of each other. This feature achieves more flexible, easy-to-manage and low-cost shared storage in a multi-protocol unified storage architecture.
Snapshot	A data backup technology through which a fully usable copy of a data object can be quickly generated. The duplicate contains the image of the data object at a point in time.
Snapshot copy	A copy of the snapshot LUN, which is also a snapshot LUN.
Soft quota	The value to alarm space usage in quota configuration. After used space arrives this value, an alarm triggered; if space used from above this value becomes lower than, the previous alarm eliminated.
Source LUN	The LUN where the original data is located.
Storage Pool Shrinking	A method of shrinking the total capacity of Storage Pool.
Storage system	An integrated system. It consists of the following parts: controller, storage array, host bus adapter, physical connection between storage units, and all control software.
Storage unit	An abstract definition of backup storage media for storing backup data. The storage unit is connected with actual storage media, used to back up data.
Streaming media	The media by which content is transmitted continuously with the streaming method in real time. Streaming media ensure high-quality playback effects at low bandwidth by integrating with the following technologies: data collection, data compression, encoding, storage, transmission, terminal playback, and network communication.
Stripe	The set of strips at corresponding locations of each member extent of a disk array which uses striped data mapping. The strips in a stripe are associated with each other in a way (e.g., relative extent block addresses) that allows membership in the stripe to be quickly and uniquely determined by a computational algorithm. Parity RAID uses stripes to map virtual disk block addresses to member extent block addresses.
Subnet	A type of smaller networks that form a larger network according to a rule, for example, according to different districts. This facilitates the management of the large network.
Subnet mask	The technique used by the IP protocol to determine which network segment packets are destined for. The subnet mask is a binary pattern that is stored in the device and is matched with the IP address.
Synchronous remote replication	A kind of remote replication. When the data on the primary site is updated, the data must be synchronously updated on the mirroring site before the update is complete. In this way, the data that is stored on both the primary and mirroring sites can be synchronized.

T

- Target** A system component that can receive SCSI I/O operation commands.
- Target LUN** The LUN on which target data resides.
- Tenant** A property of SmartTenancy, which represents a virtual storage system in a physical one. The private and independent logical resource of a tenant mainly includes disk domain space, LUN, file system and ports. Tenants get complete storage services, but also remain resource and network isolation with other tenants, which avoids interference.
- Thin provisioning** A mechanism that offers on-demand allocation of storage space.
- Thin LUN** The thin LUN is a logic disk that can be accessed by hosts. The thin LUN dynamically allocates storage resources from the thin pool according to the actual capacity requirements of users.
- Timing Snapshot** To create snapshots periodically to continuously protect data.
- Topology** The configuration or layout of a network formed by the connections between devices on a local area network (LAN) or between two or more LANs.
- Trap** A type of SNMP message that indicates the occurrence of an event. This type of message is transmitted to the receiver through UDP. The transmission process is not completely reliable.

U

- User datagram protocol** A TCP/IP standard protocol that allows an application program on one device to send a datagram to an application program on another. User Datagram Protocol (UDP) uses IP to deliver datagram. UDP provides application programs with the unreliable connectionless packet delivery service. There is a possibility that UDP messages will be lost, duplicated, delayed, or delivered out of order. The destination device does not confirm whether a data packet is received.
- User interface** The space in which users interact with a machine.

V

- Variable prefetch** A cache prefetch strategy. The size of the data to be prefetched is the multiple for prefetching multiplied by the length of a read command. This strategy applies to the applications that require reading data of variable size in a certain order or to the situations where multiple subscribers read data concurrently but no fixed prefetch size can be set, because the amount of pre-read data cannot be judged. An example is the streaming media demanded by multiple subscribers who use different bit rates.

vStore	A property of SmartTenancy. In Huawei SmartTenancy, a tenant is called a vStore, which represents a virtual storage system.
W	
Working controller	The controller that reads data from and writes data onto LUNs or file systems in a storage array.
Write back	A caching technology in which the completion of a write request is signaled as soon as the data is in cache, and actual writing to non-volatile media occurs at a later time. Write back includes an inherent risk that an application will take some action predicated on the write completion signal, and a system failure before the data is written to non-volatile media will cause media contents to be inconsistent with that subsequent action. For this reason, good write back implementations include mechanisms to preserve cache contents across system failures (including power failures) and to flush the cache at system restart time.
Write through	A caching technology in which the completion of a write request is not signaled until data is safely stored on non-volatile media. Write performance with the write through technology is approximately that of a non-cached system, but if the data written is also held in cache, subsequent read performance may be dramatically improved.
Z	
Zone	A Fibre Channel switch function that is similar to the VLAN function for Ethernet switches. It logically allocates the devices including hosts and storage systems on a SAN to different zones. In this way, the devices in different zones cannot directly access each other over a Fibre Channel network, implementing device isolation on the SAN.

E Acronyms and Abbreviations

F

FCoE Fibre Channel over Ethernet

G

GUI Graphical User Interface

H

HBA Host Bus Adapter

i

IB InfiniBand

IOPS Input/Output Operations Per Second

iSCSI Internet Small Computer Systems Interface

ISM Integrated Storage Management

L

LUN Logical Unit Number

N

NIC Network Interface Card

R

RDM Raw Device Mapping

S

SAS

Serial Attached SCSI

SCSI

Small Computer Systems Interface

W

WWN

World Wide Name