

# HP StorageWorks

## Disk Array XP operating system configuration guide: Sun Solaris

XP12000

XP10000

XP1024

XP128

This guide describes the requirements and procedures for connecting and configuring the XP family of disk arrays to work with a Sun system running the Sun Solaris operating system.

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Disk Array XP operating system configuration guide: Sun Solaris

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# Preface

## About this guide

This guide provides information about:

- Requirements and procedures for connecting an XP disk array to a host system
- Configuring the disk array for use with the Solaris operating system

## Intended audience

This guide is intended for system administrators with knowledge of:

- The host hardware
- Solaris operating system
- XP disk arrays

## Disk arrays

Unless otherwise noted, the term “disk array” refers to these disk arrays:

- HP StorageWorks Disk Array XP128
- HP StorageWorks Disk Array XP1024
- HP StorageWorks XP10000 Disk Array
- HP StorageWorks XP12000 Disk Array

## Related documentation

The following documents provide related information:

- *HP StorageWorks Disk Array XP128: Owner's Guide*
- *HP StorageWorks Disk Array XP1024: Owner's Guide*
- *HP StorageWorks XP10000 Disk Array: Owner's Guide*
- *HP StorageWorks XP12000 Disk Array: Owner's Guide*

You can find these documents on the storage web site:

<http://h18006.www1.hp.com/storage/xparrays.html>

# Document conventions and symbols

Convention	Element
blue text	Cross-reference links and email addresses
<b>Bold</b>	<ul style="list-style-type: none"><li>• Keys that are pressed</li><li>• Text typed into a GUI element, such as a box</li><li>• GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes</li><li>• Literal values typed exactly as shown</li></ul>
<i>Italics</i>	Text emphasis and book titles
Blue, underlined: <a href="http://www.hp.com">www.hp.com</a>	Web site addresses
Monospace font	<ul style="list-style-type: none"><li>• File and directory names</li><li>• System output</li><li>• Code</li><li>• Commands, their arguments, and argument values</li></ul>
<i>Monospace, italic font</i>	<ul style="list-style-type: none"><li>• Code variables</li><li>• Command variables</li></ul>
<b>Monospace, bold font</b>	Emphasized monospace text

---

 **WARNING!**

Indicates that failure to follow directions could result in bodily harm or death.

---

---

 **CAUTION:**

Indicates that failure to follow directions could result in damage to equipment or data.

---

---

 **NOTE:**

Provides additional information.

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## HP technical support

In North America, call technical support at 1-800-633-3600, available 24 hours a day, 7 days a week.

Outside North America, call technical support at the location nearest you. Telephone numbers for worldwide technical support are listed on the HP support web site: <http://www.hp.com/support>. From this web site, select your country.

Collect the following information before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed questions

For continuous quality improvement, calls may be recorded or monitored.

## Subscription service

HP strongly recommends that customers register online using the Subscriber's Choice web site: <http://www.hp.com/go/e-updates>.

Subscribing to this service provides you with e-mail updates about the latest product enhancements, driver versions, and firmware documents, plus instant access to many other product resources.

After subscribing, locate your products by selecting **Business support** and then **Storage** under Product Category.

## Other HP web sites

For additional information, see the following HP web sites:

- <http://www.hp.com/go/storage>
- <http://www.hp.com/support/>
- [http://www.hp.com/service\\_locator](http://www.hp.com/service_locator)
- <http://www.docs.hp.com>





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# 1 Installation

You and your HP service representative each play a role in installation. Your HP service representative is responsible for installing the disk array and formatting the disk devices. You are responsible for configuring the host server for the new devices with assistance from your HP service representative.

## Features and requirements

Ask your HP service representative about the latest supported hardware and software.

The disk array has the following features:

- **Storage capacity.** The storage capacity for each model is listed below:
  - XP128:** From 8 to 128 drives for up to 36 TB, 48 FC ports
  - XP1024:** From 8 to 1024 drives for up to 149 TB, 64 FC ports
  - XP10000:** Up to 240 drives for up to 69.2 TB, 48 FC ports
  - XP12000:** Up to 1152 drives for up to 332 TB, 128 FC ports
- **Server support.** Sun server
- **Operating system support.** Sun Solaris operating system, version 8.0 or later with current patches

Before installing the disk array, ensure the environment conforms to these requirements:

- **VolumeManager.** Solaris Volume Manager or Veritas Volume Manager
- **SAN Foundation Kit.** Latest SAN Foundation Kit with current patches
- **Sun StorEdge Traffic Manager requires that you configure `/kernel/drv/scsi_vhci.conf`**

For SAN information, refer to <http://www.sun.com/storage/san/> for the *Sun StorEdge SAN Foundation Software & Installation Guide* and the *Sun StorEdge Traffic Manager Software Installation and Configuration Guide*.
- **Host Bus Adapters (HBAs).** Install HBAs and all utilities and drivers. Refer to the adapter documentation for installation details
- *(Recommended)* HP StorageWorks Remote Web Console XP, Command View XP Advanced Edition or Command View XP with LUN management feature for configuring disk array ports and paths
- *(Recommended)* HP StorageWorks LUN Configuration and Security Manager XP
- *(Optional)* Other available XP software (some may not be supported by your system):

HP StorageWorks Business Copy XP  
HP StorageWorks Continuous Access XP  
HP StorageWorks Continuous Access Extension XP  
HP StorageWorks Auto LUN XP  
HP StorageWorks Data Exchange XP  
HP StorageWorks Resource Manager XP  
HP StorageWorks RAID Manager XP  
HP StorageWorks Cache LUN XP  
HP StorageWorks Auto Path XP  
HP StorageWorks Cluster Extension XP  
HP StorageWorks Performance Advisor XP

## Fibre Channel interface

The XP family of disk arrays supports these Fibre Channel elements:

- Connection speed of 1 Gbps and 2 Gbps
- Short-wave non-OFC (open fiber control) optical interface
- Multimode optical cables with SC or LC connectors
- Public or private arbitrated loop (FC-AL) or direct fabric attach
- Fibre Channel switches

Even though the interface is Fibre Channel, this guide uses the term “SCSI disk” because disk array devices are defined to the host as SCSI disks.

## Device emulation types

The XP family of disk arrays supports these device emulation types:

- **OPEN-x devices:** OPEN-x logical units represent disk devices. Except for OPEN-V, these devices are based on fixed sizes. OPEN-V is a user-defined size. Supported emulations include OPEN-3, OPEN-8, OPEN-9, OPEN-E, OPEN-L, and OPEN-V devices.
- **LUSE devices (OPEN-x\*n):** Logical Unit Size Expansion (LUSE) devices combine 2 to 36 OPEN-x devices to create expanded LDEVs larger than standard OPEN-x disk devices. For example, an OPEN-x LUSE volume created from ten OPEN-x volumes is designated as OPEN-x\*10.
- **CVS devices (OPEN-x CVS):** Volume Size Configuration (VSC) defines custom volumes (CVS) that are smaller than normal fixed-sized logical disk devices (volumes). (OPEN-V is a CVS-based custom disk size that you determine. OPEN-L does not support CVS.)
- **LUSE (expanded) CVS devices (OPEN-x\*n CVS):** LUSE CVS combines CVS devices to create an expanded device. This is done by first creating CVS custom-sized

devices and then using LUSE to combine from 2 to 36 CVS devices. For example, if three OPEN-9 CVS volumes are combined to create an expanded device, this device is designated as OPEN-9\*3-CVS.

## Failover

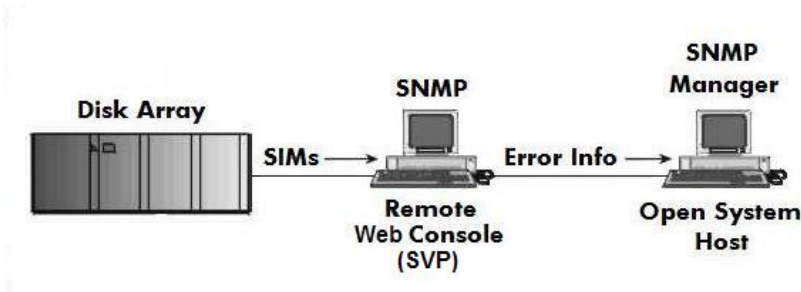
The disk arrays support many standard software products that provide host, application, or I/O path failover and management. The VERITAS Cluster Server and Sun Cluster host failover products are supported for the Sun Solaris operating system. Refer to the documentation for these products and Sun technical support for installation and configuration information. Your HP representative may have to set specific disk array System Option Modes for these products.

Sun supplies software called Sun StorEdge Traffic Manager (STMS) and Veritas offers Veritas Volume Manager (VxVM), both of which provide multipath configuration management, HBA I/O load balancing, and both automatic and manual failover support. STMS requires Sun host bus adapters. Hitachi Data Link Manager (HDLM) is another failover software product available for Solaris.

Refer to the manufacturers' manuals for instructions. STMS and VxVM installation manuals can be downloaded from the Sun website at [www.sun.com](http://www.sun.com) and the Veritas website at [www.veritas.com](http://www.veritas.com), respectively.

## SNMP configuration

The XP family of disk arrays supports standard Simple Network Management Protocol (SNMP) for remotely managing the disk array. The SNMP agent on the SVP performs error-reporting operations requested by the SNMP manager. SNMP properties are usually set from the SVP but they can also be set remotely using Remote Web Console XP, Command View XP, or Command View XP Advanced Edition. Refer to the applicable user's guide for procedures.



## RAID Manager command devices

RAID Manager manages Business Copy (BC) or Continuous Access (CA) operations from a host server. To use RAID Manager with BC or CA, you use Remote Web Console,

Command View, or Command View XP Advanced Edition to designate at least one LDEV as a command device. Refer to the applicable user's guide for information about how to designate a command device.

## Installation procedures

Perform these actions to install and configure the disk array:

- 1.** Install and configure the disk array
  - Setting the host mode for the disk array ports
  - Setting the System Option Modes
  - Configuring the Fibre Channel ports
- 2.** Install and configure the host
  - Loading the OS and software
  - Installing and configuring the HBAs
  - Verifying the HBA configuration
  - Clustering and fabric zoning
  - Fabric zoning and LUN security for multiple operating systems
- 3.** Connect the disk array
  - Defining the paths
  - Adding the new device paths to the system
  - Verifying host recognition of disk array devices
- 4.** Configure disk array devices
  - Partitioning and labeling the devices
  - Creating the file systems
- 5.** Configure for use with Veritas Volume Manager

## Install and configure the disk array

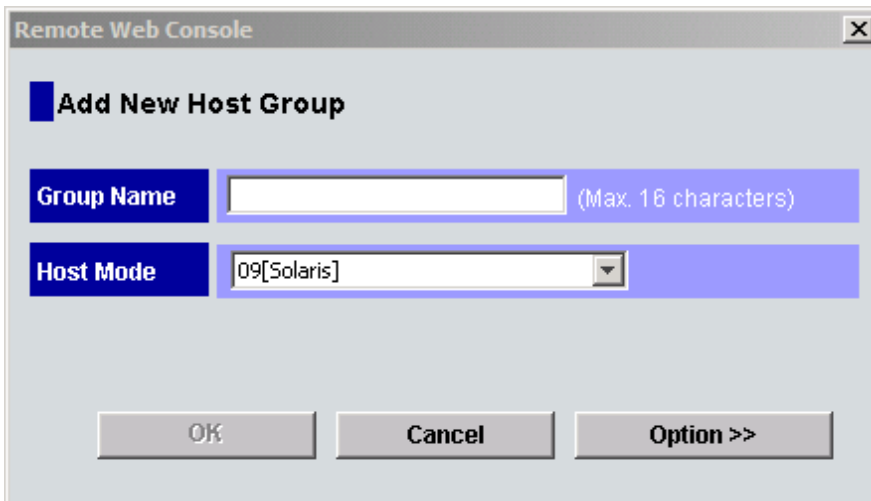
The HP service representative performs these tasks:

- Assembling hardware and installing software
- Loading the microcode updates
- Installing and formatting devices

After these tasks are finished, you will use Remote Web Console, Command View, Command View XP Advanced Edition, or LUN Configuration and Security Manager to complete the remaining tasks listed below. If you do not have these programs, your HP service representative can perform these tasks for you.

## Setting the host mode for the disk array ports

After the disk array is installed, you must set the host mode for each disk array port to match the host OS. Set the host mode using LUN Manager in Remote Web Console XP (shown), Command View XP, or Command View XP Advanced Edition. If these are not available, the HP representative can set the host mode using the SVP. The host mode setting for Solaris is **09**.



Remote Web Console

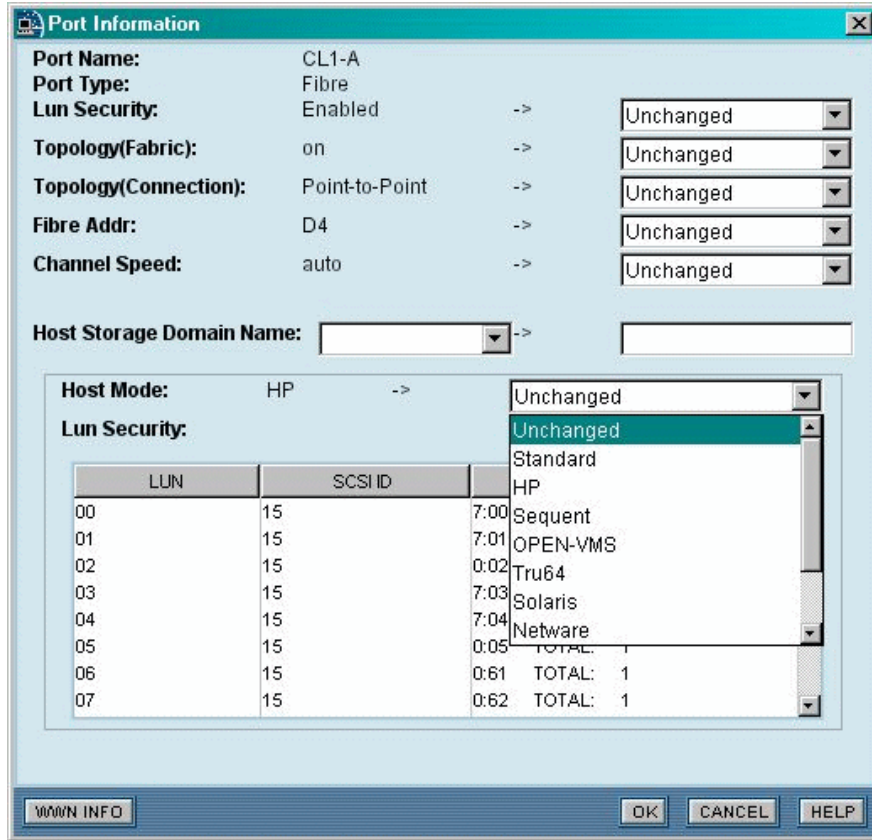
**Add New Host Group**

**Group Name**  (Max. 16 characters)

**Host Mode**

OK Cancel Option >>

For the XP1024/XP128 arrays, the host mode can also be set at the port information window in Command View XP AE.



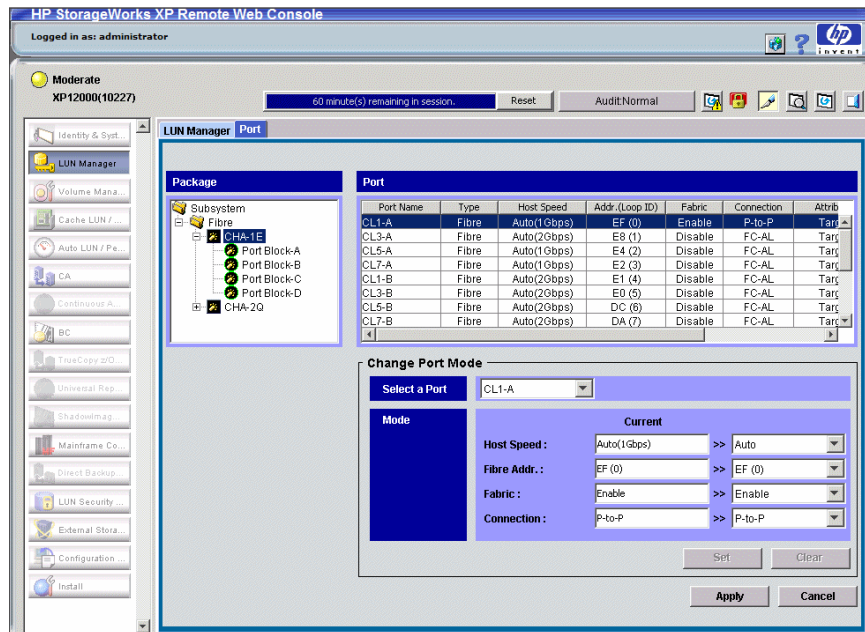
## Setting the System Option Modes

The HP service representative sets the System Option Mode(s) based on the operating system and software configuration of the host.

Mode	Level	HA Software	Description and Usage
140	Optional	None	ON: Response to the Inquiry command is changed, and the volume can be used from VeritasNetBackUP in heterogeneous OS configuration, such as HP-UX. OFF: Normal response to the Inquiry command.
186	Mandatory	Veritas Database Editions/ Advanced Cluster	ON: Mandatory setting when VERITAS Database Editions/Advanced Cluster is connected. OFF: VERITAS Database Editions/Advanced Cluster should not be connected with this setting.
254	Optional	Veritas Database Editions	Change the response of reserve conflict status to Read Capacity, Verify, and Start Stop Unit. ON: Normal end is reported. OFF: Reserve conflict status is reported.
280	Optional		HP-UX Ghost LUN Remove OS version: HP-UX 11.0 and later. ON: When the host scans the LUNS on the port, the disk array is not represented in the device list for HP-UX. OFF: When the host scans the LUNS on the port, the disk array is represented in the device list for HP-UX.

## Configuring the Fibre Channel ports

Configure the disk array Fibre Channel ports by using Remote Web Console (shown), Command View, or Command View XP AE. Select the settings for each port based on your storage area network topology. Use switch zoning if you connect different types of hosts to the array through the same switch.



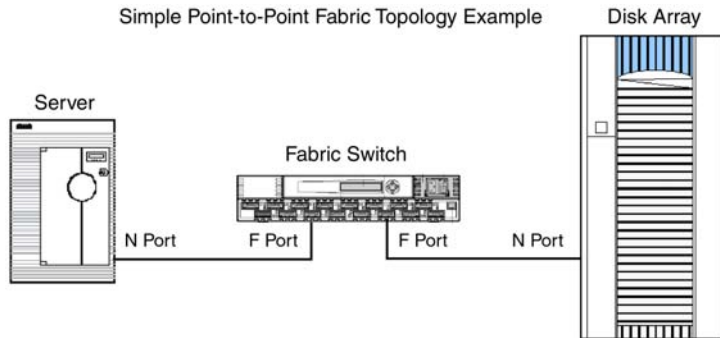
## Fibre address

In fabric environments, the port addresses are assigned automatically. In arbitrated loop environments, set the port addresses by selecting a unique arbitrated loop physical address (AL-PA) or loop ID for each port. For specific values, refer to the *HP StorageWorks LUN Configuration and Security Manager XP User Guide*.



## Fabric and connection parameter settings

Set each array port to FABRIC ON or OFF with connections of POINT-TO-POINT or FC-AL as shown in the following table and figures. For detailed topology information, refer to the *HP StorageWorks SAN Design Reference Guide* on the [www.hp.com](http://www.hp.com) website.



## Install and configure the host

This section explains how to install and configure the host and host bus adapters (HBAs) that connect the host to the disk array.

## Loading the OS and software

Follow the manufacturer's instructions to load the operating system and software onto the host. Load all OS patches and configuration utilities supported by HP and the HBA manufacturer.

## Installing and configuring the HBAs

Install and configure the HBA driver software and setup utilities according to the manufacturer's instructions. Configuration settings specific to the XP array differ depending on the manufacturer.

Specific configuration information is detailed below.

## WWN

The HBA configuration process may require you to enter the WWN for the array port(s) to which it will connect. Your HP representative can provide you this information or you may display this information on the SAN switch.

## Configuring Sun HBAs

To configure Sun HBAs:

- Have the HP representative specify array System Option Mode 244 (ON).
- Install the latest SUN Foundation Kit with associated patches. Use the Sun supplied **install\_it** script to automate installation. The script is available at <http://www.sun.com/storage/san/>.
- If you use Sun StorEdge Traffic Manager (MPxIO), edit the driver configuration file (**/kernel/drv/scsi\_vhci.conf**) to add the Vendor ID and Product ID to the "device-type-scsi-options-list" parameter. See the instructions in the driver configuration file and the excerpts below:

Change to "no" as shown:

```
mpxio-disable="no";
```

Add or comment out these lines (use exactly 6 spaces between HP and OPEN):

```
device-type-scsi-options-list =  
"HP OPEN", "symmetric-option";  
symmetric-option = 0x1000000;
```

- Reboot the host after editing the configuration file.
- After you have rebooted and the LDEV has been defined as a LUN to the host, use the **cfgadm** command to display and configure the controller instances for SAN connectivity. (Controller instance (c#) may differ between systems, and you need to replace the WWPN in the example below with the WWPNs for your array ports):

*Example*

```
# cfgadm -al
Ap_Id  Type  Receptacle Occupant  Condition
c3    fc-fabric  connected  configured  unknown
c3: : 50060e8003285301  disk  connected  configured  unknown
c4    fc-fabric  connected  configured  unknown
c4: : 50060e8003285311  disk  connected  configured  unknown

# cfgadm -c configure c3: : 50060e8003285301

# cfgadm -c configure c4: : 50060e8003285311
```

## Configuring JNI HBAs

Configure 2 Gbit and 1 Gbit HBAs differently as explained below. JNI HBA drivers are available from AMCC/JNI at <http://www.jni.com/drivers>. The JNI EZFibre HBA configuration utility does not allow dynamic LUN addition. Instead edit the configuration files manually as explained below, and use EZFibre for view only purposes. If you do not plan to use dynamic LUN addition, you may use EZFibre to configure the HBA.

Persistent bindings are necessary in a fabric topology and are used to bind a SCSI target ID to a particular WWPN (of an array port). This is required to guarantee that the SCSI target IDs will remain the same when the system is rebooted. Persistent bindings can be set by editing the configuration file as shown in the examples that follow. Make sure the target in the driver configuration file and in the kernel file (/kernel/drv/sd.conf) match. Replace the WWNs shown in the examples with the correct WWNs for your array ports. You can view port WWNs using Command View or LUN Configuration Manager.

### JNI 2 Gbit HBAs

- Use JNIC146x driver (version 5.3 or later).
- Edit the HBA driver settings in the **/kernel/drv/jnic146x.conf** file.

For a SAN environment:

```
FcLoopEnabled = 0;  
FcFabricEnabled = 1;
```

For a direct connect:

```
FcLoopEnabled = 1;  
FcFabricEnabled = 0;
```

To enable failover for VxVM Dynamic Multi Pathing (DMP):

```
FailoverDelay = 30;
```

For SAN persistent binding:

```
automap = 0;
```

```
jn146x0-target20_hba = "jn146x0";
```

```
jn146x0-target20_wwpn = "50060e8003285301";
```

```
jn146x1-target30_hba = "jn146x1";
```

```
jn146x1-target30_wwpn = "50060e8003285311";
```

(Replace the WWPNs above with the WWPNs for your array ports.)

- Make sure the `jn146x` entry below is present at the bottom of the `/kernel/drv/sd.conf` file:  
`name="sd" parent="jn146x" target=0;`
- Perform a reconfiguration reboot so the host can implement the changes you made in the configuration files.
- After configuring LUNS as explained in [Defining the paths](#), use the `jn146x_update_drv` command to request that the `jn146x` driver instances perform LUN rediscovery:  
`/opt/JN146x/jn146x_update_drv -r -a`

## JN1 1 Gbit HBAs (JNIC driver, version 4.x)

- Edit the `/kernel/drv/jnic.conf` file:  
Set the Fibre topology for a SAN or direct connect.

For a SAN environment:

```
FcLoopEnabled=0;
```

```
FcFabricEnabled=1;
```

```
FcPortCfgEnable = 1;
```

For a direct connect (FcLoopEnabled=1):

```
FcFabricEnabled=0;
```

```
FcPortCfgEnable = 0;
```

To enable failover for VxVM Dynamic Multi Pathing (DMP):

```
FailoverDelay=30;
```

For SAN persistent binding:

```
def_hba_binding="null";
```

```
target20_wwpn="50060e8003285301";
```

```
target20_hba="jn146x0";
```

```
target30_wwpn="50060e8003285311";
```

```
target30_hba="jn146x1";
```

(Replace the WWPNs above with the WWPNs for your array ports.)

- Edit the `/kernel/drv/sd.conf` file:  
**name="sd" class="scsi" target=20 lun=1;**  
**name="sd" class="scsi" target=20 lun=2;**  
 ...  
**name="sd" class="scsi" target=30 lun=1;**  
**name="sd" class="scsi" target=30 lun=2;**  
 ...
- Perform a reconfiguration reboot to implement the changes to the configuration files.
- If LUNs have been preconfigured in the `/kernel/drv/sd.conf` file, use the **devfsadm** command to perform LUN rediscovery after configuring LUNS as explained in [Defining the paths](#).

### JNI 1 Gbit HBAs (JNIfcaw/JNIfcaPCI drivers, version 2.x)

- Edit the `/kernel/drv/fca-pci.conf` (or `fca.conf`) file:  
 Set the Fibre topology for a SAN or direct connect.  
 For a SAN environment:  
**fca\_nport = 1;**  
 For a direct connect:  
**fca\_nport = 0;**  
 To enable failover for VxVM Dynamic Multi Pathing (DMP):  
**failover = 30;**  
 For SAN persistent binding:  
**def\_hba\_binding = "null";**  
**target20\_wwpn="50060e8003285301";**  
**target20\_hba="fca-pci0";**  
**target30\_wwpn="50060e8003285311";**  
**target30\_hba="fca-pci1";**  
 (Replace the WWPNs above with the WWPNs for your array ports.)
- Edit the `/kernel/drv/sd.conf` file:  
**name="sd" class="scsi" target=20 lun=1;**  
**name="sd" class="scsi" target=20 lun=2;**  
 ...  
**name="sd" class="scsi" target=30 lun=1;**  
**name="sd" class="scsi" target=30 lun=2;**  
 ...
- Perform a reconfiguration reboot to implement the changes to the configuration files.

- If LUNs have been preconfigured in the `/kernel/drv/sd.conf` file, use the **devfsadm** command to perform LUN rediscovery after configuring LUNS as explained in [Defining the paths](#).

## Configuring Emulex HBAs

Configure Emulex HBA as follows:

- Edit the `/kernel/drv/lpfc.conf` driver configuration file to set up the HBA for a SAN infrastructure:
  - topology = 2;**
  - scan-down = 0;**
- If multiple HBAs and VxVM are used, adjust the following parameters to assure correct VxVM behavior:
  - no-device-delay=0;**
  - nodev-tmo=30;**
  - linkdown-tmo=30;** # verify, should be default value
- Persistent bindings are necessary in a fabric topology and are used to bind a SCSI target ID to a particular WWPN (of an array port). This is required to guarantee that the SCSI target IDs will remain the same when the system is rebooted. Persistent bindings can be set by editing the configuration file or by using the **lputil** utility. The following example illustrates the binding of target 20 (lpfc instance 2) to WWPN 50060e8003285301 and the binding of target 30 (lpfc instance 0) to WWPN 50060e8003285311:
  - fcplib-WWPN="50060e8003285301:lpfc2i20",**
  - "50060e8003285311:lpfc0i30";**
 (Replace the WWPNs above with the WWPNs for your array ports.)
- For each LUN that needs to be accessed, add an entry to the `/kernel/drv/sd.conf` file. For example, assume you want to access LUNs 1 and 2 through both paths. You would add the following entries (preferably at the end of the file):
  - name="sd" parent="lpfc" target=20 lun=1;**
  - name="sd" parent="lpfc" target=20 lun=2;**
  - name="sd" parent="lpfc" target=30 lun=1;**
  - name="sd" parent="lpfc" target=30 lun=2;**
- Perform a reconfiguration reboot to implement the changes to the configuration files.
- If LUNs have been preconfigured in the `/kernel/drv/sd.conf` file, use the **devfsadm** command to perform LUN rediscovery after configuring LUNS as explained in [Defining the paths](#).

## Verifying the HBA configuration

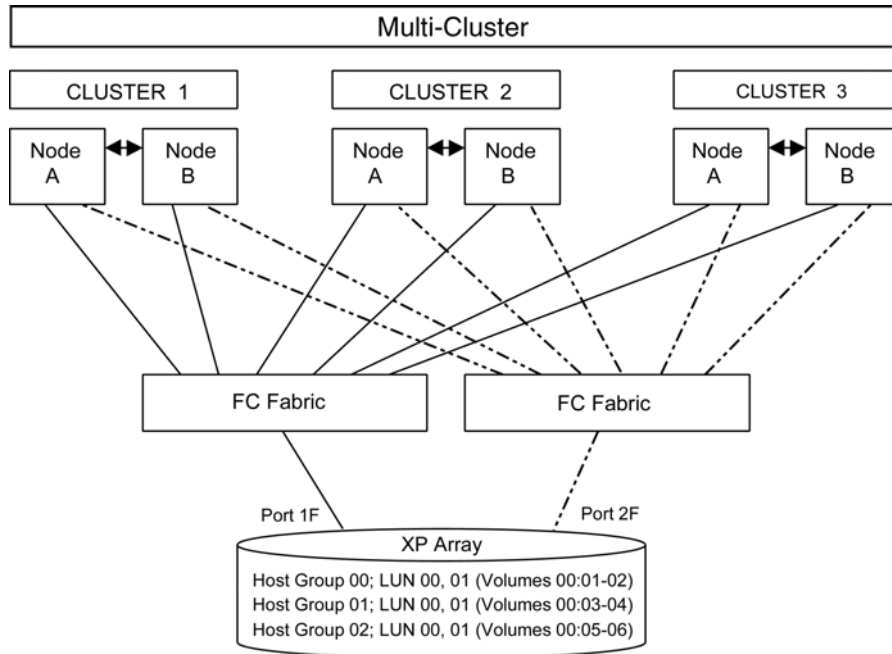
After installing the HBAs, verify recognition of the HBAs and drivers as follows:

1. Log into the system as **root**. Verify that all devices are powered on and properly connected to the system.
2. Use the **prtdiag** command (`/usr/platform/sun4u/sbin/prtdiag`) to verify that the HBA is installed properly. By using the **prtconf** command and/or by browsing the `/var/ad/messages` file, you can check whether the HBA driver has attached. Look for the WWN/WWPN of the HBA in the `/var/adm/messages` file or by using an HBA-specific tool or command.

## Clustering and fabric zoning

If you plan to use clustering, install and configure the clustering software on the servers.

Clustering is the organization of multiple servers into groups. Within a cluster, each server is a node. Multiple clusters compose a multi-cluster environment. The following example shows a multi-cluster environment with three clusters, each containing two nodes. The nodes share access to the disk array.



Within the Storage Area Network (SAN), the clusters may be homogeneous (all the same operating system) or they may be heterogeneous (mixed operating systems). How you configure LUN security and fabric zoning depends on the operating system mix and the SAN configuration.



## Fabric zoning and LUN security for multiple operating systems

You can connect multiple clusters of various operating systems to the same switch and fabric using appropriate zoning and LUN security as follows:

- Storage port zones may overlap if more than one operating system needs to share an array port.
- Heterogeneous operating systems may share an XP array port if you use Secure Manager and set the appropriate host group and mode. All others must connect to a dedicated XP array port.
- Use Secure Manager for LUN isolation when multiple hosts connect through a shared array port. Secure Manager provides LUN security by allowing you to restrict which LUNs each host can access.

Environment	OS Mix	Fabric Zoning	LUN Security
Standalone SAN (non-clustered)	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple hosts connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	
Clustered SAN	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple cluster nodes connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	
Multi-Cluster SAN	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple cluster nodes connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	

# Connect the disk array

The HP service representative connects the disk array to the host by:

1. Verifying operational status of the disk array channel adapters, LDEVs, and paths.
2. Connecting the Fibre Channel cables between the disk array and the fabric switch or host.
3. Verifying the ready status of the disk array and peripherals.

## Defining the paths

Use Remote Web Console (shown), Command View, or Command View XP AE to define paths (LUNs) between hosts and volumes in the disk array.

This process is also called “LUN mapping.” In Remote Web Console and Command View, LUN mapping includes:

- Configuring ports
- Enabling LUN security on the ports
- Creating host groups
- Assigning host bus adapter WWNs to host groups
- Mapping volumes to host groups (by assigning LUNs)

The screenshot shows the HP StorageWorks XP Remote Web Console interface. The main window is titled "LUN Manager" and is divided into several sections:

- LUN Path:** A tree view on the left shows a "Fibre" folder expanded to show various LUN targets (e.g., CL1-A(EF), CL3-A(E8), CL5-A(E4), CL7-A(E2), CL1-B(E1), CL3-B(E0), CL5-B(DC), CL7-B(D4), CL1-C(D8)). A table on the right lists these LUNs with columns for LUN, CU:LDEV, Emulation, Capacity, RAID, and P.
- WWN:** A table below the LUN Path section shows host groups and their WWNs. The "Port" is set to "CL1-A(EF)".
- LDEV:** A table below the WWN section shows LDEVs with columns for LDEV, Emulation, Capacity, RAID, Parity/Group, and Path. The "LDEV" is set to "00".

Buttons for "Add WWN" and "Add LUN Path" are visible. At the bottom, there are "Apply" and "Cancel" buttons.

In Command View XP AE, LUN mapping includes:

- Configuring ports
- Creating storage groups
- Mapping volumes and WWN/host access permissions to the storage groups

For details see LUN Configuration and Security Manager User's Guide or Command View XP Advanced Edition Device Manager Web Client User's Guide. Note the LUNS and their ports, WWNs, nicknames, and LDEVs for later use in verifying host and device configuration.

## Adding the new device paths to the system

After configuring the HBAs, some HBA drivers require you to add the new paths to the SCSI disk driver configuration file on the host (**/kernel/drv/sd.conf**). This enables the Solaris system to recognize the new devices on bootup after the disk array is connected.

---

### △ CAUTION:

To ensure that the system can boot properly even if you make a mistake in the driver configuration file, add the new paths at the end of the file. (This ensures the system boot entries higher up in the file execute first.)

---

To avoid reboots when you add new LUNs later, preconfigure extra LUNs in the **/kernel/drv/sd.conf** file. However, use LUNs sequentially without skipping any numbers to prevent delays during bootup.

After you modify the **/kernel/drv/sd.conf** file, do a reconfiguration reboot (**touch /reconfigure; shutdown -6**).

If you added unused LUNs for future use, when you later add those LUNs to the array, use the **devfsadm** command on the host to enable host recognition of the new LUNs.

## Verifying host recognition of disk array devices

Verify that the host recognizes the disk array devices as follows:

1. Use **format** to display the device information.
2. Check the list of disks to verify the host recognizes all disk array devices. If any devices are missing or if no array devices are shown, check the following:
  - SAN (zoning configuration)
  - Disk array path configuration (HBA WWNs)
  - Host HBA configuration (WWN information, driver instance, target and LUN assignment, and **/var/adm/messages**)
  - Cables

# Configure disk array devices

Disk arrays are configured using the same procedure for configuring any new disk on the host. This typically includes the following procedures:

1. Partitioning and labeling the devices
2. Creating the file systems
3. Creating the mount directories

Creating scripts to configure all devices at once may save you considerable time.

## Partitioning and labeling the devices

Partition and label the new devices using the Sun **format** utility. OPEN-x devices can have more than one partition.

---

### △ CAUTION:

Be careful when using the Sun **format** utility. Some commands are incompatible with the disk array and can overwrite data.

---

To partition and label the disks, work with all devices of one type (for example, OPEN-3), then all devices of the next type (for example, OPEN-9), and so on until you have partitioned and labeled all new devices. During disk partitioning and labeling, enter the disk parameters from the device specification table in Appendix A.

1. Enter **format** at the root prompt to start the format utility.
2. Verify that all new devices are displayed. If they are not, exit the format utility (**quit** or **Ctrl-D**), and make sure the Fibre Channel-to-LDEV paths were defined correctly for all devices and that all new devices were added to the driver configuration file.
3. Record the character-type device file names (for example, c1t2d0) for all of the new disks. You will use this data to create the file systems.
4. When you are asked to specify the disk, enter the number of the device to be partitioned and labeled.
5. When you are asked if you want to label the disk, enter **n** for “no.”
6. After the format menu is displayed, enter **type** to display the disk types.
7. If the disk type for the selected device is already defined, enter the number for that disk type.
8. If the disk type for the selected device is *not* already defined, enter the number for “other” to define the disk type.

9. Enter the disk type parameters for the selected device using the Device Geometry tables in Appendix A. See the following example.

*Example*

```
# format> type
Enter type.
:
AVAILABLE DRIVE TYPES
    0. Auto configure
      :
    14. SUN2.1G
    15. HITACHI -OPEN-3-0315 Do not select this disk type.
    16. other
Specify disk type (enter its number): 16 Enter number for "other"
Enter number of data cylinders: 3336 Enter value from Appendix A
Enter number of alternate cylinders[2]: 2
Enter value from Appendix A
Enter number of physical cylinders[3338]: Press Enter for default
Enter number of heads: 15 Enter value from Appendix A
Enter number of physical sectors/track[defaults]:
Press Enter for default
Enter rpm of drive [3600]: 10000 Enter value from Appendix A
Enter format time[defaults]: Press Enter for default
Enter cylinder skew[defaults]: Press Enter for default
Enter track skew[defaults]: Press Enter for default
Enter track per zone[defaults]: Press Enter for default
Enter alternate tracks[defaults]: Press Enter for default
Enter cache control [defaults]: Press Enter for default
Enter prefetch threshold[defaults]: Press Enter for default
Enter minimum prefetch[defaults]: Press Enter for default
Enter maximum prefetch[defaults]: Press Enter for default
Enter disk type name: "HITACHI OPEN-3"
Enter device type from Appendix A
selecting c1t2d0
[disk formatted]
No defined partition tables.
Disk not labeled. Label it now ? n Enter "n" for no.
format>
```

If you **do not** want to partition and label the disk, this is the end of the procedure. (You don't need to partition or label if you use Veritas Volume Manager.) If you **do** want to partition the disk, when you are asked whether you want to label the disk, enter **n** for "no."

10. After the format menu is displayed, enter **partition**.
11. Enter the desired partition number and partition parameters.
12. Enter **print** at the partition> prompt to display the partition table.
13. When you are finished setting the partitions for the selected device, enter **label** at the partition> prompt, and then enter **y** to label the device.

14. Exit the partition utility and return to the format utility.
15. Display the available disks by entering **disk** at the **format>** prompt. Make sure the disk you just labeled is correctly displayed.
16. Repeat this labeling procedure for each new device.
17. When you finish labeling the disks and verifying the disk labels, enter **quit** or press **Ctrl-D** to exit the format utility.

## Creating the file systems

1. If you want to create a UFS file system, create the file system using the **newfs -C *maxcontig*** command.

Example

```
# newfs -C 6 /dev/rdisk/c1t2d0s0
```

Use 6 or one of the following multiples of 6 as the ***maxcontig*** value for all disk array OPEN-x devices: 12, 18, 24, or 30.

If you use 6, the Sun OS will access 48 KB as a unit (6\*8 KB), which matches the track size of the OPEN-x devices. These ***maxcontig*** values (6, 12, 18, 24, 30) optimize the I/O performance of the disk array by keeping the I/O data range on one track. The ***maxcontig*** value that you choose depends on your applications, and you can change the ***maxcontig*** parameter to a different value at any time.

Use the character-type device file (for example, /dev/rdisk/c1t2d0s0) as the argument.

2. When the confirmation appears, enter **y** for yes if the file name is correct. If the file name is not correct, enter **n** and repeat step 1.
3. Repeat this procedure for each new OPEN-x device. Use the same ***maxcontig*** value for all disk array devices.

## Creating the mount directories

1. Create a mount directory for each device using the **mkdir** command.
2. Enter each device into the mount table by editing **/etc/vfstab**.
3. Use the **mount -a** command to auto-mount devices.
4. Use a **df -k** command to verify the devices auto-mounted.

# Configure for use with Veritas Volume Manager

HP XP disk arrays are certified for VxVM support.

Be sure the failover parameter is set correctly when you install the HBA. Failure to do so results in a loss of path failover in Dynamic Multipathing (DMP). See [Installing and configuring the HBAs](#) and the HBA manufacturer's instructions for specific HBA parameters to set.

## VxVM versions prior to 3.2

To ensure proper operation of the DMP feature of VxVM, update the **/kernel/drv/vxdmp.conf** file to reflect the appropriate Vendor string.

*Example*

```
name="vxdmp" parent="pseudo" instance=0 dmp_jbod="HP";
```

## VxVM versions 3.2 and later

More recent versions of VxVM use Array Support Libraries (ASL) to set up the Dynamic Multipathing (DMP) feature and other parameters. The ASL is required only for XP128 and XP1024 arrays.

You can download the ASL by searching for "XP128" on the Veritas website: <http://support.veritas.com>. ASL installation instructions are supplied with the Volume Manager and are also available on the Veritas website.





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# 2 Troubleshooting

This section includes resolutions for various error conditions you may encounter.

If you are unable to resolve an error condition, ask your HP support representative for assistance. See [Calling the HP support center](#).

## Error conditions

Depending on your system configuration, you may be able to view error messages (R-SIMS) as follows:

- In Remote Web Console (Status tab)
- In Command View Advanced Edition (“Alerts” panel).
- In Command View (Event History or Event Notification panels)

Error Condition	Recommended Action
<p>The logical devices are not recognized by the host.</p>	<p>Verify that the READY indicator lights on the disk array are ON. Verify that fiber cables are correctly installed and firmly connected.</p> <p>Verify that the target IDs are properly configured and either match the loop ID in a direct environment or match the target assignment from the driver configuration file in a SAN environment. For drivers where <code>sd.conf</code> needs to be configured, the LUNs for each target should start at 1 and continue sequentially without skipping numbers.</p> <p>Verify that <code>/kernel/drv/sd.conf</code> is correctly configured. For drivers where <code>sd.conf</code> is not configured, the LUNs for each target should start at 0 and continue sequentially without skipping numbers.</p> <p>Check HBA configuration as explained in Chapter 1.</p> <p>Look for the HBA WWN in the <code>/var/adm/messages</code> file and verify that it matches the WWN configured on the XP array.</p> <p>Verify the correct WWN for the XP ports have been configured in the driver configuration file (WWN binding).</p> <p>Verify the correct driver instance has been configured for the given WWN. Use the <code>prtdiag</code> command to verify the HBA is properly installed (<code>/usr/platform/sun4u/sbin/prtdiag</code>). With the <code>prtconf</code> command and/or by browsing the <code>/var/adm/messages</code> file, you can check that the HBA driver has attached.</p> <p>Check SAN (zoning configuration), which is explained in Chapter 1. A reconfiguration reboot or a rescan for new LUNs may be required (<code>devfsadm</code> command or for JNI HBAs <code>jinic146x_update_drv -r -a</code>).</p> <p>Verify that the disk array host mode is set correctly.</p>
<p>The host does not reboot properly after hard shutdown.</p>	<p>If you power off the host without executing the shutdown process, wait three minutes to allow the disk array's internal timeout process to purge queued commands. If the host restarts while the disk array is processing queued commands, the host may not reboot successfully.</p>

Error Condition	Recommended Action
Physical volumes cannot be created.	Verify that the disk array logical devices are correctly formatted.
Disks are not visible in VxVM	Verify that the LUN has been correctly labeled by the <b>format</b> command.
A file system cannot be created.	Check that a character-type device file is specified as the device file in the <b>newfs</b> command. Verify that the logical unit is correctly labeled by the <b>format</b> command.
A file system is not mounted after rebooting.	Verify that the host was restarted correctly. Verify that the file system attributes are correct. Verify that <b>/etc/vfstab</b> was edited correctly.
The disk array performs a self reboot because the disk array was busy or it logged a panic message.	Reboot the host.
The disk array responds "Not Ready" or the disk array has displayed "Not Ready" and timed out.	Contact HP.
The host detects a parity error.	Check the HBA and make sure it was installed properly.Reboot the host.
HBA driver is not attached.	Verify the installed HBA driver is the correct one for the HBA and the HBA firmware.
vxinstall aborts after device detection.	Verify that you have installed the Array Support Library.

# Calling the HP support center

If you are unable to resolve an error condition, contact the HP support center for assistance.

## Contact Information

In North America, call technical support at 1-800-633-3600, available 24 hours a day, 7 days a week.

Outside North America, call technical support at the location nearest you. The HP web site lists telephone numbers for worldwide technical support at: <http://www.hp.com/support/>. From this web site, select your country.

## Before you call

Be sure to have the following information available:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

---

# A Disk array supported emulations

This appendix provides information about supported emulations and device type specifications. Some parameters may not be relevant to your array. Consult your HP representative for information about supported configurations for your system.

## Supported emulations

XP Model	OPEN Emulation Type	OPEN Emulation Supported	LUSE	CVS	LUSE & CVS
XP128	OPEN-3	Yes	Yes	Yes	Yes
	OPEN-8	Yes	Yes	Yes	Yes
	OPEN-9	Yes	Yes	Yes	Yes
XP1024	OPEN-E	Yes	Yes	Yes	Yes
XP10000	OPEN-K				
XP12000	OPEN-L	Yes	Yes		
	OPEN-M				
	OPEN-V	Yes	Yes		

## Emulation specifications

Emulation (Note 1)	Category (Note 2)	Blocks (512 bytes )	Sector Size (bytes)	# of Cylinders	Heads	Sectors per Track	Capacity MB* (Note 3)
OPEN-3	SCSI disk	4806720	512	3338	15	96	2347
OPEN-8	SCSI disk	14351040	512	9966	15	96	7007
OPEN-9	SCSI disk	14423040	512	10016	15	96	7042
OPEN-E	SCSI disk	28452960	512	19759	15	96	13893
OPEN-L	SCSI disk	71192160	512	49439	15	96	34761
OPEN-V	SCSI disk	max=125827200	512	Note 5	15	128	Note 6
<b>LUSE</b>							
OPEN-3*n	SCSI disk	4806720*n	512	3338*n	15	96	2347*n
OPEN-8*n	SCSI disk	14351040*n	512	9966*n	15	96	7007*n
OPEN-9*n	SCSI disk	14423040*n	512	10016*n	15	96	7042*n
OPEN-E*n	SCSI disk	28452960*n	512	19759*n	15	96	13893*n
OPEN-L*n	SCSI disk	71192160*n	512	49439*n	15	96	34761*n
OPEN-V*n	SCSI disk	max=125827200 Note 4	512	Note 5	15	128	Note 6
<b>CVS</b>							
OPEN-3 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-8 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-9 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-E CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
<b>CVS LUSE</b>							
OPEN-3*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-8*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-9*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-E*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-V*n	SCSI disk	Note 4	512	Note 5	15	128	Note 6

\*Capacity = (512 x number of blocks) ÷ 1024<sup>2</sup>

### Note 1:

The availability of an emulation depends on the disk array.

### Note 2:

The devices are defined to the host as SCSI disk devices, even though the interface is Fibre Channel.

### Note 3:

The device capacity can sometimes be changed by the BIOS or host adapter board. This may make actual capacity different from that listed in the table.

### Note 4:

The number of blocks for a CVS volume is calculated as follows:

# of blocks = (# of cylinders) × (# of heads) × (# of sectors per track)

#### Example

```
For an OPEN-3 CVS volume with capacity = 37 MB:  
# of blocks = (53 cylinders-see Note 5) × (15 heads) ×  
(96 sectors per track) = 76320
```

#### Example

```
For an OPEN-V CVS volume with capacity = 49 MB:  
# of blocks = (53 cylinders-see Note 5) × (15 heads) ×  
(128 sectors per track) = 101760
```

### Note 5:

The number of cylinders for a CVS volume is calculated as follows (↑...↑ means that the value should be rounded up to the next integer):

**OPEN-3/8/9/E:** The number of cylinders for a CVS volume = # of cylinders = ↑ (capacity (MB) specified by user) × 1024/720 ↑

#### Example

```
For an OPEN-3 CVS volume with capacity = 37 MB:  
# of cylinders = ↑37 × 1024/720↑ = ↑52.62↑  
(rounded up to next integer) = 53 cylinders
```

**OPEN-V:** The number of cylinders for a CVS volume = # of cylinders = ↑ (capacity (MB) specified by user) × 16/15 ↑

### Example

```
For an OPEN-V CVS volume with capacity = 49 MB:  
# of cylinders =  $\lceil 49 \times 16/15 \rceil = \lceil 52.26 \rceil$   
(rounded up to next integer) = 53 cylinders
```

**OPEN-3/8/9/E:** The number of cylinders for a CVS LUSE volume = # of cylinders =  $\lceil (\text{capacity (MB) specified by user}) \times 1024/720 \rceil \times n$

### Example

```
For a CVS LUSE volume with capacity = 37 MB and n = 4:  
# of cylinders =  $\lceil 37 \times 1024/720 \rceil \times 4 = \lceil 52.62 \rceil \times 4 = 53 \times 4 = 212$ 
```

**OPEN-V:** The number of cylinders for a CVS LUSE volume = # of cylinders =  $\lceil (\text{capacity (MB) specified by user}) \times 16/15 \rceil \times n$

### Example

```
For an OPEN-V CVS LUSE volume with capacity = 49 MB and n = 4:  
# of cylinders =  $\lceil 49 \times 16/15 \rceil \times 4 = \lceil 52.26 \rceil \times 4 = 53 \times 4 = 212$ 
```

## Note 6:

The capacity of an OPEN-3/8/9/E CVS volume is specified in MB, not number of cylinders. The capacity of an OPEN-V CVS volume can be specified in MB or number of cylinders. You set the volume size using Remote Web Console, Command View or Command View XP Advanced Edition.



# Device Geometry Tables

Use the following geometry tables when configuring devices and file systems on the host.

## OPEN-x geometry table

Device Type	# of Data Cylinders	# of Alternate Cylinders	RPM	Partition Size (sample)
OPEN-3	3336	2	10,000	3336c
OPEN-8	9964	2	10,000	9964c
OPEN-9	10014	2	10,000	10014c
OPEN-E	19757	2	10,000	19757c
OPEN-L	19013	2	10,000	19013c
OPEN-3*n	N1*	2	10,000	N4*
OPEN-8*n	N26*	2	10,000	N29*
OPEN-9*n	N5*	2	10,000	N8*
OPEN-E*n	N30*	2	10,000	N33*
OPEN-L*n	N34	2	10,000	N37
OPEN-x VLL	See Device Type Specs	2	10,000	See Device Type Specs
OPEN-3*n VLL	N22*	2	10,000	N25*
OPEN-8*n VLL	N22*	2	10,000	N25*
OPEN-9*n VLL	N22*	2	10,000	N25*
OPEN-E*n VLL	N22*	2	10,000	N25*
OPEN-V*n VLL	N22*	2	10,000	N25*

\* For the values indicated by Nxx (for example, N15, N22), refer to the tables that follow.

## OPEN-3\*n LUSE device geometry table

n	Data Cylinders N1 Partition Size N4	Heads N2	Blocks/ Track N3	Usable Blocks (N1+2)*N2*N3	Provided Blocks 3338*15*96*n	Diff.
2	6674	15	96	9613440	9613440	0
3	10012	15	96	14420160	14420160	0
4	13350	15	96	19226880	19226880	0
5	16688	15	96	24033600	24033600	0
6	20026	15	96	28840320	28840320	0
7	23364	15	96	33647040	33647040	0
8	26702	15	96	38453760	38453760	0
9	30040	15	96	43260480	43260480	0
10	16688	30	96	48067200	48067200	0
11	20026	33	80	52873920	52873920	0
12	20026	30	96	57680640	57680640	0
13	20026	39	80	62487360	62487360	0
14	23364	30	96	67294080	67294080	0
15	16688	45	96	72100800	72100800	0
16	26702	30	96	76907520	76907520	0
17	30040	34	80	81714240	81714240	0
18	30040	30	96	86520960	86520960	0
19	30040	38	80	91327680	91327680	0
20	16688	60	96	96134400	96134400	0
21	23364	45	96	100941120	100941120	0
22	30040	55	64	105747840	105747840	0
23	30040	46	80	110554560	110554560	0
24	20026	60	96	115361280	115361280	0
25	16688	45	160	120168000	120168000	0
26	20026	39	160	124974720	124974720	0
27	30040	45	96	129781440	129781440	0
28	23364	60	96	134588160	134588160	0

n	Data Cylinders N1 Partition Size N4	Heads N2	Blocks/ Track N3	Usable Blocks (N1+2)*N2*N3	Provided Blocks 3338*15*96*n	Diff.
29	30040	58	80	139394880	139394880	0
30	16688	45	192	144201600	144201600	0
31	30040	62	80	149008320	149008320	0
32	26702	60	96	153815040	153815040	0
33	30040	55	96	158621760	158621760	0
34	30040	64	85	163428480	163428480	0
35	30040	56	100	168235200	168235200	0
36	30040	60	96	173041920	173041920	0

N1, N2, N3: Use values in OPEN-x settings in [Device type specifications](#) and [OPEN-x geometry table](#) .

N4: Use same value as N1. Specify as NNNNc, where NNNN = # of cylinders and c = cylinder (for example, enter 6674c for OPEN-3\*2).

## OPEN-8\*n LUSE device geometry table

n	Data Cylinders N26 Partition Size N29	Heads N27	Blocks/ Track N28	Usable Blocks (N26+2)*N27*N28	Provided Blocks 9966*15*96*n	Diff.
2	19930	15	96	28702080	28702080	0
3	29896	15	96	43053120	43053120	0
4	29896	20	96	57404160	57404160	0
5	29896	25	96	71755200	71755200	0
6	29896	30	96	86106240	86106240	0
7	29896	35	96	100457280	100457280	0
8	29896	40	96	114808320	114808320	0
9	29896	45	96	129159360	129159360	0
10	29896	50	96	143510400	143510400	0
11	29896	55	96	157861440	157861440	0
12	29896	60	96	172212480	172212480	0
13	29896	52	120	186563520	186563520	0
14	29896	56	120	200914560	200914560	0

n	Data Cylinders N26 Partition Size N29	Heads N27	Blocks/ Track N28	Usable Blocks (N26+2)*N27*N28	Provided Blocks 9966*15*96*n	Diff.
15	29896	60	120	215265600	215265600	0
16	29896	64	120	229616640	229616640	0
17	29896	34	240	243967680	243967680	0
18	29896	36	240	258318720	258318720	0
19	29896	38	240	272669760	272669760	0
20	29896	40	240	287020800	287020800	0
21	29896	42	240	301371840	301371840	0
22	29896	44	240	315722880	315722880	0
23	29896	46	240	330073920	330073920	0
24	29896	48	240	344424960	344424960	0
25	29896	50	240	358776000	358776000	0
26	29896	52	240	373127040	373127040	0
27	29896	54	240	387478080	387478080	0
28	29896	56	240	401829120	401829120	0
29	29896	58	240	416180160	416180160	0
30	29896	60	240	430531200	430531200	0
31	29896	62	240	444882240	444882240	0
32	29896	64	240	459233280	459233280	0
33	32614	60	242	473584320	473584320	0
34	29896	64	255	487935360	487935360	0
35	30655	64	256	502284288	502286400	2112
36	31531	64	256	516636672	516637440	768

N26, N27, N28: Use values in OPEN-x settings in [Device type specifications](#) and [Device Geometry Tables](#) .

N29: Use same value as N26. Specify as NNNNc, where NNNN = # of cylinders and c = cylinder (for example, enter 19930c for OPEN-8\*2).

Data cylinders must be less than or equal to **32767**, heads must be less than or equal to **64**, blocks per track must be less than or equal to **256** when these values are specified as parameters of Solaris format type subcommand. The whole data blocks of OPEN-3\*2 ~ OPEN-3\*36 can be used by above parameters.

## OPEN-9\*n LUSE device geometry table

n	Data Cylinders N5 Partition Size N8	Heads N6	Blocks/ Track N7	Usable Blocks (N5+2)*N6*N7	Provided Blocks 10016*15*96*n	Diff.
2	20030	15	96	28846080	28846080	0
3	30046	15	96	43269120	43269120	0
4	30046	20	96	57692160	57692160	0
5	30046	25	96	72115200	72115200	0
6	30046	30	96	86538240	86538240	0
7	30046	35	96	100961280	100961280	0
8	30046	40	96	115384320	115384320	0
9	30046	45	96	129807360	129807360	0
10	30046	50	96	144230400	144230400	0
11	30046	55	96	158653440	158653440	0
12	30046	60	96	173076480	173076480	0
13	30046	52	120	187499520	187499520	0
14	30046	56	120	201922560	201922560	0
15	30046	60	120	216345600	216345600	0
16	30046	64	120	230768640	230768640	0
17	30046	34	240	245191680	245191680	0
18	30046	36	240	259614720	259614720	0
19	30046	38	240	274037760	274037760	0
20	30046	40	240	288460800	288460800	0
21	30046	42	240	302883840	302883840	0
22	30046	44	240	317306880	317306880	0
23	30046	46	240	331729920	331729920	0
24	30046	48	240	346152960	346152960	0
25	30046	50	240	360576000	360576000	0
26	30046	52	240	374999040	374999040	0
27	30046	54	240	389422080	389422080	0
28	30046	56	240	403845120	403845120	0

n	Data Cylinders N5 Partition Size N8	Heads N6	Blocks/ Track N7	Usable Blocks (N5+2)*N6*N7	Provided Blocks 10016*15*96*n	Diff.
29	30046	58	240	418268160	418268160	0
30	30046	60	240	432691200	432691200	0
31	30046	62	240	447114240	447114240	0
32	30046	64	240	461537280	461537280	0
33	30985	64	240	475960320	475960320	0
34	31924	64	240	490383360	490383360	0
35	31298	63	256	504806400	504806400	0
36	31689	64	256	519225344	519229440	4096

N5, N6, N7: Use values in OPEN-x settings in [Device type specifications](#) , [OPEN-x geometry table](#) , and [OPEN-3\\*n LUSE device geometry table](#).

N8: Use same value as N5. Specify as NNNNc, where NNNN = # of cylinders and c = cylinder (for example, enter 20030c for OPEN-9\*2).

## OPEN-E\*n LUSE devices geometry table

n	Data Cylinders N30 Partition Size N33	Heads N31	Blocks/ Track N32	Usable Blocks (N30+2)*N31*N32	Provided Blocks 9966*15*96*n	Diff.
2	19757	30	96	56905920	56905920	0
3	19757	45	96	85358880	85358880	0
4	19757	60	96	113811840	113811840	0
5	19757	30	240	142264800	142264800	0
6	19757	45	192	170717760	170717760	0
7	19757	60	168	199170720	199170720	0
8	19757	60	192	227623680	227623680	0
9	19757	60	216	256076640	256076640	0
10	19757	60	240	284529600	284529600	0
11	27166	60	192	312975360	312982560	7200
12	29636	60	192	341429760	341435520	5760
13	32106	60	192	369884160	369888480	4320
14	27660	60	240	398332800	398341440	8640
15	29636	60	240	426787200	426794400	7200
16	31612	60	240	455241600	455247360	5760
17	31612	60	255	483694200	483700320	6120
18	31257	64	256	512147456	512153280	5824

N30, N31, N32: Use values in OPEN-x specification tables on pages [Device type specifications](#) and [Device Geometry Tables](#) .

N33: Use same value as N30. Specify as NNNNc, where NNNN = # of cylinders and c = cylinder (e.g. enter 19757c for OPEN-E\*2).

Data cylinders must be less than or equal to **32767**, heads must be less than or equal to 64, blocks per track must be less than or equal to 256 when these values are specified as parameters of Solaris format type subcommand. The whole data blocks of OPEN-E\*2~OPEN-E\*10 can be used by above parameters. About OPEN-E\*11~OPEN-E\*18, some blocks must become unusable.

## OPEN-L\*n LUSE device geometry table

n	Data Cylinders N34 Partition Size N37	HeadN35	Blocks/ Track N36	Usable Blocks (N34+2)*N35*N36	Provided Blocks 49439*15*96*n	Diff.
2	19013	64	117	142384320	142384320	0
3	30422	36	195	213576480	213576480	0
4	30422	45	208	284768640	284768640	0
5	30422	60	195	355960800	355960800	0
6	30422	60	234	427152960	427152960	0
7	30897	63	256	498339072	498345120	6048

N34, N35, N36: Use values in OPEN-x settings in [Device type specifications](#) and [OPEN-x\\*n VLL-LUSE devices geometry table \(example\)](#).

N37: Use same value as N34. Specify as NNNNc, where NNNN = # of cylinders and c = cylinder (e.g. enter 19013c for OPEN-L\*2).

Data cylinders must be less than or equal to **32767**, heads must be less than or equal to 64, blocks per track must be less than or equal to 256 when these values are specified as parameters of Solaris format type subcommand. The whole data blocks of OPEN-L\*2~OPEN-L\*6 can be used by above parameters. About OPEN-L\*7, some blocks must become unusable.



## OPEN-x\*n VLL-LUSE devices geometry table (example)

#	Data Cylinders N22 Partition Size N25	HeadN23	Blocks/ Track N24	Usable Blocks (N22+2)*N23*N24	Provided Blocks N21	Diff.
1	98	15	96	144000	35MB × 2 volumes ↑ 35 × 1024/720 ↑ × 2 = 100100 × 15 × 96 = 144000	0
2	2590	15	96	3732480	50MB × 36 volumes ↑ 50 × 1024/720 ↑ × 36 = 25922592 × 15 × 96 = 3732480	0
3	284	15	96	411840	100MB × 2 volumes ↑ 100 × 1024/720 ↑ × 2 = 286286 × 15 × 96 = 411840	0
4	5694	15	96	8202240	500MB × 8 volumes ↑ 500 × 1024/720 ↑ × 8 = 56965696 × 15 × 96 = 8202240	0
5	22758	30	96	65548800	2000MB × 2 volumes ↑ 2000 × 1024/720 ↑ × 16 = 4552045520 × 15 × 96 = 65548800	0
6	27455	40	188	206476640	2800MB × 36 volumes ↑ 2800 × 1024/720 ↑ × 36 = 143388143388 × 15 × 96 = 206478720	2080

N21: number of LUSE blocks is calculated as follows:  $N21 = N20 \times (\# \text{ of heads}) \times (\# \text{ of sectors per track})$ .

N22:  $N20 - 2$ , Use total cylinder - 2.

N23, N24: Use values in OPEN-x settings in [Device type specifications](#), [OPEN-x\\*n VLL-LUSE devices geometry table \(example\)](#), and [OPEN-3\\*n LUSE device geometry table](#).

N25: Use same value as N22.

## OPEN-V\*n VLL-LUSE device geometry table (example)

#	Data Cylinders N22 Partition Size N25	Heads N23	Blocks/ Track N24	Usable Blocks (N22+2)*N23*N24	Provided Blocks N21	Diff.
1	48	15	128	92160	45 MB volumes $\uparrow 45 \times 16/15 \uparrow = 48$ $48 \times 15 \times 128 = 92160$	0
2	27305	30	128	104858880	50 GB volumes $\uparrow 50 \times 1024 \times 16/15 \uparrow =$ $54614$ $54614 \times 15$ $\times 128 = 104858880$	0
3	10921	150	128	209721600	10 GB $\times 10$ volumes $\uparrow 10 \times 1024 \times$ $16/15 \uparrow \times 10 =$ $109230$ $109230$ $\times 15 \times 128 =$ $209721600$	0
4	32767	100	128	419443200	20 GB $\times 10$ volumes $\uparrow 20 \times 1024 \times$ $16/15 \uparrow \times 10 =$ $218460$ $218460$ $\times 15 \times 128 =$ $419443200$	0

N21 number of LUSE blocks is calculated as follows:  $N21 = N20 \times (\# \text{ of heads}) \times (\# \text{ of sectors per track})$ .

N22:  $N20 - 2$ , Use total cylinder - 2.

N23, N24: Use values in OPEN-x settings in [Device type specifications](#) , [OPEN-x geometry table](#) , and [OPEN-3\\*n LUSE device geometry table](#).

N25: Use same value as N22.

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# Glossary

<b>AL</b>	Arbitrated loop.
<b>AL-PA</b>	Arbitrated loop physical address.
<b>array group</b>	A group of 4 or 8 physical hard disk drives (HDDs) installed in an XP disk array and assigned a common RAID level. RAID1 array groups consist of 4 (2D+2D) or 8 HDDs (4D+4D). RAID5 array groups include a parity disk but also consist of 4 (3D+1P) or 8 HDDs (7D+1P). All RAID6 array groups are made up of 8 HDDs (6D+2P).
<b>BC</b>	HP StorageWorks Business Copy XP. BC lets you maintain up to nine local copies of logical volumes on the disk array.
<b>CA</b>	HP StorageWorks Continuous Access XP. CA lets you create and maintain duplicate copies of local logical volumes on a remote disk array.
<b>Command View (CVXP)</b>	HP StorageWorks Command View XP, a software product for managing XP arrays. Command View runs on a Windows-based management workstation.
<b>Command View XP Advanced Edition (CVXP AE)</b>	HP StorageWorks Command View XP Advanced Edition, installs on the user-provided Device Manager server and provides a browser-based platform from which you can manage the XP family of disk arrays—even globally distributed arrays.
<b>command device</b>	A volume on the disk array that accepts Continuous Access or Business Copy control operations which are then executed by the disk array.
<b>CU</b>	Control Unit. Contains LDEVs and is approximately equivalent to SCSI Target ID.
<b>CVS</b>	Custom volume size. CVS devices (OPEN-x CVS) are custom volumes configured using array management software to be smaller than normal fixed-size OPEN system volumes. Synonymous with volume size customization (VSC).
<b>DKC</b>	The array cabinet that houses the channel adapters and service processor (SVP).

<b>DKU (disk cabinet unit)</b>	The array cabinets that house the disk array physical disks.
<b>emulation modes</b>	The logical devices (LDEVs) associated with each RAID group are assigned an emulation mode that makes them operate like OPEN system disk drives. The emulation mode determines the size of an LDEV: OPEN-3: 2.46 GB OPEN-8: 7.38 GB OPEN-9: 7.42 GB OPEN-E: 13.56 GB OPEN-L: 36 GB OPEN-V: User-defined custom size
<b>failover</b>	Disconnecting a failed unit or path and replacing it with an alternative unit or path in order to continue functioning.
<b>FC</b>	Fibre Channel.
<b>FC-AL</b>	Fibre Channel arbitrated loop.
<b>FCP</b>	Fibre Channel Protocol.
<b>GB</b>	Gigabytes
<b>HBA</b>	Host bus adapter.
<b>host mode</b>	Each port can be configured for a particular host type. These modes are represented as two-digit hexadecimal numbers. For example, host mode 08 represents an HP-UX host.
<b>LDEV</b>	Logical device. An LDEV is created when a RAID group is carved into pieces according to the selected host emulation mode (that is, OPEN-3, OPEN-8, OPEN-L). The number of resulting LDEVs depends on the selected emulation mode. The term LDEV is often used synonymously with the term volume.
<b>LUN</b>	Logical unit number. A LUN results from mapping a SCSI logical unit number, port ID, and LDEV ID to a RAID group. The size of the LUN is determined by the emulation mode of the LDEV and the number of LDEVs associated with the LUN. For example, a LUN associated with two OPEN-3 LDEVs has a size of 4,693 MB.
<b>LUSE</b>	A LUN is normally associated with only a single LDEV. The LUSE feature allows a LUN to be associated with 1 to 36 LDEVs. Essentially, LUSE makes it possible for applications to access a single large pool of storage. The LUSE feature is available when the HP StorageWorks LUN Configuration Manager product is installed.

<b>OFC</b>	Open Fibre Control.
<b>OPEN-x</b>	A general term describing any one of the supported OPEN emulation modes (for example, OPEN-L).
<b>OS</b>	Operating system.
<b>PA</b>	Physical address.
<b>path</b>	“Path” and “LUN” are synonymous. Paths are created by associating a port, a target, and a LUN ID with one or more LDEVs.
<b>port</b>	A physical connection that allows data to pass between a host and the disk array. The number of ports on an XP disk array depends on the number of supported I/O slots and the number of ports available per I/O adapter. The XP family of disk arrays supports Fibre Channel (FC) ports as well as other port types. Ports are named by port group and port letter, such as CL1-A. CL1 is the group, and A is the port letter.
<b>RAID</b>	Redundant array of independent disks.
<b>remote console PC</b>	The PC running HP StorageWorks Remote Control XP.
<b>Remote Control (RC)</b>	HP StorageWorks Remote Control XP. A software product used for managing XP arrays.
<b>Remote Web Console (RWC)</b>	HP StorageWorks XP Remote Web Console. A browser-based program installed on the SVP that allows you to configure and manage the disk array.
<b>R-SIM</b>	Remote service information message.
<b>SCSI</b>	Small computer system interface.
<b>SIM</b>	Service information message.
<b>SNMP</b>	Simple Network Management Protocol.
<b>SVP</b>	Service processor, which is the PC built into the disk controller. The SVP provides a direct interface into the disk array. SVP use is reserved for HP support representatives only.
<b>TB</b>	Terabyte.
<b>TID</b>	Target ID.
<b>Volume</b>	On the XP array, a volume is a uniquely identified virtual storage device composed of a control unit (CU) component and a logical device (LDEV) component separated by a colon. For example 00:00 and 01:00 are two uniquely identified

volumes; one is identified as CU = 00 and LDEV = 00, and the other as CU = 01 and LDEV = 00; they are two unique separate virtual storage devices within the XP array.

**VSC**

Volume size customization. Synonymous with CVS.

**WWN**

World Wide Name. A unique identifier assigned to a Fibre Channel device.

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