

Migrating from AMCC/JNI FC Adapters to Sun FC Adapters on Sun Solaris systems that are connected to HP StorageWorks XP48/XP512/XP128/XP1024/XP12000 Disk Arrays white paper



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Executive summary

Applied Micro Circuits Corporation (AMCC), who recently merged with Jaycor Networks Incorporated (JNI), has announced that it will discontinue all Fibre Channel host bus adapter (HBA) products in Summer/Fall 2005. You therefore may need to migrate from AMCC/JNI Fibre Channel Adapters (FCAs) to a different FCA if one of the following conditions is true:

- You must install or update to Solaris 10.
- You have a broken FCA and you cannot get a replacement FCA.
- You run into a driver problem that is not/cannot be solved by AMCC.
- You decide to migrate due to support considerations.

Although this document focuses on the migration from AMCC/JNI FCAs to Sun FCAs (for example, SG-XPCI2FC-QF2 or SG-XPCI1FC-QF2) because of their ability of multipathing with Sun's driver stack (storage area network [SAN] foundation and Solaris 8 or later), FCAs from other vendors (for example, Emulex LP10000/LP10000DC or QLogic QLA2340/QLA2342) could be reasonable replacement candidates. Contact your HP representative to discuss which FCA best meets your requirements (see [Migration prerequisites](#)).

Migration prerequisites

Before performing the steps in the migration phase, perform the following:

- Analyze your SAN to identify the type of Fibre Channel switches, zoning, FCAs, and associated drivers used in your current environment (for further details, see [Analysis of current environment](#)).
- Verify that the FCA replacement candidates are supported by the FCA vendor and HP in the desired hardware configuration (Server type/Server card slots [PCI (3.3V and 5V), cCPI, Sbus]/Fibre Channel switch) and desired software configuration (Solaris version/Path Management/Volume Management/Cluster Server/Enterprise Backup Solution).
- Choose the replacement FCA candidate that fits best into your environment and be sure the replacement FCAs are available before starting with the migration.
- If you switch from 1-Gbit FCAs to 2-Gbit FCAs, be sure you have different FC cables for SAN connectivity available (SC to LC).
- Schedule planned downtime for your affected servers (to estimate your required downtime, see [Impact of migration to production environments](#) and [Sun FCA installation and configuration](#)).
- Do not add new Logic Unit Numbers (LUNs)/storage arrays during the migration process to limit the complexity.

Impact of migration to production environments

Replacing the FCAs typically involves downtime in your production environment. The different steps required for the migration are outlined in [Sun FCA installation and configuration](#). The downtime will vary, depending on the time your system takes to boot and the time required for the different steps. With small servers and experienced administrators, downtime will typically be at least one hour.

An additional consideration is custom applications that have been written with consideration of the HBA characteristics. Such custom applications will also have to be migrated, which is out of the scope of this document.

Analysis of current environment

You must know or find out the following to later modify the configuration:

- Which cards and associated package/driver are installed?
- For PCI cards, which PCI slots are occupied? Can the replacement cards be put into the same PCI slots?
- What is the World Wide Port Name (WWPN) of the FCA?
- To which XP ports is the FCA connected, WWPN of the XP ports, and on which XP ports/host groups has the WWPN of the FCA been configured?
- Is your SAN zoning WWPN based or port based?
- What are the current device files for the disks on the Solaris host and are these accessed directly (single FCA environment only) or through VERITAS Volume Manager?

To check current package/driver installed:

```
# pkginfo | grep -i jni
```

The output of the preceding command will differ depending on the type of FCA installed and the associated driver version. For all FCAs/driver you might get the SNIA library listed:

```
application JNIsnia          JNI SNIA Fibre Channel HBA LIBRARY (Solaris)
```

With FCC-6460, FCC-6562, FCC2-6562, FCE-1473, FCE2-1473, FCE-6460, FCX-6562, FCX2-6562 FCAs (config file /kernel/drv/jnic146x.conf):

```
system      JNIC146x      JNI Fibre Channel SCSI HBA Driver
```

With FCI-1063 FCA (config file /kernel/drv/fca-pci.conf):

```
system      JNIfcaPCI     JNI Fibre Channel SCSI/IP HBA Driver (PCI)
```

With FC64-1063 FCA (config file /kernel/drv/fcaw.conf):

```
system      JNIfcaw       JNI Fibre Channel SCSI/IP HBA Driver
```

With FCE-1063, FCE2-1063, FCE-6410, FCE2-6412 FCA (config file /kernel/drv/jnic.conf):

```
system      JNIC          JNI Fibre Channel SCSI HBA Driver
```

If the complete Sun StorEdge SAN 4.x software with support of Sun-branded AMCC/JNI FCAs has been installed, you may also see the following:

```
system      SUNWjfca      JNI Fibre Channel Adapter (FCA) Driver
system      SUNWjfcaw    JNI Fibre Channel Adapter (FCA) (usr)
system      SUNWjfcawx   JNI Fibre Channel Adapter (FCA) (usr) (64-bit)
system      SUNWjfcax    JNI Fibre Channel Adapter (FCA) Driver (64-bit)
```

Depending on their presence, the packages JNIC146x, JNIfcaPCI, JNIfcaw, JNIC, and JNIsnia should be removed later after the removal of the FCA.

For further commands and examples on how to find out the various information, see [Detailed example analysis of a given environment](#).

Sun FCA installation and configuration

The Sun FCA installation and configuration consists of several steps that are described in detail in [Detailed example Sun FCA configuration for a given environment](#). In short the following steps are required:

- Install SAN foundation software with all related patches for Sun FCAs.
- Shut down system.
- Detach Fibre Channel cables.
- Swap FCAs (record WWPN if listed on Sun FCA).
- Re-attach Fibre Channel cables and potentially adjust port settings on the Fibre Channel switch/director.
- Verify XP settings and potentially adjust these settings (see below).
- Boot system into OpenBoot Prom and record WWPN at OpenBoot Prom if WWPN is not available on paper.
- Do a reconfiguration boot into single user mode.
- For third-party cards/drivers, install driver (if not already present, for example, SAN foundation software for Sun FCAs) and reboot system. Refer to the FCA vendor instructions. Some vendors may require the driver installation before installing the FCA into the system.
- Adjust zoning for FCAs (if WWPN zoning used) and verify success on system.
- Adjust the WWPN configuration in the XP array.
- Rescan system (and VERITAS Volume Manager).
- If VERITAS Volume Manager is used, the device naming will default to enclosure-based naming rather than device file-based naming with Sun FCAs (`c##t#d#s#` with JNI FCAs will display as `XP###0_#` with Sun FCAs).
- Verify that system sees all previous LUNs.
- If only single FCA was used and no VERITAS Volume Manager, modify `/etc/vfstab`.
- De-install JNI drivers that are no longer needed.
- If a switch to native Solaris multipathing (Sun StorEdge Traffic Manager with Solaris 8 and 9) with Sun FCAs is desired, perform additional configuration.
- Reboot system into Multi-User Mode and verify correct operation.

With HP StorageWorks XP128 Disk Array/XP1024 Disk Array/XP12000 Disk Array and Sun FCAs, LUNs can be added dynamically on the XP array without any further activity required on the Solaris host. To have the full functionality available, some specific modes may need to be set on the XP array.

Table 1. XP modes

	HP StorageWorks XP512 Disk Array	XP1024 Disk Array	XP12000 Disk Array
Sun StorEdge Traffic Manager	System Mode 244	System Mode 244	N/R
Sun FCAs Dynamic LUN Addition	N/A	System Mode 249	Host Group Mode 7

N/R – not required, N/A – not available
Host mode must always be 09 for Solaris.

Path failover considerations

With Sun FCAs you have two choices for path failover/multipathing:

- VERITAS Volume Manager
- Sun StorEdge Traffic Manager/Sun FC Multipathing

Sun StorEdge Traffic Manager (part of SAN Foundation software) offers you the following functionality.

Solaris 8 and 9 support (no support for Solaris 2.6 and 7):

- Single instance multipath devices
- Automatic path failover
- Load balancing—round-robin or none
- Dynamic LUN addition
- Multipath configuration management (with reboot)
- Sun cluster and VERITAS cluster support
- Support or Sun Volume Manager, Solstice Disk Suite, and VERITAS Volume Manager
- SAN boot on STMS-enabled ports/devices

For details, see http://www.sun.com/products-n-solutions/hardware/docs/Network_Storage_Solutions/SAN/

See the *HP StorageWorks Disk Array XP Operating System Configuration Guide*, page 22, for details on how to configure the Sun StorEdge Traffic Manager.

With Solaris 10, multipathing is included in the operating system and offers similar functionality as Sun StorEdge Traffic Manager. For further details, see <http://docs.sun.com/source/819-0139/ProductOverview.html>.

VERITAS Volume Manager dynamic multipathing offers you the following functionality:

- Multiple instance devices are represented as one metanode (all paths visible through different disk names in format)
- Automatic and manual path failover
- Load balancing
- Default “balanced path mechanism” to optimize I/Os
- Choice of adaptive, balanced, minimum, priority, round-robin, and singleactive policies (with Version 4.0 or later)
- Dynamic LUN addition
- Dynamic multipath configuration management
- VERITAS cluster support (no Sun cluster support)
- VERITAS Volume Manager only (built-in feature)

For further details, see http://support.veritas.com/menu_ddProduct_VOLUMEMAN.htm

Detailed example analysis of a given environment

The following example illustrates the commands used and information shown for a SunFire 280R connected to an XP12000 Disk Array with two FCX2-6562 cards, the Sun StorEdge SAN 4.4.x software installed, and four disks (LUNs) visible through two paths in a VERITAS Volume Manage configuration.

List jni packages installed:

```
# pkginfo | grep -i jni
system      JNIC146x      JNI Fibre Channel SCSI HBA Driver
application JNIsnia       JNI SNIA Fibre Channel HBA LIBRARY (Solaris)
system      SUNWjfca      JNI Fibre Channel Adapter (FCA) Driver
system      SUNWjfcau     JNI Fibre Channel Adapter (FCA) (usr)
system      SUNWjfcaux    JNI Fibre Channel Adapter (FCA) (usr) (64-bit)
system      SUNWjfcax     JNI Fibre Channel Adapter (FCA) Driver (64-bit)
```

Display system diagnostic information to list which cards are installed (some cards may not show the model types):

```
# /usr/platform/sun4u/sbin/prtdiag
System Configuration: Sun Microsystems sun4u Sun Fire 280R (UltraSPARC-III)
...
```

```
===== IO Cards =====
```

Brd	IO Type	Port ID	Bus Side	Slot	Bus Freq MHz	Max Bus Freq	Dev, Func	State	Name	Model	
...	I/O	PCI	8	B	2	33	33	3,0	ok	JNI,FCR/sd (block)	FCX2-6562
I/O	PCI	8	B	2	33	33	3,1	ok	JNI,FCR/sd (block)	FCX2-6562	
I/O	PCI	8	A	1	66	66	1,0	ok	JNI,FCR/sd (block)	FCX2-6562	
I/O	PCI	8	A	1	66	66	1,1	ok	JNI,FCR/sd (block)	FCX2-6562	

Show one-line information for each XP devices (if xpinfo has been installed). Besides showing the device file names, the xpinfo command also shows the XP port where the Solaris host is connected (CL5A and CL6A in this example):

```
# xpinfo -i
Scanning disk devices...

Device File                ALPA Tgt Lun Port  CU:LDev Type          Serial#
-----
/dev/rdisk/c4t30d0s2       00  1e  00  CL5A  00:06  OPEN-V             -SUN 00010090
/dev/rdisk/c4t30d1s2       00  1e  01  CL5A  00:0e  OPEN-V             -SUN 00010090
/dev/rdisk/c4t30d2s2       00  1e  02  CL5A  00:16  OPEN-V             -SUN 00010090
/dev/rdisk/c4t30d3s2       00  1e  03  CL5A  00:1e  OPEN-V             -SUN 00010090
/dev/rdisk/c5t20d0s2       00  14  00  CL6A  00:06  OPEN-V             -SUN 00010090
/dev/rdisk/c5t20d1s2       00  14  01  CL6A  00:0e  OPEN-V             -SUN 00010090
/dev/rdisk/c5t20d2s2       00  14  02  CL6A  00:16  OPEN-V             -SUN 00010090
/dev/rdisk/c5t20d3s2       00  14  03  CL6A  00:1e  OPEN-V             -SUN 00010090
```

Show all disk devices through format (if xpinfo has not been installed). There is no information about the XP ports.

```
# echo | format
Searching for disks...done

AVAILABLE DISK SELECTIONS:
 0. c1t0d0 <SUN18G cyl 7506 alt 2 hd 19 sec 248>
    /pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w2100002037e45fe6,0
 1. c4t30d0 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
    /pci@8,600000/JNI,FCR@1,1/sd@1e,0
 2. c4t30d1 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
    /pci@8,600000/JNI,FCR@1,1/sd@1e,1
 3. c4t30d2 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
    /pci@8,600000/JNI,FCR@1,1/sd@1e,2
 4. c4t30d3 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
    /pci@8,600000/JNI,FCR@1,1/sd@1e,3
 5. c5t20d0 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
    /pci@8,700000/JNI,FCR@3,1/sd@14,0
 6. c5t20d1 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
    /pci@8,700000/JNI,FCR@3,1/sd@14,1
 7. c5t20d2 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
```

```

/pci@8,700000/JNI,FCR@3,1/sd@14,2
8. c5t20d3 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
/pci@8,700000/JNI,FCR@3,1/sd@14,3
Specify disk (enter its number): Specify disk (enter its number):

```

Verify if there are entries for slices of preceding disks in /etc/vfstab. In the following example, only the boot disk is present and a VERITAS Volume (/dev/vx/dsk/testdg/vol01):

```

# cat /etc/vfstab
#device      device          mount          FS      fsck    mount  mount
#to mount    to fsck        point         type    pass   at boot options
fd           -              /dev/fd fd     -       no     -
/proc       -              /proc proc   -       no     -
/dev/dsk/clt0d0s1 -              -            swap   -       no     -
/dev/dsk/clt0d0s0 /dev/rdisk/clt0d0s0 /             ufs    1       no     -
/dev/dsk/clt0d0s7 /dev/rdisk/clt0d0s7 /export ufs    2       yes    -
/dev/dsk/clt0d0s6 /dev/rdisk/clt0d0s6 /global ufs    2       yes    -
/dev/dsk/clt0d0s5 /dev/rdisk/clt0d0s5 /meta ufs    2       yes    -
swap        -              /tmp tmpfs   -       yes    -
/dev/vx/dsk/testdg/vol01 /dev/vx/rdisk/testdg/vol01 /mnt/test      ufs    2       yes    -

```

Show VERITAS Volume Manager disk information:

```

# vxdisk list
DEVICE      TYPE      DISK      GROUP     STATUS
c1t0d0s2    sliced   -         -         error
c4t30d0s2    sliced   disk01    rootdg    online
c4t30d1s2    sliced   c4t30d1   testdg    online
c4t30d2s2    sliced   c4t30d2   testdg    online
c4t30d3s2    sliced   c4t30d3   testdg    online

```

Display VERITAS Volume Manager configuration:

```

# vxprint -h
Disk group: rootdg

TY NAME      ASSOC      KSTATE  LENGTH  PLOFFS  STATE  TUTILO  PUTILO
dg rootdg    rootdg     -        -        -        -        -        -

dm disk01     c4t30d0s2 -        16742400 -        -        -        -

Disk group: testdg

TY NAME      ASSOC      KSTATE  LENGTH  PLOFFS  STATE  TUTILO  PUTILO
dg testdg    testdg     -        -        -        -        -        -

dm c4t30d1    c4t30d1s2 -        16742400 -        -        -        -
dm c4t30d2    c4t30d2s2 -        16742400 -        -        -        -
dm c4t30d3    c4t30d3s2 -        16742400 -        -        -        -

v vol01      fsgen      ENABLED 50227200 -        ACTIVE  -        -
pl vol01-01  vol01      ENABLED 50227200 -        ACTIVE  -        -
sd c4t30d1-01 vol01-01   ENABLED 16742400 0        -        -        -
sd c4t30d2-01 vol01-01   ENABLED 16742400 16742400 -        -        -
sd c4t30d3-01 vol01-01   ENABLED 16742400 33484800 -        -        -

```

As can be seen from the previous output, all (four) XP disks are part of the VERITAS Volume Manager configuration and the file system that is mounted during boot is on three disks. To show VERITAS Volume Manager dynamic multipathing information for a given disk from the previous list:

```

# vxdisk list c4t30d1s2
Device:      c4t30d1s2
devicetag:   c4t30d1
...
Multipathing information:
numpaths:    2
c4t30d1s2    state=enabled
c5t20d1s2    state=enabled

```

Show information about the WWPN/ World Wide Node Name (WWNN) binding (on the XP array the WWPN and WWNN of a given port are identical; the configuration file name depends on the type of JNI package/driver installed, see [Detailed example analysis of a given environment](#)). In the following example, instance jnic146x1 has been bound as target 20 to XP port with WWPN 50060E8004276A50 and instance jnic146x3 has been bound as target 30 to XP port with WWPN 50060E8004276A40:

```
# grep target /kernel/drv/jnic146x.conf | grep -v '#'  
jnic146x1-target20_hba="jnic146x1";  
jnic146x1-target20_wwnn="50060E8004276A50";  
jnic146x3-target30_hba="jnic146x3";  
jnic146x3-target30_wwnn="50060E8004276A40";
```

The following screen and screen extract (from HP StorageWorks Command View) shows the XP configuration including the worldwide names that have been configured for the ports CL5A and CL6A.

Figure 2. HP StorageWorks Command View XP LUN Manager

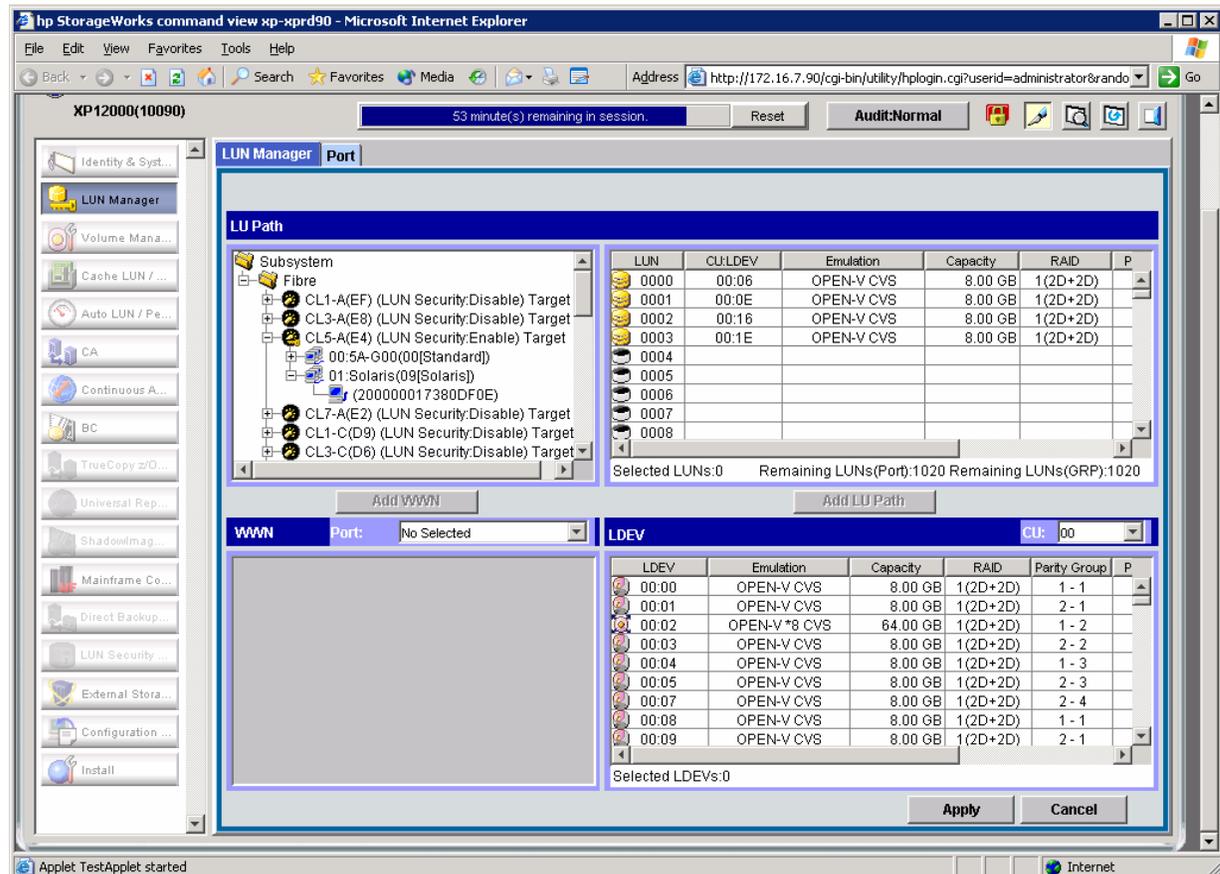


Figure 3. HP StorageWorks Command View XP LUN Manager LU Path Extract

LUN	CU:LDEV	Emulation	Capacity	RAID	P
0000	00:06	OPEN-V CVS	8.00 GB	1(2D+2D)	
0001	00:0E	OPEN-V CVS	8.00 GB	1(2D+2D)	
0002	00:16	OPEN-V CVS	8.00 GB	1(2D+2D)	
0003	00:1E	OPEN-V CVS	8.00 GB	1(2D+2D)	
0004					
0005					
0006					
0007					
0008					

Selected LUNs:0 Remaining LUNs(Port):1020 Remaining LUNs(GRP):1020

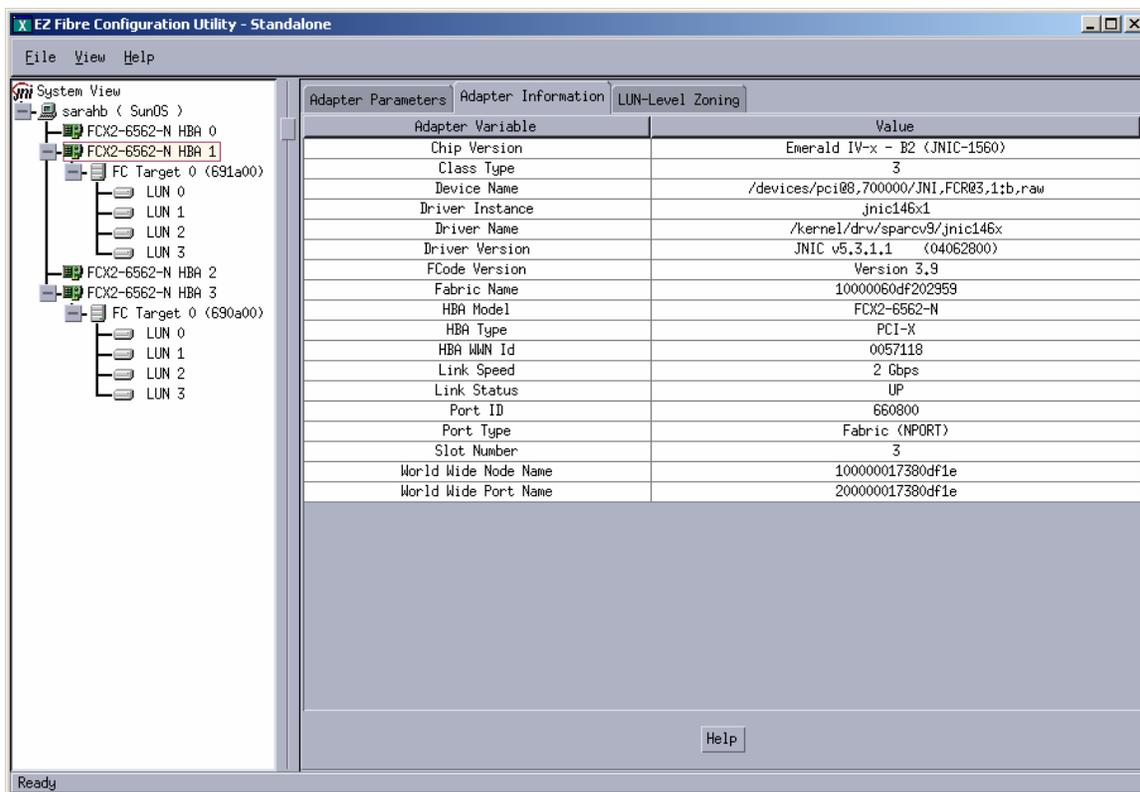
In case you have the WWPN for multiple systems configured for a given XP port and do not know which WWPN will have to be replaced, you may need to look up the WWPN of your current FCAs. If you know to which SAN ports your system is connected, you may look up this information on a SAN switch or through a SAN management application (for example, switchshow or nsshow commands on a Brocade switch). Another approach is to look up this information on the Solaris host.

As the WWPN information is only logged during boot, this assumes that either /var/adm/messages or an archived messages file contains this information. The following command searches for string wwpn in /var/adm/messages and lists the last four lines with columns 5–8 (field delimiter “.”):

```
# grep -i wwpn /var/adm/messages | tail -4 | cut -d: -f4-8
[ID 996788 kern.notice] jnic146x0: WWNN: 100000017300DF1E WWPN: 200000017300DF1E
[ID 425511 kern.notice] jnic146x1: WWNN: 100000017380DF1E WWPN: 200000017380DF1E
[ID 107312 kern.notice] jnic146x2: WWNN: 100000017300DF0E WWPN: 200000017300DF0E
[ID 436016 kern.notice] jnic146x3: WWNN: 100000017380DF0E WWPN: 200000017380DF0E
```

In case you cannot get this information from the log file, EZFibre may be used to retrieve this information (to get EZFibre and installation directions, see <http://www.amcc.com>):

Figure 4. EZFibre Adapter information



In case WWPN-based zoning is used, this information also must be retrieved from the SAN. The following output shows the WWPN-based zoning on SAN red and SAN blue (which consists of an XP port and of a JNI FCA):

Zone red-solaris-xp:

```
50060E8004276A40      # XP port CL5A
200000017380DF0E      # FCX-6562 instance jnic146x3
```

Zone blue-solaris-xp:

```
50060E8004276A50      # XP port CL6A
200000017380DF1E      # FCX-6562 instance jnic146x1
```

Detailed example Sun FCA configuration for a given environment

Before the Sun FCA is installed, the Sun StorEdge SAN release software should be installed. Go to <http://www.sun.com/storage/san/> and select Sun StorEdge SAN 4.4 release Software/Firmware Upgrades and Documentation. You are then prompted for a login and password and you must register first in case you have not done this before. After your successful login, confirm the license agreement and then download the latest Install_it Script SAN (4.4.4 at the time of this writing). See the Install_it Script SAN 4.4.x Readme to learn how to unpack it and then run it on your Solaris host. In case you have already installed the Sun StorEdge SAN software, you should check as explained in <http://sunsolve8.sun.com/search/document.do?assetkey=1-9-77230-1> (login required) regarding which version you have installed or run the install_it script again. To be sure you

have the latest version of patches installed, installation of PatchPro is recommended. The following output is an extract from the install_it script:

```
# ./install_it
...
This routine installs the packages and patches that
make up Sun StorEdge SAN.

PatchPro may be installed for use with downloading the
most up to date versions of the patches.

Would you like to continue with the installation?
[y,n,?] y

Verifying system...

      Patch 112396-02      : Installed Previously.
...

Begin installation of SAN software

Installing StorEdge SAN packages -

      Package SUNWsan      : Installed Previously.
      ...
      Package SUNWjfcaux   : Installed Previously.

StorEdge SAN packages installation completed.

Begin patch installation
      Patch 108982-09      : Installed Previously.
      ...
      Patch 113767-07      : Installed Successfully.
      Patch 114877-08      : Installed Previously.
[Optional] Install Patchpro to search for updates
to the Sun StorEdge SAN release ?

[y,n,?] y

Patchpro not installed. Starting installation of Patchpro.

This utility will install PatchPro and all required support
software. It is a wrapper around pkgadd and patchadd. It
will honor your SVR4 install policies and will backout all
changes if anything goes wrong.

...

Would you like to continue with the installation? [y,n,?,q] y

Beginning installation ...
Now installing supporting packages...
      SUNWjhrt
      == installed successfully
...
Installation is complete and verified. Be sure to:
...
Ready to configure PatchPro Security Certificates.
...
Proxy set.
PatchPro Configuration Completed.
...
No StorEdge SAN patches need to be installed.

Installation of Sun StorEdge SAN completed Successfully

-----
Please reboot your system.
-----

# init 5

INIT: New run level: 5
The system is coming down. Please wait.
System services are now being stopped.
...
The system is down.
syncing file systems... done
```

After the system has been shut down and powered off, the AMCC/JNI FCAs must be disconnected from the SAN and the cards removed from the PCI/cPCI/Sbus slots. Now the Sun FCAs must be put into the respective PCI/cPCI/Sbus slots and connected with FC cable to the SAN.

After having reconnected all the cables, power on the system.

At the OK prompt look up the WWPN of the Sun FCAs and be sure you select the correct address (in the following example qlc@1 is the internal connection to FC-AL disks). In case you cannot look up the information at the OK prompt, there are other methods to look up the WWPN, which are explained later.

```
screen not found.
keyboard not found.
Keyboard not present. Using ttya for input and output.

Sun Fire 280R (UltraSPARC-III) , No Keyboard
Copyright 1998-2004 Sun Microsystems, Inc. All rights reserved.
OpenBoot 4.13.0, 1024 MB memory installed, Serial #51385697.
Ethernet address 0:3:ba:10:15:61, Host ID: 83101561.

ok show-devs
/pci@8,600000
/pci@8,700000
/memory-controller@0,400000
/SUNW,UltraSPARC-III@0,0
/virtual-memory
/memory@0,0
/aliases
/options
/openprom
/chosen
/packages
/pci@8,600000/SUNW,qlc@1
/pci@8,600000/SUNW,qlc@4
/pci@8,600000/SUNW,qlc@1/fp@0,0
/pci@8,600000/SUNW,qlc@1/fp@0,0/disk
/pci@8,600000/SUNW,qlc@4/fp@0,0
/pci@8,600000/SUNW,qlc@4/fp@0,0/disk
/pci@8,700000/SUNW,qlc@3
/pci@8,700000/pci@1
/pci@8,700000/scsi@6,1
/pci@8,700000/scsi@6
/pci@8,700000/usb@5,3
More [<space>,<cr>,<q,n,p,c>] ? q
ok cd /pci@8,600000/SUNW,qlc@1
ok .properties
assigned-addresses      81000810 00000000 00000400 00000000 00000100
                        82000814 00000000 00102000 00000000 00002000
                        82000830 00000000 00140000 00000000 00020000
port-wwn                 21 00 00 e0 8b 10 4e de
node-wwn                 20 00 00 e0 8b 10 4e de
reg                      00000800 00000000 00000000 00000000 00000000
                        01000810 00000000 00000000 00000000 00000100
                        02000814 00000000 00000000 00000000 00001000
compatible               pci1077,2300.1077.106.1
                        pci1077,2300.1077.106
                        pci1077,106
                        pci1077,2300.1
                        pci1077,2300
                        pciiclass,0c0400
                        pciiclass,0c04
manufacturer            QLGC
#size-cells              00000000
#address-cells           00000002
device_type              scsi-fcp
name                     SUNW,qlc
version                  ISP2300 Host Adapter Driver: 1.14.01 12/20/02
fcode-rom-offset        00000000
More [<space>,<cr>,<q,n,p,c>] ? q
ok cd /pci@8,700000/SUNW,qlc@3
ok .properties
assigned-addresses      81001810 00000000 00000500 00000000 00000100
                        82001814 00000000 0012c000 00000000 00002000
                        82001830 00000000 00140000 00000000 00020000
port-wwn                 21 00 00 e0 8b 10 b2 dd
...
```

Be sure you record WWPN (port-wwn) before proceeding. After you have recorded the WWPN, boot the system.

If you use VERITAS Volume Manager and have rootdg on the XP disks, you will get similar error messages to the following messages, which is normal as your disks from the XP array cannot yet be seen.

```
ok boot -sr
Boot device: /pci@8,600000/SUNW,qlc@4/fp@0,0/disk@w2100002037e45fe6,0:a File and args: -sr
SunOS Release 5.8 Version Generic_117350-11 64-bit
Copyright 1983-2003 Sun Microsystems, Inc. All rights reserved.
Starting VxVM restore daemon...
VxVM starting in boot mode...
vxvm:vxconfigd: ERROR: enable failed: Error in disk group configuration copies
    No valid disk found containing disk group; transactions are disabled.
vxvm:vxconfigd: FATAL ERROR: Rootdg cannot be imported during boot
configuring IPv4 interfaces: eri0 qfe3.
Hostname: sarahb
Configuring /dev and /devices
Configuring the /dev directory (compatibility devices)
VxVM general startup...
vxvm:vxconfigd: ERROR: enable failed: Error in disk group configuration copies
    No valid disk found containing disk group; transactions are disabled.
vxvm: Vold is not enabled for transactions
    No volumes started

INIT: SINGLE USER MODE

Type control-d to proceed with normal startup,
(or give root password for system maintenance):
single-user privilege assigned to /dev/console.
Entering System Maintenance Mode

Mar 22 12:58:31 su: 'su root' succeeded for root on /dev/console
Sun Microsystems Inc. SunOS 5.8 Generic Patch October 2001
You have new mail.
```

Display system diagnostic information to show that the cards are installed properly (Sun FCAs are typically not showing a model string; the name is the same as the first compatible display for .properties at the OK prompt):

```
# /usr/platform/sun4u/sbin/prtdiag
System Configuration: Sun Microsystems sun4u Sun Fire 280R (UltraSPARC-III)
...
===== IO Cards =====

      Bus Max
      IO Port Bus   Freq Bus Dev,
Brd  Type ID Side Slot MHz Freq Func State Name
-----
...
I/O  PCI  8   B   2   33  33  3,0 ok  SUNW,qlc-pci1077,2300.1077.106.1+
I/O  PCI  8   A   1   66  66  1,0 ok  SUNW,qlc-pci1077,2300.1077.106.1+
```

Verify that the FCA has successfully logged in to the fabric (fc-fabric, connected) in a SAN environment. If this is not the case, you may need to offline/disable and online/enable the respective switch ports again:

```
# cfgadm -al
Ap_Id          Type          Receptacle  Occupant    Condition
c0             scsi-bus      connected    configured   unknown
c0::dsk/c0t6d0 CD-ROM        connected    configured   unknown
c1             fc-private    connected    configured   unknown
c1::2100002037e45fe6 disk          connected    configured   unknown
c2             scsi-bus      connected    unconfigured unknown
c8             fc-fabric     connected    unconfigured unknown
c9             fc-fabric     connected    unconfigured unknown
```

In case you did not look up the WWPN at the OK prompt, you may also look up the WWPN on the operating system. For additional methods besides the following prtconf command, see DocId 76953 at <http://sunsolve.sun.com>:

```
# prtconf -vp | grep -i wwn
port-wwn: 210000e0.8b10b2dd
node-wwn: 200000e0.8b10b2dd
port-wwn: 21000003.ba101561
node-wwn: 20000003.ba101561
port-wwn: 210000e0.8b104ede
node-wwn: 200000e0.8b104ede
```

In this example the WWPN of the FCAs are 210000E08B104EDE and 210000E08B10B2DD (the other WWPN is the FCA for the internal disks). The next step is to change the SAN configuration to replace the AMCC/JNI FCA WWPNs with the Sun FCA WWPNs. The following output shows the adapted WWPN-based zoning on SAN red and SAN blue (which now consists of an XP port and of a Sun FCA).

Zone red-solaris-xp:

50060E8004276A40 # XP port CL5A

210000E08B104EDE # Sun FCA

Zone blue-solaris-xp:

50060E8004276A50 # XP port CL6A

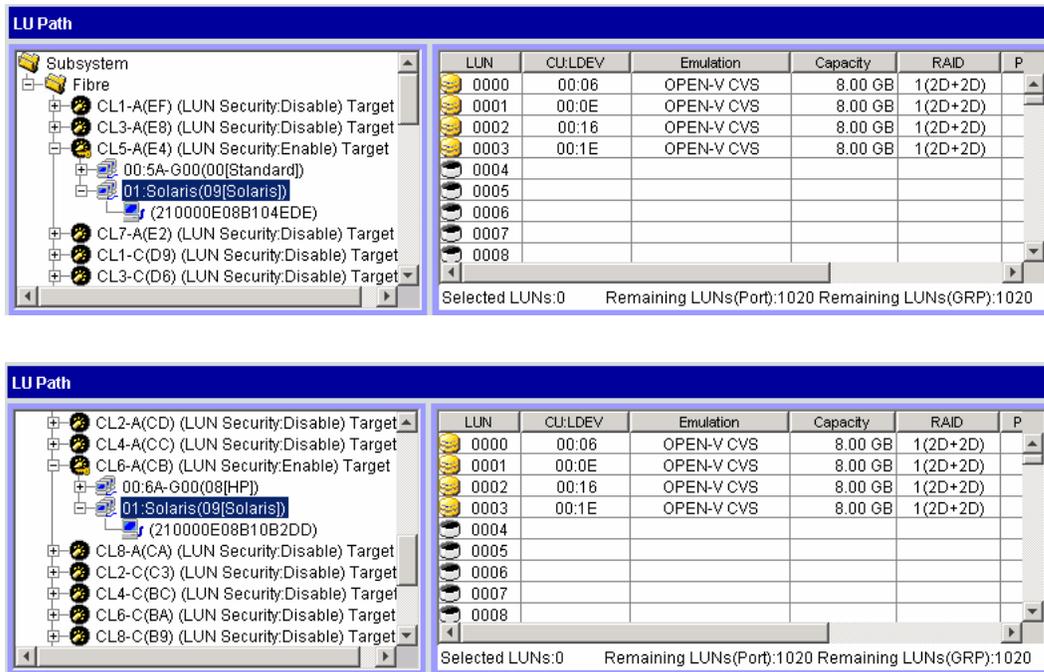
210000E08B10B2DD # Sun FCA

The next step is to change the SAN configuration to replace the AMCC/JNI FCA WWPNs with the Sun FCA WWPNs. After this change you should see the following output with the XP WWPNs listed on the Solaris host:

```
# cfgadm -al
Ap_Id      Type      Receptacle  Occupant  Condition
c0         scsi-bus  connected   configured unknown
c0::dsk/c0t6d0  CD-ROM    connected   configured unknown
c1         fc-private connected   configured unknown
c1::2100002037e45fe6  disk     connected   configured unknown
c2         scsi-bus  connected   unconfigured unknown
c8         fc-fabric  connected   unconfigured unknown
c8::50060e8004276a50  unknown  connected   unconfigured failed
c9         fc-fabric  connected   unconfigured unknown
c9::50060e8004276a40  unknown  connected   unconfigured failed
```

Change the XP configuration to reflect the new FCA. The new WWPN should be shown in Command View for the given port. Delete the previous WWPN and add the new WWPN. In this case the preceding FCA WWPN is configured on the XP ports as following (extract from Command View):

Figure 5. HP StorageWorks Command View XP LUN Manager LU Path Extracts



Configure the FCA to the XP ports:

```
# cfgadm -c configure c8
# cfgadm -c configure c9
```

Verify that all LUNs are present with the cfmadm or luxadm command:

```
# cfmadm -al -o show_FCP_dev
Ap_Id          Type          Receptacle  Occupant    Condition
c1             fc-private   connected   configured  unknown
c1::2100002037e45fe6,0  disk        connected   configured  unknown
c8             fc-fabric    connected   configured  unknown
c8::50060e8004276a50,0  disk        connected   configured  unknown
c8::50060e8004276a50,1  disk        connected   configured  unknown
c8::50060e8004276a50,2  disk        connected   configured  unknown
c8::50060e8004276a50,3  disk        connected   configured  unknown
c9             fc-fabric    connected   configured  unknown
c9::50060e8004276a40,0  disk        connected   configured  unknown
c9::50060e8004276a40,1  disk        connected   configured  unknown
c9::50060e8004276a40,2  disk        connected   configured  unknown
c9::50060e8004276a40,3  disk        connected   configured  unknown
# luxadm probe
No Network Array enclosures found in /dev/es

Found Fibre Channel device(s):
Node WWN:2000002037e45fe6 Device Type:Disk device
Logical Path:/dev/rdisk/clt0d0s2
Node WWN:50060e8004276a50 Device Type:Disk device
Logical Path:/dev/rdisk/c8t50060E8004276A50d0s2
Node WWN:50060e8004276a50 Device Type:Disk device
Logical Path:/dev/rdisk/c8t50060E8004276A50d1s2
Node WWN:50060e8004276a50 Device Type:Disk device
Logical Path:/dev/rdisk/c8t50060E8004276A50d2s2
Node WWN:50060e8004276a50 Device Type:Disk device
Logical Path:/dev/rdisk/c8t50060E8004276A50d3s2
Node WWN:50060e8004276a40 Device Type:Disk device
Logical Path:/dev/rdisk/c9t50060E8004276A40d0s2
Node WWN:50060e8004276a40 Device Type:Disk device
Logical Path:/dev/rdisk/c9t50060E8004276A40d1s2
Node WWN:50060e8004276a40 Device Type:Disk device
Logical Path:/dev/rdisk/c9t50060E8004276A40d2s2
Node WWN:50060e8004276a40 Device Type:Disk device
Logical Path:/dev/rdisk/c9t50060E8004276A40d3s2
```

Confirm new names with xpinfo or format. As you can see, both the controller id changes (c8 and c9) and the target name in the disk device name changes from the previously assigned t20 or t30 to t50060E8004276A40 or t50060E8004276A50, thus reflecting the XP WWPN in the device name:

```
# xpinfo -i
Scanning disk devices...

Device File          ALPA Tgt Lun Port  CU:LDev Type          Serial#
=====
/dev/rdisk/c8t50060E8004276A50d0s2 --- --- --- CL6A 00:06 OPEN-V -SUN 00010090
/dev/rdisk/c8t50060E8004276A50d1s2 --- --- --- CL6A 00:0e OPEN-V -SUN 00010090
/dev/rdisk/c8t50060E8004276A50d2s2 --- --- --- CL6A 00:16 OPEN-V -SUN 00010090
/dev/rdisk/c8t50060E8004276A50d3s2 --- --- --- CL6A 00:1e OPEN-V -SUN 00010090
/dev/rdisk/c9t50060E8004276A40d0s2 --- --- --- CL5A 00:06 OPEN-V -SUN 00010090
/dev/rdisk/c9t50060E8004276A40d1s2 --- --- --- CL5A 00:0e OPEN-V -SUN 00010090
/dev/rdisk/c9t50060E8004276A40d2s2 --- --- --- CL5A 00:16 OPEN-V -SUN 00010090
/dev/rdisk/c9t50060E8004276A40d3s2 --- --- --- CL5A 00:1e OPEN-V -SUN 00010090
# echo | format
Searching for disks...done
```

```
AVAILABLE DISK SELECTIONS:
 0. clt0d0 <SUN18G cyl 7506 alt 2 hd 19 sec 248>
   /pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w2100002037e45fe6,0
 1. c8t50060E8004276A50d0 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
   /pci@8,700000/SUNW,qlc@3/fp@0,0/ssd@w50060e8004276a50,0
 2. c8t50060E8004276A50d1 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
   /pci@8,700000/SUNW,qlc@3/fp@0,0/ssd@w50060e8004276a50,1
 3. c8t50060E8004276A50d2 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
   /pci@8,700000/SUNW,qlc@3/fp@0,0/ssd@w50060e8004276a50,2
 4. c8t50060E8004276A50d3 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
   /pci@8,700000/SUNW,qlc@3/fp@0,0/ssd@w50060e8004276a50,3
 5. c9t50060E8004276A40d0 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
   /pci@8,600000/SUNW,qlc@1/fp@0,0/ssd@w50060e8004276a40,0
 6. c9t50060E8004276A40d1 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
   /pci@8,600000/SUNW,qlc@1/fp@0,0/ssd@w50060e8004276a40,1
 7. c9t50060E8004276A40d2 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
   /pci@8,600000/SUNW,qlc@1/fp@0,0/ssd@w50060e8004276a40,2
 8. c9t50060E8004276A40d3 <HP-OPEN-V-SUN-5003 cyl 2182 alt 2 hd 15 sec 512>
   /pci@8,600000/SUNW,qlc@1/fp@0,0/ssd@w50060e8004276a40,3
Specify disk (enter its number): Specify disk (enter its number):
```

Rescan with the VERITAS Volume Manager and verify that the disk information is shown:

```
# vxdctl enable
NOTICE: vxvm:vxdmp: added disk array 10090, datatype = XP12K
```

Show VERITAS Volume Manager disk information:

```
# vxdisk list
DEVICE      TYPE      DISK      GROUP      STATUS
XP12K0_0    sliced   c4t30d3   testdg     online
XP12K0_1    sliced   c4t30d2   testdg     online
XP12K0_2    sliced   c4t30d1   testdg     online
XP12K0_3    sliced   disk01    rootdg     online
c1t0d0s2    sliced   -         -         error
```

Display VERITAS Volume Manager configuration:

```
# vxprint -h
Disk group: rootdg

TY NAME      ASSOC      KSTATE    LENGTH    PLOFFS    STATE     TUTILO    PUTILO
dg rootdg    rootdg     -         -         -         -         -         -

dm disk01     XP12K0_3   -         16742400 -         -         -         -

Disk group: testdg

TY NAME      ASSOC      KSTATE    LENGTH    PLOFFS    STATE     TUTILO    PUTILO
dg testdg    testdg     -         -         -         -         -         -

dm c4t30d1    XP12K0_2   -         16742400 -         -         -         -
dm c4t30d2    XP12K0_1   -         16742400 -         -         -         -
dm c4t30d3    XP12K0_0   -         16742400 -         -         -         -

v vol01      fsgen      ENABLED   50227200 -         ACTIVE    -         -
pl vol01-01  vol01      ENABLED   50227200 -         ACTIVE    -         -
sd c4t30d1-01 vol01-01   ENABLED   16742400 0         -         -         -
sd c4t30d2-01 vol01-01   ENABLED   16742400 16742400 -         -         -
sd c4t30d3-01 vol01-01   ENABLED   16742400 33484800 -         -         -
```

As can be seen from the previous output, all (four) XP disks are part of the VERITAS Volume Manager configuration and the file system that is mounted during boot is on three disks. To show VERITAS Volume Manager dynamic multipathing information for a given disk from the previous list:

```
# vxdisk list XP12K0_0
Device:      XP12K0_0
devicetag:   XP12K0_0
type:        sliced
hostid:      sarahb
disk:        name=c4t30d3 id=1110895575.1060.sarahb
group:       name=testdg id=1110895590.1063.sarahb
flags:       online ready private autoconfig autoimport imported
pubpaths:    block=/dev/vx/dmp/XP12K0_0s4 char=/dev/vx/rdmp/XP12K0_0s4
privpaths:   block=/dev/vx/dmp/XP12K0_0s3 char=/dev/vx/rdmp/XP12K0_0s3
...
Defined regions:
config priv 000017-000247[000231]: copy=01 offset=000000 enabled
config priv 000249-005468[005220]: copy=01 offset=000231 enabled
log priv 005469-006294[000826]: copy=01 offset=000000 enabled
Multipathing information:
numpaths:    2
c8t50060E8004276A50d3s2 state=enabled
c9t50060E8004276A40d3s2 state=enabled
```

Remove the AMCC/JNI driver that is no longer needed (driver name may be different as explained in [Analysis of current environment](#)):

```
# pkgrm JNIC146x JNIsnia

The following package is currently installed:
  JNIC146x      JNI Fibre Channel SCSI HBA Driver
                (sparc) v5.3.1.1 (04062800)

Do you want to remove this package? y

## Removing installed package instance <JNIC146x>

This package contains scripts which will be executed with super-user
permission during the process of removing this package.

Do you want to continue with the removal of this package [y,n,?,q] y
## Verifying package dependencies.
## Processing package information.
```

```

## Executing preremove script.
jnicl46x_unload: The jnicl46x driver has been successfully unloaded.

A jnicl46x device driver configuration file already exists. This file
may be removed or replaced, so it is being backed up.

Backing up /kernel/drv/jnicl46x.conf to /opt/JNIC146x/conf/jnicl46x.conf.20050321_143151

## Removing pathnames in class <none>
/opt/JNIC146x/readme.txt
/opt/JNIC146x/jnicl46x_update_drv
/opt/JNIC146x/jnicl46x_unload
/opt/JNIC146x/jnicl46x_load
/opt/JNIC146x/jnicl46x_busy
/opt/JNIC146x <non-empty directory not removed>
/kernel/drv/sparcv9/jnicl46x
/kernel/drv/jnicl46x.conf
/kernel/drv/jnicl46x
## Updating system information.

Removal of <JNIC146x> was successful.

The following package is currently installed:
  JNIsnia          JNI SNIA Fibre Channel HBA LIBRARY (Solaris)
                   (sparc) v2.0.b.030717-16

Do you want to remove this package? y

## Removing installed package instance <JNIsnia>

This package contains scripts which will be executed with super-user
permission during the process of removing this package.

Do you want to continue with the removal of this package [y,n,?,q] y
## Verifying package dependencies.
## Processing package information.
## Executing preremove script.
----- Updating /etc/hba.conf
----- /etc/hba.conf updated
----- /etc/hba.conf ready
## Removing pathnames in class <none>
/opt/JNIsnia/Solaris/hbaapi.h
...
/opt/JNIsnia/Solaris
/opt/JNIsnia
/etc <shared pathname not removed>
## Updating system information.

Removal of <JNIsnia> was successful.

```

Reboot the system to verify correct operation:

```

# init 6
INIT: New run level: 6
The system is coming down. Please wait.
System services are now being stopped.
...
The system is down.
syncing file systems... done
rebooting...
Resetting ...
screen not found.
keyboard not found.
Keyboard not present. Using ttya for input and output.

Sun Fire 280R (UltraSPARC-III) , No Keyboard
Copyright 1998-2004 Sun Microsystems, Inc. All rights reserved.
OpenBoot 4.13.0, 1024 MB memory installed, Serial #51385697.
Ethernet address 0:3:ba:10:15:61, Host ID: 83101561.

Rebooting with command: boot
Boot device: /pci@8,600000/SUNW,qlc@4/fp@0,0/disk@w2100002037e45fe6,0:a File and args:
SunOS Release 5.8 Version Generic_117350-11 64-bit
Copyright 1983-2003 Sun Microsystems, Inc. All rights reserved.
Starting VxVM restore daemon...
VxVM starting in boot mode...
vxvm:vxconfigd: ERROR: enable failed: Error in disk group configuration copies
      No valid disk found containing disk group; transactions are disabled.
vxvm:vxconfigd: FATAL ERROR: Rootdg cannot be imported during boot
configuring IPv4 interfaces: eri0 qfe3.
Hostname: sarahb
VxVM general startup...
NOTICE: vxvm:vxdump: added disk array 10090, datatype = XP12K

```

```

The system is coming up. Please wait.
checking ufs filesystems
/dev/vx/rdisk/testdg/vol101: is clean.
/dev/rdisk/clt0d0s5: is clean.
/dev/rdisk/clt0d0s6: is clean.
/dev/rdisk/clt0d0s7: is clean.
starting rpc services: rpcbind done.
Setting netmask of eri0 to 255.255.0.0
Setting netmask of qfe3 to 255.255.248.0
Setting default IPv4 interface for multicast: add net 224.0/4: gateway sarahb
syslog service starting.
Print services started.
volume management starting.
Starting VxVM Diskgroup Configuration Log Daemon...
The system is ready.

```

Glossary

FCA	Fibre Channel Adapter
LUN	Logical Unit Number. An addressable storage collection. Seen as a disk on Solaris
WWNN	World Wide Node Name, unique 64-bit address for Fibre Channel addressing of a node
WWPN	World Wide Port Name, unique 64-bit address for Fibre Channel addressing of a port

For more information

For additional information, refer to the following web resources.

Resource description	Web address
HP Storageworks Disk Array XP Operating System Configuration Guide: Sun Solaris, A5951-96033	http://h20000.www2.hp.com/bizsupport/TechSupport/DocumentIndex.jsp?contentType=SupportManual&prodSeriesId=436460
SAN Foundation Software and Sun StorEdge Traffic Manager documentation	http://www.sun.com/products-n-solutions/hardware/docs/Network_Storage_Solutions/SAN
Sun Adapter documentation	http://www.sun.com/products-n-solutions/hardware/docs/Network_Storage_Solutions/Adapters/
HP Customer Notice: AMCC JNI Adapter End Of Life Customer Communication	http://h20000.www2.hp.com/bizsupport/TechSupport/Document.jsp?objectID=PSD_CN0714W

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