

# VERITAS Volume Manager™ 3.1

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## Hardware Notes

Solaris

August 2000  
32-000001-399

  
VERITAS

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Printed in the USA, August 2000.

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## Introduction

This document provides hardware support information for the VERITAS Volume Manager™ Release 3.1.

This release of the Volume Manager has been tested on:

- ◆ Solaris 2.6
- ◆ Solaris 7 (32- and 64-bit)
- ◆ Solaris 8 (32- and 64-bit).

## Getting Help

For license information or information about VERITAS® service packages, contact VERITAS Customer Support.

US Customers: 1-800-342-0652

International Customers: +1 (650) 335-8555

Fax: (650) 335-8428

Electronic mail: [support@veritas.com](mailto:support@veritas.com)

For licensing issues: [licensing @veritas.com](mailto:licensing@veritas.com)

## Using Prestoserve With the Volume Manager

Prestoserve is designed to accelerate performance of file systems, particularly when used on a server for NFS advertised file systems. This is accomplished via the use of NVRAM hardware and the Prestoserve drivers. The hardware provides a fast, nonvolatile solid-state memory writeback cache that can cause writes to a disk device to be returned to the user as completed before the data reaches the disk.



---

This mechanism can be configured to work below VxVM<sup>®</sup> as direct replacement for the disk device that VxVM uses. This approach presents no particular problems for VxVM, which remains unaware of the underlying cache device. In the event of a failure of the NVRAM devices, it is possible to lose data since the disks backing the NVRAM may not be up-to-date.

Prestoserve can be configured to run above VxVM in such a way that VxVM replaces the disks that Prestoserve controls. In this situation, VxVM has a number of problems to address.

The most serious problem is with the startup of Prestoserve. Following a system failure, the Prestoserve drivers cause a flush of all outstanding dirty buffers to be flushed to disk. If this flush request occurs before VxVM drivers have been loaded into the kernel and before the volume devices can be started and made available for use, then Prestoserve's attempts at flushing to the volumes fails.

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**Caution** This problem could lead to file system corruption and data loss.

---

To prevent this situation, it is recommended that the order of the starting of Prestoserve with respect to the volumes be altered to occur after the volumes have been started. To achieve this, perform the following steps:

1. Edit the `/etc/system` file to add the line

```
exclude: drv/pr
```

and remove any line similar to this:

```
forceload: drv/pr
```

This causes the Prestoserve driver to be loaded and the flush operation to be started *after* the volume devices have been started.

1. Edit the file `/etc/init.d/vxvm-startup2` and add the following lines to the end of the file:

```
modload /kernel/drv/pr
presto -p > /dev/null
```

This causes initialization of the Prestoserve driver (and flushing of saved blocks) following the start of all volumes.

Edit the `/etc/init.d/prestoserve` file and replace the following line:

```
presto -u
```

with the following:

```
presto -u /mnt1 /mnt2 ...
```



Where */mnt1* and */mnt2* should list every file system to be accelerated with Prestoserve. Note that this list must *not* include */*, */usr*, */usr/kvm*, */var*, or */var/adm*.

---

**Caution** Without the explicit starting of `presto` with the desired file systems, the default action accelerates all file systems, which (on the next reboot) could lead to data corruption since the file system checks for */*, */usr*, */usr/kvm*, */var*, and */var/adm* precede the flushing of the Prestoserve buffers.

---

As is stated in the *Prestoserve User's Guide*, it is important not to reboot the system using the `-r` flag unless the system was cleanly shut down. VxVM can be used to add and remove drives without the need for a `boot -r`.

A second, and more subtle problem, is in Prestoserve's use of disk devices. Some applications (including Prestoserve) maintain device numbers between reboots. VxVM also attempts to maintain device numbers between reboots. However, if a disk group is moved from one machine to another (or reattaching of disks causes some previously non-working disk group to reappear), it is possible for a conflict of minor numbers to be detected. VxVM tries to prevent this by using randomly-assigned device number ranges (which are less likely to result in conflicts), but this policy can fail if two disk groups from different machines end up with the same randomly-assigned range.

The danger of VxVM changing its device numbers on a reboot following a system failure is that Prestoserve may flush its dirty buffers to the wrong volume devices. This may have destructive results.

If two disk groups do end up with volumes that use conflicting device numbers, the device number for one of the volumes is temporarily remapped on reboot (or when the second disk group is imported). Each reboot may choose a different remapping than was chosen on the previous reboot, leading to problems with Prestoserve. Anytime a volume device number is temporarily remapped, the following console message is displayed:

```
vxvm:vxconfigd: WARNING: Group ...: Duplicate virtual device
number:          Volume ... remapped from old-number to new-number
```

If you see such a message, you should change the numbers for all volumes in the named disk group, using the `vxdg remminor` command.

One method for ensuring that Prestoserve never encounters two volumes with conflicting device numbers is to use Prestoserve only on volumes in the `rootdg` disk group. The `rootdg` disk group is always imported first, so it cannot conflict with a previously-imported disk group.



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## VERITAS Volume Manager Disk Array Configuration Updates

This section lists some of the disk arrays supported for Dynamic Multipathing (DMP) and describes how to use Volume Manager with the Sun StorEdge A3000/A3500 Array. These topics are described in this section.

- ◆ The DMP Command Utility (`vxdmpadm`)
- ◆ Disk arrays supported for DMP
- ◆ Using the Sun StorEdge A3000/A3500 Array with the VERITAS Volume Manager
- ◆ Installation of the Volume Manager with the Sun StorEdge A3000/A3500 Array
- ◆ VERITAS Volume Manager and Sun StorEdge A3000/A3500 Array device nodes
- ◆ Benefits in using VERITAS Volume Manager with the Sun StorEdge A3000/A3500 Array
- ◆ VERITAS Volume Manager and Sun StorEdge A3000/A3500 Array supported and unsupported configurations
- ◆ Volume Manager hot relocation and Sun StorEdge A3000/A3500 Array hot sparing

### The DMP Command Utility (`vxdmpadm`)

The `vxdmpadm` utility administers the dynamic multipathing (DMP) functionality of Volume Manager. Refer to the manual page of the `vxdmpadm(1M)` utility for a detailed description of the options and attributes of this command.

You can use the `vxdmpadm` utility command `listctlr` to list all controllers connected to disks that are attached to the host. For example, to list all controllers connected to disks on the host, use the following command:

```
# vxdmpadm listctlr all
```

to display the following example output:

CTLR-NAME	ENCLR-TYPE	STATE	ENCLR-NAME
c0	OTHER	ENABLED	others0
c1	SEAGATE	ENABLED	seagate0
c2	SEAGATE	ENABLED	seagate0

The above displayed output shows that:

- ◆ the first controller `c0` is connected to disk(s) that are not under any recognized DMP category
- ◆ the second and third controllers (`c1` and `c2`) are connected to A5x00 (SEAGATE) disk array





All the above controllers are in the ENABLED state which indicates that they are available for IO operations.

The state DISABLED is used to indicate that controllers are unavailable for IO operations. The unavailability can be due to a hardware failure or due to IO operations being disabled on that controller by the System Administrator. The controller state can be changed by using the vxddmpadm utility.

To list all the paths(s) that are connected to a particular controller, you can use the getsubpaths option with the ctlr attribute. For example, use the following command:

```
# vxddmpadm getsubpaths ctlr=c1
```

to display the following example output:

NAME	STATE	PATH-TYPE	DMPNODENAME	ENCLR-TYPE	ENCLR-NAME
c1t0d0s2	ENABLED	-	c2t0d0s2	SEAGATE	seagate0
c1t1d0s2	ENABLED	-	c2t1d0s2	SEAGATE	seagate0
c1t2d0s2	ENABLED	-	c2t2d0s2	SEAGATE	seagate0
c1t3d0s2	ENABLED	-	c2t3d0s2	SEAGATE	seagate0
c1t4d0s2	ENABLED	-	c2t4d0s2	SEAGATE	seagate0
c1t5d0s2	ENABLED	-	c2t5d0s2	SEAGATE	seagate0
c1t6d0s2	ENABLED	-	c2t6d0s2	SEAGATE	seagate0
c1t16d0s2	ENABLED	-	c2t16d0s2	SEAGATE	seagate0
c1t17d0s2	ENABLED	-	c2t17d0s2	SEAGATE	seagate0
c1t18d0s2	ENABLED	-	c2t18d0s2	SEAGATE	seagate0
c1t19d0s2	ENABLED	-	c2t19d0s2	SEAGATE	seagate0
c1t20d0s2	ENABLED	-	c2t20d0s2	SEAGATE	seagate0
c1t21d0s2	ENABLED	-	c2t21d0s2	SEAGATE	seagate0
c1t22d0s2	ENABLED	-	c2t22d0s2	SEAGATE	seagate0

The output display shows the paths that are connected to the controller named **c1**

Additional information displayed shows that:

- ◆ path c1t0d0s2 (represented by nodes in the /dev/rdisk and /dev/dsk directories) is in the ENABLED state
- ◆ path c1t0d0s2 is represented by the DMP metanode c1t0d0s2 which is represented by device nodes in the /dev/vx/dmp and /dev/vx/rdmp directories.

You can use the getsubpaths option combined with the dmpnodename attribute to list all paths(s) that are connected to a LUN (represented by a DMP device). For example, to list information about paths that lead to the LUN named c1t0d0s2, use the following command:

```
# vxddmpadm getsubpaths dmpnodename=c1t0d0s2
```

to display the following example output:



---

NAME	STATE	PATH-TYPE	CTLR-NAME	ENCLR-TYPE	ENCLR-NAME
c2t0d0s2	DISABLED	-	c2	SEAGATE	seagate0
c1t0d0s2	ENABLED	-	c1	SEAGATE	seagate0

The listing above shows that the DMP device `c1t0d0s2` has two paths to it that are named `c1t0d0s2` and `c2t0d0s2`. Additional information indicates that only one of these paths is available for I/O operations. One of these paths is in the ENABLED state and the other is in the DISABLED state. Both paths are in a SEAGATE disk array.

To retrieve the name of the DMP device that controls a particular path, the `getdmpnode` option can be combined with the `nodename` attribute by using the following command:

```
# vxddmpadm getdmpnode nodename=c1t0d0s2
```

to display the following example output:

NAME	STATE	ENCLR-TYPE	PATHS	ENBL	DSBL	ENCLR-NAME
c2t0d0s2	ENABLED	SEAGATE	2	2	0	seagate0

This example output shows that the path `c2t0d0s2` is owned by the DMP device `c2t0d0s2` which has two paths to it.

## Disk Arrays Supported for DMP

---

**Note** Arrays supported by the DMP feature are a subset of the arrays supported by Volume Manager. The following arrays can have multiple paths to the same disk. Other arrays not listed here can only have a single path to the physical disk.

---

The Dynamic Multipathing feature of the Volume Manager supports the following arrays:

- ◆ EMC Symmetrix™
- ◆ HP SureStore™ E Disk Array XP256
- ◆ IBM Enterprise Storage Servers™ (ESS)
- ◆ Hitachi Data Systems™ 5700E Disk Array Subsystem™
- ◆ Hitachi Data Systems 5800E/7700E Disk Array Subsystem™
- ◆ Sun StorEdge A5x00 Array™
- ◆ Sun StorEdge T3 Array™
- ◆ JBOD (Just a Bunch of Disks)
- ◆ SEAGATE disks that return unique serial numbers in standard SCSI inquiry data



- ◆ Storage Computer™ OmniRaid™ disk array. To multipath Storage Computer disk arrays connected to the system while using Volume Manager 3.1, you must assign a unique *system name* for each disk array connected to a machine. The RAID-5 Users Manual at the ftp site *www.storage.com* describes how to set a system name for Storage Computer disk arrays.
- ◆ ECCS™ Synchronix™ Array

### DMP Co-existence With Drivers

The Dynamic Multipathing feature of the Volume Manager also supports co-existence with the following arrays:

- ◆ DG CLARiiON with the ATF driver installed on the system
- ◆ SYMBIOS Sun StorEdge A3000/A3500 Array, only when the RDAC driver is installed on the system

### DMP and EMC Symmetrix Disk Array Support

The Dynamic Multipathing feature of the Volume Manager works with the EMC Symmetrix disk array only if the disk array is configured in the *Common Serial Number Mode*. This is because only the *Common Serial Number Mode* configuration provides unique device identification on different paths for DMP to configure its database. Without this mode, DMP cannot provide multipathing functionality. DMP cannot access EMC Symmetrix disks as individual disks with a single path it found by scanning the device information tree in the kernel.

For the DMP functionality to work with the EMC Symmetrix disk array, the following conditions must be met:

- ◆ It is necessary that the EMC Symmetrix users program their disk arrays in the *Common Serial Number Mode* before installing the Volume Manager package.
- ◆ The minimum level of microcode on the EMC Symmetrix should be:

Sym-4	3330, 3430,3700	5265 and 5266 microcode
Sym-4.8	3630,3830,3930	5265 and 5266 microcode
Sym-5	8130,8430,8730	5566 microcode

- ◆ The *Common Serial Number Mode* should be enabled for all channels that participate in DMP. This is done at installation time in the Symmetrix configuration by the EMC Customer Engineer.



- ◆ In addition, the *disable queue reset on unit attention mode* must be set for all channels that participate in the DMP. This also is done at installation time in the Symmetrix configuration by the EMC Customer Engineer.

Contact your EMC Technical Support Representative for instructions.

DMP supports SCSI and SAN data gateways using JNI and QLOGIC cards.

DMP supports the Ultra SCSI and the fast-wide differential (FWD) SCSI controllers used with the EMC Symmetrix disk array.

- ◆ Ultra SCSI and fast-wide differential (FWD) SCSI support has been tested on the EMC OSD (Open System Director) controller.
- ◆ DMP was tested on and supports the Jaycor fiber controllers: firmware release level F, and driver level V2.0.1EMC and V2.0.2EMC. You should contact Jaycor and EMC for the latest supported driver for the specific controller being used on the EMC Symmetrix.

---

**Note** Uncommenting the *failover= line* in */kernel/drv/fca.conf* line is important for the DMP failover as it reduces the amount of time it takes for a path to be considered failed. The default time is over five minutes and setting this value reduces the time considerably.

---

See your sales representative for further updates on hardware support.

### HP SureStore™ E Disk Array XP256

The minimum software driver and firmware levels for the JNI adapter are:

FC64-1063 Software Driver: Minimum level is V2.3. Current level V2.4.1 is recommended.

FC64-1063 Firmware level: Minimum level 13.3.5, or above.

```
romance:/-> vxddmpadm listctlr all
CTLR-NAME          ENCLR-TYPE          STATE          ENCLR-NAME
=====
c0                  OTHER               ENABLED        others0
c5                  XP256               ENABLED        xp256-0
c6                  XP256               DISABLED       xp256-0
romance:/-> vxddmpadm getsubpaths ctlr=c5
NAME              STATE              PATH-TYPE      DMPNODENAME     ENCLR-TYPE      ENCLR-NAME
=====
c5t11d1s2         ENABLED            -              c5t11d1s2       XP256           xp256-0
c5t11d2s2         ENABLED            -              c5t11d2s2       XP256           xp256-0
c5t11d3s2         ENABLED            -              c5t11d3s2       XP256           xp256-0
c5t11d4s2         ENABLED            -              c5t11d4s2       XP256           xp256-0
c5t11d5s2         ENABLED            -              c5t11d5s2       XP256           xp256-0
```



```

c5t11d6s2  ENABLED  -      c5t11d6s2  XP256      xp256-0
c5t11d7s2  ENABLED  -      c5t11d7s2  XP256      xp256-0
c5t11d8s2  ENABLED  -      c5t11d8s2  XP256      xp256-0
c5t11d9s2  ENABLED  -      c5t11d9s2  XP256      xp256-0
c5t11d10s2 ENABLED  -      c5t11d10s2 XP256      xp256-0
c5t11d11s2 ENABLED  -      c5t11d11s2 XP256      xp256-0
c5t11d12s2 ENABLED  -      c5t11d12s2 XP256      xp256-0

```

romance: /-> **vxddisk list**

DEVICE	TYPE	DISK	GROUP	STATUS
c0t0d0s2	sliced	-	-	error
c5t11d1s2	sliced	disk04	rootdg	online
c5t11d2s2	sliced	disk05	rootdg	online
c5t11d3s2	sliced	disk06	rootdg	online
c5t11d4s2	sliced	disk07	rootdg	online
c5t11d5s2	sliced	disk08	rootdg	online
c5t11d6s2	sliced	-	-	error
c5t11d7s2	sliced	-	-	error
c5t11d8s2	sliced	-	-	error
c5t11d9s2	sliced	-	-	error
c5t11d10s2	sliced	disk01	rootdg	online
c5t11d11s2	sliced	disk02	rootdg	online
c5t11d12s2	sliced	disk03	rootdg	online

romance: /-> **vxddisk list disk03**

```

Device:      c5t11d12s2
devicetag:  c5t11d12
type:       sliced
hostid:     romance
disk:       name=disk03 id=961801990.1071.romance
group:      name=rootdg id=961801968.1025.romance
flags:      online ready private autoconfig autoimport imported
pubpaths:   block=/dev/vx/dmp/c5t11d12s4
             char=/dev/vx/rdmp/c5t11d12s4
privpaths:  block=/dev/vx/dmp/c5t11d12s3
             char=/dev/vx/rdmp/c5t11d12s3
version:    2.1
iosize:     min=512 (bytes) max=256 (blocks)
public:     slice=4 offset=0 len=14417280
private:    slice=3 offset=1 len=2879
update:     time=963519037 seqno=0.240
headers:    0 248
configs:    count=1 len=2104
logs:       count=1 len=318
Defined regions:
config  priv 000017-000247[000231]: copy=01 offset=000000
        disabled
config  priv 000249-002121[001873]: copy=01 offset=000231
        disabled

```



```

log      priv 002122-002439[000318]: copy=01 offset=000000
      disabled
Multipathing information:
numpaths:    2
c5t11d12s2   state=enabled
c6t8d12s2   state=disabled

```

## IBM Enterprise Storage Server (ESS)

Minimum software driver and firmware levels for the JNI adapter are:

- ◆ FC64-1063 Software Driver: Minimum level is V2.3. Current level V2.4.1 is recommended.
- ◆ FC64-1063 Firmware level: Minimum level 13.3.5, or above.

QLogic Solaris V2.6 required patches:

- ◆ 105181-15 SunOS 5.6: kernel update patch
- ◆ 105797-06 SunOS 5.6: /kernel/drv/sd patch
- ◆ 105604-07 SunOS 5.6: ebus/pci/rootnex driver patch

JNI Solaris V2.6 required patches:

- ◆ 105181-19 SunOS 5.6: Kernel update patch
- ◆ 105356-13 SunOS 5.6: /kernel/drv/ssd and /kernel/drv/sd patch
- ◆ 105600-15 SunOS 5.6: /kernel/drv/isp patch

Solaris Parameters:

- ◆ set sd:sd\_max\_throttle = 24
- ◆ set sd:sd\_io\_time=0xf0
- ◆ set sd:sd\_retry\_count=10

```

# vxddm adm listctlr all
CTLR-NAME      ENCLR-TYPE      STATE      ENCLR-NAME
=====
c0              OTHER           ENABLED    others0
c3              IBM-SHARK       ENABLED    shark0
c4              IBM-SHARK       DISABLED   shark0
c0              SEAGATE         ENABLED    seagate0
# vxddm adm getsubpaths ctlr=c4
NAME          STATE      PATH-TYPE  DMPNODENAME  ENCLR-TYPE  ENCLR-NAME
=====
c4t1d2s2     DISABLED  -          c3t0d2s2     IBM-SHARK   shark0

```



```

c4t1d3s2  DISABLED  -      c4t1d3s2  IBM-SHARK  shark0
c4t1d4s2  DISABLED  -      c3t0d4s2  IBM-SHARK  shark0
c4t1d5s2  DISABLED  -      c3t0d5s2  IBM-SHARK  shark0
c4t1d6s2  DISABLED  -      c3t0d6s2  IBM-SHARK  shark0
c4t1d7s2  DISABLED  -      c3t0d7s2  IBM-SHARK  shark0
c4t1d8s2  DISABLED  -      c3t0d8s2  IBM-SHARK  shark0
c4t1d9s2  DISABLED  -      c3t0d9s2  IBM-SHARK  shark0
c4t1d10s2 DISABLED  -      c3t0d10s2 IBM-SHARK  shark0
c4t1d11s2 DISABLED  -      c3t0d11s2 IBM-SHARK  shark0
c4t1d12s2 DISABLED  -      c3t0d12s2 IBM-SHARK  shark0
c4t1d13s2 DISABLED  -      c3t0d13s2 IBM-SHARK  shark0
c4t1d14s2 DISABLED  -      c3t0d14s2 IBM-SHARK  shark0

```

**# vxdisk list**

DEVICE	TYPE	DISK	GROUP	STATUS
c0t0d0s2	sliced	-	-	error
c0t1d0s2	sliced	-	-	error
c3t0d1s2	sliced	disk06	rootdg	online
c3t0d2s2	sliced	disk07	rootdg	online
c3t0d4s2	sliced	disk09	rootdg	online
c3t0d5s2	sliced	disk10	rootdg	online
c3t0d6s2	sliced	disk11	rootdg	online
c3t0d7s2	sliced	disk14	rootdg	online
c3t0d8s2	sliced	disk12	rootdg	online
c3t0d9s2	sliced	disk13	rootdg	online
c3t0d10s2	sliced	-	-	error
c3t0d11s2	sliced	-	-	error
c3t0d12s2	sliced	-	-	error
c3t0d13s2	sliced	-	-	error
c3t0d14s2	sliced	-	-	error
c3t1d10s6	simple	-	-	error
c3t1d11s6	simple	-	-	error
c4t1d3s2	sliced	disk08	rootdg	online

**# vxdisk list disk08**

```

Device:      c4t1d3s2
devicetag:  c4t1d3
type:       sliced
hostid:     banjo
disk:       name=disk08 id=963015532.1097.banjo
group:      name=rootdg id=963015492.1025.banjo
flags:      online ready private autoconfig autoimport imported
pubpaths:  block=/dev/vx/dmp/c4t1d3s4 char=/dev/vx/rdmp/c4t1d3s4
privpaths: block=/dev/vx/dmp/c4t1d3s3 char=/dev/vx/rdmp/c4t1d3s3
version:    2.1
iosize:     min=512 (bytes) max=256 (blocks)
public:     slice=4 offset=0 len=3897600
private:    slice=3 offset=1 len=3839
update:     time=963517507 seqno=0.213

```



```

headers:    0 248
configs:    count=1 len=2808
logs:       count=1 len=425
Defined regions:
  config    priv 000017-000247[000231]: copy=01 offset=000000 enabled
  config    priv 000249-002825[002577]: copy=01 offset=000231 enabled
  log       priv 002826-003250[000425]: copy=01 offset=000000 enabled
Multipathing information:
numpaths:   2
c4t1d3s2    state=disabled
c3t0d3s2    state=enabled
# vxddmpadm listctlr all
CTLR-NAME    ENCLR-TYPE    STATE    ENCLR-NAME
=====
c0            OTHER         ENABLED  others0
c3            IBM-SHARK     ENABLED  shark0
c4            IBM-SHARK     DISABLED shark0
c0            SEAGATE       ENABLED  seagate0
# vxddmpadm getsubpaths ctlr=c3
NAME         STATE    PATH-TYPE    DMPNODENAME    ENCLR-TYPE    ENCLR-NAME
=====
c3t0d1s2    ENABLED  -            c3t0d1s2       IBM-SHARK     shark0
c3t0d2s2    ENABLED  -            c3t0d2s2       IBM-SHARK     shark0
c3t0d4s2    ENABLED  -            c3t0d4s2       IBM-SHARK     shark0
c3t0d5s2    ENABLED  -            c3t0d5s2       IBM-SHARK     shark0
c3t0d6s2    ENABLED  -            c3t0d6s2       IBM-SHARK     shark0
c3t0d7s2    ENABLED  -            c3t0d7s2       IBM-SHARK     shark0
c3t0d8s2    ENABLED  -            c3t0d8s2       IBM-SHARK     shark0
c3t0d9s2    ENABLED  -            c3t0d9s2       IBM-SHARK     shark0
c3t0d10s2   ENABLED  -            c3t0d10s2      IBM-SHARK     shark0
c3t0d11s2   ENABLED  -            c3t0d11s2      IBM-SHARK     shark0
c3t0d12s2   ENABLED  -            c3t0d12s2      IBM-SHARK     shark0
c3t0d13s2   ENABLED  -            c3t0d13s2      IBM-SHARK     shark0
c3t0d14s2   ENABLED  -            c3t0d14s2      IBM-SHARK     shark0
c3t0d3s2    ENABLED  -            c4t1d3s2       IBM-SHARK     shark0

```

### DMP and Hitachi Data Systems 5700E SCSI Disk Array Subsystem Support

The Dynamic Multipathing feature of the Volume Manager supports the Hitachi Data Systems 5700E Disk Array Subsystem under the following conditions:

- ◆ The optional second controller is installed in the array.
- ◆ One controller is configured as *Active* and the other controller is configured as *Passive* (for improved performance).
- ◆ The array is connected to two SCSI cards in the host machine.





- ◆ The array has a firmware version that supports serial numbers in the SCSI inquiry data and they are configured correctly.

Table 1. Supported Microcode Levels

Unit	Microcode Version	Flash Revision
DF350 5700E	x308/E	pb28
DF350F 5700E	x356/F	pe27
DF300 5700	x109/L	dq3x/4x (x=89)
DF400 5800	x407/M	a03, b13
DF400 5800	x457/H	a03, b13

Contact your Hitachi Data Systems Technical Support Representative for instructions.

#### DMP and Hitachi Data Systems 5800E/7700E Fiber Disk Array Subsystem Support

The Dynamic Multipathing feature of the Volume Manager supports the Hitachi Data Systems 5800E/7700E Disk Array Subsystems in *Active/Active* mode only. The 5800E/7700E are treated as a `jbod` by DMP when the string `HITACHI` is added to the `/kernel/drv/vxddmp.conf` file in the `dmp_jbods[ ]` array. This entry is present in the `/kernel/drv/vxddmp.conf` file by default.

If more than 500 volumes are to be created in a single disk group, the private region for each disk must be increased from the default to one Mb. This can be accomplished by initializing each disk with the following command:

```
# vxdisksetup -i cXtXdX privlen=1m
```

#### DMP and Sun StorEdge T3 Array

The Dynamic Multipathing feature of VERITAS Volume Manager supports the Sun StorEdge T3 Array in the *Active/Passive* mode.

DMP only works with the T3 disk array if it is configured as follows:

- ◆ The minimum level of the firmware on the disk array must be Revision 1.0.
- ◆ The `mp_support` parameter must set to `rw`

Contact your Sun Technical Support Representative for instructions.



---

## DMP and JBOD Disk Array Support

The dynamic multipathing feature on JBOD drives enables DMP to multipath JBOD disk arrays connected to a system using VxVM. These JBOD disk arrays/disks can contain disks from any vendor. However, DMP can correctly detect multiple paths to these disks/disk arrays *only* if the following conditions are satisfied:

- ◆ The serial number field of the Standard SCSI INQUIRY DATA (bytes 36—47) should be “world wide unique” for any disk that is connected to a JBOD. This fact must be known to the user before the user attempts to configure DMP to add these disks to the JBOD category of DMP.

---

**Note** If any disk DOES NOT provide a unique serial number, DMP **cannot** detect multiple paths to the disk correctly and results are unpredictable. Contact the JBOD disk/disk array vendors to get correct information about uniqueness of serial numbers on the disks.

---

- ◆ The JBOD disk arrays that require multipathing functionality from DMP should be of the Active/Active type. This means that all paths to all LUNs on the JBOD disk array should be simultaneously accessible through all paths, without causing any performance degradation.

Once it is known that disks connected to a JBOD disk array satisfy the above conditions, the following four steps must be followed to get these disks under the JBOD category of DMP:

1. Go to the `/kernel/drv` directory
2. Edit the file `vxdmp.conf` in that directory
3. You will see the following default entry in the `vxdmp.conf`:

```
dmp_jbod="HITACHI "
```

For example, assume that there is a JBOD connected to a machine that contains DG Clariion disks. You need to know the **exact** Vendor ID string returned by these disks to configure DMP. This is to ensure that the required disks are claimed under the JBOD category.

The `format` command could be used to retrieve the Vendor ID string for a disk (for more details about the `format` command, check the `format(1M)` manual page on the system). The Vendor ID string is contained in bytes 8—15 of standard SCSI INQUIRY data returned by the disk. The `inquiry` option of the `format` command (when executed on a disk) returns the Vendor ID associated with a disk under the `Vendor:` field of the output. For example, a DG Clariion disk might return the Vendor ID

```
string "DGC".
```

This string must be included in the `vxdmp.conf` file as follows:



```
dmp_jbod="DGC" ;
```

If disks from multiple vendors are present in one JBOD disk array, vendor IDs of all vendors should be specified in the `vxddmp.conf` file. If this is not done, disks belonging to vendors that are not mentioned in the `dmp_jbod[]` array, are not multipathed by DMP and come under the category of OTHER DISKS. (Other Disks is a separate category of disks not multipathed by DMP and does not come under any of the supported categories in DMP.)

The following example shows how to add entries for multiple vendors in the `dmp_jbod[]` array.

```
dmp_jbod="DGC" ,
         "IBM" ,
         "FUJITSU" ;
```

The specified Vendor ID in the `vxddmp.conf` file cannot be more than eight characters long. If a Vendor ID string more than eight characters long is specified in the `vxddmp.conf` file, the following message is displayed on the console:

```
NOTICE: vxvm:vxddmp: Invalid Vendor ID = <vendor_id> specified
in vxddmp.conf file
```

```
Action: Remove or correct this entry in the vxddmp.conf file.
```

4. After the `vxddmp.conf` file has been edited to add the required entries, the system should be rebooted so that DMP can multipath the specified JBODs.

## Using the ATF Driver With the VERITAS Volume Manager

In previous releases, the CLARiiON ATF driver and DMP could not co-exist. Co-existence is allowed in VM 3.0 and above.

For DMP to co-exist with the ATF driver, the `CLatf` package (Application Transparent Failover Driver for CLARiiON) must be installed before the `VRTSvxvm/xVSUNWvxvm` packages are installed on the system.

---

**Note** In VM 3.1, ATF/DMP co-existence works **only** with the `CLatf 1.3.1` package.

---

For DMP to co-exist with the ATF driver, the boot disk should not be under control of the ATF driver.

You can get DMP to co-exist with the ATF driver by following the procedure described here. Here is a summary of steps to be taken for three scenarios, followed by a detailed procedure:



- 
1. Volume Manager is not installed.
    - ◆ Add ATF
  2. Add Volume Manager
  3. Volume Manager installed with DMP currently enabled.
    - ◆ Disable DMP
    - ◆ Add the ATF driver
    - ◆ Add Volume Manager 3.1, if appropriate
    - ◆ Re-enable DMP
  4. Volume Manager installed with DMP currently disabled:
    - ◆ Add the ATF driver
    - ◆ Add Volume Manager 3.1, if appropriate
    - ◆ Enable DMP

#### **DMP and ATF Driver Co-existence Procedure**

The following warning messages may be displayed after the ATF driver is forceloaded by the operating system (this is required for DMP co-existence with the ATF driver). The messages are similar to the following:

```
WARNING: atf[ 0/ 0/ 1/ 0]:No peer found.  
WARNING: atf[ 0/ 0/ 1/ 1]:No peer found.  
WARNING: atf[ 0/ 0/ 1/ 2]:No peer found.
```

These messages are normal and appear only when a DG CLARiiON connected to the system is single pathed. If it is dual pathed, these messages should not appear. You can safely ignore these warnings. Co-existence of DMP and ATF is in no way affected by these messages.

#### **Sun StorEdge A5x00 Array**

This section pertains to the A5000, A5100, and A5200 disk arrays. These disk arrays are claimed by VxVM (DMP) under the SEAGATE category.

When a cable connecting any of these disk arrays to the host is removed and the commands `drvconfig`, `disks`, and `vxdctl enable` are executed on the host, DMP does not display the pathnames in the standard `c#t#d#s#` format. Instead, the `NONAME` string is displayed to represent the name of the removed path.



For example, assume that a host is connected to one of the A5x00 disk arrays. That disk array has two fibre cables connecting it to the host. There is one disk on the disk array. The two paths to this disk are called `/dev/[r]dsk/c1t33d0s2` and `/dev/[r]dsk/c2t33d0s2`. When the disk is used by VxVM, the `vxdisk list <aname>` command executed on this disk displays the following:

```
# vxdisk list c1t33d0s2
Device:      c1t33d0s2
devicetag:   c1t33d0
type:        sliced
hostid:      gluon.veritas.com
disk:        name=rootdisk id=933470913.1042.gluon.veritas.com
group:       name=rootdg id=933470911.1025.gluon.veritas.com
flags:       online ready autoconfig autoimport imported
pubpaths:    block=/dev/vx/dmp/c1t33d0s6 char=/dev/vx/rdmp/c1t33d0s6
privpaths:   block=/dev/vx/dmp/c1t33d0s7 char=/dev/vx/rdmp/c1t33d0s7
version:     2.1
iosize:      min=512 (bytes) max=2048 (blocks)
public:      slice=6 offset=1 len=35363560
private:     slice=7 offset=1 len=4711
update:      time=933471058 seqno=0.9
headers:     0 248
configs:     count=1 len=3448
logs:        count=1 len=522
Defined regions:
config  priv 000017-000247[000231]: copy=01 offset=000000 enabled
config  priv 000249-003465[003217]: copy=01 offset=000231 enabled
log     priv 003466-003987[000522]: copy=01 offset=000000 enabled
Multipathing information:
numpaths:    2
c1t33d0s2   state=enabled
c2t33d0s2   state=enabled
```

After the cable connected to controller `c2` is removed and a `vxdtl enable` command is executed on the system, the display changes as follows:

```
# vxdisk list c1t33d0s2
Device:      c1t33d0s2
devicetag:   c1t33d0
type:        sliced
hostid:      gluon.veritas.com
disk:        name=rootdisk id=933470913.1042.gluon.veritas.com
group:       name=rootdg id=933470911.1025.gluon.veritas.com
flags:       online ready autoconfig autoimport imported
pubpaths:    block=/dev/vx/dmp/c1t33d0s6 char=/dev/vx/rdmp/c1t33d0s6
privpaths:   block=/dev/vx/dmp/c1t33d0s7 char=/dev/vx/rdmp/c1t33d0s7
version:     2.1
iosize:      min=512 (bytes) max=2048 (blocks)
```



```

public:    slice=6 offset=1 len=35363560
private:  slice=7 offset=1 len=4711
update:   time=933471058 seqno=0.9
headers:  0 248
configs:  count=1 len=3448
logs:     count=1 len=522
Defined regions:
  config  priv 000017-000247[000231]: copy=01 offset=000000 enabled
  config  priv 000249-003465[003217]: copy=01 offset=000231 enabled
  log     priv 003466-003987[000522]: copy=01 offset=000000 enabled
Multipathing information:
numpaths: 2
c1t33d0s2 state=enabled
NONAME     state=disabled

```

Similarly, the output of the `vxdmpadm` command also displays the `NONAME` string for the names of the paths that have been removed. For example, if the controller `c1` is removed from the host, the `vxdmpadm` command displays the following:

```

# vxdmpadm getsubpaths c1r=/c1
NAME      STATE      TYPE      DMPNODENAME  DA-TYPE  DA-SNO
=====
NONAME    DISABLED  -         c1t36d0s2   SEAGATE  SEAGATE_DISKS
NONAME    DISABLED  -         c1t49d0s2   SEAGATE  SEAGATE_DISKS
NONAME    DISABLED  -         c1t38d0s2   SEAGATE  SEAGATE_DISKS
NONAME    DISABLED  -         c1t37d0s2   SEAGATE  SEAGATE_DISKS
NONAME    DISABLED  -         c1t53d0s2   SEAGATE  SEAGATE_DISKS
NONAME    DISABLED  -         c1t34d0s2   SEAGATE  SEAGATE_DISKS
NONAME    DISABLED  -         c1t51d0s2   SEAGATE  SEAGATE_DISKS
NONAME    DISABLED  -         c1t54d0s2   SEAGATE  SEAGATE_DISKS
NONAME    DISABLED  -         c1t52d0s2   SEAGATE  SEAGATE_DISKS
NONAME    DISABLED  -         c1t33d0s2   SEAGATE  SEAGATE_DISKS
NONAME    DISABLED  -         c1t50d0s2   SEAGATE  SEAGATE_DISKS
NONAME    DISABLED  -         c1t32d0s2   SEAGATE  SEAGATE_DISKS
NONAME    DISABLED  -         c1t48d0s2   SEAGATE  SEAGATE_DISKS
NONAME    DISABLED  -         c1t35d0s2   SEAGATE  SEAGATE_DISKS

```

You should also note that when the path used to name the DMP metadvice (that represents a LUN) is removed, DMP uses the name of the alternate path to name the DMP metadvice.

For example, assume that there are two paths to a LUN called `c1t33d0s2` and `c2t33d0s2`. The DMP metadvice that represents the LUN is named `c1t33d0s2` and is in the `ONLINE` state. If the cable connected to controller `c1` is removed, followed by the `vxdctl enable` command, the DMP metadvice is renamed to `c2t33d0s2`. As a result, there are two metadvice corresponding to the same LUN visible to the user. Any one of these could be in the `error` state and the other in the `online` state. Note that this is not a problem. However, this results in some error messages when the `vxdisk list`



`<daname>` command is used on the original `daname` that was used to name the DMP device. The Multipathing Information is not displayed to the user but the following error message is displayed:

```
vxvm:vxdisk: ERROR: <da_name> not a valid dmpnode disk access name.
```

The disk paths that are no longer accessible can be removed using the `rm` command.

### To Disable DMP

**Note** Be sure to do these steps first:

1. Unmount all file systems created on Volume Manager volumes.
2. Stop the Volume Manager (use `vxctl stop`).

1. Remove the `vxadm` driver from the `/kernel/drv` directory using the following command:

```
# rm /kernel/drv/vxadm (For Solaris 2.6, 7, & 8)
# rm /kernel/drv/sparcv9/vxadm (For Solaris 7 & 8 64-bit only)
```

2. Edit `/etc/system`, and remove the line:

```
forceload: drv/vxadm
```

3. Remove the Volume Manager DMP files using the following command:

```
rm -rf /dev/vx/dmp /dev/vx/rdmp
```

4. Symbolically link `/dev/vx/dmp` to `/dev/dsk` using the following command:

```
ln -s /dev/dsk /dev/vx/dmp
```

5. Symbolically link `/dev/vx/rdmp` to `/dev/rdisk` using the following command:

```
ln -s /dev/rdisk /dev/vx/rdmp
```

6. Shut down the system to disable the DMP functionality using the following command:

```
/usr/sbin/shutdown
```

7. Reboot the system.

### To Re-enable DMP After It Has Been Disabled

Follow these instructions to re-enable the DMP driver once it has been removed:



- 
1. Halt the system using the following command:

```
# shutdown -g0 -y -i0
```

2. Boot to single-user mode using the following command:

```
# boot -s
```

3. Copy `vxdmp` driver back using the following commands:

```
# cp /kernel/drv/vxdmp.SunOS_`uname -r` \  
/kernel/drv/vxdmp (For Solaris 2.6, 7, & 8)  
# cp /kernel/drv/sparcv9/vxdmp.SunOS_`uname -r` \  
/kernel/drv/sparcv9/vxdmp (For Solaris 7 & 8 64-bit only)
```

4. Edit `/etc/system` and restore DMP entry using the following command:

Insert the line:

```
forceload: drv/vxdmp
```

above the line:

```
forceload:drv/vxio
```

5. Remove DMP links using the following command:

```
# rm /dev/vx/rdmp /dev/vx/dmp
```

6. Restore DMP directories using the following command:

```
# mkdir /dev/vx/dmp /dev/vx/rdmp  
# add_drv vxdmp
```

Disregard the following message if it appears:

```
Driver (vxdmp) is already installed
```

7. Halt the system:

```
# shutdown -g0 -y -i0
```

8. Perform a reconfiguration boot: `boot -r`

## Moving From Alternate Pathing to DMP

If your system had been using Alternate Pathing (AP) software from Sun, DMP would not have been installed on your system. If you would like to move from using AP to using DMP, follow this procedure:





1. Remove the AP software from your system. (Refer to the documentation from Sun for the proper method to remove the AP software.)
2. Perform a reconfiguration reboot using the following command:

```
# boot -r
```

3. Copy the appropriate DMP driver into place using the following commands:

```
# cp /kernel/drv/vxdmp.SunOS_`uname -r` /kernel/drv/vxdmp  
(For Solaris 2.6, 7, & 8)
```

```
# cp /kernel/drv/sparcv9/vxdmp.SunOS_`uname -r` \  
/kernel/drv/sparcv9/vxdmp (For Solaris 7 & 8 64-bit only)
```

4. Add the line:

```
forceload: drv/vxdmp
```

into your `/etc/system` file, just above the line:

```
forceload: drv/vxio
```

5. Remove the DMP links using the following command:

```
# rm /dev/vx/rdmp /dev/vx/dmp
```

6. Create the DMP directories using the following command:

```
# mkdir /dev/vx/rdmp /dev/vx/dmp  
# add_drv vxdmp
```

Disregard the following message if it appears:

```
Driver (vxdmp) is already installed
```

7. Halt the system using the following command:

```
# shutdown -g0 -y -i0
```

8. Perform a reconfiguration reboot using the following command:

```
# boot -r
```

## Dynamic Reconfiguration

Dynamic Reconfiguration (DR) is a feature available on some high end SUN Enterprise systems. The *board* to be reconfigured is a system board that contains disks controlled by Volume Manager (in addition to cpus, memory, and other controllers or I/O boards) that can be offlined while the system is still running. You can dynamically reconfigure your system using one of the relevant procedures described below.



---

**Note** The system board, disks and controllers could be configured in three different ways. Each of these configurations has a different procedure and may or may not require data to be offlined.

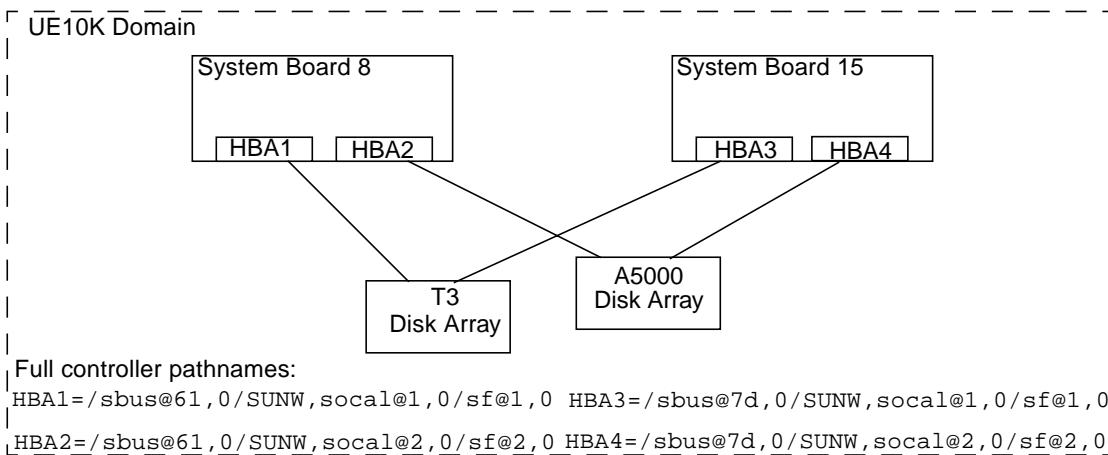
---

### Domain Configuration Type 1

In this configuration, each of the disk arrays connected to the system board to be detached satisfy the following criteria:

- ◆ The disk array is multipathed.
- ◆ Paths to the disk array are connected to more than one system board that constitute the *domain*. In other words, even if one board is removed, there will still be one or more access paths to the disk array, from other system boards.

An example of such a configuration is shown in the illustration, below.



Follow these steps while reconfiguring a system board in the domain, for example the System Board 8 in UE10K domain in the figure.

1. Identify all the disk controllers that are on the system board.

To identify the full controller names of all disk controllers connected to the board being detached, use the following commands:

```
# vxdmpadm listctlr all  
# drshow board_no IO
```

where *board\_no* is the system board to be detached.

For example, in Configuration 1, on the System Board 8, the disk controllers are:



```
/sbus@61,0/SUNW,socal@1,0/sf@1,0 and
/sbus@61,0/SUNW,socal@2,0/sf@2,0.
```

To obtain multipathing information, use the following command:

```
# vxdumpadm getsubpaths ctlr=ctlr-name
```

2. For each disk controller that is on the System Board, use the following command:

```
# vxdumpadm disable ctlr=ctlr_name
```

For example, in case of system board 8 shown in the figure above, use the following commands:

```
# vxdumpadm disable ctlr=/sbus@61,0/SUNW,socal@1,0/sf@1,0
# vxdumpadm disable ctlr=/sbus@61,0/SUNW,socal@2,0/sf@2,0
```

This command insures that I/Os are shifted over from the specified controller to an alternate controller connected to one of the other system boards (System Board 15 in the figure, above). This is a blocking command and may take some time to return to the caller depending on the number of I/Os currently active through this controller.

3. Follow the steps in the Sun documentation to dynamically reconfigure the system board.

When the board is replaced (or attached):

4. Re-enable the Volume Manager configuration daemon using the following command:

```
# vxdctl enable
```

5. Enable all the controllers on the board being attached using the following command:

```
# vxdumpadm enable ctlr=ctlr_name
```

for each controller on the board being replaced.

For example, in the figure, above, for attaching System Board 8, run the following commands:

```
# vxdumpadm enable ctlr=/sbus@61,0/SUNW,socal@1,0/sf@1,0
# vxdumpadm enable ctlr=/sbus@61,0/SUNW,socal@2,0/sf@2,0
```

This command insures that the controllers are now available for I/O to the Volume Manager.

## Domain Configuration Type 2

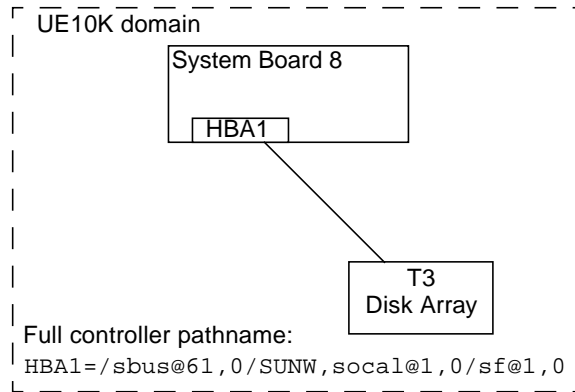
In this case, the disk array(s) connected to the system board to be detached are not accessible via other system boards in the same domain. For example, see the illustration, below.



---

**Note** This procedure may require data to be offlined during the operation if it is not on redundant VxVM volumes (example: RAID5, Mirror etc.).

---



The following procedure is used for this configuration:

1. All disks connected to the board being detached must be removed entirely from the VxVM control. Run the command `vxdiskadm` and choose the option:

```
Remove a disk for replacement
```

Run the following command on the disk:

```
# vxdisk rm daname
```

2. Follow the steps in the Sun documentation in order to detach the system board.

When the board is replaced (or attached):

Follow the steps in the SUN documentation to see the new drives/paths on this domain (for example, this can include the need to run utilities like `drvconfig` followed by `disks` etc).

3. Run the Volume Manager configuration daemon using the following command

```
# vxdctl enable
```

4. Re-add the disks to Volume Manager using the command `vxdiskadm` and choose

```
Replace a failed disk or removed disk
```

5. Restart all the volumes that were stopped as a result of the system board reconfiguration.

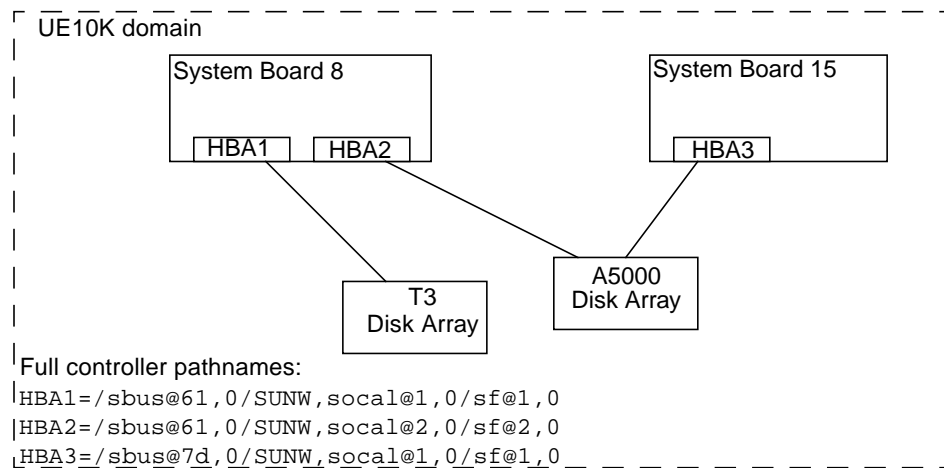


### Domain Configuration Type 3

In this case, the system board being detached has disk arrays connected in the following fashion:

- ◆ Some disk arrays are accessible only through the system board being reconfigured.
  - For disk arrays that are accessible through one system board, use the procedure for Domain Configuration Type 2.
- ◆ The remaining disk arrays are accessible through the other system board(s) as well.
  - For disk arrays that are accessible through multiple system boards, use the procedure for Domain Configuration Type 1.

An example configuration is shown in the following illustration:



To detach or attach System Board 8, use the following procedure:

1. For the T3 disk array which is accessible only through System Board 8, follow the procedure for Domain Configuration Type 2.
2. For the A5000 disk array which is accessible through multiple system boards, that is System Board 8 and System Board 15, follow the procedure for Domain Configuration Type 1.

### Using the Sun StorEdge A3000/A3500 Array With the VERITAS Volume Manager

**Note** The information in this section is current at the time of this printing, but is subject to change with new versions of the Sun StorEdge A3000/A3500 Array software.



---

The Sun StorEdge A3000/A3500 Array subsystem with the Sun StorEdge A3000/A3500 Array RAID Manager software is compatible with Volume Manager Release 3.1. To ensure compatibility between the Sun StorEdge A3000/A3500 Array and Volume Manager, you must do the following:

- ◆ The Sun StorEdge A3000/A3500 Array and Volume Manager installation sequence must be followed exactly as documented in the section *“Installation of the Volume Manager With the Sun StorEdge A3000/A3500 Array”*.
- ◆ Volume Manager volumes configured using devices from the Sun StorEdge A3000/A3500 Array subsystem cannot be part of the root disk group, `rootdg`. Configure StorEdge A3000/A3500 Array devices only to non-`rootdg` disk groups.
- ◆ When Volume Manager encapsulates a device that has a mounted file system and entry in the `/etc/vfstab` file, VxVM updates the `/etc/vfstab` entry for that device to contain the Volume Manager device node name. Volume Manager is not compatible with the Sun StorEdge A3000/A3500 Array RAID Manager device node naming convention, but is compatible with the Solaris operating system device node naming convention.

To encapsulate the Sun StorEdge A3000/A3500 Array devices that have been configured with file systems and have entries in the `/etc/vfstab` file, you should not use the Sun StorEdge A3000/A3500 Array RAID Manager generated disk device nodes. For example (see the StorEdge A3000/A3500 Array documentation for the device nodes):

```
/dev/rRAID_module01/0s[0-7]
```

and

```
/dev/RAID_module01/0s[0-7].
```

Instead, use the standard Solaris operating system device nodes. For example (see the Solaris operating system documentation for the standard device nodes):

```
/dev/rdisk/c3t4d0s0 and /dev/dsk/c3t4d0s0.
```

For example, if you have an `/etc/vfstab` entry similar to this:

```
/dev/RAID_module01/0s0 /dev/rRAID_module01/0s0 /mountpt ufs 2  
yes -
```

use the Solaris operating system device node that represents this device:

```
/dev/dsk/c3t4d0s0 /dev/rdisk/c3t4d0s0 /mountpt ufs 2 yes -
```

- ◆ Follow the Sun StorEdge A3000/A3500 Array controller error recovery procedures as documented by the Sun StorEdge A3000/A3500 Array subsystem documentation.



**Caution** Sun StorEdge A3000/A3500 Array error recovery procedures must be followed according to the Sun StorEdge A3000/A3500 Array subsystem documentation. Improper error recovery procedures can cause incompatibility with the VERITAS Volume Manager.

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## Installation of the Volume Manager With the Sun StorEdge A3000/A3500 Array

The Sun StorEdge A3000/A3500 Array installation sequence must be followed as documented in the *Sun StorEdge A3000/A3500 Array Subsystem Release Notes*, the *Sun StorEdge A3000/A3500 Array System Manual*, and the *Sun StorEdge A3000/A3500 Array RAID Manager Installation Guide*.

**Caution** Any deviation of the installation sequence causes the StorEdge A3000/A3500 Array to be incompatible with the VERITAS Volume Manager.

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The Volume Manager should be installed only after the following steps have been completed and validated:

1. The Sun StorEdge A3000/A3500 Array subsystem is properly attached to the host computer.
2. The Sun StorEdge A3000/A3500 Array RAID Manager software is properly installed.
3. The Sun StorEdge A3000/A3500 Array Logical Unit Numbers (LUNs) are properly configured using the Sun StorEdge A3000/A3500 Array RAID Manager software.
4. The host system is rebooted using the `-r` flag (`reboot(1M)`) to rescan for attached devices upon boot.
5. Upon reboot, the Sun StorEdge A3000/A3500 Array RAID Manager has recognized the Sun StorEdge A3000/A3500 Array configured devices and has created the appropriate Solaris operating system device nodes (see *VERITAS Volume Manager and Sun StorEdge A3000/A3500 Array Device Nodes*).
6. Install the Volume Manager software package.



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## VERITAS Volume Manager and Sun StorEdge A3000/A3500 Array Device Nodes

After installing and configuring the Sun StorEdge A3000/A3500 Array subsystem, the host needs to be rebooted using the `-r` flag (`reboot(1M)`) to rescan for attached devices. Upon reboot, the Sun StorEdge A3000/A3500 Array scripts and Solaris operating system startup scripts create device nodes.

After the host system reboot, the original set of device nodes should be seen (the device nodes that existed before the Sun StorEdge A3000/A3500 Array subsystem was installed), plus the new device nodes for each StorEdge A3000/A3500 Array LUN. If there are more device nodes created than attached devices (including StorEdge A3000/A3500 Array LUNs), then do not install the VERITAS Volume Manager until the proper device nodes exist on the host system.

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**Caution** The Sun StorEdge A3000/A3500 Array startup scripts must properly configure and create device nodes. Improper host system device nodes cause incompatibility with the VERITAS Volume Manager.

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## Benefits in Using VERITAS Volume Manager With the Sun StorEdge A3000/A3500 Array

This section describes some of the benefits in using the host-based Volume Manager software and controller-based StorEdge A3000/A3500 Array hardware. When the VERITAS Volume Manager is used in conjunction with the Sun StorEdge A3000/A3500 Array, availability, performance and manageability of the combined configuration can be improved.

### Improved Manageability

The online reconfiguration capabilities of the VERITAS Volume Manager can be used to enhance the performance monitoring, tuning, and reconfiguration of the Sun StorEdge A3000/A3500 Array. These capabilities can simplify administration while increasing uptime and performance.

### Performance Analysis and Online Load Balancing Between LUNs

Using the Volume Manager statistics-gathering capability allows administrators to analyze the I/O loads and responsiveness of volumes in the configuration and to move storage between disks. Since each LUN within the Sun StorEdge A3000/A3500 Array looks like a single disk to the host, and therefore to Volume Manager, it is not possible to identify the load on each spindle, or to tune the layout of the LUN itself. However,





performance imbalances between arrays, or between LUNs in the same array, may be detected and alleviated. This can be done by using the Volume Manager performance analysis and online reconfiguration capability.

### **Increasing Capacity Online by LUN Concatenation**

The size of a single file system or database tablespace is limited by the maximum size of a single LUN in a controller-based RAID subsystem. To create very large file systems or tablespaces, administrators can use Volume Manager to combine LUNs from multiple RAID controllers into a larger “super-LUN” volume.

### **Online Data Movement Between LUNs**

The backup/reconfigure/reload cycle required to change the layout of hardware RAID LUNs causes data access interruption and possible data loss. To reduce the likelihood of data loss, if extra disks are available, administrators can choose to construct the destination LUN according to the desired parameters, then copy data directly from the old location to the new one. However, even this requires the interruption of data access, since it is necessary to prevent changes to the old copy of the data after it has been copied to the new location.

If the data copying is performed by adding the new Sun StorEdge A3000/A3500 Array LUN as a Volume Manager mirror of the data, however, all writes are delivered to all mirrors, keeping all copies up-to-date at all times. Once the mirror synchronization is complete, the mirror set can be separated, and the original LUN can be removed or used for other data. The data is kept online without interrupting access throughout the operation.

### **Stable Backup**

The method described above for data movement can also be used to provide consistent stable backup without interrupting user access. An additional mirror of data can be created, or an existing mirror can be detached from the updating applications, and that data instance can be backed-up to tape or other offline storage pool (see “*Preparing a Volume to Restore From Backup*” in the *VERITAS Volume Manager Administrator’s Guide*). This guarantees a backup that is internally consistent at a single point in time. Upon completion of backups, the additional mirror space can be freed, or the mirror reattached to the live data volume and resynchronized.



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## Dynamic Partitioning

The dynamic partitioning capability of VERITAS Volume Manager is useful when used with the large disks presented by the system for each LUN. The Solaris operating systems have limits on the number of slices into which a disk can be partitioned (7 partitions plus the full-disk partition). These limits can make it impossible to divide a large LUN into the number of separate slices needed for file systems or databases.

## Sun StorEdge A3000/A3500 Array Supported Configurations

VERITAS Volume Manager supports the Sun StorEdge A3000/A3500 Array subsystem in the following configurations:

- ◆ VxVM RAID-1 (Mirroring) and Sun StorEdge A3000/A3500 Array
- ◆ VxVM RAID-0 (Striping) and Sun StorEdge A3000/A3500 Array

For more information about mirroring and striping, see the *VERITAS Volume Manager Administrator's Guide*.

## Sun StorEdge A3000/A3500 Array Unsupported Configurations

The following Volume Manager and Sun StorEdge A3000/A3500 Array configurations are not supported:

### Volume Manager RAID-5 and Sun StorEdge A3000/A3500 Array RAID-5 Configuration

Using RAID-5 at both levels in the I/O subsystem can result in poor performance for no significant gain in reliability or availability. Use of this configuration is not supported.

## Volume Manager Hot-Relocation and Sun StorEdge A3000/A3500 Array Hot Sparing

Volume Manager hot-relocation allows the host system to automatically react to I/O failures on redundant (mirrored or RAID-5) VxVM objects and restore redundancy and access to these objects. Sun StorEdge A3000/A3500 Array hot sparing allows the StorEdge A3000/A3500 Array to automatically react to I/O failures internal to the StorEdge A3000/A3500 Array to restore access to StorEdge A3000/A3500 Array LUNs.

If a disk failure occurs within the Sun StorEdge A3000/A3500 Array, and the array hot sparing is configured, then the StorEdge A3000/A3500 Array provides the disk failure redundancy. If data redundancy is provided by a Volume Manager RAID-5 or mirror configuration, then Volume Manager hot-relocation can also provide disk or partial disk



failure redundancy protection. The most complete level of disk redundancy is achieved with both Volume Manager hot-relocation and Sun StorEdge A3000/A3500 Array hot sparing enabled.



