Sun StorEdge™ Fast Write Cache 2.0 Installation Guide

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Sun StorEdge Fast Write Cache 2.0 Installation Guide

Introduction

The Sun StorEdge™ Fast Write Cache 2.0 Installation Guide describes installation procedures and product considerations for the Sun StorEdge Fast Write Cache software. The Fast Write Cache software is an application host-based write accelerator of disk I/O. It improves performance for transaction processing and delivers faster response times to user requests for data by reducing the frequency of disk I/O accesses. Writes are cached in non-volatile memory and then the cached data is destaged to disk at a later time. Fast Write Cache is installed on Solaris™ servers and consists of NVRAM (non-volatile memory) boards used as cache memory and storage cache management software.

Sun StorEdge Fast Write Cache is implemented as a UNIX device driver, using nonvolatile memory to cache write requests. As the cache fills, older data is written asynchronously to the real disk. Fast Write Cache works as a layer between other disk drivers and the rest of the UNIX kernel. Stubs replace the original driver's entry points in the device switch tables. Whenever Fast Write Cache performs actual I/O (for example, when its cache must be destaged), it uses the real device driver routines.

Note – Fast Write Cache is implemented using a pair of SBus or PCI NVRAM cards installed on your system.

Document Structure

This document contains the following information:

- Introduction
- Related Documentation
- New Feature
- Reading Fast Write Cache man Pages
- Installation Requirements
- Qualified Platforms
- Limitations
- Product Considerations
- Installing the Fast Write Cache Software
- Installing the Fast Write Cache Software
- Adding Fast Write Cache Volumes to the Storage Volume Driver Configuration File
- Starting the Sun StorEdge Management Console
- Reinstalling Fast Write Cache Software

Related Documentation

TABLE P-1 Related Documentation

Application	Title	Part Number

man Pages	`fwcadm(1FWC)`
	`cache_control`
	`cache_config`
	`cache_health`
	`svadm(1SV)`
		N/A

User	*Sun StorEdge Fast Write Cache 2.0 System Administrator's Guide*	806-2064
User	*Sun StorEdge Fast Write Cache 2.0 Release Notes*	806-3165
Configuration	*Sun StorEdge Fast Write Cache 2.0 Configuration Guide*	806-4383
Installation	*Solaris 2.6 Handbook for SMCC Peripherals*	802-7295
Installation	*Solaris Handbook for SMCC Peripherals*	805-7404
Installation	*Solaris 2.x Handbook for SMCC Peripherals*	801-5488
Options	*OpenBoot 3.x Command Reference Manual*	802-3242
Diagnostics (Solaris 2.6)	*SunVTS 2.1 User's Guide*	802-7299
Diagnostics (Solaris 2.6)	*SunVTS 2.1.3 Test Reference Manual*	805-4163
Diagnostics (Solaris 2.6)	*SunVTS 2.1 Quick Reference*	802-7301
Diagnostics (Solaris 7)	*SunVTS 3.0 User's Guide*	805-4442
Diagnostics (Solaris 7)	*SunVTS 3.0 Test Reference Manual*	805-4443
Diagnostics (Solaris 7)	*SunVTS 3.0 Programmer's Guide*	805-7338
Diagnostics (Solaris 7)	*SunVTS 3.0 Quick Reference*	805-4444
Diagnostics (Solaris 7)	*SunVTS 3.1 User's Guide*	805-7406
Diagnostics (Solaris 7)	*SunVTS 3.1 Test Reference Manual*	805-7407
Diagnostics (Solaris 7)	*SunVTS 3.1 Quick Reference*	805-7408
User	*Dynamic Reconfiguration User's Guide For Sun Enterprise 3x00/4x00/5x00/6x00 Systems*	805-3530
User	*Sun Enterprise 6x00, 5x00, 4x00, and 3x00 Systems Dynamic Reconfiguration Guide*	806-0280
User	*Sun Enterprise 10000 Dynamic Reconfiguration User's Guide*	805-7985

Reading Fast Write Cache man Pages

- **Set the** MANPATH **environment variable to include** /usr/opt/SUNWesm/man**: for example:**

```
# setenv MANPATH $MANPATH:/usr/opt/SUNWesm/man
```

After the setenv command has been executed, you do not have to type the path to the man pages.

- **To read the legacy CLI** fwcadm**(1M) man page, type:**

```
# man -M fwcadm /usr/opt/SUNWesm/SUNWfwc/man fwcadm
```

- **To read any of the Fast Write Cache management service** man **pages, type:**

```
# man -M /usr/opt/SUNWesm/SUNWfwcmsu/man manpagename
```

where *manpagename* is fwcadm, cache_control(1M), cache_config (1M), or cache_health (1M).

Qualified Platforms

The following platforms are qualified for Fast Write Cache:

- Sun Enterprise™ 250
- Sun Enterprise 450
- Sun Enterprise 3000
- Sun Enterprise 3500
- Sun Enterprise 4000
- Sun Enterprise 4500
- Sun Enterprise 5000
- Sun Enterprise 5500
- Sun Enterprise 6000
- Sun Enterprise 6500
- Sun Enterprise 10000

Limitations

Fast Write Cache 2.0 does not support the following:

- Single NVRAM cards
- Multiple NVRAM card pairs
- Clusters

Product Considerations

- Do not cache underlying volume manager devices (for example, VxVM log devices), as this can result in unpredictable behavior.
- The volume manager must always be below the Fast Write Cache:
  - To allow coalescing stripe width size writes for RAID 5
  - The volume manager partitioning of disks does not necessarily map to the Solaris partitions
- Fast Write Cache can cache Volume Manager volumes. The example for configuring the `/etc/opt/SUNWspsv/sv.cf` file that is shown in the Sun *StorEdge Fast Write Cache 2.0 System Administrator's Guide* lists linear disks, only. The following example adds a volume manager volume for the Sun Enterprise Volume Manager by including the entry in the `/etc/`opt/SUNWspsv/`sv.cf` file:

```
/dev/vx/rdsk/vol01     cache
```

- Install Fast Write Cache only on systems with clean NVRAM cards. If an unclean shutdown of the system occurred, recover or purge the data before installing Fast Write Cache.
- The file systems must always be above the Fast Write Cache so data and metadata can be destaged to the disk after a crash before `fsck(1M)` is run.
- Do not cache the root (`/`) and `/usr` file systems (or any file systems that come up before Fast Write Cache) because to recover disk data stored in an NVRAM card after a system crash, the data must be restored to disk before file systems are mounted or applications are written to raw volumes.
- Do not cache the swap partition.
- Avoid multiple paths to data. The following are examples of operations that can access data using alternate cached or non-cached paths:
  - `mmap(2)` I/O

- caching overlapping slices
- commands that write to a device using `ioctl(2)`, such as `format(1M)`

- In general, devices must be Storage Volume (SV) disabled using the `fwcadm volume -d` command before doing any operations requiring a device to be quiescent. Some procedures (for example, an A5000 firmware download) will not complete successfully unless the appropriate devices are SV disabled.
- Limit any changes in the default `/etc/sd.cf` file to the following two parameters:
  - `cache_mem` – The `size_in_megabytes` for the `cache_mem` parameter must be greater than 0 and must be at least equal to the amount of memory (in Mbytes) that is available on one board (PCI NVRAM card 64Mbytes or SBus 32Mbytes).
  - `threads` – This parameter must be at least equal to the number of cached volumes.
- If the NVRAM card contains dirty data, do not reconfigure your disks or move the card to another system until the dirty data is destaged to disk.
- Because `SUNWvtsnp` is not a stand-alone package, the appropriate SunVTS must be installed. `SUNWvtsnp` is an enhanced SunVTS test that verifies the SBus NVRAM card for Fast Write Cache.

Solaris Version	SunVTS version
Solaris 2.6	SUNWvts 2.1.3
Solaris 7	SUNWvts 3.0
Solaris 7	SUNWvts 3.1

  The Solaris 2.6 version of the `SUNWvtsnp` package contains a 32-bit nvtest.

  The Solaris 7 versions of the `SUNWvtsnp` package contains both 32-bit and 64-bit nvtest binaries. Package dependency is checked during installation, and the nvtest binaries are installed in the appropriate directories. The 64-bit nvtest is not installed unless the `SUNWvtsx` (64-bit SunVTS) package is already installed.
- If even one of the batteries on an NVRAM card is low, the cache is destaged and a warning message is sent to the console and the message log.

Installation Requirements

- The minimum requirements for installing Fast Write Cache are:
  - Solaris™ 2.6 or Solaris 7 operating environment or a subsequent compatible version
  - Pair of SBus or PCI NVRAM cards
  - CD-ROM drive connected to the host server where Fast Write Cache is to be installed
  - Approximately 40 Mbytes of disk drive space to install the data services, `java/framework/sundae`, and the Fast Write Cache Management service.

    `root`—50KBytes
    `/usr`—40MBytes
    `/var`—136KBytes
    `SUNWmscmr` and `SUNWmscmu` —283KBytes
- `SUNWvtsnp` is the enhanced SunVTS that verifies the SBus or PCI NVRAM card for Fast Write Cache. `SUNWvtsnp` is not a stand-alone package. It does not run without the corresponding `SUNWvts` package being installed.
- If you are using the Sun Enterprise Volume Manager™, ensure that you have the appropriate patch for your version.
  - Volume Manager 2.5 – patch 107773-01
  - Volume Manager 2.6 – patch 107735-01
  - Volume Manager 3.0.2 - no required patches
- On Sun Enterprise 10000 server -- Solaris 2.6 patch 105181-15

  So that the cache software can allocate host memory for optimum performance, set the OpenBoot PROM variable `dr-max-mem` to 2. As superuser, enter:

  ```
  # eeprom dr-max-mem=2
  ```

  Or, at the `OK` prompt, enter:

  ```
  ok setenv dr-max-mem 2
  ```

Configuration Files

Fast Write Cache and its related packages include configuration files with a `.cf` suffix. For example, `sv.cf` is in the `/etc/opt/SUNWspsv` directory.

The Fast Write Cache CD contains sample configuration files that are installed in the `/etc/opt/`*SUNWpackage* directory; however, the packages do not overwrite existing configuration files in this directory.

Note – Install Fast Write Cache only on systems with clean NVRAM cards. If an unclean shutdown of the system occurred, recover or purge the data before installing Fast Write Cache.

Do the following before installing Fast Write Cache:

- Install the NVRAM cards. See the *Sun StorEdge Fast Write Cache 2.0 System Administrator's Guide* for the NVRAM installation instructions.
- Install the `SUNWvts` diagnostic package. Refer to the appropriate SunVTS documentation.

Installing the Fast Write Cache Software

These procedures describe how to perform a clean install of the Fast Write Cache software. The procedures assume you have not previously installed any versions of Fast Write Cache software.

Note – Before you enable and use Fast Write Cache software, you must add the Fast Write Cache volumes to the Storage Volume driver configuration file and reconfigure the driver. Add the volumes after you install Fast Write Cache software. See "Adding Fast Write Cache Volumes to the Storage Volume Driver Configuration File" on page 12.

▼ Mount the CD-ROM

Note – If your CD-ROM is already mounted, go to "Install the Fast Write Cache Software" on page 10.

---

1. **Become superuser (root).**
2. **Insert the Fast Write Cache CD into the CD-ROM drive connected to your system.**
3. **Make sure that Volume Manager is running:**

```
# ps -e | grep vold
```

If the Volume Manager is running, output similar to the following is displayed:

```
239 ?   0:00    vold
```

4. **If Volume Manager is not running, start it by typing:**

```
# /etc/init.d/volmgt start
```

5. **Confirm that the CD-ROM is mounted by typing:**

```
# /etc/mount |grep cdrom
```

Output similar to the following is displayed:

```
/cdrom/sun_ultra_1_series_hw_ab on /vol/dev/dsk/c0t6d0/
sun_ultra_1_series_hw_ab read only/setuid on Tue Jan 12 15:05:57
1999
```

6. **Mount the CD-ROM:**

```
# /etc/mount -F hsfs -o ro /dev/dsk/device /mnt
```

where *device* is the CD-ROM drive device name (for example, `c0t6d0s0`).

▼ Install the Fast Write Cache Software

1. **Become superuser (root).**
2. **If the Fast Write Cache CD is not already in the CD-ROM, insert it into the CD-ROM drive connected to your system.**
3. **Start the Fast Write Cache installation.**

   a. **To install the package in the Solaris 2.6 operating environment:**

```
# cd /cdrom/cdrom0/Products
# ./install_fwc.ksh
```

   `install_fwc` installs the data services, `java/framework/sundae` and the Fast Write Cache Management service.

   b. **To install the package in the Solaris 7 operating environment:**

```
# cd /cdrom/cdrom0/Solaris_7
# ./install_fwc.ksh
```

   c. **To install the package in the Solaris 7 8/99 and subsequent compatible operating environments:**

```
# cd /cdrom/cdrom0/Solaris_7-899
# ./install_fwc.ksh
```

4. **The license agreement is displayed; type Y:**

```
This product provides a graphical interface to the monitoring and
configuring of Fast Write Cache .  It is assumed that you agree to
legal terms explained in
http://www.sun.com/share/text/SMICopyright.html

DO YOU AGREE TO THE ABOVE TERMS AND WISH TO INSTALL THIS ON TO YOUR
SYSTEM?
Do you agree to the above license terms? [yes or no] Y
```

5. **Type `Y` in response to all prompts.**

   If a package to be installed currently exists on your server, make sure you install the most recent version.

   When the entire installation finishes, the installation script displays:

```
Installation of Sun StorEdge Fast Write Cache was successful.

The System must now be rebooted to complete product installation
An un-install script has been generated to aid in the removal of
this software.

The location of the un-install script is:
/var/tmp/uninstall_fwc
```

6. **Reboot your server using `shutdown` and `reboot` commands.**

```
#shutdown -i6 -g0 -y
```

   Before enabling and using the Fast Write Cache software, see “Adding Fast Write Cache Volumes to the Storage Volume Driver Configuration File” on page 12.

Adding Fast Write Cache Volumes to the Storage Volume Driver Configuration File

Before you can enable and use the Fast Write Cache software, you must add the Fast Write Cache volumes to the Storage Volume (SV) driver configuration file and reconfigure the driver.

You cannot enable and use the Fast Write Cache software on volumes that are not in the SV driver configuration file and enabled by the SV driver. The SV driver provides a simple layer of volume management for the Fast Write Cache software.

Tip – If you want to add devices later, repeat the steps in “To Add Fast Write Cache Volumes” on page 12”.

▼ To Add Fast Write Cache Volumes

1. **Decide which volumes you are going to use with the Fast Write Cache software.**

2. **Using a text editor, add the volumes to the Storage Volume (SV) driver configuration file** `/etc/opt/SUNWspsv/sv.cf`**.**

   This file includes two fields per line for each volume: the resource name field and access mode field. Separate the fields in the file with spaces.

   The resource name field contains the name of a raw device for which the SV driver is to be enabled. *It must be the full path to the raw device node and cannot be the block device node.*

   The access mode field can be `cache` or `raw`. This field specifies how this device volume is accessed: through the Storage Cache Management module cache.

Solaris Version	SunVTS version
Solaris 2.6	SUNWvts 2.1.3
Solaris 7	SUNWvts 3.0
Solaris 7	SUNWvts 3.1

Starting the Sun StorEdge Management Console

If you have rebooted your server after fully installing Fast Write Cache software (see Step 6 of “Installing the Fast Write Cache Software” on page 8), start the Sun StorEdge™ Management Console (Management Console).

1. **On a local system (where the software is not installed) add the server system to the access control list of the current display.**

```
% xhost <hostname>
```

2. **Become superuser (root) on the server system.**
3. **Start the Management Console.**

```
# /usr/opt/SUNWesm/bin/esm_gui &
```

4. **After the initial splash screen, the Management Console is displayed. See** FIGURE 1**.**
5. **Double-click Fast Write Cache.**

   The GUI tabs are highlighted. The Fast Write Cache software is ready for use.

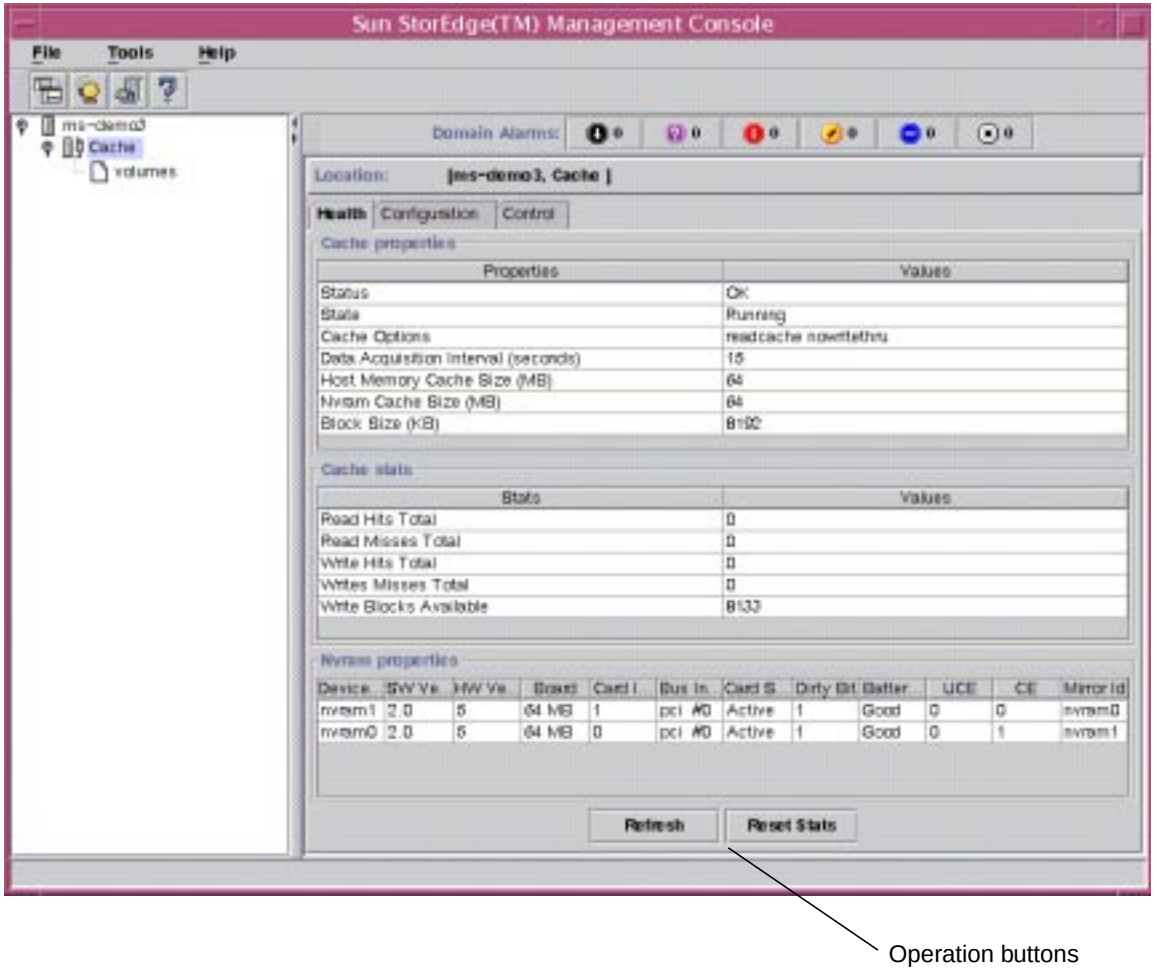

FIGURE 1 Fast Write Cache Management Console

Reinstalling Fast Write Cache Software

This section describes how to reinstall Fast Write Cache software and its related packages.

▼ To Reinstall the Fast Write Cache Management Services SUNWmscmu and SUNWmscmr

1. **Become superuser (root).**
2. **Disable any currently enabled volumes.**
   - **Using the Management Console**, click the Control tab (FIGURE 1), then click the `Disable` button.
   - **Using the CLI**, type:

```
# /usr/opt/SUNWesm/bin/esm_cli
> cd cache
> control -d
```

3. **Before reinstalling the Fast Write Cache software, be sure to deinstall the old version, using the `/var/tmp/uninstall_fwc script` created for you on installation. Then you may reinstall the Fast Write Cache software.**
4. **Reinstall the packages according to the steps in "Installing the Fast Write Cache Software" on page 8. Reply yes to all prompts by typing `Y`.**
5. **Reboot your server using `shutdown` and `reboot` commands.**

```
#shutdown -i6 -g0 -y
```