Ultra™ Enterprise™ 10000 SSP 3.1 User's Guide

THE NETWORK IS THE COMPUTER™

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Preface

The *Ultra Enterprise 10000 SSP 3.1 User's Guide* describes the SSP (System Service Processor), which enables you to monitor and control the Ultra Enterprise 10000 system.

How This Book Is Organized

This document contains the following chapters:

Chapter 1, "Introduction," introduces the System Service Processor (SSP).

Chapter 2, "Overview of the SSP Tools," introduces Hostview and the `netcontool(1M)` command.

Chapter 3, "System Administration Procedures," describes how to perform common system administration procedures.

Chapter 4, "SSP Internals," provides more detailed information for system administrators interested in how the SSP works. Included are descriptions of the SSP booting process and the `edd(1M)` daemon, which monitors the Ultra Enterprise 10000 system.

Before You Read This Book

This manual is intended for the Ultra Enterprise 10000 system administrator, who should have a working knowledge of UNIX® systems, particularly those based on the Solaris™ operating environment. If you do not have such knowledge, you should first read the Solaris User and System Administrator AnswerBooks provided with this system, and consider UNIX system administration training.

Using UNIX Commands

This document does not contain information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following for this information:

- AnswerBook™ online documentation for the Solaris™ 2.x software environment, particularly those dealing with Solaris system administration.
- Other software documentation that you received with your system

Typographic Conventions

TABLE P-1 Typographic Conventions

Typeface or Symbol	Meaning	Examples
`AaBbCc123`	The names of commands, files, and directories; on-screen computer output.	Edit your `.login` file. Use `ls -a` to list all files. `% You have mail.`
`AaBbCc123`	What you type, when contrasted with on-screen computer output.	`% su` `Password:`
AaBbCc123	Book titles, new words or terms, words to be emphasized. Command-line variable; replace with a real name or value.	Read Chapter 6 in the *User's Guide.* These are called *class* options. You *must* be `root` to do this. To delete a file, type `rm` *filename.*

Shell Prompts

TABLE P-2 Shell Prompts

Shell	Prompt
C shell	*machine_name*%
C shell superuser	*machine_name*#
Bourne shell and Korn shell	$
Bourne shell and Korn shell superuser	#

Related Documentation

TABLE P-3 Related Documentation

Application	Title
Installation	*Ultra Enterprise 10000 System Hardware and Software Installation and De-Installation Guide*
Reference (man pages)	*Ultra Enterprise 10000 SSP 3.1 Reference Manual*
Release Notes	*SMCC Open Issues Supplement Release Notes* (Solaris 2.6), or *SSP 3.1 Release Notes* (Solaris 2.5.1). The Open Issues Supplement contains the information in the section, "Ultra Enterprise 10000 Servers".
Other	*Dynamic Reconfiguration User's Guide* *Dynamic Reconfiguration Reference Manual* *Alternate Pathing User's Guide* *Alternate Pathing Reference Manual* *Inter-Domain Network User's Guide*

Ordering Sun Documents

SunDocs[SM] is a distribution program for Sun Microsystems technical documentation. Contact SunExpress for easy ordering and quick delivery. You can find a listing of available Sun documentation on the World Wide Web.

TABLE P-4 SunExpress Contact Information

Country	Telephone	Fax
Belgium	02-720-09-09	02-725-88-50
Canada	1-800-873-7869	1-800-944-0661
France	0800-90-61-57	0800-90-61-58
Germany	01-30-81-61-91	01-30-81-61-92
Holland	06-022-34-45	06-022-34-46
Japan	0120-33-9096	0120-33-9097
Luxembourg	32-2-720-09-09	32-2-725-88-50

TABLE P-4 SunExpress Contact Information

Sweden	020-79-57-26	020-79-57-27
Switzerland	0800-55-19-26	0800-55-19-27
United Kingdom	0800-89-88-88	0800-89-88-87
United States	1-800-873-7869	1-800-944-0661
World Wide Web: `http://www.sun.com/sunexpress/`		

Sun Documentation on the Web

The `docs.sun.com` web site enables you to access Sun technical documentation on the World Wide Web. You can browse the `docs.sun.com` archive or search for a specific book title or subject at `http://docs.sun.com`.

Sun Welcomes Your Comments

We are interested in improving our documentation and welcome your comments and suggestions. You can email your comments to us at `smcc-docs@sun.com`. Please include the part number of your document in the subject line of your email.

CHAPTER 1

Introduction

The System Service Processor (SSP) is a SPARC® workstation that enables you to control and monitor the Ultra Enterprise 10000 system. The SSP software packages must be installed on the SSP workstation. In addition, the SSP workstation must be able to communicate with the Ultra Enterprise 10000 system over an Ethernet connection. In this book, the SSP workstation is simply called the *SSP*.

The Ultra Enterprise 10000 system is often referred to as the *platform*. *S*ystem boards within the platform may be logically grouped together into separately bootable systems called *Dynamic System Domains*, or simply *domains*. Up to eight domains may exist simultaneously on a single platform. (Domains are introduced in this chapter, and are described in more detail in "Domains" on page 3-14.) The SSP enables you to control and monitor domains, as well as the platform itself.

Domains can communicate with each other at high speeds using the Inter-Domain Networks (IDN) feature, which is only available with Solaris version 2.6 (and later) on the Ultra Enterprise 10000. IDN exposes a normal network interface to the domains that make up the network, but no cabling or other network hardware is required. Instead, domains communicate using hardware features that are built into the Ultra Enterprise 10000. IDN networks are described in the *Inter-Domain Network User's Guide*.

SSP Features

SSP 3.1 software can be loaded only on Sun workstations running Solaris 2.5.1 in an OpenWindows™ or Open Look environment. The SSP software cannot be run on Solaris 2.6. However, the SSP does work well with Ultra Enterprise 10000 domains running Solaris 2.5.1 or Solaris 2.6. The GUI programs that are provided with the SSP 3.1 software can be used remotely, possibly on a workstation running the Common Desktop Environment (CDE) rather than Open Look.

The SSP enables the system administrator to perform the following tasks:

- Boot domains.
- Perform emergency shutdown in an orderly fashion. For example, the SSP software automatically shuts down a domain if the temperature of a processor within that domain rises above a pre-set level.
- Dynamically reconfigure a domain so that currently installed system boards can be *logically* attached to or detached from the operating system while the domain continues running in multiuser mode. This feature is known as *Dynamic Reconfiguration* and is described in the *Dynamic Reconfiguration User's Guide*. (A system board can easily be *physically* swapped in and out when it is not attached to a domain, even while the system continues running in multiuser mode.)
- Create domains by logically grouping system boards together. Domains are able to run their own operating system and handle their own workload. See "Domains" on page 3-14.
- Assign paths to different controllers for I/O devices, which enables the system to continue running in the event of certain types of failures. This feature is known as *Alternate Pathing* and is described in the *Alternate Pathing User's Guide*.
- Monitor and display the temperatures, currents, and voltage levels of one or more system boards or domains.
- Control fan operations.
- Monitor and control power to the components within a platform.
- Execute diagnostic programs such as POST (power-on self test).

In addition, the SSP environment:

- Warns you of impending problems, such as high temperatures or malfunctioning power supplies.
- Notifies you when a software error or failure has occurred.
- Automatically reboots a domain after a system software failure (such as a panic).
- Keeps logs of interactions between the SSP environment and the domains.

Enterprise 10000 System Architecture

The Enterprise 10000 platform, SSP, and other workstations communicate over Ethernet as shown in FIGURE 1-1.

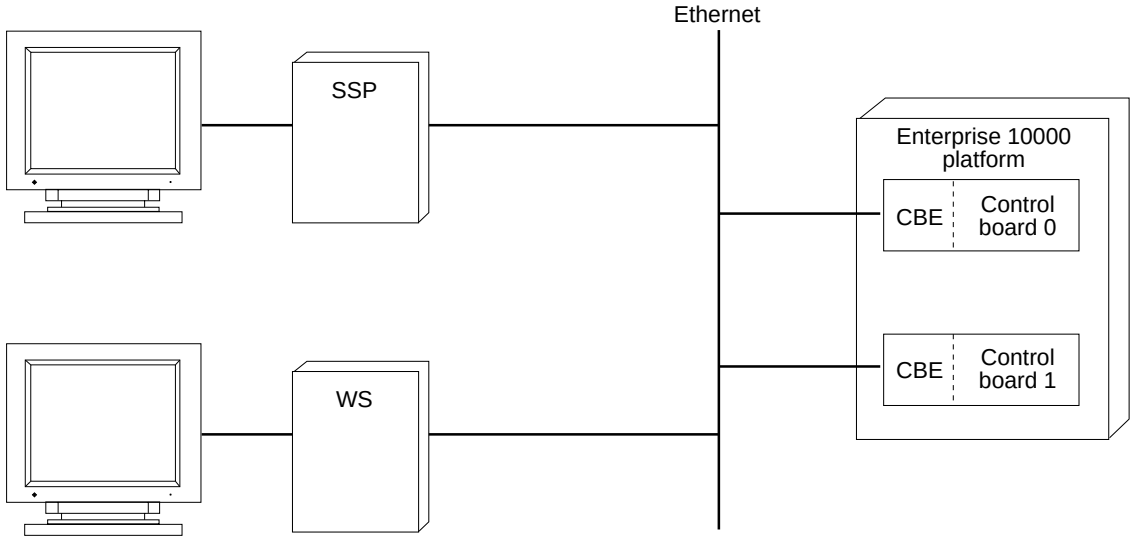


FIGURE 1-1 Enterprise 10000 System and Control Boards

Redundant control boards are supported within the Enterprise 10000 platform. Each control board runs a Control Board Executive (CBE) that communicates with the SSP over the network. One control board is designated as the primary control board, and the other is designated as the alternate control board. If the primary control board fails, you can manually switch to the alternate control board as described in “Dual Control Board Handling” on page 3-27.

SSP operations can also be performed by remotely logging in to the SSP from another workstation on the network. Whether you log in to the SSP remotely or locally, you must log in as user `ssp` and provide the appropriate password if you want to perform SSP operations (such as monitoring and controlling the platform).

SSP User Environment

You can interact with the SSP and domains by using the Hostview GUI or other window environments.

SSP Window

An SSP Window provides a command line interface to the Solaris and SSP environments.

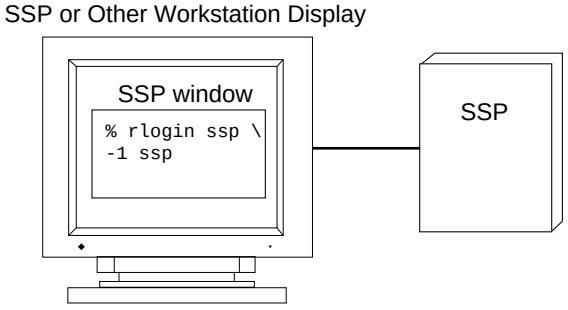


FIGURE 1-2 SSP Window

To display an SSP Window, you must log in as user `ssp` and enter the `ssp` user password. You are then prompted for the name of a domain. The `SUNW_HOSTNAME` environment variable is set to that domain. (You can change the value of `SUNW_HOSTNAME` at any time.) The effect of `SUNW_HOSTNAME` on client applications and daemons is described in “Instances of Client Programs and Daemons” on page 2-1.

You can also display an SSP Window on any workstation on the network by using `rlogin(1)` to remotely log in to the SSP machine as user `ssp`. The `DISPLAY` environment variable must be set to your display, and your `xhost(1)` settings must enable the SSP software to display on your workstation.

Multiple SSP Windows can be used simultaneously.

SSP Console Window

The SSP Console Window is the console for the SSP machine.

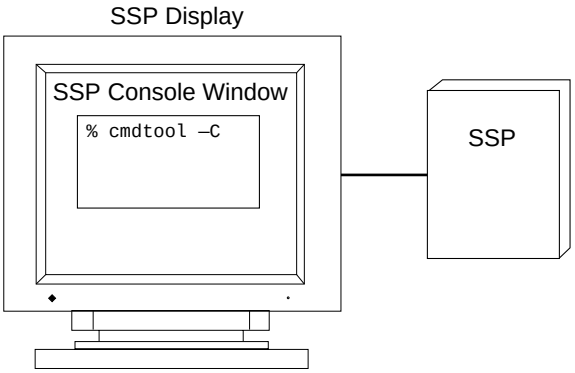


FIGURE 1-3 SSP Console Window

This window is normally created when OpenWindows starts but, if necessary, you can display it using `cmdtool(1)` with its `-C` option. This window displays messages from programs running in the SSP and its Solaris environment and kernel.

Network Console Window

A `netcon(1M)` window receives system console messages from a domain.

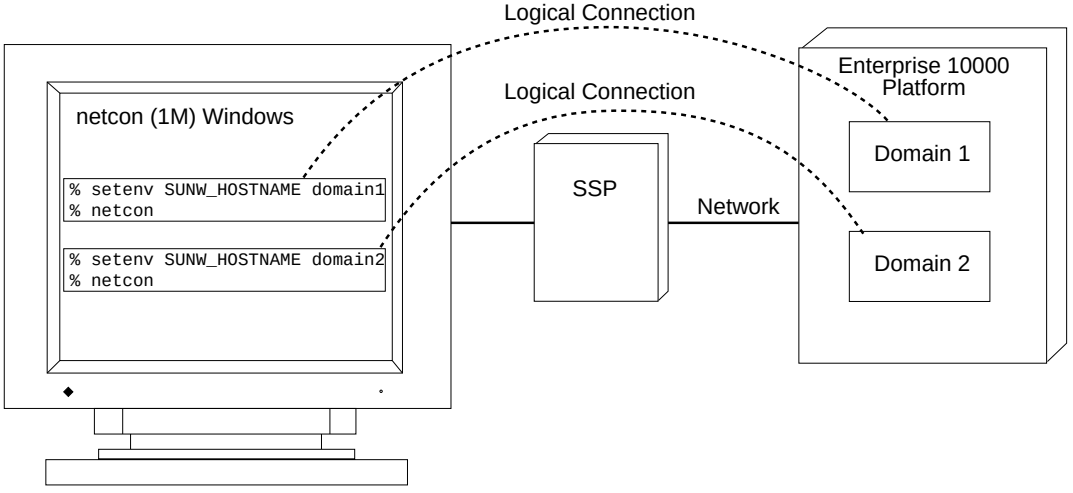


FIGURE 1-4 `netcon(1M)` Window

Multiple `netcon(1M)` windows can be open simultaneously, but only one at a time can have write privileges to a specific domain. When a `netcon(1M)` window is in read-only mode, you can view messages from the `netcon(1M)` window, but you cannot enter any commands. For more information, see the `netcon(1M)` man page.

Hostview

The Hostview program provides a graphical user interface (GUI) with the same functionality as many of the SSP commands:

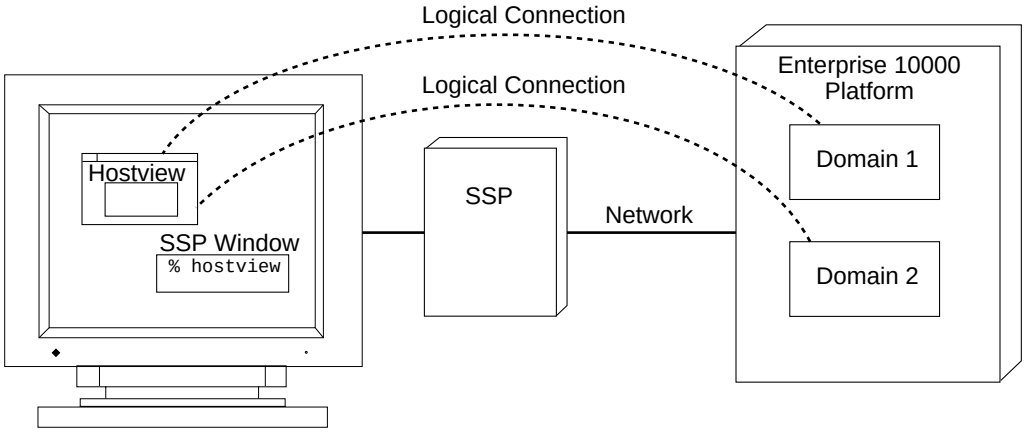


FIGURE 1-5 Hostview GUI Program

Hostview is introduced in Chapter 2, “Overview of the SSP Tools” and is described in more detail in Chapter 3, “System Administration Procedures”. It is also described in `hostview(1M)` in the *Ultra Enterprise 10000 SSP Reference*.

Using a Spare SSP

The SSP unit is a Sun workstation with a defined hardware configuration. Any identical Sun workstation can also serve as an SSP. You can optionally designate such a Sun workstation as a spare SSP unit, to serve as a backup if your primary SSP unit fails. You can also order your Ultra Enterprise 10000 server with a spare SSP unit. The spare SSP can be a *dedicated spare SSP* or a *non-dedicated spare SSP*.

A dedicated spare SSP is a unit that you maintain in a ready state; if the primary SSP fails, you can quickly switch to the spare SSP. The dedicated spare SSP is not used for any other purpose. A non-dedicated spare SSP is one that you do not necessarily

maintain in a ready state, one that may require a re-install of the operating system and SSP software before you can begin using it as the SSP, should the primary SSP fail. However, you can use a non-dedicated SSP for other purposes in the meantime.

To maintain a spare SSP, you must adhere to the following requirements:

- The hardware for the spare SSP must be identical to the hardware for the main SSP. (A spare SSP purchased from Sun satisfies this requirement.)
- The operating system and SSP software on the spare SSP must be identical to the operating system and SSP software on the main SSP before you switch to the spare SSP. If you are maintaining a dedicated spare SSP, you must install the same operating system upgrades and patches on it as you do on the primary SSP.
- If you are maintaining a dedicated spare SSP, you must not install or use any non-SSP software on it.
- The main SSP must be backed up regularly. You should perform weekly full backups and daily incremental backups. After any system configuration operation, you should *immediately* perform an incremental backup in case the main SSP crashes prior to the next scheduled daily incremental backup. System configuration operations include:
  - Changing the primary control board
  - Inserting or removing a board (using the Hot Swap procedure)
  - Attaching or detaching a board
  - Creating, removing, or renaming a domain
  - Performing a `bringup(1M)` operation on a domain
  - Rebooting a domain
  - Automatic domain recovery operations due to events such as system panics or hardware failures

To switch over to the spare SSP, see the following sections in the *Ultra Enterprise 10000 System Hardware and Software Installation and De-Installation Guide*, a copy of which is in both the SSP 3.1 Media Kit and the SMCC Server Media Kit:

- *Replacing the SSP With a Dedicated Spare SSP*
- *Replacing the Main SSP With a Non-dedicated Spare SSP*

Documentation

For general system administration information, such as adding users and mounting file systems, refer to the *Solaris 2.5 System Administrator AnswerBook*. If you encounter any information in these documents that conflicts with the Ultra Enterprise 10000 documents, the Ultra Enterprise 10000 documents take precedence, followed by documents that describe Sun hardware, and then the Solaris documents.

man Pages

The man pages for functions that run on the SSP are initially located on the SSP in `/opt/SUNWssp/man`. When running Solaris 2.5.1 on the Ultra Enterprise 10000, the man pages for Network Time Protocol (NTP) are initially loaded on the SSP (and on domains) within `/opt/SUNWxntp/man`. When running Solaris 2.6 on the Ultra Enterprise 10000, the man pages for NTP are bundled with operating system. Unless noted otherwise, all man pages referenced in this document are SSP man pages. They are included in the *Ultra Enterprise 10000 SSP Reference*, and you can view them in an SSP Window by using the `man(1)` command.

CHAPTER 2

Overview of the SSP Tools

This chapter introduces:

- Hostview —This is a graphical user interface (GUI) front-end to SSP commands.
- `netcontool(1M)`—This is a GUI interface to the `netcon(1M)` command. `netcontool(1M)` simplifies the process of configuring and bringing up `netcon(1M)` Windows. You can also use the `netcon(1M)` command directly to display a `netcon(1M)` Window. However, when using `netcon(1M)`, you must know escape sequences to perform operations that can be performed by clicking on buttons under `netcontool(1M)`.

Instances of Client Programs and Daemons

An Enterprise 10000 platform may host multiple domains, where each domain runs its own copy of the operating system, independent of any other domains. The client programs and daemons running on the SSP fall into three categories with respect to how many instances are created relative to a platform and its domains:

- Only one instance
- One instance per platform
- One instance per domain

Only One Instance

For certain clients and daemons, exactly one instance is created on the SSP, without regard to the platform or the number of domains that exist on the platform. For these clients and daemons, the setting of the environment variable SUNW_HOSTNAME is irrelevant. See FIGURE 2-1.

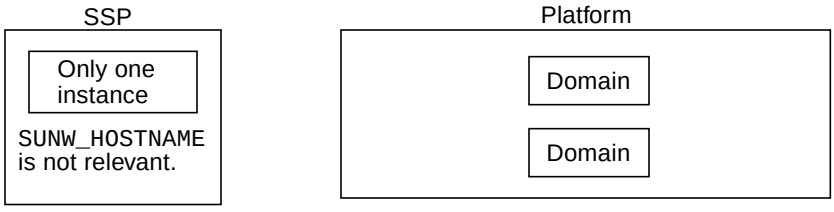


FIGURE 2-1 SSP clients and daemons: only one instance.

One Instance per Platform

For some clients and daemons, one instance is started for the platform. In the current release, where the SSP can control only a single platform, there is little difference between this type of client or daemon and the type previously described. However, when a client or daemon is specific to a platform, the setting of the SUNW_HOSTNAME environment variable is important; SUNW_HOSTNAME must identify the platform. This can be accomplished by setting SUNW_HOSTNAME to the name of the platform or to the name of a domain on the platform. See FIGURE 2-2.

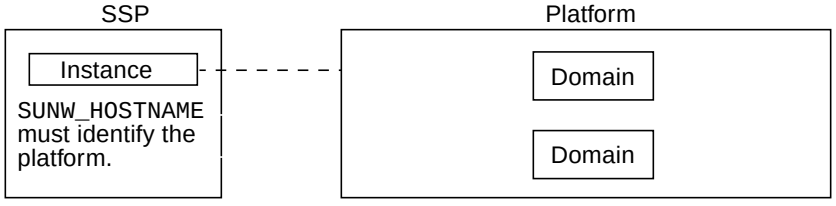


FIGURE 2-2 SSP clients and daemons: one instance per platform

One Instance per Domain

For certain other clients and daemons, one instance is created on the SSP for each domain on the platform. Before you run a client application of this genre, set `SUNW_HOSTNAME` to the relevant domain name. (`hpost(1M)` and `bringup(1M)` are examples of this genre.) See FIGURE 2-3.

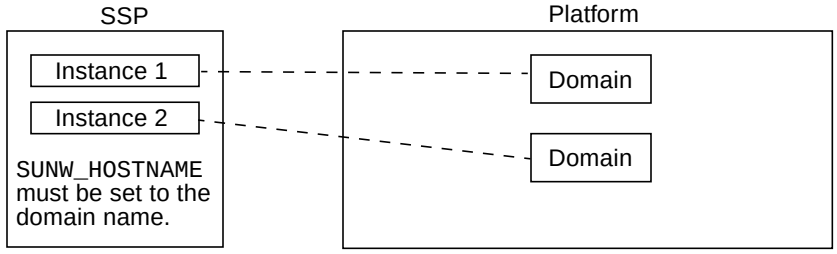


FIGURE 2-3 SSP clients and daemons: one instance per domain.

Hostview

Hostview is a GUI program that enables you to perform the following actions:

- Power a platform on and off.
- Dynamically reconfigure the boards within a platform, logically attaching or detaching them from the operating system. This feature is described in the *Dynamic Reconfiguration User's Guide*.
- Dynamically group system boards into domains. Each domain runs its own instance of Solaris and has its own log messages file.
- Bring up domains.
- Start an SSP Window for each domain.
- Access the SSP log messages file for each platform or domain.
- Remotely log in to each domain.
- Edit the `blacklist(4)` file to enable or disable hardware components on a domain.
- Display a `netcon(1M)` Window.

If you want to run Hostview, you only need to run one instance for a given platform, although it is possible to run more than one instance simultaneously (perhaps on different SSPs) to work with the same platform. You can run Hostview from any SSP Window (such as, a session where you have logged in as user `ssp`).

If you have logged into the SSP environment from a workstation, make sure your `DISPLAY` environment variable is set to your current display and that your `xhost` settings enable the SSP to display on your workstation (see `xhost(1)` in the *Solaris X Window System Reference Manual*).

- **To start up Hostview, run the `hostview(1M)` command in an SSP Window:**

```
ssp% hostview &
```

Hostview Main Window

When you start up Hostview, the main window is displayed:

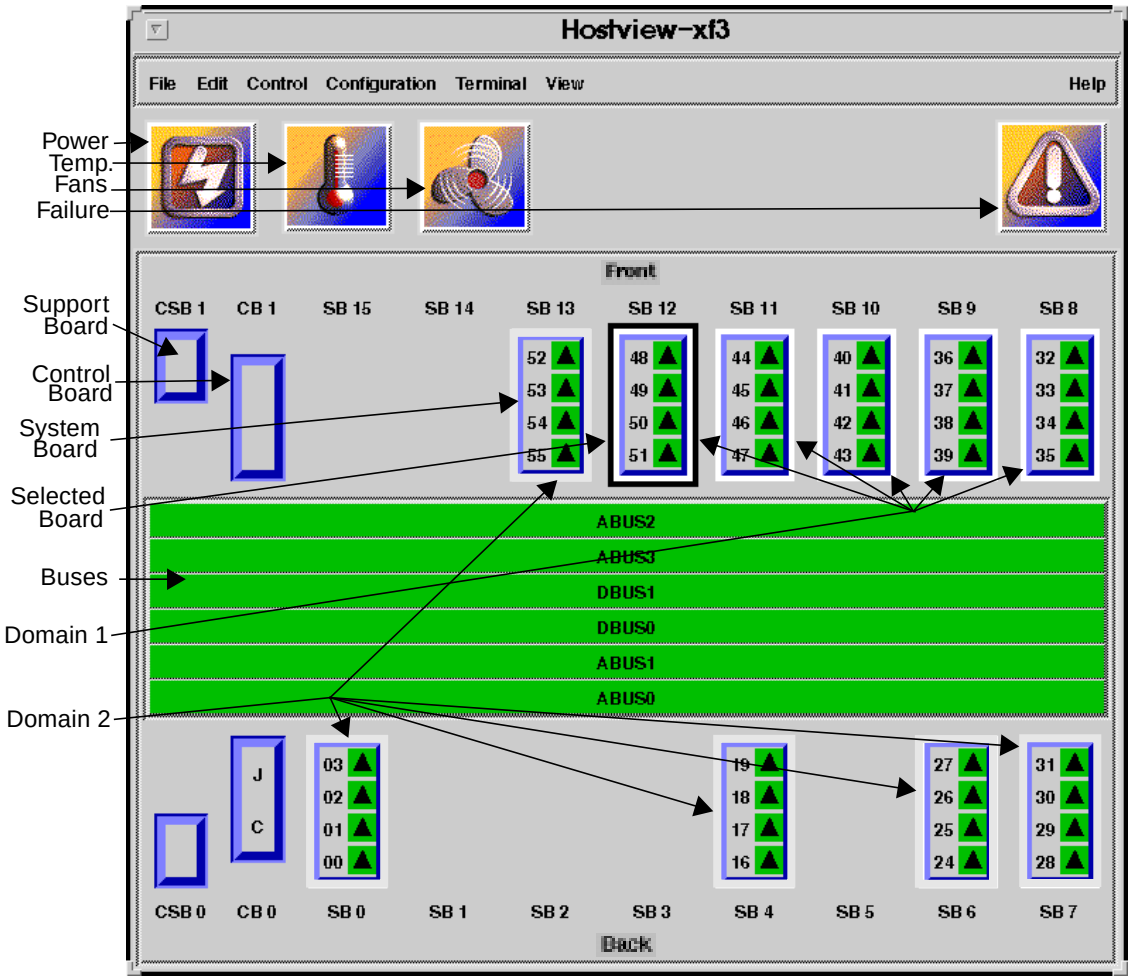


FIGURE 2-4 Hostview Main Window

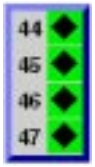
The menu bar on the main window provides the commands that you can use to control the platform. See “Main Window Menu Bar” on page 2-7.

The buttons on the main window (power, temperature, and so forth) bring up status details. The buttons are introduced in “Main Window Buttons” on page 2-11.

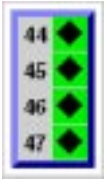
The rest of the main window provides a graphical view of the platform boards and buses. The system boards are named SB0 through SB15, and their processor numbers are shown. The control boards are named CB0 and CB1. The support boards are named CSB0 and CSB1. The buses are named ABUS0 through ABUS3, and DBUS0 through DBUS3.

The system boards along the top of the display are arranged in the order they appear on the front side of the physical platform. The system boards along the bottom of the display are arranged in the order they appear on the back side of the physical platform.

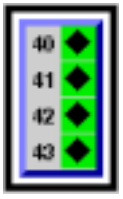
If a system board is shown with no outline, the board is not part of a domain and is not currently selected. Here is an example:



If a system board is part of a domain, a colored outline surrounds it. The boards within a given domain all have an outline of the same color. Here is an example:



A black outline (around the domain color outline) indicates that a board is selected. Here is an example:



The processors within the boards are numbered 0 through 63. The processor symbols (diamond, circle, and so forth) indicate the state of the processors, and are described in “Main Window Processor Symbols” on page 2-12.

▼ To Select Items in the Main Window

You can select one or more boards in the Hostview main window. You can also select one domain in the main window. You must select a set of boards prior to performing certain operations, such as creating a domain.

- To select a single board, click it with the left mouse button. The selected board is indicated by a black outline, and all other boards are deselected.
- To select additional boards, click them with the middle mouse button. You can also deselect a currently selected board by clicking on it with the middle mouse button. (The middle mouse button toggles the selection status of the board without affecting the selection status of any other board.)
- To select a domain, click a board within that domain with the left mouse button. Note that it is possible to select boards from different domains (using the middle mouse button), but the selected domain will correspond to the board that you selected with the left mouse button.

Main Window Menu Bar

The items on the main Hostview menu are described in the following table.

TABLE 2-1 Hostview Menu Items

Menu	Selection	Description
File	SSP Logs	Displays a window that shows the SSP messages for a domain or for the platform. For more information, see “SSP Log Files” on page 3-1.
	Quit	Terminates Hostview.
Edit	Blacklist File	Lets you specify boards and CPUs to be blacklisted.
Control	Power	Displays a window that enables you to turn the power on and off for the selected board. See “To Power Components On or Off From Within Hostview” on page 3-3. You can also set the JTAG claim and margin/trip settings.
	Bringup	Displays a window that lets you run `bringup(1M)` on a domain. See “To Bring up a Domain From Within Hostview” on page 3-20.

TABLE 2-1 Hostview Menu Items

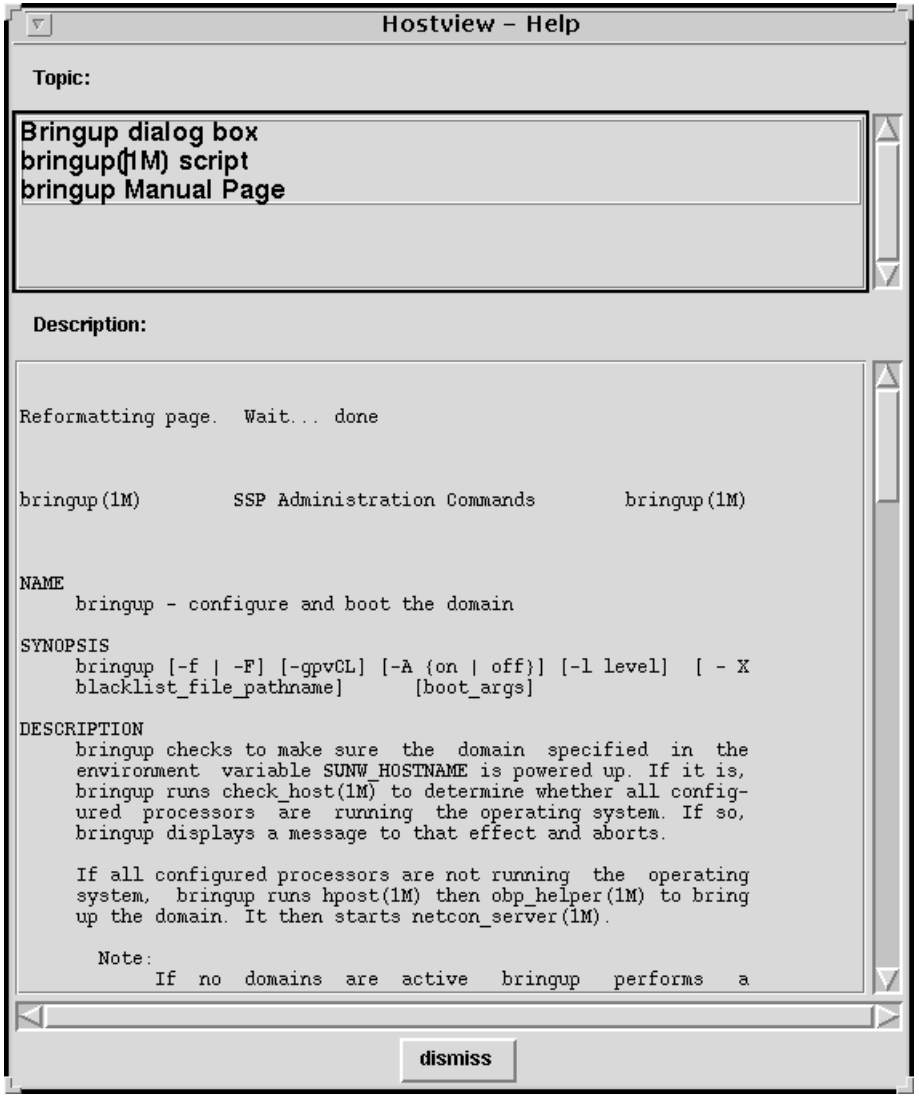
Menu	Selection	Description
	Fan	Displays a window that lets you run the `fan(1M)` command to control the fans within the platform. See "To Control Fans From Within Hostview" on page 3-12.
Configuration	Board	Enables you to attach and detach system boards. This feature is described in the *Dynamic Reconfiguration User's Guide.*
	Domain	Provides a pull-right menu with several choices. The menu choices enable you to create domains, remove domains, rename domains, obtain the status of domains, and view the history of domains. A domain consists of one or more system boards running the same operating system kernel. Domains function independently of each other. Each domain can carry its own workload and has its own log messages file. For more information see "To Create Domains From Within Hostview" on page 3-15 and "To Remove Domains From Within Hostview" on page 3-17.
Terminal	netcontool	Displays a window that provides a graphical interface to the `netcon(1M)` command, enabling you to open a network console window for a domain. This menu item is equivalent to executing the `netcontool(1M)` command. See "The `netcon(1M)` Window" on page 2-13.
	SSP	Provides pull-right menu choices that enable you to display an SSP Window in xterm, shelltool, or cmdtool format with a platform or domain as its host. Choose a domain (by selecting any system board within that domain) before choosing this option.
	rlogin	Provides pull-right menu choices that enable you to remotely log on to the selected platform or domain in an xterm, shelltool, or cmdtool window. Choose a domain (by selecting any system board within that domain) before choosing this option.

TABLE 2-1 Hostview Menu Items

Menu	Selection	Description
View	All Domains	Displays the boards within all domains, as well as any boards that are not part of a domain. (A board can be present without being part of a domain, although a board cannot be used when it is not part of a domain.)
	Individual Domains	When you select an individual domain, only the boards within that domain are displayed. Note that the color of the outline used to designate a given domain is also used as the background color for that domain in the menu. The system board numbers for the boards that belong to each domain are shown in square brackets.
Help	*topic*	Provides online help information on several topics.

Help Window

When you select a topic from the Help menu, the following window is displayed.



You can select the desired topic in the upper pane. The corresponding help information is displayed in the lower pane.

Main Window Buttons

The main Hostview window contains the buttons described below. If an out-of-boundary condition exists or an error has occurred, one or more of these buttons turn red.

The Power button (above) displays the Power Control and Status window which enables you to view the power status for the platform. See “To Power Components On or Off From Within Hostview” on page 3-3.

The Temperature button (above) displays the Thermal Status window which enables you to view the temperature status for the boards and components within the platform. See “To Monitor Thermal Conditions From Within Hostview” on page 3-8.

The Fan button (above) displays the Fan Status window which enables you to view the status of the fans within the platform. See “To Monitor Fans From Within Hostview” on page 3-10.

When certain error conditions occur, the Failure button (above) turns red. If you click a red Failure button, a window is displayed showing the error condition(s) that have occurred.

The following types of error conditions are trapped by this mechanism:

- `Host panic recovery in progress` – The operating system on a domain has failed and is recovering.

- `Heartbeat failure recovery in progress` – The SSP was not receiving updated platform or domain information as expected.
- `Arbitration stop recovery in progress` – A parity error or other fatal error has occurred, and the domain is recovering. See *arbitration stop* in the Glossary.
- `Host reboot is in progress` – The domain is being manually rebooted.
- `Power-on-bringup recovery in progress` – The platform and domains failed due to a power outage. Power has been restored, and the system is bringing up the domains.

Main Window Processor Symbols

In the main window display, the shape and background color of a processor symbol indicate the status of that processor. For example, a diamond on a green background indicates the processor is running the operating system.

The shape indicates what the processor is running:

◆	Operating system
●	`hpost(1M)`
■	`download_helper`
▲	OBP
?	Unknown program

The color of a symbol indicates the state of a processor:

green	Running.
maroon	Exiting.
yellow	Prerun. (The OS is currently being loaded.)
blue	Unknown.
black	Blacklisted. (The processor is unavailable to run programs or diagnostics.)
red	Redlisted. (The processor is unavailable to run programs or diagnostics and its state may not be changed.)

white Present but not configured. The processor is unavailable, but not blacklisted or redlisted. One example is a board that has been Hot Swapped in but not yet attached to the operating system

Hostview Performance Considerations

Each copy of Hostview requires a significant amount—5 to 10 Mbytes—of the available swap space in the SSP. Before running multiple copies of Hostview, make sure the SSP has sufficient swap space available.

The `netcon(1M)` Window

▼ To Display a `netcon(1M)` Window Using netcon(1M)

- **Run the following commands in the SSP Window.**

```
% setenv SUNW_HOSTNAME domain_name
% netcon
```

As shown, you must be sure that the `SUNW_HOSTNAME` environment variable is set to the name of the domain for which you want to display a `netcon(1M)` Window. For more information about the `netcon(1M)` command options, refer to `netcon(1M)` man page.

▼ To Display a `netcon(1M)` Window Using netcontool(1M)

1. **Bring up** `netcontool(1M)` **in either of two following ways.**

- From an SSP Window, enter the following commands.

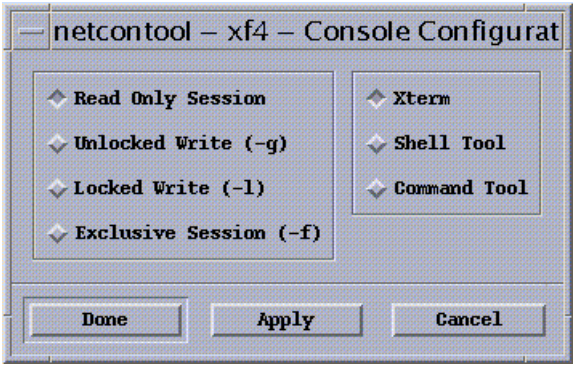
```
% setenv SUNW_HOSTNAME domain_name
% netcontool &
```

Note that the SUNW_HOSTNAME environment variable must be set to the domain for which you want to display a `netcontool(1M)` Window before you run the `netcontool(1M)` command.

- Alternatively, from Hostview, select a board from the domain for which you want to display a `netcontool(1M)` Window (by clicking on that board with the left mouse button), and select `Terminal` ➤ `netcontool`.

The `netcontool(1M)` Window is displayed.

2. **If you want to configure the `netcon(1M)` Window before you display it, choose the Configure button. The Console Configuration window is displayed:**



   a. **Select the session type in the left panel, and the window type in the right panel.**

   b. **Choose Done.**

3. **In the** `netcontool(1M)` **Window, choose the Connect button.**

   The `netcon(1M)` Window is displayed beneath the `netcontool(1M)` Window.

Overview of `netcontool(1M)`

The `netcontool(1M)` Window is shown below.

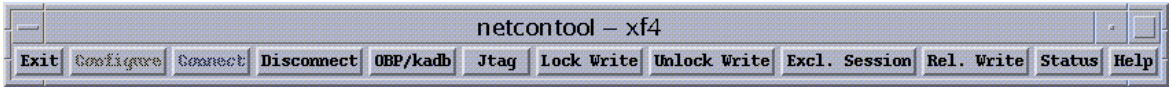


FIGURE 2-5 `netcontool(1M)` Main Window

If you choose the Configure button, the Console Configuration window is displayed:

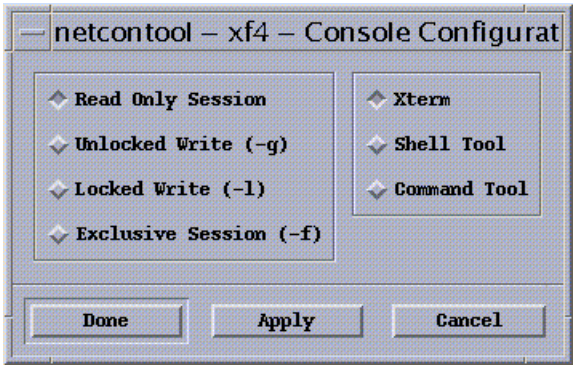


FIGURE 2-6 `netcontool(1M)` Console Configuration Window

- `Read Only Session`
  Displays a console window where you can view output from a domain, but cannot enter commands. This is the default session type.
- `Unlocked Write (-g)`
  Attempts to display a `netcon(1M)` Window with unlocked write permission. If this attempt succeeds, you can enter commands into the console window, but your write permission is taken away whenever another user requests Unlocked Write, Locked Write, or Exclusive Session permission for the same domain.
  - If another user currently has Unlocked Write permission, it is changed to read only permission, and you are granted Unlocked Write permission.
  - If another user currently has Locked Write permission, you are granted read only permission.
  - If another user currently has Exclusive Session permission, you are not allowed to display a `netcon(1M)` Window.
  - If you are granted Unlocked Write permission and another user requests Unlocked Write or Locked Write permission, you are notified and your permission is changed to read only. You can attempt to reestablish Unlocked Write permission at any time, subject to the same constraints as your initial attempt to gain Unlocked Write permission.
- `Locked Write (-l)`
  Attempts to display a console window with Locked Write permission.
  - If you are granted Locked Write permission, no other user can remove your write permission unless they request Exclusive Session permission.
  - If another user currently has Locked Write permission, you are granted only Read Only permission.
  - If another user currently has Exclusive Session permission, you are not allowed to display a `netcon(1M)` Window.
- `Exclusive Session (-f)`
  Displays a console window with Locked Write permission, terminates all other open console sessions for this domain, and prevents new console sessions for this

domain from being started. You can change back to multiple session mode by choosing the Rel. Write button to release write access, or by choosing the Disconnect button to terminate your console session for the domain. You can also simply quit from the console window (using the Control menu of the window). You are not granted Exclusive Session permission if any other user currently has exclusive session permission.

- `Terminal Type`
  Use this part of the Console Configuration window to specify the window type as xterm, shell tool (`shelltool(1)`), or command tool (`cmdtool(1)`). The `netcon(1M)` Window is brought up in the specified type of window. The default is xterm.

When you are satisfied with the contents of the window, you can choose Done to accept the settings and dismiss the window, or Apply to accept the settings without dismissing the window.

To display the `netcon(1M)` Window, choose the Connect button in the `netcontool(1M)` Window. `netcon(1M)` attempts to connect to the domain that you specified in the Console Configuration window, or to your default domain if you did not specify a domain in that window. If an error occurs, you are notified with a message box.

If no error occurs, the `netcon(1M)` Window is displayed directly beneath the `netcontool(1M)` Window. Note that these are two separate windows, although they can affect each other. You can view messages in the console window and, if you have write permission, enter commands.

The Disconnect button in the `netcontool(1M)` Window disconnects the console window from the domain and removes the console window. The `netcontool(1M)` Window is still available so that you can reconfigure for another connect session.

The OBP/kadb button in the `netcontool(1M)` Window breaks to the OpenBoot PROM (OBP) or `kadb(1M)` programs.

The Jtag button toggles the SSP-to-platform connection between a network connection and a JTAG connection.

The Lock Write, Unlock Write, and Excl. Write buttons in the `netcontool(1M)` Window request the corresponding mode for the console window.

The Rel. Write button in the `netcontool(1M)` Window releases write access and places the console in read only mode.

The Status button in the `netcontool(1M)` Window displays information about all open consoles that are connected to the same domain as the current session.

Overview of netcon(1M)

The netcon(1M) command is similar to netcontool(1M) except that no GUI interface is provided, making it more functional for dial-in or other low-speed network access. Typically, you log in to the SSP machine as user ssp, and enter the netcon(1M) command in one of the following formats:

```
ssp% netcon
ssp% netcon -g
ssp% netcon -l
ssp% netcon -f
```

This action changes the window in which you run the netcon(1M) command into a netcon(1M) Window for the domain specified by the SUNW_HOSTNAME environment variable for the SSP Window. You can specify -g for Unlocked Write permission, -l for Locked Write permission, and -f to force Exclusive Session mode.

If you execute netcon(1M) with none of these options while all console sessions for the domain are running in read only, unlocked write, or locked write mode, you are granted read only permission. If you execute netcon(1M) with none of these options when the domain has no other sessions running, you are granted Unlocked Write permission. (If another user is running Exclusive Session for the domain, you cannot bring up a console session.)

If you have write permission, you can enter Solaris commands. In addition, you can enter special commands prefixed by tilde (~) to perform the functions offered by the netcontool(1M) Window, described in the previous section.

netcon(1M) Communications

netcon(1M) uses two distinct paths for communicating console input/output between the SSP and a domain: the standard network interface and the cbe interface. Usually, when the domain is up and running, console traffic flows over the network. If the local network becomes inoperable, all interactive access to the domain is lost and, for example, telnet, rlogin, and netcon(1M) sessions hang. In this case, you can switch to the cbe interface and access the host's console window. To perform this switch, use the ~= command in the netcon(1M) window.

CHAPTER 3

System Administration Procedures

This chapter describes the Ultra Enterprise 10000 system administration procedures. Also see the man pages in the *Ultra Enterprise 10000 SSP Reference* and *SunOS Reference Manual*. For information about standard Solaris system administration functions, see the *Solaris 2.5 System Administrator AnswerBook*.

You can run many Enterprise 10000 system administration procedures on the SSP by using Hostview and `netcontool(1M)`.

SSP Log Files

When you perform procedures on an SSP, error messages for a particular domain are logged in the file:

```
$SSPOPT/adm/domain_name/messages
```

where *domain_name* is the host name of the domain for which the error occurred.

Error messages for the platform (which are not specific to a domain) are logged in the file:

```
$SSPOPT/adm/messages
```

▼ To View a Messages File From Within Hostview

1. **Select the appropriate board.**

- If you want to view the `messages` file for a particular domain, select that domain in the main Hostview window (by clicking on a board from that domain with the left mouse button).
- If you want to view the `messages` file for the platform, make sure that no domain is selected.

2. **Choose File ➤ SSP Logs.**

The following window is displayed.

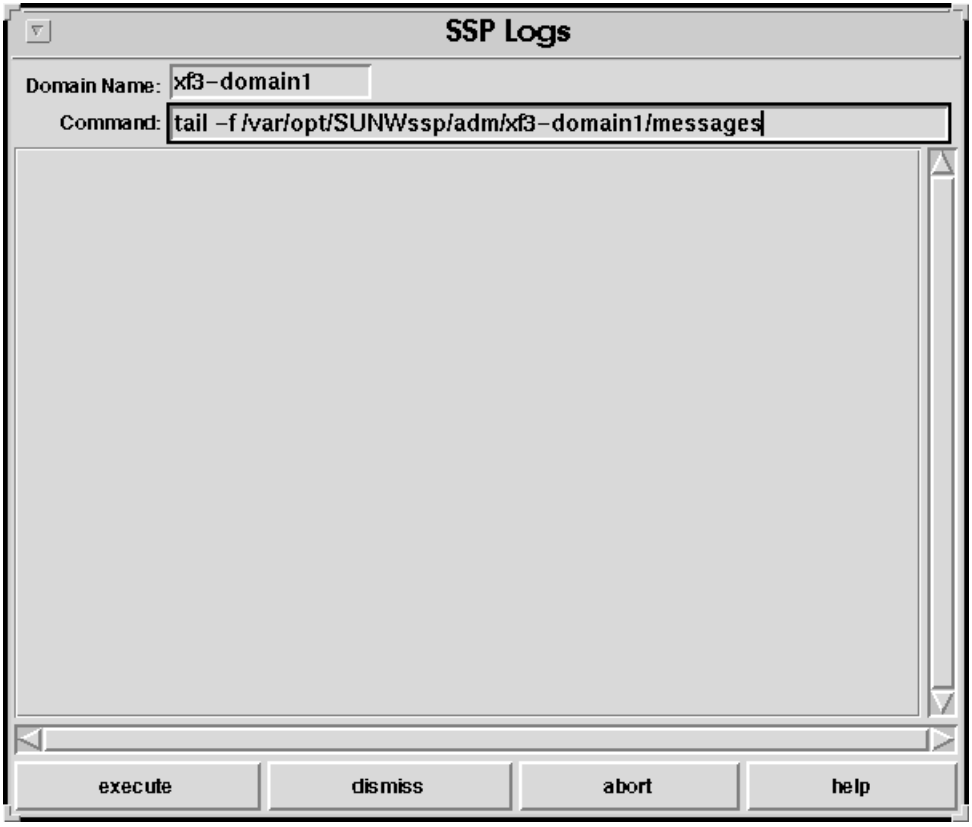


FIGURE 3-1 SSP Logs Window

The Domain Name field shows the name of the domain that you selected. The `messages` file is displayed in the main panel of the window.

Administering Power

▼ To Power Components On or Off From Within Hostview

1. **Click the left mouse button to select a board in the main Hostview window.**
2. **Choose Control ➤ Power. The following window is displayed.**

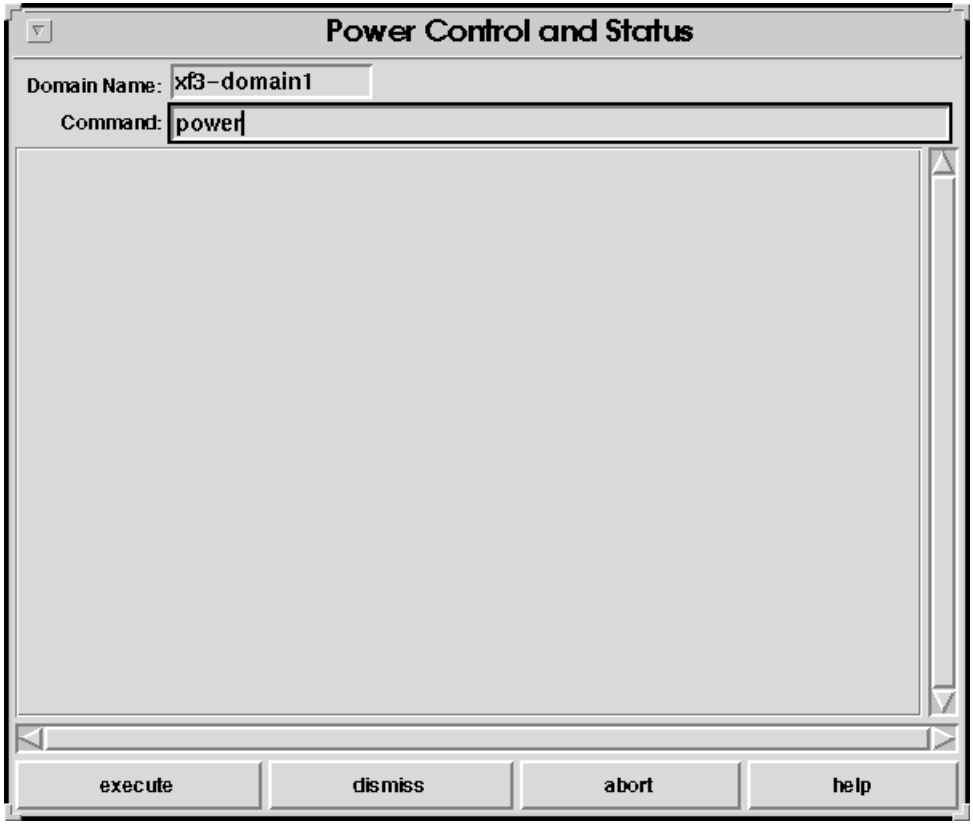


FIGURE 3-2 Hostview — Power Control and Status Window

The default `power(1M)` command is displayed in the Command field.

3. **Optionally, add options to the `power(1M)` command.**

4. **Click the Execute button (or type Return) to run the command.**

   The results are shown in the main panel of the window.

5. **For information about the `power(1M)` command, choose the Help button.**

   A help window is displayed. See "Help Window" on page 2-10.

   Usually, after powering on the necessary components, you run the bring up commands on the SSP for the domains you want to boot. See "To Bring up a Domain From Within Hostview" on page 3-20.

   If you try to power off the system while any domain is actively running the operating system, the command fails and a message is displayed in the message panel of the window. In this case, you have two choices. You can force a power off by using the `-f` (force) option of the `power(1M)` command, and reissuing the command. Or, you can issue a `shutdown(1M)` or similar command for the active domain(s) to gracefully shut down the processors, and then reissue the power off command. Using `shutdown(1M)` ensures that all resources are de-allocated and users have time to log off before the power is turned off. To use `shutdown(1M)`, you must be logged on to the domain as `root`.

   If the platform loses power due to a power outage, Hostview displays the last state of each domain before power was lost.

▼ To Power Components On or Off From the Command Line

- To power on the Enterprise 10000 platform from the command line use:

```
ssp% power -on -all
```

- To power on only selected power supplies, use the `-s` option. See `power(1M)`.

Note – The Enterprise 10000 platform does not boot any domains when powered on; individual domains must receive bring up instructions from the SSP. See "To Bring up a Domain From Within Hostview" on page 3-20.

- To power off the entire Enterprise 10000 system, use the following command:

```
ssp% power -off -all
```

This command fails and returns an appropriate error message if it finds that any processors are still running the operating system. To force the power off without first deallocating resources and warning the users, use the `-f` option.

Alternatively, to shut down a platform more gracefully before powering it off, follow these steps.

1. **Open a window for each domain.**
2. **Log in as root.**
3. **Run** `shutdown(1M)` **or a similar command.**
4. **After you have performed the above steps for each domain, reissue the** `power -off -all` **command.**

Note – Running the `power(1M)` command with no options displays the status of the power supplies and I/O cabinets.

See the `power(1M)` man page for more information.

▼ To Power Peripherals On or Off From the Command Line

- **Use the** `-p` **option the** `power(1M)` **command:**

```
ssp% power -p 2 3 -on
```

This example powers on the peripherals attached to the power control units 2 and 3.

In place of `-on`, you can use `-off` to turn off the power to the specified peripherals, or `-v` to determine the state of the power to the specified peripherals. For more information, refer to `power(1M)`.

▼ To Monitor Power Levels in Hostview

1. **Click the Power button:**

The following window is displayed:

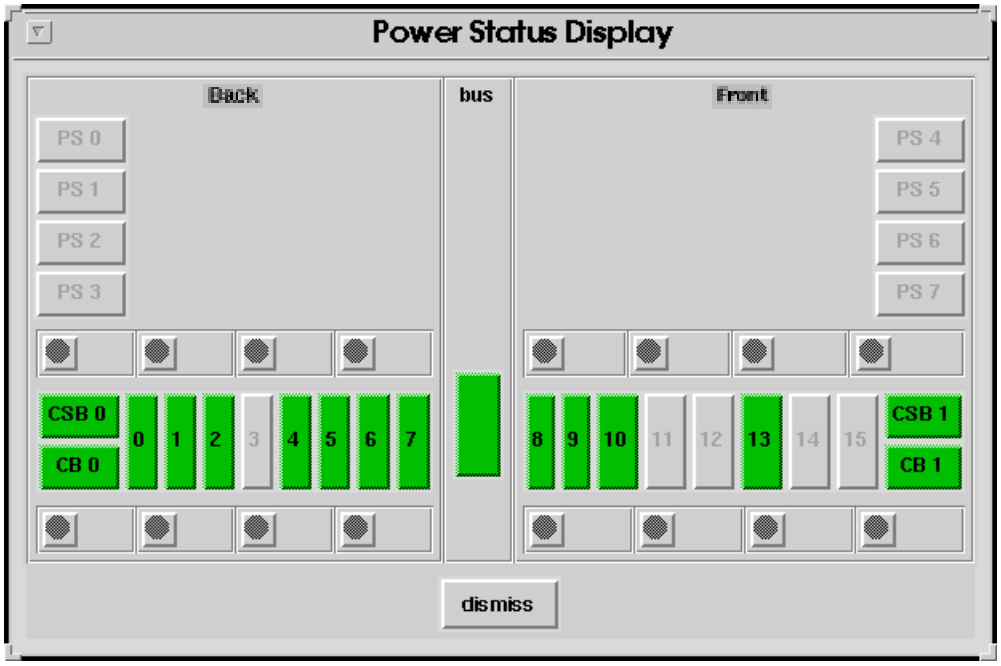


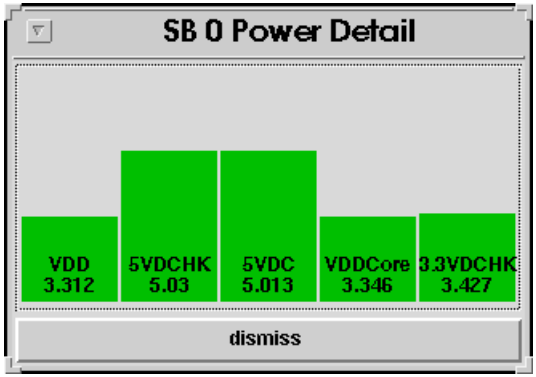
FIGURE 3-3 Hostview — Power Status Display

In this window, the bulk power supplies are named PS0 through PS7. The system board power supplies are numbered 0 through 15. The support board power supplies are named CSB0 and CSB1. The control board power supplies are named CB0 and CB1.

Power supplies may be colored green, red, or grey. A green power supply is functioning properly. A red power supply has failed. A grey power supply is not present.

2. **Click on a system board.**

   The Power Detail window for that board is displayed.



3.

FIGURE 3-4 Hostview — System Board Power Detail Window

The Power Detail window shows the voltage for each of the five power supplies on the board. The power levels are indicated in volts. The bars give a visual representation of the relative voltage levels so that you can monitor them more easily. If a bar is green, the voltage level is within the acceptable range. If a bar is red, the voltage level is either too low or too high. (Thus, a red bar could be short or tall.) The bars never grow taller than the height of the window, so voltage levels that exceed the maximum threshold are displayed as red maximum-height bars. Similarly, bars never shrink below a minimum height, so voltage levels below the minimum threshold are displayed as red minimum-height bars.

The control board and support board power details are similar to the system board power detail, described above. The only difference between the detail for a system board and the detail for a controller or support board, is the number of power supplies.

Administering Thermal Conditions and Fans

▼ To Monitor Thermal Conditions From Within Hostview

You can use Hostview to monitor thermal conditions for power supplies, processors, ASICs (application-specific integrated circuits), and other sensors located on system boards, support boards, controller boards, and the centerplane.

1. **Click the Temperature button.**

The following window is displayed:

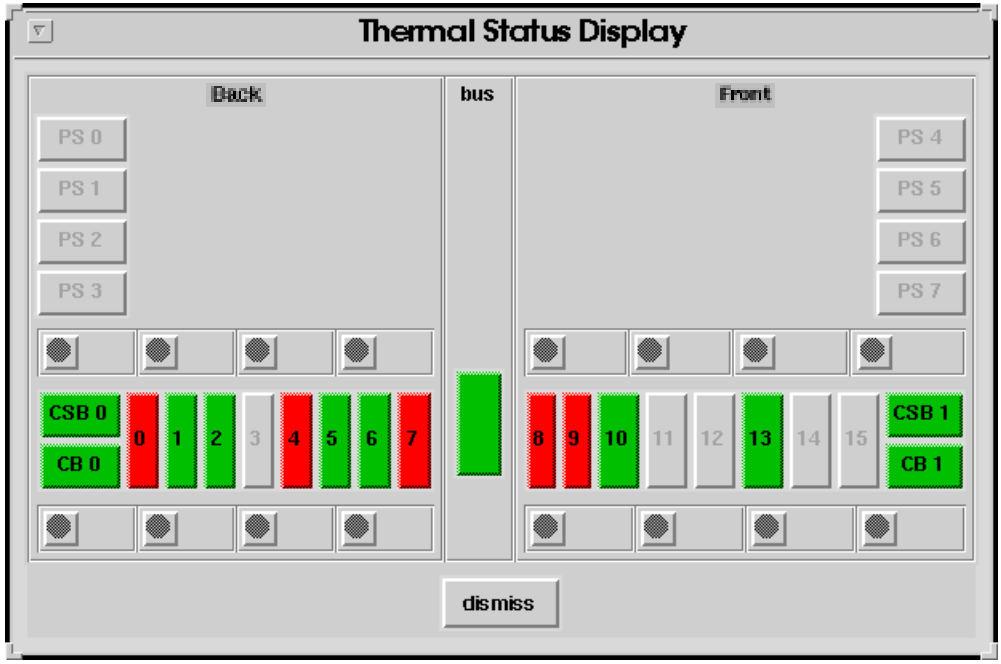


FIGURE 3-5 Hostview — Thermal Status Display

The centerplane, support boards, controller boards, and system boards are shown in green if their temperatures are in the normal range, and in red otherwise.

2. **To see the Thermal Detail window for a component, click on it with the left mouse button. A Thermal Detail window for a system board is shown below.**

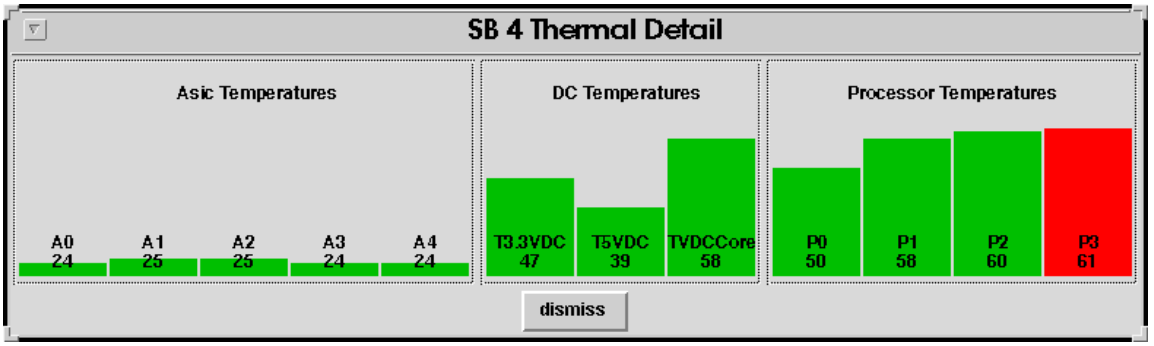


FIGURE 3-6 Hostview — System Board Thermal Detail

The left panel of the system board detail shows the temperatures for the five ASICs, named A0 through A4. The middle panel shows the temperatures for the three power supplies. The right panel shows the temperatures for the four processors, named P0 through P3.

The temperatures are displayed in degrees Centigrade, and the values are shown numerically and as vertical bars. The vertical bars are colored green if the temperature is within the normal range, and red otherwise. The bars never grow taller than the height of the window, so temperature levels above the maximum threshold are displayed as red maximum-height bars. Similarly, bars never shrink below a minimum height, so temperature levels below the minimum threshold are displayed as red minimum-height bars.

The detail windows for control boards, support boards, and the center plane are similar.

▼ To Monitor Fans From Within Hostview

You can use Hostview to monitor fan speeds and fan failures for the 32 fans located throughout the Enterprise 10000 platform.

1. **Click on the Fan button:**

The following window is displayed:

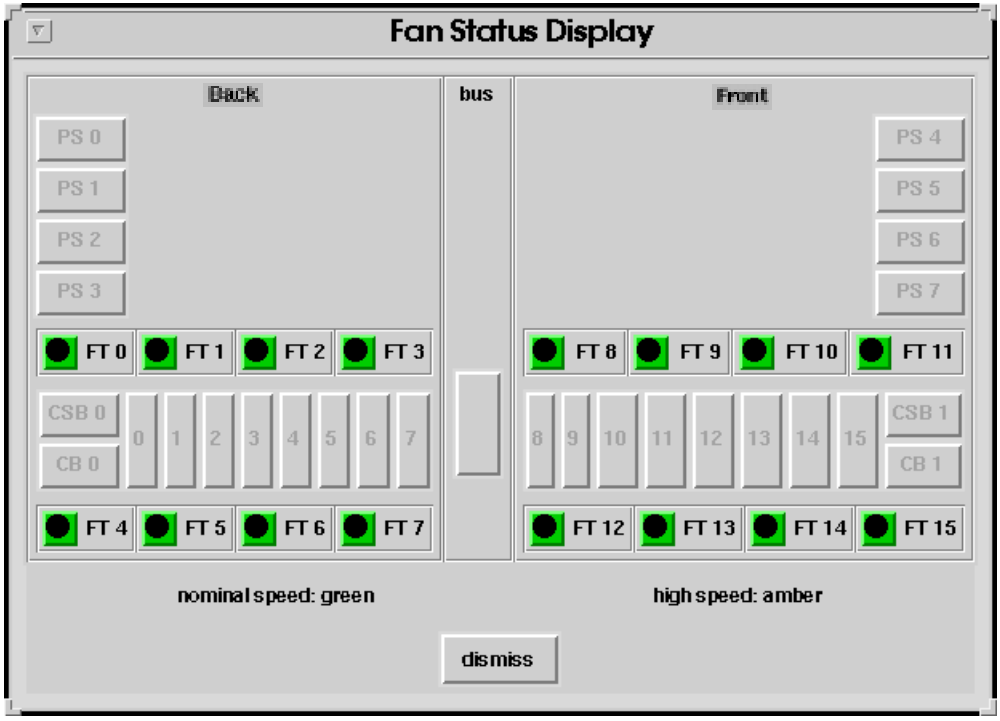


FIGURE 3-7 Hostview — Fan Status Display

The fan trays are named FT0 through FT7 on the back, and FT8 through FT15 on the front. Each fan tray contains two fans. The color of the fan tray symbol is green if both fans in the tray are functioning at normal speed, amber if both fans are functioning at high speed, and red if either fan within the fan tray has failed.

2. **To see a detail window that provides fan information, click on a fan tray symbol with the left mouse button. A fan detail window is displayed.**

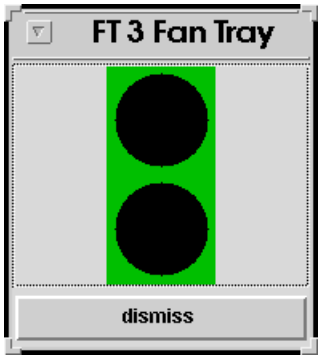


FIGURE 3-8 Hostview — Fan Tray Display

The top circle indicates the inner fan when you open the fan tray, and the lower circle indicates the outer fan. The color surrounding each circle in the fan detail indicates the status of that fan. The colors are green for normal operation at normal speed, amber for normal operation at high speed, and red for failure.

▼ To Control Fans From Within Hostview

You can control fan power and speed from within Hostview.

1. **Choose Control ➤ Fan.**

   The following window is displayed:

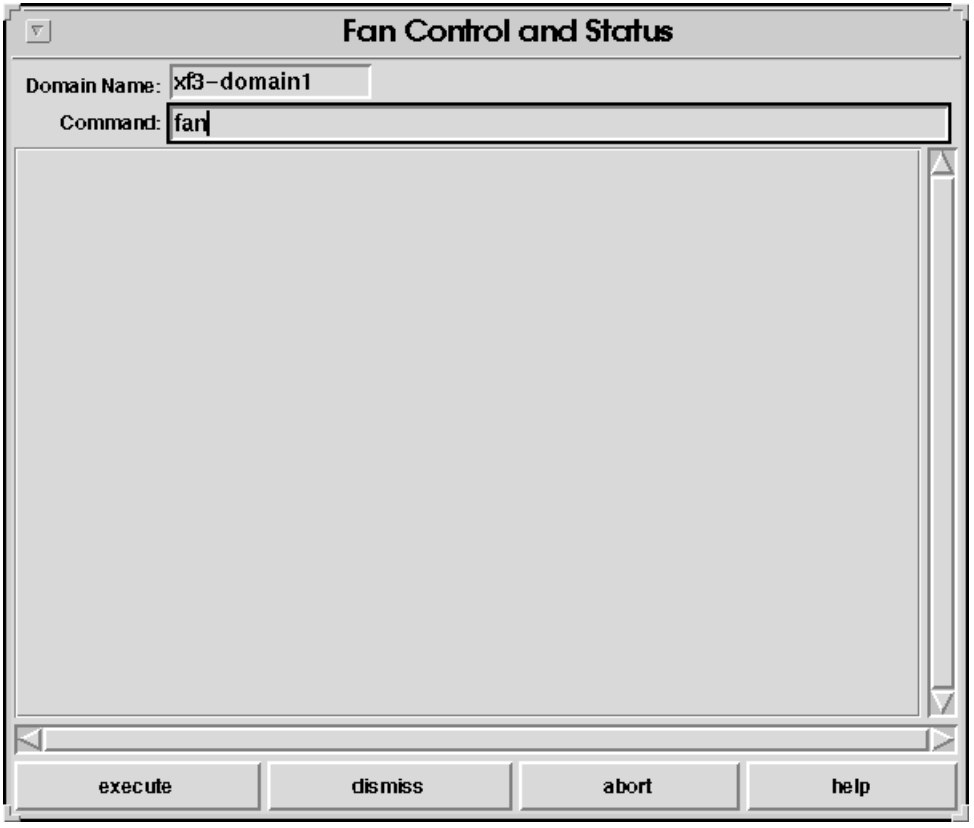


FIGURE 3-9 Hostview — Fan Control and Status Window

   The Domain Name field shows the selected domain from the platform to which Hostview is connected. The `fan(1M)` command is shown in the Command field without any options.

2. **Add the desired set of options to the `fan(1M)` command, and click the execute button (or press Return).**

   For information on the `fan(1M)` command itself, choose the Help button. A help window is displayed. See “Help Window” on page 2-10.

For example, if you want to set the fans on the front fan shelves to high speed, enter the following command:

```
fan -s fast
```

For more information, see `fan(1M)`.

Domains

The SSP supports commands that let you logically group system boards into Dynamic System Domains, or simply *domains*, which are able to run their own operating system and handle their own workload. Domains can be created and deleted without interrupting the operation of other domains. You can use domains for many purposes. For example, you can test a new operating system version or set up a development and testing environment in a domain. In this way, if problems occur, the rest of your system is not affected. You can also configure several domains to support different departments, with one domain per department. In this situation, you might reconfigure the system into one domain to run a large job over the weekend.

Domain Configuration Requirements

You can create a domain out of any group of system boards, provided the following conditions are met:

- The boards are present and not in use in another domain.
- At least one board has a network interface.
- The boards have sufficient memory to support an autonomous domain.
- The name given the new domain is unique and matches the hostname of the domain to be booted.

The boards which will be grouped together into domains should have their own disk from which they can be brought up, as well as a SCSI interface for that disk. If the created domain does not have its own disk, you must always boot it from the network.

▼ To Create Domains From Within Hostview

Note – Before proceeding, see “Domain Configuration Requirements” above. If the system configuration must be changed to meet any of these requirements, call your service provider.

---

1. **Select the board(s) that the domain will contain.**

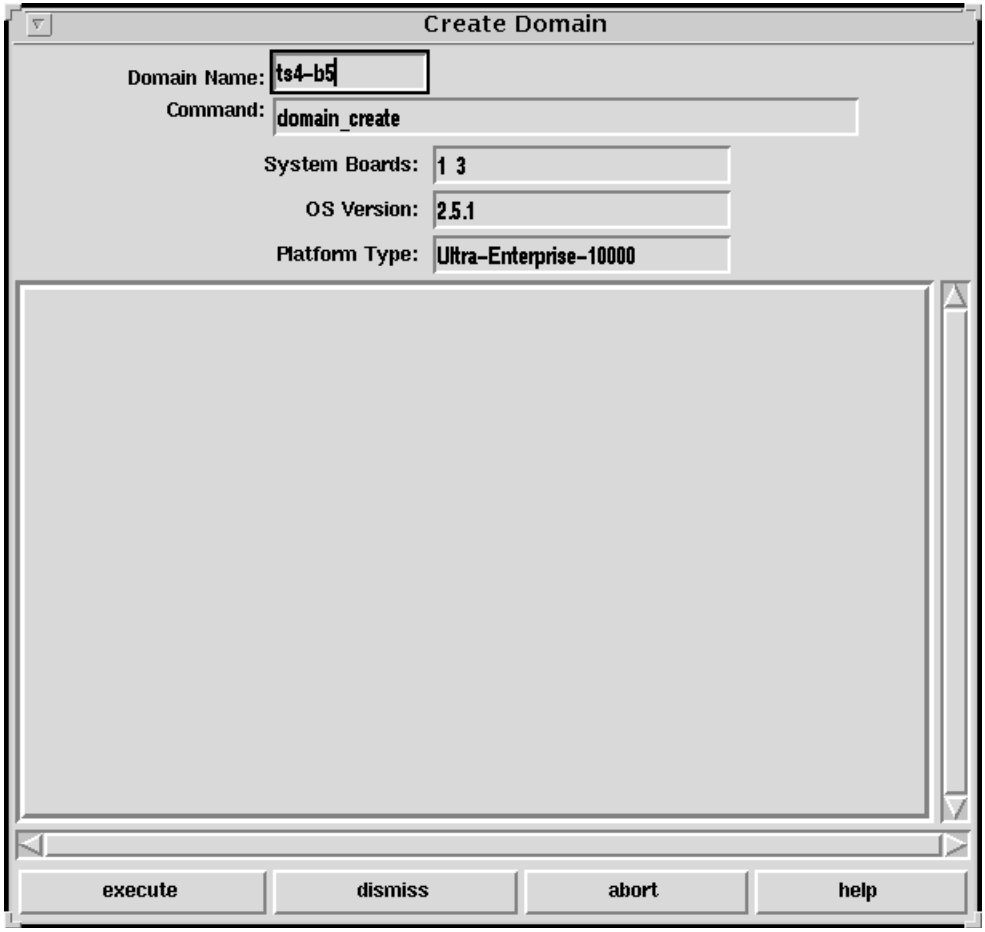
   a. **Click the left mouse button on the first board.**

   b. **Click the middle mouse button on any additional boards.**

      Note that the boards you select should not currently belong to any domain.

2. **Choose Configuration ➤ Domain ➤ Create.**

   The Create Domain window is displayed.



3. **Enter the Domain Name.**

   The name of the domain must be preconfigured into your system by Sun Microsystems.

4. **If all other fields are acceptable, choose execute.**

   Note that the System Boards field indicates the boards that you selected in the main Hostview window. The default OS version and the default platform type are shown.

   If Hostview successfully executes the command, it displays the message `Command completed` in the informational panel of the window.

Note – Hostview can run only one `create` or `remove` command at a time. If you attempt to execute a second `create` or `remove` command before the first has completed, your second attempt fails.

▼ To Create Domains From the Command Line

Many of the instructions that follow were copied from the SunInstall™ section of the Sun document *SPARC: Installing Solaris Software* in the *Solaris 2.5 System Administrator AnswerBook*. Several of these steps have been modified to reflect Ultra Enterprise 10000 system-specific changes to the SunInstall procedures. For more information, see the above mentioned document.

Before proceeding, see “Domain Configuration Requirements” on page 3-14. If the system configuration must be changed to meet any of these requirements, call your service provider.

1. **Run** `domain_create(1M)` **in an SSP Window.**

```
ssp% domain_create -d domain_name -b system_board_list \
-o os_version -p platform_name
```

where

domain_name is the name you want to give to the new domain. It should be unique among all Enterprise 10000 systems controlled by the SSP.

system_board_list specifies the boards that are to be part of this domain. The specified system boards must be present and not in use. Each domain must have a network interface, SCSI interface, and sufficient memory to support an autonomous system. List the board numbers, separated by commas or spaces, for all boards you want to include.

os_version is the version of the operating system (possibly including the patch-level) to be loaded into the domain, such as `2.5.1`.

platform_name is the name of the platform that contains the boards which will make up the new domain (in case the SSP controls multiple platforms).

2. **Optionally, create a new SSP Window.**

   Log in to the SSP machine as user `ssp`. When prompted for the `SUNW_HOSTNAME` environment variable, enter the name of the new domain.

▼ To Remove Domains From Within Hostview

1. **In the main Hostview window, click any board in the domain to be removed.**
2. **Choose Configuration ➤ Domain ➤ Remove.**

   A window similar to the following is displayed.

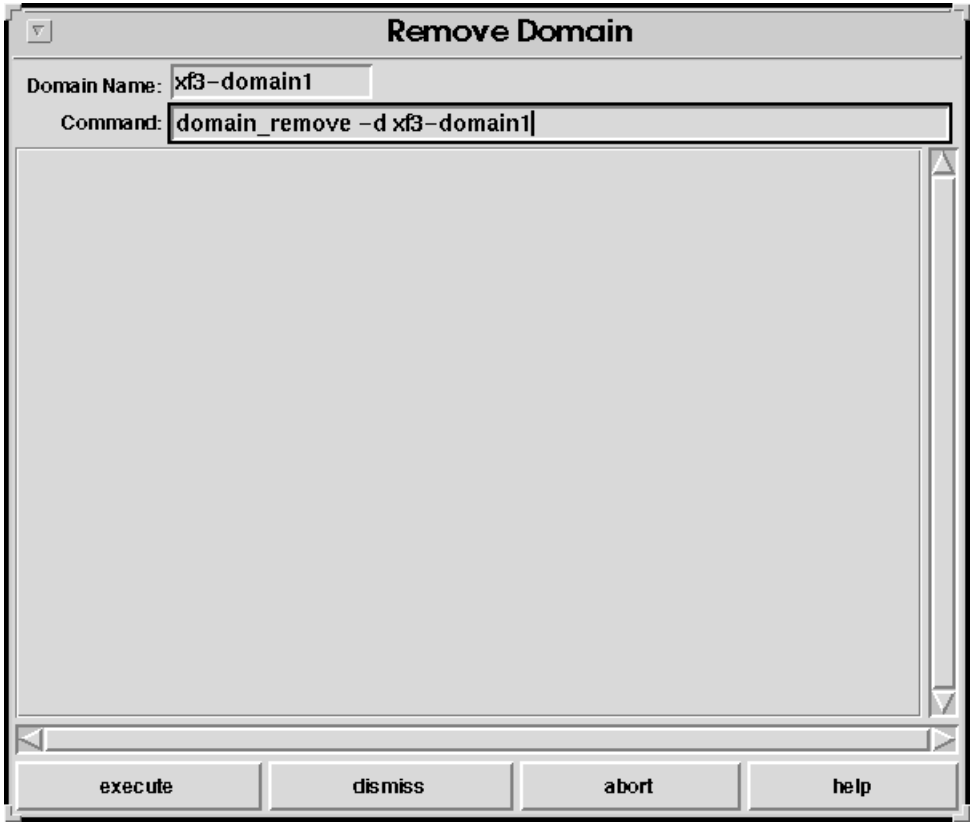


FIGURE 3-10 Hostview — Remove Domain

3. **If the default** `domain_remove(1M)` **command is satisfactory, choose the execute button; otherwise, edit the command first.**

   For help on the `domain_remove(1M)` command, choose the help button. A help window is displayed. See "Help Window" on page 2-10.

Note – If the system cannot remove your domain, see `domain_remove(1M)` for a list of potential errors.

▼ To Remove Domains From the Command Line

1. **Run** `domain_remove(1M)`**.**

   You must execute this command in an SSP Window whose environment variable `SUNW_HOSTNAME` is set to the name of the domain you want to remove. The domain must be inactive.

```
ssp% domain_remove -d domain_name
```

2. **Verify that the command was successful.**

   Upon successful completion, the SSP file system for this domain is removed.

Note – If the system cannot remove your domain, an error message is displayed. See `domain_remove(1M)` for a list of potential errors.

▼ To Rename Domains From Within Hostview

1. **Shut down the domain.**
2. **In the main Hostview window, select a board from the domain that you want to rename by clicking it with the left mouse button.**

3. **Choose Configuration ➤ Domain ➤ Rename.**

   A window similar to the following is displayed:

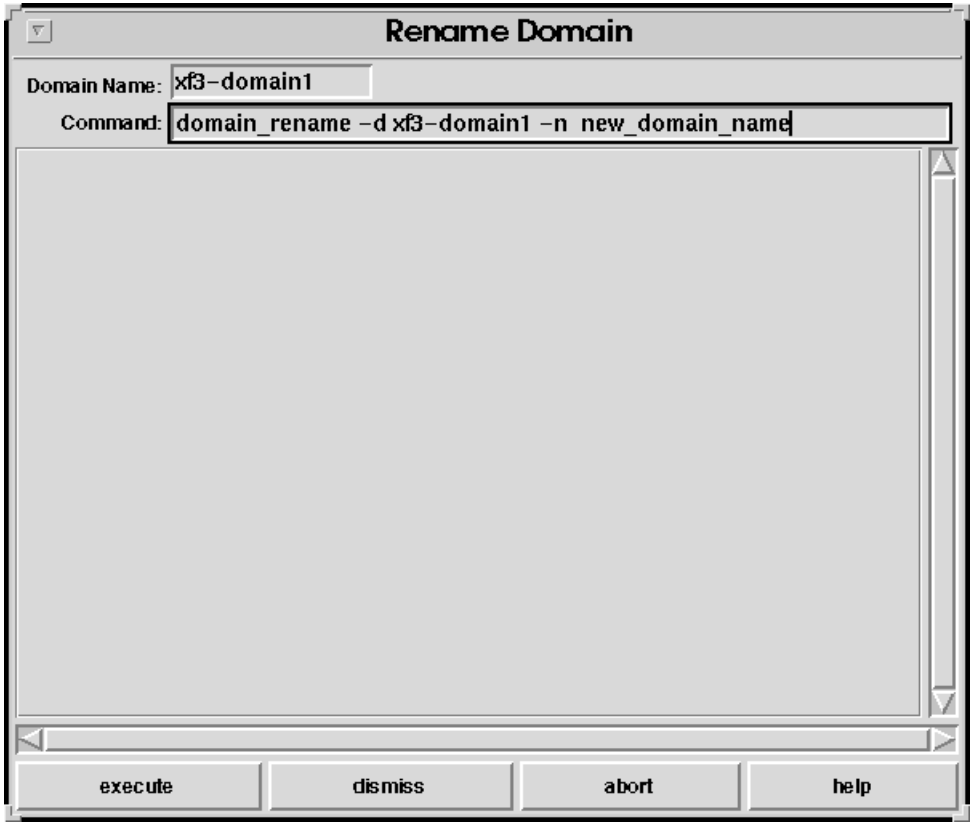


FIGURE 3-11 Hostview — Rename Domain Window

4. **If the default** `domain_rename(1M)` **command is satisfactory, choose the execute button. Otherwise, edit the command first.**

   For help on the `domain_rename(1M)` command, click the help button. A help window is displayed. See "Help Window" on page 2-10.

▼ To Rename Domains From the Command Line

- **Use the** `domain_rename(1M)` **command.**

```
% domain_rename -d old_host_name -n new_host_name
```

For more information, see the `domain_rename(1M)`, `domain_remove(1M)`, and `domain_create(1M)` commands.

▼ To Bring up a Domain From Within Hostview

1. **Select the domain you want to bring up.**

   Use the mouse to select any system board belonging to the domain you want to bring up.

2. **Choose Control ➤ Bringup.**

   A window is displayed that shows the name of the selected domain.

3. **Choose `Execute` to perform the bringup.**

4. **After the bringup operation up has completed, choose Terminal ➤ netcontool. If the OBP prompt appears (i.e., the `OK` prompt), boot the domain:**

```
OK boot boot_device
```

   The domain should boot and then display the login prompt. Note that you can use the OBP command `devalias` to determine the alias for the disk you want to use as *boot_device*.

▼ To Bring up a Domain From the Command Line

Before you can bringup a domain from the command line in an SSP Window, the power supplies for the domain must be powered on.

1. **Set the SSP to control the proper domain.**

   The SSP controls the domain specified by the `SUNW_HOSTNAME` environment variable. To check its value, enter:

```
ssp% env
```

   If `SUNW_HOSTNAME` is set to a domain other than the one you want to bringup, change it by switching to the desired domain:

```
ssp% domain_switch domain_name
```

2. **Power on the power supplies for all boards in the domain (specified by SUNW_HOSTNAME).**

```
ssp% power -on
```

3. **Bringup the domain by running the following commands**:

```
ssp% bringup -A [off/on] [disk]
ssp% netcon
ok boot
```

`-A` is the autoboot option. If `-A` is on, the domain will automatically boot. If `-A` is off, you need to explicitly boot the domain as shown.

▼ To Obtain Domain Status From Within Hostview

1. **In the main Hostview window, select a board from the domain for which you want to obtain status information.**

   If the boards from the desired domain are not displayed, use the `View` menu to display the desired domain (or all domains).

2. **Choose Configuration ➤ Domain ➤ Status.**

A window similar to the following window is displayed.

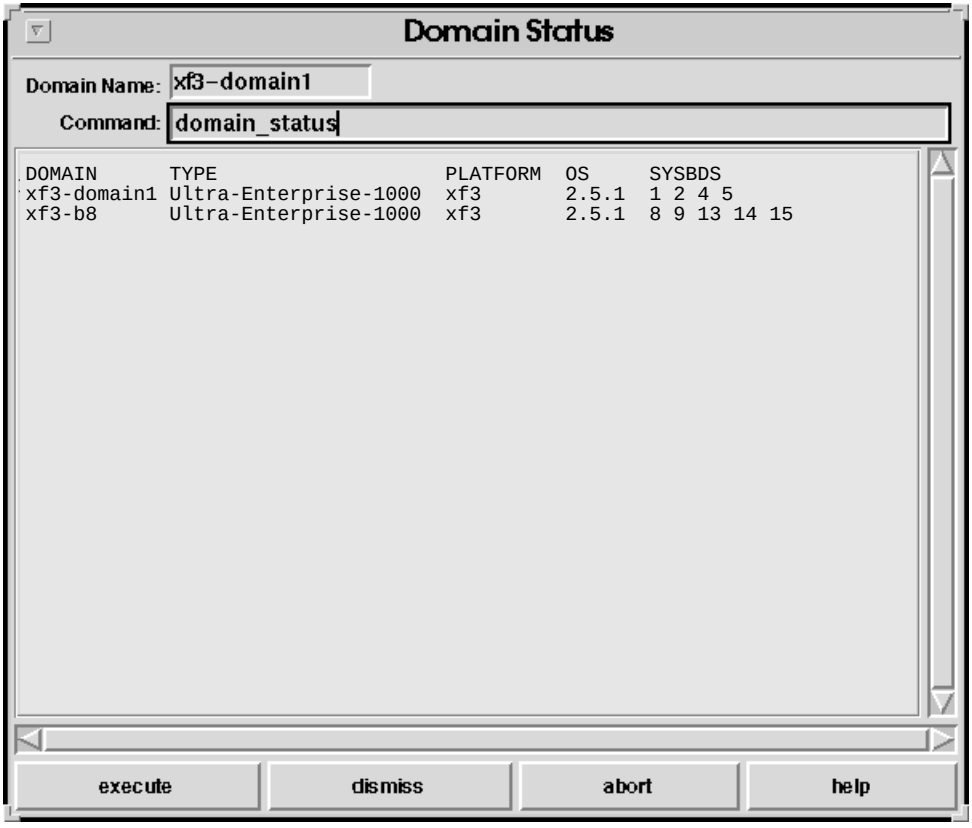


FIGURE 3-12 Hostview — Domain Status Window

3. **Choose the execute button. The status listing is displayed in the main panel of the window.**

The status listing has five columns:

- DOMAIN is the name of the domain.
- TYPE is the platform type. It can only take the value UE10000 in the current release.
- PLATFORM is the name of the platform. (The platform name is set after the SSP packages are installed.)
- OS is the operating system identification number.
- SYSBDS indicates the system boards that make up the domain.

▼ To Specify the Domain for an SSP Window

1. **Open a new SSP Window.**
2. **When you are prompted to provide a value for the environment variable** `SUNW_HOSTNAME`**, specify the name of the domain that you want to control and monitor from within that SSP window.**

▼ To Create a `netcon(1M)` Window for a Domain

- **Run** `netcontool(1M)` **or** `netcon(1M)` **in an SSP Window that has its** `SUNW_HOSTNAME` **set to the domain name.**

SSP Messages Files

Each domain has its own SSP messages file, named `${SSPVAR}/adm/{$SUNW_HOSTNAME}/messages`, where `$SUNW_HOSTNAME` is the name of the domain.

Blacklisting Components

The blacklisting feature enables you to configure the following components out of the system:

- System boards
- Processors
- Address buses
- Data buses
- Data Routers
- I/O controllers
- I/O adapter card
- System board memory
- Memory DIMM groups
- Enterprise 10000 half-centerplane
- Port controller ASICs
- Data buffer ASICs
- Coherent interface controller ASICs
- 72-bit half of 144-bit local data router within system boards

Generally, you may want to blacklist a component if you believe that component is having intermittent problems, or if it is failing sometime after the system is booted.

If a component has a problem that shows up in the power-on self test (POST) run by `hpost(1M)` (which is run by the `bringup(1M)` command), that component is automatically configured out of the system by `hpost(1M)`. However, that component is not blacklisted. `hpost(1M)` is run on the components in the system before a domain is booted, and on the components on a given board before that board is attached with Dynamic Reconfiguration (DR). See the *Dynamic Reconfiguration User's Guide*.

To blacklist a component, you can edit the `blacklist(4)` file with a text editor, or use Hostview. (Hostview does not allow you to blacklist all possible components, so there may be times when you need to edit `blacklist(4)` directly.) When a domain runs POST, `hpost(1M)` reads the `blacklist(4)` file and automatically configures out the components specified in that file. Thus, changes that you make to the `blacklist(4)` file do not take effect until the machine is rebooted.

The file is `$SSPVAR/etc/`*platform_name*`/blacklist`, where *platform_name* is the name of the platform. See the `blacklist(4)` man page for information about the contents of the `blacklist(4)` file.

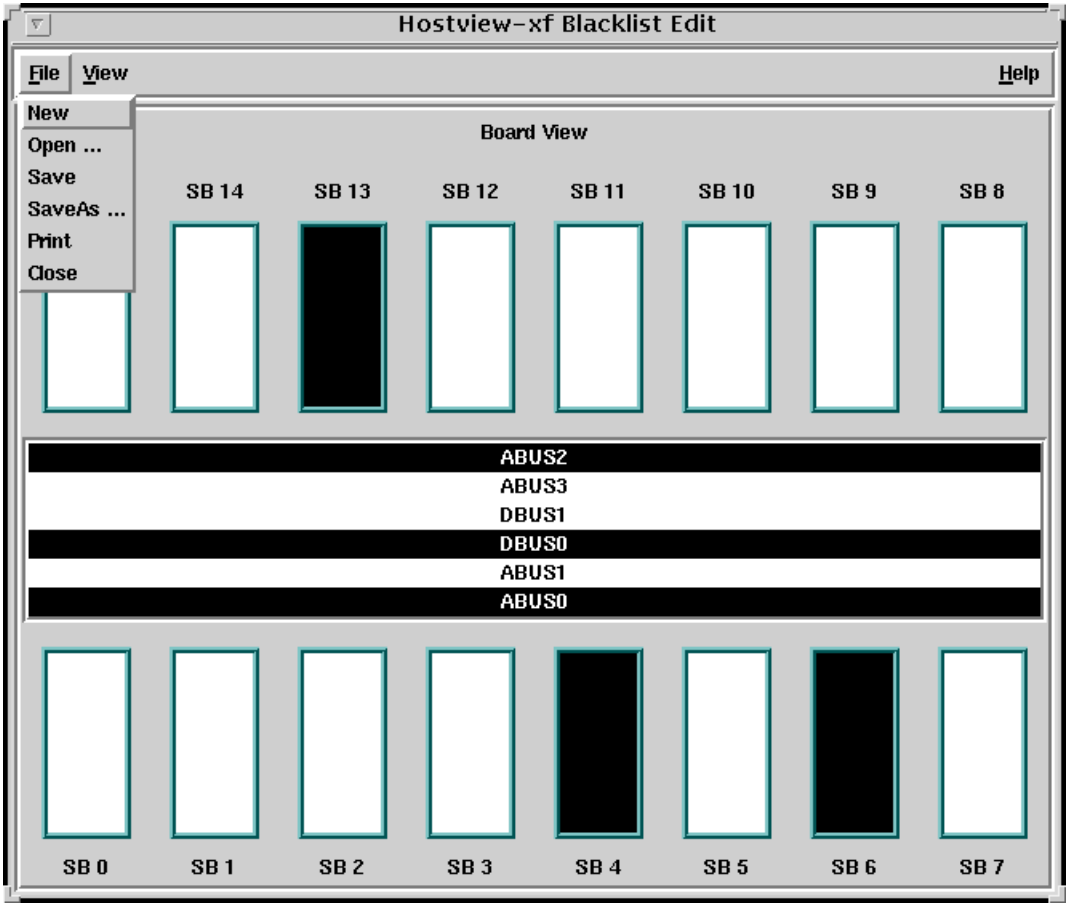
▼ To Blacklist Boards and Buses From Within Hostview

Note – Hostview only

---

1. **In Hostview, select Edit ➤ Blacklist File.**

   The Blacklist Edit window is displayed.



2. **Select the boards and/or buses that you want to blacklist.**

   To select a single component and de-select all other components of that type (e.g., to select a single board and de-select all other boards), click that component with the left mouse button. To toggle the selection status of a single component without affecting the selection status of any other component, click that component with the middle mouse button. The selected components are displayed in black.

3. **To save the changes, select File ➤ Save.**

4. **To exit the Blacklist Edit window, select File ➤ Close.**

   If you have unsaved changes and you close the Blacklist Edit window with File ➤ Close, you are prompted to save the changes.

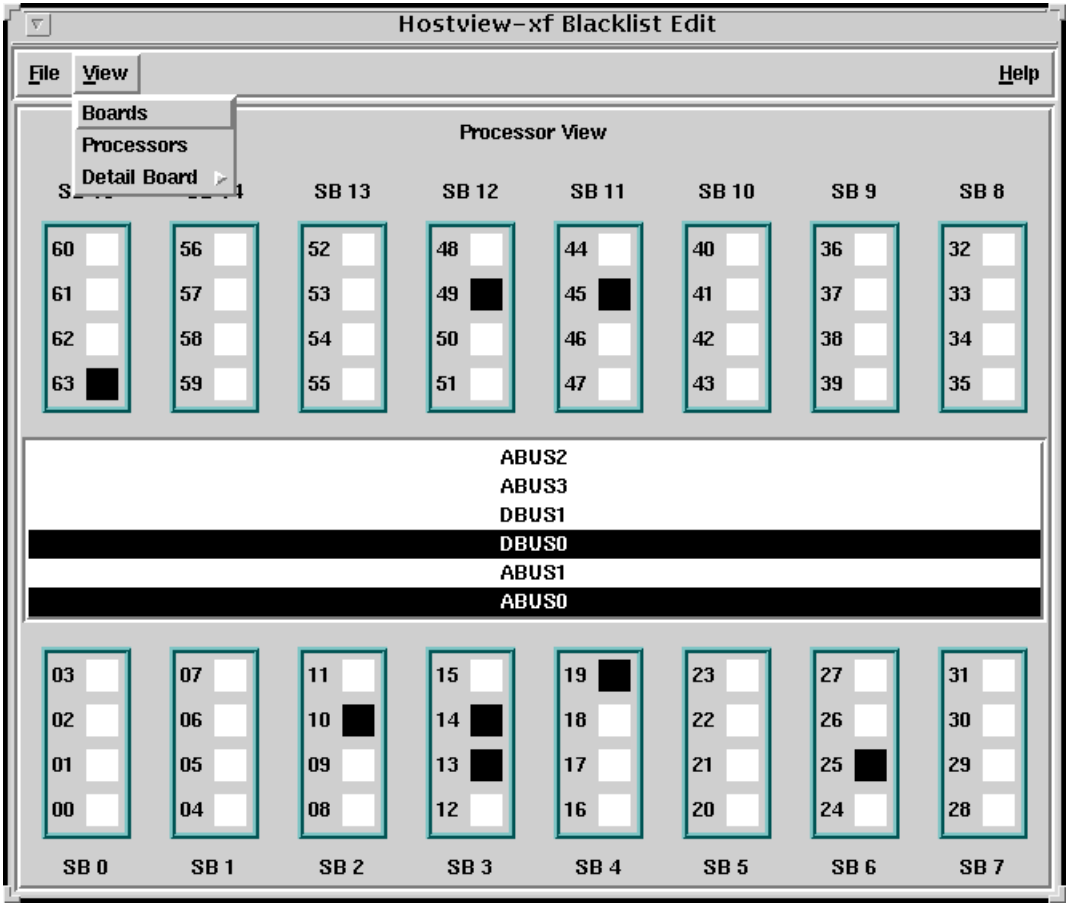
▼ To Blacklist Processors From Within Hostview

1. **Select Edit ➤ Blacklist File.**

   The Blacklist Edit window is displayed.

2. **From the Blacklist Edit window, select View ➤ Processors.**

   The Blacklist Edit window displays the processor view.



3. **Select the processors that you want to blacklist.**

   To select a single processor on a board and de-select all other processors on that board, click that processor with the left mouse button. To toggle the selection status of a processor on a board without affecting the selection status of any other processors on that board, click that processor with the middle mouse button. The selected processors are displayed in black.

4. **To save the changes, select File ➤ Save.**

5. **To exit the Blacklist Edit window, select File ➤ Close.**

   If you have unsaved changes and you close the Blacklist Edit window with File ➤ Close, you are prompted to save the changes.

▼ To Clear the Blacklist File From Within Hostview

1. **In Hostview, select Edit ➤ Blacklist File.**

   The Blacklist Edit window is displayed.

2. **From the Blacklist Edit window, select File ➤ New.**

3. **From the Blacklist Edit window, select File ➤ Close.**

Dual Control Board Handling

A platform can be configured with dual control boards for redundancy purposes. Although you can manually switch between the control boards, only one control board at a time is used by the system. This section covers various issues concerning dual control boards:

- Configuring and switching between dual control boards
- Control board executive
- Control board server

One of the control boards is identified as the primary control board. The SSP attempts to communicate only with the primary control board. If the system administrator decides that it is necessary to switch the primary control board because of a connection failure or for other reasons, the system administrator must modify the control board configuration file and reboot the SSP to activate the new primary control board. Note that this operation cannot be performed without rebooting all running domains, because the control board provides the system clocks for all boards.

Control Board Executive (cbe)

The control board executive runs on the control board, and facilitates communication between the SSP and the platform.

Booting

When power is applied, both control boards boot from the SSP serving as the boot server. Once `cbe` is booted, it waits indefinitely for the control board server running on the SSP to establish a connection.

Primary Control Board

When the control board server running on the SSP connects to the control board executive running on a control board, the control board executive asserts the control board as the primary control board. The primary control board is responsible for providing the system clock and JTAG clock, and for controlling fan trays and bulk power supplies.

Control Board Server (cbs)

After the SSP is booted, the control board server, `cbs(1M)`, is started automatically. The control board server is responsible for all communication between the SSP and the primary control board.

Connection

The control board server attempts to connect only to the primary control board identified in the control board configuration file. The format of the file is as follows:

platform_name`:`*platform_type*`:`*cb0*`:`*status0*`:`*cb1*`:`*status1*

where:

platform_name is the name assigned by the system administrator.

platform_type is defaulted to `Ultra-Enterprise-1000`.

cb0 is the hostname for control board 0, if available.

status0 indicates if control board 0 is the primary control board. P indicates primary, and anything else indicates non-primary.

cb1 is the hostname for control board 1, if available

status1 indicates if control board 1 is the primary control board.

For example:

```
xf2:Ultra-Enterprise-10000:xf2-cb0:P:xf2-cb1:
```

This example indicates that there are two control boards in the xf2 platform. They are xf2-cb0 and xf2-cb1. xf2-cb0 is specified as the primary. See the cb_config(4) man page for more information.

The communication port that is used for communication between the control board server and the control board executive is specified in /tftpboot/XXXXXXXX.cb_port where XXXXXXXX is the control board IP address represented in hexadecimal format.

Control Board Executive Image and Port Specification Files

The SSP is the boot server for the control board. Two files are downloaded by the control board boot PROM during boot time: the image of cbe and the port number specification file. These files are located in /tftpboot on the SSP and the naming conventions are:

```
/tftpboot/XXXXXXXX  for the cbe image
/tftpboot/XXXXXXXX.cb_port  for the port number
```

where XXXXXXXX is the control board IP address in hex format.

For example, the files for control board xf2-cb0 are:

```
/tftpboot/81973213
/tftpboot/81973213.cb_port
```

If you are using NIS, the IP address of xf2-cb0 can be determined as follows:

```
% ypcat hosts | grep xf2-cb0
```

The returning address is 129.153.49.147. This can be converted to 81993193.

▼ To Switch the Primary Control Board

Caution – Do *not* edit the `/var/opt/SUNWssp/.ssp_private/cb_config` file manually. Instead, use the `ssp_config(1M)` command as described below. If you do not follow this recommendation, your domains may fail and arbitration stops (arbstops) may occur.

1. **If any domains are running, shutdown those domains using the standard Solaris shutdown command.**
2. **Log onto the main SSP as user `ssp`, and perform one of the following two steps:**

   a. **If the primary control board is currently functioning and the SSP can communicate with the platform, power down all Ultra Enterprise 10000 components (except the control boards):**

```
ssp% power -off -all
```

   b. **Alternatively, if the `power(1M)` command shown above will not execute successfully (because the primary control board is not currently functioning), remove all domains. Here is an example of removing one domain:**

```
ssp% domain_remove -d domain_name
...
Keep directories (y/n)? y
ssp% domain_status
```

   You should run `domain_status(1M)`, as shown, to verify that you have removed all domains. If necessary, run `domain_remove(1M)` again.

3. **Log onto the main SSP as `root`.**
4. **Obtain the hostnames and IP addresses for the two control boards.**
5. **Verify that control board IP addresses are set up properly in the `/etc/inet/hosts` file or in your local name service system.**

6. **As user `root`, execute the `ssp_config(1M)` command, as shown in the following sample session.**

   In this sample session, the primary control board is switched from `snax-cb0` to `snax-cb1`.

```
 ssp# /opt/SUNWssp/bin/ssp_config cb

Configuring control boards.

Platform name   = snax
Control Board 0 = snax-cb0 => 129.153.49.181
Control Board 1 = snax-cb1 => 129.153.49.182
Primary Control Board = snax-cb0

Is this correct? (y/n): n
Do you have a control board 0? (y/n): y
Please enter the host name of the control board 0 [snax-cb0]:
Do you have a control board 1? (y/n): y
Please enter the host name of the control board 1 [snax-cb0]:

Please identify the primary control board.
Is Control Board 0 [snax-cb0] the primary? (y/n) n
Is Control Board 1 [snax-cb1] the primary? (y/n) y

Platform name   = snax
Control Board 0 = snax-cb0 => 129.153.49.181
Control Board 1 = snax-cb1 => 129.153.49.182
Primary Control Board = snax-cb1

Is this correct? (y/n): y
```

Note – The platform name identifies the *entire host machine* not a particular domain.

---

7. **If you have a spare SSP, repeat Step 4 through Step 6 above, on the spare SSP.**

8. **Reboot the main and spare SSPs from their root windows:**

```
ssp# init 6
```

9. **After the main SSP reboots, login as user `ssp`, and start Hostview:**

```
 ssp% hostview &
```

Note – Wait at least a minute after the SSP displays the console login prompt before starting Hostview. This allows time for the SSP daemons to start.

Verify that the "J" and "C" symbols are shown on the symbol for Control Board 1 in the main Hostview screen. This indicates that the JTAG connection and clock distribution signals are coming from Control Board 1.

If Hostview fails to respond, verify that you can communicate with Control Board 1. If you are unable to use `ping(1M)` to communicate with Control Board 1, visually examine the LEDs to verify that the control board is operating correctly. For example, verify that the link integrity LED is on. This indicates that the Ethernet connection is good. If the LEDs are cycling through a pattern, the control board is booted. If the LEDs are all off or all on continuously (without cycling through a pattern), the control board is not booted. Also, try running `snoop(1M)` on the SSP to verify that the control boards are communicating correctly.

10. **Depending on what actions you took in Step 2, above, perform one of the following steps:**

    a. **If you turned off the power in Step 2, issue the following `power(1M)` command on the main SSP to power on all Ultra Enterprise 10000 components:**

```
ssp% power -on -all
```

    b. **If you removed all domains in Step 2, create those domains again. Here is an example of creating one domain:**

```
ssp% domain_create -d domain_name
```

11. **Issue the `bringup(1M)` command for all domains.**

CHAPTER 4

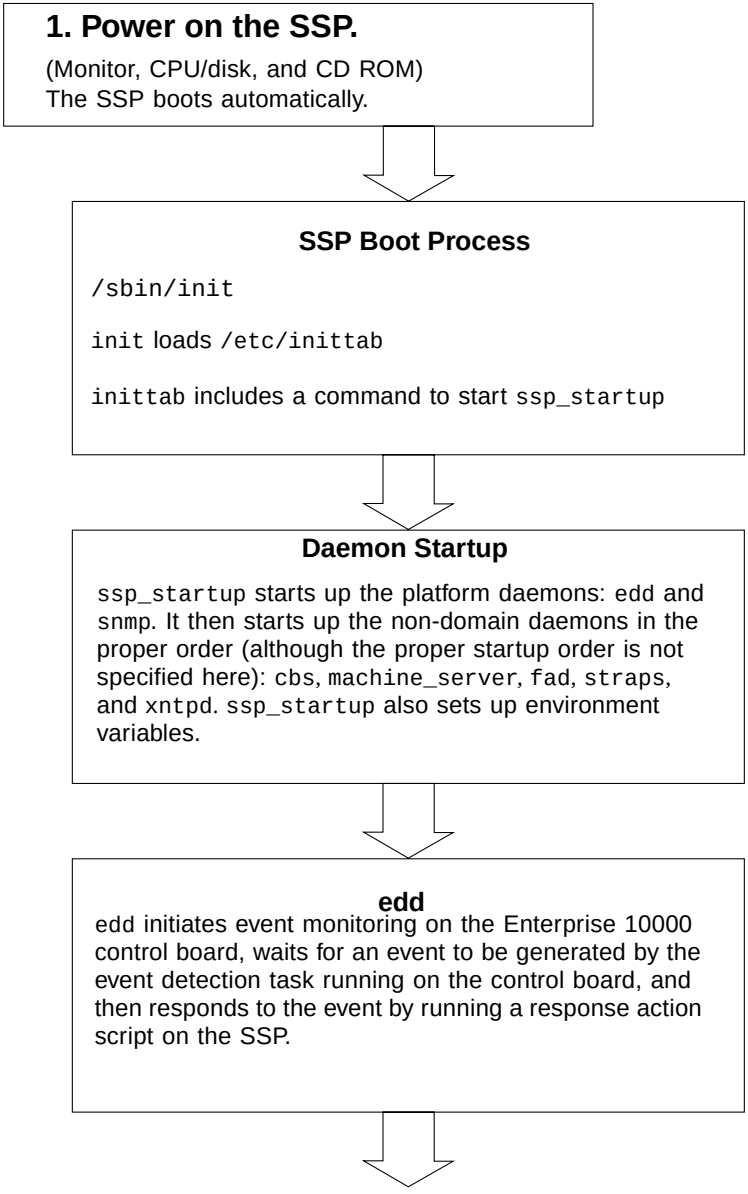
SSP Internals

SSP operations are generally performed by a set of daemons and commands. This chapter provides an overview of how the SSP works, and describes the SSP daemons, processes, commands, and system files. For more information about daemons, commands, and system files, refer to the *Ultra Enterprise 10000 SSP Reference*.

Caution – Changes made to files in `/opt/SUNWssp` can cause serious damage to the system. Only very experienced system administrators should risk changing the files described in this chapter.

Startup Flow

The sequence of events that take place when the SSP boots and starts the Enterprise 10000 system are illustrated in FIGURE 4-1.


1. Power on the SSP.
(Monitor, CPU/disk, and CD ROM)
The SSP boots automatically.
SSP Boot Process
/sbin/init
init loads /etc/inittab
inittab includes a command to start ssp_startup
Daemon Startup
ssp_startup starts up the platform daemons: edd and snmp. It then starts up the non-domain daemons in the proper order (although the proper startup order is not specified here): cbs, machine_server, fad, straps, and xntpd. ssp_startup also sets up environment variables.
edd
edd initiates event monitoring on the Enterprise 10000 control board, waits for an event to be generated by the event detection task running on the control board, and then responds to the event by running a response action script on the SSP.

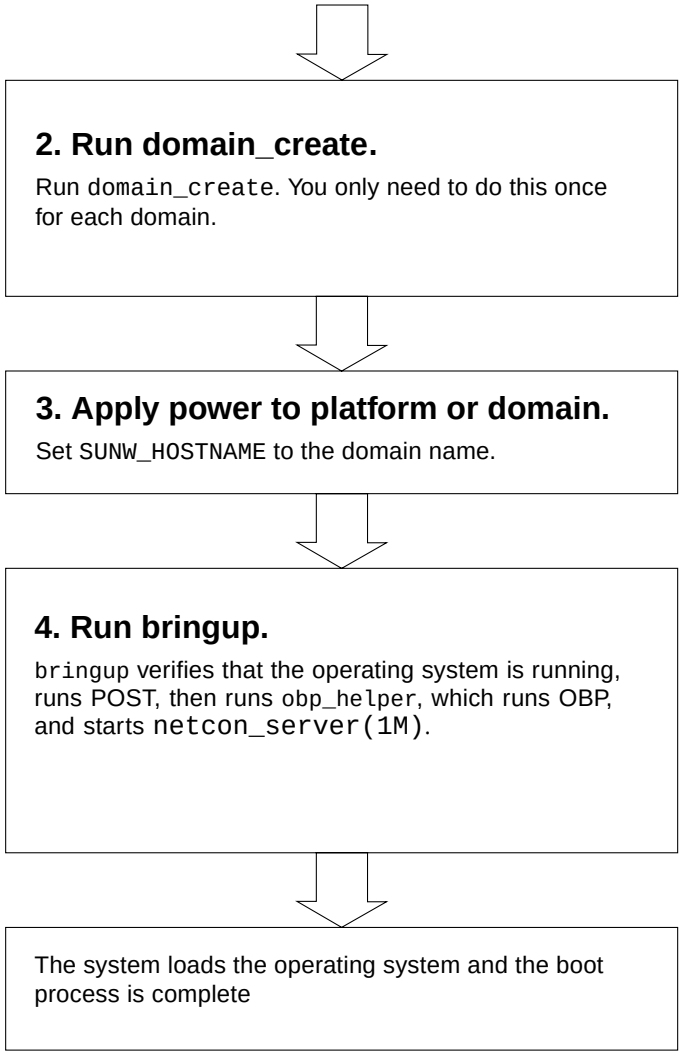


FIGURE 4-1 Startup Flow

The SSP monitors the Enterprise 10000 system using the event detector daemon, `edd(1M)`. Each time the SSP boots, it runs `init(1M)` which in turn loads `edd(1M)` via the startup script, `$SSPETC/ssp_startup.sh`. The startup script checks the environment for availability of certain files and the availability of the Enterprise 10000 system, sets environment variables, and then starts `edd(1M)`. `edd(1M)` obtains many of its initial control parameters from the following configuration files:

- `$SSPVAR/etc/`*platform_name*`/edd.erc` provides configuration information for the Enterprise 10000 platform.
- `$SSPVAR/etc/`*platform_name*`/`*domain_name*`/edd.erc` provides configuration information for a particular domain. The event response configuration files (`edd.erc`) specify how the event detector will respond to events.
- `$SSPVAR/etc/`*platform_name*`/edd.emc` lists the events that `edd(1M)` will monitor.

If a domain crashes, `edd(1M)` invokes the `bringup(1M)` script. The `bringup(1M)` script runs the power-on self test (POST) program, which tests Enterprise 10000 components. It then uses the `obp_helper(1M)` daemon to download and begin execution of OpenBoot PROM (OBP) in the domain specified by the `SUNW_HOSTNAME` environment variable. This only happens if a domain fails (for example, after a kernel panic) in which case it is rebooted automatically. After a manual power on, or after a halt or shutdown, you must manually run `bringup(1M)`, which then causes OBP to be downloaded and run.

`obp_helper(1M)` is responsible for loading `download_helper` in all the configured processors' bootbus SRAM. All the processors are started, with one processor designated the boot processor. With the assistance of `download_helper`, `obp_helper(1M)` loads OBP into the memory of the Enterprise 10000 system and starts OBP on the boot processor. See "`obp_helper(1M)` Daemon" on page 4-13 for more information about `obp_helper(1M)` and OBP.

The primary task of OBP is to boot and configure the operating system from either a mass storage device or from a network. OBP also provides extensive features for testing hardware and software interactively. As part of the boot procedure, OBP probes all the SBus slots on all the system boards and builds a device tree. This device tree is passed on to the operating system.

Enterprise 10000 Client / Server Architecture

The Enterprise 10000 control board interface is accessed over an Ethernet connection using the TCP/IP protocol. The control board executive, `cbe`, runs on the control board and the control board server, `cbs(1M)`, runs on the SSP and makes service requests. The SSP control board server (the client to the real `cbs(1M)`) is a server to other SSP clients.

FIGURE 4-2 illustrates the Ultra Enterprise 10000 system client/server architecture:

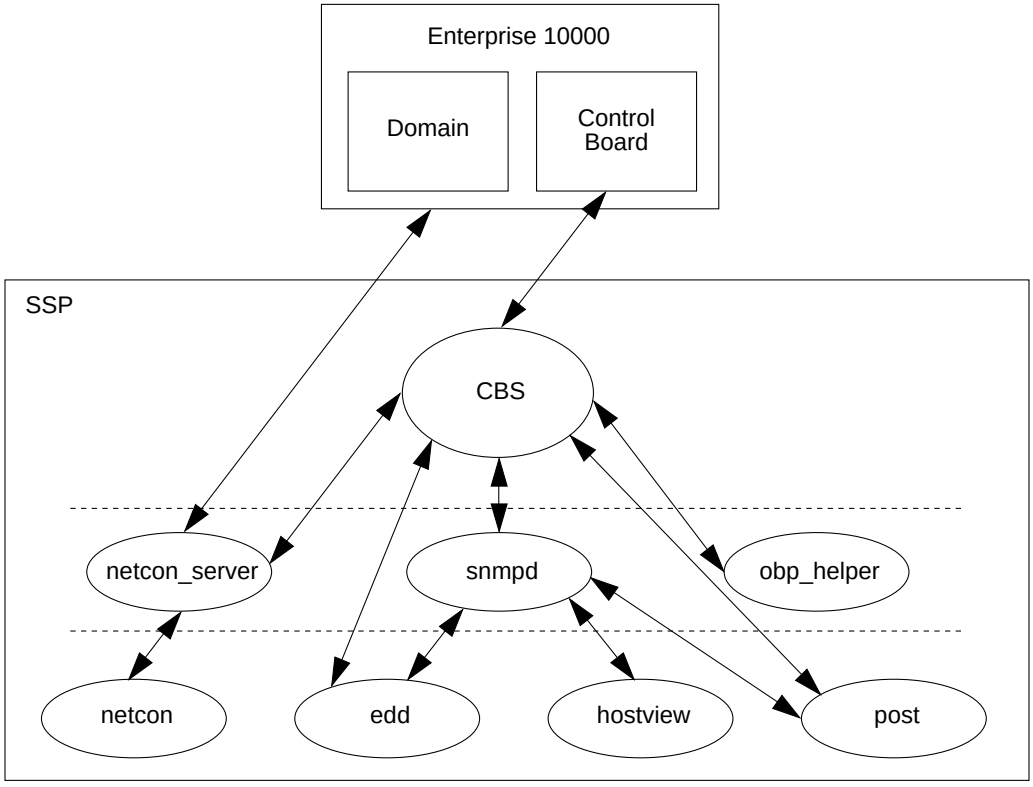


FIGURE 4-2 Enterprise 10000 Client/Server Architecture

Note – There is one instance of `edd(1M)` for each platform supported by the SSP. Also, there is one instance of `obp_helper(1M)` and `netcon_server(1M)` per domain.

POST

POST (power-on self test) probes and tests the components of uninitialized Enterprise 10000 system hardware, configures what it deems worthwhile into a coherent initialized system, and hands it off to OpenBoot PROM (OBP). POST passes to OBP a list of only those components that have been successfully tested; those in the `blacklist(4)` file are excluded.

`hpost(1M)` is the SSP-resident executable program that controls and sequences the operations of POST. `hpost(1M)` reads directives in the optional file `.postrc` (see `postrc(4)`) before it begins operation with the host.

Warning – Running `hpost(1M)` outside of the `bringup(1M)` command can cause the system to fail. `hpost(1M)`, when run by itself, does not check the state of the platform, and causes fatal resets.

POST looks at `blacklist(4)` which is on the SSP, before preparing the system for booting. `blacklist(4)` specifies the Enterprise 10000 components that POST must not configure.

POST stores the results of its tests in an internal data structure called a *board descriptor array.* The board descriptor array contains status information for most of the major components of the Enterprise 10000 system, including information about the UltraSPARC modules.

POST attempts to connect and disconnect each system board, one at a time, to the system centerplane. POST then connects all the system boards that passed to the system centerplane.

Daemons

The SSP daemons play a central role on the SSP. Each daemon is fully described in its corresponding man page. The daemons are:

`cbs`	The control board server provides central access to the Enterprise 10000 control board for client programs running on the SSP.
`edd`	The event detector daemon initiates event monitoring on the control boards. When a monitoring task detects an event, `edd(1M)` runs a response action script.
`fad`	The file access daemon provides distributed file access services to SSP clients that need to monitor, read, and write to the SSP configuration files.
`machine_server`	Provides machine services for `netcon(1M)` and routes host messages to proper messages file. See `machine_server(1M)`.
`netcon_server`	The connection point for all `netcon(1M)` clients. `netcon_server(1M)` communicates with OBP using a control board protocol. `netcon_server(1M)` communicates with the OS using the TCP protocol.
`obp_helper`	Runs OpenBoot. `obp_helper(1M)` terminates when OBP is terminated. During execution, `obp_helper(1M)` provides services to OBP, such as NVRAM simulation, IDPROM simulation, and time of day.

`snmpd`	The SNMP proxy agent listens to a UDP port for incoming requests, and services the group of objects specified in `Ultra-Enterprise-10000.mib`.
`straps`	The SNMP trap sink server listens to the SNMP trap port for incoming trap messages and forwards received messages to all connected clients.
`xntpd / ntpd`	The network time protocol (NTP) daemon provides time synchronization services. (`xntpd` is the daemon for Solaris 2.5.1, and `ntpd` is the daemon for Solaris 2.6.) Clients can connect to this service and have their clocks automatically adjusted. This service is used to synchronize SSP and domain times. See `xntpd(1M)` and the *Network Time Protocol User's Guide.*

Event Detector Daemon (`edd(1M)`)

The event detector daemon, `edd(1M)`, is a key component in providing the reliability, availability, and serviceability (RAS) features of Enterprise 10000. `edd(1M)` initiates event monitoring on the Enterprise 10000 control board, waits for an event to be generated by the event detection monitoring task running on the control board, and then responds to the event by executing a response action script on the SSP. The conditions that generate events and the response taken to events are fully configurable.

The `edd(1M)` provides the mechanism for event management, but doesn't handle the event detection monitoring directly. Event detection is handled by an event monitoring task that runs on the control board. `edd(1M)` configures the event monitoring task by downloading a vector that specifies the event types to be monitored.

The `edd(1M)` provides the mechanism for event management, but it doesn't handle the events directly. Event handling is provided by response action scripts, which are invoked by the `edd(1M)` when an event is received.

The RAS features are provided by several collaborative programs. The control board within the platform runs a control board executive (cbe) program that communicates via Ethernet with a control board server (`cbs(1M)`) program on the SSP. These two components provide the data link between the platform and the SSP.

The SSP provides a set of interfaces for accessing the control board through the Control Board Server and the simple network management protocol (SNMP) agent. `edd(1M)` uses the Control Board Server interface to configure the event detection monitoring task on the Control Board Executive. This is illustrated in FIGURE 4-3:

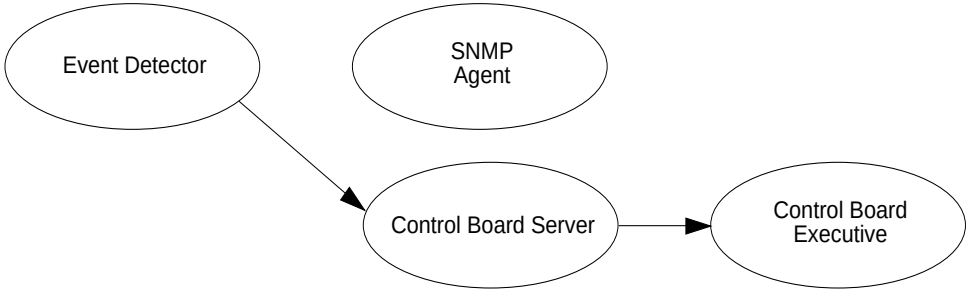


FIGURE 4-3 Uploading Event Detection Scripts

Once configured, the event detection monitoring task polls various conditions within the platform, including environmental conditions, signature blocks, power supply voltages, performance data, and so forth. If an event detection script detects a change of state that warrants an event, an event message containing the pertinent information is generated and delivered to the Control Board Server (`cbs(1M)`) running on the SSP. Upon receipt of the event message, the Control Board Server delivers the event to the SNMP Agent, which in turn generates an SNMP trap, as shown in FIGURE 4-4:

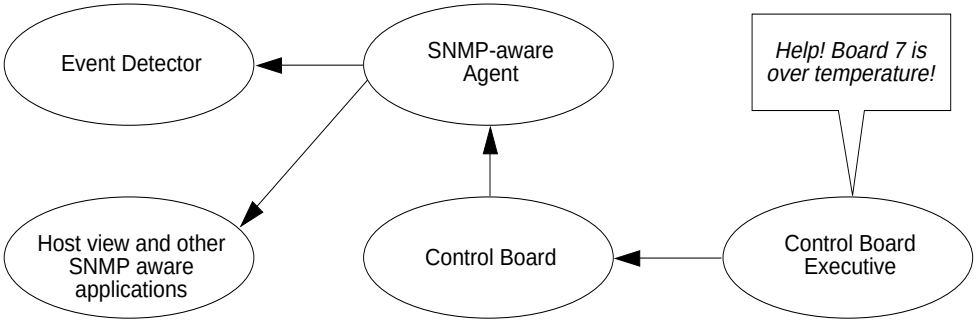


FIGURE 4-4 Event Recognition and Delivery

Upon receipt of an SNMP trap, `edd(1M)` determines whether to initiate a response action. If a response action is required, the `edd(1M)` runs the appropriate response action script as a subprocess. This is illustrated in FIGURE 4-5:

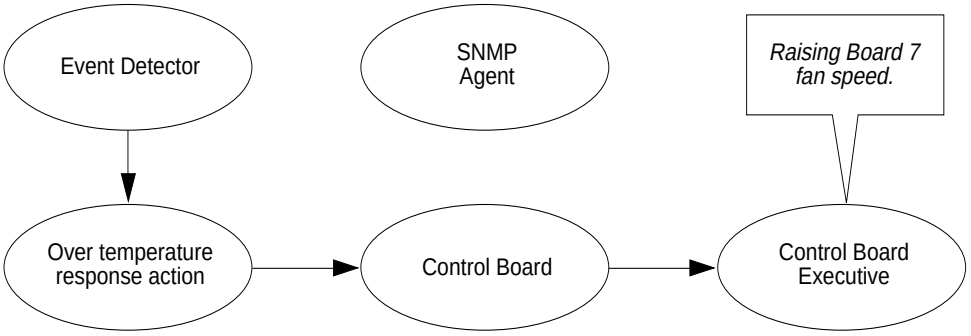


FIGURE 4-5 Response Action

Event messages of the same type or related types may be generated while the response action script is running. Some of these secondary event messages may be meaningless or unnecessary if a responsive action script is already running for a similar event.

For instance, in FIGURE 4-5 `edd(1M)` is running a response action script for a high temperature event. While the response action script is running, additional high temperature events may be generated by the event monitoring scripts. `edd(1M)` does not respond to those high temperature events (generated in response to the same high temperature condition) until the first response script has finish. It is the responsibility of applications (such as `edd(1M)`) to filter the events they will respond to as necessary.

The cycle of event processing is completed at this point.

Control Board Server (`cbs(1M)`)

The Control Board Server (`cbs(1M)`) is a server that runs on the SSP. Whenever a client program running on the SSP needs to access the Enterprise 10000, the communication is funneled through `cbs(1M)`. `cbs(1M)`, in turn, communicates directly with a Control Board Executive (`cbe`) running on one of the control boards

in the Ultra Enterprise 10000 system. `cbs(1M)` converts client requests to the control board management protocol (CBMP) that is understood by `cbe`. The following diagram illustrates how this communication takes place:

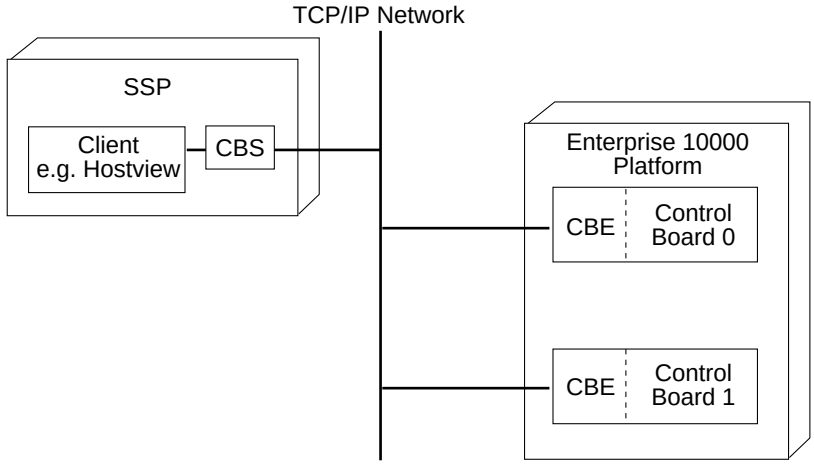


FIGURE 4-6 SSP / Enterprise 10000 Communication Through `cbs(1M)`

`cbs(1M)` relies on the `cb_config(4)` file to determine the platform it is to manage, and the control board with which it is to interact. The `cb_config(4)` file specifies the platforms managed by the SSP. You should not directly modify this file, however.

File Access Daemon (`fad(1M)`)

The file access daemon (`fad(1M)`) is used when `ssp_to_domain_hosts(4)` or any other configuration file is updated. `fad(1M)` provides distributed file access services, such as file locking, to all SSP clients that need to monitor, read, and write changes to SSP configuration files. Once a file is locked by a client, other clients are prevented from locking that file until the first client releases the lock.

Network Time Protocol Daemon (`xntpd(1M)` / `ntpd(1M)`)

The NTP daemon (which is `xntpd(1M)` for Solaris 2.5.1, and `ntpd(1M)` for Solaris 2.6) provides a mechanism for keeping the time settings synchronized between the SSP and the domains. Each domain obtains the time from the SSP at boot time.

Note – SSP 3.1 runs only on Solaris 2.5.1, so it supports only `xntpd(1M)`. However, `xntpd(1M)` on the SSP can communicate with either `xntpd(1M)` or `ntpd(1M)` running in a domain.

The configuration is based on information provided by the system administrator. If you are not currently running NTP at your site and you do not have access to the Internet and you are not going to use a radio clock, you can set up the Enterprise 10000 system to use its own internal reference clock as the reference clock.

The Solaris 2.5 NTP packages are compiled with support for a local reference clock. This means that your system can poll itself for the time instead of polling another system or network clock. The poll is done through the network loopback interface. The first three numbers in the IP address are 127.127.1. The last numbers in the IP address are the NTP stratum to use for the clock.

When setting up an Ultra Enterprise 10000 system and its SSP, the SSP should usually be set to stratum 4. The Enterprise 10000 system should be set up as a peer to the SSP and its local clock should be set two stratums higher.

An example of server / peer lines in the `/etc/opt/SUNWxntp/ntp.conf` file on the SSP is shown below.

```
server 127.127.1.4
```

An example of server / peer lines in the `/etc/opt/SUNWxntp/ntp.conf` file on the platform is shown below.

```
peer my_ue10000-ssp
server 127.127.1.6
```

This tells the SSP to pretend its clock is stratum 4 so the SSP runs at stratum 5. The Enterprise 10000 system considers its own time to be stratum 6. While the SSP is up, the Enterprise 10000 system favors the SSP's time at stratum 5, and so it runs at stratum 6. If, for some reason, the SSP goes down, the Enterprise 10000 system uses its own clock and runs at stratum 7.

For more information on the NTP daemon, refer to the *Network Time Protocol User's Guide* and the *NTP Reference*.

obp_helper(1M) Daemon

Note – OpenBoot PROM (OBP) is not a hardware PROM; it is actually loaded from a file on the SSP. An SSP file also replaces the traditional OBP NVRAM and idprom (hostid).

The OBP file is located in:

```
/opt/SUNWssp/release/Ultra-Enterprise-10000/2/5/1/hostobjs/obp
```

The "`/2/5/1`" portion of this path is specific to the version of the operating system in your release, in this case Solaris 2.5.1. If your release contains a different version of the operating system, that portion of the path will be different.

Note – The OBP file is required for successful system operation. You should back up this file so you have an extra copy in case of a catastrophic SSP disk failure.

`bringup(1M)` starts `obp_helper(1M)` in the background, which kills the previous `obp_helper(1M)`, if one exists. `obp_helper(1M)` runs `download_helper` and subsequently downloads and runs OBP.

`obp_helper(1M)` is essential in starting processors other than the boot processor. It communicates with OBP through BootBus SRAM, responding to requests to supply the time-of-day, get or put the contents of the pseudo-EEPROM, and release slave processors when in multiprocessor mode. To release the slave processors, `obp_helper(1M)` must load `download_helper` into the bootbus SRAM of all the slave processors, place an indication in bootbus SRAM that it is a slave processor, then start the processor by releasing the bootbus controller reset.

For more information, see the `obp_helper(1M)`, and `bringup(1M)` man pages and "`download_helper` File" on page 4-15.

Environment Variables

Most of the necessary environment variables are set when `$SSPETC/ssp_env.sh` is called. The following list describes the environment variables.

TABLE 4-1 Environment Variables

`SUNW_HOSTNAME`	The name of the domain controlled by the SSP.
`SSPETC`	The path to the directory containing miscellaneous SSP-related files.
`SSPLOGGER`	You should never change the value of this environment variable. It specifies the location of the configuration file for message logging.
`SSPOPT`	The path to the SSP package binaries, libraries, and object files.
`SSPVAR`	The path to the directory where modifiable files reside.

Executable Files Within a Domain

These files reside in `/opt/SUNWssp/release/Ultra-Enterprise-10000/` *os_version* and are run within a domain. The man pages for these programs reside within the domain.

Some of the commands listed in this section should be used or modified only by your service provider; they are normally called internally by other programs rather than run on the command line.

Caution – Improper use of these commands may result in failure or damage to the system. If you are not sure of the function of any command, contact your service provider for assistance.

*.elf File

These are executable files that are downloaded by `hpost(1M)`.

download_helper File

`download_helper` allows programs to be downloaded to the memory used by a domain instead of BBSRAM. This provides an environment in which host programs can run without having to know how to relocate themselves to memory. These programs can be larger than BBSRAM.

`download_helper` works by running a protocol through a mailbox in BBSRAM. The protocol has commands for allocating and mapping physical to virtual memory, and for moving data from a buffer in BBSRAM to virtual memory, and vice-versa. Once complete, the thread of execution is usually passed to the new program at an entry point provided by the SSP. After this occurs, `download_helper` lives on in BBSRAM so it can provide reset-handling services. Normally, a user would not be concerned with the download helper; it should be used only by the `obp_helper(1M)` daemon. See the `obp_helper(1M)` man page for more information.

obp File

The file `obp` is named after OpenBoot PROM. `obp` is fundamental to the boot process of a domain. OBP knows how to probe the SBUS to determine which devices are connected where, and provides this information to the operating system in the form of a device tree. The device tree is ultimately visible using the Solaris command `prtconf` (for more information, see the SunOS `prtconf(1M)` man page).

`obp` also interprets and runs FCode on SBus cards, which provides loadable, simple drivers for accomplishing boot. In addition, it provides a kernel debugger, which is always loaded.

Glossary

Application-specific integrated circuit (ASIC) Application-specific integrated circuit. Used in the Enterprise 10000 system context to mean any of the large main chips in the design, including the UltraSPARC™ processor and data buffer chips.

arbitration stop A condition that occurs when one of the Ultra Enterprise 10000 ASICs detects a parity error or equivalent fatal system error. Bus arbitration is frozen, so all bus activity stops. The system is down until the SSP detects the condition by polling the CSRs of the Address Arbiter ASICs through JTAG, and clears the error condition.

BBSRAM See bootbus SRAM.

blacklist A text file that `hpost(1M)` reads when it starts up. The blacklist file specifies the Ultra Enterprise 10000 system components that are not to be used or configured into the system. The default path name for this file can be overridden in the `.postrc` file (see `postrc(4)`) and on the command line.

board descriptor array The description of the single configuration that `hpost(1M)` chooses. It is part of the structure handed off to `OBP`.

bootbus A slow-speed byte-wide bus controlled by the processor port controller ASICs, used for running diagnostics and boot code. UltraSPARC starts running code from BootBus when it exits reset. In Enterprise 10000 system, the only component on the BootBus is the BBSRAM.

bootbus SRAM A 256-Kbyte static RAM attached to each processor PC ASIC. Through the PC, it can be accessed for reading and writing from JTAG or the processor. Bootbus SRAM is downloaded at various times with `hpost(1M)` and OBP startup code, and provides shared data between the downloaded code and the SSP.

CSR Control and Status Register. A general term for any embedded register in any of the ASICS in the Enterprise 10000 system.

DIMM Dual in-line memory module, a small printed circuit card containing memory chips and some support logic.

domain A set of one or more system boards that act as a separate system capable of booting the OS and running independently of any other domains.

DRAM Dynamic RAM. Hardware memory chips that require periodic rewriting to retain their contents. This process is called *refresh*. In Enterprise 10000 system, DRAM is used only on main memory SIMMs, and on the control boards.

ECache External Cache. A 1/2-MByte to 4-MByte synchronous static RAM second-level cache local to each processor module. Used for both code and data. This is a direct-mapped cache.

JTAG A serial scan interface specified by IEEE standard 1149.1. The name comes from Joint Test Action Group, which initially designed it. See JTAG+.

JTAG+ An extension of JTAG, developed by Sun Microsystems Inc., which adds a control line to signal that board and ring addresses are being shifted on the serial data line. Often referred to simply as JTAG.

OBP OpenBoot PROM. A layer of software that takes control of the configured Enterprise 10000 system from `hpost(1M)`, builds some data structures in memory, and boots the operating system.

POST Power-on self test, performed by `hpost(1M)`. This is the program that takes uninitialized Enterprise 10000 system hardware and probes and tests its components, configures what seems worthwhile into a coherent initialized system, and hands it off to OBP.

.postrc A text file that controls options in `hpost(1M)`. Some of the functions can also be controlled from the command line. Arguments on the command line take precedence over lines in the `.postrc` file, which takes precedence over built-in defaults. **`hpost -?postrc`** gives a terse reminder of the `.postrc` options and syntax. See `postrc(4)`.

SBus A Sun Microsystems Inc. designed I/O bus, now an open standard.

SRAM Static RAM. These are memory chips that retain their contents as long as power is maintained.

SSP System Service Processor, a workstation containing software for controlling power sequencing, diagnostics, and booting of a Enterprise 10000 system.

UltraSPARC The UltraSPARC processor, which is the processor module used in the Enterprise 10000 system.

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