Sun microsystems

Platform Notes: SunFDDI™ Adapter

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Contents

Preface

Platform Notes: SunFDDI™ Adapter provides configuration instructions for the Solaris™ supplement software used by the SunFDDI™ adapter. These instructions are designed for a system administrator with networking experience.

Using UNIX Commands

This document may 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:

- *Solaris Handbook for SMCC Peripherals*
- Online documentation for the Solaris software environment
- 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	#

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Configuring the Driver Software for SunFDDI Adapters

This chapter includes information and instructions for configuring the driver software used by the SunFDDI adapter. Unless otherwise noted, all instructions apply to both the SunFDDI PCI adapter (pf) and the SunFDDI SBus adapter (nf).

Installing the Driver Software

The Solaris CD-ROM contains the software that must be installed in order to use the SunFDDI adapter.

Note – Do not use the installation CD-ROM that shipped with your SunFDDI adapter. The software on the Solaris CD-ROM is more current and replaces previous versions of the driver.

Before using the SunFDDI adapter, you will need to create and edit system host files, as described in the next section

Configuring the Host File

After installing the SunFDDI driver software, you must create a `hostname` file forthe adapter's interface. You must also create both an IP address and a host name for the interface in the `/etc/hosts` file.

▼ To Configure the Host File

1. **At the command line, use the** grep **command to search the** /etc/path_to_inst **file for** pf **or** nf **devices.**

   For a SunFDDI PCI adapter:

   ```
   # grep pf /etc/path_to_inst
   "/pci@1f,2000/pci@2/pf@0" 0 "pf"
   ```

   In the example above, the pf@0 instance shows a SunFDDI PCI adapter installed in slot 1.

   For a SunFDDI SBus adapter:

   ```
   # grep nf /etc/path_to_inst
   "/sbus@1f,0/SUNW,nf@1,7880" 1 "nf"
   ```

   In the example above, the nf@1 instance shows a SunFDDI SBus adapter installed in slot 2.

2. **Create an** /etc/hostname.pf*num* **or** hostname.nf*num* **file, where** *num* **is the instance number of the interface you plan to use.**

   - Do not create /etc/hostname.nf*num* or hostname.pf*num* files for SunFDDI adapter network interfaces you plan to leave unused.
   - The /etc/hostname.nf*num* or hostname.pf*num* file must contain the host name for the appropriate network interface.
   - The host name should have an IP address that will need to be entered in the /etc/hosts file.
   - The host name should be different from any other host name of any other interface, for example: /etc/hostname.hme0 **and** /etc/hostname.nf1**cannot** share the same host name.

   Using the instance example in SBus Step 1, the following example shows the /etc/hostname.nf*num* files required for a system called zardoz that has a SunFDDI adapter (zardoz-11).

   ```
   # cat /etc/hostname.hme0
   zardoz
   # cat /etc/hostname.nf0
   zardoz-11
   ```

1. **Create an appropriate entry in the** `/etc/hosts` **file for each active** `nf` **or** `pf` **network interface.**

   Using the previous example, you will have:

   ```
   # cat /etc/hosts
   #
   # Internet host table
   #
   127.0.0.1      localhost
   129.144.10.57 zardoz     loghost
   129.144.11.83 zardoz-11
   ```

2. **Reboot your system.**

Note – The Internet Protocol, version 6 (IPv6), expands the capabilities of IPv4, which is the current version and the default. The SunFDDI device driver included in this release of the Solaris operating environment supports both IPv4 and IPv6. IPv4 uses the /etc/hosts configuration file, but IPv6 uses a different configuration file. To transition to, manage, and implement IPv6, refer to the Solaris 8 System Administration Guide, Volume 3.

Booting From the Network

To use a SunFDDI adapter interface as the boot device, perform the following tasks:

▼ To Boot From the Network

1. **At the** `ok` **prompt type:**

   ```
   ok show-devs
   ```

   The `show-devs` command lists the system devices. You should see the full path name of the `pf` or `nf` devices, similar to the following examples:

For **SunFDDI PCI adapter**:

```
/pci@1f,2000/pci@2/pf@0,1
```

For **SunFDDI SBus adapter**:

```
/sbus@1f,0/nf@1,7880
```

Note – You need to select only one of these FDDI devices for booting.

---

2. **At the** ok **prompt type:**

```
ok  boot full_path_name_of_the_fddi_device
```

local-mac-address Property

Each of the network interfaces of the SunFDDI adapter has been assigned a unique Media Access Control (MAC) address, which represents the 48-bit Ethernet address for that network interface. The OpenBoot firmware reports this MAC address via the local-mac-address property in the device nodes corresponding to the network interfaces.

A system is not obligated to use this assigned MAC address if it has a systemwide MAC address. In such cases, the systemwide MAC address applies to all network interfaces on the system.

The device driver, or any other adapter utility, can use the network device's MAC address (local-mac-address) while configuring it. A network interface's MAC address can be used when booting over the network.

The mac-address property of the network device specifies the network address (systemwide or local-mac-address) used for booting the system. To start using the MAC addresses assigned to the network interfaces of the SunFDDI adapter, set the NVRAM configuration variablelocal-mac-address? to true.

```
ok setenv local-mac-address? true
```

Using the SunFDDI Network Utilities

This chapter describes the network utilities of SunFDDI. While some examples show only pf or nf, unless otherwise noted, all instructions apply to both the SunFDDI PCI adapter (pf) and the SunFDDI SBus adapter (nf).

Throughout this chapter, it is assumed that you have installed the SunFDDI software under the default base directory *<basedir>* for your operating system:

The default base directory *<basedir>* is:

```
/opt/SUNWconn/bin
```

Changing the Default MAC Address

Each attachment to an FDDI network is identified by a unique 48-bit MAC address. By default, the first SunFDDI card takes the host-resident MAC address, which is stored in nonvolatile memory (NVRAM) on the motherboard of the machine. Each subsequent SunFDDI card adopts the card-resident MAC address stored in its own IDPROM.

In general, this convention is sufficient to ensure that each SunFDDI card installed in the machine has a unique MAC address. However, there may be a conflict with other LAN interfaces that also take the host-resident MAC address—for example, an Ethernet (le) interface or a SunFDDI 2.0 (bf) interface. In this event, change the default MAC address assigned to the first SunFDDI card installed in the system.

▼ To Change the Default MAC Address with `pf_macid` or `nf_macid`

Use the `pf_macid(1M)` or the `nf_macid(1M)` utility to recover the card-resident MAC address, and then modify the system files to override the default MAC address:

1. **Become superuser.**

2. **Use the `pf_macid(1M)` or `nf_macid(1M)` utility to recover the MAC address from the IDPROM on the SunFDDI interface identified by the instance number *<inst>*.**

   ```
   # <basedir>/nf_macid nf<inst>
   <mac_address>
   ```

3. **Modify the start-up file on your machine so that the MAC address is assigned correctly when the system is rebooted.**

   a. **Edit the** `/etc/rcS.d/S30rootusr.sh` **file to add the following** `if` **statement immediately *after* the** `ifconfig` **command that initializes the interface** `nf<inst>`**.**

   If you are changing the MAC address of more than one interface, add one `if` statement for each interface.

   ```
   ifconfig $1 plumb
       if [ $1 = "nf<inst>" ]; then
           ifconfig nf<inst> ether <mac_address>
       fi
   ```

   On most systems, the `/etc/rcS.d/S30rootusr.sh` file is a hard link to the `/etc/rootusr` file.

4. **Reboot your machine to assign the new MAC address to the SunFDDI interface.**

   When a SunFDDI card takes the host-resident MAC address, it can be swapped to another system without affecting the existing network. However, once a station starts sending packets on the network, the Address Resolution Protocol (ARP) updates the ARP tables on other stations to include the MAC address of its interface. The `ES-IS` protocol performs the same function for SunFDDI OSI running over FDDI. If you swap SunFDDI cards that use the card-resident MAC address, you must wait until the ARP entries time-out, or remove the ARP entries from every active station manually before packets can be routed correctly.

Displaying SunFDDI Statistics

The `pf_stat(1M)` or `nf_stat` utility interrogates a specified SunFDDI interface and displays the accumulated statistics. This command must be executed as `root` and has the general form:

```
# <basedir>/pf_stat [-m] pf<inst> [<interval>] [<count>]
```

pf*<inst>* specifies the SunFDDI interface

<interval> is the elapsed time (in seconds) between interrogations

<count> the total number of interrogations

The `pf_stat` utility displays information using column headings that conform to SMT revision 7.3, which differ from SMT revision 5.1 and 4.2 headings in the following cases:

- The ECM heading corresponds to the 5.1 MIM heading.
- The RMT heading does not have an analog in SMT revision 4.2. If you run SunFDDI at revision level 4.2, ignore any data displayed under the RMT heading of `pf_stat`.

Displaying Local Interface Statistics

When you enter the pf_stat command without the -m option, it displays statistics recovered from the local interface pf*<inst>*.

For example, to display the accumulated statistics for the interface pf0, type:

```
# <basedir>/pf_stat pf0
RingECMRMTPCMSRing_OPXmitPRecvP
UP  INRING_OPACTIVEc16fde1862d
```

You can also monitor the interface dynamically (active monitor), by specifying the *interval* (the elapsed time between interrogations) and *count* (the total number of interrogations). This displays the incremental difference between the current state and the previous state. The minimum interval is one second and the accumulated statistics are displayed after every tenth interrogation.

For example, to monitor the interface `pf0` once every 60 seconds for 3 minutes (a total of 3 interrogations), type:

```
# <basedir>/pf_stat pf0 60 3
RingECMRMTPCMSRing_OPXmitPRecvP
UP  INRING_OPACTIVEc131a0131aa
UP  INRING_OPACTIVE000
UP  INRING_OPACTIVE011
```

Interpreting Local Statistics

Running the `pf_stat` utility *without* the –m option displays information about the various SMT state machines and the network to which the local station is attached.

Ring *(Ring Status)*

The `Ring` status shows the current state of the physical connection to the FDDI network. The following states may be returned by `pf_stat` under the `Ring` heading:

- UP–SunFDDI interface physically connected to the active network
- DOWN–SunFDDI interface disconnected, or connected to the inactive network

ECM *(Entity Coordination Management)*

ECM shows the current state of the Entity Coordination Management state machine, which controls the following features and facilities:

- Media availability
- Trace
- Path test
- Optical bypass (optional)
- Hold policy (optional)

The following table lists the states that may be returned by `pf_stat` under the ECM heading.

TABLE 2-1   `pf_stat` States Under the ECM Heading

State	Meaning
OUT	ECM is inactive and is waiting for a connect request (initial state).
IN	ECM is active; normal state after successful connection request.
TRACE	ECM is propagating a trace request to the appropriate entity.
LEAVE	ECM is closing all connections prior to the station leaving the ring.
PATH_TEST	ECM is entering a path test state following trace completion.
INSERT	ECM is sending a request to the optical bypass switch to indicate that the station is entering the ring. This disengages the switch.
CHECK	ECM is verifying that symbols are being received from the network.
DEINSERT	ECM is sending a request to the optical bypass switch, to indicate that the station is leaving the ring. This engages the switch.

RMT (Ring Management)

RMT shows the current state of the Ring Management state machine, which controls the following features and facilities:

- MAC availability
- Detection and resolution of duplicate addresses
- Identification of stuck beacon and initiation of trace

The following table lists the states that may be returned by `pf_stat` under the RMT heading.

TABLE 2-2   `pf_stat` States Under the RMT Heading

State	Meaning
ISOLATED	RMT is inactive (initial state).
NON_OP	RMT is waiting for an operational ring.
RING_OP	RMT is operating normally.
DETECT	RMT is checking for duplicate addresses (transient state during initialization).
NON_OP_DUP	RMT has detected that its address is duplicated and is initiating recovery. The ring is not operational in this state.
RING_OP_DUP	RMT has detected that the MAC address is duplicated and flagged the error. The ring is operational in this state.
DIRECTED	RMT has been beaconing for an extended period of time and is transmitting a stream of directed beacons prior to initiating recovery.
TRACE	RMT has initiated a trace to recover a stuck beacon.

PCM (Physical Connection Management)

PCM shows the current state of the Physical Connection Management state machine that controls the following features and facilities:

- Connection initialization
- Maintenance support

This heading is modified to indicate the type of port that is being managed:

- PCMS: single-attached station, S-port
- PCMA: dual-attached station, A-port
- PCMB: dual-attached station, B-port

The following table lists the states that may be returned by `pf_stat` under the PCM heading.

TABLE 2-3   `pf_stat` States Under the PCM Heading

State	Meaning
OFF	PCM is inactive (initial state).
BREAK	PCM is starting the connection synchronization phase.
CONNECT	PCM is synchronizing the connection end-points prior to the signaling sequence.
NEXT	PCM is transmitting PDUs prior to entering SIGNAL state.
SIGNAL	PCM is transmitting and receiving signal bits (information) following a NEXT state.
JOIN	First state in the sequence leading to a synchronized connection.
VERIFY	Second state in the sequence leading to a synchronized connection.
ACTIVE	Final state indicating that the port is successfully incorporated in the token path.
TRACE	PCM is localizing a stuck beacon condition.

The normal sequence of PCM states leading to a fully synchronized connection and incorporation of the port into the token path is shown in FIGURE 2-1. Note that the minimum interval between interrogations is one second and that this is not always fast enough to recover and display the complete sequence of PCM states.
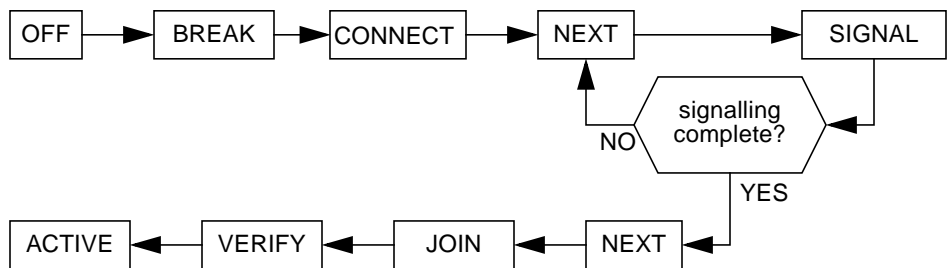
FIGURE 2-1   Normal Sequence of PCM States

Ring_OP *(Ring Operational)*

Ring_OP shows the number of Ring_OP (Ring Operational) signals received. This signal is generated when the station is incorporated into an operational network.

XmitP *(Transmit Packets)*

Running pf_stat *without* an interval and count, displays the total number of packets transmitted since the interface was activated. Running pf_stat *with* an interval and count, displays the number of packets transmitted since the last interrogation.

RecvP *(Receive Packets)*

Running pf_stat *without* an interval and count displays the total number of packets received since the interface was activated. Running pf_stat *with* an interval and count displays the number of packets received since the last interrogation.

Example Local Statistics

The following output was recovered from a single-attached station using the command shown. A temporary fault condition was simulated by disconnecting the FDDI cable from the SunFDDI card and then reconnecting it.

```
# <basedir>/pf_stat pf0 1 20
RingECMRMTPCMSRing_OPXmitPRecvP
UP  INRING_OPACTIVE2261d
UP  INRING_OPACTIVE000
UP  INRING_OPACTIVE000
UP  INRING_OPACTIVE000
DOWNINISOLATEDCONNECT011
DOWNINISOLATEDCONNECT000
DOWNINISOLATEDNEXT000
UP  INRING_OPACTIVE100
UP  INRING_OPACTIVE011

RingECMRMTPCMSRing_OPXmitPRecvP
UP  INRING_OPACTIVE32920
UP  INRING_OPACTIVE000
UP  INRING_OPACTIVE011
UP  INRING_OPACTIVE000
UP  INRING_OPACTIVE000
UP  INRING_OPACTIVE000
UP  INRING_OPACTIVE000
UP  INRING_OPACTIVE000
UP  INRING_OPACTIVE000
UP  INRING_OPACTIVE011
```

Note the following observations regarding this example:

- Accumulated statistics are displayed automatically after every tenth interrogation.
- The combination of Ring=DOWN and RMT=ISOLATED indicates that the station is disconnected from the network.
- The minimum interval of one second is not fast enough to recover and display the complete sequence of PCM states during the path re-establishment phase.
- A Ring_OP signal is received when the path is re-established, indicating that the ring is operational.

The link status indicator mounted on the SunFDDI card displays the following sequence of events:

Green (connected) —> **Amber** (disconnected) —> **Green** (connected)

Displaying Statistics from Neighboring Stations

When you use the `pf_stat` or `nf_stat` command with the `-m` option, it displays information about the neighboring stations attached to the local interface pf*<inst>* and the frames received from the network.

For example, to display information about the neighboring stations attached to the interface pf0, type:

```
# <basedir>/pf_stat -m pf0
PhySFrameErrorLostSAUNADNA
M   b43eb203<mac_addr1><mac_addr2><mac_addr3>
```

You can also monitor the neighboring stations dynamically (active monitor), by specifying the *interval* (the elapsed time in seconds between interrogations) and *count* (the total number of interrogations). The minimum interval is one second and the accumulated statistics are displayed after every tenth interrogation.

For example, to monitor the stations attached to pf0 once every 10 seconds for 1 minute (a total of 6 interrogations), type:

```
# <basedir>/pf_stat -m pf0 10 6
PhySFrameErrorLostSAUNADNA
M   c460a6d03<mac_addr1><mac_addr2><mac_addr3>
M   2722400 <mac_addr1><mac_addr2><mac_addr3>
M   2722700 <mac_addr1><mac_addr2><mac_addr3>
M   2722000 <mac_addr1><mac_addr2><mac_addr3>
M   2722e00 <mac_addr1><mac_addr2><mac_addr3>
M   2722300 <mac_addr1><mac_addr2><mac_addr3>
```

Interpreting Statistics from Neighboring Stations

Running the `pf_stat` utility with the `-m` option displays information about the neighboring stations attached to the local interface pf*<inst>*.

Phy (Physical Connection)

Phy shows the type of physical connection to the FDDI network. This heading is modified to indicate the type of port being managed:

- `PhyS`: single-attached station, port S
- `PhyA`: dual-attached station, port A
- `PhyB`: dual-attached station, port B

The following states may be returned by `pf_stat` under the `Phy` heading:

TABLE 2-4   `pf_stat` States Under the PHY Heading

State	Meaning
NONE	Port disconnected
M	Port connected to Port M on a concentrator
S	Port connected to Port S on a single-attached station
A	Port connected to Port A on a dual-attached station
B	Port connected to Port B on a dual-attached station

Frame (Frames Received)

Running `pf_stat` or `nf_stat` *without* an interval and count displays the total number of SMT frames received since the interface was activated. Running `pf_stat` or `nf_stat` *with* an interval and count displays the number of SMT frames received since the last interrogation.

More detailed information about the SMT frames can be recovered using the `pf_smtmon`*(1M)* or *nf_smtmon(1M)* utility described in "Monitoring SMT Frames" on page 217.

Error (Error Frames)

Running `pf_stat` or `nf_stat` *without* an interval and count displays the total number of `error` frames received since the interface was activated. Running `pf_stat` or `nf_stat` *with* an interval and count displays the number of `error` frames received since the last interrogation. An `error` frame is defined as an SMT frame whose `E` (error) bit is set, and whose `E` bit is first detected by the local station. It does not indicate the location of the cause of the error. Frequent `error` frames can indicate a noise problem on the network, either dirt (optical fiber) or electrical interference (UTP).

Lost (Lost Frames)

Running `pf_stat` or `nf_stat` *without* an interval and count displays the total number of `lost` frames since the interface was activated. Running `pf_stat` or `nf_stat` *with* an interval and count displays the number of `lost` frames since the last interrogation. A `lost` frame is defined as an SMT frame whose reception is

aborted by the local station. It does not indicate the location of the cause of the error. A large number of `lost` frames can indicate a noise problem on the network, either dirt (optical fiber) or electrical interference (UTP).

SA (Station Address)

Displays the MAC address for the local station.

UNA (Upstream Neighbor Address)

Displays the MAC address for the neighboring station, connected upstream on the ring from the local station.

DNA (Downstream Neighbor Address)

Displays the MAC address for the neighboring station, connected downstream on the ring from the local station.

Example Neighbor Statistics

The following output was recovered from a single-attached station using the command shown. A temporary fault condition was simulated by disconnecting the FDDI cable from the SunFDDI card and then reconnecting it.

```
# <basedir>/pf_stat —m pf0 1 20
PhySFrameErrorLostSAUNADNA
    Mc45d546311b<mac_addr1><mac_addr2><mac_addr3>
    M274370 0<mac_addr1><mac_addr2><mac_addr3>
    M274270 0<mac_addr1>  <mac_addr2><mac_addr3>
    M274350 0<mac_addr1><mac_addr2><mac_addr3>
    NONE182f100<mac_addr1><mac_addr2><mac_addr3>
    NONE00  0<mac_addr1><mac_addr2><mac_addr3>
    NONE00  0<mac_addr1><mac_addr2><mac_addr3>
    Md4320  7<mac_addr1><mac_addr2><mac_addr3>
    M2707e0 0<mac_addr1><mac_addr2><mac_addr3>

PhySFrameErrorLostSAUNADNA
    Mc46e5ce7122<mac_addr1><mac_addr2><mac_addr3>
    M272280 0<mac_addr1><mac_addr2><mac_addr3>
    M272300 0<mac_addr1><mac_addr2><mac_addr3>
    M272270 0<mac_addr1><mac_addr2><mac_addr3>
    M2722e0 0<mac_addr1><mac_addr2><mac_addr3>
    M2722c0 0<mac_addr1><mac_addr2><mac_addr3>
    M272280 0<mac_addr1><mac_addr2><mac_addr3>
    M272310 0<mac_addr1><mac_addr2><mac_addr3>
    M2722b0 0<mac_addr1><mac_addr2><mac_addr3>
    M272270 0<mac_addr1><mac_addr2><mac_addr3>
```

Note the following observations regarding this example:

- Accumulated statistics are displayed automatically after every tenth interrogation.
- The combination of PhyS=NONE and the loss of frame activity indicates that the station is disconnected from the network.

Monitoring SMT Frames

The pf_smtmon(1M) or nf_smtmon(1M) utility is an active monitor that displays the SMT frames received by the local station. It is particularly useful for diagnosing communication problems with the SunNet Manager proxy agent.

This command must be executed as root (or superuser) and has the general form:

```
# <basedir>/pf_smtmon [-i pf<inst>] [-x] [-h] [<frameclass>]
```

-i pf<inst> specifies the SunFDDI interface

-x displays the received SMT frames in hexadecimal

-h displays help information, including a list of valid frame classes

<frameclass> specifies one or more SMT frame classes (used to filter output)

If you do not specify an interface, pf_smtmon(1M) or nf_smtmon(1M) returns the SMT frames received by pf0. If you do not specify a frame type, pf_smtmon displays all the SMT frames that it receives. Use Ctrl-C to stop pf_smtmon(1M) or nf_smtmon(1M).

To display the encoded SMT frames received by interface pf1, type:

```
# <basedir>/pf_smtmon -i pf1
pf1: nif_request  v=0x1 t=0xfc03e781 s=10-0-4-48-6f-a5 i=0x28
pf1: nif_response v=0x1 t=0xfc03e781 s=10-0-4-8-24-5c  i=0x28
pf1: nif_request  v=0x1 t=0xfc00dec6 s=10-0-4-b8-6e-ab i=0x28
pf1: nif_request  v=0x1 t=0xfc03e787 s=10-0-4-48-6f-a5 i=0x28
pf1: nif_response v=0x1 t=0xfc03e787 s=10-0-4-8-24-5c  i=0x28
```

The elements of the SMT frames are defined as follows:

TABLE 2-5   Elements of the SMT Frames

Element	Definition
class_type	Identifies the SMT frame class and type
v	Version ID; identifies the structure of the SMT information field
t	Transaction ID; used to pair SMT response and request frames
s	Station ID; uniquely identifies the station transmitting the frame
i	InfoField Length; defines the length of the SMT information field

1. To display the SMT frames received by interface `pf1` **in hexadecimal format, type:**

```
# <basedir>/pf_smtmon -i pf1 —x
pf1: nif_request v=0x1 t=0x170 s=10-0-4-8-24-5c i=0x28
004DC000 0000004F FFFFFFFF FFFF1000 0408245C 01020001 00000170 00001000
0408245C 00000028 00010008 00001000 04B86EAB 00020004 00010100 00030004
00002100 200B0008 00000001 00000001 76C467A0

pf1: nif_request v=0x1 t=0x5e0f s=10-0-d4-78-42-4d i=0x28
004D0000 0000004F FFFFFFFF FFFF1000 D478424D 01020001 00005E0F 00001000
D478424D 00000028 00010008 00001000 0408245C 00020004 01010208 00030004
00001200 200B0008 0000000B 00000002 A522BBA1

pf1: nif_response v=0x1 t=0xfc00d94a s=10-0-4-8-24-5c i=0x28
004D0000 00000041 100004B8 6EAB1000 0408245C 01030001 FC00D94A 00001000
0408245C 00000028 00010008 00001000 04B86EAB 00020004 00010100 00030004
00002100 200B0008 00000001 00000001 865549E2 0049C020 F0154E4F FFFFFFFF
FFFF1000 04B86EAB 01020001 FC00D94A 00001000 04B86EAB 00000028 00010008
00001000 D478424D 00020004 00010100 00030004 00002000 200B0008 00000001
00000001

pf1: nif_request v=0x1 t=0x5e13 s=10-0-d4-78-42-4d i=0x28
004D0000 0000004F FFFFFFFF FFFF1000 D478424D 01020001 00005E13 00001000
D478424D 00000028 00010008 00001000 0408245C 00020004 01010208 00030004
00001200 200B0008 0000000B 00000002 4AD75A79

pf1: nif_request v=0x1 t=0x5e17 s=10-0-d4-78-42-4d i=0x28
004D0000 0000004F FFFFFFFF FFFF1000 D478424D 01020001 00005E17 00001000
D478424D 00000028 00010008 00001000 0408245C 00020004 01010208 00030004
00001200 200B0008 0000000B 00000002 DCEBADA2

pf1: nif_request v=0x1 t=0x171 s=10-0-4-8-24-5c i=0x28
004DC000 0000004F FFFFFFFF FFFF1000 0408245C 01020001 00000171 00001000
0408245C 00000028 00010008 00001000 04B86EAB 00020004 00010100 00030004
00002100 200B0008 00000001 00000001 127B1D3B

pf1: nif_request v=0x1 t=0x5e1b s=10-0-d4-78-42-4d i=0x28
004D0000 0000004F FFFFFFFF FFFF1000 D478424D 01020001 00005E1B 00001000
D478424D 00000028 00010008 00001000 0408245C 00020004 01010208 00030004
00001200 200B0008 0000000B 00000002 626FA878
```

SMT Frame Classes and Types

SMT frames are used for peer-to-peer (station-to-station) management. They are divided into *classes*, which define the function of the frame. Each class is then divided into up to three *types*, which define whether the frame is an announcement (information only), a request for service, or a response to a request. Refer to the *ANSI/FDDI Station Management (SMT) X3.299 R7.3 Specification* for a detailed description of SMT frames and their functions.

The pf_smtmon(1M) or nf_smtmon(1M) utility is used to monitor the following SMT frame classes:

NIF (Neighbor Information Frames)

These are the most common frames displayed when you run pf_smtmon(1M) or nf_smtmon(1M). As the name suggests, they carry information about a neighboring station (for example, address, description, state, MAC capabilities) and are used as keep-alive notifications that a station is still attached to the ring and functioning. An NIF frame can be an announcement, a request, or a response.

SIF (Status Information Frames)

These frames carry more detailed information about a station. SIF configuration frames describe the station configuration (for example, number of ports, number of MAC entities, connection policy). SIF operation frames describe the current status of the station. A SIF frame can be either a request or a response.

ECF (Echo Frames)

These frames are equivalent to ICMP ping packets and are used to test connectivity between stations. An ECF frame can be either a request or a response.

RDF (Request Denied Frame)

These frames are used to indicate that the request is rejected. If an SMT agent (such as the SunNet Manager proxy agent delivered with SunFDDI) receives an unsupported or unrecognized request, it issues an RDF frame to indicate that the request is rejected. An RDF frame is always a response.

ESF (Extended Service Frame)

These frames are implementation dependent. An ESF frame can be an announcement, a request, or a response.

PMF (Parameter Management Frame)

These frames are used to access remote station attributes. The Parameter Management Protocol supports both `get` (display) and `set` (modify) functions. However, the `pf_smtmon(1M)` or `nf_smtmon(1M)` utility can display only `PMF_get` frames. A `PMF_get` frame can be either a request or a response.

Filtering Output from `pf_smtmon`

By default, `pf_smtmon(1M)` or `nf_smtmon(1M)` displays all of the SMT frames received by the local station. You can filter the output generated by `pf_smtmon(1M)` or `nf_smtmon(1M)` by specifying one or more frame classes on the command-line: `nif`, `sif_config`, `sif_operat`, `ecf`, `rdf`, `esf`, `pmf_get`.

For example:

1. **To display only the RDF frames received by interface** `pf0`, **type:**

```
# <basedir>/pf_smtmon rdf
```

2. **To display the SIF configuration and SIF operation frames received by interface** `pf1`, **type:**

```
# <basedir>/pf_smtmon —i pf1 sif_config sif_operat
```

3. **To display the** NIF **frames,** SIF **configuration frames, and** SIF **operation frames received by interface** `pf1`, **type:**

```
# <basedir>/pf_smtmon —i pf1 nif sif_config sif_operat
```

SunFDDI 6.0 on the Sun Enterprise 10000 Server

Dynamic Reconfiguration (DR) Issues

Before detaching a system board, you must kill the SNMP daemons and unload the SMT driver from the kernel when using Solaris 2.5.1 and Solaris 2.6 operating environments.

To do this execute the following command from the host window command line:

```
# /etc/opt/SUNWconn/nf/bin/nf_snmd_kill
```

The Station Management (SMT) daemon starts two agents that collect and return FDDI statistics to a SunNet Manager™ (SNM) console. Without the SNMP daemons, network data will not be available for monitoring.

After you have detached the system board and have at least one FDDI adapter plumbed and up, you can restart the SNMP daemons and reload the SMT driver into the kernel. Type the following command from the host window command line:

```
# /etc/opt/SUNWconn/bin/nf_fddidaemon start
```

When you remove a system board that is part of a FDDI configuration, no data will travel through the FDDI adapters once the detach is completed.

To restore the configuration, attach the system board and plumb (`ifconfig`) the FDDI adapters. This allows the data to travel through the FDDI adapters.

The FDDI adapter must have the inet (IP address), netmask, and broadcast values set to be in an active state. The implications of having a FDDI adapter that does not pass data will vary with your specific topology.

Note – Check the SunSolve database for any patches that may be issued against DR and FDDI 6.0.

Alternate Pathing (AP) Issues

When using AP with FDDI, you must specify an unique MACID for the metanetwork. To ensure that the MACID is set properly at boot time, place `ifconfig` commands in the `/etc/rcS.d/S30rootusr.sh` startup script. For more information, refer to the *Alternate Pathing User Guide* for your version of the AP software.

Before detaching a system board that has an active metanetwork, the FDDI path group must be switched or DR will not allow the system board to be detached.

By switching the path group, the system board is detachable and the data being transmitted/received by the metanetwork continues uninterrupted. All AP devices, whether primary or secondary, are part of the ring. Detaching any FDDI device may constitute breaking the FDDI ring, depending on your specific topology.

SunFDDI SAS and DAS Adapters

The SunFDDI SBus adapters (SAS and DAS) with SunFDDI 6.0 software were verified on the Sun Enterprise 10000 against Solaris 2.5.1, Solaris 2.6 and Solaris 7 operating environments. This verification establishes the maximum number of SunFDDI adapters that can be supported per domain on the Sun Enterprise 10000.

TABLE 3-1 Maximum Number of SunFDDI Adapters

Operating Environments	Maximum SAS Adapter Configurations (Sbus Only)	Maximum DAS Adapter Configurations (Sbus Only)
Solaris 2.5.1	7	7
Solaris 2.6	7	7
Solaris 7(64 bit)	9	9
Solaris 7(32 bit)	9	9

SunFDDI SAS Adapter Configurations

The following sections describe the configurations used in testing SunFDDI SAS adapters.

Point to Point

FDDI SAS adapters in one domain are directly connected to FDDI SAS adapters in another domain and must have the same subnet address. For example, the FDDI SAS adapter in domain A with an IP address of 10.10.1.80 and the FDDI SAS adapter in domain B with an IP address of 10.10.1.81 constitute a valid configuration because both have the same subnet address (10.10.1).

■ Advantages

No FDDI concentrator needed.

■ Disadvantages

A maximum of two domains can be part of this configuration.

Only two FDDI SAS adapters can communicate with each other. If one fails then the connection is lost.

Does not support alternate pathing (AP).

FDDI Concentrator

The FDDI concentrator connects one or more FDDI SAS adapters from multiple domains to the FDDI concentrator, via the M port(s). The FDDI concentrator must have multiple M ports as well as one A and one B port. The FDDI Concentrator used must be smart enough to know the subnet address for each FDDI SAS adapters.

As with Point to Point, the FDDI SAS adapters must have the same subnet address to communicate to one another.

This configuration is AP capable when a domain has two or more FDDI SAS adapters connect to the FDDI concentrator.

- Advantages

Can communicate with multiple domains and multiple FDDI SAS adapters.

DR/AP capable.

- Disadvantages

The FDDI concentrator is now part of the equation and must be smart enough to know subnet addresses for each of the FDDI SAS adapters connected to the FDDI concentrator.

SunFDDI DAS Adapter Configuration

The following sections describe the configurations used in testing SunFDDI DAS adapters.

Ring Using No FDDI Concentrator

The ring configuration consists of connecting the A port of one FDDI DAS adapter to the B port of another FDDI DAS adapter and continuing this process until you have created a ring that encompasses the desired number of FDDI DAS adapters.

This configuration can go across domains. As with SAS, the subnet addresses must be the same in order for FDDI DAS adapters to communicate. The ring configuration is AP capable when two or more FDDI DAS adapters are installed into the ring and are configured in the same domain.

For example, two domains, A and B, connected in a ring configuration with NO FDDI concentrator or any other devices or HUBs involved.

Domain A consists of two system boards. Each system board has one FDDI DAS adapter. System board one has FDDI DAS adapter nf0 and system board two has FDDI DAS adapter nf1.

Domain B consists of one system board with one FDDI DAS adapter nf2.

Based on this information, the cables should be connected as follows to create a ring configuration:

```
nf0 (A port) is connected to nf1
(B port)
```

```
nf1 (A port) is connected to nf2
(B port)
```

```
nf2 (A port) is connected to nf0
(B port)
```

■ Advantages

No FDDI concentrator needed.

Tolerates single failure.

DR/AP capable.

■ Disadvantages

FDDI does not support optical bypass. Therefore, if a FDDI DAS adapter within the ring is not configured, the data will not be allowed to pass through that FDDI DAS adapter, thus breaking that part of the ring.

Tolerates only a single failure in ring.

Dual Homing

If you have two FDDI concentrators, you can create a dual homing topology when the B port of a FDDI DAS adapter is connected to the M port of first FDDI concentrator and the A port of the same FDDI DAS adapter is connected to the M port of the second FDDI concentrator. You can repeat this process for as many M ports as exist on the FDDI concentrators.

Do not connect A and B ports of the same FDDI DAS adapter to the same FDDI concentrator.

As with SAS, the subnets address must be the same in order for FDDI adapters to communicate.

This configuration is AP capable when a domain has two or more FDDI DAS adapters connect to the FDDI concentrators.

- Advantages

Two FDDI rings - active and standby.

Tolerates multiple points of failure.

DR/AP capable.

- Disadvantages

The FDDI concentrator is now part of the equation and must be smart enough to know the subnet addresses for each of the FDDI DAS adapters connected to the FDDI concentrator.

SunFDDI DAS and SAS Adapter Configuration

The following sections describe how the DAS and SAS FDDI adapters can be configured together.

Point to Point

Basically follow the same process as with SAS Point to Point, having the FDDI DAS adapter act like a FDDI SAS adapter by using only one port (A or B). Thus you connect the port of the FDDI SAS adapter to the selected port of the FDDI DAS adapter.

- Advantages

No FDDI concentrator needed.

- Disadvantages

A maximum of two domains can be part of this configuration.

Only two FDDI SAS adapters can communicate with each other. If one fails then the connection is lost.

Does not support Alternate Pathing (AP).

FDDI Concentrator

There are two FDDI concentrator configurations available for DAS adapters to communicate with SAS adapters; one uses a ring, the other does not. The following sections describe both.

DAS Adapters in a Ring Configuration to Communicate With SAS Adapters

First, connect the FDDI SAS adapters into the M ports of the FDDI concentrator. Second, determine where in the FDDI DAS ring configuration you want the FDDI concentrator to enter.

In the example below, the FDDI concentrator will be connected between FDDI DAS adapters nf1 and nf2. The A port of FDDI DAS adapter nf1 is connected into the B port of the FDDI concentrator, then the A port of the FDDI concentrator is connected into the B port of the FDDI DAS adapter nf2 to complete the ring.

For example:

Ring Configuration before FDDI concentrator

```
nf0 (A port) is connected to nf1 (B port)

nf1 (A port) is connected to nf2 (B port)

nf2 (A port) is connected to nf0 (B port)
```

Ring Configuration with FDDI Concentrator

```
nf0 (A port) is connected to nf1 (B port)

nf1 (A port) is connected to FDDI Concentrator (B
port)

FDDI Concentrator (A port) is connected to nf2 (B
port)

nf2 (A port) is connected to nf0 (B port)
```

- Advantages

Can communicate with multiple domains and multiple FDDI adapters, both DAS and SAS.

DR/AP capable.

- Disadvantages

The FDDI concentrator is now part of the equation and must be smart enough to know what the subnet addresses are for each of the FDDI adapters.

DAS Adapters Not in a Ring Configuration to Communicate With SAS Adapters.

Treat the FDDI DAS adapter like a FDDI SAS adapter by connecting either the A or B port into the M port of the concentrator. Then, from another domain, connect the FDDI SAS adapter port into the M port of the same concentrator.

Do not connect both A and B ports of the same DAS adapter to the same concentrator.

The A and B port of a concentrator can also be used to connect multiple concentrators together.

- Advantages

Can communicate with multiple domains and multiple FDDI adapters, Both DAS and SAS.

DR/AP capable.

- Disadvantages

The FDDI concentrator is now part of the equation and must be smart enough to know the subnet addresses for each of the FDDI adapters connected to the FDDI concentrator.

SunFDDI SAS and DAS Adapter Issues

The following sections describe outstanding issues with SAS and DAS adapters.

Optical Bypass

This feature is not supported by FDDI DAS or SAS adapters. To bypass a shutdown DAS adapter in a ring without a concentrator, you need an optical bypass (a device that allows you to connect incoming and outgoing fibers). There is no need to bypass a station if you use an FDDI concentrator. The FDDI concentrator provides the bypass.

Broken Pipes

When running heavy I/O load between domains using Solaris 2.6 software, you may experience broken pipes. Check the value of `tcp_rexmit_interval_max`:

```
# ndd -get /dev/tcp tcp_rexmit_interval_max
```

If the return value is not 60000, use the following command to reset the parameter:

```
# ndd -set /dev/tcp tcp_rexmit_interval_max 60000
```

To avoid losing this change between system reboots, you can create a script and put it in `/etc/rc2.d` directory.