NP (ATM Release 2) Manager's Guide

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Protection Against Electrostatic Discharge

To prevent damage to the system due to electrostatic discharge, always wear the antistatic wrist strap provided with your network server when you come in contact with the system.

Publication Change Record

The following table records all revisions to this publication. The first entry is always the publication's initial release. Each entry indicates the date of the release and the number of the system release to which the revision corresponds.

Part Number	Date	Description
850479-001	March 1998	Release 1.10, first release

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Preface

About This Guide

This guide provides information on how to operate and manage NP (ATM Release 2) software. It assumes you are familiar with the ATM network environment and terminology.

Information in this guide was derived in part from the *ForeRunner™ SBA-200 ATM SBus Adapter User's Manual* dated March 1996.

Applicable Documentation

The following is a list of documents you will find useful when installing or operating NP (ATM Release 2):

▲   Software Release Note, Auspex Systems, Inc.

▲   *System Manager's Guide,* Auspex Systems, Inc.

▲   Hardware Release Note, Auspex Systems, Inc.

▲   Hardware manual for your server model

Typographical Conventions

In this guide, different typefaces indicate different kinds of information. The following table explains these typographical conventions.

Font	Meaning
Typewriter	Indicates a literal screen message.
Bold	In a command line, indicates information to be entered exactly as shown. In text, indicates a command name or device name.
Italics	In a command line, indicates a nonliteral item or variable for which you substitute an appropriate value. In text, indicates a path name or a special term.

Hexadecimal values in the text are preceded with "0x," and leading zeros are not always shown. For example, the notation 0x68 is used to indicate the hexadecimal address 00000068.

Special Messages

The following special messages are used in this guide:

Warning: Warnings alert you to the danger of personal injury and call attention to instructions you must follow for your personal safety.

Caution: Cautions call attention to instructions you must follow to prevent damage to system hardware or software or loss of system data.

Note: Notes call attention to important information you should be aware of as you follow the procedures described in this guide.

Recommendation: Recommendations call attention to an item or procedure that is not required but might help improve performance, ease of use, and ease of installation or configuration.

Tools The tools icon identifies the tools you need to complete a task.

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Getting Help

Customer support is described in this section.

North America Telephone Support

Customers in North America can reach Auspex customer service at any time by dialing 1-800-3-AUSPEX or 1-800-328-7739.

International Telephone Support

Customers within the countries and territory listed as follows can reach Auspex customer service at any time by dialing the appropriate telephone number.

Country or territory	Telephone number	Country or territory	Telephone number
Australia	1-800-121-194	Luxembourg	0800-2721
Austria	0-660-7912	Malaysia	800-4509
Belgium	0800-1-0180	Netherlands	06-0222158
Denmark	80-01-03-60	Norway	800-1-1294
France	0800-91-21-32 (0800-26-38-22)*	Philippines	1-800-116-0005
Germany	0130-81-8306	Poland	00-800-441-1220
Hong Kong	800-4803	Spain	900-95-4445
Ireland	1800 55 3343	Sweden	020-797326
Israel	177 440 9285	Switzerland	0800-55-1339
Italy	1678-73541	Taiwan	0080-14-9580
Japan	0044-22-12-2414	United Kingdom	0800-28-7739
Korea	0038-13-0374		

* France has two toll-free numbers. The number in () is directed to the Paris office during the working day.

International customers who purchase Auspex products from an authorized distributor or reseller should contact that distributor or reseller for support

Email Support

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World Wide Web

For more information about Auspex Systems, Inc. and its products, use the following resource location on the World Wide Web:

http://www.auspex.com

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1 Overview of NP (ATM Release 2)

About This Chapter

This chapter describes NP (ATM Release 2) software and features.

The following topics are covered in this chapter:

▲ Overview

▲ FORE IP Interface

▲ Classical IP Interface

▲ Address Registration and ILMI

▲ ATMARP Server Operation

▲ NP (ATM Release 2) Limitations

Overview

NP (ATM Release 2) is Auspex's Network Processor (NP)-resident implementation of Asynchronous Transfer Mode (ATM). The Auspex implementation, with hardware and software supported directly on the NP, results in improved throughput and response time.

NP (ATM Release 2) is based on FORE Systems' SBA-200 Series ATM adapter hardware and software. NP (ATM Release 2) provides connectivity to compatible ATM switches through multi-mode fiber-optic (OC-3) cables with SC and ST-type connectors, or unshielded twisted pair category 5 (UTP5) cables with RJ-45 connectors at 155 megabits per second.

Auspex supports up to 3 adapters per NP and up to 15 adapters per system. Each NP supports up to 1024 active virtual connections. Each adapter provides up to 21 IP interfaces (1 FORE IP interface, 4 Classical IP interfaces, and 16 LEC interfaces), allowing you to configure up to 21 IP subnets per adapter.

Table 1-1 lists the features available with NP (ATM Release 2).

Table 1-1. NP (ATM Release 2) features

▲   LAN Emulation (LANE) over ATM

▲   LAN Emulation Client (LEC) support for Ethernet LANs

▲   SPANS Switched Virtual Circuit (SVC) signalling protocol

▲   Permanent Virtual Circuits (PVC)

▲   Supports up to 1024 Virtual Circuit Identifiers (VCIs)

▲   Supports UNI 3.0 signalling

▲   Supports Interim Local Management Interface (ILMI)

▲   Supports up to 21 virtual Internet Protocol (IP) interfaces per adapter
      (1 FORE IP, 4 Classical IP, and 16 LEC)

FORE IP Interface

The FORE IP interface supports the Single Protocol for ATM Network Signalling (SPANS) protocol and enables communication using ATM Adaptation Layer 4 or 5 (AAL4 or AAL5) without encapsulation. FORE IP uses a broadcast ATMARP server for SPANS signalling and supports direct communication of all hosts on a physical ATM network without the use of IP routers. Since SPANS and UNI 3.0 use different virtual connections to establish network communication, a host can simultaneously support both FORE IP over SPANS and Classical IP over UNI 3.0 on the same ATM adapter.

As a result of standard IP routing, all traffic sent through an **afa** interface will use FORE IP, while all traffic sent through an **aqa** interface will use Classical IP.

> **Note:** Both the **afa** and **aqa** interfaces can be configured simultaneously, but they must reside on separate subnets. Classical IP specific configuration changes can only be made with the **aqa** devices, while SPANS specific configuration changes can only be made with **afa** devices.

Classical IP Interface

The term classical indicates that the ATM network has the same properties as the existing legacy LANs. That is, even though ATM technology allows for large globally connected networks, for example, it is only used in the LAN environment as a direct replacement of existing LAN technology. The classical model of LANs connected through IP routers is maintained in ATM networks.

Classical IP over ATM is different than IP in legacy LANs in that ATM provides a virtual connection environment through the use of permanent virtual circuits (PVCs) and/or switched virtual circuits (SVCs). SVC management is performed via UNI 3.0 signalling. UNI 3.0 is a broadband signalling protocol designed to establish connections dynamically.

On an Auspex NetServer, each Classical IP interface name begins with **aqa**.

Once a Classical IP connection has been established, IP datagrams are encapsulated using IEEE 802.3 LLC/SNAP and are segmented into ATM cells using AALS.

> **Note:** There is currently no support for IP broadcast or IP multicast datagrams in Classical IP network environments.

RFC-1577 is the standard specification for Classical IP over ATM.

Logical IP Subnets

An important concept in Classical IP networks is that of a Logical IP Subnet (LIS). An LIS is a group of hosts configured to be members of the same IP subnet (that is, they have the same IP network and subnetwork numbers). In this sense, one LIS can be equated to one legacy LAN. In a Classical IP ATM network, placing a host on a specific subnet is a logical choice rather than a physical one.

The number of LISs, and the division of hosts into each LIS, is purely an administrative issue. Limitations of IP addressing, IP packet filtering, and administrative boundaries may guide a network manager into establishing several LISs into a single ATM network.

> **Note:** Communication between LISs must occur through IP routers.

LANE Services

Auspex's NP (ATM Release 2) software is compliant with the ATM Forum's *LAN Emulation over ATM Version 1.0* specification, and supports LAN Emulation (LANE) of Ethernet (IEEE 802.3) LANs only. LANE allows higher level protocols and LAN applications to interoperate, without modifications, in an ATM network. The components of LANE work together to emulate an emulated LAN (ELAN), resolve MAC to ATM addresses, replace the connectionless operation of legacy LANs with point-to-point connections, and provide broadcast and multicast services.

An ELAN has the following components:

▲   LANE Clients (LECs)

▲   LANE Configuration Server (LECS)

▲   LANE Server (LES)

▲   Broadcast and Unknown Server (BUS)

Each of these components is described as follows.

LEC   The LEC runs on each end station in the ELAN. LECs communicate with other ELAN components (LES and BUS) to resolve MAC addresses into ATM addresses.

LECS   The LECS runs on a SunOS workstation or a FORE Systems ATM switch. It maintains information about all ELANs within the administrative domain. When the LEC successfully communicates with the LECS, the LECS provides a list of ELANs that the LEC can join.

LES   The LES runs on a SunOS workstation or a FORE Systems ATM switch. It maintains information about the LECs within a single ELAN and performs address resolution.

BUS   The BUS runs on a SunOS workstation or a FORE Systems switch. It provides services within a single ELAN allowing broadcasts, multicast, and unknown unicasts within a single ELAN.

Note: Auspex currently supports Ethernet LECs only. The LECS and LES should be configured either on an ATM switch or an external host.

Figure 1-1 shows an example of a single LANE network in which the NetServer (workstation A) attempts to initiate data transfers to workstation B.
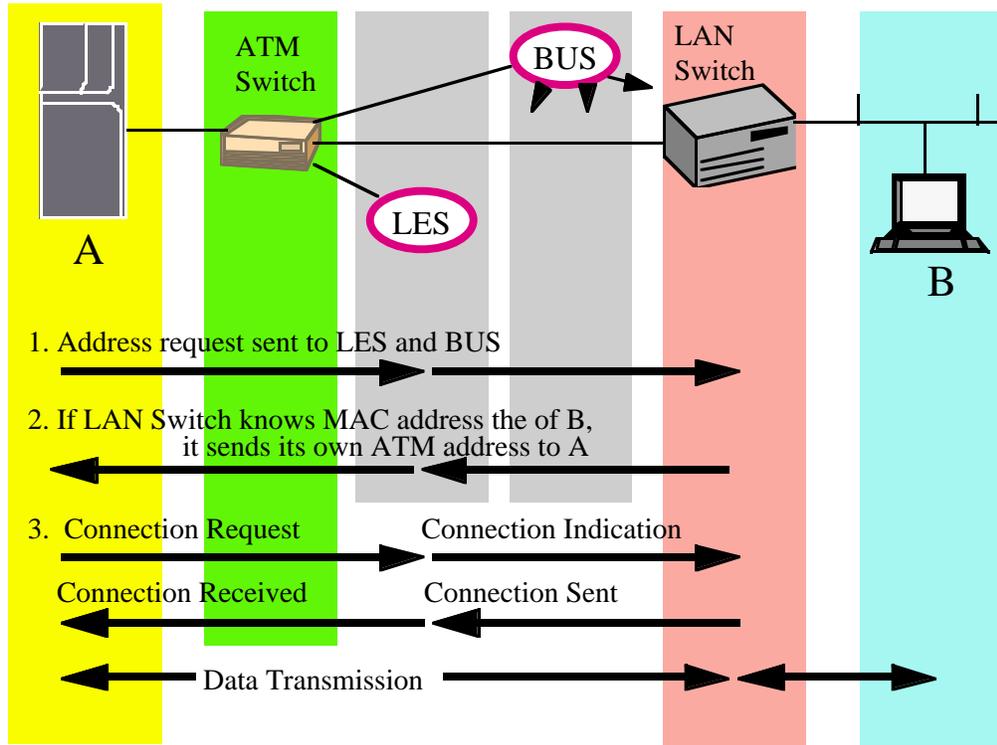
Figure 1-1. Single LANE network

Address Registration and ILMI

Before a host can establish connections over a physical interface, the host must know the ATM address for that interface. The primary purpose of the Interim Local Management Interface (ILMI) is to discover and register these ATM addresses dynamically. ATM addresses and ILMI support are discussed in the following sections.

ATM Addresses

For private ATM networks, addresses uniquely identify ATM endpoints. The UNI 3.0 address format is modeled after that of an OSI Network Service Access Point (NSAP).

Since ATM does not have the concept of MAC addresses, ATM uses NSAP addresses, which are 20 bytes long.

An ATM address consists of the following:

▲ 13-byte network-side prefix. The prefix is the ATM prefix of the switch to which the host is attached.

▲ 7-byte user-side portion consisting of the following:

   – 6-byte End System Identifier (ESI). The ESI is the unique IEEE MAC address of the interface.

   – 1-byte selector. Although each virtual interface for a given physical interface uses the same prefix and ESI, the selector field identifies a specific virtual interface. For example:

   `0x47.0005.80.ffe100.0000.f21a.1d25.002048062f8b.00`

   In the example, **0x47.0005.80.ffe100.0000.f21a.1d25.** is the ATM switch prefix, **002048062f8b** is the MAC portion, and **.00** is the selector field that identifies the number of the adapter interface.

Operating with ILMI Support

If ILMI is supported on all of the switches and hosts in a given network, when a switch boots up, ILMI enables the switch to discover all of the hosts attached to it and to send its ATM prefix associated with the port to those hosts dynamically. In return, the host prepends that prefix to its ESI and selector fields, forming a complete ATM address.

If a host changes network ports after an ATM address has been registered for its interface, all existing connections will be closed. If the new port is on a different switch, a new ATM address (with a different network address prefix) will be registered. The host can then establish new connections.

Auspex NetServers support ILMI by default. Instructions for using NP (ATM Release 2) without ILMI support are in Chapter 4. There is one instance of the ILMI (**ax_ilmid**) daemon running per adapter. See the **ax_ilmid** man page for more information.

ATMARP Server Operation

Auspex supports the ATM Address Resolution Protocol (ATMARP) operation for customers who want to obtain the ATM to IP address resolution from the NetServer.

In order for a host to establish a connection to another host, it must first determine the other host's ATM address. ATMARP is the procedure used to resolve an IP address into an ATM address. Since the ATM standards do not currently support broadcast on an ATM ⁄ Classical IP interface, address resolution is performed by direct communication with a special ARP server, rather than broadcasting ARP requests as is done in legacy LANs.

Each host in an LIS must be configured with the ATM address of the host providing ARP service for its LIS. On a host ATMARP server, the ATM address of the ARP server can be obtained by running **ax_atmarp** -**z** (remember to use the interface associated with the given LIS). The ARP server address is normally configured into each host at installation time (the appropriate commands are placed in the script *rc.ax_sba200* in the directory */usr/etc/fore* or the user specified directory), but it may be done at any time by running **ax_atmarp** -**p**. If the ATMARP server address is configured in the firmware download script, it will be persistent across reboots, but if it is configured using **ax_atmarp** -**p**, it will not be persistent across reboots.

Since only one ATMARP server can function at a time in a given LIS, and since the ATMARP server's address is manually configured into each host, it is not possible to use multiple, redundant ATMARP servers to improve robustness. If an ATMARP server becomes nonfunctional, a new ATMARP server must be configured, and each host within the LIS must be configured to use the new ATMARP server. A new ATMARP server address can be configured on a host by running the **ax_atmarp** -**p** command to set the new address and the **ifconfig** command to mark the appropriate interface UP or DOWN for the change to take effect. For example:

```
# ax_atmarp -p <ATMaddress device>
# ifconfig aqax down; ifconfig aqax up
```

In the example, **x** represents the number of the interface.

Figure 1-2 shows an Auspex NetServer configured as an ARP server. In the figure, workstation A is attempting to make a connection to workstation B on LIS 1. Workstation A sends an ARP request containing the IP address to be resolved to the ATMARP server. When workstation A receives the ATMARP reply from the ATMARP server, workstation A creates an ATMARP cache to store the IP to ATM address map and begins data transmission to workstation B.
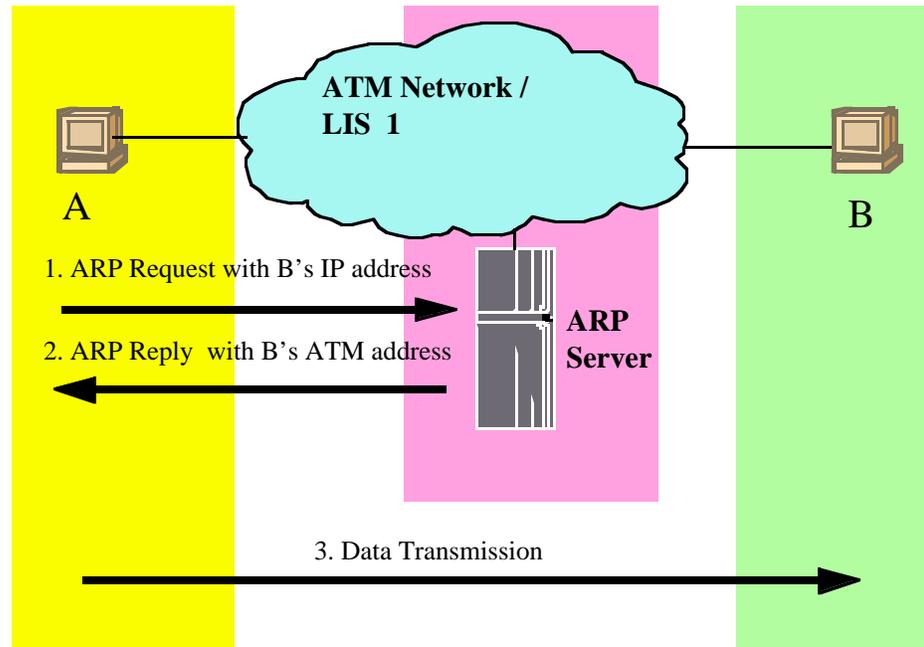
Figure 1-2. ATMARP server operation

NP (ATM Release 2) Limitations

Table 1-2 lists limitations in the NP (ATM Release 2) software architecture.

Table 1-2. NP (ATM Release 2) limitations

▲   Up to 1,024 connections per adapter

▲   Up to 16 LECs supported per adapter (Ethernet only)

▲   No UNI 3.1 support

▲   No support for LES, BUS, or LECS

▲   No Token Ring support

▲   No support for IP multicasting

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2 Installing NP (ATM Release 2)

About This Chapter

This chapter describes how to install and configure NP (ATM Release 2) software. The procedures described in this chapter assume that your NetServer is already installed at your site.

The following topics are covered in this chapter:

▲ Hardware Configuration

▲ Package Tools

▲ Software Installation

Hardware Configuration

NP (ATM Release 2) uses ForeRunner SBA-200 Series ATM adapters. Each NP can have up to 3 adapters for a maximum of 15 adapters per NetServer.

To display your NetServer's hardware configuration, enter the **ax_config command**; for example:

```
# ax_config -d
```

Information regarding your NetServer's hardware configuration is displayed. Here is an example:

```
60-0028 ?        84383FORE ATM/OC3SC Module SBA-200E (4.0.0)
60-0047 ?        84383FORE ATM/UTP5 Module SBA-200E (4.0.0)
```

Contact your Auspex sales representative to purchase ATM adapters, or your Auspex service representative to install ATM adapters.

Package Tools

Package tools allow you to install NP (ATM Release 2) from the Auspex Premier Software Series CD-ROM shipped with your system. Package tools are the standard SVR4 package utilities, which are shipped as part of the Auspex system software. The tools allow you to add, check, remove, and display information about NP (ATM Release 2). The basic commands are as follows:

▲ **pkgadd**(1M) – Transfers the contents of a software package from the distribution medium, and installs it onto a system. Messages from this command display on the console and are written to the file /var/log/pkgadd.log on the target drive and /tmp/pkgadd.log on the current root drive.

> **Note: pkgadd**(1M) sets userid to *install*, if it exists; otherwise, it sets userid to *root*. If you have a userid of *install* set up, it must have superuser permission or the **pkgadd** will fail. Either remove or rename the *install* userid, or give the *install* userid superuser permissions.

▲ **pkgchk(1M)** – Checks the accuracy of installed files or, by using the -**l** option, displays information about package files.

▲ **pkgrm(1M)** – Removes a previously or partially installed package from the system. Messages from this command display on the console and are written to the file */var/log/pkgrm.log* on the target drive and */tmp/pkgrm.log* on the current root drive.

▲ **pkginfo(1M)** – Displays information about software packages installed on the system.
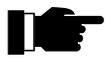
For more information, refer to the UNIX man pages for these commands: **pkgadd**(1M), **pkgchk**(1M), **pkgrm**(1M), and **pkginfo**(1M).

Software Installation

This section provides procedures for installing the NP (ATM Release 2) software.

👉 **Recommendation:** After completing the installation, test the new software to verify that the updated root drive is usable (for example, it boots, runs, and the newly added features work). If everything works correctly, clone the entire root disk to an alternate root disk using the **ax_sputil**(8) command with the **copy** option. Alternatively, copy each file system on the root disk to an alternate root disk using the **ax_clonefs**(8) command on each file system.

To install NP (ATM Release 2)

1. Mount the Premier Software Series CD. For example:

   ```
   # mount -rt hsfs /dev/acd1 /cdrom
   ```

   This command mounts the CD in drive slot 1 on */cdrom*.

2. Mount */usr* with read/write privilege:

   ```
   # mount -o remount,rw /usr
   ```

3. Add the software package to the server by entering the following command:

   ```
   # pkgadd -d /cdrom
   ```

   The system prompts you to select a software package from a list similar to the following.

   ```
   pkgadd session stated on Mar 2 10:45:05 PST 1998

   The following packages are available:

     1  AXatm2       ATM 2
                      (HP-VII,HP-VIII) 1.10
     2  AXbackup     FastBackup
                      (HP-VII,HP-VIII) 1.10
     3  AXdguard     DataGuard
                      (HP-VII,HP-VIII) 1.10
     4  AXdocs       Auspex System Documentation
                      (HP-VII,HP-VIII) 1.10
     5  AXdrvgrd     DriveGuard
                      (HP-VII,HP-VIII) 1.10
     6  AXftp        NP Resident FTP
                      (HP-VII,HP-VIII) 1.10
     7  AXsrvgrd     ServerGuard
                      (HP-VII,HP-VIII) 1.10
     8  AXEC1        EtherChannel
                      (HP-VII,HP-VIII) 1.10
     9  AXNeTsrv     NeTservices Products
                      (HP-VII,HP-VIII) 1.10
    10  AXNTadmin    NeTservices Administration
                      (HP-VII,HP-VIII) 1.10
    11  AXNTBios     NeTservices Concepts and Planning
                      (HP-VII,HP-VIII) 1.10

   Select package(s) you wish to process (or 'all' to process
   all packages). (default: all) [?,??,q]:
   ```

where ? is a one-digit entry, and ?? is a two-digit entry.

4. Type **3** for the NP (ATM Release 2) package.

The system responds with:

```
Processing package instance <AXatm2> from /cdrom
ATM 2
(HP-VII,HP-VIII) 1.10
```

pkgadd installs NP (ATM Release 2) on the NetServer. The system then responds with the following message:

```
Do you want to activate ATM 2 immediately after installation?[y/n]
```

5. Enter **y** to activate NP (ATM Release 2) immediately after installation. Enter **n** if you do not wish to activate NP (ATM Release 2) immediately after installation.

> **Note:** If you choose not to activate the NP (ATM Release 2) software immediately after installation, use the **ax_enable**(8) command to activate the software at a later time.

The installation process continues with the following messages:

```
## Processing package information.
## Processing system information.
## Verifying package dependencies.
## Verifying disk space requirements.
## Checking for conflicts with packages already installed.
## Checking for setuid/setgid programs.
This package contains scripts which will be executed with
superuser permission during the process of installing this
package.
Do you want to continue with the installation of this package?
[y,n]
```

6. Enter **y** to continue with the installation.

```
Installing ATM 2 as <AXatm2>
## Executing preinstall script.
## Installing part 1 of 1.
[ verifying class <none> ]
/usr/etc/fore/ax_adinfo
/usr/etc/fore/ax_atmarp
/usr/etc/fore/ax_atmconfig
/usr/etc/fore/ax_atmlooptest
/usr/etc/fore/ax_atmstat
/usr/etc/fore/ax_elarp
/usr/etc/fore/ax_elconfig
/usr/etc/fore/ax_elcreate
/usr/etc/fore/ax_ilmid
/usr/etc/fore/ax_ncomm
/usr/etc/fore/ax_objcopy
/usr/etc/fore/ax_sba200.ucode1
/usr/etc/fore/ax_sba200.ucode2
/usr/etc/fore/ax_sba200e.ucode1
/usr/etc/fore/ax_sba200e.ucode2
```

```
/usr/etc/fore/rc.ax_sba200
/usr/man/man4/afa.4
/usr/man/man4/aqa.4
/usr/man/man8/ax_adinfo.8c
/usr/man/man8/ax_atmarp.8c
/usr/man/man8/ax_atmconfig.8c
/usr/man/man8/ax_atmlooptest.8c
/usr/man/man8/ax_atmstat.8c
/usr/etc/fore/ax_elarp.8c
/usr/etc/fore/configuration.lane
/usr/etc/fore/ax_elconfig.8c
/usr/etc/fore/ax_elcreate.8c
/usr/man/man8/ax_ilmid.8c
/usr/man/man8/ax_ncomm.8c

Installation of <AXatm2> was successful.
The following packages are available:

  1  AXatm2       ATM 2
                  (HP-VII,HP-VIII) 1.10
  2  AXbackup     FastBackup
                  (HP-VII,HP-VIII) 1.10
  3  AXdguard     DataGuard
                  (HP-VII,HP-VIII) 1.10
  4  AXdocs       Auspex System Documentation
                  (HP-VII,HP-VIII) 1.10
  5  AXdrvgrd     DriveGuard
                  (HP-VII,HP-VIII) 1.10
  6  AXftp        NP Resident FTP
                  (HP-VII,HP-VIII) 1.10
  7  AXsrvgrd     ServerGuard
                  (HP-VII,HP-VIII) 1.10
  8  AXEC1        EtherChannel
                  (HP-VII,HP-VIII) 1.10
  9  AXNeTsrv     NeTservices Products
                  (HP-VII,HP-VIII) 1.10
 10  AXNTadmin    NeTservices Administration
                  (HP-VII,HP-VIII) 1.10
 11  AXNTBios     NeTservices Concepts and Planning
                  (HP-VII,HP-VIII) 1.10

Select package(s) you wish to process (or 'all' to process
all packages). (default: all) [?,??,q]:
```

7. Enter **q** to quit the **pkgadd** routine.

```
pkgadd session finished on Mar 2 17 10:58:50 PST 1998

A log of this session of pkgadd is at /tmp/pkgadd.log on the
current root disk, and at /var/log/pkgadd.log on the target disk.
```

8. Verify the installation using the **pkgchk** command; for example:

```
# pkgchk -l AXatm2
```

This completes NP (ATM Release 2) installation.

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3 Configuring Network Interfaces

About This Chapter

This chapter provides procedures for configuring FORE IP, Classical IP, and LEC interfaces.

The following topics are covered in this chapter:

▲ NP (ATM Release 2) Network Interface Numbering

▲ Configuring FORE IP Interfaces

▲ Configuring Classical IP Interfaces

▲ Configuring LEC Interfaces

The procedures in this chapter assume that ILMI is running and the NSAP addresses are automatically configured for each interface. See Chapter 4 for procedures on manually configuring NSAP addresses on the Classical IP interfaces.

NP (ATM Release 2) Network Interface Numbering

This section describes NP (ATM Release 2) network interface numbering.

After installing the NP (ATM Release 2) software, you need to configure the network interface s. Each network interface must be configured with a unique IP address that is within the subnet assigned to the ELAN.

NP (ATM Release 2) allows you to configure three types of ATM network interfaces: 1 FORE IP primary (**afa**) interface, 4 Classical IP virtual (**aqa**) interfaces, and 16 LEC (**ael**) interfaces.

Table 3-1 shows an example of the NP (ATM Release 2) network interface numbering for an Auspex NetServer with two NP boards (NP0 and NP1), each having two ATM adapters (0, 1 and 2, 3).

Table 3-1. Example of NP (ATM Release 2) network interface numbering

NP board no.	ATM adapter no.	FORE IP primary interfaces	Classical IP virtual interfaces	LEC interfaces
0	0	afa0	aqa0, aqa1, aqa2, aqa3	ael0 – ael15
0	1	afa1	aqa4, aqa5, aqa6, aqa7	ael16 – ael31
1	2	afa2	aqa8, aqa9, aqa10, aqa11	ael32 – ael47
1	3	afa3	aqa12, aqa13, aqa14, aqa15	ael48 – ael63

In the example, FORE IP primary interfaces are named **afa0** – **afa3**, depending on the number of ATM adapters installed in the server. Classical IP virtual interfaces are named **aqa0** – **aqa15**, depending on the number of FORE IP primary interfaces configured. Each Classical IP interface has its virtual interface number as a suffix. LEC interfaces are named **ael0** – **ael63**, depending on the number of ELANs configured.

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Configuring FORE IP Interfaces

This section provides the procedures for configuring FORE IP primary interfaces.

Each ATM adapter in the NetServer must be configured with a FORE IP address. Auspex system software recognizes FORE IP primary interfaces as **afa** in commands and displays.

To configure the FORE IP primary interface addresses

1. Run **NSconfig**(8) to edit the network information for each **afa** interface, then execute **NSconfig** with **Ctrl**-**F**.

   > **Note: NSconfig** executes ifconfig's of network interfaces whether you are running in single or multi-user mode.

   > **Caution:** Do not alter the **ifconfig** command lines in the file */etc/rc.boot*. **NSconfig** relies on these command lines to function properly.

   For example, the following NSconfig form shows entries for five ATM adapters installed in an Auspex NetServer:

   ```
   ATM FORE SPANS Intf
   afa0  >UP   [host-afa0__]        [100.00.00.0_]  [ffffff00_____]>0
   .     afa0 on-net              afa0 off-net
   .
   .
   afa1  >UP   [host-afa1__]        [100.00.00.1_]  [ffffff00_____]>0
   .     afa1 on-net              afa1 off-net
   .
   .
   afa2  >UP   [host-afa2__]        [100.00.00.2_]  [ffffff00_____]>0
   .     afa2 on-net              afa2 off-net
   .
   .
   afa3  >Dwn
   .
   .
   .
   afa4  >UP   [host-afa4__]        [100.00.00.3_]  [ffffff00_____]>0
          afa4 on-net              afa4 off-net
   ```

   In this example, interfaces **afa0**, **afa1**, **afa2, and afa4** are marked UP, and interface **afa3** is marked DWN.

2. If you changed the IP address or netmask of a network interface, or if the NIS type is changed to master or slave, reboot the server after running **NSconfig**. This creates entries in the */etc/rc.boot* file.

This completes the procedure for configuring the FORE IP primary interface addresses.

Configuring Classical IP Interfaces

This section provides the procedures for configuring Classical IP virtual interfaces.

Each ATM adapter in the NetServer can be configured with a Classical IP virtual interface address. Auspex system software recognizes Classical IP virtual interfaces as **aqa** in commands and displays.

To configure the Classical IP virtual interface addresses

1. Run **NSconfig**(8) to edit the network information for each **aqa** interface, and execute NSconfig using **Ctrl-F**.

    Note: NSconfig executes the ifconfig's of network interfaces whether you are running in single or multi-user mode.

    Caution: Do not alter the **ifconfig** command lines in the file */etc/rc.boot*. **NSconfig** relies on these command lines to function properly.

    For example, the following NSconfig form shows entries for five ATM adapters installed in an Auspex NetServer:

    ```
    ATM Classical IP Intf
    aqa0   >UP   [host-aqa0__]        [100.00.00.0_]   [ffffff00_____]>0
    .      aqa0 on-net                aqa0 off-net
    .
    .
    aqa4   >UP   [host-aqa4__]        [100.00.00.1_]   [ffffff00_____]>0
    .      aqa4 on-net                aqa4 off-net
    .
    .
    aqa8   >UP   [host-aqa8__]        [100.00.00.2_]   [ffffff00_____]>0
    .      aqa8 on-net                aqa8 off-net
    .
    .
    aqa12  >Dwn
    .
    .
    .
    aqa16  >UP   [host-aqa16__]       [100.00.00.3_]   [ffffff00_____]>0
            aqa16 on-net              aqa16 off-net
    ```

    In this example, interfaces **aqa0**, **aqa4**, **aqa8, and aqa16** are marked UP, and interface **aqa12** is marked DWN.

    The NSAP address for each interface is automatically determined by the ILMI daemon (**ax_ilmid**).

2. If you changed the IP address or netmask of a network interface, or if the NIS type is changed to master or slave, reboot the server after running **NSconfig.**

    This completes the procedure for configuring Classical IP virtual interface addresses.

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Configuring LEC Interfaces

This section provides the procedures for configuring LEC interfaces.

> **Note:** NP (ATM Release 2) does not support the LAN Emulation Configuration Server (LECS) and LAN Emulation Server (LES) features of LANE. This guide does not provide procedures for these features.

Auspex system software recognizes the LEC interfaces as **ael** in commands and displays.

Setting LEC interface addresses requires a few simple steps including, running the **NSconfig**(8) command.

> **Note: NSconfig** executes the ifconfig's of network interfaces whether you are running in single or multi-user mode.

> **Caution:** Do not alter the **ifconfig** command lines in the file */etc/rc.boot*. **NSconfig** relies on these command lines to function properly.

A reboot after running **NSconfig** is only required if you are running in multi-user mode, changing the IP address or netmask of a network interface, or the NIS type is changed to master or slave.

To configure LEC interfaces

1. Using **vi**(1) or other editor, edit the */usr/etc/fore/configuration.lane* file. Using the following examples as guidelines. Note that "UNIT" means ATM adapter.

    Example 1:

    ```
    #
    ELAN=Marketing UNIT=0 (which will create ael0)
    #
    ```

    In the example, the ELAN name is specified as "Marketing". Since the UNIT number is not set, it defaults to zero, and the LECS defaults to "-well-known".

    Example 2:

    ```
    #
    ELAN=Finance -1 UNIT=1 (which creates ael16)
    #
    ELAN=Finance -2 UNIT=2 (which creates ael32)
    #
    ELAN=Finance -3 UNIT=3 (which creates ael48)
    #
    ```

    In the example, three ELAN names are specified as "Finance". The UNIT numbers are set to 1, 2, and 3. The LECS defaults to "-well-known".

    Example 3:

    ```
    #
    ELAN=Engineering -3 UNIT=3 (which creates ael49)
    #
    ```

In the example, the ELAN name is specified as "Engineering". Since Engineering is being configured on the same UNIT, the UNIT number is set to 3 and the LECS defaults to "-well-known".

2. Run **NSconfig**(8) to edit the network information for each **ael** interface, then execute **NSconfig** with Ctrl-F.

   The following NSconfig form displays the entries for **the LEC interface examples described in** :

```
ATM LANE Intf
ael0   >UP    [host-ael0_]        [100.00.00.0_]   [ffffff00_____]>0
       ael0 on-net                ael0 off-net
.
.
.
ael16  >UP    [host-ael16_]       [100.00.00.1_]   [ffffff00_____]>0
       ael16 on-net               ael16 off-net
.
.
.
ael32>UP      [host-ael32_]       [100.00.00.2_]   [ffffff00_____]>0
       ael32on-net                ael32 off-net
.
.
.
ael48  >Dwn
.
.
.
ael49  >UP    [host-ael49_]       [100.00.00.3_]   [ffffff00_____]>0
        ael49 on-net              ael49 off-net
```

   In the example, interfaces **ael0**, **ael16**, **ael32**, and **ael49** are marked UP; interface **ael48** is marked DWN.

   NSconfig automatically launches the **ax_elcreate** command to create the **ael** entries from the *configuration.lane* file. The NSAP address for each interface is automatically determined by ILMI daemon (**ax_ilmid**).

3. Edit the */usr/kvm/sys/aushp/conf/<config file>* file to tune "net interfaces" to create more than 60 LEC addresses.

4. Run the **ax_elconfig**(8C) command to view the configured interfaces. The server displays the ELAN information for each **ael** interface; for example:

```
# ax_elconfig show -configured -unit 0
# ax_elconfig show -configured -unit 1
# ax_elconfig show -configured -unit 2
# ax_elconfig show -configured -unit 3
```

This completes the procedure for configuring LEC interfaces.

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4 Maintenance

About This Chapter

This chapter provides maintenance information for NP (ATM Release 2).

The following topics are covered in this chapter:

- ▲ Maintenance Utilities
- ▲ NP (ATM Release 2) and ax_perfmon
- ▲ Operating Without ILMI Support
- ▲ Configuring the NetServer as an ATMARP Server
- ▲ Load Balancing
- ▲ Removing NP (ATM Release 2)

Maintenance Utilities

This section describes the maintenance utilities available with the NP (ATM Release 2) software. See the man pages for complete information on these utilities.

ax_adinfo(8C)

This command displays the hardware and firmware versions of the ATM adapter, media type, and slot number. If the firmware release is `0.0.0`, the ATM firmware is not downloaded.

ax_atmarp(8C)

This command is used for MAC/NSAP address mapping. It has the following functions:

▲   Displays translation table entries

▲   Deletes translation table entries

▲   Routes IP traffic to particular destinations over PVCs. Deleting and routing features have numerous options for fine-tuning NP (ATM Release 2) operations.

ax_atmconfig(8C)

This configuration tool command for NP (ATM Release 2) devices and has the following functions:

▲   Displays an NP (ATM Release 2) device's current configuration

▲   Sets the MTU on an interface

▲   Enables and disables IP load balancing

▲   Enables and disables SPANS on a device

▲   Enables and disables IP multicasting on an interface

ax_atmlooptest(8C)

This command is a diagnostic tool that tests an ATM interface for cell reception and transmission functionality. The test uses the FORE ATM user-level Application Programming Interface (API), which requires configuring the FORE IP interface. The ATM interface needs SPANS signalling turned by using the `ax_atmconfig`(8C) command.

ax_atmstat(8C)

This command displays numerous FORE ATM device driver statistics. You can choose to display statistics from the physical layer (TAXI, OC-3), ATM layer, ATM adaptation layer, or the NP (ATM Release 2) device drivers. It also allows you to select an interval to use when gathering the statistics.

ax_elarp(8C)

This command removes dynamic table entries for LECs in the router.

ax_elconfig(8C)

This command allows the user to manually create LANE client (ael) interfaces.

ax_elcreate(8C)

This command interprets the definitions from the file */usr/etc/fore/configuration.lane*, and automatically creates LANE client interfaces.

NP (ATM Release 2) and ax_perfmon

The performance monitoring tool `ax_perfmon`(8) displays specific information for NP (ATM Release 2) connections. Refer to the `ax_perfmon` man page for more information.

Figure 4-1 displays a portion of the `ax_perfmon` screen. The NP (ATM Release 2) entry is designated as `a00`.

```
1.0 System SummarySrvA Sun Mar 1 15:26:20 1998
CPU Util     NFS Bytes/sec HP CPU Util   NP1:Bytes/sec SP0:OPs/sec
NP0  2%[   ] [  4524]         33% usr    a00[    211] (0~ 80 bar)
NP1  1%[   ] [ 11211]         20% sys    f00[   2081] R1[        ]
NP2  0%[   ] [  3365]         66% idle   H00[      0] [          ]
```

Figure 4-1. Example of an NP (ATM Release 2) entry in an ax_perfmon display

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Operating Without ILMI Support

If ILMI is not supported on a particular switch or host in a given network, then the ATM addresses must be manually configured. If a given switch does not support ILMI, it cannot supply an ATM prefix to the hosts. Therefore, the user must assign a unique, valid prefix to the switch. Additionally, the same prefix should be used for all the hosts in the LIS.

Once a network interface ATM address is set, it can be changed by running the **ax_atmarp**(8C) command to set the new address, and then bringing the interface down and back up (ifconfig aqa*xx* down; ifconfig aqa*xx* up) for the ATM address change to take effect.

To manually configure ATM addresses for systems without ILMI support

1. Get the network prefix from your ATM switch.

2. Get the network address from your ATM adapter.

    This can be done by logging in as "root" and running the **ifconfig** command to obtain the "ether" portion of the display. You can add any selector byte you choose.

3. On the NetServer, run the **ax_atmarp** command to configure the ATM address for each specified interface. For example:

    ```
    # ax_atmarp -n 0x47.0000.00.ffe100.0000.f21a.1d25.002048062f8b.00
    aqa16
    ```

    In the example, `0x47.0000.00.ffe100.0000.f21a.1d25.` is the ATM switch prefix, **002048062f8b** is the MAC portion, and **.00** is any selector byte you choose.

    The switch directly attached to this interface is then informed of the address through adapter software and the NetServer can then begin signalling.

When ILMI is not supported, you need to manually configure the LEC NSAP addresses while creating the LEC interfaces. See the */usr/etc/fore/configuration.lane* file for more information.

This completes the procedure for manually configuring ATM addresses for systems without ILMI support.

Configuring the NetServer as an ATMARP Server

With NP (ATM Release 2), the NetServer can be configured as an ATMARP server. The ATMARP server address is configured using the **ax_atmarp** -**p** command. Set up the ATMARP to IP address translations by using the **ax_atmarp** -**o** command.

Use **NSconfig** to UP the interfaces and **ifconfig** to set the IP address and netmask.

Load Balancing

ATM adapters on an NP can be configured for load balancing.

> **Note:** FORE IP interfaces on the same NP must be configured with the same IP address for load balancing. See the **NSconfig**(8C) or **ifconfig**(8C) man page for more information.

Load balancing can be turned off by using the **ax_atmconfig** -**b off afa***x* command, where **x** represents the number of the interface. This command turns off load balancing for the NP on which the interface resides.

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Removing NP (ATM Release 2)

This section describes how to use the **pkgrm**(1M) command for removing the NP (ATM Release 2) software from the NetServer. Refer to the **pkgrm** man page for additional information on how to use this command.

To remove the NP (ATM Release 2) package

1. Type the **pkgrm** command at the system prompt as follows:

   ```
   # pkgrm
   ```

   The system lists installed packages and then prompts you for removing a package.

   ```
   pkgrm session started on Sun Mar 1 15:28:47 PST 1998

   The following packages are available:
   .
   .
   Select package(s) you wish to process (or 'all' to process all
   packages). (default: all) [?,??,q]:
   ```

2. Type the number of the package you want to remove. The system responds with:

   ```
   The following package is currently installed:
   AXatm2    ATM 2
             HP-VII,HP-VIII) 1.10

   Do you want to remove this package?
   ```

3. Enter **y** to remove the NP (ATM Release 2) package.

   The system responds with:

   ```
   ## Removing installed package instance <AXatm2>
   This package contains scripts which will be executed with
   super-user permission during the process of removing this package.
   Do you want to continue with the removal of this package [y,n,?,q]
   ```

   The system responds with:

   ```
   ## Removing installed package instance <AXatm2>
   This package contains scripts which will be executed with
   super-user permission during the process of removing this package.
   Do you want to continue with the removal of this package [y,n,?,q]
   ```

4. Enter **y** to continue removing NP (ATM Release 2).

   The system responds with:

   ```
   ## Verifying package dependencies.
   ## Processing package information.
   ## Executing preremove script.
   ## Removing pathnames in class <none>
   /usr/etc/fore/ax_adinfo
   /usr/etc/fore/ax_atmarp
   /usr/etc/fore/ax_atmconfig
   /usr/etc/fore/ax_atmlooptest
   /usr/etc/fore/ax_atmstat
   ```

```
/usr/etc/fore/ax_elarp
/usr/etc/fore/ax_elconfig
/usr/etc/fore/ax_elcreate
/usr/etc/fore/ax_ilmid
/usr/etc/fore/ax_ncomm
/usr/etc/fore/ax_objcopy
/usr/etc/fore/ax_sba200.ucode1
/usr/etc/fore/ax_sba200.ucode2
/usr/etc/fore/ax_sba200e.ucode1
/usr/etc/fore/ax_sba200e.ucode2
/usr/etc/fore/rc.ax_sba200
/usr/man/man4/afa.4
/usr/man/man4/aqa.4
/usr/man/man8/ax_adinfo.8c
/usr/man/man8/ax_atmarp.8c
/usr/man/man8/ax_atmconfig.8c
/usr/man/man8/ax_atmlooptest.8c
/usr/man/man8/ax_atmstat.8c
/usr/etc/fore/ax_elarp.8c
/usr/etc/fore/configuration.lane
/usr/etc/fore/ax_elconfig.8c
/usr/etc/fore/ax_elcreate.8c
/usr/man/man8/ax_ilmid.8c
/usr/man/man8/ax_ncomm.8c
## Removing pathnames in class <none>
## Updating system information.
Removal of <AXatm2> was successful.
```

5. Type **q** to exit the **pkgrm** routine.

```
pkgrm session finished on Sun Mar 1 15:28:50 PST 1998

A log of this session of pkgrm is at /tmp/pkgrm.log on the current
root disk, and at /var/log/pkgrm.log on the target disk.
```

This completes NP (ATM Release 2) package removal.