

4515/4525/4575
PMC ATM Adapter
Users Guide

4515/4525/4575 AIX Quick Install

Print Date: April 28, 1998

With AIX version 4.1.2 or 4.1.4 up and running:

1. Create a temporary directory, and copy the installation CD-ROM's **AIX** directory contents to that directory.
2. Log in as superuser, execute SMIT, and select:
 - **Software Installation and Maintenance**
 - **Install and Update Software**
 - **Install/Update Selectable Software**
 - **Install Additional Device Software**
3. Enter the path to the temporary directory, and select **4.1.4.0 devices.ip5515x All@@devices.ip5515x**.

NOTE: 55xx drivers are appropriate for all Interphase PCI and PMC ATM adapters (55xx and 45xx adapters).

4. Return to the System Management dialog and select **Devices**; then select **Install/Configure Devices Added After IPL**.
5. Initialize the LAN Emulation and IP over ATM clients:
 - a. From the System Management dialog, select:
 - **Devices/Communications**
 - **Interphase 5515 ATM Adapter**
 - **Interphase 5515 ATM Interface**
 - **Add an Interphase 5515 ATM Interface**
 - b. Select the clients you want to initialize.
 - c. Return to **Interphase 5515 ATM Adapter**, select **Interphase 5515 ATM Interface Parameters**, and enter your hostname, IP address, and mask for all clients. Verify that Interface Status is set to **up**.
6. Exit SMIT, then use CellView to configure network clients and services, as described in the Users Guide.
7. Reboot the machine to complete the driver installation.

4515/4525/4575 IRIX Quick Install

Print Date: April 28, 1998

With IRIX version 6.4 (64-bit kernel only) up and running:

1. Configure the IRIX network interface:
 - a. For each client being initialized, add the IP name and IP address to the `/etc/hosts` file.
 - b. Add the interfaces to the kernel by editing the file:
`/etc/config/netif.options`
 - c. Create the configuration file for each client.
2. Log in as `root`, insert the CD-ROM in the local drive, and enter the command `cd /CDROM/IRIX_64bit`
3. Run the driver installation script by entering:
`./inatm [option(s)]`
where `[option(s)]` is the command-line option(s), if needed, to change the driver's default settings.
4. If an existing PCI ATM driver is detected on your machine, enter **yes** at the prompt to remove it.
5. When you are prompted to confirm the parameters for installing the driver, enter **yes** at the prompt.
The installation script runs to completion without additional attention.
6. When complete, answer **Yes** to reboot the system.
7. Use CellView to configure network clients and services, as described in the Users Guide.
8. Automate the signalling for boot-time by adding the appropriate startup and shutdown commands to the file:
`/etc/init.d/network`
9. Reboot the machine.

Driver installation is complete.

4515/4525/4575 NetWare Server Quick Install

Print Date: April 28, 1998

With NetWare version 3.12, 4.10 or 4.11 up and running, use the NetWare `install` utility and do the following:

1. Select **Driver Options**, select **Configure network drivers**, select **Select an additional driver**, and then press **Insert** to install an unlisted driver.
2. Insert the installation CD-ROM and change the path (**F3** key) to `[drv]:\NetWare` where `[drv]` is the drive letter of the CD-ROM.
3. Select a driver that matches your network's speed and framing type.
4. Select **Select/Modify driver parameters & protocols**.
 - a. If you need to add TCP/IP or AppleTalk, select the protocol to enable. If you are installing an Ethernet driver, you can change the frame type from 802.2 by pressing **F3**.
 - b. Edit the value of Channel to match the increment number in the box titles.
 - c. Select **Save parameters and load driver** and press **Enter** to accept the random network number.
5. Select **No** to exit the configuration, or select **Yes** to configure another client. If Yes, select the same driver for the client and repeat step 4.
6. Add the `load asig` and `load cvconf` commands after the last `BIND` command in the `AUTOEXEC.NCF` file, and then restart the server.
7. Use CellView to configure network clients and services, as described in the Users Guide.

Driver installation is complete.

4515/4525/4575 OS/2 Quick Install

Print Date: April 28, 1998

With OS/2 WARP version 3.0 or later up and running:

1. Start the Multi-Protocol Transport Service.
2. To display the LAPS Configuration dialog, select:
 - **Configure**
 - **LAN Adapters and Protocols**
 - **Configure**
3. To copy the driver and utility files to the hard disk, insert the Interphase installation CD-ROM. Then:
 - Select **Other adapters**.
 - Enter **d:\os2** (for the path to the CD-ROM).
4. To initialize the clients:
 - Select the entry for **Lec1** in the Network Adapters list.
 - Select **Add** located under the Network Adapters box.
 - The client appears in the Current Configuration list.
 - Repeat as needed for additional clients Lec2 – Lec4.
5. To map the network protocols to the clients:
 - Select a client in the Current Configuration list.
 - Select a protocol in the Protocols list.
 - Select **Add** located under the Protocols box.
 - The protocol appears under the client.
 - Repeat as needed for all clients in the list.
6. When complete, exit the Multi-Protocol Transport Service. You do not need to reboot at this time.
7. See the respective configuration folders for the protocols mapped to the clients and configure each client accordingly.
8. Use CellView to configure network clients and services, as described in the Users Guide.
9. Restart the machine.

Driver installation is complete.

4515/4525/4575 SCO Quick Install

Print Date: April 28, 1998

With SCO OpenServer version 5.0 or later up and running:

1. Log in as `root` and switch to single-user mode with the command `init s`
2. Double click the Software Manager and remove any existing version of an Interphase PCI ATM driver.
3. Insert the installation CD-ROM and mount it with the command `mount -r /dev/cd0 [mount_point]`
4. From the `SCO` directory on the CD-ROM, copy the media image `VOL.000.000` to a temporary directory on your hard disk, such as `/tmp/iphase`.
5. From the Software menu, select **Install New**.
6. From the Select Media dialog select **Media Images**, and enter the full path to the temporary directory.
7. Select **OK**.
The installation might take several minutes.
8. Answer the prompts about the number of adapters being installed, the number of clients being initialized, the TCP/IP parameters for the clients, and other prompts.
9. If you are installing multiple adapters, answer the prompts as they are repeated for each adapter.
10. Use CellView to configure network clients and services, as described in the Users Guide.
11. Reboot the system with the command
`shutdown -y -i6 -g0`

Driver installation is complete.

4515/4525/4575 Solaris Quick Install

Print Date: April 28, 1998

With Solaris version 2.5 or later up and running:

1. Log in as `root`.
2. Run the `df-k` command to verify at least 5MB of free space is available in the `/root` partition and 1 MB is available in the `/usr` partition.
3. Run the `pkginfo` command to check for an existing installation of the driver.

If `INPHatm`, `INPHia`, `INPHipatm`, or `INPHpa` exists, remove it with the command `pkgrm [driver name]` and reboot the machine.

4. Insert the Interphase CD-ROM and run the script:

```
pkgadd -d/cdrom/cdrom0/[path] INPHatm
```

where `[path]` represents `x86_Solaris` for Intel x86 machines or `Sparc_Solaris` for Sun UltraSPARC machines.

The installation might take several minutes.

5. Answer the prompts about the number of adapters being installed, the number of clients being initialized, the hostname for each client, and other prompts.
6. Reboot the machine.
7. Use CellView to configure network clients and services, as described in the Users Guide.
8. Reboot the system with the command

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

Driver installation is complete.

4515/4525/4575 Windows NT 3.51 Quick Install

Print Date: April 28, 1998

With Windows NT version 3.51 up and running:

1. From the Main Group, open the Program Manager, then open the Control Panel, and double-click the **Network** icon.
2. From the Network Settings dialog, select **Add Adapter**.
3. Select **<Other> Requires disk from manufacturer** from the list box in the Add Network Adapter dialog, and then select **Continue**.
4. Insert the installation CD-ROM and change the path to the directory that matches your CPU:
 - [drv]:\x86_winNT for Intel x86 machines
 - [drv]:\ppc_winNT for PowerPCswhere [drv] is the drive letter of the CD-ROM.
5. When the Select OEM Option dialog appears, select **OK** to confirm the name of the driver.
The installation might take several minutes.
6. When the Network Settings dialog appears, select **OK**.
7. If TCP/IP is installed on your computer, the TCP/IP Configuration dialog appears. Enter the IP address, net mask, and other TCP/IP information for all clients.
8. Select **Restart Now** in the Network Settings Change dialog.
9. Use CellView to configure network clients and services, as described in the Users Guide.
10. Restart the machine.

Driver installation is complete.

4515/4525/4575 Windows NT 4.0 Quick Install

Print Date: April 28, 1998

With Windows NT version 4.0 up and running:

1. From the Desktop, select **Start, Settings, Control Panel**, and then double-click the **Network** icon.
2. From the Network dialog, select the **Adapters** tab, then select **Add**, and then select **Have Disk**.
3. Insert the installation CD-ROM and change the path to the directory that matches your CPU:
 - [drv]:\x86_winNT for Intel x86 machines
 - [drv]:\ppc_winNT for PowerPCswhere [drv] is the drive letter of the CD-ROM.
4. When the Select OEM Option dialog appears, select **OK** to confirm the name of the driver.
The installation might take several minutes.
5. When the Network dialog appears, select **Close**.
6. If TCP/IP is installed on your computer, the Microsoft TCP/IP Properties dialog appears. Enter the IP address, net mask, and other TCP/IP information for all clients
7. Select **Restart Now** in the Network Settings Change dialog.
8. Use CellView to configure network clients and services, as described in the Users Guide.
9. Restart the machine.

Driver installation is complete.

4515/4525/4575 Windows 95 Quick Install

Print Date: April 28, 1998

1. Install the PCI ATM adapter and turn on the machine.
2. When the New Hardware Found dialog appears:
 - Select **Driver from disk provided by manufacturer**, and select **OK**.
 - Insert the Interphase installation CD-ROM.
 - Enter the path to the CD-ROM (typically `d:\win95`), and select **OK**.

The drivers are copied to your hard disk.

3. When prompted for the Windows 95 install files, insert the Microsoft installation CD-ROM and select **OK**.
4. If you are prompted that setup cannot find the `cellview.cpl` file, insert the Interphase installation CD-ROM and select **OK**.
5. In the System Settings Change dialog, select **Yes** to reboot the computer.
6. Select **Start**, then **Settings**, then **Control Panel**, and double-click the **Network** icon to display the Network dialog.

NOTE: The Network dialog lists selections for Interphase 55xx drivers. These selections are appropriate for all PCI and PMC ATM adapters (55xx and 45xx).

7. If a 4525 or 4575 adapter is installed in the machine, replace the 5515 driver as follows:
 - a. From the Network dialog:
 - Select **Interphase 5515 PCI ATM Adapter (LEC1)**, and then select **Remove**.
 - Select **Add**, then highlight **Adapter**, and select **Add**.
 - b. When the Select Network Adapters dialog appears, select **Interphase 5575/5525 PCI ATM Adapter (LEC1)**, and then select **Have Disk**.

- c. When the Install From Disk dialog appears, enter the path to your system directory (typically `c:\windows\system`), and select **OK**.

The Network/Configuration dialog reappears with the new driver bound to the adapter.

8. Add or remove the network protocols for LEC1.
9. Configure the remaining protocols for your network.
10. To add additional clients:
 - a. To add the client and bind it to installed protocols:
 - Select **Add** in the Network/Configuration dialog; then highlight **Adapter** and select **Add**.
 - Highlight the client to initialize and select **Have Disk**; then enter the path to your system directory and select **OK**.

- b. Next, to set up the protocols:
 - Remove unwanted protocols from the new client.
 - Configure the remaining protocols.

Repeat step **10** until you have installed all of the clients you need, up to a maximum of five clients.

11. Select **OK** in the Network/Configuration dialog.
12. If you are prompted to install the `cellview.cpl` file, select **Skip**.
13. If you are prompted for the location of the Microsoft Windows 95 install files, insert the Microsoft installation CD-ROM and select **OK**.
14. When you are prompted to restart the computer, select **No**.
15. Use CellView to configure network clients and services, as described in the Users Guide.
16. Restart the machine to complete the driver installation.

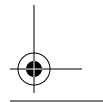
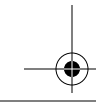
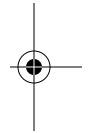
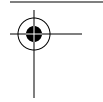
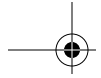
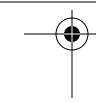
4515/4525/4575 UnixWare Quick Install

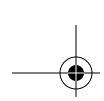
Print Date: April 28, 1998

With UnixWare version 2.01, 2.1 or 2.11 up and running:

1. Log in as `root` and switch to single-user mode with the command `init s`
2. Check for an existing installation of the driver:
 - a. Enter the command `pkginfo INPHatm`
 - b. If you find an existing driver in the previous step, remove it with the command `pkgrm INPHatm`
 - c. Reboot the machine.
3. Insert the installation CD-ROM and mount it with the command:
`mount -F cdfs -r /dev/cdrom/device_name [mount_point]`
For example,
`mount -F cdfs -r /dev/cdrom/c0b0t010 /CD-ROM_1`
4. Run the install script by entering:
`pkgadd -d /[mount_point]/UnixWare INPHatm`
where `[mount_point]` is the same name you used in the previous step to mount the CD-ROM.
The installation might take several minutes.
5. Answer the prompts about the number of adapters being installed, the number of clients being initialized, the TCP/IP parameters for each client, other prompts.
6. Use CellView to configure network clients and services, as described in the Users Guide.
7. Reboot the system with the command
`shutdown -y -g0 -i6`

Driver installation is complete.



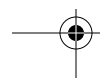


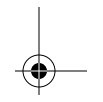
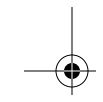
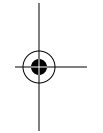
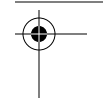
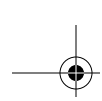
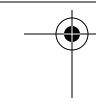
4515/4525/4575 PMC ATM Adapter Users Guide



Document No. UG04575-000, REV B

Print Date: April 28, 1998





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Assistance

Product Purchased from Reseller

Contact the reseller or distributor if

- You need ordering, service or any technical assistance.
- You received a damaged, incomplete or incorrect product.

Product Purchased Directly from Interphase Corporation

Contact Interphase Corporation directly for assistance with this, or any other Interphase Corporation product. Please have your purchase order and serial numbers ready.

Customer Service

United States:	Telephone: (214) 654-5555
	Fax: (214) 654-5500
	E-Mail: intouch@iphase.com
Europe:	Telephone: + 33 (0) 1 41 15 44 00
	Fax: + 33 (0) 1 41 15 12 13

World Wide Web

<http://www.iphase.com>

Anonymous FTP Server

<ftp.iphase.com>

Safety Precautions

The following general safety precautions must be observed during all phases of operation of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment. Interphase Corporation assumes no liability for the user's failure to comply with these requirements. You, as the user of the product, must observe all stated warnings and safety precautions in order to safely operate the equipment in your environment.

Do Not Substitute Parts or Modify Equipment

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification of the equipment. Contact your local Interphase representative for service and repair to ensure that safety features are maintained.

Ground the Instrument

To minimize shock hazard, the equipment chassis and enclosure must be connected to an electrical ground. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter, with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet.

Do Not Operate in an Explosive Atmosphere

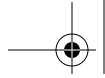
Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.

Keep away from Live Circuits

Do not install or replace the component with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

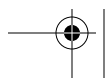
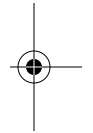
Observe Dangerous Procedure Warnings

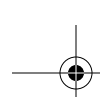
Warnings precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed. You should also employ all other safety precautions which you deem necessary for the operation of the equipment in your operating environment.



WARNING

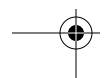
This equipment generates, uses, and can radiate electromagnetic energy. It may cause or be susceptible to electromagnetic interference (EMI) if not installed and used in a cabinet with adequate EMI protection.





4515/4525 FCC Part 15 Regulatory Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



4515X/4575 FCC Part 15 Regulatory Compliance

Tested To Comply With FCC Standards

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Radio Frequency Interference Statement

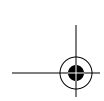
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15, Subpart B of the FCC Rules. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause interference to radio communications.

The limits are designed to provide reasonable protection against such interference in a residential situation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna of the affected radio or television.
- Increase the separation between the equipment and the affected receiver.
- Connect the equipment and the affected receiver to power outlets on separate circuits.
- Consult the radio/TV dealer or an experienced radio/TV technician for help.

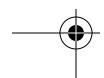
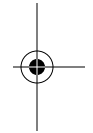
Modifications

Changes or modifications not expressly approved by Interphase Corporation could void the user's authority to operate the equipment.



Interphase Fiber Products' Compliance

All Interphase fiber products comply with IEC regulations 825-1 and 825-2 for Class 1 laser devices.



Declaration of Conformity

(according to ISO/IEC Guide 22 and EN 45014)

Manufacturer's Name: Interphase Corporation
**Manufacturer's Address and
Phone Number:** 13800 Senlac
Dallas, Texas 75234
U.S.A.
214/654-5000

declares, that the product:

Product Name: PMC ATM FIBER

Model Number: 4515

conforms to the following Standards:

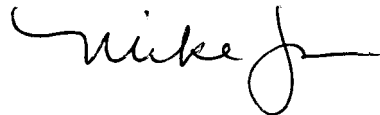
Safety: EN 60950:1988 + A1, A2
IEC 825 -1 & -2 1993

EMC: EN 55022:1988 class A
EN 50082-1 Part 1 1992

Supplementary Information:

This product complies with the requirements of the **Low Voltage Directive 73/23/EEC** and the **EMC directive 89/336/EEC**.

Dallas, March 17, 1998



Mike Jobe, Quality Manager

European Contact:

Interphase European Headquarters, Centre d'affaires 10^{ème} Avenue, 855,
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Phone: + 33 (0) 1 41 15 44 00; Fax: + 33 (0) 1 41 15 12 13

Declaration of Conformity

(according to ISO/IEC Guide 22 and EN 45014)

Manufacturer's Name: Interphase Corporation
**Manufacturer's Address and
Phone Number:** 13800 Senlac
Dallas, Texas 75234
U.S.A.
214/654-5000

declares, that the product:

Product Name: PMC ATM IChip Fiber

Model Number: 4515X-0-B

conforms to the following Standards:

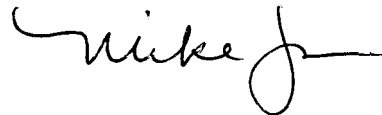
Safety: EN 60950:1988 + A1, A2
IEC 825 -1 & -2 1993

EMC: EN 55022:1988 class B
EN 50082-1 Part 1 1992

Supplementary Information:

This product complies with the requirements of the **Low Voltage Directive 73/23/EEC** and the **EMC directive 89/336/EEC**.

Dallas, March 17, 1998



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avenue Roger Salengro, 92370 Chaville - France
Phone: + 33 (0) 1 41 15 44 00; Fax: + 33 (0) 1 41 15 12 13

Declaration of Conformity

(according to ISO/IEC Guide 22 and EN 45014)

Manufacturer's Name: Interphase Corporation

**Manufacturer's Address and
Phone Number:** 13800 Senlac
Dallas, Texas 75234
U.S.A.
214/654-5000

declares, that the product:

Product Name: PMC ATM IChip+ Fiber

Model Number: 4575-0-B

conforms to the following Standards:

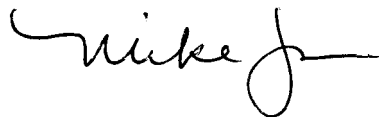
Safety: EN60950:1988 + A1, A2
IEC 825-1 & -2 1993

EMC: EN55022: 1988 class B
EN50082-1 Part 1 1992

Supplementary Information:

This product complies with the requirements of the **Low Voltage Directive 73/23/EEC** and the **EMC directive 89/336/EEC**.

Dallas, March 17, 1998



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avenue Roger Salengro, 92370 Chaville - France
Phone: + 33 (0) 1 41 15 44 00; Fax: + 33 (0) 1 41 15 12 13

Declaration of Conformity

(according to ISO/IEC Guide 22 and EN 45014)

Manufacturer's Name: Interphase Corporation
**Manufacturer's Address and
Phone Number:** 13800 Senlac
Dallas, Texas 75234
U.S.A.
214/654-5000

declares, that the product:

Product Name: PMC ATM IChip+ UTP

Model Number: 4575-0-B

conforms to the following Standards:

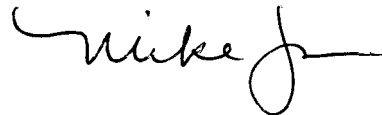
Safety: EN60950:1988 + A1, A2

EMC: EN55022:1988 class B
EN50082-1 Part 1 1992

Supplementary Information:

This product complies with the requirements of the **Low Voltage Directive 73/23/EEC** and the **EMC directive 89/336/EEC**.

Dallas, March 17, 1998



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avenue Roger Salengro, 92370 Chaville - France
Phone: + 33 (0) 1 41 15 44 00; Fax: + 33 (0) 1 41 15 12 13

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Using This Guide

Audience

This manual assumes that its audience has a general understanding of computing and networking terminology. If you need more information about this terminology (in addition to what this manual provides), see the following web sites:

- ATM Networking:
<http://www.atmforum.com>
- Networking glossary:
<http://www.ctcnet.com/tips/glossary.htm>
- Computing dictionary:
<http://wfn-shop.Princeton.EDU/foldoc/>
- Networking glossary:
<http://www.ctcnet.com/tips/glossary.htm>
- Computing dictionary:
<http://wfn-shop.Princeton.EDU/foldoc/>

Icon Conventions

Icons draw your attention to especially important information:



NOTE

The Note icon indicates important points of interest related to the current subject.

Text Conventions

**CAUTION**

The Caution icon brings to your attention those items or steps that, if not properly followed, could cause problems in your machine's configuration or operating system.

**WARNING**

The Warning icon alerts you to steps or procedures that could be hazardous to your health, cause permanent damage to the equipment, or impose unpredictable results on the surrounding environment.

Text Conventions

The following conventions are used in this manual. Computer-generated text is shown in typewriter font. Examples of computer-generated text are: program output (such as the screen display during the software installation procedure), commands, directory names, file names, variables, prompts, and sections of program code.

Computer-generated text example

Commands to be entered by the user are printed in **bold Courier** type. For example:

```
cd /usr/tmp
```

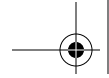
Pressing the return key (↵ **Return**) at the end of the command line entry is assumed, when not explicitly shown. For example:

/bin/su

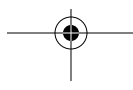
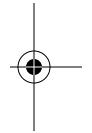
is the same as:

/bin/su ↵ **Return**

Required user input, when mixed with program output, is printed in **bold Courier** type.



Text Conventions



Introduction

1

Adapter Overview

There are two types of PMC ATM adapters from Interphase. The 4515 and the 4575 adapters support a data rate of 155 Mbps, and the 4525 adapter supports a data rate of 25 Mbps. Most of the examples and diagrams in this manual refer to the 4575 adapter. This information applies equally to the 4515 and the 4525 except where noted.

These adapters adhere to the PMC (PCI Mezzanine Card) mechanical layout for use in mezzanine systems, such as many of the VME CPU boards. The adapters conform to PMC P1386.1 Draft 2.0. They are based on the Interphase (i)chipTM SAR technology, which provides a full range of ATM network communications. The 4515 and 4525 integrate the (i)chipSAR. The 4575 integrates the (i)chipTM SAR+, which includes hardware-based available bit rate (ABR) support in compliance with the ATM Forum Traffic Management 4.0 specification.

The network connections available for the boards are shown in the following table:

Product	Data Rate	Interface	Connections
4515	155 Mbps	SONET OC-3c Fiber	SC Duplex, Single-mode SC Duplex, Multimode
		SONET UTP	Slim-line, UTP Cat 5
4525	25.6 Mbps	AF-PHY-0040.00 UTP	Slim-line, UTP Cat 3, 4, or 5

Product Features

Product	Data Rate	Interface	Connections
4575	155 Mbps	SONET OC-3c Fiber	SC Duplex, Multimode
		SONET UTP	Slim-line, UTP Cat 5

Product Features

- PMC P1386.1 Draft 2.0 compliant
- 155 Mbps SONET OC-3c over single-mode or multimode fiber
- 155 Mbps SONET over UTP copper
- 25.6 Mbps AF-PHY-0040.00 over UTP copper
- 128K standard buffer memory
- AAL5 ATM Adaptation Layer
- Dual function memory management for Cell-FIFO or on-board packet reassembly
- Hardware-based Segmentation and Reassembly (SAR) functions
- LED displays for board status and network link
- 32-bit, zero wait-state PCI DMA master
- Up to 128-byte burst transfers for the 4575 and up to 64 bytes for the 4515 and the 4525

Software Drivers

The PMC ATM adapters use Interphase's Integrated Driver (ID 1.0). The Integrated Driver integrates support for various ATM network technologies into one driver. It provides standards-based support for LAN Emulation networks and Classical IP networks.

Each Integrated Driver release provides a set of features that is standard across all operating systems for which the release is available. It supports permanent virtual circuits (PVCs), based on RFC-1483 standards. It also supports switched virtual circuits (SVCs), based on the User-Network Interface (UNI) 3.0/3.1 signalling specification, which allow communication links between nodes to be set up and torn down dynamically for each data transmission.

The driver supports up to eight 4575 adapters per machine. It is available for the following platforms:

- AIX™ version 4.1.2 or 4.1.4
- IRIX™ version 6.4 (64-bit kernel only)
- NetWare® version 3.12, 4.10 or 4.11
- OS/2® WARP™ version 3.0 or later
- SCO® OpenServer™ version 5.0 or later
- Solaris™ version 2.5 or later
- UnixWare™ version 2.01, 2.1 or 2.11
- Windows NT® version 3.51 or 4.0
- Windows 95

The installation package also includes the CellView™ utility, which you can use to configure adapters to the network and to view network operation statistics. The version of CellView described in *Configuring the Adapter Using CellView* on page 29 is a cross-platform utility for systems with a graphical user interface (GUI). The version of CellView described in *Using CellView for NetWare Servers* on page 93 is designed for NetWare systems, and has a textual user interface.

Software Documentation Options

Quick installation cards for all the drivers are located at the front of this users guide. These are useful if you are an experienced user and need only major steps. Expanded procedures for installing the Windows NT and NetWare drivers are included in this manual. Expanded procedures for all other drivers are available in *.pdf format on the installation CD-ROM, as shown in the following table:

OS	DirectoryFileName
AIX	AIX\addendum.b.pdf
IRIX	IRIX_64bit\addendum.b.pdf
OS/2	OS2\addendum.b.pdf
SCO	SCO\addendum.b.pdf
Solaris	either Sparc_Solaris\addendum.b.pdf or x86_Solaris\addendum.b.pdf
UnixWare	UnixWare\addendum.b.pdf
Windows 95	Win95\addendum.b.pdf

Minimum System Requirements

The PMC ATM adapters require a mezzanine expansion slot in the host machine. If the UTP copper version of the adapter is being installed, the interface to the network requires a Compu-shield® compatible connector or an RJ-45 converter harness as shown in Figure 2-3 on page 12.

The following topics identify additional minimum system requirements for installing the adapters and drivers on Windows NT and NetWare systems. Minimum system requirements for other drivers are available in *.pdf format on the installation CD-ROM.

Windows NT

The Windows NT workstation must meet the following minimum requirements:

- Intel x86 or PowerPC running Microsoft Windows NT version 3.51 or 4.0
- CD-ROM drive
- 5 MB of free space on the hard disk
- System memory
 - 20 MB minimum
- 32 MB minimum with multiple clients and LAN services enabled
- TCP/IP interface (if applicable)
 - IP addresses for four LECs and the IP-over-ATM client
 - Subnet mask for each client

NetWare

The NetWare file server must meet the following minimum requirements:

- Intel x86 CPU file server running Novell NetWare version 3.12, 4.10, or 4.11
- CD-ROM drive
- 2 MB of free space on the hard disk

Minimum System Requirements

- System memory
 - 20 MB minimum
 - up to 32 MB with multiple clients and LAN services enabled
- TCP/IP interface (if applicable)
 - IP address for each enabled client
 - IP mask

Hardware Installation

2

Overview

The PMC ATM adapter is designed to be installed in PCI mezzanine expansion slots. This chapter describes the procedures for physically installing the adapter, which include:

- Inspecting the adapter
- Installing the adapter in a host mezzanine expansion slot
- Connecting the adapter to the network

The only tools required are a grounding strap and a #1 Phillips screwdriver. For specification information, see *Specifications* on page 135.

Inspecting the Adapter

Before installing the adapter in your computer, you need to visually inspect it for damage that might have occurred during shipment from the factory.



CAUTION

The adapter is packed in an antistatic bag to protect it during shipment. Keep the adapter in its protective antistatic bag until you are ready to install it in the host computer. To prevent damage to the adapter due to electrostatic discharge, wear a grounding strap and handle the adapter only by its edges. Do not touch its components or any metal parts other than the faceplate.

Installing the Hardware

1. Open the shipping container and carefully remove its contents.
2. Inspect each item for damage. If you find any omissions or damage, contact your network supplier and the carrier (for example, UPS or Federal Express) that delivered the package.



WARNING

Do not install, or apply power to, a damaged board. Failure to observe this warning could result in extensive damage to the board and/or the system.

Installing the Hardware



WARNING

Your computer operates at voltages that can be lethal. Before you remove the computer cover, carefully review the following procedures and observe all cautions and warnings to protect yourself and to prevent damage to the system. Use only insulated or nonconductive tools

To install the adapter in a host machine, attach a grounding strap to your wrist or ankle and do the following:

1. With power disconnected, gain access to the mezzanine location on the motherboard.
2. If the motherboard is easily removed, as in most VME-based systems, remove it from the chassis.

3. Remove the blank cover from the aperture of the mezzanine expansion slot.
4. Carefully remove the adapter from its antistatic bag.
5. Hold the adapter at an angle and insert the card through the rear of the faceplate of the motherboard while aligning the dual mating connectors on the motherboard to the connectors (P1 and P2) on the adapter card.

Figure 2-1 on page 10 illustrates the installation of a PMC adapter in a VME style motherboard.

6. Align the standoff post on the motherboard with the matching hole in the adapter and carefully press the adapter into place.
7. Fasten the cards together with screws.
8. Reinstall all parts removed in earlier steps.

Continue the installation with the procedure in the next section.

Installing the Hardware

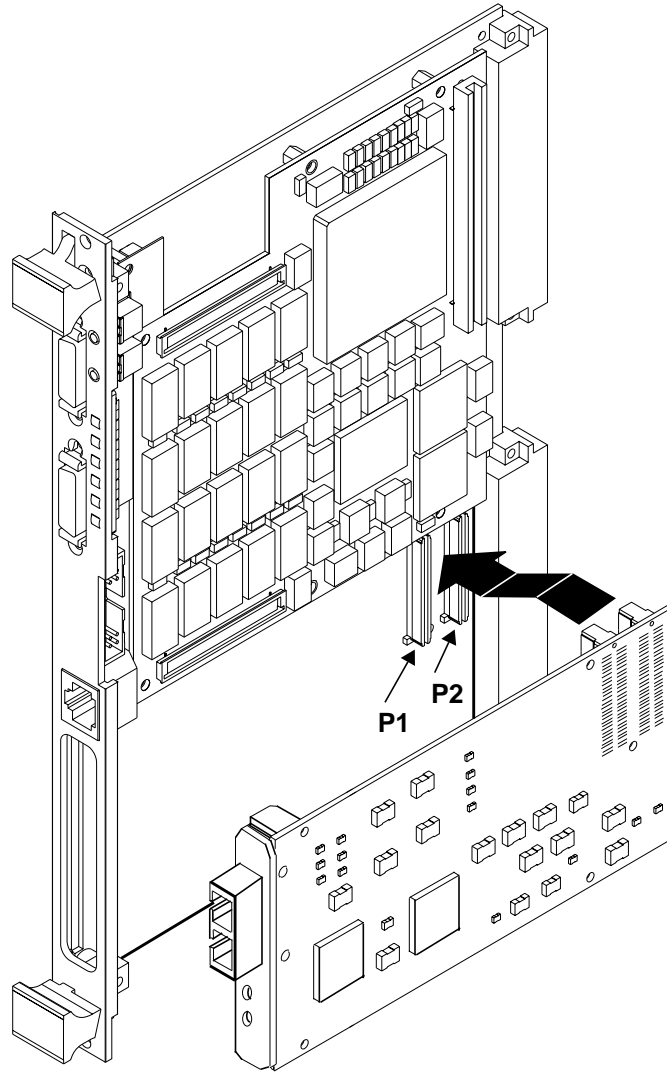


Figure 2-1. Installing a PMC ATM Adapter

Connecting the Adapter to the Network

With the adapter installed in the chassis as discussed in the previous section, you are now ready to connect the adapter to the network. The following table contains a list of the cables and connectors required for each adapter.

Adapter	Connector	Medium	Configuration
155 Mbps	SC Duplex	Single-mode fiber	8.5/125 micron
155 Mbps	SC Duplex	Multimode fiber	62.5/125 micron
155 Mbps	Compu-shield*	Cat 5 copper	UTP
25.6 Mbps	Compu-shield*	Cat 3, 4 or 5 copper	UTP

* Series 31 available from Stewart Connector Systems, Inc.

To connect the adapter to the network:

1. Attach the appropriate network connector to the PMC ATM adapter.

Figure 2-2 shows the SC Duplex connection for ATM over fiber:

Connecting the Adapter to the Network

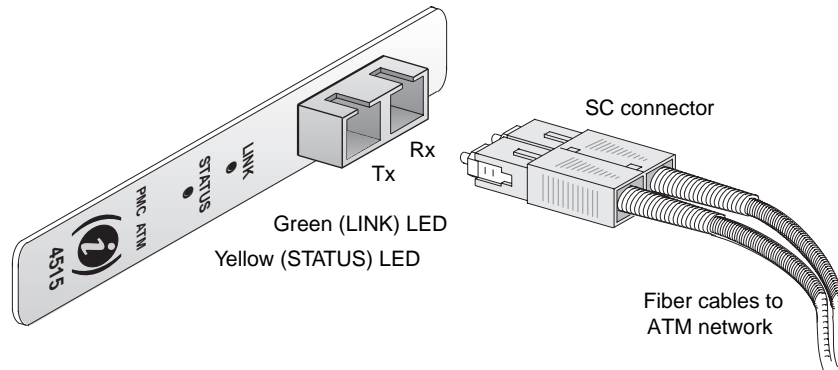


Figure 2-2. SC Duplex Connection

Figure 2-3 shows the Compu-shield Series 31 connector for unshielded twisted pair (UTP):

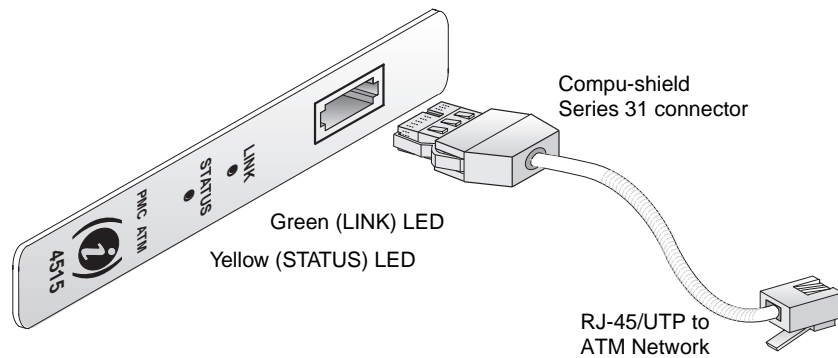


Figure 2-3. Compu-shield UTP Connection

2. Turn on the power to the host computer.

Installation of the adapter is complete. Next, install the adapter driver. See the appropriate driver installation chapter or addendum for your system.

Installing the Windows NT Driver

3

Overview

This chapter describes your adapter's driver and explains how to install it on an end station running Windows NT version 3.51 or 4.0. It provides information about the following:

- Driver support features
- Verifying minimum system requirements
- Installing the driver for Windows NT 3.51
- Installing the driver for Windows NT 4.0



CAUTION

For proper operation, your ATM switch must be able to support the UNI 3.0/3.1 signalling standard for SVCs. Some switch vendors allow the two standards to be mixed. Some vendors require all ports to be set to either UNI 3.0 or UNI 3.1. Check your switch documentation for correct settings. The adapter's default setting is UNI 3.0.

If *Read Me First* documentation is in your installation kit, review it before installing the driver. It may contain changes and updates made to this users guide after the print date. Also, check for a `README` file in the `x86_WinNT` directory or the `PPC_WinNt` directory of the installation CD-ROM.

In addition, if you are not thoroughly familiar with ATM networking, see *ATM Technology Overview* on page 141.

Driver Support Features

The driver complies with the ATM Forum LAN Emulation specification version 1.0. It provides broadcast/multicast addressing, allowing you to run legacy LAN (Ethernet, Token Ring, and FDDI) applications and protocols over an ATM network.

The driver supports up to eight adapters per machine. It allows each adapter to join up to four different ELANs (Ethernet or Token Ring) and one IP-over-ATM segment simultaneously.

For each adapter, the driver supports the following:

- Up to four LAN Emulation Clients (LECs)
- Up to eight LAN Emulation Servers (LESs) along with Broadcast and Unknown Servers (BUSs)
- One LAN Emulation Configuration Server (LECS)
- One IP-over-ATM Client, based on RFC-1577
- One IP-over-ATM Server, based on RFC-1577
- SVC connections, based on the UNI 3.0/3.1 Signalling specification
- PVC connections between each client and other end stations, based on RFC-1483

During installation, four LECs (Client 0 – Client 3) and one IP-over-ATM client (Client 4) are initialized per adapter. Client 0 is enabled by default. All remaining clients and LAN services are disabled.

After installation, you can configure client and server network support with CellView, a cross-platform, graphical utility included with the installation package. You can also display adapter operating statistics using CellView. See *Configuring the Adapter Using CellView* on page 29 for instructions.

Verifying Minimum Requirements

If you haven't already done so, verify that your system meets the minimum requirements described in *Minimum System Requirements* on page 4.

Installing the Driver for Windows NT 3.51

This section explains how to do the following on Windows NT 3.51 platforms:

- Install the driver
- Configure network protocols
- Remove a driver

Installing the Driver



CAUTION

If an earlier version of an Interphase PMC ATM driver is installed on the end station, you must remove it before proceeding with the new driver (see *Removing a Driver* on page 20).

To install the driver for Windows NT version 3.51, do the following:

1. Boot your system under Windows NT.
2. Log in to your Windows NT administrator account.

Installing the Driver for Windows NT 3.51

3. From the Main Group, open the Program Manager, then open the Control Panel, and double-click the **Network** icon.
4. Insert the installation CD-ROM.
5. In the Network Settings dialog, select **Add Adapter**.
A message informs you that Setup is preparing network card choices.
6. In the Add Network Adapter dialog, select **<Other> Requires disk from manufacturer**; then select **Continue**.
7. Run the installation script as follows:
 - a. Change the path to the directory that matches your CPU (where [drv] is the drive letter of the CD-ROM):
 - [drv]:\x86_winNT for Intel x86 machines
 - [drv]:\ppc_winNT for PowerPCs
 - b. When the Select OEM Option dialog appears, select **OK** to confirm the name of the driver.

If you are installing multiple adapters and repeating the installation steps, a message informs you that a network card of this type is already installed. Select **OK** to continue loading the driver.

The installation may take several minutes. When copying is complete, the Network Settings dialog reappears:

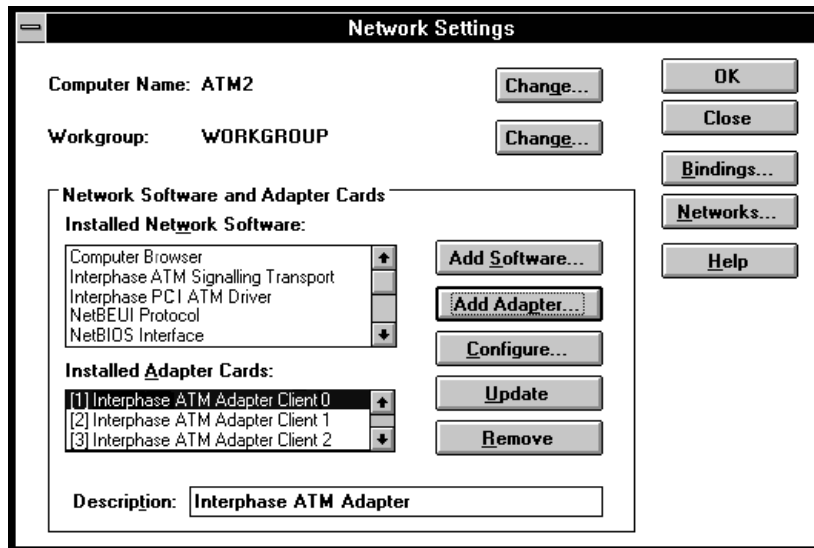


Figure 3-1. Completed Network Settings

Five clients (Clients 0 – 4) are included in the Installed Adapter Cards list. Client 0 – Client 3 are the LECs. Client 4 is the IP-over-ATM client. Each client is mapped to the adapter with a unique instance number (enclosed in brackets “[]”). CellView will recognize clients by this unique instance number.

8. To install the driver for additional adapters, repeat steps 5 – 7 until a driver is loaded for each adapter.
9. Select **OK** in the Network Settings dialog.

Continue the installation with the procedures in the next section.

Configuring Network Protocols

When you exit the Network Settings dialog as directed in the previous section, if TCP/IP is installed on your computer, the TCP/IP Configuration dialog appears:

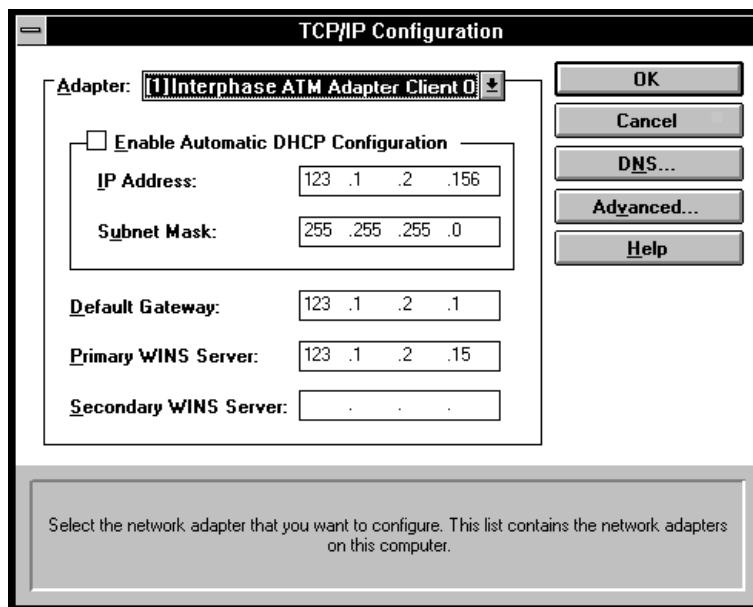


Figure 3-2. TCP/IP Configuration

You must enter an IP address and subnet mask for all clients before exiting this dialog. You can enter dummy numbers for clients that will not be enabled.



NOTE

The IP addresses shown in Figure 3-2 are examples only. Use the IP addresses for your network when editing the TCP/IP parameters.

To edit the TCP/IP Configuration dialog, do the following:

1. Select a client to configure from the Adapter list box.
You can configure the clients in any order; however, it is recommended you work with Client 0 first.
2. Enter the **IP Address**.
This is the Internet address for the host client. The format is dotted decimal notation in the form xxx.xxx.xxx.xxx, where xxx ranges from 0 to 254.
3. Enter the **Subnet Mask**.
This mask is used to partition the IP address into subnets at the local company level.
4. Enter the **Default Gateway**.
This is normally in the form of an IP address identifying your network's leg from a router or other network device.
5. Enter the IP address of the **Primary WINS Server**.
This is the address of the primary name server used for looking up the host names of local and connected networks.
6. Enter the IP address of the **Secondary WINS Server**.
The secondary server (if available) is a backup to the primary name server.
7. Repeat steps 1 – 6 until all clients are configured.
8. When all the clients are configured, select **OK**.
9. In the Network Settings Change dialog, select **Restart Now**.

Installing the Driver for Windows NT 3.51

If you have not yet installed the adapter(s), shut down the machine and do so now, as described in *Hardware Installation* on page 7.

Next, with the driver and adapter(s) installed, start CellView and configure the adapter(s) as described in *Configuring the Adapter Using CellView* on page 29.

If you need to verify the driver is up and running, see *Verifying Driver Installation* on page 60.

Removing a Driver

To remove a driver from Windows NT version 3.51, do the following:

1. From the Main Group, open the Program Manager, open the Control Panel, and double-click the **Network** icon.
2. In the Network Settings dialog, select **Interphase ATM Adapter Client 0** in the Installed Adapter Cards list box.

The NT operating system does not allow you to remove the drivers individually. You must select Client 0.

3. Select **Remove**.

You are prompted to confirm removal of the adapter.

4. Select **Yes** to remove all the clients and associated drivers.
5. Select **OK** in the Network Settings dialog.
6. Select **Restart Now** in the reboot prompt.
7. Exit Windows NT and reboot the computer.

The driver is now removed from the computer.

Installing the Driver for Windows NT 4.0

This section explains how to do the following on Windows NT 4.0 platforms:

- Install the driver
- Configure network protocols
- Remove a driver

Installing the Driver



CAUTION

If an earlier version of a driver is installed on the end station, you must remove it before proceeding with the new driver. See *Removing a Driver* on page 26 for instructions.

To install the driver for Windows NT version 4.0, do the following:

1. Boot your system under Windows NT.
2. Log in to your Windows NT administrator account.
3. Insert the installation CD-ROM.
4. From the Desktop:
 - Select **Start**, then **Settings**, and then **Control Panel**.
 - Double-click the **Network** icon.

The Network dialog appears:

**Figure 3-3. Network Dialog before Installation**

5. In the Network dialog, select the **Adapters** tab.

6. Select **Add**; then select **Have Disk**.

The Insert Disk dialog appears.

7. Run the installation script as follows:

a. Change the path to the directory that matches your CPU (where [drv] is the drive letter of the CD-ROM):

- [drv]:\x86_winNT for Intel x86 machines
- [drv]:\ppc_winNT for PowerPCs

b. Select **OK**.

The Select OEM Option dialog appears, prompting you to confirm the name of the driver.

c. Select **OK**.

If you are installing multiple adapters and repeating the installation steps, a message informs you that a network card of this type is already installed. Select **OK** to continue loading the driver.

The installation may take several minutes. When copying is complete, the Network dialog reappears:



Figure 3-4. Network Dialog after Installation

Five clients, (Clients 0 – 4) are included in the Network Adapters list. Client 0 – Client 3 are the LECs. Client 4 is the IP-over-ATM client. Each client is mapped to the adapter with a unique instance number (enclosed in brackets “[]”). CellView will recognize clients by the unique instance number.

8. To install the driver for additional adapters, repeat steps 6 and 7 until a driver is loaded for each adapter.

Installing the Driver for Windows NT 4.0

9. When driver installation is complete, select **Close** in the Network dialog.

Continue the installation with the procedures in the next section.

Configuring Network Protocols

When you exit the Network dialog as directed in the previous section, if TCP/IP is installed on your computer, the Microsoft TCP/IP Properties dialog appears:



Figure 3-5. TCP/IP Settings

You must enter an IP address and subnet mask for all clients before exiting this dialog. You can enter dummy numbers for clients that will not be enabled.



NOTE

The IP addresses shown in Figure 3-5 on page 24 are examples only. Use the IP addresses for your network when editing the TCP/IP parameters.

To edit the Microsoft TCP/IP Properties dialog, do the following:

1. Select a client to configure in the Adapter list box.
You can configure the clients in any order; however, it is recommended you work with Client 0 first.
2. Enter the **IP Address**.
This is the Internet address for the host client. The format is dotted decimal notation in the form xxx.xxx.xxx.xxx, where xxx ranges from 0 to 254.
3. Enter the **Subnet Mask**.
This mask is used to partition the IP address into subnets at the local company level.
4. Enter the **Default Gateway**.
This is normally in the form of an IP address identifying your network's leg from a router or other network device.
5. Repeat steps 1 – 4 until all clients are configured.
6. Enter the remainder of information in the Microsoft TCP/IP Properties dialog as required for your network.
7. When complete, select **OK**.
The Network Settings Change dialog appears.

8. Select **Yes to restart the computer.**

If you have not yet installed the adapter(s), shut down the machine and do so now, as described in *Hardware Installation* on page 7.

Next, with the driver and adapter(s) installed, start CellView and configure the adapter(s) as described in *Configuring the Adapter Using CellView* on page 29.

If you need to verify the driver is up and running, see *Verifying Driver Installation* on page 60.

Removing a Driver

To remove a driver from Windows NT version 4.0, do the following:

1. From the Desktop:
 - Select **Start**, then **Settings**, and then **Control Panel**.
 - Double-click the **Network** icon.

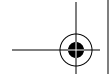
The Network dialog appears:



Figure 3-6. Network Dialog before Installation

2. In the Network dialog, select the **Adapters** tab.
3. Highlight a client and select **Remove**.
You are prompted to confirm removal of the driver.
4. Select **Yes**.
5. Repeat steps 3 and 4 until all clients are removed.
6. Select **Close** in the Network dialog.
The Network Settings Change dialog appears.
7. Select **Yes** to restart the computer.

The driver is now removed from the computer.



Installing the Driver for Windows NT 4.0



Configuring the Adapter Using CellView

4

Overview

This chapter provides information about CellView, a cross-platform, GUI utility that enables you to configure clients and services for adapters across a wide range of operating systems. It explains how to use CellView on all compatible operating systems other than NetWare. (Your adapter might not support all of the operating systems that are compatible with CellView.)



NOTE

For ATM adapters that consist of a motherboard and 1 or 2 PMC ATM daughtercards, the term *adapter* in this chapter refers to the daughtercard.

This chapter describes the following:

- CellView features
- ATM address format
- Configuration requirements
- CellView startup procedure
- Setup procedures
- CellView statistics
- CellView global settings

CellView Features

Because of differences in operating systems, the example CellView dialogs shown in this chapter may vary slightly from the dialogs on your screen. However, the functions are the same. For example, you might use a button to enable a setting where the example shows a checkbox.

CellView Features

CellView enables you to:

- Configure signalling parameters
- Enable, disable, and configure up to four LAN Emulation Clients (LECs) and one IP-over-ATM client per adapter
- Set up PVC communications with other end stations
- Enable, disable, and configure up to eight LAN Emulation Servers (LESs) and one IP-over-ATM ARP server per adapter
- Enable, disable, and configure one LAN Emulation Configuration Server (LECS) per adapter
- Display operating statistics for:
 - SONET, signalling, and cell-level activity
 - ATM Adaptation Layer 5 (AAL5) activity
 - LEC membership and activity
 - IP-over-ATM activity
 - LECS and LES activity
- Set parameters for displaying and updating CellView dialogs

ATM Address

During configuration, you will need to know the end station's unique ATM address, as shown in the ATM Address field in Figure 4-1:

ATM Address:	
47:00:00:00:dd:01:00:00:27:2a:84:00:00:77:86:da:61-00	
Network Prefix:	ESI/Selector:
47:00:00:00:dd:01:00:00:27:2a:84:00	00:00:77:86:da:61-00

Figure 4-1. ATM Address

The Network Prefix and ESI/Selector fields show the separate ATM address components.

The network prefix is the 13-byte link address of the adapter, as set by the ATM switch.

The ESI/Selector consists of a unique end station identifier (ESI) and a pointer (selector) with the following values:

- The ESI value is the 6-byte MAC address of the adapter (00:00:77:86:da:61 in the example).
- The Selector value is a 1-byte pointer to clients and services located in the end station (00 in the example).

The Selector value for the end station is always 00. The Selector values for the clients and services located in the end station are as follows:

Item Number	Range of Selector Values
LEC1 – LEC4	0x00–0x03
LES1 – LES8	0x20–0x27
BUS1 – BUS8	0x40–0x47

Configuration Requirements

The degree of configuration needed for the adapter(s) depends largely on whether the services are already installed on the network. For example, if the LECS, LESs, and ARP server are running elsewhere on the network, you need to enable and configure only the local clients.

At least one LEC or IP-over-ATM client must be enabled and fully configured on each adapter before running applications on the network.

Before you begin the configuration procedures described in this chapter, the following prerequisite requirements must be met:

- At least one adapter is installed in the end station.
- The driver for your operating system is installed.
- The machine has been rebooted after the driver installation.

If any of these tasks are not complete, please complete them now. See the appropriate chapter(s) or addendum(s) for instructions.

Starting CellView

The startup procedure for CellView depends on the operating system you are running. The following table describes the startup procedure for each operating system:

Operating System	CellView Startup Procedure
AIX	Enter the command <code>cellview</code>
HP-UX	Enter the command <code>cellview</code>
Solaris	Enter the command <code>cellview</code>

Operating System	CellView Startup Procedure
UnixWare	Enter the command <code>cellview</code>
IRIX	Add to your path: <code>/usr/sbin/</code> Enter the command <code>cellview</code>
SCO	Add to your path: <code>/etc/atm/bin</code> Enter the command <code>cellview</code>
Windows 95	Select Start . Select Programs . Select Control Panel . Double-click the CellView icon.
Windows NT 3.51	Go to the Main Group. Open the Program Manager . Open the Control Panel . Double-click the CellView icon.
Windows NT 4.0	Select Start . Select Settings . Select Control Panel . Double-click the CellView icon.

When you start CellView, the main dialog appears:

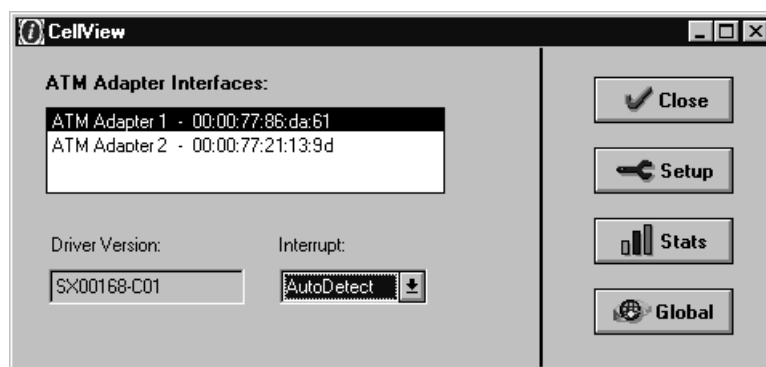


Figure 4-2. Main CellView Dialog

Starting CellView



NOTE

If you are configuring a PCI or PMC ATM adapter under Windows NT, the main dialog contains a selection box for changing the PCI Interrupt value.

The main CellView dialog lists the adapter(s) installed in your computer and provides navigation buttons. All subsequent dialogs are *child* dialogs. The contents of each Setup and Statistics dialog apply to the adapter that is highlighted in the ATM Adapter Interfaces box.

The main CellView dialog provides the following selections:

Select...	To do this...
Interrupt (Windows NT only)	Set the PCI interrupt value for the adapter highlighted in the ATM Adapter Interfaces box. We recommend the default AutoDetect setting. If the driver fails to recognize the adapter with AutoDetect set, you might need to set a specific interrupt level.
Close	Exit CellView.
Setup	To configure: <ul style="list-style-type: none"> • Signalling • LECs • LESSs (on the same adapter as the LECS) • LECS (on the same adapter as the LESSs) • IP-over-ATM (1577) client and ARP server

Select...	To do this...
Stats	To display the status of: <ul style="list-style-type: none"> • Signalling • AAL5 • LECs • LESs • LECS • IP-over-ATM (1577) client and ARP server
Global	To configure: <ul style="list-style-type: none"> • Applications (parameters for Setup and Stats dialogs) • Connection limits for end stations (display only) • Debugging (enable tracking of API, Signalling, ILMI)

The setting **Enable Advanced Settings**, which is located in the Application dialog of Global settings, controls whether the LECS and LES tabs appear for editing and viewing in the Setup and Stats routines. If Enable Advanced Settings is set to **OFF** (the default), the tabs do not appear.

Setup

Use CellView Setup dialogs to configure your adapter(s) for use on the ATM network. You can configure up to four LECs and one IP-over-ATM client per adapter. The initial number of clients per adapter is specified during driver installation.

You can also configure one LECS and up to eight LESs per adapter for the ATM network. If you will be enabling the LECS and LESs, it is recommended that you configure these before configuring clients.

Setup

Following is an overview of the procedures to use to configure network services for each adapter in an end station. The topics in this section provide detailed information about each of these procedures.

1. On the main CellView dialog, highlight the adapter you are configuring, and select **Setup** to make dialogs available for setting up signalling, clients, and servers.
2. On the Signalling dialog, check that all signalling parameters conform to the capabilities of your ATM switch, and change settings, if needed.
3. **If the LECS and the LES(s) will be on this machine,** use the LECS and LES dialogs to configure these servers. (You might need to enable settings in the Global Application dialog to make these dialogs available.)
4. On the LEC dialog(s), configure the LECs specified for the adapter during driver installation.
5. On the 1577 dialog, configure the IP-over-ATM client and ARP server, if specified for the adapter during driver installation.
6. Exit CellView Setup.
7. **If you are running Windows NT,** exit CellView and reboot the machine.

The edits made with CellView are stored in a system file (`/etc/atm/cvconf`) on your hard disk. In Windows 95/NT systems, you must exit CellView and restart the machine to make these changes take effect. In UNIX-based systems, however, all changes to Setup dialogs, except UNI Signalling, are dynamic when you exit Setup. You can restart Signalling from the command line without rebooting the machine, as described on page 40, to make signalling changes take effect.

The following table shows where to find information about CellView Setup tasks:

For information about...	See page...
<i>Setting Up UNI Signalling</i>	37
<i>Setting Up LAN Emulation Clients</i>	40
<i>Setting Up IP-over-ATM Client and Server</i>	46
<i>Setting Up a LAN Emulation Configuration Server</i>	51
<i>Setting Up a LAN Emulation Server</i>	53

Setting Up UNI Signalling

The ATM adapter drivers are designed to operate with the UNI 3.0/3.1 signalling specification. All connections between two end stations are set up and torn down dynamically using SVC communications.

To set up UNI signalling parameters:

1. On the main CellView dialog, highlight the adapter you want to configure. Then select **Setup** to display the Signalling dialog:

Setup

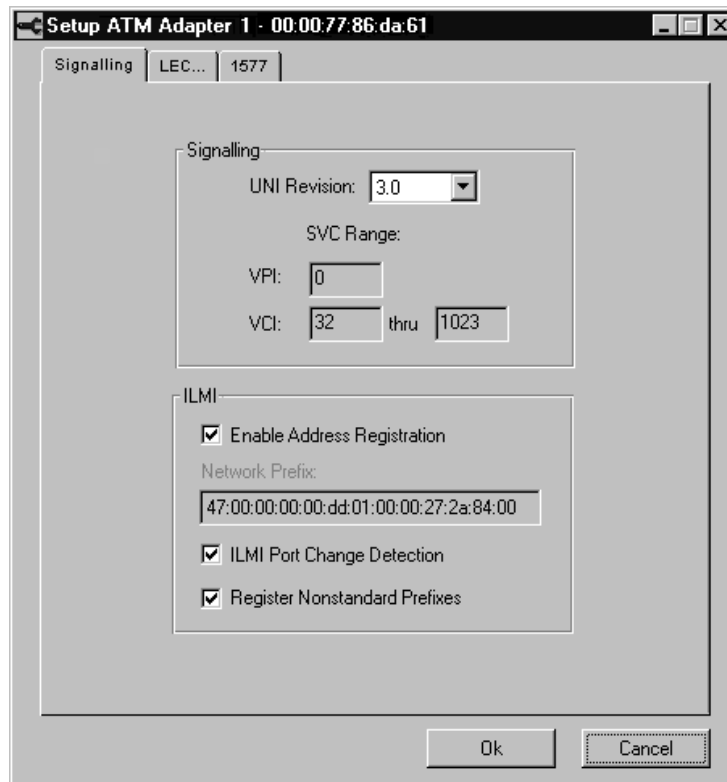


Figure 4-3. CellView Signalling Setup

2. Provide information in the Signalling dialog fields, as follows:

Use this field...	To do this...
UNI Revision	Select the UNI revision (UNI 3.0 or UNI 3.1).
SVC Range: VPI (Virtual Path Identifier)	Determine the VPI available to the driver for SVCs. The VPI is a one-byte field in the ATM cell header that, when combined with the VCI, forms an ATM address. Currently, only VPI 0 is supported.

Use this field...	To do this...
SVC Range: VCI (Virtual Circuit Identifier)	Determine the range of VCIs available to the driver for SVCs. The range is fixed and cannot be edited. In the sample dialog (Figure 4-3 on page 38), circuits 0–31 are reserved for system communications. Circuits 32–1023 are available for station-to-station traffic.
Enable Address Registration	Enable the adapter to acquire its 13-byte network prefix at bootup from the switch. Disable this feature if your switch does not support address registration.
Network Prefix	Display or enter the adapter's 13-byte network prefix. If the Enable Address Registration feature is enabled, the network prefix is entered automatically at bootup, and is display-only. If the Enable Address Registration feature is disabled, obtain the network prefix from the switch and enter it manually.
ILMI Port Change Detection	Enable the adapter to poll the ATM switch every 30 seconds, to advise that it is up and running. At bootup, the switch adds the host station to the active stations list. If the host station is turned off, polling stops, and the switch removes the host from this list. Disable this feature if your switch does not support ILMI polling.
Register Nonstandard Prefixes	Enable the ILMI to register the ATM Forum's well-known address for the LECS with the switch. The prefix in the well-known address usually differs from the ATM prefix for the adapter. Some switches might not support the registration of different prefixes through a single port. Disable this setting if your switch does not support mixed prefixes.

Setup

In UNIX-based systems, you must restart signalling for signalling setup changes to take effect.

- In IRIX operating systems, restart signalling with the command `sigd_start`
- In other UNIX operating systems, restart signalling with the command `restart_sigald`

Setting Up LAN Emulation Clients

CellView provides a separate tabbed LEC dialog for each LEC setup. Using the LEC dialogs, you can set parameters for each LEC to establish communications with an LECS at bootup, or to contact a LES directly. You can also set up PVC links with other end stations.

To set up a LEC:

1. On the main CellView dialog, highlight the adapter you want to configure.
2. Select **Setup**, and then select the **LEC...** tab.
3. Select the **LEC<x>** tab (where <x> is the number of the LEC you are configuring) to display the appropriate LEC dialog:

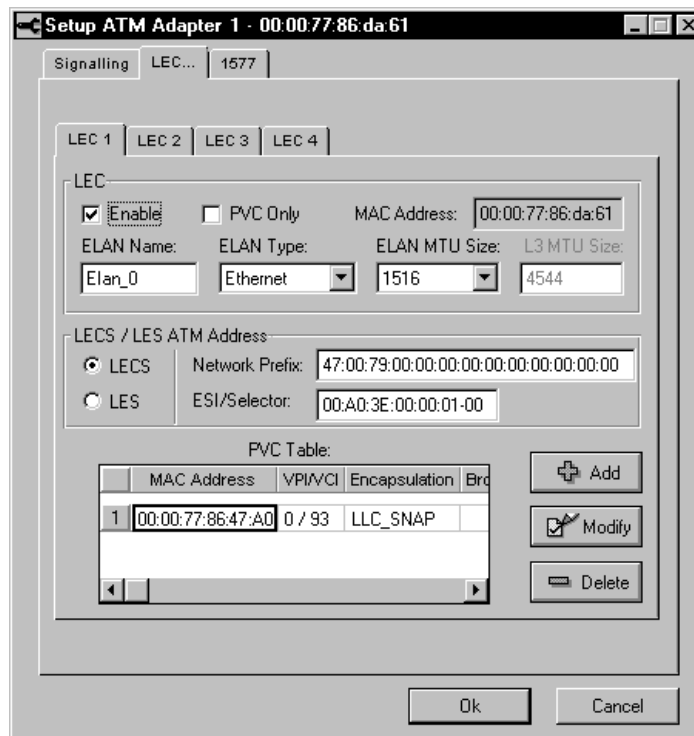


Figure 4-4. CellView LEC Setup

4. Enter information in the LEC dialog fields to configure the following:
 - LEC settings and LECS/LES ATM address settings
 - LEC PVC settings

The topics that follow provide information about configuring these settings.

LEC and LECS/LES ATM Address Settings

To configure LEC settings and LECS/LES ATM address settings, provide information in LEC dialog fields, as follows:

 Setup

Use this field...	To do this...
Enable	Enable the LEC.
PVC Only	Set up PVC communications without enabling SVC activity. For PVC-only clients, the only other settings you need to configure are the L3MTU Size and the PVC Table.
MAC Address	View the MAC address of the LEC. LEC 1 is assigned the base address for the adapter. The remaining LECs use increments of the base address for their MAC addresses. If the LEC is enabled as Token Ring, the MAC Address is displayed in non-canonical format.
ELAN Name	Identify the network name of the emulated LAN that you want the client to join. Some configuration servers require a name while others do not. The Interphase LECS and LESs require a name only in the following cases: <ul style="list-style-type: none"> • The Strict ELAN Name field is enabled on the LES dialog. • You need to differentiate between two or more LESs with the same MTU size and ELAN type. For exact requirements, see your server documentation. For information about setting up Interphase servers, see <i>Setting Up a LAN Emulation Configuration Server</i> on page 51.
ELAN Type	Select the ELAN type (Ethernet or Token Ring).

Use this field...	To do this...
ELAN MTU Size	<p>Select the requested ELAN MTU size. The client uses this entry when making a request to join a LES. The MTU returned to the client is equal to or less than the requested value.</p> <p>Recommended settings are:</p> <ul style="list-style-type: none"> • ELAN with Ethernet edge device: 1516 • ELAN with Token Ring edge device: 4544 • ELAN with ATM end stations only: 9234 <p>All nodes on the same logical subnet must use the same MTU size.</p>
L3MTU Size	<p>Force the MTU size to the entered value, rather than the value returned by the LANE server (LES). Done only for values other than zero (0).</p> <p>If the client is in PVC-only mode (no LAN Emulation services), you must set the L3MTU size to the IP MTU of the network.</p> <p>If the MTU is not based on the MAC layer, you must set the L3MTU size to the actual IP MTU of the network. For example, if the ELAN MTU Size of a Token Ring network is 4544, but the IP MTU is 2048, set the L3MTU Size to 2048.</p>
LECS/LES ATM Address	<p>Select the mode of contact at bootup:</p> <ul style="list-style-type: none"> • LECS contacts the LES with the 20-byte ATM address in the Network Prefix and ESI/Selector fields. (The default address is the ATM Forum's well-known address.) • LES uses the 20-byte address in the ATM address fields to contact a LES directly.

Setup

LEC PVC Settings

Use the PVC Table in the LEC dialog to set up PVC connections between a client and other network end stations. Figure 4-5 illustrates the PVC Table for LECs:

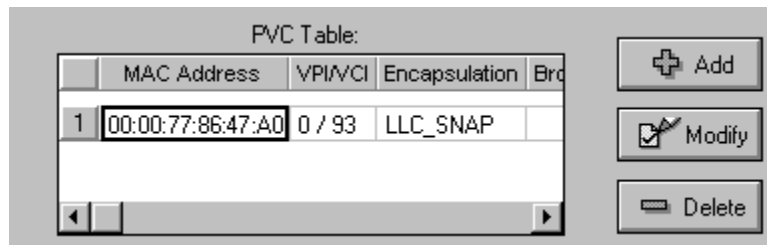


Figure 4-5. PVC Table in LEC Dialog

A 6-byte MAC address and a VCI number are associated with each PVC. Packets from the upper layers whose destination MAC addresses match an address in the PVC table are transmitted on that PVC.

In addition to providing setup information in the PVC Table, you must also consider the following when configuring PVCs for LECs:

- All PVCs must be configured in the adapters and the switch(es) manually.
- The MAC address of the target station must be mapped to a VCI in the local host.
- The MAC address of the local client must be mapped to a VCI in the target station.

You can use buttons in the PVC table block to add, modify, or delete PVC table entries, as described in the topics that follow.

Adding or Modifying LEC PVC Entries

To add or modify PVC table entries for the LEC:

1. Select **Add**, or highlight the appropriate entry and select **Modify**.

The following dialog appears:

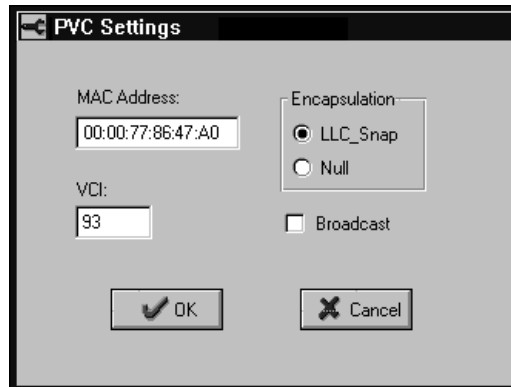


Figure 4-6. PVC Settings for LECs

2. Provide information in the PVC Settings dialog fields, as follows:

Use this field...	To do this...
MAC Address	Enter the 6-byte address of the target station. Use the natural format for the ELAN. For example, for a Token Ring ELAN, use non-canonical format.
VCI	Identify the VCI number that the LEC uses to communicate with the target. To determine the range of VCIs available, go to the Setup dialog for Signalling, and check the SVC Range in the VCI fields (Figure 4-3 on page 38). In most cases, the range is 32–1023. (The corresponding VPI cannot be edited and is fixed at a value of zero.)

Setup

Use this field...	To do this...
Encapsulation	Select the encapsulation method (LLC_Snap or Null). The host and target must use the same encapsulation method. See <i>Multiprotocol Encapsulation over ATM AAL5</i> on page 162 for an explanation of these encapsulation methods.
Broadcast	Enable the entry as a Broadcast PVC. If enabled, all broadcast/multicast packets from the upper layers are transmitted on this PVC. A maximum of 16 Broadcast PVCs can be enabled on each LEC.

Deleting LEC PVC Entries

To delete a PVC table entry, highlight the entry, and select **Delete**.

Setting Up IP-over-ATM Client and Server

The IP-over-ATM client conforms to the RFC-1577 specification using Classical IP-over-ATM where no multicast or broadcast services are available.

Using the 1577 dialog, you can enable the Classical IP-over-ATM client and enable the host adapter as the Address Resolution Protocol (ARP) server for the network. You can also set up PVC links with other end stations.

To set up an IP-over-ATM client/ARP server configuration:

1. On the main CellView dialog, highlight the adapter you want to configure.
2. Select **Setup**, and then select the **1577** tab to display the 1577 dialog:

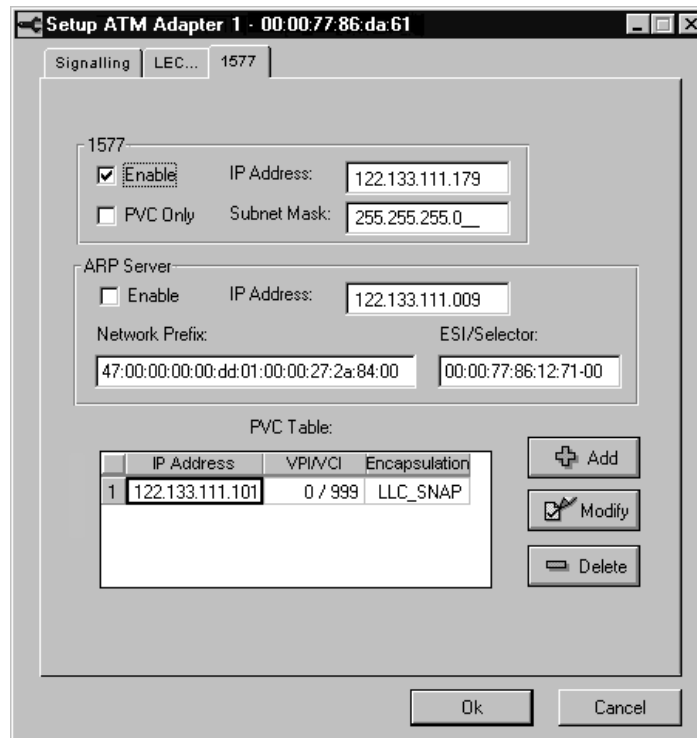


Figure 4-7. CellView IP-over-ATM Setup

3. Enter information in the 1577 dialog fields to configure the following:
 - IP-over-ATM client and ARP server settings
 - IP-over-ATM PVC settings

The topics that follow provide information about configuring these settings.

 Setup

IP-over-ATM Client and ARP Server Settings

To configure IP-over-ATM client and ARP server settings, provide information in the 1577 dialog fields, as follows:

Use this field...	To do this...
Enable	Enable the Classical IP-over-ATM client.
PVC Only	Set up PVC communications without enabling the SVC activity. For PVC-only clients, the only other settings you need to configure are the PVC Table settings.
IP Address	Enter the client's IP address.
Subnet Mask	Enter the client's subnet mask identifier.
ARP Server: Enable	Enable the host adapter as the ARP server for your IP-over-ATM network.
ARP Server: IP Address	If the host adapter is not the ARP server, enter the IP address of the ARP server located elsewhere in the network.
ARP Server: Network Prefix and ESI/Selector	If the host adapter is not the ARP server, enter the ARP server's ATM address, which consists of the Network Prefix and ESI/Selector. (For details about the address structure, see <i>ATM Address</i> on page 31.) The IP-over-ATM driver must know the ATM address of the ARP server. When the system is powered up, it calls the ARP server with this ATM address.

IP-over-ATM PVC Settings

Use the PVC Table in the 1577 dialog to set up PVC connections between the local client and other end stations in the IP-over-ATM subnetwork. Figure 4-8 illustrates the PVC Table for IP-over-ATM clients:

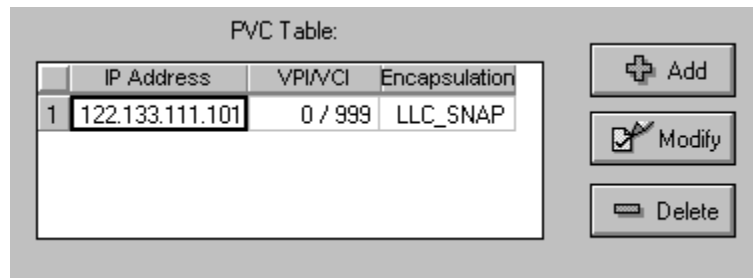


Figure 4-8. PVC Table in 1577 Dialog

In addition to providing setup information in the PVC Table, you must also consider the following when configuring PVCs for the IP-over-ATM client:

- All PVCs must be configured in the adapters and the switch(es) manually.
- The IP address of the target station must be mapped to a VCI in the local host.
- The IP address of the local client must be mapped to a VCI in the target station.

You can use buttons in the PVC table block to add, modify, or delete PVC table entries, as described in the topics that follow.

Adding or Modifying IP-over-ATM PVC Entries

To add or modify PVC table entries for an IP-over-ATM client:

1. Select **Add**, or highlight the appropriate entry and select **Modify**.

The following dialog appears:

Setup

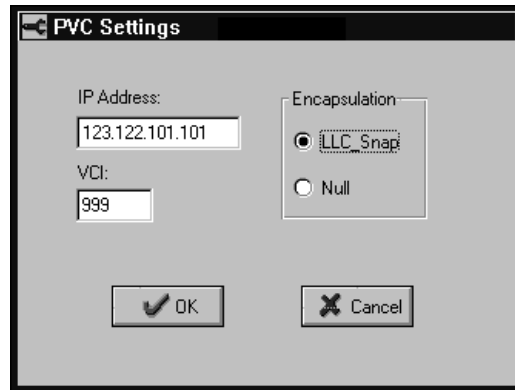


Figure 4-9. PVC Settings for IP-over-ATM Clients

2. Provide information in the PVC Settings dialog fields, as follows:

Use this field...	To do this...
IP Address	Enter the IP address of the target station.
VCI	<p>Identify the VCI number that the IP-over-ATM client uses to communicate with the target.</p> <p>To determine the range of VCIs available, go to the Setup dialog for Signalling, and check the SVC Range in the VCI fields (Figure 4-3 on page 38).</p> <p>In most cases, the range is 32–1023. (The corresponding VPI cannot be edited and is fixed at a value of zero.)</p>
Encapsulation	<p>Select the encapsulation method (LLC_Snap or Null). The host and target must use the same encapsulation method. See <i>Multiprotocol Encapsulation over ATM AAL5</i> on page 162 for an explanation of these encapsulation methods.</p>

Deleting IP-over-ATM PVC Entries

To delete a PVC table entry, highlight the entry, and select **Delete**.

Setting Up a LAN Emulation Configuration Server

To communicate on an ATM network, a LEC must join an emulated LAN (ELAN). The ELAN consists of a group of end stations that communicate among themselves with the same MTU size, the same frame format, and the same broadcast/multicast services. The LAN Emulation Server (LES) is the central server for the ELAN. The LAN Emulation Configuration Server (LECS) manages which LEC joins which LES.

The LECS must reside on the ATM adapter with the LESs it serves; it cannot communicate with LESs across the network. You must enable the LECS and associated LESs before configuring LECs that join LESs.

The LECS provides a central point of contact on the network for LECs at bootup. At bootup, the LEC sends the LECS a request for the type of ELAN it wants to join. The LECS responds with the current ATM address and the configuration parameters of the LES that serves the requested ELAN.

To set up the LECS:

1. If the LECS tab is not available, select **Global** from the main CellView dialog to display the Application Dialog. Then enable the **Enable Advanced Settings** field and click **OK**.
2. On the main CellView dialog, highlight the adapter you want to configure.

Setup

3. Select **Setup**, and then select the **LECS** tab to display the LECS dialog:

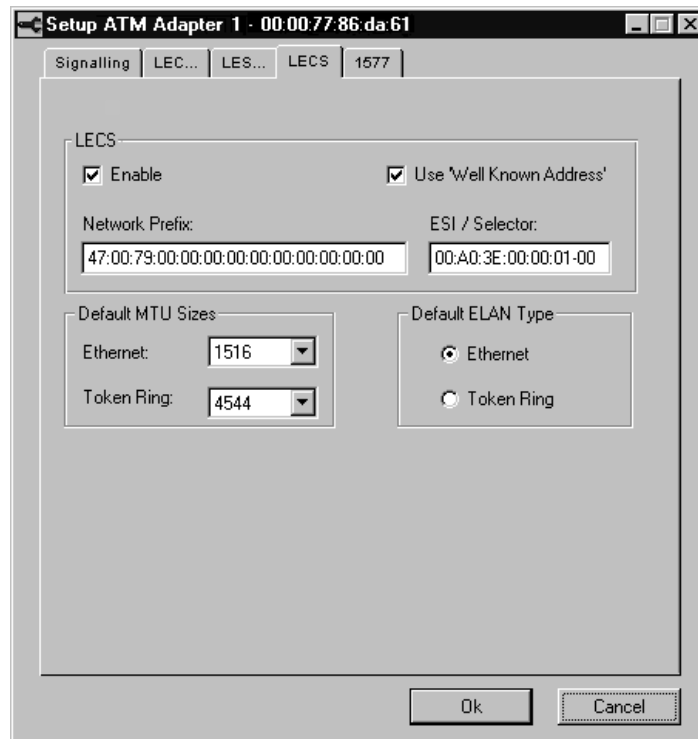


Figure 4-10. CellView LECS Setup

4. Provide information in the LECS dialog fields, as follows:

Use this field...	To do this...
Enable	Enable the LECS and all permanent mappings of LECs to specific LESs.
Use 'Well Known Address'	Enable the ATM Forum's well-known address to be loaded to the Network Prefix and ESI/Selector fields. When enabled, these address fields cannot be edited.

Use this field...	To do this...
Default MTU Sizes	Select the default Ethernet or Token Ring ELAN MTU size to assign to a LEC if the LEC's configuration request omits the MTU size. If the request also omits the ELAN type, the LECS will attempt to assign the LEC to a LES of the default ELAN type with an MTU size equal to or less than the requested size.
Default ELAN Type	Select a default ELAN type to assign to a LEC if the LEC's configuration request omits the ELAN type. The LECS will attempt to assign the LEC to a LES of the Default ELAN Type with an MTU size equal to or less than the requested size.

Setting Up a LAN Emulation Server

To communicate on an ATM network, a LEC must join an emulated LAN (ELAN). The ELAN consists of a group of end stations that communicate among themselves with the same MTU size, the same frame format, and the same broadcast/multicast services. The LAN Emulation Server (LES) is the central server for the ELAN. It provides address registration, address resolution, and broadcast services for all ELAN members. The LAN Emulation Configuration Server (LECS) manages which LEC joins which LES.

The driver allows up to eight LESs to be enabled per adapter at one time (allowing adapter support for up to eight ELANs). LESs must reside on the ATM adapter with the LECS that serves them; they cannot communicate with the LECS across the network. You must enable a LES and its associated LECS before configuring LECs to join the LES.

Setup

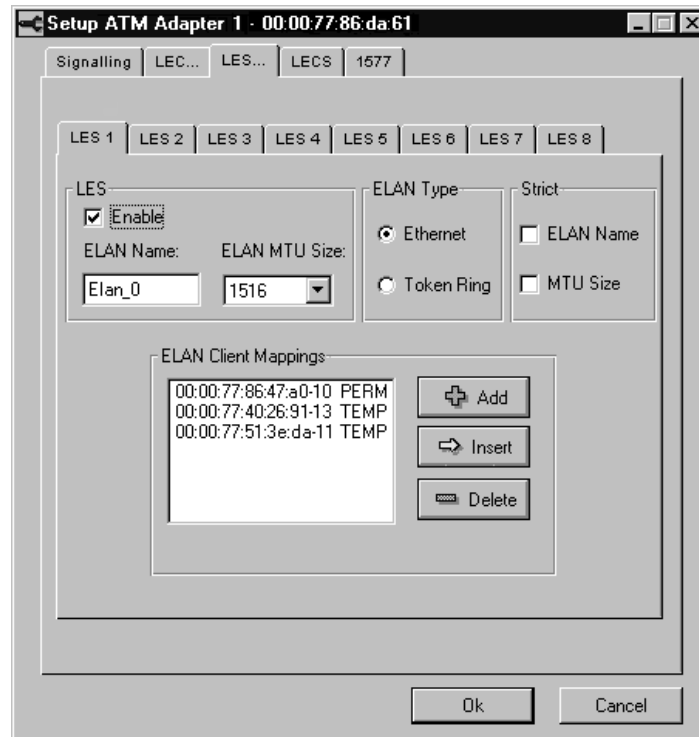
When a LEC joins a LES, the MAC-ATM relationship of the client is registered with the LES. The LES maintains a running account of these addresses to resolve queries from ELAN members. The connection between the LES and each LEC is a permanent, open connection as long as the client is running.

The LES maintains a table of client information that it uses to provide address resolution services to the ELAN. When an end station is disconnected or turned off, the LES removes client(s) from the table automatically. Therefore, relocating an end station is a matter of physically moving the hardware and connecting it to the same or another ATM switch. At bootup, the client(s) rejoin the previous LES with a new ATM address.

CellView provides a separate tabbed LES dialog for each LES-ELAN setup.

To set up a LES:

1. If the LES... tab is not available, select **Global** from the main CellView dialog to display the Application Dialog. Then enable the **Enable Advanced Settings** field, and click **OK**.
2. On the main CellView dialog, highlight the adapter you want to configure.
3. Select **Setup**, and then select the **LES...** tab.
4. Select the **LES<x>** tab (where <x> is the number of the LES you are configuring) to display the appropriate LES dialog:

**Figure 4-11. CellView LES Setup**

5. Enter information in the LES dialog fields to configure the following:
 - LES settings
 - ELAN Client Mappings settings

The topics that follow provide information about configuring these settings.

LES Settings

To configure LES settings, provide information in the LES dialog fields, as follows:

 Setup

Use this field...	To do this...
Enable	Enable the LES.
ELAN Name	<p>Enter the name of the ELAN for which the LES provides services (not required for a LEC to join the group).</p> <p>If the ELAN Name setting in the Strict block is enabled, the ELAN name in the LEC request must exactly match this name (case-sensitive). Otherwise, the server prevents the LEC from joining the group.</p>
ELAN MTU Size	<p>Select the MTU size for the ELAN for which the LES provides services. Recommended options are:</p> <ul style="list-style-type: none"> • ELAN with Ethernet edge device: 1516 • ELAN with Token Ring edge device: 4544 • ELAN with ATM end stations only: 9234 <p>If the MTU Size setting in the Strict block is enabled, the request from the LEC must exactly match the ELAN MTU Size. Otherwise, the server prevents the LEC from joining the group.</p>
ELAN Type	<p>Select the ELAN type (Ethernet or Token Ring) to use for all communications between end stations.</p> <p>If the ELAN includes an edge device to a legacy LAN, the ELAN type must be set to interface with that edge device.</p>
Strict: ELAN Name	Specify that the ELAN Name in the LEC's request must exactly match the entry in the ELAN Name text field on this dialog (case-sensitive).
Strict: MTU Size	Specify that the ELAN MTU Size in the LEC's request must exactly match the entry in the ELAN MTU Size selection field on this dialog.

ELAN Client Mappings Settings

The ELAN Client Mappings block of the LES dialog shows the ESI/Selector value for each LEC currently assigned to the LES. The clients can be *permanently* or *temporarily* assigned to the LES, based on settings configured in this LES dialog or in the LEC dialog. Figure 4-12 illustrates the ELAN Client Mappings block:

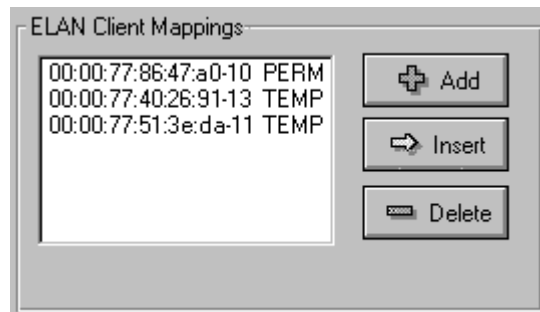


Figure 4-12. ELAN Client Mappings Table in LES Dialog

ELAN Client Mappings use two client classifications:

- **PERM** means the client is permanently assigned to the LES (using the Add or Insert button on this dialog). A permanently-assigned client can join only its assigned LES. This gives network administrators control in assigning clients to specific ELANs.
- **TEMP** means the client is temporarily assigned to the LES based on the configuration parameters requested by the client. This entry is removed when the client leaves the ELAN.

The ELAN Client Mappings table obtains the list of permanently-assigned clients from a table maintained by the LECS. When the LECS is enabled, it checks for a permanent

Setup

status each time a client attempts to join the network, regardless of whether the client is configured to contact the LECS or directly contact a LES.

Use the ELAN Client Mappings block of the LES dialog to permanently assign or remove LES client assignments.

Both the Add and Insert buttons in the ELAN Client Mappings block enable you to permanently assign clients to the LES.

- Use the **Add** button to enter the client's ESI/Selector value.
- If the client is currently assigned or running on another ELAN, it is more convenient to use the **Insert** button to move the client to this LES.

You can permanently assign a client that is permanently assigned to another LES, temporarily assigned to another LES, or currently not a member of any ELAN.

Adding a Client

To add a client to a LES:

1. Select **Add** to display the following dialog:

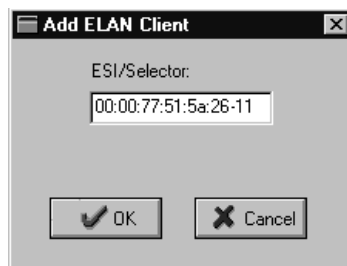


Figure 4-13. Add Permanent Clients to a LES

2. Enter the ESI/Selector value for the client.

If you are not familiar with the structure of this address, see *ATM Address* on page 31.

3. Select **OK**.

This procedure permanently adds the new entry to the LES's ELAN Client Mappings table. Also, if the client was a member of another ELAN, this procedure removes the client from that ELAN's LES. When the client attempts to join the network again, it can join only the newly-assigned LES.

Inserting Clients

To move clients from another LES to the LES being configured:

1. Select **Insert** to display the following dialog:

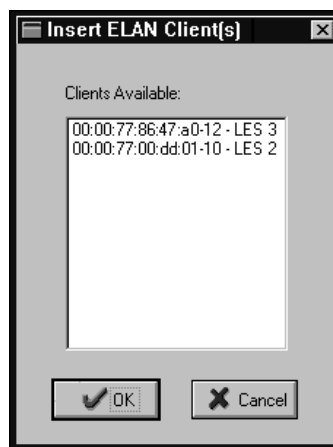


Figure 4-14. Insert Permanent Clients

This dialog lists all permanent and temporary clients that are assigned to other LESs.

2. Highlight the clients you want to move to the LES being configured, and select **OK**.

This procedure permanently adds the new entries to the LES's ELAN Client Mappings table and removes the client from other LESs.

Statistics Information

Deleting a Client

To remove a client from the LES, highlight the client in the ELAN Client Mappings block, and select **Delete**.

If the client was permanently assigned, it is removed from the ELAN served by the LES and from the table of permanent clients maintained by the LECS. It can attempt to join the network again any time after deletion.

If the client was temporarily assigned, it is removed from the ELAN served by the LES. When it attempts to join the network again, it will be assigned to a LES based on requested parameters. (This will be the same LES unless changed in the LEC Setup dialog since the last startup.)

Statistics Information

The dialogs in the CellView Statistics group provide statistics about installed adapters that can help you check for proper driver operation and troubleshoot network problems.

To see statistics about an installed adapter, select the adapter on the main CellView dialog, and then select **Stats**. To see statistics for an LECS or LESs located on an adapter, you might first need to make the LECS and LES tabs available in the Statistics group. To do so, on the main CellView dialog select **Global**; then select the **Application** tab and enable the **Enable Advanced Settings feature**.

Verifying Driver Installation

You can use information in the Statistics dialogs to verify that the driver is up and running properly. When the end station boots up, certain systems communications must occur between

the client and the server (through the switch) so the client can log on to the network. Statistics routines monitor the state of client and server traffic, as well as signalling and AAL5 traffic.

To do a quick check of an adapter's operating statistics:

1. Start CellView.

For instructions, see *Starting CellView* on page 32.

2. On the main CellView dialog, if more than one adapter is installed in the machine, select an adapter.

3. Select **Stats, and check the following indicators in the Signalling dialog:**

– All three graphical LEDs in the Signalling State box should be green.

– In the State Detail box, the ILMI, QSAAL, and Signalling field values should be similar to:

ILMI: **ILMI Registered**

QSAAL: **Data transfer ready**

Signalling: **Signalling ready**

– In the Signalling Statistics box, the Frames In and Frames Out columns should indicate traffic.

4. Select the **AAL5 tab, and check the following indicators:**

– All six graphical LEDs in the SONET box should be green.

– The fields in the AAL5 Statistics box should indicate traffic.

5. For each LEC enabled on the adapter, select the **LEC tab, and check the following indicators:**

– The LEC graphical LED should be green.

Statistics Information

- The Tx Packets and Rx Packets fields of the display boxes should indicate traffic.
6. If the IP-over-ATM client is enabled, select the **1577** tab, and check the following indicators:
 - The 1577 graphical LED should be green.
 - The 1577 Statistics fields should indicate traffic.
 7. If more than one adapter is installed in the machine, repeat steps 2 through 6 for each additional adapter.

If you find an item in error, the driver might be incorrectly installed or configured. If you suspect a problem with your driver setup, see *Problems and Possible Solutions* on page 124.

Troubleshooting

You can use the Statistics dialogs to provide helpful information when you contact Interphase support personnel concerning ATM network problems. Statistics dialogs display network statistics gathered by CellView, such as signalling and traffic information, for the clients and servers on the adapter(s) installed in an end station.

CellView gathers network operation statistics for local Interphase clients and servers only. It does not gather statistics from switches or from other end stations.

For additional information about using Statistics dialogs to troubleshoot network problems, see *Problems and Possible Solutions* on page 124.

Global Settings

Settings for global routines control CellView parameters that are common to all adapters. You are not required to restart end stations to make global settings take effect. Use Global settings to:

- Control application display settings
- Display signalling connection settings in drivers
- Produce information to use for debugging

The following table shows where to find information about CellView Global tasks:

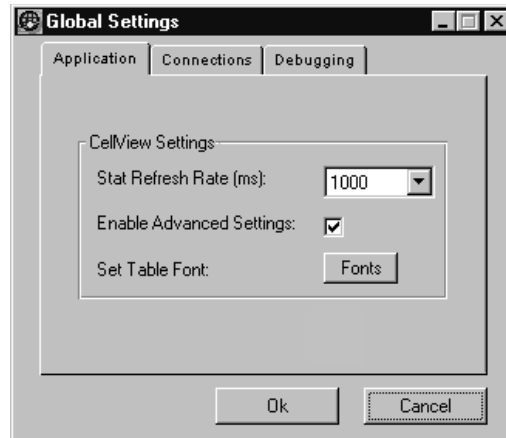
For information about...	See page...
<i>Controlling Application Display Settings</i>	63
<i>Displaying Signalling Connections Settings</i>	65
<i>Producing Debugging Messages</i>	66

Controlling Application Display Settings

Use the Application dialog to control display settings for CellView Setup and Statistics routines, such as refresh rates and tabbed dialogs available for setup and statistics routines.

To control display settings:

1. From the main CellView dialog, select **Global** to display the Application dialog:

Global Settings**Figure 4-15. CellView Global Application**

2. Provide information in Application dialog fields, as follows:

Use this field...	To do this...
Stat Refresh Rate	Control the update or refresh rate, in milliseconds, of the data fields in the Statistics dialogs.
Enable Advanced Settings	Activate the tabs for the LECS and the LES in the Setup and Statistics dialogs. This setting does not affect the enable/disable condition of the ELAN servers. The tabs can be hidden from view while the servers remain enabled.
Set Table Font	Select the font used for tables in dialogs.

Displaying Signalling Connections Settings

Use the Connections dialog to display the signalling connections configuration in adapter drivers. Currently, these settings cannot be changed; they are preset in the drivers.

To display the Connections dialog, select **Global** from the main CellView dialog, and then select the **Connections** tab:

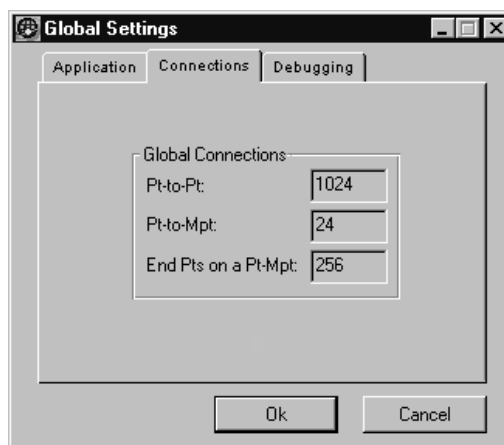


Figure 4-16. CellView Global Connections

The following table describes Connections dialog fields:

Use this field...	To do this...
Pt-to-Pt	Display the maximum number of SVC connections with other end stations that are allowed simultaneously.
Pt-to-Mpt	Display the maximum number of SVC multipoint connections that are allowed simultaneously. These are used primarily between LECs and a LES/BUS.
End Pts on a Pt-Mpt	Display the maximum number of end points on each multipoint connection. This affects the number of clients allowed on the same ELAN.

Producing Debugging Messages

Use the Debugging dialog as a troubleshooting aid for the adapter. If you have difficulty establishing connections with other network nodes or establishing ILMI connectivity with the switch, enable the appropriate debug options. The debug options produce signalling debug messages from various modules to help isolate the problem. Be sure to disable the options when debugging is complete.

To produce Debugging messages:

1. From the main CellView dialog, select **Global**, and then select the **Debugging** tab.



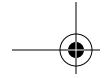
Figure 4-17. CellView Debugging Options

2. Select Debugging dialog options, as follows:

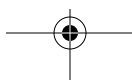
Use this field...	To do this...
API	Track the Signalling Application Program Interface (API). These are the routines used by the application software to manage SVCs.

Chapter 4: Configuring the Adapter Using CellView

Use this field...	To do this...
Signalling	Track the Signalling PDUs exchanged by the host Signalling and the switch.
ILMI	Track the IME PDUs exchanged by the host Signalling and the switch. Useful in debugging ILMI Address Registration problems.



Global Settings



Installing the NetWare Server Driver

5

Overview

This chapter describes your adapter's driver and explains how to install it on file servers running Novell NetWare version 3.12, 4.10, or 4.11. It provides information about the following:

- Driver support features
- Verifying minimum system requirements
- Driver file names
- Installing the driver
- Configuring network protocols and parameters
- Editing the system's Maximum Packet Size
- Editing the bootup configuration file (AUTOEXEC.NCF)
- Removing a driver



CAUTION

For proper operation, your ATM switch must be able to support the UNI 3.0/3.1 signalling standard for SVCs. Some switch vendors allow the two standards to be mixed. Some vendors require all ports to be set to either UNI 3.0 or UNI 3.1. Check your switch documentation for correct settings. The adapter's default setting is UNI 3.0.

Driver Support Features

If *Read Me First* documentation is in your installation kit, review it before installing the driver. It may contain changes and updates made to this users guide after the print date. Also, check for a `README` file in the `NetWare` directory of the installation CD-ROM.

In addition, if you are not thoroughly familiar with ATM networking, see *ATM Technology Overview* on page 141.

Driver Support Features

The driver complies with the ATM Forum LAN Emulation specification version 1.0. It provides broadcast/multicast addressing, enabling you to run legacy LAN (Ethernet, Token Ring, and FDDI) applications and protocols over an ATM network. The driver supports up to four adapters per machine. It allows each adapter to join up to four different ELANs (Ethernet or Token Ring), or three ELANs and one IP-over-ATM segment, simultaneously.

The driver takes advantage of recent evolutions in switch designs where SVCs and PVCs can be mixed throughout the network. For example, you can have multiple clients using SVC signalling, and at the same time have a dedicated PVC between a client and another end station on the network.

For each adapter, the driver supports the following:

- Up to four LAN Emulation Clients (LECs)
- Up to eight LAN Emulation Servers (LESs) along with Broadcast and Unknown Servers (BUSs)
- One LAN Emulation Configuration Server (LECS)
- One IP-over-ATM Client, based on RFC-1577
- One IP-over-ATM Server, based on RFC-1577

- SVC connections, based on the UNI 3.0/3.1 Signalling specification
- PVC connections between each client and other end stations, based on RFC-1483

During installation, up to four LECs, or three LECs and one IP-over-ATM client, can be initialized per adapter.

After installation, you can configure client and server network support with CellView, a text-based utility included with the installation package. You can also display adapter operating statistics using CellView. See *Using CellView for NetWare Servers* on page 93 for instructions.

Verifying Minimum Requirements

If you haven't already done so, verify that your system meets the minimum requirements described in *Minimum System Requirements* on page 4.

Driver Names

One driver package supports all Interphase PCI and PMC ATM adapters. The driver package includes four driver files, to accommodate two data transfer speeds and two ELAN types.

Each driver name begins with the numerals *55* (which indicate PCI compatible). Next, the numerals *15* indicate a speed of 155 Mbps, or the numerals *25* indicate a speed of 25 Mbps. Then the letters *SI* indicate an Ethernet ELAN type, or the letters *TSI* indicate a Token Ring ELAN type. The names are as follows:

- The **5515SI** supports PCI and PMC adapters with a rate of 155 Mbps (*15*) on an Ethernet ELAN (*SI*)

Installing the Driver

- The **5515TSI** supports PCI and PMC adapters with a rate of 155 Mbps (15) on a Token Ring ELAN (TSI)
- The **5525SI** supports PCI and PMC adapters with a rate of 25 Mbps (25) on an Ethernet ELAN (SI)
- The **5525TSI** supports PCI and PMC adapters with a rate of 25 Mbps (25) on a Token Ring ELAN (TSI)

Installing the Driver



CAUTION

If an earlier version of an Interphase ATM adapter driver is installed on the server, you must remove it before installing the new driver. See the section *Removing a Driver* on page 90 for instructions.



CAUTION

If TCP/IP is not installed on the server and one or more of the clients are to use this protocol, you should install TCP/IP on the server before installing the ATM driver.

To install the driver:

1. With the file server up and running, enter the command
`load install`
2. When the Installation Options menu appears, select **Driver Options**, and then select **Configure network drivers**.

(You might need to press **ALT-ESC** to toggle from the monitor screen to the Installation Options menu.)

3. In the Additional Driver Actions dialog, select **Select an additional driver.**

The Select A Driver dialog appears. If this is your first installation of the driver, a driver does not appear in the selection list.

4. If the driver you want to install is not listed, press **Insert.**

A prompt appears for changing the installation path.

5. Insert the Interphase installation CD-ROM.

6. Press **F3 and set the path to:**

`[drv]:\NetWare`

where `[drv]` is the drive letter of the CD-ROM.

7. Press **Enter.**

A dialog appears, listing the driver files in the `NetWare` directory. These selections are appropriate for all Interphase PCI and PMC ATM adapters (55xx and 45xx).

Installing the Driver

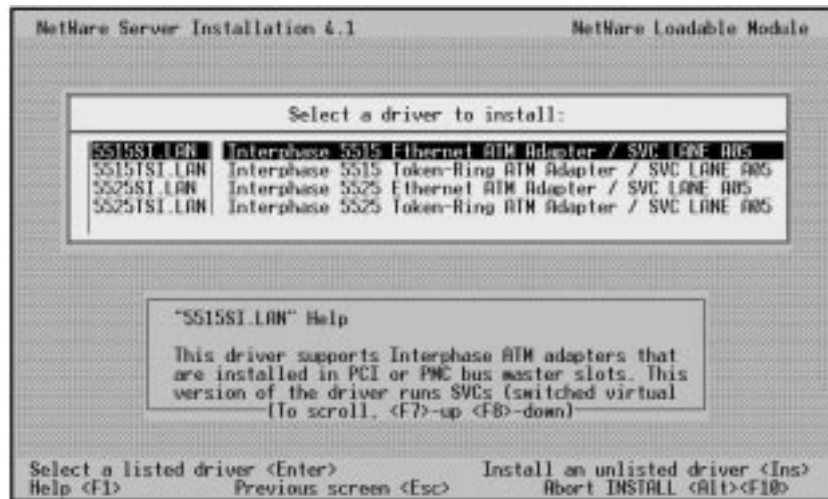


Figure 5-1. Selecting a Driver



CAUTION

Ethernet and Token Ring drivers cannot be mixed on the same machine. You must use the same frame type for all channels on all adapters installed in the NetWare server.

8. Select the driver that matches the speed of the adapter and the type of framing for the network:

Driver	Adapter	Frame Type
5515SILAN	155 Mbps (4515 or 4575)	Ethernet
5515TSILAN	155 Mbps (4515 or 4575)	Token Ring
5525SILAN	25 Mbps (4525)	Ethernet
5525TSILAN	25 Mbps (4525)	Token Ring

9. Confirm the name of the driver and select **Yes**.

The driver files are copied to the NetWare server.

Continue the installation with the next section.

Configuring Protocols and Parameters

After the driver files are copied to the NetWare server, as instructed in the previous section, a dialog appears similar to the following:

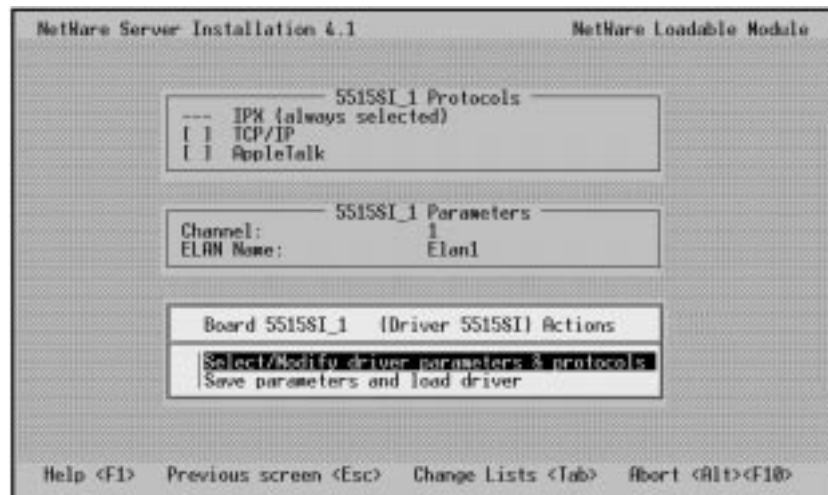


Figure 5-2. Protocols/Parameters Configuration

The driver name, located in the box titles, contains the increment of the client being configured. For example, if you are initializing the second client on the 155 Mbps adapter for the Ethernet driver, the name in the box titles reads 5515SI_2 (55 for PCI/PMC, 15 for 155 Mbps, SI for Ethernet, and _2 for Client 2).

To configure the protocols and parameters for the adapter:

1. Select **Select/Modify driver parameters & protocols** at the bottom of the dialog.

The highlight moves to TCP/IP in the Protocols box.

If this LEC is to use TCP/IP or this client is to be an IP-over-ATM client, you must add the protocol to the client with the next step.

2. If you need to add TCP/IP or AppleTalk:

- a. Select the protocol you want to enable.

When you select the TCP/IP option, a dialog appears with the following options for entering the IP interface.

IP Address: The Internet address for the client is in decimal notation of the form *xxx.xxx.xxx.xxx*, where *xxx* ranges from 0 to 254.

IP Mask: The most commonly used mask is *ff.ff.ff.0* (hex) or *255.255.255.0* (decimal notation).

- b. Press **F10** to save and exit the TCP/IP dialog.

3. If you are loading an Ethernet driver and need to change the frame type from its default of 802.2, press **F3**.

- a. In the Frame Type List dialog, select a frame type.
- b. Press **F10** to save and exit the Frame Type List dialog.

4. If the value of **Channel** in the Parameters box does not match the increment number in the box titles, change the Channel value to match the client number.

- a. Use the arrow keys to highlight the Channel number in the Parameters box, and press **Enter**.

A dialog appears for setting the channel number.

- c. Repeat the configuration steps for the new client beginning with step 1 on page 76.

Continue the installation with the next section.

Editing System Maximum Packet Size

If any of the clients are to use a Maximum Transfer Unit (MTU) size larger than 1516 (the system default), you must edit the `STARTUP.NCF` file so that the system can accommodate the larger framing size. If you do not need to edit the system's maximum packet size, skip to *Editing the Bootup Configuration File* on page 79.

To change the maximum packet size for the system:

1. With the NetWare `install` utility running, go to the Installation Options menu, if you are not there already.
2. Select **NCF files option**, and then select **Edit the startup.ncf file** to open the file for editing.
3. If you are prompted to specify a server boot path, accept the default or type the correct path, and press **Enter**.
4. Modify or add the line:

```
SET maximum physical receive packet size=[mtu]
```

where [mtu] is 1516, 4544, or 9234.

The recommended size for different ELANs is:

- ELAN with Ethernet edge device: **1516** (default)
- ELAN with Token Ring edge device: **4544**
- ELAN with ATM end stations only: **9234**



CAUTION

The maximum packet size in the `STARTUP.NCF` file must be equal to or greater than the largest MTU size used for any LEC or IP-over-ATM client.

5. Press **Esc** to exit the `STARTUP.NCF` file, and select **yes** when prompted to save your changes.

Continue the installation with the next section.

Editing the Bootup Configuration File

The commands and parameters in the `AUTOEXEC.NCF` file are used to configure system components at bootup. For ATM networking, you can edit `AUTOEXEC.NCF` to automate the ATM startup, change clients' default MTU size and UNI signalling parameters, change a LEC to an IP-over-ATM client, and add commands for multiple adapters.

The procedures in this section are presented in the order in which they should be done during the initial driver installation. You can perform any of these procedures later as needed to meet your network requirements. In all cases, reboot the server after you save and exit the file.

To open the `AUTOEXEC.NCF` file for editing:

1. With the NetWare `install` utility running, go to the Installation Options menu, if you are not there already.
2. Select **NCF files option**, and then select **Edit the autoexec.ncf file**.

Editing the Bootup Configuration File

The following table identifies where to find information for configuring the commands and parameters in the AUTOEXEC.NCF file:

For information about...	See page...
<i>Formatting Commands</i>	80
<i>Automating ATM Startup</i>	84
<i>Editing Client MTU Size</i>	85
<i>Editing UNI Signalling</i>	86
<i>Changing a LEC to an IP-over-ATM Client</i>	87
<i>Configuring Multiple Adapters</i>	88

Formatting Commands

This section describes the format for the `LOAD` and `BIND` commands used to configure ATM clients at bootup.

LOAD Command

The format of the `LOAD` command (all on one line) is as follows:

```
LOAD [driver]
    CHANNEL=[channel_number]
    NAME=[channel_name]
    FRAME=[frame_type]
    ELAN=[network_name]
    SLOT=[slot_number]
    UNI=(30 or 31)
    IPENABLE=(Y or N)
    MTU=(1, 4, or 9)
```

Following is an example `LOAD` command:

```
LOAD c:\nwserver\5515SI CHANNEL=1 NAME=atm_1_1_1
    FRAME=Ethernet_802.2 ELAN=137_1 UNI=31 MTU=9
```

The following table describes LOAD command variables:

Variable	Description
[driver]	Driver name. For multiple adapters, the driver name should be the same unless the adapter speeds differ. Ethernet and Token Ring cannot be mixed on the same machine. See step 8 on page 74 for more information.
CHANNEL	The client number on the adapter. The range of [channel_number] is 1 - 4.
NAME	Name for binding the protocol to the driver. Each client must have a unique name.
FRAME	Framing options. The options for Ethernet drivers are: <ul style="list-style-type: none">• FRAME=Ethernet_802.2• FRAME=Ethernet_802.• FRAME=Ethernet_II• FRAME=Ethernet_Snap For Token Ring drivers, use FRAME=Token-Ring
ELAN	The name of the emulated LAN the client wants to join.
UNI	UNI signalling specification version number. If not set to 31, or if not included in the command, the driver assumes version 3.0. Set to 31 for version 3.1.

Editing the Bootup Configuration File

Variable	Description
MTU	<p>MTU size. All nodes on the same logical subnet must use the same MTU size. The three options for a client are 1, 4, or 9 with the following recommendations:</p> <ul style="list-style-type: none"> • 1 = 1516 for ELAN with Ethernet edge device • 4 = 4544 for ELAN with Token Ring edge device • 9 = 9234 for ELAN with ATM end stations only <p>If the MTU variable does not appear in the command, the driver uses a setting of MTU=1.</p> <p>If the MTU is set to 4 or 9, the maximum packet size for the system must be set to accommodate the larger framing size. For more information, see <i>Editing System Maximum Packet Size</i> on page 78.</p>
IPENABLE	<p>IP Enable. Set to Y for IP-over-ATM client.</p> <p>If not set to Y, or if not included in the command, the driver initiates LEC activity.</p>
SLOT	<p>The number of the slot in which the adapter is located. Required only if installing multiple adapters.</p>

BIND Command for IPX

The format of the `BIND` command for IPX is as follows:

```
BIND IPX to [channel_name] NET=[elan_number]
```

Following is an example `BIND IPX` command:

```
BIND IPX to atm1_1_1 NET=d00d1
```

The following table describes `BIND IPX` command variables:

Variable	Description
[<code>channel_name</code>]	The name of the channel (as defined in the <code>NAME</code> variable in the previous <code>LOAD</code> command) for which to bind the IPX protocol.

Variable	Description
NET	The unique identification number in hex format for the emulated LAN.

BIND Command for TCP/IP

The format of the `BIND` command (all on one line) for TCP/IP is as follows:

```

BIND IP to [channel_name]
      ARP=[enable_arp]
      ADDRESS=[IP_address]
      MASK=[net_mask]

```

Following is an example `BIND IP` command:

```

BIND IP to atm1_1_2 ADDRESS=157.175.2.136
      MASK=ff.ff.ff.0

```

The following table describes `BIND IP` command variables:

Variable	Description
[channel_name]	The name of the client in the previous <code>LOAD</code> command (as defined in the <code>NAME</code> variable) for which to bind the IP protocol.
ARP	ARP Protocol. Enables or disables the ARP protocol. The two settings are Yes to enable and No to disable.
ADDRESS	The Internet address for the channel. The format is dotted decimal notation in the form <code>xxx.xxx.xxx.xxx</code> , where <code>xxx</code> ranges from 0 to 254.
MASK	The most commonly used mask is <code>ff.ff.ff.0</code> in hex notation, or <code>255.255.255.0</code> in decimal notation.

Automating ATM Startup

A few commands need to be added to the `AUTOEXEC.NCF` file to automate the ATM requirements at boot time. If they are not added to the file, the commands have to be entered manually each time the NetWare server is started.

To automate ATM startup for your adapter:

1. Find the last `BIND` command for the adapter's clients in the `AUTOEXEC.NCF` file.

This might be either a `BIND IPX` or `BIND IP` command. For example, if Clients 1 – 4 are initialized, the last `BIND` command might be similar to:

```
BIND IPX to 5515SI_4 NET=[random_8_digits]
```

2. Insert the following commands in the line immediately following the last `BIND` command:

```
LOAD asig  
LOAD cvconf
```

3. If TCP/IP is installed on the NetWare server, make sure the following command precedes the file's first `LOAD` command for the driver:

```
LOAD TCPIP RIP=Yes FORWARD=No
```

(`LOAD TCPIP` is required. The `RIP` and `FORWARD` variables are optional, depending on your needs for your server.)

At bootup, the system must load the TCP/IP protocol stack before encountering a `BIND IP` command.

Editing Client MTU Size

All clients on the same logical subnet must use the same MTU (Maximum Transfer Unit) size. The driver allows communications at 1516 bytes, 4544 bytes, or 9234 bytes.

To edit the MTU size for a client:

1. Find the `LOAD` line in the `AUTOEXEC.NCF` file for the client you want to change.

For example, the line for the Client 1 on the first adapter should be similar to:

```
LOAD 5515SI CHANNEL=1 NAME=chl_sta12  
FRAME=Ethernet_II ELAN=engr SLOT=1
```

(all on one line)

If the MTU variable does not appear in the command, as shown in the above example, the driver assumes a setting of 1516 bytes.

2. Add or modify the MTU variable with one of the following values:

MTU=1: representing 1516 bytes

MTU=4: representing 4544 bytes

MTU=9: representing 9234 bytes

The previous example set to 4544 bytes would be as follows:

```
LOAD 5515SI CHANNEL=1 NAME=chl_sta12  
FRAME=Ethernet_II ELAN=engr SLOT=1 MTU=4
```

For more information about these settings, see *LOAD Command* on page 80.

**NOTE**

If the MTU variable in the previous step is set to 4 or 9, the maximum packet size for the system must be set to accommodate the larger framing size. For instructions, see *Editing System Maximum Packet Size* on page 78.

Editing UNI Signalling

The ATM drivers are designed to operate with the UNI 3.0/3.1 signalling specification.

To edit the UNI setting for a client:

1. Find the `LOAD` line in the `AUTOEXEC.NCF` file for the client you want to change.

For example, the line for the second client on the first adapter should be similar to:

```
LOAD 5515SI CHANNEL=2 NAME=ch2_sta12  
      FRAME=Ethernet_II ELAN=sales SLOT=1
```

(all on one line)

If the UNI variable does not appear in the command, as shown in the above example, the driver assumes a setting of UNI 3.0.

2. Add or modify the UNI variable with one of the following values:
 - `UNI=30`: representing UNI specification 3.0
 - `UNI=31`: representing UNI specification 3.1

The previous example set to UNI specification 3.1 would be as follows:

```
LOAD 5515SI CHANNEL=2 NAME=ch2_sta12
      FRAME=Ethernet_II ELAN=sales SLOT=1 UNI=31
```

For more information about these settings, see *LOAD Command* on page 80.

Changing a LEC to an IP-over-ATM Client

One LEC per adapter can be changed to an IP-over-ATM client. The prerequisites for changing a LEC are:

- TCP/IP is installed on the machine
- The target LEC is configured to use the TCP/IP protocol

For more information on these items, see *Configuring Protocols and Parameters* on page 75.

To change a LEC to an IP-over-ATM client:

1. Find the set of `LOAD` and `BIND` commands in the `AUTOEXEC.NCF` file that represent the client you want to change to an IP-over-ATM client.

For example, if you configured Channel 3 (Client 3) for TCP/IP communications, you would look for a set of commands similar to:

```
LOAD 5515SI CHANNEL=3 NAME=ch3_sta12
      FRAME=Ethernet_II ELAN=admin SLOT=1

BIND IP to ch3_sta12 ARP=Yes
      ADDRESS=123.234.100.015 MASK=255.255.255.0
```

2. To make this client an IP-over-ATM client, add the term `IPENABLE=Y` to the end of the `LOAD` line.

For example:

```
LOAD 5515SI CHANNEL=3 NAME=ch3_sta12
      FRAME=Ethernet_II ELAN=admin SLOT=1
      IPENABLE=Y
```

Editing the Bootup Configuration File

For more information about these settings, see *Formatting Commands* on page 80.

3. Make sure the following command precedes the file's first `LOAD` command for the driver:

```
LOAD TCPIP RIP=Yes FORWARD=No
```

(`LOAD TCPIP` is required. The `RIP` and `FORWARD` variables are optional, depending on your needs for your server.)

Configuring Multiple Adapters

The NetWare `install` utility does not provide for multiple adapter configurations. You must install driver commands manually for each additional adapter in the server. Install the commands manually by adding a set of `LOAD` and `BIND` commands in the `AUTOEXEC.NCF` file for each client on each additional adapter. The easiest way to add these commands is to copy and paste a set of existing commands, and then edit the parameters to support a different adapter.

To configure multiple adapters:

1. Find and copy a set of `LOAD` and `BIND` commands for an existing client that are similar to the commands you want to use for a client on the new adapter.
2. Paste the commands above the `load asig` command (which was inserted after the last `BIND` command for the group of clients, as described in step 2 of *Automating ATM Startup* on page 84.)
3. Edit the parameters to support a different adapter.

For example, if you are installing an additional adapter in slot #2 with IPX for one client and TCP/IP for a

second client, you might enter commands in the `AUTOEXEC.NCF` file similar to the following:

```
LOAD 5515SI CHANNEL=1 NAME=ch1_sta22
      FRAME=Ethernet_802.3 ELAN=engr2 SLOT=2

BIND IPX to ch1_sta22 NET=99A64B52

LOAD 5515SI CHANNEL=2 NAME=ch2_s22
      FRAME=Ethernet_II ELAN=engr3 SLOT=2

BIND IP to ch2_s22 ARP=Yes
      ADDRESS=123.234.100.015 MASK=255.255.255.0
```

For more information about these commands, see *Formatting Commands* on page 80.

4. Continue to copy, paste, and edit the `LOAD` and `BIND` commands until all clients needed on all adapters are properly configured.
5. Make sure the following command precedes the file's first `LOAD` command for the driver:

```
LOAD TCPIP RIP=Yes FORWARD=No
```

(`LOAD TCPIP` is required. The `RIP` and `FORWARD` variables are optional, depending on your needs for your server.)

Completing the Driver Installation

When you finish editing the `AUTOEXEC.NCF` file as described in the previous sections, complete the driver installation by doing the following:

1. Save and exit the `AUTOEXEC.NCF` file.
2. Exit the NetWare `install` utility.
3. Reboot the server.

Removing a Driver

At this point, if you have not yet installed the adapter(s), shut down the machine and do so now, as described in *Hardware Installation* on page 7.

Next, with the driver and adapter(s) installed, start CellView and configure the adapter(s) as described in *Using CellView for NetWare Servers* on page 93.

If you need to verify the driver is up and running, see *Verifying Driver Installation* on page 119.

Removing a Driver

To remove a driver from the `AUTOEXEC.NCF` file:

1. At the system prompt, enter the command
`load install`
2. When the Installation Options menu appears, select **NCF files options**, then select **Edit the autoexec.ncf file** to open the file for editing.
3. Remove the `LOAD` and `BIND` commands for each channel of the adapter by deleting all lines similar to the following:

```
LOAD 5515SI CHANNEL=1 NAME=ch1_s12
      FRAME=Ethernet_802.3 ELAN=enr2 SLOT=2
BIND IPX to ch1_s12 NET=99A64B52
```

If the driver(s) are not being reinstalled, then remove the commands:

```
load asig
load cvconf
```

4. Save and exit the `AUTOEXEC.NCF` file.
5. Exit the NetWare `install` utility.

6. Reboot the server.



CAUTION

Do not attempt to reinstall the driver before rebooting the NetWare server.

The driver removal is complete.



Removing a Driver



Using CellView for NetWare Servers

6

Overview

This chapter provides information about CellView for NetWare, a text-based utility that enables you to configure ATM clients and services for adapters in file servers running Novell NetWare Server version 3.12, 4.10, or 4.11.

This chapter describes the following:

- CellView features
- ATM address format
- Configuration requirements
- CellView startup procedure
- Setup procedures
- CellView statistics

CellView Features

CellView enables you to:

- Enable, disable, and configure up to four LAN Emulation Clients (LECs), or 3 LECs and one IP-over-ATM client, per adapter
- Set up PVC connections with other end stations
- Enable, disable, and configure up to eight LAN Emulation Servers (LESSs) and one IP-over-ATM ARP server per adapter
- Enable, disable, and configure one LAN Emulation Configuration Server (LECS) per adapter

ATM Address

- Display operating statistics for:
 - SONET, signalling, and cell-level activity
 - ATM Adaptation Layer 5 (AAL5) activity
 - LEC membership and activity
 - IP-over-ATM activity
 - LECS and LES activity

All screens and dialogs are in text format and require input from the keyboard to navigate the utility. You do not have to reboot the server for the edits to take effect. Pressing the **F10** key at any time sends your changes to the driver for immediate, dynamic update.

ATM Address

During configuration, you will need to know the end station's unique ATM address. The ATM address consists of two components, the network prefix and the ESI/Selector.

The network prefix is the 13-byte link address of the adapter, as set by the ATM switch.

The ESI/Selector consists of a unique end station identifier (ESI) and a pointer (selector) with the following values:

- The ESI value is the 6-byte MAC address of the adapter (00:00:77:86:da:61 in the example).
- The Selector value is a 1-byte pointer to clients and services located in the end station (00 in the example).

The Selector value for the end station is always 00. The Selector values for the clients and services located in the end station are as follows:

Item Number	Range of Selector Values
LEC1 – LEC4	0x00–0x03
LES1 – LES8	0x20–0x27
BUS1 – BUS8	0x40–0x47

Configuration Requirements

The degree of configuration needed for the adapter(s) depends largely on whether the services are already installed on the network. For example, if the LECS, LESs and ARP server are running elsewhere in the network, you need to enable and configure only the local clients.

At least one LEC or IP-over-ATM client must be enabled and fully configured on each adapter before running applications on the network.

Before you begin the configuration procedures described in this chapter, the following prerequisite requirements must be met:

- At least one adapter is installed in the end station.
- The driver for your operating system is installed.
- The NetWare server has been rebooted after the driver installation.

If any of these tasks are not complete, please complete them now. See the appropriate chapter(s) or addendum(s) for instructions.

Starting CellView

Starting CellView

To start the CellView utility, enter the command
load cellview

The main CellView dialog appears:

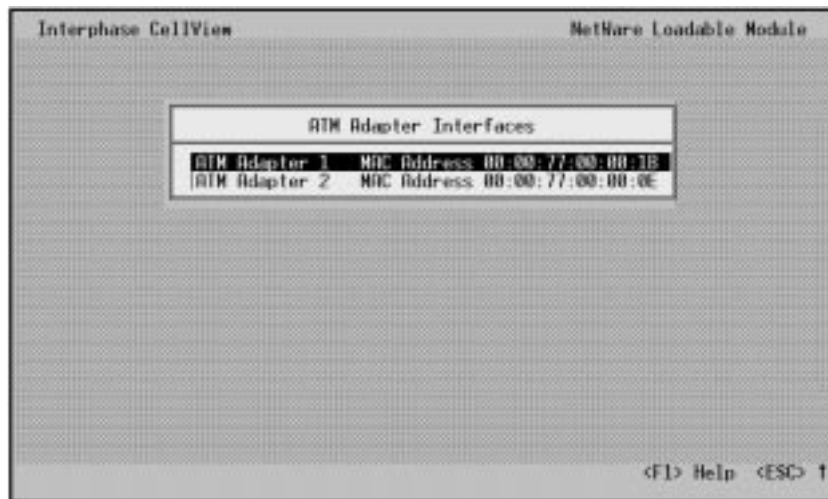
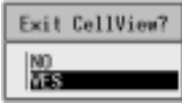


Figure 6-1. Main CellView Dialog

The ATM Adapter Interfaces box of the main CellView dialog lists the adapter(s) installed in the NetWare server. The contents of subsequent Setup and Statistics dialogs apply to the adapter highlighted in the ATM Adapter Interfaces box.

The following table describes the keyboard commands available on the main CellView dialog:

Press this key...	To do this...
F1 (Help)	Activate the Help dialog.

Press this key...	To do this...
ESC (Exit)	Exit CellView.  When you press ESC, a dialog appears prompting you to select NO to return to CellView or YES to exit.
Enter (Select)	Select the adapter highlighted in the ATM Adapter Interfaces box. The contents of subsequent dialogs apply to this adapter.

After you select an adapter, the ATM Adapter dialog appears:

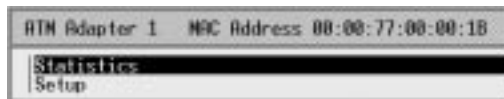


Figure 6-2. ATM Adapter Selections

The ATM Adapter dialog provides the following selections:

Select...	To do this...
Statistics	To display the status of: <ul style="list-style-type: none"> • Signalling • AAL5 • LECs • LESs • LECS • IP-over-ATM (1577) client and ARP server

Setup

Select...	To do this...
Setup	To configure: <ul style="list-style-type: none"> • LECs • LEC PVC connections • LESs • LECS (on same adapter as the LESs) • IP-over-ATM (1577) client and ARP server • IP-over-ATM (1577) PVC connections

Setup

Use the CellView Setup dialogs to configure your adapter(s) for use on the ATM network. You can configure up to four LECs, or three LECs and one IP-over-ATM client, per adapter. The number of clients per adapter is specified during driver installation.

You can also configure one LECS and up to eight LESs per adapter for the ATM network. If you will be enabling the LECS and LESs, it is recommended that you configure these before configuring clients.

Following is an overview of the procedures to use to configure network services for each adapter in an end station. The topics in this section provide detailed information about each of these procedures.

1. On the main CellView dialog, highlight the adapter you are configuring, and press **Enter**.
2. Highlight **Setup** and press **Enter** to make dialogs available for setting up clients and servers.

3. **If the LECS and the LES(s) will be on this machine,** use the LECS and LES dialogs to configure these servers.
4. On the LEC dialogs, configure the LECs specified for the adapter during driver installation.
5. On the 1577 dialogs, configure the IP-over-ATM client and ARP server, if specified for the adapter during driver installation.

Make changes take effect at any time by pressing the **F10** key.

The following table identifies where to find information about CellView Setup tasks:

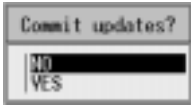
For information about...	See page...
<i>Setup Keyboard Commands</i>	99
<i>Setting Up LAN Emulation Clients</i>	100
<i>Setting up LEC PVCs</i>	104
<i>Setting up IP-over-ATM Client and Server</i>	107
<i>Setting up IP-over-ATM PVCs</i>	110
<i>Setting Up a LAN Emulation Configuration Server</i>	113
<i>Setting Up a LAN Emulation Server</i>	116

Setup Keyboard Commands

The following table describes the common keyboard commands available on the Setup dialogs:

Press this key...	To do this...
F1 (Help)	Activate the Help dialog.

Setup

Press this key...	To do this...
F2 (Edit)	Change the current dialog to edit mode.
F10 (Commit)	Send your changes to the driver for immediate, dynamic update.
TAB (Move)	Move the cursor to the next edit field in the dialog if the edit mode (F2) is active; otherwise, move the cursor to the next dialog.
<numeric keys 1–4>	Select clients 1–4 when displaying the LEC dialogs. The option appears at the bottom of the dialog when more than one client is initialized for the adapter.
<numeric keys 1–8>	Select servers 1–8 when displaying the LES dialogs.
ESC (Exit)	<p>Exit the dialog.</p>  <p>When you exit a Setup dialog after making changes, you are prompted to commit updates. If you want to save updates, select YES to send them to the driver for immediate action. You do not have to reboot the machine for the changes to take effect. Otherwise, select NO to discard updates.</p>

Setting Up LAN Emulation Clients

CellView provides a separate dialog to set up each LEC that was initialized during driver installation. On the LEC dialog, you can enable the LEC, and set parameters for the LEC to establish communications with an LECS at bootup or to contact an LES directly.

After you enable the client, you can also enable SVC and PVC communications or PVC-only communications. PVC setup is explained in *Setting up LEC PVCs* on page 104.

To set up a LEC:

1. On the main CellView dialog, highlight the adapter you want to configure and press **Enter**.
2. Select **Setup**.

The LEC dialog appears for LEC 1:

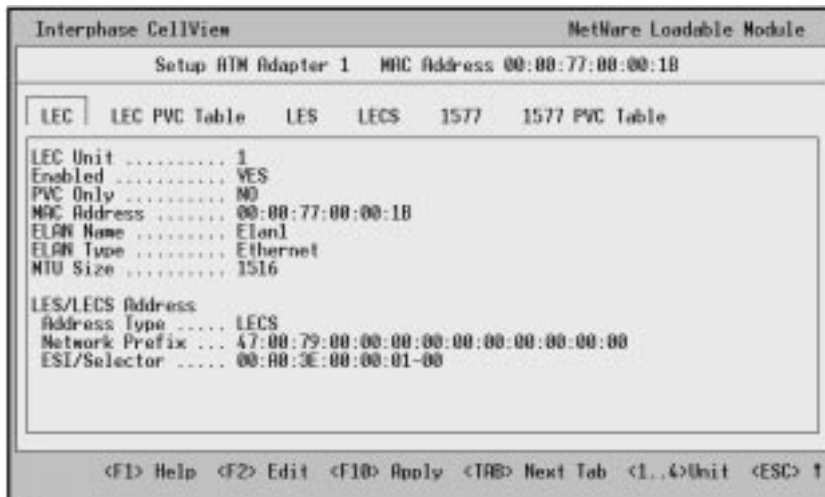
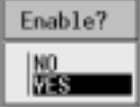
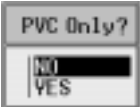


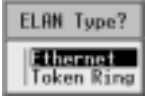
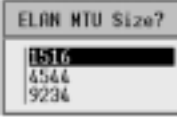
Figure 6-3. CellView LEC Setup

3. If more than one LEC is initialized for the adapter and you want to edit a client other than LEC 1, press numeric key **2**, **3**, or **4** to select LEC 2, LEC 3, or LEC 4.
4. Press **F2** to edit the LEC dialog.
5. Enter information in the LEC dialog fields, as follows:


Use this field...	To do this...
LEC Unit	Select the LEC you want to configure.

Setup

Use this field...	To do this...
Enabled	<p>Set to YES to enable the LEC.</p>  <p>If using PVC-only activity, the client must be enabled for the driver to recognize the client.</p>
PVC Only	<p>Enable PVC-only activity for the client (and disable SVC activity).</p>  <p>If you select to enable PVC-only activity, you must set up the PVC table as described in <i>Setting up LEC PVCs</i> on page 104.</p>
MAC Address	<p>View the MAC address of the LEC. LEC 1 is assigned the base address for the adapter. The remaining LECs use an increment of the base address for their MAC addresses.</p> <p>If the LEC is enabled as Token Ring, the MAC Address is displayed in non-canonical format.</p>
ELAN Name	<p>Identify the network name of the emulated LAN you want the client to join.</p> <p>Some configuration servers require a name while others do not. The Interphase LECS and LESs require a name only in the following cases:</p> <ul style="list-style-type: none"> • The Strict ELAN Name field is enabled on the LES dialog. • You need to differentiate between two or more LESs with the same MTU size and ELAN type. <p>For exact requirements, see your server documentation. For information about setting up Interphase servers, see <i>Setting Up a LAN Emulation Configuration Server</i> on page 113 and <i>Setting Up a LAN Emulation Server</i> on page 116.</p>

Use this field...	To do this...
ELAN Type	 <p>Select the ELAN type (Ethernet or Token Ring). All nodes on the same logical subnet must use the same ELAN type.</p>
ELAN MTU Size	 <p>Select the requested ELAN MTU size. The client uses this entry when making a request to join a LES. The MTU returned to the client is equal to or less than the requested value.</p> <p>Recommended settings are:</p> <ul style="list-style-type: none"> • ELAN with Ethernet edge device: 1516 • ELAN with Token Ring edge device: 4544 • ELAN with ATM end stations only: 9234 <p>All nodes on the same logical subnet must use the same MTU size.</p> <p>CAUTION: At driver installation, the default MTU size value is 1516. Do not select a different value for the ELAN MTU Size unless the MTU value in the client's <code>LOAD</code> line in the <code>AUTOEXEC.NCF</code> file is changed accordingly. The CellView setting and the <code>AUTOEXEC.NCF</code> file setting must be the same. See <i>Editing Client MTU Size</i> on page 85.</p> <p>Also, if you use a MTU size of 4544 or 9234 for any client, the maximum packet size for the system must be set to accommodate the larger MTU size. See <i>Editing System Maximum Packet Size</i> on page 78.</p>

 Setup

Use this field...	To do this...
LECS/LES ATM Address	 <p>Select the mode of contact at bootup. uses the 20-byte address in the ATM address fields to contact a LES directly.</p> <p>LECS contacts the LECS with the 20-byte ATM address in the Network Prefix and ESI/Selector fields. (The default address is the ATM Forum's well-known address.)</p>

Setting up LEC PVCs

Use the LEC PVC Table to set up PVC connections between a LEC and other network end stations.



NOTE

You must enable the LEC before it can use PVC communications. Also, if the PVC Only parameter in the LEC dialog is set to YES, make sure the LEC's MTU Size is set to the appropriate value for PVC communications.

Changes to the PVC Table take effect immediately and do not require you to reboot the computer.

To set up the LEC PVC Table:

1. If you have not done so, enable the LEC, as described in *Setting Up LAN Emulation Clients* on page 100. Then exit the LEC dialog.
2. Tab to **LEC PVC Table**.

3. If more than one LEC is initialized for the adapter and you want to edit a table other than for LEC 1, press numeric key **2**, **3**, or **4** to select the table for LEC 2, LEC 3 or LEC 4.

4. Press **F2**.

The PVC table for the client appears:

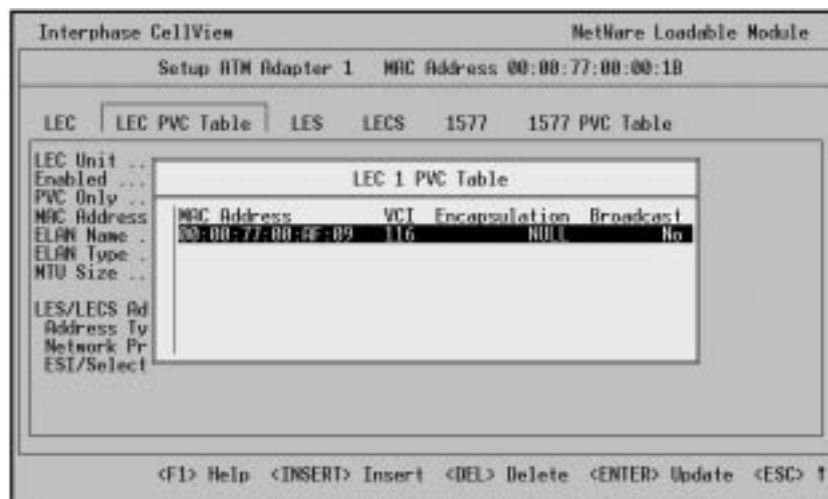


Figure 6-4. LEC PVC Table

In this example, the table for LEC 1 is selected.

A 6-byte MAC address and a VCI number are associated with each PVC. Packets from the upper layers whose destination MAC address matches an address in the PVC table are transmitted on that PVC.

In addition to providing setup information in the PVC Table, you must also consider the following when configuring PVCs:

- All PVCs must be configured in the adapters and the switch(es) manually.

Setup

- The MAC address of the target station must be mapped to a VCI in the local host.
- The MAC address of the local client must be mapped to a VCI in the target station.

You can use the keyboard options to add, modify, or delete PVC table entries, as described in the following topics.

Adding or Modifying LEC PVC Entries

To add or modify PVC table entries for the LEC:

1. Press **Insert** to add a PVC setting; or highlight the appropriate entry and press **Enter** to revise a PVC setting.

The following dialog appears:

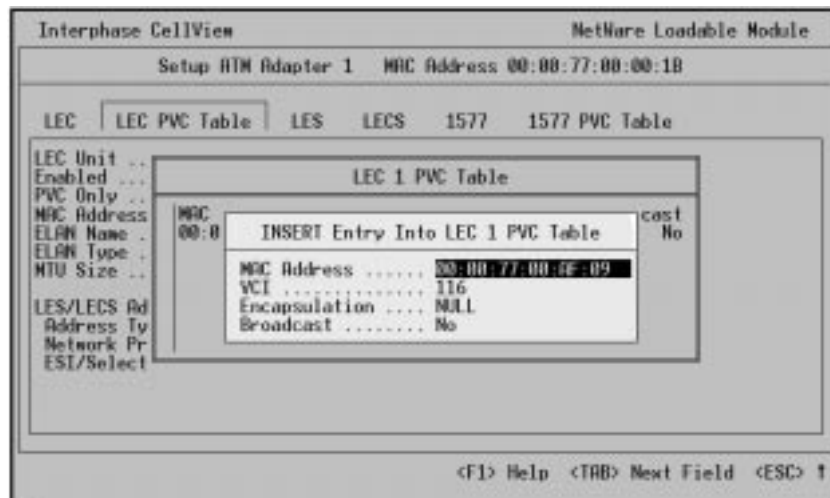
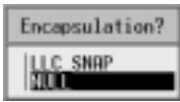
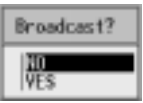


Figure 6-5. PVC Settings for LECs

2. Enter information in the PVC Settings dialog fields as follows:

Use this field...	To do this...
MAC Address	Enter the 6-byte address of the target station. Use the natural format for the ELAN. For example, for a Token Ring ELAN, use non-canonical format.
VCI	Enter the VCI number the LEC uses to communicate with the target station. The range is 32–1023. (The corresponding VPI cannot be edited and is fixed at a value of zero.)
Encapsulation	 Select the encapsulation method (LLC_Snap or Null). The host and target must use the same encapsulation method. See <i>Multiprotocol Encapsulation over ATM AAL5</i> on page 162 for an explanation of these encapsulation methods.
Broadcast	 Set to YES to enable the entry as a Broadcast PVC. If enabled, all broadcast/multicast packets from the upper layers are transmitted on this PVC. A maximum of 16 Broadcast PVCs can be enabled on each LEC.

Deleting LEC PVC Entries

To delete a PVC table entry, highlight the entry and press **Delete**.

Setting up IP-over-ATM Client and Server

The IP-over-ATM client conforms to the RFC-1577 specification using Classical IP-over-ATM where no multicast or broadcast services are available.

Setup

Using the 1577 dialog, you can enable the Classical IP-over-ATM client and enable the host adapter as the Address Resolution Protocol (ARP) server for the network.

After you enable the client, you can also enable SVC and PVC communications or PVC-only communications. PVC setup is explained in *Setting up IP-over-ATM PVCs* on page 110.

To set up an IP-over-ATM client/server configuration:

1. On the main CellView dialog, highlight the adapter you want to configure and press **Enter**.
2. Select **Setup**, and then tab to **1577** to display the 1577 dialog:

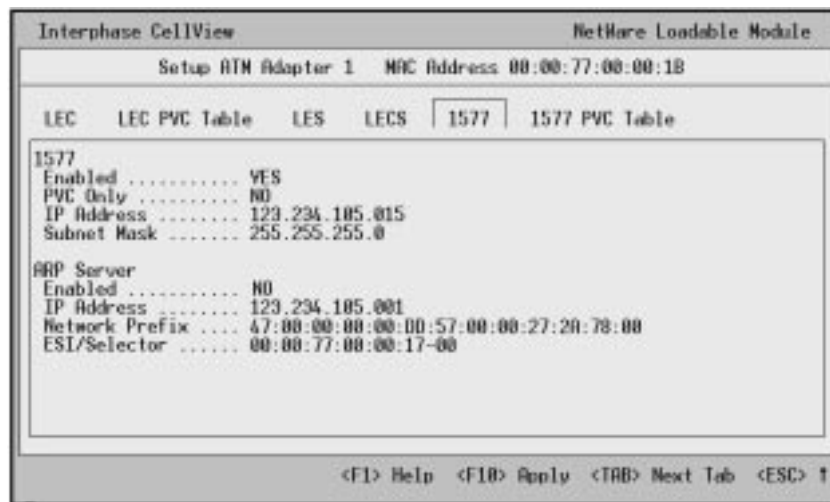
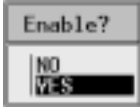
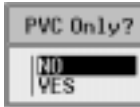
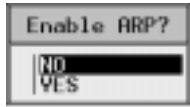


Figure 6-6. CellView IP-over-ATM Setup

3. Press **F2** to edit the 1577 dialog.
4. Enter information in the 1577 dialog fields, as follows:

Use this field...	To do this...
Enabled	Set to YES to enable the Classical IP-over-ATM client.  If using PVC-only activity, the client must be enabled for the driver to recognize the client.
PVC Only	Enable PVC-only activity for the client (and disable SVC activity).  If you select to enable PVC-only activity, you must set up the PVC table as described in <i>Setting up IP-over-ATM PVCs</i> on page 110.
IP Address	Verify or enter the client's IP address.
Subnet Mask	Verify or enter the client's subnet mask identifier.
ARP Server: Enabled	 Set to YES to enable the host adapter as the ARP server for your IP-over-ATM network.
ARP Server: IP Address	If the host adapter is not the ARP server, enter the IP address of the ARP server located elsewhere in the network.
ARP Server: Network Prefix and ESI/Selector	If the host adapter is not the ARP server, enter the ARP server's ATM address, which consists of the Network Prefix and ESI/Selector. (For details about the address structure, see <i>ATM Address</i> on page 94.) The IP-over-ATM driver must know the ATM address of the ARP server. When the system is powered up, it calls the ARP server with this ATM address.

Setup

Setting up IP-over-ATM PVCs

Use the 1577 PVC Table to set up PVC connections between the local IP-over-ATM client and other end stations on the network.



NOTE

You must enable the IP-over-ATM client before it can use PVC communications.

Changes to the PVC Table take effect immediately and do not require you to reboot the computer.

To set up the IP-over-ATM PVC Table:

1. If you have not done so, enable the IP-over-ATM client, as described in *Setting up IP-over-ATM Client and Server* on page 107. Then exit the 1577 dialog.
2. Tab to **1577 PVC Table**.
3. Press **F2**.

The 1577 PVC Table dialog appears:



Figure 6-7. PVC Table for IP-over-ATM

An IP address and VCI number are associated with each PVC. Packets from the upper layers whose destination address matches an address in the PVC table are transmitted on that PVC.

In addition to providing setup information in the PVC Table, you must also consider the following when configuring PVCs for the IP-over-ATM client:

- All PVCs must be configured in the adapters and the switch(es) manually.
- The IP address of the target station must be mapped to a VCI in the local host.
- The IP address of the local client must be mapped to a VCI in the target station.

You can use the keyboard options to add, modify, or delete PVC table entries, as described in the following topics.

Setup

Adding or Modifying IP-over-ATM PVC Entries

To add or modify PVC table entries for an IP-over-ATM client:

1. Press **Insert** to add a PVC setting; or highlight the appropriate entry and press **Enter** to revise a PVC setting.

The following dialog appears:

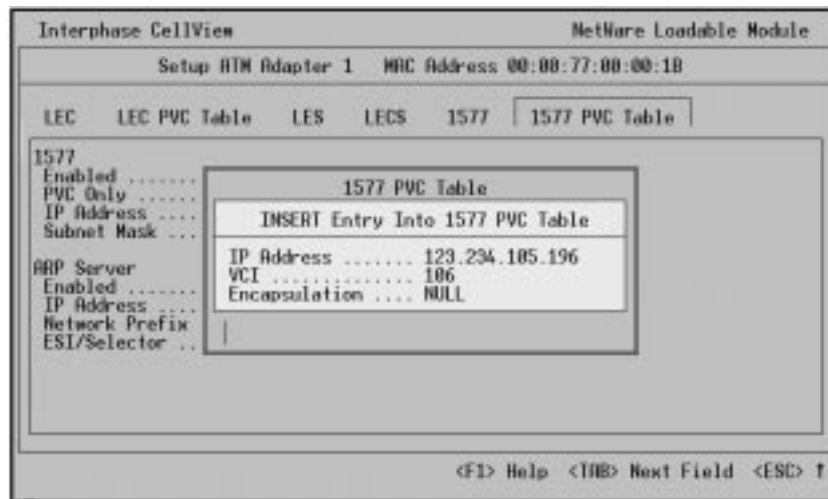



Figure 6-8. PVC Settings for IP-over-ATM

2. Enter information in the 1577 PVC Table fields as follows:

Use this field...	To do this...
IP Address	Enter the IP address of the target station.
VCI	Enter the VCI number the IP-over-ATM client uses to communicate with the target. The range is 32–1023. (The corresponding VPI cannot be edited and is fixed at a value of zero.)

Use this field...	To do this...
Encapsulation	 <p>Select the encapsulation method (LLC_Snap or Null). The host and target must use the same encapsulation method.</p> <p>See <i>Multiprotocol Encapsulation over ATM AAL5</i> on page 162 for an explanation of these encapsulation methods.</p>

Deleting IP-over-ATM PVC Entries

To delete a PVC table entry, highlight the entry, and press **Delete**.

Setting Up a LAN Emulation Configuration Server

To communicate on an ATM network, a LEC must join an emulated LAN (ELAN). The ELAN consists of a group of end stations which communicate among themselves with the same MTU size, the same frame format, and the same broadcast/multicast services. The LAN Emulation Server (LES) is the central server for the ELAN. The LAN Emulation Configuration Server (LECS) manages which LEC joins which LES.

The LECS must reside on the same ATM adapter with the LESs it serves; it cannot communicate with LESs across the network. You must enable the LECS and associated LESs before configuring the LECs which join LESs.

Setup

The LECS provides a central point of contact on the network for each LEC at bootup. The LEC sends the LECS a request for the type of ELAN it wants to join. The LECS responds with the current ATM address and the configuration parameters of the LES that serves the requested ELAN.

To set up the LECS:

1. On the main CellView dialog, highlight the adapter you want to configure and press **Enter**.
2. Select **Setup**, then tab to **LECS** to display the LECS dialog:

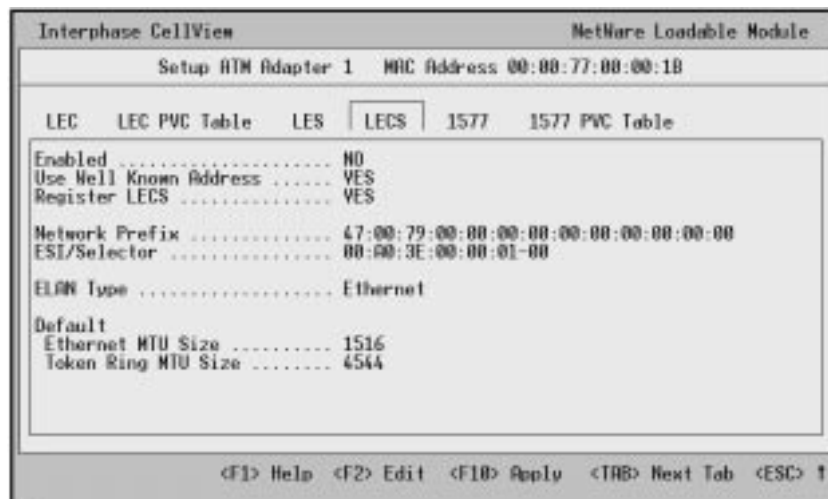
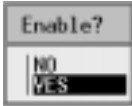


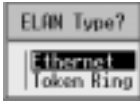


Figure 6-9. CellView LECS Setup

3. Press **F2** to edit the dialog.
4. Enter information in the LECS dialog fields as follows:

Use this field...	To do this...
Enabled	 <p>Set to YES to enable the LECS and all permanent mappings of LECS to specific LESs.</p>
Use Well Known Address	 <p>Set to YES to enable the loading of the ATM Forum's well-known address to the Network Prefix and ESI/Selector fields. When enabled, these address fields cannot be edited.</p>
Register LECS	 <p>Set to YES to register the ATM address in the Network Prefix and ESI/Selector fields with the switch at bootup.</p>
ELAN Type	 <p>Select a default ELAN type (Ethernet or Token Ring) to assign to an LEC if the LEC's configuration request omits the ELAN type.</p> <p>If the request also omits the MTU size, the corresponding value in the Default Ethernet MTU Size field or Default Token Ring MTU Size field is returned to the client.</p>
Default: Ethernet MTU Size	View the default Ethernet MTU size. For Ethernet, an MTU size of 1516 is assigned to an LEC if the LEC's configuration request omits the MTU size.
Default: Token Ring MTU Size	View the default Token Ring MTU size. For Token Ring, an MTU size of 4544 is assigned to an LEC if the LEC's configuration request omits the MTU size.

Setting Up a LAN Emulation Server

To communicate on an ATM network, a LEC must join an emulated LAN (ELAN). The ELAN consists of a group of end stations which communicate among themselves with the same MTU size, the same frame format, and the same broadcast/multicast services. The LAN Emulation Server (LES) is the central server for the ELAN. It provides address registration, address resolution, and broadcast services for all ELAN members. The LAN Emulation Configuration Server (LECS) manages which LEC joins which LES.

The driver allows up to eight LESs to be enabled per adapter at one time (therefore allowing adapter support for up to eight ELANs). LESs must reside on the same ATM adapter with the LECS that serves them; they cannot communicate with the LECS across the network. You must enable a LES and its associated LECS before configuring LECs to join the LES.

When a LEC joins a LES, the MAC-ATM relationship of the client is registered with the LES. The LES maintains a running account of these addresses to resolve queries from ELAN members. The connection between the LES and each LEC is a permanent, open connection as long as the client is running.

The LES maintains a table of client information which it uses to provide address resolution services to the ELAN. When an end station is disconnected or turned off, the LES removes client(s) from the table automatically. Therefore, relocating an end station is a matter of physically moving the hardware and connecting it to the same or another ATM switch. At bootup, the client(s) rejoin the previous LES with a new ATM address.

CellView provides a separate dialog for each LES-ELAN setup. Changes to the LES dialogs are dynamic, and take effect when you exit the dialog or press the **F10** key.

To set up a LES:

1. On the main CellView dialog, highlight the adapter you want to configure and press **Enter**.
2. Select **Setup**, and then tab to **LES**.
3. The LEC dialog appears for LES 1:

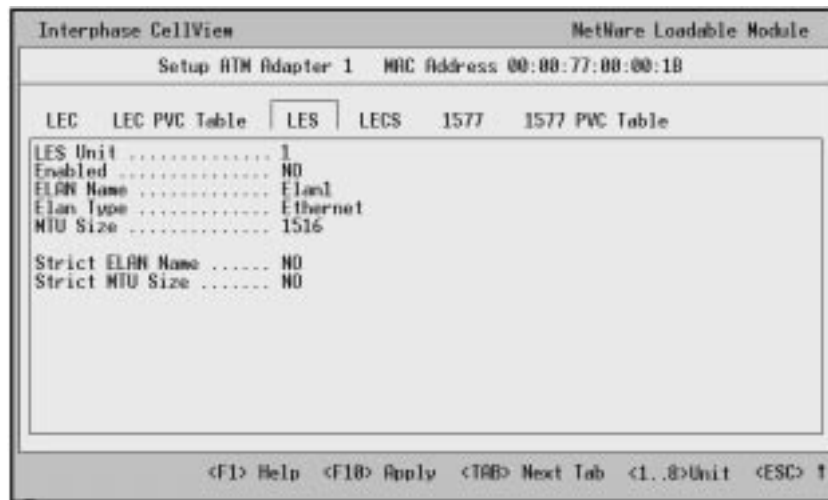
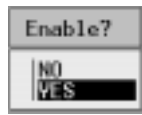
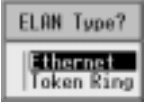
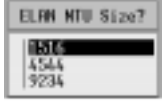
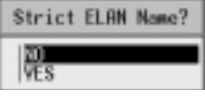


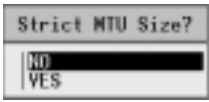
Figure 6-10. CellView LES Setup

4. If you want to edit a LES other than LES 1, press the appropriate numeric key (**2–8**) to select the dialog corresponding to the LES you want to edit.
5. Press **F2** to edit the LES dialog.
6. Enter information in the LES dialog fields, as follows:

Use this field...	To do this...
Enabled	 Set to YES to enable the LES.

Setup

Use this field...	To do this...
ELAN Name	<p>Enter the name of the ELAN for which the LES provides services (not required for a LEC to join the group).</p> <p>If the Strict ELAN Name field (on this dialog) is set to YES, the ELAN name in the LEC request must exactly match this name (case sensitive). Otherwise, the server prevents the LEC from joining the group.</p>
ELAN Type	 <p>Select the ELAN type (Ethernet or Token Ring) to use for all communications between end stations.</p> <p>If the ELAN includes an edge device to a legacy LAN, the ELAN type must be set to interface with that edge device.</p>
ELAN MTU Size	 <p>Select the MTU size for the ELAN for which the LES provides services. Recommended options are:</p> <ul style="list-style-type: none"> • ELAN with Ethernet edge device: 1516 • ELAN with Token Ring edge device: 4544 • ELAN with ATM end stations only: 9234 <p>If the Strict MTU Size field (on this dialog) is set to YES, the request from the LEC must exactly match the ELAN MTU Size. Otherwise, the server prevents the LEC from joining the group.</p>
Strict: ELAN Name	 <p>Set to YES to specify that the ELAN Name in the LEC's request must exactly match the entry in the ELAN Name text field on this dialog (case sensitive).</p>

Use this field...	To do this...
Strict: MTU Size	 <p>Set to YES to specify that the ELAN MTU Size in the LEC's request must exactly match the entry in the ELAN MTU Size field on this dialog.</p>

Statistics Information

The dialogs in the Statistics group provide statistics about installed adapters that can help you check for proper driver operation and troubleshoot network problems.

To see statistics about an installed adapter, select the adapter on the main CellView dialog, and then select **Statistics**.

Verifying Driver Installation

You can use information in the Statistics dialogs to verify that the driver is up and running properly. When the end station boots up, certain systems communications must occur between the client and the server (through the switch) so the client can log on to the network. Statistics routines monitor the state of client and server traffic, as well as signalling and AAL5 traffic.

To do a quick check of an adapter's operating statistics:

1. Start the CellView utility with the command
`load cellview`
2. On the main CellView dialog, if more than one adapter is installed in the machine, select an adapter.
3. Select **Statistics**, and check the following indicators in the Signalling dialog:

Statistics Information

- In the Signalling State box, the ILMI, QSAAL, and Signalling field values should be similar to:
ILMI: **Up**
QSAAL: **Up**
Signalling: **Init**
 - In the State Detail box, the ILMI, QSAAL, and Signalling field values should be similar to:
ILMI: **Registered**
QSAAL: **Ready**
Signalling: **Ready**
 - In the Signalling Statistics box, both ILMI Frames In and ILMI Frames Out should indicate traffic.
- 4.** Select **AAL5**, and check the following indicators:
- All six text fields under SONET should read **OK**.
 - The fields in the AAL5 Statistics box should indicate traffic.
- 5.** If at least one LEC on the adapter is enabled, select **LEC**, and do the following.
- a.** Select an enabled LEC.
The LEC State field should read **Ready**.
 - b.** Select **LEC (CCT)** for the client.
The Tx Packets and Rx Packets fields of the display boxes should indicate traffic.
 - c.** Repeat steps a and b for all enabled LECs.
- 6.** If the IP-over-ATM client is enabled, select **1577**, and check the following indicators.
- The 1577 State field should read **Ready**.
 - The 1577 Statistics fields should indicate traffic.

7. If more than one adapter is installed in the machine, repeat steps 2 through 6 for each additional adapter.

If you find an item in error, the driver might be incorrectly installed or configured. If you suspect a problem with your driver setup, see *Problems and Possible Solutions* on page 124.

Troubleshooting

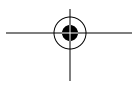
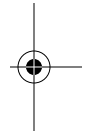
You can use the Statistics dialogs to provide helpful information when you contact Interphase support personnel concerning ATM network problems. Statistics dialogs display network statistics gathered by CellView, such as signalling and traffic information, for the clients and servers on the adapter(s) installed in an end station.

CellView gathers network operation statistics for local Interphase clients and servers only. It does not gather statistics from switches or from other end stations.

For additional information about troubleshooting network problems, see *Problems and Possible Solutions* on page 124.



Statistics Information



Troubleshooting

7

Overview

This chapter provides possible solutions for common problems encountered while installing and operating the ATM adapter. Before proceeding with the troubleshooting, make sure you have carefully followed the steps for installing the hardware and the software, and have rebooted the system. Also, check the systems log for your operating system to see what kind of errors, if any, are being recorded. This may provide some insight to the problem.

If the information in this chapter does not resolve the problem, contact Interphase Customer Support at one of the locations listed in the front of this users guide.

Interpreting LEDs

The adapter has two LEDs:

- Green Link LED
- Yellow Status LED

The following table provides information about LED states:

This LED...	In this State...	Means...
Link	Off	The adapter is not receiving a signal from a switch or remote system.
Link	Solid Green	The adapter is receiving a signal from a switch or remote system.

Problems and Possible Solutions

This LED...	In this State...	Means...
Status	Off	The adapter does not have power.
Status	Solid Yellow	The adapter has power.
Status	Flashing Yellow	The driver is loaded and the interface has been configured.

The green Link LED indicates the condition of the physical link between the adapter and the ATM switch. When the Link LED is lit, light or electrical current is flowing between the two sets of hardware; however, data may or may not be flowing through the cable.

The yellow Status LED serves two functions. When the machine is turned on, the LED glows a solid yellow to indicate that the adapter has power. When it begins flashing to indicate that the software driver is loaded and an adapter interface has been configured.

Problems and Possible Solutions

This section presents possible solutions for the following types of adapter problems:

- Link and status problems
- Bootup problems
- Network problems

Link and Status Problems

Problems indicated by the Link and Status LEDs might be related to hardware failure, inadequate power access, or improper driver installation.

Problem	Possible Solution
Link LED not lit	<p>A failure in the hardware is preventing the adapter from completing a physical link with the switch.</p> <ol style="list-style-type: none">1. Check the switch. It must be up and running for the adapter to make a link.2. Unplug and reinstall the connectors.3. Try a known good cable.4. Check the transmit and receive wiring to see if they are reversed.5. If a known good cable is installed, try another adapter in the PMC expansion slot. <p>If the green LED does not illuminate, the problem is probably at the switch. Confirm this by configuring the cable to another port on the switch.</p>
Status LED not lit	<p>Power is not getting to the adapter.</p> <ol style="list-style-type: none">1. Do a power reset of the computer by turning the power off and then on again.2. Make sure the adapter is seated correctly in the PMC expansion slot. Check for a bent pin or crack in the connector.3. Try another PMC expansion slot.4. Try another adapter known to operate correctly.

Problems and Possible Solutions

Problem	Possible Solution
Status LED lit, but not flashing	<p>The driver is not installed correctly, or the network interface is not configured.</p> <ol style="list-style-type: none">1. If the driver is not installed, install it.2. If the driver is installed, check your system's error message log to see if any errors pertaining to the ATM driver were recorded during bootup. This might provide some insight to the problem.3. Reinstall the driver if it is not installed correctly.4. If the driver is installed correctly, you might need to configure the network protocols, as described in the driver installation instructions for your system.

Bootup Problems

Bootup problems are usually hardware related. For example, the adapter is located in the wrong slot, or the bus address is incorrect or in conflict with another device. If the machine worked properly before the adapter was installed, then the problem is probably with the adapter or with the hardware that was removed and replaced during installation of the adapter.

Problem	Possible Solution
Computer does not boot up	<ol style="list-style-type: none"><li data-bbox="667 516 1226 611">1. Check to see if the adapter is properly seated in the PMC expansion slot. Reseat the adapter and restart the machine.<li data-bbox="667 621 1226 653">2. Try a different PMC expansion slot.<li data-bbox="667 663 1226 789">3. Remove the adapter and reboot the system. If the system boots up and returns to a normal state, the adapter is probably defective. Confirm this by installing an adapter known to work correctly.<li data-bbox="667 800 1226 890">4. If this is not the problem, try changing the interrupt setting or removing other hardware on the bus until the conflict is located.

Problems and Possible Solutions

Problem	Possible Solution
Host adapter not found	<p>The system cannot find or does not recognize the adapter. The PCI system in your computer is supposed to automatically configure the bus address locations; therefore, an address conflict is probably not the problem. If the driver is installed correctly, a driver message should appear in the message log when computer boots up.</p> <ol style="list-style-type: none"><li data-bbox="638 730 1205 919">1. If this is your first bootup since installing the adapter, the adapter hardware interrupt or configuration registers might not match what the system expects. Instead of rebooting the system, turn the power off and then on again to reset all components to an initial state.<li data-bbox="638 930 1205 1056">2. The adapter might be installed in the wrong slot. Make sure the adapter is in the slot for which the driver is configured. See your system manual(s) for the location of the PMC expansion slots.<li data-bbox="638 1066 1205 1129">3. Make sure the adapter is seated correctly in the PMC expansion slot.<li data-bbox="638 1140 1205 1171">4. Try another PMC expansion slot, if available.<li data-bbox="638 1182 1205 1213">5. Try another adapter known to operate correctly.<li data-bbox="638 1224 1205 1350">6. Check for correct configurations of the network cable to the adapter card. Verify the cable is properly connected at both ends. Ping the failed system from another host on the network.<li data-bbox="638 1360 1205 1486">7. Check the error message log on your system to see if any errors pertaining to the ATM adapter or driver were recorded during bootup. This might provide some insight to the problem.

Network Problems

The procedures in this section assume the host workstation is up and running, the driver is loaded (yellow Status LED is flashing), and the adapter has formed a physical link with the switch (green Link LED is lit). Most of the problems discussed in this section concern getting the clients up and running, and logged onto the network. In all cases, check the error message log on your system to see if the clients are being rejected by the LECS or the LES. For the client to have any form of communication with a server:

- The switch must be configured correctly.
- Signalling must be up and running.
- The adapter must be assigned a network prefix.
- At least one client must be enabled.
- At least one LES must be present on the network.

The GUI version of the CellView utility provides debugging options as a tool for troubleshooting adapter and network-related problems. With debugging enabled, various modules log messages to assist in isolating the problem. (Be sure to disable the options when debugging is complete so that debugging output does not continue to print to the screen.) See *Producing Debugging Messages* on page 66 for additional information about CellView debugging options.

Problem	Possible Solution
The adapter cannot communicate with other hosts on the network.	<ol style="list-style-type: none">1. Make sure the network cable is correctly installed.2. Try to ping other end stations on the network from your host computer.3. Try to ping the host computer from another end station on the network.

Problems and Possible Solutions

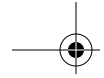
Problem	Possible Solution
<p>The driver loads at bootup, but network clients are not connecting. (GUI systems)</p>	<p>For GUI systems:</p> <ol style="list-style-type: none"> 1. Use CellView to check the state of signalling. <ol style="list-style-type: none"> a. From the main dialog, select Stats; then check indicators on the Signalling dialog. b. If the graphical LEDs for Signalling are green, then signalling is up and running. See the next Problem/Possible Solution in this table. c. If the graphical LEDs are red, exit to the main dialog and select Setup. d. Make sure the setting in the UNI Revision field of the Signalling dialog corresponds to the UNI setting of your switch. 2. Use CellView to check the hardware. <ol style="list-style-type: none"> a. From the main dialog, select Stats; then select the AAL5 tab. b. If any of the graphical LEDs in the SONET box is red, a failure occurred somewhere in the cable or connectors. 3. Use CellView to track communications between the adapter and the ATM switch. <ol style="list-style-type: none"> a. From the main dialog, select Global; then select the Debugging tab. b. Enable the Signalling and ILMI options. <p>CellView tracks communications between the adapter and signalling in the switch, as well as the protocols used to monitor all other traffic. Check the error message log on your system for error messages about these communications.</p> <p>When network debugging is complete, disable CellView Debugging options to stop further debugging output to the screen.</p>

Problem	Possible Solution
The driver loads at bootup, but network clients are not connecting. (NetWare systems)	<p>For NetWare systems:</p> <ol style="list-style-type: none">1. Use CellView to check the state of signalling.<ol style="list-style-type: none">a. From the main dialog, select Statistics; then check the Signalling State fields on the Signalling dialog.b. If ILMI and QSAAL read up and Signalling reads init, then signalling is up and running. See the next Problem/Possible Solution in this table.c. If Signalling State fields indicate that Signalling is not up, open the <code>AUTOEXEC.NCF</code> file (as described in <i>Editing the Bootup Configuration File</i> on page 79).d. Make sure the <code>UNI</code> parameter value in each client's <code>LOAD</code> command corresponds to the <code>UNI</code> setting of your switch.2. Use CellView to check the hardware.<ol style="list-style-type: none">a. From the main dialog, select Statistics; then select the AAL5 tab.b. If any of the SONET fields do not read as OK, a failure occurred somewhere in the cable or connectors.

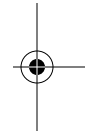
Problems and Possible Solutions

Problem	Possible Solution
<p>Signalling is running, but network clients are not connecting</p>	<p>Check the Network Prefix for the adapter.</p> <ol style="list-style-type: none"> 1. From the main dialog, select Stats (Statistics for Netware). 2. Check Signalling statistics for a 13-byte address in the Network Prefix field. If the address is not present, the switch is configured incorrectly or the signalling setup for the adapter is in error. 3. For GUI systems, exit to the main dialog and select Setup. Then make sure the settings for Enable Address Registration, ILMI Port Change Detection, and Register Nonstandard Prefixes correspond to the capabilities of your LAN Emulation services. <p>If automatic address assignment is not supported by the switch, the 13-byte address must be entered manually in the Network Prefix field.</p>
<p>Signalling and Address Registration are working, but network clients are not connecting</p>	<p>Check the settings for the client.</p> <ol style="list-style-type: none"> 1. From the main dialog, select Setup; then select the LEC tab and the appropriate LEC# tab. 2. Make sure the LECS/LES parameters are specified correctly. These settings must correspond to the capabilities of your switch. 3. The MTU size must be equal to or greater than the setting for an LES. For example, if only one LES is enabled with an MTU of 9K, and the client attempts to join with an MTU of 1516, the client will be rejected. 4. Make sure the other settings in the dialog correspond to at least one of the enabled LESs.

Problem	Possible Solution
A network application no longer works	<ol style="list-style-type: none"><li data-bbox="667 499 1226 716">1. If the application worked before adapter installation, a hardware conflict probably occurred. Some programs that access the hardware can cause a conflict at some point. This typically happens with hardware such as printers and modems. Check the PCI configuration that came with your system.<li data-bbox="667 730 1226 1379">2. Check the Application Program Interface (API) functions.<ul style="list-style-type: none"><li data-bbox="699 806 1226 898">– For GUI systems, start CellView. Then from the main dialog, select Global. Select the Debugging tab, and enable the API option.<p data-bbox="724 911 1226 1003">CellView tracks the lower-level functions of the API. These are the routines used by application software to manage or obtain system resources.</p><p data-bbox="724 1016 1226 1142">Check your system's message log. If no messages are being recorded, reboot the machine, run the application again, and check the log again.</p><p data-bbox="724 1155 1226 1247">When network debugging is complete, disable CellView Debugging options to stop further debugging output from printing to the screen.</p><li data-bbox="699 1260 1226 1379">– For NetWare systems, press CTRL + ESC to display the system console. Then select ASIG_Process and press Enter to view API functions.



Problems and Possible Solutions



Specifications

A

4515/4525/4575 Specifications

Item	Specification
Memory	4525: 128K buffer 4515: 128K or 512K buffer 4575: 128K, 512K, or 1M buffer 1K serial EEPROM Optional Expansion ROM 128K Control SRAM
Host Bus Interface	PMC P1386.1 Draft 2.0 32-bit 0 wait state Master 132 Mbyte/s burst DMA rate 32-bit Slave 128-Byte FIFO
Network Interface	155 Mbps SONET OC-3c fiber 155 Mbps SDH STM-1 fiber 155 Mbps SONET UTP 25.6 Mbps AF-PHY-0040.00 UTP
Standards Compliance	IEEE: IEEE 1496 ATM Layer: CCITT I.361, ANSI T1S1/92-002R3 ATM Adaptation Layer: AAL 5
Operating Power	7.5W (1.5A @ 5V)
Interrupts	Interrupt Pin: INTA#
Diagnostics	LEDs: - Green "Live incoming link" - Yellow "Status"
PCI Slave	Memory and Configuration cycles Write posting

4515/4525/4575 Specifications

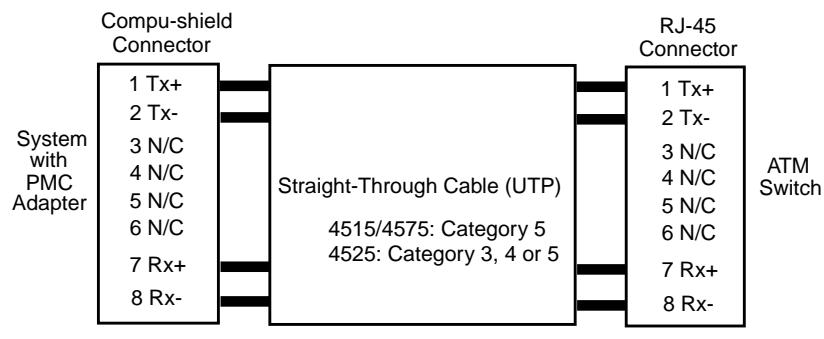
Item	Specification
PCI Master	Zero wait states Memory cycles only Burst size selections: 64, 32, 16, 8, 4 (Tx) 64, 48, 32, 16, 8, 4 (Rx, On-board) 48, 32, 16, 8, 4 (Rx, CELL-FIFO) Memory Read Line support Memory Read Multiple support Memory Write and Invalidate
Mechanical PMC ATM adapter	PMC mezzanine slot
Operating Environment Temperature Relative Humidity Altitude	0–55° C / 32–131° F 10–95% noncondensing 0–15,000 feet
Storage Environment Temperature Relative Humidity Altitude	(adapter stored in its original packaging) -20–85° C / -4–185° F 10–95% noncondensing 0–50,000 feet
Network Connections SC Duplex (155 Mbps) SC Duplex (155 Mbps) Compu-shield (155 Mbps) Compu-shield (25.6 Mbps)	Single Mode Fiber (8.5/125) Maximum cable length: 15 km Minimum cable length: 3 m Dual Mode Fiber (62.5/125) Maximum cable length: 2 km Minimum cable length: 3 m Category 5 UTP Copper Maximum cable length: 100 m Category 3, 4 or 5 UTP Copper Maximum cable length: 100 m

Cabling

B

Straight-Through Cable

To connect an adapter to an ATM switch, use a straight-through cable.



Crossover Cable

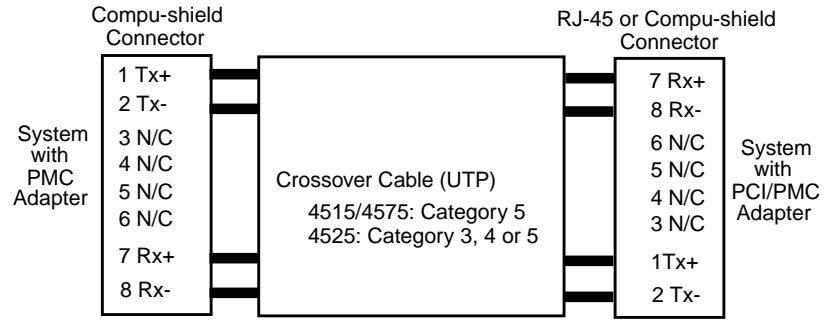
To connect two end stations back-to-back, use a crossover cable.



CAUTION

For straight-through and crossover cabling to meet EMI specifications, the unused pairs must be connected at both ends of the cable to the Compu-shield and/or RJ-45 connectors.

Crossover Cable



PCI/PMC Technology Overview



PCI/PMC Technology

Intel® Corporation's Architecture Lab, along with leading computer vendors (the PCI SIG), designed the Peripheral Component Interconnect (PCI) bus as the next generation I/O expansion bus. Its predecessors were the ISA, EISA, and MCA buses. The PCI bus is a high-performance bus found in systems ranging from low-end PCs to high-end servers.

PCI was developed to overcome the bottlenecks associated with traditional 16-bit expansion slots, operating at 8 MHz, or essentially 5 megabytes per second. The result was a local bus system capable of transferring 32 bits of data at 33 MHz for a maximum data transfer rate of 132 MBps. The PCI Local Bus takes peripherals off the I/O bus and connects them together with the CPU and the memory subsystem. This provides a wider, faster pathway for data, which is especially important for servers, graphic-intensive software, high-speed networks, and other high-performance peripherals.

Features of the PCI Local Bus architecture include:

- Processor-independent bridge between the CPU and high-speed peripherals that serves as a traffic controller between buses
- 32-bit memory addressing for CPU, Direct Memory Access (DMA) devices, and bus masters
- 32-bit data transfers at 33 MHz for CPU, DMA, and bus master devices
- 132 MBps maximum data transfer rate
- Data is written and read from the peripherals in linear bursts at every clock cycle

PCI/PMC Technology

- Buffers located between the peripherals and the CPU that allow multiple, high-speed peripherals to be attached to the same PCI local bus
- Automatic configuration of system and expansion boards

Three sizes of PCI add-in boards are defined: long, short, and variable short length. Systems are not required to support all board types. To accommodate the 5V and 3.3V signalling environments and to facilitate a smooth migration path between the voltages, three add-in board electrical types are specified: a “5 volt” board which plugs into only 5V connectors, a “universal” board which plugs into both 5V and 3.3V connectors, and a “3.3 volt” board which plugs into only 3.3V connectors.

The PMC bus was designed for embedded environments. It implements PCI bus logic in a daughtercard (mezzanine) form factor.

CompactPCI is another PCI form factor which implements PCI bus logic in a Eurocard 3U or 6U format with a high-density connector. This form factor is used in environments similar to the more traditional VME bus. The PCI Industrial Computer Manufacturers Group (PICMG®) is developing the CompactPCI standard.

ATM Technology Overview

D

Introduction to ATM

Asynchronous Transfer Mode (ATM) is a switched, connection-oriented technology that allows voice, data, images, and video to be sent over the same network media. With significantly higher bandwidths than legacy LANs such as Ethernet and Token Ring, ATM supports applications such as multimedia and teleconferencing with a quality of service that is unavailable from other networks.

In addition, ATM can be scaled down to interface with a wide range of existing network configurations, as shown in Figure D-1. This flexibility is a result of ATM's inherent scalability, which extends from desktops to supercomputers.

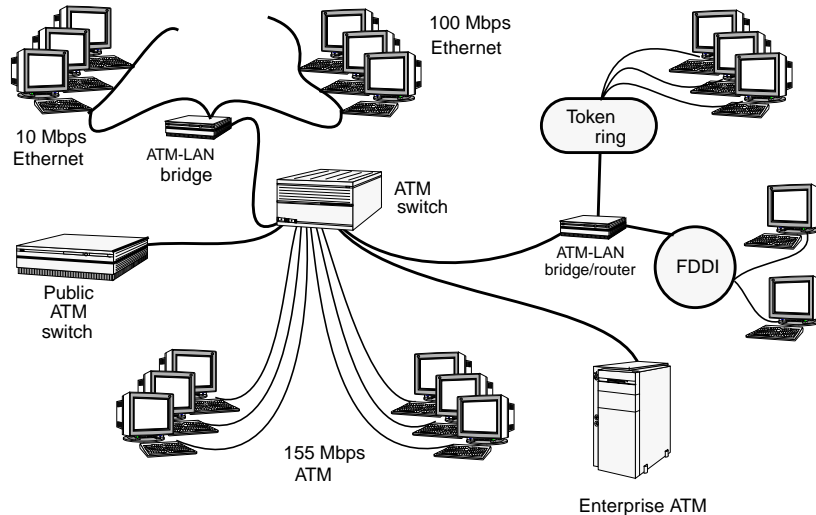


Figure D-1. ATM Network Topology

Virtual Circuits

The core concept of ATM is cell switching. Cell switching combines the benefits of packet switching, as used in traditional data networks, with circuit switching, as used in voice communications.

With ATM, all data, voice, and video information is converted into small, fixed-length packets, called *cells*, of 53 bytes each. These cells provide a standard way to combine the transmission rates required by bursty, variable-length packets of data and images with the constant, average rates required by voice and full-motion video. Transmitting fixed-length cells virtually eliminates the traditional overhead delays encountered with variable-length packets.

Virtual Circuits

ATM uses *virtual circuits (VCs)* to create individual communication links between network nodes for transporting the 53-byte fixed-length cells. These virtual circuits carry all transmissions between nodes. They maintain the correct cell sequence throughout the length of the transmission and provide a defined Quality of Service (QoS).

ATM networks use two types of virtual circuits:

- Permanent virtual circuits (PVCs)
- Switched virtual circuits (SVCs)

The path or connection used by virtual circuits is the *virtual circuit connection (VCC)*.

Virtual Circuit Connections

A virtual circuit connection (VCC) is a path or connection between any source and any destination in the ATM network. A VCC between two stations is configured manually for

PVCs, and dynamically, via signalling, for SVCs. All communication between the two stations proceeds along the same VCC.

The ATM cell header's virtual circuit identifier (VCI) is assigned per network VCC link, that is, end station-to-switch, switch-to-switch, switch-to-end station, and so on.

The *virtual path* (VP) creates groups of the VCs carried between the ATM entities, such as the ATM switches shown in Figure D-2:

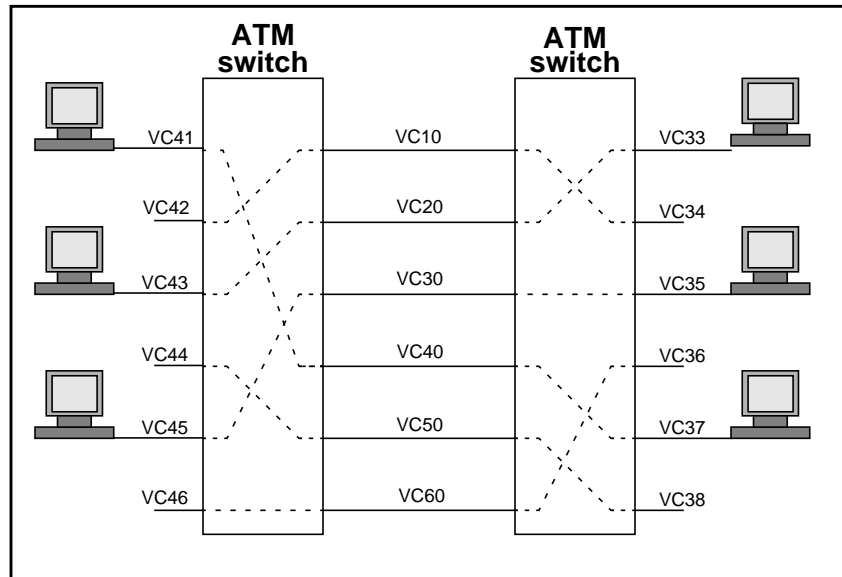


Figure D-2. Virtual Circuits

The VCs associated with a VP are globally switched without unbundling or processing the individual VCs. Thus, the cell-carrying capacity of each VC is preserved, and the quality of service of the VP can be scaled to extremely high speeds.

Permanent Virtual Circuits

Permanent virtual circuits (PVCs) are permanent, static connections between network nodes. With PVCs, the nodes operate as if they are connected with a dedicated physical line.

PVCs must be configured manually. To implement PVCs in an ATM network, you must create individual tables at each station and a master table at the switch. The table for each station must list the VCIs that identify the first steps in the paths leading to other stations with which the station is to communicate. At the switch, the master table must link all the information in the individual station tables.

When you move a station, you must recreate its table and also recreate its information in the switch's master table so that the station can reconnect to the network.

Switched Virtual Circuits

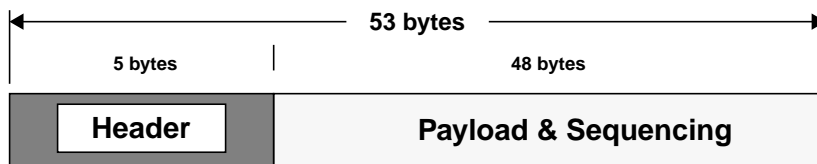
Switched virtual circuits (SVCs) are similar to voice telephone network connections; temporary connections between any two end points on the network are created dynamically for each session and torn down when the information exchange is complete. SVCs are created by signalling software in the end stations and the switches. This dynamic configuration eliminates the manual work required to implement PVCs.

With SVCs, the ATM switch only has to identify the output port to which to route a received cell and identify the new VPI/VCI on the output link.

Fixed-Length Cells

Fixed-length cells of 53 bytes each are transmitted over the VC established between the sending node and the receiving node. As shown in Figure D-3, each cell contains the following:

- A 5-byte header for connection identification, flow control, routing, and error control
- 48 bytes of data



Breakdown of 5-byte Header

	Bits 0-3	Bits 4-7
Byte #1	GFC/VPI*	VPI
Byte #2	VPI	VCI
Byte #3	VCI	
Byte #4	VCI	Payload Type CLP
Byte #5	Header Error Control	

GFC: Generic Flow Control **VPI:** Virtual Path Identifier
VCI: Virtual Circuit Identifier **CLP:** Cell Loss Priority bit

* First 4 bits are used as GFC field in the case of User-Network Interfaces.

Figure D-3. The ATM Cell

Scalability

The fixed-byte count allows fast hardware switching, lowers processing requirements, and practically eliminates the overhead associated with processing variable-length packets. As a result, ATM cells can be transmitted through multiple, contiguous connections and still maintain the time-sensitive quality of service required for audio and video applications.

Scalability

A major benefit of ATM is its inherent ability to support many different access and transmission speeds on different physical media. This is referred to as *scalability*.

For example, a cell generated on a 155 Mbps ATM LAN can be carried over a 45 Mbps asynchronous DS3 line to a network in a different location. From there, the cell can be switched into a 2.4 Gbps SONET (synchronous) transport system.

ATM networks can allocate a guaranteed amount of bandwidth for fixed-bit-rate, delay-sensitive transmissions such as video and voice data. And they can allocate a variable amount of bandwidth for the balance of network data that is less delay-sensitive.

ATM Layers

The B-ISDN (Broadband Integrated Services Digital Network) model defines three ATM layers:

- Physical Layer
- ATM Layer
- ATM Adaptation Layer (AAL)

In comparison with the OSI model, the three ATM layers are similar to the Physical Layer (Layer 1) and a portion of the Data Link Layer (Layer 2):

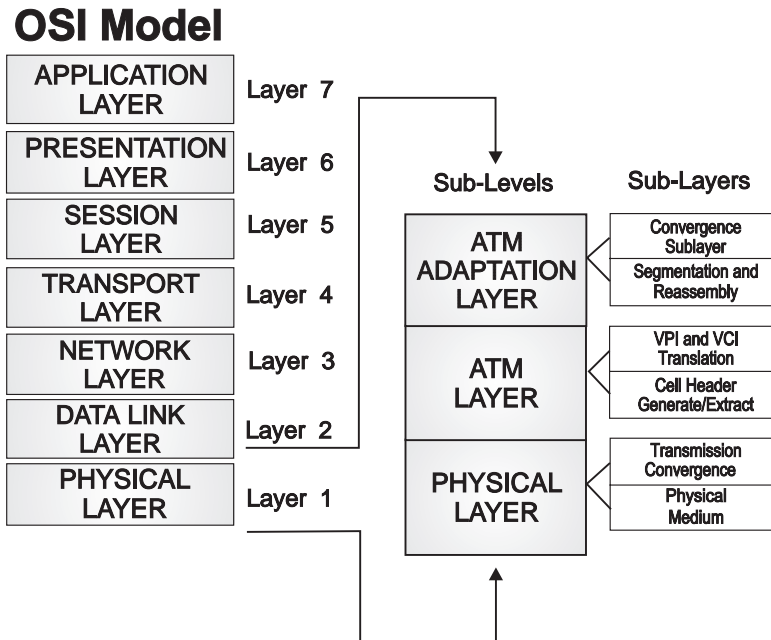


Figure D-4. ATM Compared to the OSI Model

Physical Layer

The ATM Physical layer defines the interface and framing protocol for the ATM network. The ATM Physical layer has two sublayers:

- The PMD sublayer provides bit transfer functions that are specific to the medium used in the network.
- The TC sublayer controls the transmission of frames over the physical medium.

ATM Layer

The ATM Layer defines the cell structure and how cells move between connections in an ATM network. This layer creates the cells and controls the setup and teardown of virtual connections and virtual paths in the network.

ATM Adaptation Layer

The ATM Adaptation layer (AAL) enhances the services provided by the ATM layer to better serve the next higher layer's functions. It provides timing and sequencing information tailored to the upper layer it is working with. It converts this information and the data being sent to ATM cells according to its rules. It then converts the ATM cells back to data after they reach their destination.

AAL is classified into four classes of service. For each class, AAL consists of two sublayers. The different service classes vary in the form of data transfer they support and in their sublayer structures.

AAL Service Classes

The currently defined AAL service classes are:

- AAL1
- AAL2
- AAL3/4
- AAL5

AAL1

AAL1 service supports the transfer of constant bit rate (CBR) data and provides mechanisms for maintaining timing and structure information for that data. It is primarily intended for transporting small data samples, such as voice.

AAL2

AAL2 service is not yet standardized. Its definition is currently under development by the ITU.

AAL3/4

AAL3/4 service supports the transfer of data that is sensitive to cell loss, but less sensitive to delay than AAL1-type data. AAL3/4 segments upper-layer data into cells, each of which consists of:

- A 2-octet header
- 44 octets of protocol data unit (PDU) payload
- A 2-octet trailer

The header and trailer provide message- and cell-level sequencing, as well as per-cell CRC. This cell-level management comes at the cost of the additional overhead octets in each cell. AAL3/4 is rarely used.

AAL5

AAL5 service, like AAL3/4, supports the transfer of data that is less sensitive to delay than AAL1 data. AAL5 is a simpler and more space-efficient protocol than AAL3/4. It relies on higher-level services to handle cell loss and other errors.

AAL5 encapsulates upper-layer SDUs into PDUs. Each PDU has a single trailer, which contains the upper-layer SDU control information, SDU length, and a CRC to guarantee the

ATM Layers

integrity of the entire PDU. AAL5 then segments the PDU into cells, each of which uses the entire 48-octet cell payload to deliver user data.

AAL Sublayers

The AAL for all service classes consists of two sublayers:

- The Segmentation and Reassembly (SAR) sublayer converts data into cells, and cells back to data.
- The Convergence Sublayer (CS) meets the specific service requirements of the next higher layer.

In AAL3/4 and AAL5, the Convergence Sublayer consists of two further sublayers:

- The Service Specific Convergence Sublayer (SSCS) handles details of the higher layer's specific services.
- The Common Part Convergence Sublayer (CPCS) converts upper-level SDUs to AAL PDUs.

Figure D-5 illustrates the protocol model for AAL3/4 and AAL5 sublayers:

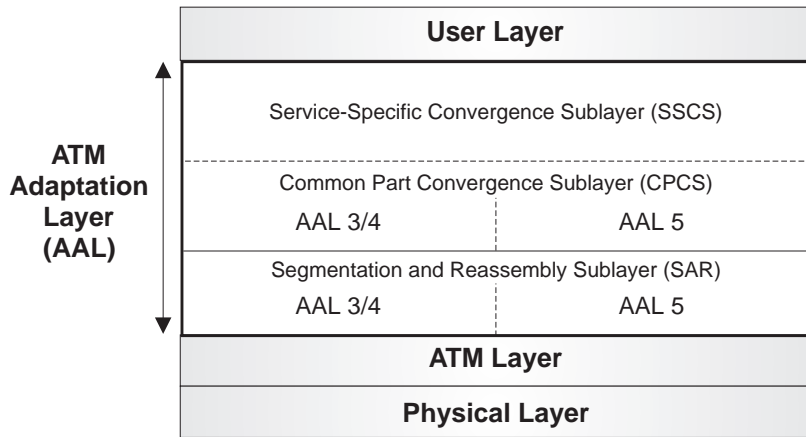


Figure D-5. Protocol Model for AAL3/4 and AAL5

Figure D-6 illustrates how the AAL5 sublayers handle data segmentation:

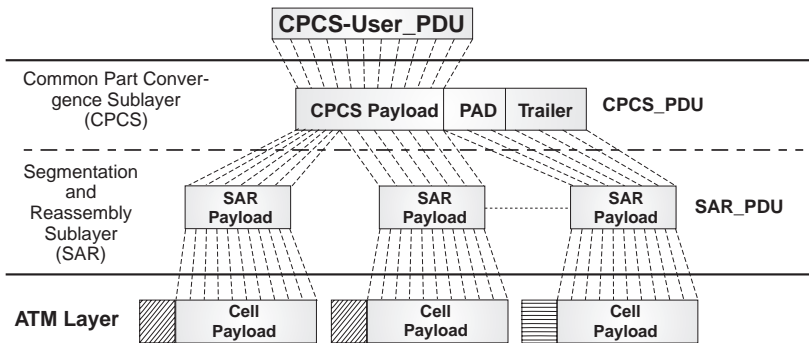


Figure D-6. AAL5 Sublayers

SONET/SDH

SONET (Synchronous Optical Network) is a North American multiplexing standard that defines a signal used in optical fiber networks. For ATM over fiber, OC-3c, with a base rate of 155.520 Mbps, is the most widely-used signal in the US.

SDH (Synchronous Digital Hierarchy) is the European equivalent of SONET. STM-1 (Synchronous Transport Mode, Level 1) is the European equivalent of OC-3c. Like OC-3c, STM-1 has a base rate of 155 Mbps, but STM-1 has slightly different framing information than the OC-3c signal.

Integrated Local Management Interface

Integrated Local Management Interface (ILMI) is the ATM Forum specification for incorporating network management into ATM networks. ILMI is based on the Simple Network Management Protocol (SNMP). The Interface Management Entities (IMEs) on the end station and the switch use ILMI to manage the physical link connecting them.

A subset of ILMI, known as *address registration*, is used when a station is connected to the ATM network. Address registration lets the end station and the switch dynamically build a unique ATM End Station Address (AESA). The AESA consists of two parts, the end station identifier (ESI) and the network prefix, which are concatenated together to define the end station's unique ATM network address.

- The ESI is the ATM adapter's unique 6-byte identifier.
- The network prefix is the 13-byte link address, as determined by the ATM switch.

LAN Emulation

LAN Emulation (LANE) is designed to allow existing network applications and network protocols to run over ATM networks. It supports ATM as a backbone for connecting *legacy* networks such as Ethernet, FDDI, and Token Ring. It supports efficient interaction for both directly-attached ATM end systems (in their own subnet) and legacy end systems attached through Layer 2 bridging devices.

LAN Emulation allows multiple emulated LANs (ELANs) to exist on the same physically interconnected ATM network. For example, using an appropriate ATM network interface card, an ATM end station can communicate with all of the following:

- An Ethernet segment on one ELAN
- A Token Ring segment on a second ELAN
- An FDDI segment on a third ELAN
- A fourth ELAN comprised of ATM nodes only (taking full advantage of high-speed ATM communications)

LAN Emulation Multiple Protocol Support

LAN Emulation supports a wide variety of protocols primarily because the functionality of the LANE interface is defined at the MAC layer. This allows for protocol-independent data transfer between devices attached to the ELAN and to other legacy-attached devices, as shown in Figure D-7:

LAN Emulation

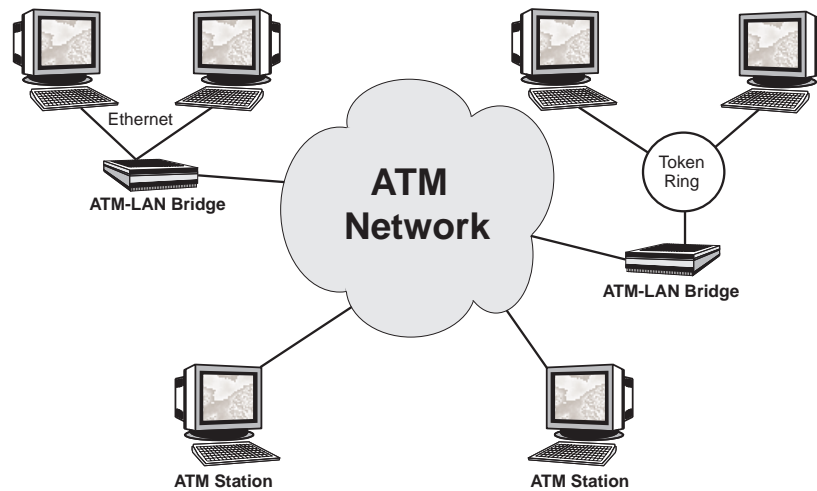


Figure D-7. ATM LAN Emulation

MAC-Dependent Protocol Support

However, LAN Emulation does not support protocols or applications that are dependent on MAC layer protocols, such as SMT/Token Management and CSMA/CD. These MAC-dependent applications are designed to deal with specific media issues such as ring arbitration and collision detection. In addition, because each ATM link carries traffic destined only for the one station attached to that link, a given station cannot receive all of the ELAN's frames like it would on a shared media network.

Therefore, removing the old equipment and installing LAN Emulation-based ATM equipment does not solve existing Ethernet/Token Ring/FDDI bridging problems.

Legacy LAN Protocol Support

LAN Emulation enables legacy LAN applications to operate over ATM while hiding the complexities of ATM point-to-point connections. With LAN Emulation, an ATM switch arranges ATM stations into groups that can implement and receive each other's broadcast/multicast requests. LAN Emulation supports requests in Ethernet and Token Ring frame formats, enabling legacy applications to run without modification over ATM networks. (LANE Emulation also supports FDDI, which uses Ethernet frames.)

LAN Emulation implements this frame format support with true MAC-level bridging. Multiple protocols, such as IP, IPX, and NetBIOS, can communicate across the ATM-LAN bridge. To illustrate how LAN Emulation works, Figure D-8 shows how an ATM host, an ATM-LAN bridge, and a legacy LAN host fit into the same network.

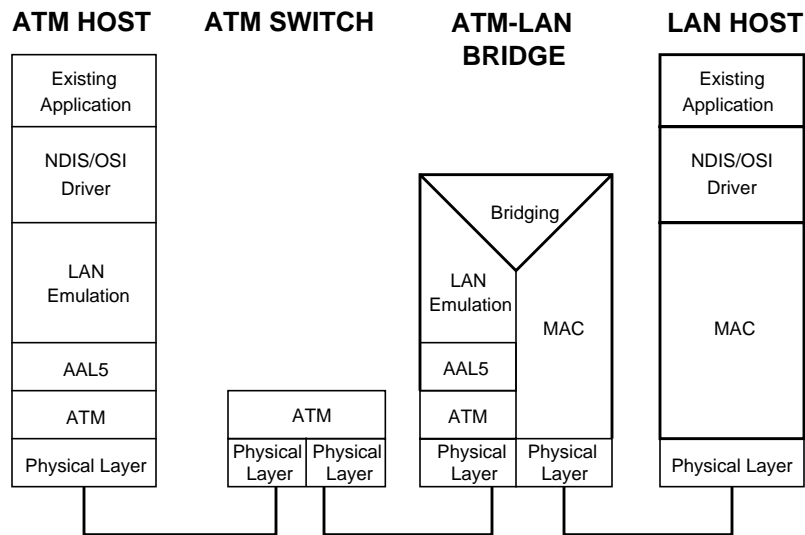


Figure D-8. LAN Emulation Protocol Stack

LAN Emulation

The goal of LAN Emulation (on the ATM side of the bridge) is to convince the upper layer protocols that a MAC layer of a legacy LAN lies in the lower layers, when actually it does not. The only discernible difference is that ATM's emulated LAN interface operates at much higher transmission rates.

All LAN Emulation connections (as defined by the ATM Forum) use the AAL5 ATM Adaptation layer to reassemble and segment the PDUs of legacy LANs into 53-byte ATM cells. The ATM-LAN bridge implements the MAC layer emulation to and from the legacy LAN. As illustrated by the LAN Host diagram in Figure D-8 on page 155, existing software requires no changes to run over ATM networks. ATM switches transport the cells just as they would for any other connection.

LAN Emulation Services

The LAN Emulation Client (LEC) defines the interface between a MAC layer entity of an ATM node and the emulated LAN. The LAN Emulation Service defines how the protocol interoperates with multiple LECs. It provides functions for initialization, address registration and resolution, and data forwarding. The three components that implement these functions are:

- LAN Emulation Configuration Server (LECS)
- LAN Emulation Server (LES)
- Broadcast and Unknown Server (BUS)

Some vendors provide these services in one or more switches, while others provide them in end station or edge devices.

LAN Emulation Configuration Server

The LECS provides a central point of contact for each LEC on the ATM network. It provides each LEC with configuration information, including the address of the LES that serves a specific ELAN. At bootup, LECs initially communicate with the LECS to locate the appropriate LES for their emulated LAN. The connection between the LEC and the LECS can be terminated when this transfer of information is complete.

Network personnel implement and maintain LECS information. Depending on the vendor, the LECS implementation might also provide numerous features such as support for multiple ELANs, ELAN management based on MAC addresses, and other network management features.

LAN Emulation Server

The LES provides LAN Emulation address resolution. This is a critical function because MAC addresses are 6-byte entities and ATM addresses are 20-byte entities. Each LEC notifies the LES of its MAC-ATM address bindings. The LES stores the MAC-ATM relationship so it can resolve queries from other clients for these MAC addresses.

All LECs on an ELAN connect to the same LES. All LECs on the same ELAN must log in with the LES before attempting to communicate with any other LEC in the group. They also must use the same Maximum Transfer Unit (MTU) size. An ELAN's MTU size depends on what type of legacy edge devices (if any) are being supported.

If the network interface card at the ATM node supports multiple LECs, each LEC on the card can be configured to a different ELAN and have a different MTU size than the other

LAN Emulation

LECs. For example, three different LECs on the card might be configured as follows to communicate with nodes on three different ELAN types:

- LEC1 is configured to use a 1.5K MTU size to communicate with nodes on Ethernet subnets.
- LEC2 is configured to use a 4.5K MTU size to communicate with nodes on Token Ring and FDDI subnets.
- LEC3 can use a 9K (or maximum rate) MTU size to communicate with all ATM-only nodes on the ELAN.

If clients require more than one ELAN with the same MTU size, network personnel can configure differentiating characteristics (for example, logical names) in the LECS.

The connection between the LES and each LEC is open as long as the LEC is up and running. The LES maintains information about all LECs currently connected to the server. When a LEC is disconnected or turned off, the LES removes all information about the LEC.

Therefore, ATM networks using LAN Emulation support relocation of end stations with ease. Moving a station is a matter of physically moving the hardware to a new location, connecting it to the same or another ATM switch in the network, and turning on the power. At bootup, each client contacts the LECS; the LECS supplies the ATM address for the appropriate LES; the client joins the LES, and can then start communicating with other clients on that ELAN.

Broadcast and Unknown Server

The Broadcast and Unknown Server (BUS) provides a simplified mechanism to support both broadcasting and bridged network functionality. Most protocols use the network

topology's shared media broadcast capabilities to implement the mechanism for translating network addresses to MAC addresses.

Because ATM is inherently non-shared, additional work must be done to enable every station on an ELAN to receive the broadcast and multicast frames. The BUS is a centralized server for the ELAN that accepts broadcast traffic from all clients in the group and then forwards that traffic to all the clients on a point-to-multipoint connection.

LAN Emulation Protocol

This section describes how the various phases of the LAN protocol accomplish the goal of getting multiple stations to communicate in the ATM network environment. The LAN Emulation protocol phases are:

1. Initialization
2. Configuration
3. Joining
4. Registration and BUS initialization
5. Data movement

Initialization

At power-up or reset, during initialization, a LEC's first action is to establish a connection with an LECS. The protocol defines a multi-step procedure to ensure that the LEC can reach the LECS in a variety of environments.

LAN Emulation

The first mechanism involves getting the LECS address(es) via ILMI. If no addresses are listed, or if none of the addresses work, the LEC uses the *well-known* ATM address (defined by the ATM Forum). An error occurs if this address does not work.

Additionally, as an out-of-band mechanism for obtaining the required configuration, network personnel can enter the address of the appropriate LES directly in the LEC setup.

Configuration

After the LEC establishes a connection to the LECS, the LEC transmits a message to the LECS. The message provides the LEC's ATM address, MAC address, LAN type, and frame size (MTU) request. When the LECS validates the request, it returns configuration information about the appropriate LES, including the LES's ATM address and the LAN type and frame size for the LEC to use for the session.

Joining

When the LEC gets the ATM address of the LES, it attempts to join the ELAN by creating a permanent connection to the LES. When it connects, the LEC transmits a message to the LES providing the configuration information obtained from the LECS and, optionally, a MAC address to register. A separate registration message can be used to register additional MAC addresses. The join process culminates in the LES adding the client as a leaf to its point-to-multipoint tree.

Registration and BUS Initialization

Upon joining the LES, the LEC requests the ATM address for the *all 1's* broadcast MAC address. The LES responds with the ATM address for the Broadcast and Unknown Server.

The LEC then initiates a Multicast Send connection to the BUS and accepts the incoming Multicast Forward multipoint VCC from the BUS.

Data Movement

After BUS connections are established, the LEC can begin forwarding frames. When a data frame needs to be transmitted, the LEC checks an internal table to see if a connection already exists for the destination MAC address. If so, it transmits the frame on that VCC. Otherwise, it queries the LES for the ATM address that corresponds with the MAC address. While waiting for a response, it forwards the frames destined for this MAC address to the BUS.

For a device on the legacy side of a bridge, the bridge learns the device's MAC address when the device starts transmitting. Then future requests to resolve the MAC address result in the bridge responding with its own ATM address.

Connections time out after periods of 20 minutes of inactivity in both directions. MAC entries received from the bridges are also timed out and reverified. This is done to support station movement on the legacy network where the edge devices do not have definitive knowledge of station movement activity.

LAN Applications

The advantage of LAN Emulation is that existing applications and protocols can be adapted to ATM merely by installing new ATM interfaces and drivers. The disadvantage is that these driver interfaces do not utilize any of the benefits of ATM, such as a varying quality of service, full ATM addressing, and other non-LAN protocol applications.

Multiprotocol Encapsulation over ATM AAL5

For future software designs, the ATM Forum has developed a Native Service Interface, which defines how new applications can be adapted to ATM networks, multiple vendors, and WinSock 2 support. This development provides an evolutionary solution where existing applications can continue to work as before, while new applications can take full advantage of ATM capabilities. The two interfaces are able to coexist in the same end systems.

Multiprotocol Encapsulation over ATM AAL5

The Internet Engineering Task Force (IETF) defines Multiprotocol Encapsulation over ATM AAL5 in RFC-1483. Multiprotocol Encapsulation over ATM AAL5 provides methods for encapsulating existing network protocol frames so that they can be transported over ATM in AAL5 frames. This encapsulation enables higher-layer protocols to use ATM networks to interconnect and exchange existing frame types.

RFC-1483 defines two encapsulation methods:

- The first method, *LLC encapsulation*, allows different frame types to be multiplexed over the same ATM VC. LLC encapsulation uses IEEE 802.2 Logical Link Control (LLC) headers to differentiate frame types. This is the primary method used in most environments.
- The second method, known as *VC Based Multiplexing* or *Null Encapsulation*, allows one frame type to exist on the VC because no encapsulation is used.

There are two classes of protocol frames:

- Routed protocols

An example of a routed protocol is IP, which is the encapsulation defined in RFC 1577 to carry IP data over ATM networks.

- Bridged protocols

Examples of bridged protocols are Ethernet and FDDI, which many ATM PVC services use to interconnect like legacy networks.

Specific encapsulation rules are spelled out for each class. In general, the LLC header identifies the encapsulated payload.

Classical IP over ATM

Classical IP (CIP) over ATM is designed to allow existing unicast IP network applications to run over ATM networks. The Internet Engineering Task Force (IETF) defines Classical IP in RFC 1577. Classical IP over ATM uses LLC Encapsulation for Routed Protocols, as defined in RFC-1483, for data encapsulation.

Figure D-9 on page 164 illustrates a Classical IP-over-ATM network configuration. Figure D-10 on page 164 illustrates the Classical IP-over-ATM protocol stack.

Classical IP over ATM

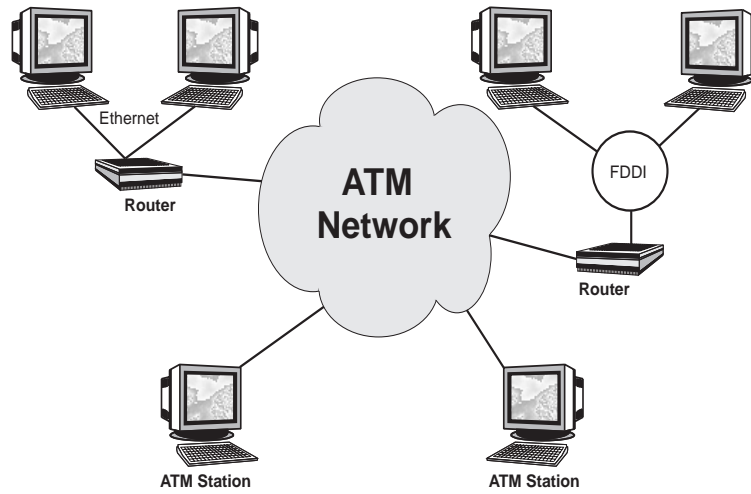


Figure D-9. Classical IP over ATM

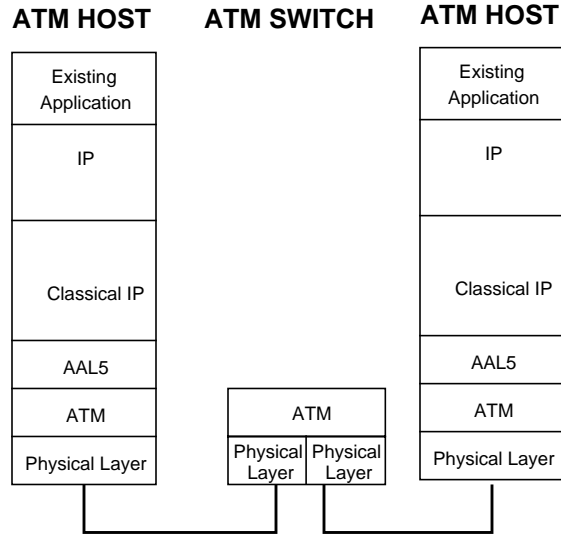


Figure D-10. Classical IP Protocol Stack

Classical IP Client Interface

The CIP Client defines the interface between an IP layer entity of an ATM node and the Logical IP Subnetwork (LIS). The standard supports only the delivery of unicast IP packets over ATM networks. To transfer a unicast IP packet, the CIP client must translate the IP address to an ATM address, create an SVC to that host, and then pass LLC encapsulated IP data over that VC.

The ATM ARP Server provides address resolution service to CIP clients. The ATM Address Resolution Protocol (ATMARP) defines how a CIP client can obtain the ATM address of an IP client it wants to connect to. This is done with ARP on broadcast enabled networks. Because the ARP protocol requires a broadcast medium, IP-over-ATM networks use an additional protocol, the Inverse ATM Address Resolution Protocol (InATMARP), which is based on the Inverse Address Resolution defined in RFC 1293.

ATM ARP Servers use InATMARP to discover client address information. IP clients connected by PVC use InATMARP to discover address information about the remote end.

Most vendors provide ATM ARP Server services in one or more switches or ATM-attached devices such as routers.

Classical IP ARP Server

The ARP Server provides address resolution functions for clients on a Logical IP Subnet. Each client connects to the server via an SVC as it comes up on the ATM network or when it needs to resolve the address of another IP attached device. When the client connects, the server acquires the client's ATM to IP address mapping by means of InATMARP and builds a

table of all the IP addresses on the LIS. Then when a client asks for the mapping via ATMARP, it can return the ATM address the client needs to create an SVC to the device.

Data Movement

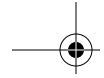
When the ARP Server connection is established, the CIP client resolves IP to ATM address mappings and directly connects to other CIP Clients. When it needs to transmit a data frame, the client checks an internal table to see if a connection already exists for the destination IP address. If so, it encapsulates that frame with an LLC/SNAP header and transmits the frame on that VCC.

Otherwise, it queries the ARP Server for the ATM address that corresponds to the IP address. The Client then sets up an SVC to that ATM address and transmits the frame. For a device on the legacy (such as Ethernet) side of a router, the router's IP address must be configured as the gateway for the legacy subnet or as the default gateway for all unknown IP addresses not resolved by the ARP Server.

CIP Applications

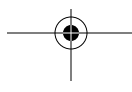
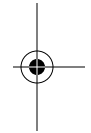
The advantage of CIP is that existing IP unicast applications can be adapted to ATM merely by installing new ATM interfaces and drivers. They also perform better than other types of applications because of the larger MTU size supported by CIP.

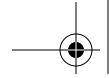
The disadvantage is that the ATM driver interfaces do not utilize any of the benefits of ATM beyond its bandwidth and larger MTU support. The driver interfaces also do not support broadcast or multicast applications under CIP.



For More Information

For more information about ATM networking, see
<http://www.atmforum.com>





For More Information



Glossary

The ATM Forum's glossary is at <http://www.atmforum.com> (click on the Glossary icon).

The following glossaries may also be helpful:

- Networking Glossary: <http://www.ctcnet.com/tips/glossary.htm>
- Computing Dictionary: <http://wfn-shop.Princeton.EDU/foldoc/>

802.2 IEEE ♦ Standards that govern the LLC within the Data Link layer of the OSI model. LLC frames carry user information between the nodes on a network and define the transmission of a frame between two stations. These standards are common across the various lower level standards within the Data Link and the Physical layers.

802.3 IEEE ♦ Standards that govern the use of the CSMA/CD (Carrier Sense Multiple Access/Collision Detection) network access method used by Ethernet networks.

802.5 IEEE ♦ Standards that govern the use of the token ring indicator and frame priority.

AAL (ATM Adaptation Layer) ♦ Converts packets of data to 53-byte cells for transmission on the network. Several AALs are defined to provide different types of service for ATM connections, and to provide a method of mapping data from a particular class of service into ATM cells in such a way that the data can be remapped into its original format at the other end of an ATM network.

ABR (Available Bit Rate) ♦ One of the two non-guaranteed service types (the other is UBR). With ABR, the network makes no absolute guarantee of cell delivery, but does guarantee a minimum bit rate for user transmission. ABR also makes an effort to keep cell loss as low as possible through a closed feedback loop conveying congestion information back to the source so the source can adjust its rates.

adapter ♦ A device, usually a user interface card, that physically connects an end station to the network medium (for example, twisted pair, coaxial, fiber).

address registration ♦ A subset of ILMI which enables the switch and end station to dynamically construct an end station address.

Glossary

AESA (ATM End Station Address) ♦ The 20-byte address defined by the ATM Forum for identifying end stations on a private ATM network.

ANSI (American National Standards Institute) ♦ An organization which coordinates, develops, and publishes standards used in the United States.

ARP (Address Resolution Protocol) ♦ The Internet protocol used to dynamically translate the Internet address of a network host to its LAN hardware address. This action is limited to LANs that support hardware broadcasts.

ASIC (Application Specific Integrated Chip)

ATM (Asynchronous Transfer Mode) ♦ A switched, connection-oriented technology for LANs and WANs. ATM accommodates a mix of data types, such as audio, video, and data, on a single network. The multiplexed information is organized into cells, and can be transported between network nodes at many different access and transmission speeds. Synonyms: asynchronous transmission, cell relay.

ATM Forum ♦ A communications industry organization made up of hundreds of vendors and users that defines ATM networking protocols.

ATM LAN ♦ Topology that consists of ATM switches and computer interfaces that provide high data rate connectivity for voice, video, and data (IP and multimedia). In addition, ATM interfaces are being integrated into existing LAN hubs and bridge/router platforms. Besides supporting high bandwidth, ATM LANs map to the WAN via central office ATM switches and services being deployed in the telecommunications world.

attenuation ♦ Signal power lost in a transmission medium as the signal travels from sender to receiver.

backbone ♦ A network configuration that connects LANs to form an integrated network.

bandwidth ♦ Capacity for transmitting data through a given circuit. Generally, the greater the bandwidth, the more information can be sent through a circuit during a given amount of time.

best effort ♦ A QoS class where no specific traffic parameters and no attempts are made to guarantee no cell loss or delay variation.

B-ISDN (Broadband ISDN)

bridge ♦ An internetworking device used to connect two or more computer networks at the MAC level, and to forward MAC packets among those networks.

BUS (Broadcast and Unknown Server) ♦ A LAN emulation server for ATM networks which has the ability to receive broadcast requests and forward them to all the attached LECs, thus emulating the broadcast feature of Ethernet and Token Ring LANs.

CAC (Connection Admission Control) ♦ An ATM function which determines whether a VC connection request should be accepted or rejected.

call control ♦ A process that uses signalling procedures to establish VCs. These connections are much like telephone calls. Synonym: call setup.

CAT-3 (Category 3 UTP) ♦ A type of UTP commonly used with ATM interfaces for cell transmission at low speeds (25 Mbps) and at distances up to 100 meters.

CAT-5 (Category 5 UTP) ♦ A type of UTP commonly used with ATM interfaces for higher-speed cell transmission (155 Mbps).

CBR (Constant Bit Rate) ♦ The continuous transmission of data at a fixed and guaranteed rate over a network with a guaranteed cell delay variation.

CCITT (International Telephone and Telegraph Consultative Committee) ♦ See *ITU (International Telecommunication Union)* on page 174.

CDV (Cell Delay Variation) ♦ A QoS parameter that measures the difference between a single cell's transfer delay (CTD) and the expected transfer delay. It gives a measure of how closely cells are spaced in a VC. CDV can be introduced by ATM multiplexers (MUXs) or switches.

cell ♦ Basic ATM transmission unit. A 53-byte packet comprised of a 5-byte header and a 48-byte payload. User traffic is segmented into cells at the source, transmitted through the ATM switched network, and reassembled at the destination.

cell FIFO ♦ Optimized DMA of ATM cells from reassembly engine to system memory requiring minimal CPU intervention.

cell switching ♦ ATM technology that combines the best features of circuit-and packet-switching technology and supports several classifications of AAL service (voice/video, packet/video, data).

circuit switching ♦ A connection-oriented service that uses switching techniques such as time division. It is an ideal mode for continuous, constant bandwidth applications, such as voice and video.

Glossary

CLIP (Classical IP) ♦ A set of IETF-defined protocols for developing IP-over-ATM networks. The main issues in the transport of IP over ATM that CLIP resolves are packet encapsulation and address resolution.

CLP (Cell Loss Priority) ♦ A 1-bit field in the ATM cell header that corresponds to the loss priority of a cell. Lower-priority (CLP=1) cells can be discarded in congestion situations.

compression ♦ Method of reducing the quantity of data that must be transmitted across a network, primarily to enable the transmission of voice and video. The major compression standards are JPEG for still images, MPEG/MPEG-2 for full-screen motion images, and Px64 and H.261 for video conferencing.

configuration cycle ♦ A type of I/O cycle provided on the PCI bus to facilitate system configuration.

CPC (Cell Personality Card)

CPCS (Common Part Convergence Sublayer) ♦ Part of the AAL convergence sublayer (CS), it must be present in the AAL implementation. Its task is to pass primitives to the other AAL sublayers (SAR, SSCS). It supports the functions of the standardized Common Part AALs: AAL1, AAL3/4, and AAL5.

CRC (Cyclic Redundancy Check) ♦ A bit errors detection technique that employs an algorithm to calculate a value for the information bits in a packet. The receiver, using the same algorithm, recalculates that value and compares it to the value received. If the two values do not agree, the transmitted packet is considered to be in error.

DLE (DMA/Descriptor List Element) ♦ The structure that describes to the PCI bus interface how to move data between the packet buffer and system memory.

DMA (Direct Memory Access) ♦ A fast method of moving data between two subsystems without processor intervention.

DS3 (Digital Standard 3) ♦ This ANSI standard defines the format of asynchronous data sent at the rate of 44.736 Mbps.

E.164 ♦ An ITU-defined 8-byte address format. In ATM it is typically used in public networks and is provided by the telecommunication carriers, while 20-byte NSAP-format addresses are used in private networks.

EFCI (Explicit Forward Congestion Indication) ♦ A 1-bit field in the cell header that contains information about whether congestion at an intermediate node has been experienced. The EFCI bit is set when, for example, a buffer threshold has been exceeded. When recognized by end stations, causes a reduction in the data rate.

ELAN (Emulated LAN) ♦ See *LANE (LAN Emulation)* on page 175.

end station ♦ A machine, intended for running user application programs, that is connected to a network. In an ATM network, the end station is where an ATM connection is terminated or initiated.

fiber optic cable ♦ A transmission medium designed to transmit digital signals in the form of pulses of light.

FIFO (First In First Out) memory ♦ A type of dual-ported memory where the data is read out in the same order in which it was written in.

fragmentation ♦ A process where large frames from one network are broken up into smaller frames that are compatible with the frame size requirements of the network to which they will be forwarded.

frame ♦ Data in a highly-structured format for the purpose of transmission. *Frame*, *packet*, and *PDU* are equivalent in most contexts.

FTP (File Transfer Protocol)

GFC (Generic Flow Control) ♦ A field in the ATM cell header that supports multiplexing functions. The GFC mechanism is intended to support simple flow control in ATM connections.

HDLC (High-level Data Link Control) ♦ A framing protocol specified by the ISO that can provide error-free Data Link layer services.

header ♦ Control information attached to the front of a frame or packet. In ATM cells, the header is the bits in a cell allocated for functions required to transfer the cell payload within the network.

HEC (Header Error Control) ♦ A cell header CRC field that guarantees the integrity of the cell header information.

host ♦ Generally, any computer on a network.

host name ♦ A unique name that identifies each host machine on a network.

ICMP (Internet Control Message Protocol) ♦ A Network layer Internet protocol which enables network IP packets to report errors and other relevant information for packet-processing purposes.

Glossary

IEEE (Institute of Electrical and Electronic Engineers) ♦ An information exchange organization. Among other functions, it coordinates, develops, and publishes network standards for use in the United States, following ANSI rules.

IETF (Internet Engineering Task Force) ♦ Organization responsible for all Internet protocols (for example, IP, TCP, FTP).

ILMI (Integrated Local Management Interface) ♦ The ATM Forum standard, ILMI is used to manage the physical and logical interface between two ATM devices.

IME (Interface Management Entity) ♦ The logical management layer implementing ILMI.

IP (Internet Protocol) ♦ A networking protocol for providing a connectionless (datagram) service to the higher transport protocol. It is responsible for discovering and maintaining topology information and for routing packets across homogeneous or heterogeneous networks. Combined with TCP, it is commonly known as the TCP/IP platform.

IPX (Internetwork Packet Exchange Protocol) ♦ A connectionless Network layer protocol similar to IP.

ISDN (Integrated Services Digital Network) ♦ An early, CCITT-adopted protocol reference model intended to provide a ubiquitous, end-to-end, interactive digital service for data, audio, and video. Synonym: narrowband ISDN.

ISO (International Standards Organization) ♦ An international body that creates networking standards, including the OSI model.

ITU (International Telecommunication Union) ♦ The international standards organization for telecommunications, previously known as the CCITT (International Telephone and Telegraph Consultative Committee). For more information, see <http://www.itu.ch>

isochronous ♦ A time-slot protocol that allows delivery of realtime data by dividing a time slot into equal-size mini slots allocated to different channels for synchronous transmission of information.

jitter ♦ See *CDV (Cell Delay Variation)* on page 171.

KB (Kilobytes) ♦ One kilobyte is equivalent to 1024 bytes when referring to memory size, and 1000 bytes when referring to speed.

Kbps (Kilobits per second)

KBps (Kilobytes per second)

LAN (Local Area Network) ♦ A data communications system designed to operate over a limited geographic distance, such as a single building.

LANE (LAN Emulation) ♦ An ATM Forum service specification that allows a connection-oriented ATM network to emulate legacy LAN (for example, Ethernet or Token Ring) services, such as broadcast.

LAP-D (Link Access Procedure-D) ♦ A Data Link layer procedure using D channel communications, typical of ISDN.

LE-ARP (LAN Emulation ARP) ♦ The ARP used in LAN emulation for binding a requested ATM address to the MAC address.

LEC (LAN Emulation Client) ♦ Typically located in an ATM end system (for example, an ATM host), its task is to maintain address resolution tables and forward data traffic. It is uniquely associated with an ATM address.

LES (LAN Emulation Server) ♦ A server which provides support for the LAN emulation address resolution protocol (LE-ARP). The LECs register their own ATM and MAC addresses with the LES. An LES is uniquely identified by an ATM address.

LECS (LAN Emulation Configuration Server) ♦ A server whose main function is to provide configuration information to an LEC (such as the ELAN it belongs to or its LES).

LLC (Logical Link Control) ♦ The upper half of the Data Link layer in LANs. Performs error control, broadcasting, multiplexing, and flow control functions. See also *MAC (Medium Access Control)* on page 175.

LLC/SNAP (Logical Link Control/SubNetwork Attachment Point)

local ♦ Describes files and devices, such as disk drives, that are attached to, or on, your machine.

MAC (Medium Access Control) ♦ A set of protocols that are the lower part of the Data Link layer and comprise the basis of the IEEE LAN specifications. In general, MAC determines the way devices can transmit in a broadcast network. See also *LLC (Logical Link Control)* on page 175.

Mbps (Megabits per second) ♦ Transmission speed or rate of one million bits per second.

Glossary

MBps (Megabytes per second) ♦ Transmission speed or rate of one million bytes per second or 8 Mbps.

MIB (Management Information Base) ♦ The specification that defines objects for referencing variables such as integers and strings. In general, it contains information about the network's management and performance (for example, traffic parameters). See also *ILMI (Integrated Local Management Interface)* on page 174.

MTU (Maximum Transmission Unit) ♦ The largest packet that can be sent over a given medium.

multicast ♦ A technique that allows copies of a single packet or cell to be passed to a set of destinations.

multimode fiber ♦ A large-core (62.5 micron) optical fiber through which multiple signals can propagate. Length constraint is 2 kilometers.

network ♦ An interconnection of multiple stations or systems that are able to send messages to and receive messages from one another.

NIC (Network Interface Card) ♦ A component that connects a station to a network (for example, a LAN). Synonym: adapter.

NMS (Network Management Station) ♦ The system responsible for managing a network or a portion of a network. The NMS communicates to network management agents (an agent resides in each managed node) using a network management protocol.

NNI (Network-to-Network Interface) ♦ The interface between two pieces of equipment on a public network.

node ♦ A device, such as a station or concentrator, connected to the network media, usually with an adapter.

NRZI (Non-Return to Zero Inverted) ♦ A data transmission technique where a polarity transition from low to high, or high to low, represents a logical 1. The absence of a polarity transition represents a 0.

NSAP (Network Services Access Point) ♦ In the OSI environment it is the SAP between the network and the transport layers. It identifies a Data Terminal Equipment by a unique address.

OAM (Operations and Maintenance) ♦ Set of administrative and supervisory actions regarding network performance monitoring, failure detection, and system protection.

OAM cell ♦ A cell that contains ATM layer management information. It does not form a part of the upper layer information transfer. Generated by hardware or network administrators. Cell header bits distinguish OAM cells from normal data cells.

OC-3c (Optical Carrier level 3, concatenated) ♦ An optical signal defined with a base rate of 155.52 Mbps. The concatenated signal is indivisible, that is, it cannot be multiplexed and demultiplexed.

OSI (Open Systems Interconnection) Model ♦ The 7-layer protocol model defined by the ISO for data communications.

packet ♦ Data in a highly-structured format for the purpose of transmission. *Frame*, *packet*, and *PDU* are equivalent in most contexts.

packet buffer ♦ Memory used on the Interphase NIC to store data for fragmentation and reassembly. Synonym: Side RAM.

packet switching ♦ Statistical, connectionless switching based on information contained in variable-length packets.

payload ♦ Part of the ATM cell, it contains the actual information to be carried, and may also contain overhead. It occupies 48 bytes.

PCI (Peripheral Component Interconnect) bus ♦ A high-performance multiplexed address and data bus. Supporting 32-bit with optional 64-bit data transfers, the PCI bus is intended to be an interconnect between peripheral controllers, peripheral add-in boards, and processor/memory systems. The PCI bus operates at up to 33 MHz, providing burst transfer rates up to 132 MBps 32 bits wide, or up to 264 MBps 64 bits wide.

PDU (Protocol Data Unit) ♦ Data in a highly-structured format for the purpose of transmission. *Frame*, *packet*, and *PDU* are equivalent in most contexts.

PHY (Physical Layer) ♦ Layer 1 of the OSI model. Defines and handles the electrical and physical connections between systems. The Physical layer can also encode data in a form that is compatible with the medium (coaxial, twisted pair, fiber, and so on).

PING (Packet Internet Groper) ♦ An Internet protocol facility used to test the reachability of destinations by sending an ICMP echo request, and waiting for a reply.

PMC (PCI Mezzanine Card) ♦ A daughtercard form factor implementation of the PCI bus specification.

PMD (PHY Medium Dependent) ♦ A standard that defines the medium and protocols to transfer symbols between PHYs.

point-to-multipoint connection ♦ A unidirectional, one-to-many VC that allows one station to simultaneously send data to the connected end stations.

point-to-point connection ♦ A bidirectional VC between two end points.

Glossary

primitive ♦ Data and events passed between a layer service user and a layer service provider.

protocol ♦ A set of rules and conventions that govern the exchange of information between communicating parties.

PVC (Permanent/Provisioned Virtual Connection) ♦ A VC provisioned for indefinite use in an ATM network, established by the network management system (NMS). See also *SVC (Switched Virtual Circuit)* on page 180.

Q.93B ♦ Early draft of the signalling specification now known as Q.2931, on which UNI 3.0 was based.

Q.2110 ♦ ITU Recommendation for specifying the UNI SSCOP.

Q.2931 ♦ ITU Recommendation derived from both Q.931 and Q.933 to provide SVC specifications and standards.

QoS (Quality of Service) ♦ The set of ATM performance parameters that characterize the traffic over a given VC.

QoS classes ♦ Five service classes defined by the ATM Forum in terms of the QoS parameters.

reassembly ♦ The portion of the ATM SAR that reassembles an incoming multiplexed stream of ATM cells into packets.

RFC (Request for Comment) ♦ IETF documents that contain proposed standards and specifications. RFCs can be either approved, or simply archived as historical recommendations.

RFC-1577 ♦ IETF standard for running Layer 3 IP traffic directly over ATM. See also *CLIP (Classical IP)* on page 172.

RJ-45 connector ♦ Standard 8-wire connector for IEEE 802.3 networks and some telephone applications.

SAAL (Signalling AAL) ♦ Service-specific parts of the AAL protocol responsible for signalling. Its specifications, being developed by the ITU, were adopted from N-ISDN.

SAP (Service Access Point) ♦ Functional interface between the layers in the OSI model through which lower layers provide services to the higher layers along with PDUs.

SAR (Segmentation and Reassembly) ♦ The lower half of the AAL. The segmentation portion inserts data from packets into cells, adds any necessary header or trailer bits to the data, and passes the 48-octet payload to the ATM layer. Each AAL type has its own SAR format. At the destination, the reassembly portion extracts the cell payload and rebuilds the packet.

SAR-PDU ♦ The 48-octet PDU that the SAR sublayer exchanges with the ATM layer. It is comprised of the SAR-PDU payload and any control information that the SAR sublayer adds.

SC (Subscriber Connector) ♦ A connector where the transmit and receive fibers are one keyed module plug that latches.

SDH (Synchronous Digital Hierarchy) ♦ A hierarchy that designates signal interfaces for very high-speed digital transmission over optical fiber links. See also *SONET (Synchronous Optical Network)* on page 179.

SDU (Service Data Unit) ♦ User data passed through a SAP between the layers of the OSI or a similar model.

signalling ♦ An ATM connection procedure that dynamically implements explicit routes through switches to establish a communication link with another station on the network.

single-mode fiber ♦ A small-core (9 micron) optical fiber through which only one signal can propagate. Length constraint for the device used in Interphase products is 20 kilometers.

SLIP (Serial Line Internet Protocol) ♦ A protocol for transmitting and receiving IP datagrams via a serial interface.

SNMP (Simple Network Management Protocol) ♦ A high-level, standards-based protocol for network management, usually used in TCP/IP networks. An SNMP manager controls and measures the activities of SNMP agents that are embedded in nodes and network devices on the network. SNMP relies on MIBs embedded in the network resources to monitor and control the network.

SONET (Synchronous Optical Network) ♦ An ANSI-defined standard for high-speed and high-quality digital optical transmission. It has been recognized as the North American standard for SDH.

SSCF (Service Specific Coordination Function) ♦ Part of the SSCS portion of the SAAL. Among other functions, it provides a clear interface for relaying user data and providing independence from the underlying sublayers. See also *SSCOP (Service Specific Connection-Oriented Protocol)* on page 179.

SSCOP (Service Specific Connection-Oriented Protocol) ♦ Part of the SSCS portion of the SAAL. SSCOP is an end-to-end protocol that provides error detection and correction by retransmission and status reporting between the sender and the receiver. It also guarantees delivery integrity. See also *SSCF (Service Specific Coordination Function)* on page 179.

Glossary

SSCS (Service Specific Convergence Sublayer) ♦ One of the two components of the Convergence Sublayer (CS) of the AAL. It supports the specific requirements of upper-layer protocols.

ST (Straight Through) connector ♦ A connector where the transmit and receive fibers have separate twist-on connections.

station ♦ An addressable node on the network capable of transmitting and receiving data.

STM (Synchronous Transfer Mode) ♦ A packet-switching approach where time is divided into time slots assigned to single channels during which users can transmit periodically. Basically, time slots denote allocated (fixed) parts of the total available bandwidth.

STM-1 (Synchronous Transport Module-1) ♦ An ITU-defined SDH physical interface for ATM digital transmission at the rate of 155.52 Mbps.

STM-n (Synchronous Transport Module-n) ♦ An ITU-defined SDH physical interface for ATM digital transmission at n times the basic STM-1 rate. STM-n and SONET STS-3n transmission rates are equivalent.

STS (Synchronous Transport Signal)

subnet address ♦ An extension of the Internet addressing scheme. Using this method, a site can use a single Internet address for multiple physical networks.

SVC (Switched Virtual Circuit) ♦ A software-created dynamic connection between two network nodes. SVCs are created “on demand” and torn down upon completion of the data transfer.

symbol ♦ The smallest signaling element used by the MAC sublayer. The symbol set consists of sixteen data symbols and sixteen nondata symbols. Each symbol corresponds to a specific sequence of code bits (code group) to be transmitted by the PHY.

synchronous transmission ♦ A data transmission scheme where the interval between transmitted characters is fixed so that start and stop bits are not required. As opposed to asynchronous transmissions, synchronous transmissions are guaranteed a specific percentage of bandwidth on the network medium.

TCP/IP (Transmission Control Protocol/Internet Protocol) ♦ A set of communications protocols that define how different types of computers talk to each other. It is the standard architecture for internetworking multiple organizations, and the common link that ties the huge Internet together.

TELNET ♦ A TCP/IP protocol that supports remote terminal operations via a network.

Token Ring ♦ A 4 Mbps or 16 Mbps network that uses a ring topology and a token-passing access method.

UBR (Unspecified Bit Rate) ♦ With UBR, the source specifies no traffic parameters, and therefore the network does not guarantee transmission quality.

UNI (User-Network Interface) ♦ Definition of the interface between an end system and an ATM switch. Defines a set of specifications for signaling. Produced by the ATM Forum.

UNI 3.0 ♦ ATM Forum UNI specification for the physical (PHY) and ATM layers, the ILMI, OAM (traffic control), and PVC support.

UNI 3.1 ♦ A corrected version of UNI 3.0, this specification also includes SSCOP standards.

UNI 4.0 ♦ This UNI specification covers signalling issues in ABR and VP, as well as QoS negotiation.

UTP (Unshielded Twisted Pair) ♦ Type 3 cable with one or more twisted pairs where the wiring is not protected from electromagnetic and radio frequency interferences. There are two main categories of UTP used in ATM: category 3 for 25 Mbps, and category 5 for 155 Mbps. See also *CAT-3 (Category 3 UTP)* on page 171 and *CAT-5 (Category 5 UTP)* on page 171.

VBR (Variable Bit Rate) ♦ The bit rate available to a user for the transfer of user information that requires a guaranteed service for a bounded variable transmission rate.

VBR-RT (Variable Bit Rate—Real Time) ♦ One of the service types for transmitting traffic which is timing- and control-dependent and is characterized by having both average and peak cell rates. VBR-RT is suitable for carrying traffic such as packetized (compressed) video and audio.

VBR-NRT (Variable Bit Rate—Non-Real Time) ♦ One of the service types for transmitting traffic which is not timing-critical and is characterized by having both average and peak cell rates. VBR-NRT is well-suited to long data packet transfers.

VC (Virtual Channel/Connection/Circuit) ♦ A logical transmission path or connection between two network endpoints.

VCI (VC Identifier) ♦ A 16-bit identifier in an ATM cell header which, when combined with the VPI, identifies the VC to the next ATM device.

Glossary

VLAN (Virtual LAN) ♦ A networking environment where users on physically independent LANs are interconnected in such a way that it appears they are in the same LAN workgroup.

VP (Virtual Path) ♦ A logical pipe which can contain a group of VCs that connect network devices.

VPI (VP Identifier) ♦ A field in an ATM cell header which, when combined with the VCI, identifies the VC to the next ATM device.

WAN (Wide Area Network) ♦ A network spanning a large geographical area that provides communications among devices on a regional, national, or international basis.

workstation ♦ A networked computer typically reserved for end-user applications.

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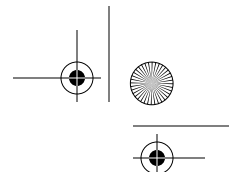
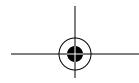
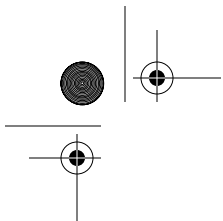
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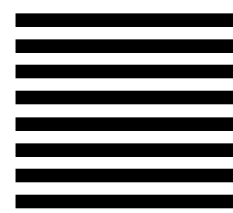
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