



Dell™ PowerVault™ 7x0N Systems

**CONNECTING TO ATM
AND FDDI NETWORKS**

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Notes, Notices, Cautions, and Warnings

Throughout this guide, blocks of text may be accompanied by an icon and printed in bold type or in italic type. These blocks are notes, notices, cautions, and warnings, and they are used as follows:



NOTE: A NOTE indicates important information that helps you make better use of your computer system.

NOTICE: A NOTICE indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.



CAUTION: A CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



WARNING: A WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious bodily injury.

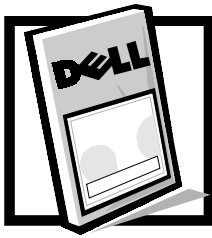
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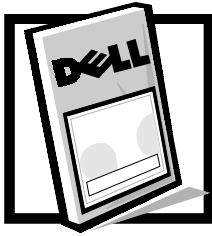
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Dell™ PowerVault™ 7x0N Systems Connecting to ATM and FDDI Networks

This document discusses the following topics:

- Asynchronous transfer mode (ATM)
- Connecting to an ATM network
- Connecting to a fiber distributed data interface (FDDI) network
- Command reference guide

Asynchronous Transfer Mode (ATM)

ATM is a network technology that combines the features of cell-switching and multiplexing to offer reliable and efficient network services.

ATM provides an interface between devices such as workstations and routers, and the network. The asynchronous nature of ATM means that bandwidth is made available on demand instead of allocating slots of transmission time to network devices, as is the case in a synchronous system employing time-division multiplexing (TDM).

ATM employs fixed-sized cells of 53 bytes each as the basic unit of transmission. Each cell consists of a 5-octet header, identifying the source of the transmission, among other information, and a 48-octet payload containing the user data and headers for higher-level protocols. This architecture permits data ranging from text, voice, graphics, and video to share the same network without any one source dominating network bandwidth.

ATM employs a star topology with an ATM switch acting as the hub of the network. All devices are connected directly to this hub, making network configuration and troubleshooting more straightforward, as well as offering dedicated bandwidth to the central switch.

You can use ATM in two ways on a Dell PowerVault 720N, 740N, or 760N filer (hereafter referred to as a filer):

- ATM local area network emulation (LANE), which provides the services of an Ethernet LAN (ELAN) to higher-level network application software
- FORE/IP over Simple Protocol for ATM Network Signaling (SPANS) with permanent virtual circuits (PVCs)

The filer can simultaneously support FORE/IP over SPANS as well as LANE over user network interface (UNI) 3.0 or 3.1 on the same physical interface.

ATM LANE

Many organizations use a LAN for their internal data communications needs. Examples of these LANs include Ethernet/IEEE 802.3 and IEEE 802.5 (Token Ring). However, LANs typically offer a connectionless service, while ATM is always connection-oriented.



NOTE: To use LAN-based applications with ATM, some form of LANE is required.

Differences Between LANs and ATM

In addition to the issue of connection-based versus connectionless service, LANs differ from ATM in the following ways:

- The shared medium approach of LANs make them ideal for broadcast and multi-cast messages.
- The media access control (MAC) addresses used to identify a network interface are typically based on the manufacturer's serial numbers.

This means that the address is constant, independent of the network to which the interface is connected.

Services Provided by LANE

LANE is an ATM service that offers the following services:

- The capability to run LAN-based application software on an ATM network.
- The capability for ATM networks to be interconnected with conventional LANs by means of existing bridging methods.

This permits application programs running on ATM-connected end systems to interoperate with those running on traditional LAN-based devices. These LAN-based end systems can also communicate with each other across the ATM network.

- The capability of running more than one ELAN on the same ATM network, with each ELAN independent of the others.

This means that users cannot communicate between ELANs without the appropriate routing or bridging methods.

What Is an ELAN?

An ELAN consists of the following components:

- A single LANE service, which itself consists of a LAN Emulation Configuration Server (LECS), a LAN Emulation Server (LES), and a Broadcast and Unknown Server (BUS). Each of these components are discussed in more detail later in this document.
- A set of LECs.

The LEC communicates with other LECs and with the LANE service using virtual channel connections (VCCs) in an ATM switched virtual circuit (SVC) environment.

An ELAN comprises a group of ATM-attached devices, logically analogous to a group of LAN stations attached to an Ethernet/802.3 LAN segment. Several ELANs can be configured within an ATM network, and membership to an ELAN is independent of where the end station is physically connected. The end station can belong to multiple ELANs.

Addressing and Address Resolution

LANs use a MAC address to designate the source and destination addresses for stations. For LANE to function transparently, it must be capable of offering similar functionality. In practical terms, this means that each LEC has a MAC address, and when more than one LEC uses the same network interface, each LEC is assigned a different MAC address.

When the LEC needs to send data to another MAC address, it must first resolve that address to an ATM address, thus enabling it to establish a data direct VCC to that LEC. To do so, it sends an LE_ARP_REQUEST to the LES. The LES can either respond to this request, if it can, or it can forward it to other LECs. If the specified MAC address is known anywhere on the ELAN, the originating LEC gets an LE_ARP_RESPONSE frame containing the corresponding ATM address.

LAN Emulation Client (LEC)

The LEC is part of an ATM end station or a MAC bridge and performs data forwarding as well as address resolution, among other control functions. The LEC supplies higher-level software with an Ethernet/IEEE 802.3 MAC layer interface that enables LAN-based application software to communicate over ATM networks just as they would over a traditional LAN.

LECs communicate with other clients using the LANE Service, and represent users by their MAC addresses. An LEC employs separate VCCs for data and control communication, including LE_ARP requests for address resolution. User data, intended for another end station, is encapsulated in IEEE 802.3 frames.

LAN Emulation Service (LANE Service)

The LANE Service, consisting of a LES, BUS, and LECS, can be implemented as part of one or more end systems or as part of the ATM switch. In cases where the service is implemented in a distributed fashion over multiple devices, benefits include parallel operation as well as better error recovery through redundancy.

Within the LANE Service, the LES is responsible for coordinating the control functions, while the LECS serves network clients by supplying ELAN configuration information. Finally, the BUS forwards broadcast and multicast frames, and handles unresolved unicast frames.

LAN Emulation Server (LES)

The LES performs a number of control services within an ELAN, including registering MAC addresses and resolving these addresses to corresponding ATM addresses when requested. LECs can also request the LES to resolve a route descriptor to an ATM address. In either case, the LES responds to the client or forwards the request to other clients, which might be in a better position to service the query.

The LES also coordinates the process of a LEC joining an ELAN. There is a single LES per ELAN, and each LES has a unique ATM address.

LAN Emulation Configuration Server

The LECS maintains information concerning all the ELANs in an administrative domain, and supplies the LEC with the ATM address for the LES in the domain. Before joining an ELAN, the LEC first exchanges configuration information with the LECS.

Upon successfully communicating with the LECS, the LEC receives a list of ELANs that are available to join. There is a single LECS per administrative domain for ELANs within a domain.

Broadcast and Unknown Server

The BUS accepts and processes data sent by an LEC to the broadcast MAC address 'FFFFFFFFFFFF'. The BUS also handles all multicast messages, as well as initial unicast frames sent by a LEC before the ATM address has been resolved.

The BUS thereby offers services that emulate the shared medium capabilities typical of a LAN. The BUS does this by serializing the frames and retransmitting them to the appropriate LECs within the ELAN.

Although there might be multiple BUSs defined within an ELAN, each LEC is associated with only a single BUS per ELAN.

UNI Load Balancing

The UNI, which serves as an interface point between ATM end systems and the ATM switch, supports both automatic adapter failover and load balancing across multiple adapters connected to the same physical ATM switch. This means that the UNI signaling module automatically detects which adapters are connected to a single physical network and places all adapters connected to that network in a failover group.

With respect to load balancing, both incoming and outgoing connections are directed to the least used adapter in a load balancing group. In cases when an adapter in a load balancing group fails, the connections on that adapter are automatically transferred to another adapter.

UNI load balancing and adapter failover does not require any configuration. However, you can statically configure or disable UNI load balancing, if desired.

LANE Standards Supported in This Release

This release of Data ONTAP supports the following features and standards:

- ATM Forum LANE Version 1.0 LEC Support
- UNI 3.0 and 3.1
- Interim local management interface (ILMI) Address Registration
- ILMI management information base (MIB) extensions for LANE

The software works with the FORE OC3 ATM network interface and on Dell PowerVault 7x0N filers. The software provides Ethernet LANE services, with the capability to configure multiple ELANs on each available network interface.

The current release does not support ATM LANE 2.0, Multi-Protocol Over ATM (MPOA), Classical IP (CLIP), or Token Ring LANE services.

Configuring the ATM Adapter for LANE

This section and the following sections describe how to configure the ATM adapter in the filer to communicate using ATM LANE. The sections also describe how to verify that an ATM adapter is properly configured and operating on one or more ELANs.



NOTE: See Table 1 for important information before you start configuring the ATM adapters in the filer.

Table 1. Prerequisites for Configuring ATM Adapters

Prerequisite	Explanation
Complete the normal setup procedure for your filer, run automatically when you first install the filer.	You need an ATM switch with one or more ELANs already configured on the switch (with the corresponding configurations for the LECS, LES, and BUS)
Know the LECS address for the ELAN that you want the filer to join.	In most cases, the LECS has been configured to use the “well-known” address; however, this might be different at your site.
If your site has multiple ELANs, know the ATM address of the LECS for each ELAN you want a client to join.	You can configure each ATM adapter in the filer to communicate over multiple ELANs on the network.

If you need more information about creating an ELAN or configuring the LECS, LES, and BUS, refer to the documentation that came with your switch.

Getting Started With LANE Configuration

To start the configuration, perform the following steps:

1. Type the following commands to make sure the ATM adapter is functioning:

 adinfo — To check that the ATM adapter is installed and functioning properly

 adstat — To check that the ATM adapter has a working physical connection to the ATM network
2. Check that the UNI is operational. The UNI provides an interface between ATM clients and the ATM switch.

Using the **adinfo** Command

To access an ELAN, the ATM adapter in your filer must be installed and functioning properly. Use the **adinfo** command to verify this.

Command syntax: The **adinfo** command has the following syntax:

```
adinfo
```

Example: The sample output from this command is as follows:

```
a1:unit 1:          PCA-200E Media=OC3-MM-SC HW=2.0.1 FW=4.2.0
Serial=4201600 Slot=1

          MAC=00:20:48:40:1C:80

a2:unit 2:          PCA-200E Media=OC3-MM-SC HW=2.0.1 FW=4.2.0
Serial=4201621 Slot=2

          MAC=00:20:48:40:1C:95

a3:unit 3:          PCA-200E Media=OC3-MM-SC HW=2.0.1 FW=4.2.0
Serial=4201955 Slot=3

          MAC=00:20:48:40:1D:E3
```

Interpreting the output: You should see lines for each of the ATM adapters in your filer that is functioning properly. The presence of the line indicates that the adapter has passed its self-test procedure and that the filer initialized the adapter. However, it does not verify that the adapter is sending or receiving packets. The **adinfo** command also displays the device name for each of the installed adapters, as well as the unit number, at the beginning of each line.

The unit number uniquely identifies the ATM adapter in the filer, and there is a one-to-one mapping between the device names and unit numbers. The device name consists of the prefix 'a' followed by the physical slot number. The unit number is simply the slot number.

Some commands, such as **uniconfig** and **el config**, require the unit number as a parameter. Other commands, including **adinfo** and **adstat**, require the device name.

You might want to note the unit number for any ATM adapters you plan to configure in the near future. You can also perform the **adinfo** command again at any time to determine the correct unit number.

Using the adstat Command

The ATM adapter in your filer should be properly connected using the appropriate cabling. To check that your filer has a working physical connection to your ATM network, use the **adstat** command.

Command syntax: The **adstat** command has the following syntax:

```
adstat -d device
```

device is the name of the particular ATM adapter whose connection you want to check.

The following command displays statistics about the ATM adapter in slot 1 of your filer:

```
adstat -d a1
```

The sample output from this command is as follows:

```
Device statistics:
```

```
          Buffer Allocation Failures
          Type 1           Type 2
          Small   Large   Small   Large   Receive Queue Full   Carrier
          0         0       0         0         0                   ON
```

Interpreting the output: Verify that the `Carrier` is `ON` in the output. If the `Carrier` is not `ON`, your cabling is either incorrectly connected or faulty, or your ATM network is malfunctioning or misconfigured.

If you need information about connecting the cabling to your filer's ATM adapter, refer to the enclosed ATM installation guide.

Ensuring the UNI Is Operational

To check whether the UNI is operational, use the **uniconfig** command.

Because the filer's ATM address is automatically registered with the switch, you only use the **uniconfig** command to display configuration parameters, check the UNI version number, and ensure that the UNI is operational.

Command syntax: The **uniconfig** command has the following syntax:

```
uniconfig show
```

The abbreviated sample output (showing unit 3 only) from this command is as follows:

```
UNI parameters for unit 3
=====
VPI/VCI                : 0/5
AAL type                : 5
QoS                     : UBR
UNI configured version  : 3.1
UNI operating version   : 3.1
SSCOP operational state : operational
Primary ATM address    :
47.0005.80.ffe100.0000.f21a.4d19.002048401de3.00
UNI failover configuration
=====
Status: dynamic
Groups: (0) (1*) (2)
```

Interpreting the output: To verify that the ATM interface is operational, check the following items:

- The `UNI configured version` and `UNI operating version`. This value should be 3.1 in both cases.
- The `SSCOP operational state`. This should indicate that the UNI is operational. If you see `inoperational` instead, the ATM card is improperly connected to the network or the switch is improperly configured.
- The `Primary ATM address`. This should be a valid ATM address for your network. If you see an address consisting entirely of zeros, the ATM card is either improperly connected to the network, or there might be a configuration problem.

Configuring the LECS Address

For the filer to participate in an ELAN, you must configure the ATM adapter with the address of the LECS. The LEC joins an ELAN by first exchanging configuration information with the LECS. The LECS then supplies the client with the ATM address for the LES.

To configure the LECS address, perform the following steps:

1. Set the LECS address.
2. Check that the adapter is communicating with the LECS.

Setting the LECS Address

To configure the LECS address for your ATM adapter, use the **elconfig set** command.

Command syntax: The **elconfig set** command has the following syntax:

```
elconfig set -lecs ATM_address | -wellknown -unit unit_number
```

ATM_address is the ATM address of the LECS on the network.

unit_number is the unit designator for the ATM adapter in the filer.

The following command sets the LECS address to the well-known ATM address for the adapter in slot 2:

```
elconfig set -lecs -wellknown -unit 2
```

If the LECS on your network does not use the well-known address, specify this address in place of "wellknown," as shown in the following command:

```
elconfig set -lecs  
47.0079.00.000000.0000.0000.0000.00a03e000001.00 -unit  
unit_number
```

Knowing the LECS address, the system can now determine all existing ELANs, as well as the ATM address of the LES. However, the LAN Type remains unknown until you configure the adapter to join the ELAN, which is discussed in "Configuring the ATM Adapter for an ELAN," found later in this document.

To check the state of all adapters in the filer, use the **elconfig show** command.

Command syntax: The **elconfig show** command has the following syntax:

```
elconfig show -all
```

The abbreviated sample output (showing ELANs available through the LECS for Adapter 2 only) from this command is as follows:

```
ELANs on Adapter 2
```

```
=====
```

```
LECS (current): 47.0079.00.000000.0000.0000.0000.00a03e000001.00
```

ELAN	LAN Type	LES ATM Address
====	=====	=====
eighteenKMTU	Unknown	
47.0005.80.ffe100.0000.f21a.4d19.0020481a4d19.14		
=> default	Unknown	
47.0005.80.ffe100.0000.f21a.4d19.0020481a4d19.f0		
nineKMTU	Unknown	
47.0005.80.ffe100.0000.f21a.4d19.0020481a4d19.11		

Interpreting the output: Verify that each of the ELANs on the network appears in the output, and that the LAN Type and LES ATM addresses appear as expected. There should be a separate line for each configured ELAN on the network, grouped and arranged for each ATM adapter that is installed in the filer.

If a separate line fails to appear for each configured ELAN, grouped by adapter, you need to go back to the ATM switch and make sure that each of the ELANs is properly configured. The documentation that came with your switch should help you with this.

An arrow appearing to the left of an ELAN signifies that the ATM adapter has been configured to operate on that ELAN. The lack of an arrow along with a LAN Type of `Unknown` signifies that the adapter has not yet joined the ELAN. Information about configuring adapters to operate on an ELAN is in “Configuring the ATM Adapter for an ELAN,” found later in this document.

Check that the LES ATM address appears valid. If this is the case, you know that the ATM adapter in the filer is communicating properly with the switch. If the LES ATM address is all zeros, it might mean that the cable connection is not working, or that something else is improperly configured at the switch.

Finally, ensure that the LECS ATM address matches the address that you specified earlier in “Setting the LECS Address,” found earlier in this document.

Configuring the ATM Adapter for an ELAN

You must configure the ATM adapter to enable it to operate on one or more ELANs.

Before doing so, however, you must configure the LECS ATM address for each adapter, as described in “Configuring the LECS Address,” found earlier in this document. In most cases, the LECS is set to the well-known address, although this might be different for your network. Also, the ELAN you specify must already have been configured at the switch.

To configure the LECS address, perform the following steps:

1. Add an ELAN to the adapter.
2. Configure the emulated Ethernet interface.
3. Add additional ELANs to the adapter, if required.
4. Correct ELAN addition mistakes, if necessary.

Adding an ELAN to the Adapter

To add the ELAN to the adapter, use the **elconfig add** command.

Command syntax: The **elconfig add** command has the following syntax:

```
elconfig add ELAN -if interface -type ethernet -unit unit_number
```

ELAN is the Emulated LAN that you want the adapter to join.

interface is the logical network interface.

unit_number is the unit designator for the ATM adapter in the filer.

Example: The following command adds the adapter Unit 2 to the nineKMTU ELAN of type Ethernet, using interface *e11*:

```
elconfig add nineKMTU -if e11 -type ethernet -unit 2
```

Interpreting the output: This specific example assumes that the nineKMTU ELAN already exists on the switch. Also, if there is only a single ATM adapter in the filer, you do not need to specify the unit number in the command. The **elconfig** command sets it automatically.

The *e11* interface refers to a logical interface, thereby enabling you to configure more than one logical interface for the same physical ATM adapter. This means that you can use the **elconfig add** command repeatedly to configure the filer to communicate over multiple ELANs using a single physical ATM adapter. Only Ethernet emulated networks are supported.

To add an ELAN to an adapter using FilerView, enter the **elconfig** command using FilerView's command-line interface.

Configuring the Logical Ethernet Interface

After the ATM adapter joins an ELAN, you need to assign an IP address to the logical network interface and configure additional parameters.

To configure a network interface, use the **ifconfig** command.

Command syntax: The **ifconfig** command has the following syntax:

```
ifconfig interface address netmask mask up
```

interface is the name of the logical network interface.

address is the IP address associated with the interface.

mask is a dot notation Internet address that is selected according to the class of the IP address.

For more information about the `netmask` parameter and the **ifconfig** command, refer to the *System Administrator and Command Reference Guide*.

Example: The following command configures the `e10` logical network interface, assigning a corresponding IP address and netmask:

```
ifconfig e10 172.20.12.19 netmask 255.255.252.0 up
```

Adding More Than One ELAN to an Adapter

Adding more than one ELAN to an ATM adapter enables the filer to communicate over more ELANs than the number of physical adapters installed in the filer. To do so, repeat the procedures in “Adding an ELAN to the Adapter” and “Configuring the Logical Ethernet Interface,” found earlier in this document, for each ELAN you want to add to the adapter.

Correcting ELAN Addition Mistakes

If you make a mistake using the **elconfig add** command, you can delete an ELAN from an adapter using the **elconfig delete** command.

Command syntax: The **elconfig delete** command has the following syntax:

```
elconfig delete ELAN -unit unit_number
```

ELAN is the Emulated LAN that you want to delete from the adapter.

unit_number is the unit designator for the ATM adapter in the filer.

Example: The following command deletes the nineKMTU ELAN for the adapter designated by unit 2:

```
elconfig delete nineKMTU -unit 2
```

Correcting ELAN Addition Mistakes After an IP Address Is Assigned

If an IP address has already been assigned to a logical Ethernet interface on the adapter using **ifconfig**, you should see a message stating `elconfig ELAN in use` displayed as output from the **elconfig delete** command.

In this case, you must mark the interface as “down” by entering the **ifconfig** command before deleting the ELAN from the adapter:

Command syntax: The **ifconfig** command has the following syntax:

```
ifconfig interface down
```

interface is the name of the logical network interface.

Example: The following command marks the `e11` logical network interface as “down”:

```
ifconfig e11 down
```


Checking and Completing the ELAN Configuration

1. Verify the communication link.
2. Check the configuration settings.
3. Check the other elements of the ELAN.
4. Modify the load balancing setting, if desired.
5. Save the configuration in the **/etc/rc** and **/etc/hosts** files.

Verifying the Communication Link Using ping

After you add an ELAN to an adapter and configure the interface, check to ensure that the filer can communicate with other clients through the ELAN. The easiest way to do this is to **ping** another LEC on the ELAN to ensure that information is traveling out through the ATM adapter and back again.

To **ping** an LEC, or any other client, use the **ping** command.

Command syntax: The **ping** command has the following syntax:

```
ping host
```

host is the IP address of the computer to which you want to send an Internet control message protocol (ICMP) ECHO_REQUEST datagram.

Example: The following command sends the datagram to host 204.125.14.45, and waits for a response:

```
ping 204.125.14.45
```

If the host responds, **ping** prints "*host* is alive." Otherwise, **ping** resends the ECHO_REQUEST once a second. If the host does not respond after 20 seconds, **ping** prints "no answer from *host*."

From a diagnostics point of view, it is often useful to have an LEC configured on the switch.

Checking the Configuration Settings

Double-check the state of the adapters in the filer to ensure that the configuration is as you expect.

To check the configuration setting, use the **elconfig show** command.

Syntax: The **elconfig show** command has the following syntax:

```
elconfig show -all
```

Example: The abbreviated sample output (showing ELANs on Adapter 2 only) from this command is as follows:

```
ELANs on Adapter 2
=====
LECS (current): 47.0079.00.000000.0000.0000.0000.00a03e000001.00

  ELAN          LAN Type    LES ATM Address
  ====          =====    =====
      eighteenKMTU Ethernet
47.0005.80.ffe100.0000.f21a.4d19.0020481a4d19.14
=> default      Unknown
47.0005.80.ffe100.0000.f21a.4d19.0020481a4d19.f0
=> nineKMTU     Ethernet
47.0005.80.ffe100.0000.f21a.4d19.0020481a4d19.11
```

Interpreting the output: Verify the following for newly configured ATM adapters:

- There is an arrow preceding the ELAN name, which indicates that the adapter has joined the ELAN.
- The LAN Type is Ethernet.
- The LES ATM Address is a valid ATM address. If the address is all zeros, it indicates a configuration problem at the switch.

Checking the Other Elements of the ELAN

You should also check to ensure that the other elements of the ELAN are configured and operating as expected. For example, you should verify that the LES, LECS, and BUS ATM addresses are all valid, and that the state of the ELAN is operational.

In addition, you should check the MTU of each ELAN to verify that the setting matches the configuration created on the switch, by using the **elconfig show** command.

Syntax: The **elconfig show** command has the following syntax:

```
elconfig show -configured
```

Example: The abbreviated sample output (showing information related to the eighteenKMTU ELAN on adapter 2 only) from this command is as follows:

```
ELAN Name          : eighteenKMTU
Interface          : e11
Configured Unit    : 2
MAC Address        : 00:20:48:40:1c:95
LEC Address        :
47.0005.80.ffe100.0000.f21a.4d19.002048401c95.00
```

```

LECS Address          :
47.0079.00.000000.0000.0000.0000.00a03e000001.00

  Configuration Direct VCC :   unit=1 vpi/vci=0/17

LES Address           :
47.0079.00.000000.0000.0000.0000.00a03e000001.00

  Control Direct VCC      :   unit=- vpi/vci=-/-

  Control Distribute VCC  :   unit=- vpi/vci=-/-

LAN Type              : Ethernet/IEEE 802.3

Maximum Frame Size    : 18190

State                  : operational

MPOA                   : disabled

LECID                  : 8

```

Modifying Load Balancing [optional]

To modify load balancing groups, use the **uniconfig set failover** command.

Syntax: The **uniconfig set failover** command has the following syntax:

```
uniconfig set failover [ -state off | static | dynamic ] [-group
unit ... ]
```

-state static puts UNI load balancing in a static mode.

-group unit... specifies the load balancing group membership.

-state off disables load balancing and failover.

The option -state dynamic is the default.

Example: The following command disables load balancing and failover:

```
uniconfig set failover -state off
```

The arguments to the -group parameter specify the ATM adapters (units) that should be logically assigned to a load balancing and failover group. If you specify a unit that has already been assigned to another group, the unit is automatically removed from the original group before being assigned to the new group.

Load balancing does not depend on any nonstandard extensions to the UNI. However, the switch must support the following:

- Registering the same ATM address on multiple ports
- Registering multiple ATM addresses on a single port

If the switch does not support these features, load balancing and failover is automatically disabled.

By default, all ATM adapters are dynamically assigned to load balancing groups. In this case, no configuration is necessary to activate the load balancing and failover features.

Saving the ATM Configuration Information

After you successfully configure each of the ATM adapters in the filer and verify their proper operation, you should do the following:

- Save the commands in the **/etc/rc** file for automatic execution at boot time.
- Save the host and IP address information in the **/etc/hosts** file for each logical ELAN interface.

This saves you from having to reconfigure the adapters manually each time the filer is restarted.

Saving the Configuration in the /etc/rc File

Save the commands in the **/etc/rc** file for automatic execution at boot time. To do this, mount the root file system and edit the file using a text editor such as vi.

Example: The following is a sample portion of an **/etc/rc** file containing configuration commands for three ATM adapters:

```
# unit 1
elconfig set -lecs -wellknown -unit 1
elconfig add default -if e10 -type ethernet -unit 1
ifconfig e10 172.20.12.19 netmask 255.255.252.0 up
# unit 2
elconfig set -lecs -wellknown -unit 2
elconfig add nineKMTU -if e11 -type ethernet -unit 2
ifconfig e11 201.201.201.219 netmask 255.255.255.0 up
# unit 3
elconfig set -lecs -wellknown -unit 3
elconfig add eighteenKMTU -if e12 -type ethernet -unit 3
ifconfig e12 201.201.210.219 netmask 255.255.255.0 up
elconfig add nineKMTU -if e13 -type ethernet -unit 3
ifconfig e13 201.201.210.220 netmask 255.255.255.0 up
elconfig wait
```

Note that in this example, both adapter 2 and adapter 3 are on the nineKMTU ELAN, and that adapter 3 is on two ELANs.

Configuring the /etc/hosts file

Save the host and IP address information of the ELAN configuration in the **/etc/hosts** files.

Example: The following is a sample portion of the **/etc/hosts** file containing the host and IP address information for the ATM adapters:

```
172.20.12.19myfiler-e10
201.201.201.219myfiler-e11
201.201.210.219myfiler-e12
201.201.210.220myfiler-e13
```

If you have a filer that has only ATM adapters, the **/etc/hosts** file must contain an entry for the filer's host name. For example, the first line in the example might be as follows:

```
172.20.12.19myfiler myfiler-e10
```

The host name is not displayed as part of the command prompt until you add the host name in one IP entry and reboot the filer. On filers that include other types of network interfaces, the installation setup procedure automatically adds the host name entry to the **/etc/hosts** file.

Configuring Additional ATM Adapters

Repeat the complete instructions in this document to configure additional ATM adapters in the filer.

Connecting to an ATM Network



WARNING: See your PowerVault 7x0N filer system documentation for important safety information before working inside your computer.

ATM Cable Requirements

To connect to an ATM network, you must have a duplex 62.5/125 micron multimode fiber optic cable with an SC connector. Make sure that you observe the maximum cable length specifications listed in the appropriate ATM Forum UNI standard.

Connecting the Filer to an ATM Network

To connect the filer to an ATM network, push the duplex fiber optic cable connector into the card's connector until it clicks and locks into place. Figure 1 shows a duplex fiber optic cable connecting to an ATM card. The transmit port on the ATM card is labeled T and the receive port is labeled R.

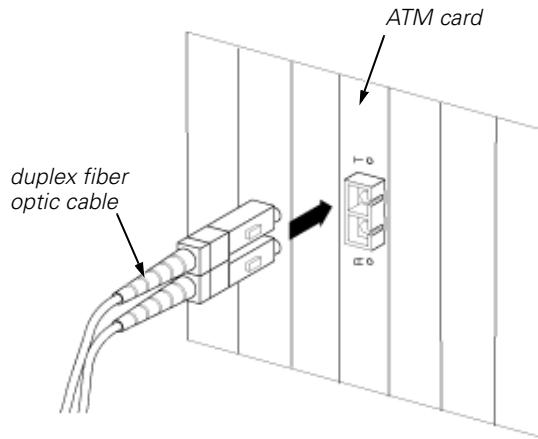


Figure 1. Duplex Fiber Optic Cable Connecting to an ATM Card

FORE/IP Over SPANS

This section describes how to configure ATM PVCs.

Types of ATM Connections

ATM supports two types of SPANS connections: SVCs and PVCs.

Use of SVCs

The filer dynamically assigns SVCs when interoperating with ATM hosts and with switches that support the FORE/IP over SPANS protocols.

Use of PVCs

You use ATM PVCs to interoperate with ATM hosts and with switches that do not support FORE/IP over SPANS. For example, if you are not using a FORE systems switch, PVCs can connect FORE equipment at each end through non-FORE switches.

Data ONTAP currently supports only FORE/IP 5.3. The following differences from previous versions are significant:

- The name of a SPANS interface in Data ONTAP 5.3 is *fan* (where *n* is a number); in previous versions of Data ONTAP it was *an*. This means that you must change the interface names in your **/etc/rc** and **/etc/hosts** files.
- In Data ONTAP 5.3, you use the new command **atmconfig** to configure PVCs.

For further information about the differences between FORE/IP 5.3 and older versions, consult FORE documentation.

PVCs are static; for each destination, you must establish (attach the IP layer to) a PVC explicitly and delete (detach the IP layer from) the PVC explicitly.

For each destination that needs to establish a PVC with the filer, you must establish an outgoing and an incoming PVC in at least three places:

- On the filer
- On the destination ATM host
- On all interconnecting ATM switches

SPANS Interfaces

For each physical ATM interface, the filer creates a FORE/IP interface, called *fa*, at boot time. The *fa* interface supports FORE/IP on top of SPANS signaling. FORE/IP allows communication as follows:

- Using AAL4 or AAL5 ATM adaptation layer types with no encapsulation
- Using a broadcast address resolution protocol (ARP) for SPANS address resolution
- Using direct communication of all hosts on a physical ATM network without the use of IP routers

Network Appliance does not support FORE/IP load balancing or failover options.

Establishing an Outgoing FORE/IP PVC on the Filer

To establish an outgoing FORE/IP PVC on the filer, type the following filer command:

```
atmarp -s hostname pvc iface vpi vci [aal [encap [addr]]]
```

Table 2 provides descriptions of the variables in the filer command.

Table 2. Descriptions of Variables

Variable	Description
<i>hostname</i>	Name or IP address of the remote host.
<i>iface</i>	Name of the ATM interface; this is usually <i>fan</i> , where <i>n</i> is a number.
<i>vpi</i>	Virtual path identifier (VPI); this must be 0.
<i>vci</i>	Virtual channel identifier (VCI); this number must have the following properties: <ul style="list-style-type: none">• It must not be in use on your filer.• It must be less than 1024.• It must obey the limits of the destination host and interconnecting devices.

Table 2. Descriptions of Variables (continued)

Variable	Description
<i>aal</i>	ATM adaptation layer type. It must be 4 or 5, and should be the AAL type supported by the destination host, which is typically 5. The default is 5.
<i>encap</i>	Encapsulation type. Specify one of the following encapsulation types: <ul style="list-style-type: none">• null (no encapsulation; this is the default)• llc_routed (IEEE LLC encapsulation for routed power distribution units [PDUs])• llc_bridged_8023 (IEEE LLC encapsulation for Ethernet/802.3 bridged PDUs) It should also be the same as the encapsulation type used by the destination host. If the encapsulation type is llc_bridged_8023, you must include <i>addr</i> .
<i>addr</i>	Six-byte colon-separated destination MAC address.

Establishing an Incoming FORE/IP PVC on the Filer

To establish an incoming FORE/IP PVC on the filer, use the following command at the filer:

```
atmarp -l pvc iface vpi vci [aal [encap]]
```

Use the variables as described in Table 2.

Establishing a FORE/IP PVC on the Remote ATM Host

Set up a FORE/IP PVC on the remote ATM host according to the documentation for that host.

Establishing a FORE/IP PVC on Interconnecting ATM Switches

On the interconnecting ATM switches, assign virtual channels corresponding to the VPI and VCI entries made on the filer and the remote ATM host according to the documentation for those switches.

Displaying Information About a FORE/IP PVC

To display information about all FORE/IP PVCs and other interfaces on a host, type the following command:

```
atmarp hostname
```

hostname is the name of a host.

To display information about all the current FORE/IP PVCs, type the following command:

```
atmarp -a
```

A display similar to the following appears:

```
atmarp -a  
  
iface=a5 switch.port=f21a2420.56 vpi.vci=0.114 aal=5  
encapsulation=NULL  
iface=a5 switch.port=f21a2420.25 vpi.vci=0.113 aal=5  
encapsulation=NULL
```

Deleting a FORE/IP PVC

You can delete outgoing and incoming FORE/IP PVCs.

To delete an outgoing FORE/IP PVC entry, type the following command:

```
atmarp -d hostname
```

hostname is the name or IP address of the remote host.

To delete an incoming FORE/IP PVC for a remote host, use the following command:

```
atmarp -x iface vpi vci
```

iface is the name of the interface

vpi and *vci* have the values of the VPI and VCI of the FORE/IP PVC to be deleted for the specified interface.

Connecting to an FDDI Network

You can connect the filer to one of three available FDDI network configurations.

Table 3 describes the three FDDI configurations you can use, and Table 4 lists the FDDI cabling requirements:

Table 3. FDDI Configurations

Single-attached FDDI configuration	Dual-attached FDDI configuration	Optical bypass configuration
Single-attached FDDI Fiber or FDDI-TP card*	Dual-attached FDDI fiber card	Dual-attached FDDI fiber card

**Do not exceed the maximum cable length specifications in the appropriate FDDI American National Standards Institute (ANSI) standard.*

Table 4. FDDI Cabling Requirements

FDDI card	Cabling requirements
FDDI-TP (single-attached)	Category 5 unshielded twisted-pair (UTP) or Category 5 sheath-shielded, 100-ohm twisted-pair (TP) cable with a TP-MIC plug. RJ45 connector.
FDDI fiber (single-attached or dual-attached)	Duplex 62.5/125 micron or 50/125 micron multimode fiber optic cable with SC connectors. Duplex SC connector.

**Do not exceed the maximum cable length specifications in the appropriate FDDI ANSI standard.*

Connecting a Filer to a Single-Attachment FDDI Network

To connect the filer to a single-attachment FDDI network, use a single-attached FDDI-TP or fiber card to push the cable connector into the card's connector until it clicks and locks into place. You can connect to an FDDI single-attachment station or concentrator. Figure 2 shows a duplex FDDI fiber optic cable connecting to a single-attached FDDI fiber card.

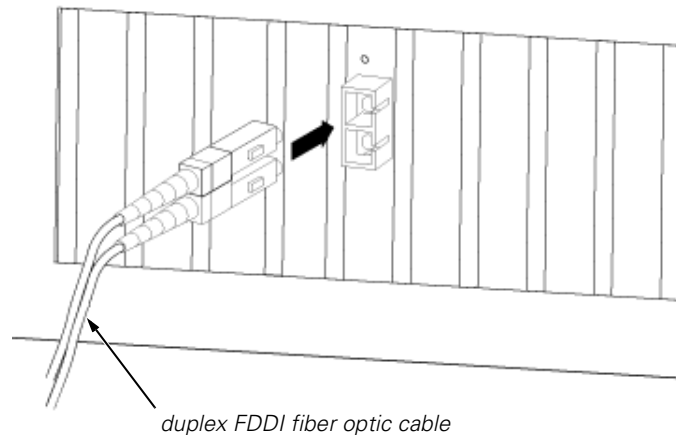


Figure 2. Connecting a Duplex FDDI Fiber Optic Cable to a Single-Attached FDDI Fiber Card

You can also use a dual-attached FDDI fiber card with a single-attachment FDDI network. Push the cable connector into the card's top connector (port B) until it clicks and locks into place. Leave the card's bottom connector unused.

Connecting the Filer to a Dual-Attachment FDDI Network

1. To connect port A, push a duplex FDDI fiber optic cable connector into the card's bottom connector (port A) until it clicks and locks into place. Figure 3 shows port A and port B on the dual-attached FDDI fiber card and two duplex FDDI fiber optic cables.
2. To connect port B, push a cable connector into the card's top connector (port B) until it clicks and locks into place. Use port B if you want to connect only a single port.

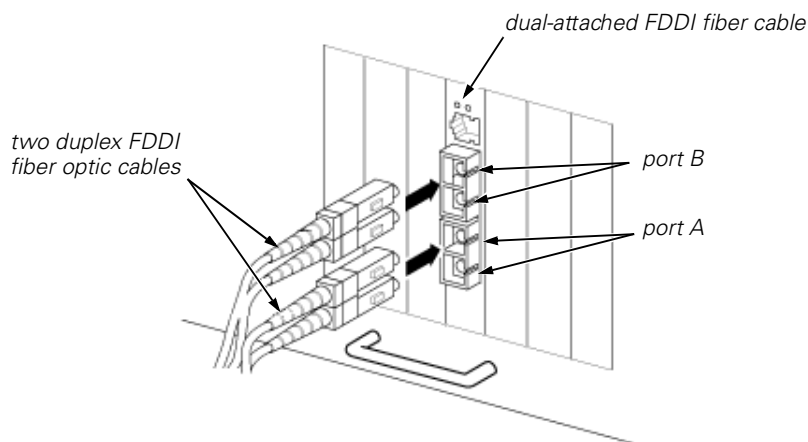


Figure 3. Connecting the Filer to a Dual-Attachment FDDI Network

Connecting the Filer Using an Optical Bypass Switch

1. Make sure that the pin settings on the card's RJ12 modular connector (optical bypass connector) match the settings in Table 5. The connector is pictured in Figure 4.
2. Connect the cable to the card's RJ12 connector and to the bypass switch. Figure 5 shows the RJ12 connector on the dual-attached FDDI fiber card. Refer to the documentation for the bypass switch for information about cabling.

1 - 6

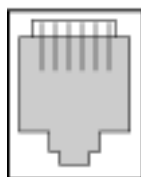


Figure 4. RJ12 Modular Connector

Table 5. RJ12 Pin Settings

Pin	Function
1 and 2	Relay drive: +5.0 V DC
3 and 4	Bypass_enable
5	Bypass_present
6	Return: grounded internally

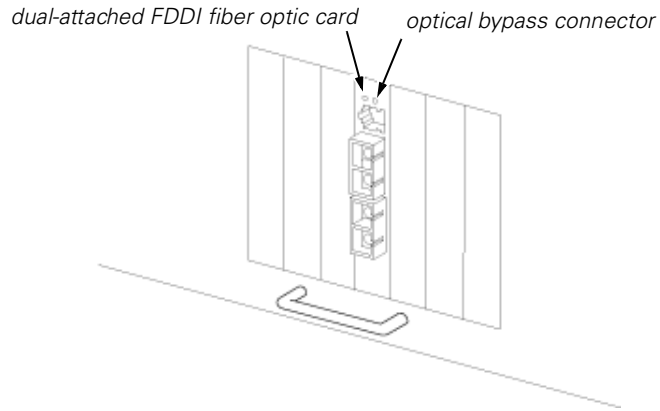


Figure 5. RJ12 Connector on the Dual-Attached FDDI Fiber Optic Card

Command Reference Guide

NAME

`adconfig` - Configuration tool for ATM devices

SYNOPSIS

`adconfig` *device*

`adconfig -p` *vpi-bits device*

`adconfig -l` **on** | **off** *device*

`adconfig -f` **sonet** | **sdh** *device*

`adconfig -i` **idle** | **unassigned** *device*

`adconfig -c` **external** | **internal** *device*

DESCRIPTION

adconfig is a tool to display and modify the current configuration of an ATM device. If no action is indicated for the specified device, the configuration information for the device is displayed.

The physical media device (PMD) configuration displayed includes the current framing used, the device clock source, the loopback state, the state of frame and stream scrambling, and the cell insertion type.

OPTIONS

- p** Specifies the number of least-significant bits to match in the VPI field of the ATM cell header. The number of VCI bits is computed automatically based upon the number of VPI bits specified and the total number of VPI/VCI bits supported by the adapter.
- l** Enable/Disable PMD internal loopback mode.
- f** Set PMD framing type to either SONET or SDH.
- i** Set PMD to insert idle cells (ITU-T standard) or unassigned cells (ATM Forum and ANSI standard).
- c** Set PMD clock source to external or internal.

RESTRICTIONS

It is not possible to set the number of VPI bits on 200E series adapters.

NOTES

Modifying PMD parameters may cause communication problems. The parameters must agree with the parameters chosen at the far end or intermediate switching module.

CLUSTER CONSIDERATIONS

You cannot run this command in partner mode.

Interface names are those on the live filer.

ERRORS

No such device This indicates that the specified device is invalid.

NAME

adinfo - Show ATM device information

SYNOPSIS

adinfo [-c | *device*]

DESCRIPTION

adinfo is a tool to display information about ATM devices, or the copyright notice if the -c option is specified. If *device* is given, then information about the specified device is displayed. Otherwise, information is displayed for all ATM devices.

The information displayed includes the device driver version, the device type, the media type, the hardware version, the firmware version (if applicable), the serial number, the slot number, and the MAC address.

CLUSTER CONSIDERATIONS

You cannot run this command in partner mode.

Interface names are those on the live filer.

ERRORS

No such device This indicates that the specified device is invalid.

NAME

adstat - Show ATM device driver statistics

SYNOPSIS

adstat [**-poa045d**] *device* [*interval*]

DESCRIPTION

The **adstat** program displays Physical layer, ATM layer, ATM Adaptation Layer (AAL), and device-specific counters gathered by the ATM device driver.

The *device* argument is the name of the ATM device, for example fatm1. If *interval* is specified, **adstat** summarizes activity during each *interval* second period. Only a single layer may be selected when specifying an interval. The fields of **adstat's** display are as follows:

Output Cells

Number of cells transmitted by the ATM device driver.

Input Cells

Number of cells received by the ATM device driver.

Framing

Numbers of cells received with bad framing.

Hdr-CRC

Number of cells received with bad header CRC.

VPI-OOR

Number of cells received with out of range VPI.

VPI-NoC

Number of cells received for a disconnected VP.

VCI-OOR

Number of cells received with out of range VCI.

VCI-NoC

Number of cells received for a disconnected VC.

Drops

Number of cells dropped due to lack of buffer space or queue overflow.

Congestn

Number of AAL 5 CS-PDUs dropped due to cells lost or gained as a result of network congestion.

CS-PDUs

Number of PDUs to (input) or from (output) CS-sublayer.

CSProto

Number of CS-PDUs received with protocol errors.

Pay-CRC

Number of cells (AAL 4) or CS-PDUs (AAL 5) received with bad payload CRC.

SARProto

Number of cells received with SAR protocol errors.

Section BIP

Number of PMD section layer BIP errors detected in STS stream.

Path BIP

Number of PMD path layer BIP errors detected in STS stream.

Line BIP

Number of PMD line layer BIP errors detected in STS stream.

Line FEBE

Number of PMD line layer FEBE errors detected in STS stream.

Path FEBE

Number of PMD path layer FEBE errors detected in STS stream.

Corr HCS

Number of cells received with correctable HCS.

Uncorr HCS

Number of cells received with uncorrectable HCS.

Buffer Allocation Failures

Number of times a buffer of the required size and type was unavailable. The type and size of small and large buffers is platform dependent.

Receive Queue Full

Number of cells dropped due to a full receive queue.

Carrier

Indicates that a carrier has been detected on the receive line.

OPTIONS

- p** Display physical layer statistics.
- o** Display physical media device (PMD) error statistics.
- a** Display ATM layer statistics.
- 0** Display statistics about "null" AAL traffic.
- 4** Display statistics about AAL 4 traffic.
- 5** Display statistics about AAL 5 traffic.
- d** Display device specific statistics.

CLUSTER CONSIDERATIONS

You cannot run this command in partner mode.

In takeover mode, the counters represent the combined statistics of the live filer and failed filer.

ERRORS

No such device This indicates that the specified device is invalid.

NAME

atmarp - Manipulate FORE/IP Internet-to-ATM address mappings

SYNOPSIS

atmarp [**-N**] *hostname*

atmarp [**-N**] **-a**

atmarp **-s** *hostname device vpi vci aal [encapsulation] [peak]*

atmarp **-l** *device vpi vci aal [decapsulation]*

atmarp **-d** *hostname*

atmarp **-x** *device vpi vci*

atmarp **-f**

DESCRIPTION

The **atmarp** program displays and deletes FORE/IP Internet-to-ATM address translation table entries used by the ATM address resolution protocol. It also allows IP traffic to particular destinations to be routed over Permanent Virtual Circuits (PVCs). This functionality is only needed for special applications that may require the use of PVCs for IP traffic. This program does not actually control the creation of the PVCs.

If the single argument *hostname* is given, the ATM ARP entry for *hostname* is displayed. When used with the **-N** flag, the network address is displayed in numerical form. When the **-N** flag is not specified, both the symbolic and numerical forms are displayed.

OPTIONS

- a** Display all of the current ATM ARP table entries. When used with the **-N** flag, the network address is displayed in numerical form. When the **-N** flag is not specified, both the symbolic and numerical forms are displayed.
- s** Set ARP entry for outgoing Permanent Virtual Channel (PVC). All traffic to *hostname* will be encapsulated based on *encapsulation* and sent via the *device* interface on VPI *vpi*, VCI *vci*, using AAL type *aal*. *device* must be a FORE IP device. Specifying *peak* will limit all traffic to *hostname* to *peak* kilobits per second. If *peak* is not specified, no traffic shaping is applied.
- l** Attach IP to an incoming PVC. All traffic received on the interface *device* with VPI *vpi*, VCI *vci*, and AAL type *aal* will be decapsulated based upon *decapsulation* and handed up to IP. *device* must be a FORE/IP device.
- d** Delete address mapping for specified hostname from the ATM ARP table. If an ATM connection is open to the specified host, then the connection is closed.

- x Detach IP from an incoming SVC or PVC. IP traffic will no longer be accepted on the specified VPI and VCI.
- f Delete all dynamic address mappings from the ATM ARP table and close all Switched Virtual Circuits (SVCs) to all hosts in the table.

NOTES

The allowed values for *vpi*, *vci*, *aal*, and *peak* will depend on the capabilities of the ATM adapter used by the given interface. In addition, certain adapters may only support discrete peak cell rates. If so, the rate will be set to the closest supported rate, which is less than the specified rate.

encapsulation must be one of null (no encapsulation, the default), *llc_routed* (IEEE LLC encapsulation for routed PDUs), or *llc_bridged_8023* (IEEE LLC encapsulation for Ethernet/802.3 bridged PDUs). If *encapsulation* is specified as *llc_bridged_8023*, the following argument must be the 6-byte colon separated destination MAC address. *decapsulation* must be either null (no decapsulation, the default) or *llc* (IEEE LLC decapsulation).

CLUSTER CONSIDERATIONS

In takeover mode, the FORE/IP SPANS interface names are those on the live filer, and in partner mode interface names are those on the failed filer.

In takeover mode, the **atmarp** command only affects the arp entries of the live filer, and in partner mode the **atmarp** command only affects the arp entries of the failed filer.

SEE ALSO

na_arp(1),

NAME

atmconfig - FORE/IP configuration tool

SYNOPSIS

atmconfig *device*

atmconfig -q peak | off *device*

atmconfig -c vpi vci aal [peak] *device*

atmconfig -s vpi vci aal [peak] *device*

DESCRIPTION

atmconfig is a tool to display and modify the current FORE/IP configuration. If no action is indicated for the specified device, the configuration information for the device is displayed. Configuration information includes the interface MTU, the peak rate used by SVCs, and the VC parameters for the FORE/IP connectionless and SPANS signaling VCs.

OPTIONS

- q Set/disable SVC rate shaping on the specified device. The peak rate is specified in kilobits per second.
- c Set FORE/IP connectionless VC parameters for the given device. The connectionless VC will use VPI *vpi*, VCI *vci*, and AAL type *aal*. If *peak* is specified, traffic sent on the VC will be shaped to *peak* kilobits per second.
- s Set SPANS signaling VC parameters for the given device. The signaling VC will use VPI *vpi*, VCI *vci*, and AAL type *aal*. If *peak* is specified, traffic sent on the VC will be shaped to *peak* kilobits per second.

NOTES

The allowed values for *vpi*, *vci*, *aal*, and *peak* will depend on the capabilities of the ATM adapter used by the given interface. In addition, certain adapters may only support discrete peak cell rates. If so, the rate will be set to the closest supported rate which is less than the specified rate.

The use of SVC rate control limits the peak bandwidth of all SVC traffic from the specified interface. If the peak rate is modified or disabled, the connections must be torn down (see `na_atmarp` [1]) and re-established for the new rate to take effect.

CLUSTER CONSIDERATIONS

In takeover mode, the FORE/IP SPANS interface names are those on the live filer, and in partner mode the interface names are those on the failed filer.

SEE ALSO

`na_atmarp`(1)

NAME

elarp - Displays or manipulates MAC-to-ATM address mappings

SYNOPSIS

```
elarp show [ -elan elan | -mac mac ]  
[ -unit unit ]
```

```
elarp delete -all | -elan elan | -mac mac [ -unit unit ]
```

DESCRIPTION

elarp is a tool to display and delete MAC-to-ATM address ARP cache entries and associated Switch Virtual Circuits (SVCs). Used in conjunction with the ATM Forum LAN Emulation Client (LEC).

COMMANDS

show

The **-elan** flag will display all LANE ARP entries for elan *elan*. If the **-mac** flag is used, the ARP entry for MAC address *MAC* is displayed. The time to live (TTL) in seconds for both the connections and address mappings are displayed. If no flags are given, all current LANE ARP entries are displayed. If more than one MAC address is associated with an ATM address, then all the MAC-to-ATM address mappings are shown in a single entry.

delete

The **-all** and **-elan** flags will delete all dynamic address mappings from the ARP cache and close all SVCs to all hosts in the cache, or all hosts on elan *elan*, respectively. The **-mac** flag will delete the single dynamic address mapping and SVC for *MAC*.

The unit number entered is the configured adapter unit number of an ELAN. The unit number displayed is the adapter unit number of a connection. The connection unit number may differ from the configured unit number if UNI loadbalancing/failover is enabled.

CLUSTER CONSIDERATIONS

In takeover mode, the elarp command only affects the arp entries of ELANs on the live filer, and in partner mode the elarp command only affects the arp entries of ELANs on the failed filer. The unit number displayed is always the adapter unit number on the live filer, even in partner mode.

EXAMPLE

The following examples display an address mapping for a host on elan *my_elan*.

```
% elarp show -elan my_elan  
0:20:48:10:d:65 at 0x45.000580ffe1000000.f215149c002048100d65.02  
ELAN=my_elan state=valid addrTTL=300 vcTTL=1200 unit=1 vpi/vci=0/49
```

```
% elarp show -all
8:0:9:e3:44:d0
8:0:20:7a:c2:8d
8:0:20:78:ef:9a at 0x470005.80.ffe100.0000.f21a.264c.00a0360081da.00
    ELAN=my_elan state=valid addrTTL=176 vcTTL=922 unit=1 vpi/vci=0/291
```

SEE ALSO

na_arp(1)

NAME

elconfig - ATM Forum LAN Emulation configuration tool

SYNOPSIS

elconfig show [*elan* | **-auto** | **-all** | **-configured** | **-lecs**] [**-unit** *unit*]

elconfig add *elan* | **-auto** [**-unit** *unit*] [**-if** *interface*] [**-les** *ATMAddress*]
[**-type ethernet**]

elconfig delete *elan* | **-auto** | **-lecs** [**-unit** *unit*]

elconfig set -lecs *ATMAddress* | **-wellknown** | **-manual** [**-unit** *unit*]

elconfig wait [*maxSeconds*]

DESCRIPTION

elconfig is a tool to display and modify the ATM Forum LAN Emulation Client configuration. **elconfig** allows the superuser to set the ATM address of the LAN Emulation Configuration Server (LECS), display the list of Emulated LANs (ELANs) configured in the LECS for this host, display the list of ELANs locally configured along with the membership state of each, and locally administer ELAN membership.

COMMANDS

show

The **-configured** flag is used to display the name, the ATM addresses of the LE Services, local ATM addresses of the LEC, specific ELAN information, and the local network interface name of each ELAN currently configured in the system. Because the LE Services' ATM addresses may be acquired dynamically, only those addresses that have been learned will be displayed. In addition, if connections exist to the LE Services, the VPI/VCI pairs for each connection are displayed. Alternatively, a single ELAN's configuration information may be displayed by specifying the single argument *elan*. To retrieve the ATM address of the current LECS, the **-lecs** flag is used. If no options are given, the name and ATM address of the LES for each ELAN returned by the LECS are displayed.

add

The **add** command enables the user to join a particular ELAN and specify certain configuration parameters. The **-auto** flag is used to instruct the LEC to join the ELAN that is returned by the LECS. The **-if** flag maps *elan* to the network *interface* (for example, **e10**), providing a mapping between ELAN name and network interface name. The **-les** flag allows the specification of the LES's ATM address as *ATMAddress* for joining ELANs whose configuration information is not returned by a LECS.

delete

Used with *elan*, unjoin the specified ELAN, terminating connections to both its LES and BUS and removing the network interface associated with this ELAN.

The **-auto** flag is used to delete an Automatic ELAN that was specified by **-auto** flag during the add operation. Used with the **-lecs** flag, remove the current LECS from the configuration. A LECS may be deleted only if no ELANs are currently configured from that LECS.

set -lecs

If the single argument, *ATMaddress* is used, set the ATM address of the LECS to *ATMaddress* and mark this LECS as current. If another set command is invoked with a different LECS address, this LECS is now marked as current. The add and delete commands may only be applied to ELANs returned by the current LECS. The **-manual** flag places the host in a manual configuration mode; configuration information will not be retrieved from the LECS and the addition of ELANs will require the user to set the LES address.

wait

The **wait** command waits until all ELAN interfaces are ready, or until the number of seconds specified by *maxSeconds* have elapsed, whichever occurs first. If *maxSeconds* is not specified, then the default is 60 seconds. The **elconfig wait** command should be put in the */etc/rc* file after the last **ifconfig** command so that subsequent commands that depend on the ELAN interfaces do not fail. When the filer is booted, the ELAN interfaces may not become ready immediately after the **ifconfig** command has been issued because it may take several seconds for the filer and ATM switch to complete the initialization required by the UNI signalling, ILMI, and LANE protocols.

NOTES

The **-unit** flag is mandatory if there is more than one adapter installed.

RESTRICTIONS

The interface associated with an ELAN must first be configured "down" through *ifconfig(1)* before deleting the ELAN. If the user attempts to delete an ELAN that is "up", the message `elconfig: ELAN in use` will be displayed.

CLUSTER CONSIDERATIONS

In takeover mode, the ELAN interface names and unit numbers are those on the live filer, and in partner mode the interface names and unit numbers are those on the failed filer. Only ELANs associated with the live or failed filer are shown, depending on the current host mode.

SEE ALSO

`na_ifconfig(1)`

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