

# 37 LANE Server Configuration

## Introduction

The integration of LES/BUS and LECS services into the OmniSwitch architecture provides a complete, “on-board” solution for supporting ATM LAN Emulation (LANE). The software that supports these services inserts several commands into the switch’s User Interface (UI) to provide you with a means of configuring LES/BUS and LECS services and monitoring their operational status and configuration parameters.

To be able to configure LES/BUS and LECS services properly, you will need to have at least some basic knowledge of the design and operation of ATM LANE itself. The information which follows below provides an overview of LAN Emulation and its component services, including LES/BUS and LECS. Chapter 38, “Configuring ATM Services,” provides more information on configuring your switch to perform ATM LAN Emulation.

## LAN Emulation Components

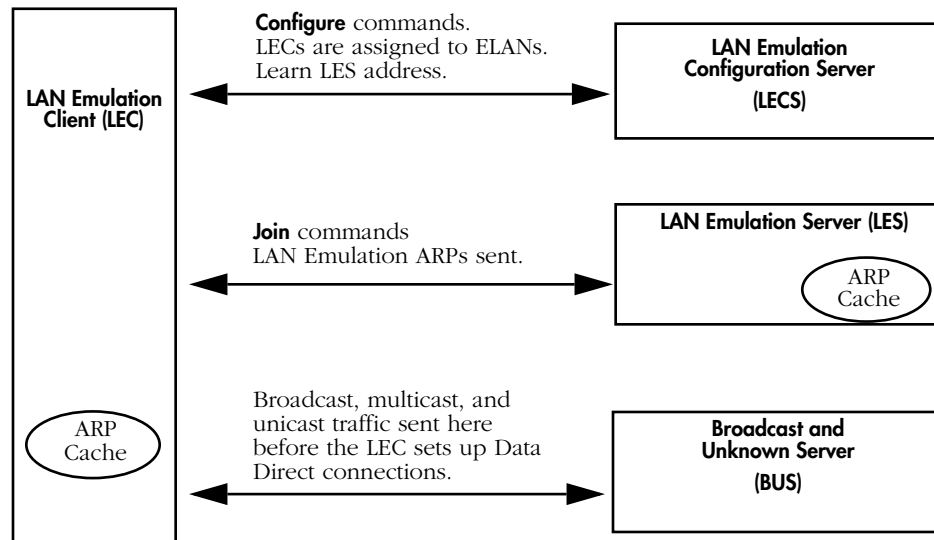
ATM LAN Emulation is made up of a group of both physical and “logical” ATM devices which collectively are called an ELAN (Emulated LAN). The counterpart to an ELAN in the traditional LAN world is a group of workstations attached to a LAN segment (either Ethernet or Token-Ring). But, because an ELAN is a *logical* grouping of devices, it does not limit membership to only those devices that are attached to the same physical network segment. However, a single ELAN “entity” can be comprised of only one media type: either Ethernet (IEEE 802.3) or Token-Ring (IEEE 802.5). In other words, if you need to support more than one media type in LANE, you will need to configure multiple ELANs (one for each type).

The software running in your OmniSwitch provides your ATM networks with the logical devices required by LANE to support interoperability between ATM and Ethernet and/or Token-Ring LANs. There are four logical ATM devices created “within” the switch which comprise an ELAN:

- The LAN Emulation Client (LEC): an entity which performs data forwarding, address resolution, and other control functions for a single broadcast domain (that is, a single ELAN). The software in your switch which supports the ASM module provides LEC services.
- LAN Emulation Server (LES): an entity which implements the control functions for an single ELAN. There is only one LES per ELAN. When we say that a LEC “belongs to” a particular ELAN, we means that it has a control relationship with that ELAN’s LES. Additional software in your switch provides LES services as well as the following two services.
- Broadcast and Unknown Server (BUS): an entity which floods unknown destination address traffic as well as forwarding multicast and broadcast traffic to the LECs that belong to an individual ELAN. There is only one BUS per ELAN. And, because the LES and the BUS within an ELAN must operate together, they are typically called a “LES/BUS pair.” Within the switch’s UI, the term “ELAN” is often used to refer to a single LES/BUS pair.
- LAN Emulation Configuration Server (LECS): an entity which assigns individual LECs to a particular ELAN by “directing” them to the LES that corresponds to that ELAN. There is only one LECS within a broadcast domain which serves all the ELANs within that domain. By using the switch’s UI commands, you can set policies for the LECS to use to control which LECs (and consequently which Groups and VLANs) are allowed to join a specified ELAN.

### LANE Component Interactions

The figure below shows the four logical ATM entities that comprise LANE (LEC, LES, BUS, and LECS) and the different types of communications that take place between them.



#### The LAN Emulation Client/Services Model

**Initializing the ELAN.** The LEC starts the ELAN initialization process by sending a Configure request to the LAN Emulation Configuration Server (LECS). The LECS verifies the configuration settings for the LEC, assigns it to an ELAN, and informs it of the LES's address.

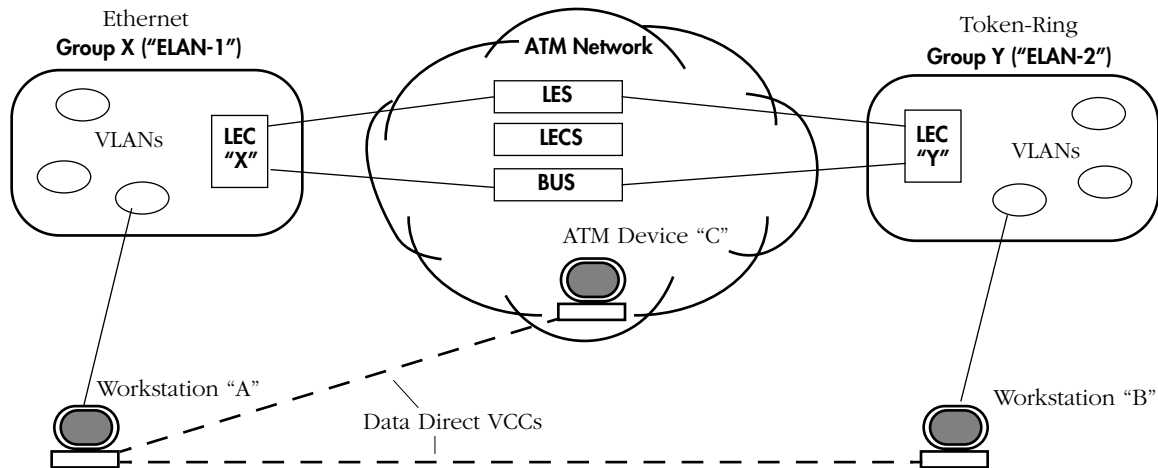
After configuration, the LEC sends a Join request to the LES so that it can participate in address resolution and the creation of virtual circuit connections (VCCs). The LES assigns the LEC an identification number, and, in some configurations, begins to register the MAC addresses in the broadcast domain of the LEC. The OmniSwitch's LEC, however, acts as a "proxy" and only provides registration information when specifically requested by the LES.

Next, the LEC sets up a connection with the BUS by sending ARPs to the broadcast MAC address. The BUS can handle all broadcast, unicast, and multicast traffic from the LEC. While the LES tries to resolve the MAC-to-ATM address request from the LEC, the BUS will try to reach the same ATM destination by forwarding LEC broadcasts to the ATM address.

**The LAN Emulation ARP Cache.** The LAN Emulation ARP cache is a table of entries that maps MAC-to-ATM addresses for unicast and broadcast addresses (but not multicast addresses). Each table entry establishes a relationship between a LAN destination and the ATM address where data frames for that LAN destination are to be sent. The ARP cache binds a MAC address to an ATM address. The LEC contains an ARP cache for those addresses that are in its broadcast domain, while the LES contains a master ARP cache.

## LAN-to-ATM Communication

After a LEC has established a connection to a LES/BUS pair, it can begin responding to LES's requests for MAC addresses from the ATM side and to Ethernet's requests for ATM address destinations from the LAN side. The following diagram shows a simple LAN Emulation setup.



### Traditional LANs and an ATM Network Connected Through LAN Emulation

The LES, BUS, and LECS all "reside" in a single OmniSwitch that contains at least one ASM module which is connected to an ATM network. After you have configured the LANE services, including "creating" the two ELANs as shown in the above diagram, interaction between the devices on the ATM network and those on the Ethernet and Token-Ring networks can begin. Here is an example of a LAN-to-ATM communication interaction:

Whenever Workstation **A** wants to communicate with either ATM device **C** or Workstation **B** on another ELAN it must use the LANE services because it cannot directly communicate with either of these devices. The LEC in Workstation **A**'s Group **X** picks up **A**'s request to connect with ATM device. This LEC does not "know" the whereabouts of the ATM device, so it sends out an ARP to the LES. In the meantime, it may also send one or more unicast packets to the BUS to locate the ATM device, thereby setting up a virtual circuit with the BUS which allows the BUS to forward packets to the ATM device.

When the LES does locate the ATM device, LEC **X** can then set up a "Data Direct" VCC between Workstation **A** and the ATM device **C**. However, it must first stop sending unicast packets to the BUS. Otherwise, the ATM device would receive data from both the BUS and the Data Direct VCC at the same time, resulting in frame-out-of-order errors. Therefore, the LEC first flushes the connection to the BUS, then sets up a Data Direct VCC with the ATM device. Once the Data Direct VCC has been established, data may begin passing directly between the devices on the traditional LAN and the ATM network.

## Overview of LES/BUS and LECS Configuration

You will need to perform the following steps, using parameters that are relevant to your ATM network, to enable the operation of LES/BUS and LECS services on your OmniSwitch:

1. Create at least one LES/BUS pair (synonymous with creating a single ELAN). See *Creating a LES/BUS Pair* on page 37-8 for information on this procedure.
2. Creating the LECS (LAN Emulation Configuration Server) entity and its database. See *Creating the LECS* on page 37-13 for information on this procedure.
3. Adding at least one LES/BUS pair (or ELAN) to the LECS database. See *Adding ELANs to the LECS* on page 37-17 for information on this procedure.
4. Adding “policy values” to the LES/BUS pairs (ELANs) added to the LECS database to control which LAN Emulation Clients (LECs) are allowed to join the ELAN(s). See *Adding Policies to ELANs in the LECS* on page 37-20 for information on this procedure.

## The LANE Service Menu (LSM)

The software which provides LES/BUS and LECS services inserts a submenu under the Interface menu. This submenu is abbreviated LSM for “LANE Service Menu.” The first command (**lsmcfg**) in the LSM menu is used to access a submenu where you can configure the LES/BUS and LECS services. The other commands in the LSM menu are used to display screens showing the LES/BUS and LECS operational status, statistics, and configuration.

To switch to the **LSM** submenu, enter the following command:

**lsm**

A screen similar to the following displays (if you have enabled verbose mode):

Command	LANE Service Menu
<b>autolesbus</b>	Automatic Configuration of LES/BUS, LECS and/or LECS database
<b>lsmcfg</b>	Configuration of LES/BUS, LECS and/or LECS database
<b>lsb</b>	List all LES-BUS pairs configured on this port
<b>vlb</b>	Show status of a LES/BUS pair
<b>vlbs</b>	Show statistics of a LES/BUS pair
<b>vlbc</b>	Show configuration of a LES/BUS pair
<b>vlec</b>	List all LE clients per LES/BUS pair
<b>vmac</b>	List registered MAC address of a given LES/BUS pair
<b>vrđ</b>	List registered route descriptor of a given LES/BUS pair
<b>vlecd</b>	List detail LE client information by LEC id
<b>vlecs</b>	Show status of a LECS
<b>vlecsc</b>	Show statistics of a LECS
<b>vlecsc</b>	Show configuration of a LECS
<b>velan</b>	List elan(s) configured in the LECS database
<b>vpolicy</b>	List policy value assigned to an elan in the LECS database
<div> Main    File    Summary    VLAN    Networking  Interface    Security    System    Services    Help </div>	

All of the commands in the LSM menu, as well as all of the commands in all of its submenus, require the specification in the command line of both the switch slot that contains the ASM or FCSM board and the ATM port to which the command is to be applied.

In other words, the command line syntax is: **command <slot>/<port>**.

## Configuring LES/BUS and LECS

The **autolesbus** command on the LANE Service Menu is used to quickly set up your switch to support one ELAN (named “default”) and to initialize LECS services.

To run this automated procedure, enter the following command (in this example command line, the ASM board is in switch slot 2, and the port being addressed is port 1):

```
autolesbus 2/1
```

A screen similar to the following displays:

```
One LECS is already configured on this physical interface.
```

```
Creating LES/BUS pair for elan 'default' on slot 2, port 1, please wait...
```

```
LES/BUS pair for elan 'default' on slot 2, port 1 created
```

```
Creating default ELAN 'default' for LES/BUS pair on slot 2, port 1, please wait...
```

```
default elan default added to the LECS database  
default policy (ELAN_NAME) added to LECS database for elan 'default'
```

You can use the **lsmcfg** command on the LANE Service Menu to modify the “default” LES/BUS pair. Entering the **lsmcfg** command displays a submenu which contains all the commands used to configure LES/BUS and LECS services.

To display the LES/BUS and LECS configuration submenu, enter the following command (in this example, the ASM board is in switch slot 2, and the port being addressed is port 1):

```
lsmcfg 2/1
```

A screen similar to the following displays:

- 1) Global elan name (currently none specified)**
- 2) Create LES/BUS**
- 3) Modify LES/BUS**
- 4) Delete LES/BUS**
- 5) Create LECS**
- 6) Modify LECS**
- 7) Delete LECS**
- 8) Add elan to LECS database**
- 9) Delete elan from LECS database**
- 10) Add policy to elan in LECS database**
- 11) Delete policy from elan in LECS database**
- 12) Exit configuration menu**

```
Enter option :
```

The **lsmcfg** submenu contains individual options for:

- Specifying a “global” ELAN name (to be used with the other commands to save time);
- Creating, modifying, and deleting LES/BUS pairs (which are related to individual ELANs);
- Creating, modifying and deleting a LECS database;
- Adding and deleting a LES/BUS pair (i.e., an ELAN) to and from the LECS database;
- Adding and deleting policy values to the LES/BUS pairs (i.e., ELANS) in the LECS database.
- Exiting the submenu and returning to the LSM menu.

Each of these options is described in the subsections that follow immediately below.

### Making SubMenu Option Selections

To make changes to the individual options at the **lsmcfg** submenu simply enter the option's index number. The program will respond with a prompt indicating any more information needed by the option. For example, the first option ("Global elan name") will respond with a prompt asking for the name of the ELAN.

#### Important Note

Before you can configure LES/BUS and LECS services, you must first change the ASM port's type from "PVC" to "SVC" (Switched Virtual Port) using the **map** command. See Chapter 35, "Managing ATM Access Ports," for a complete description of the procedure.

If you have not yet made this change, do so *now* *before* continuing with the instructions below.

## Specifying a Global ELAN Name

Option 1 on the **lsmcfg** submenu (“Global elan name”) is used to specify the ELAN to which you want the other options to be applied. This “shortcut” will save you the trouble of having to specify the name of the desired ELAN when you access the other options (to modify or delete configurations). In other words, if you decide not to set a “global ELAN name,” you will have to specify the ELAN with which you want to work by entering its name whenever you access the other options on the **lsmcfg** submenu. You must have *already* created an ELAN (i.e., a LES/BUS pair) to be able to use this option.

Here is what the screen looks like before you enter any command:

- 1) Global elan name (currently none specified)
- 2) Create LES/BUS
- 3) Modify LES/BUS
- 4) Delete LES/BUS
- 5) Create LECS
- 6) Modify LECS
- 7) Delete LECS
- 8) Add elan to LECS database
- 9) Delete elan from LECS database
- 10) Add policy to elan in LECS database
- 11) Delete policy from elan in LECS database
- 12) Exit configuration menu

Enter option :

1. To specify that you want to work with “elan1”, enter the following command:

1

A screen similar to the following displays:

Enter (elan name) :

2. Enter the name of the ELAN with which you wish to work. For example, you could enter:

elan1

A screen similar to the following displays:

- |  |       |
|--|-------|
| 1) Global elan name                          | elan1 |
| 2) Create LES/BUS                            |       |
| 3) Modify LES/BUS                            |       |
| 4) Delete LES/BUS                            |       |
| 5) Create LECS                               |       |
| 6) Modify LECS                               |       |
| 7) Delete LECS                               |       |
| 8) Add elan to LECS database                 |       |
| 9) Delete elan from LECS database            |       |
| 10) Add policy to elan in LECS database      |       |
| 11) Delete policy from elan in LECS database |       |
| 12) Exit configuration menu                  |       |

Enter option :

The screen has changed to indicate that the LES/BUS pair named “elan1” will be used as the default when the other commands on this submenu are used.

### Creating a LES/BUS Pair

Option 2 on the **lsmcfg** submenu (“Create LES/BUS”) is used to create a LES/BUS “pair.” These two entities work together to provide services for a single ELAN (emulated LAN). The hosts and other devices which make up a single ELAN can be connected by only one media type, either Ethernet (IEEE 802.3) or Token Ring (IEEE 802.5). Therefore, you’ll need to create a separate ELAN for each media type.

#### Note

If the chosen LES/BUS is more than one hop away, you *must* change the CSM post from UNI to PNNI with the **map** command. See Chapter 42, “Managing Cell Switching Modules (CSMs),” for more information on the **map** command for CSMs.

Here is what the screen looks like before you enter any command:

- |     |  |       |
|-----|--|-------|
| 1)  | Global elan name                         | elan1 |
| 2)  | Create LES/BUS                           |       |
| 3)  | Modify LES/BUS                           |       |
| 4)  | Delete LES/BUS                           |       |
| 5)  | Create LECS                              |       |
| 6)  | Modify LECS                              |       |
| 7)  | Delete LECS                              |       |
| 8)  | Add elan to LECS database                |       |
| 9)  | Delete elan from LECS database           |       |
| 10) | Add policy to elan in LECS database      |       |
| 11) | Delete policy from elan in LECS database |       |
| 12) | Exit configuration menu                  |       |

Enter option :

1. To begin to create a LES/BUS pair, enter the following command:

2

A screen similar to the following displays:

Enter (elan name) :

2. To create an ELAN named “elan1”, you would enter the following command:

elan1

A screen similar to the following displays:

#### LES/BUS for Slot 2 Port 1

- |    |   |           |
|----|---|-----------|
| 1) | ELAN name (32 chars max)                                  | : elan1   |
| 2) | ELAN type { 802.3 (1), 802.5 (2) }                        | : 802.3   |
| 3) | Max Data Frame Size { 1516 (1), 4544 (2),<br>9234 (3), 86 |           |
| 4) | Control time-out { 10 - 300 seconds }                     | : 120     |
| 5) | Max. Frame age { 1 - 4 seconds }                          | : 1       |
| 6) | Enable redundancy { No (1), Yes (2) }                     | : NO      |
| 7) | Admin Status { Disable (1), Enable (2) }                  | : Enable  |
| 8) | LES/BUS Security { Disable (1), Enable (2) }              | : Disable |

Enter (option=value/save/cancel) :



The fields on this screen have the following meanings:

**ELAN {32 characters max}**

The name of the ELAN the LES/BUS is administering.

**ELAN type {802.3 (1), 802.5 (2) }**

The assigned type of ELAN. Ethernet ELANs are 802.3 while Token Ring ELANs are 802.5.

**Max Data Frame Size {1516 (1), 4544 (2), 9234 (3), 18190 (4)}**

The maximum size, in octets, for the data frames sent to/from this ELAN. The default for Ethernet is 1516; for Token Ring, 4544. Token Ring ELANs can also support sizes of 9234 and 18190. To avoid packet loss, you should select a setting for the LECS which matches, or is a higher rate than, the maximum size used by the LE Clients on the ELAN.

**Control time-out {10-300 seconds}**

The period, in seconds, used to time out most request/response control frames.

**Max Frame age {1-4 seconds}**

The number of seconds allowed for the BUS to transmit the frame. If the age is exceeded, the BUS will discard the frame.

**Enable redundancy {No (1), Yes (2)}**

Used to turn redundancy on or off (the default is off). If you decide to use redundancy, you will be asked to specify whether this ELAN is to take a “primary” or “secondary” role. If you set it to “secondary”, make sure that you add this secondary LES ATM address to the primary LES when you configure the primary LES.

**Admin Status {Enable (1), Disable (2)}**

Used to turn this ELAN on or off in regards to the LES.

**LES/BUS Security {Enable (1), Disable (2)}**

Used to turn the security option for this ELAN on or off (the default is off). When on, security will prevent LAN Emulation Clients (LECs) from directly accessing the LES/BUS and its ELAN without having to pass the policy review of the LECS (LAN Emulation Configuration Server).

3. The defaults settings for each of the fields on this screen are appropriate for an Ethernet ELAN. If you need to change any of them, do so now. Simply enter the desired option number first, followed by an “equals” (=) sign, then the desired value.
4. When you are finished setting the parameters for each option, you must save the changes you have made. To save changes, enter the following command:

**save**

But, if you wish to abort and discard changes, simply enter the **cancel** command.

After entering the **save** command, a message similar to the following displays, then the previous configuration menu reappears:

**Creating LES/BUS pair for elan 'elan1' on slot 2, port 1, please wait...**

**LES/BUS pair for elan 'elan1' created on slot 2, port 1**

## Modifying a LES/BUS Pair

Option 3 on the **lsmcfg** submenu (“Modify LES/BUS”) is used to modify the configuration of an existing LES/BUS “pair” (emulated LAN or ELAN).

Here is what the menu looks like before you enter any command:

- ```

1) Global elan name                elan1
2) Create LES/BUS
3) Modify LES/BUS
4) Delete LES/BUS
5) Create LECS
6) Modify LECS
7) Delete LECS
8) Add elan to LECS database
9) Delete elan from LECS database
10) Add policy to elan in LECS database
11) Delete policy from elan in LECS database
12) Exit configuration menu

```

Enter option :

1. First, you must specify that you want to modify an ELAN. If you did not use Option 1 to set a “global” ELAN name, you would enter the following command:

3

A screen similar to the following displays:

Enter (elan name) :

2. To proceed to modify the configuration of “elan1”, enter the following command:

elan1

A screen similar to the following displays:

LES/BUS for Slot 2 Port 1

- ```

1) ELAN name (32 chars max)        : elan1
2) ELAN type { 802.3 (1), 802.5 (2) } : 802.3
3) Max Data Frame Size { 1516 (1), 4544 (2),
    9234 (3), 86
4) Control time-out { 10 - 300 seconds } : 120
5) Max. Frame age { 1 - 4 seconds }      : 1
6) Enable redundancy { No (1), Yes (2) } : NO
7) Admin Status { Disable (1), Enable (2) } : Enable
8) LES/BUS Security { Disable (1), Enable (2) } : Disable

```

Enter (option=value/save/cancel) :

This screen shows the parameters that were originally entered for this ELAN. The meaning of the options at this screen is given earlier under the heading “*Creating a LES/BUS Pair*” on page 37-8.

3. If you want to make changes to any of these parameters, enter the desired option number first, followed by an “equals” (=) sign, then the desired value.
4. When you are finished changing the parameters for each option, you must save the changes you have made. To save changes, enter the following command:

save

But, if you wish to abort and discard changes, simply enter the **cancel** command.

### Deleting a LES/BUS Pair

Option 4 on the **lsmcfg** submenu (“Delete LES/BUS”) is used to delete the configuration of an existing LES/BUS “pair” (emulated LAN or ELAN).

Here is what the menu looks like before you enter any command:

- ```

1) Global elan name                elan1
2) Create LES/BUS
3) Modify LES/BUS
4) Delete LES/BUS
5) Create LECS
6) Modify LECS
7) Delete LECS
8) Add elan to LECS database
9) Delete elan from LECS database
10) Add policy to elan in LECS database
11) Delete policy from elan in LECS database
12) Exit configuration menu
  
```

Enter option :

1. First, you must specify that you want to delete an ELAN. If you did not use Option 1 to set a “global” ELAN name, you would enter the following command:

4

A screen similar to the following displays:

Enter (elan name) :

2. To proceed to delete “elan1”, enter the following command:

elan1

A screen similar to the following displays:

| ELAN<br>typ st | ELAN Name | LES ATM Addr                           |
|----------------|-----------|----------------------------------------|
| Eth UP         | elan1     | 0000000000000000000000000020da8055fdd2 |

Delete this LES/BUS pair ([N]/Y):

3. To answer “yes”, enter the following command (the default response is **N** for “no”):

Y

A message will appear informing you of the deletion.

## Creating the LECS

Option 5 on the **lsmcfg** submenu ("Create LECS") is used to create a LECS (LAN Emulation Configuration Server). A LECS assigns individual LAN Emulation Clients (LECs) to a particular ELAN by directing them to the LES that corresponds to the ELAN. To be able to do so, the LECS maintains a database of ELANs (which are related to the LES/BUS pairs you create). When you create the LECS, you also create its database (that is, there are no other steps involved). However, you must manually add the ELANs you have created to the LECS database (this subject is covered below).

Here is what the menu looks like before you enter any command:

- ```

1) Global elan name                elan1
2) Create LES/BUS
3) Modify LES/BUS
4) Delete LES/BUS
5) Create LECS
6) Modify LECS
7) Delete LECS
8) Add elan to LECS database
9) Delete elan from LECS database
10) Add policy to elan in LECS database
11) Delete policy from elan in LECS database
12) Exit configuration menu

```

Enter option :

1. To create the LECS, enter the following command:

5

A screen similar to the following displays:

### Configuration for LECS at Slot 2 Port 1

- |   |                             |                |
|---|-----------------------------|----------------|
| 1) Max Config Direct VCCs to LECS         | {1 - 65535}                 | : 128          |
| 2) Seconds before VCC declare idle        | {1 - 43200}                 | : 60           |
| 3) Priority for ELAN name policies        | {0 - 65535}                 | : 1            |
| 4) Priority for ELAN type policies        | {0 - 65535}                 | : 0 - not used |
| 5) Priority for ATM addr prefix policies  | {0 - 65535}                 | : 0 - not used |
| 6) Priority for MAC address policies      | {0 - 65535}                 | : 0 - not used |
| 7) Priority for Max. Frame Size policies  | {0 - 65535}                 | : 0 - not used |
| 8) Priority for Route Descriptor policies | {0 - 65535}                 | : 0 - not used |
| 9) Admin Status                           | { Disable (1), Enable (2) } | : Enable       |

Enter (option=value/save/cancel) :

The fields on this screen have the following meanings:

### Max Config Direct VCCs to LECS {1-512}

The maximum number of simultaneous VCCs (Virtual Channel Connections) that the LECS can support at one time. A higher number requires more RAM and processing time.

### Seconds before VCC declare idle {1-43200}

The number of seconds before the LECS releases an idle VCC. Releases will only occur after the maximum number of Direct VCCs (as configured above) has been reached.

### **Priority for ELAN name policies {1-65535}**

The priority of ELAN name policies in regards to the LECS. The lower the number, the higher the priority. The LECS uses this, and the other priority settings, to determine which ELANs are allowed to establish a connection when multiple requests are received at once.

### **Priority for ELAN type policies {1-65535}**

The priority of ELAN type policies in regards to the LECS.

### **Priority for ATM addr prefix policies {1-65535}**

The priority of ATM address prefix policies in regards to the LECS.

### **Priority for MAC address policies {1-65535}**

The priority of MAC address policies in regards to the LECS.

### **Priority for Max. frame size policies {1-65535}**

The priority of maximum frame size policies in regards to the LECS.

### **Priority for Route Descriptor policies {1-65535}**

The priority of route descriptor policies in regards to the LECS.

### **Admin Status {Enable (1), Disable (2)}**

Used to enable or disable the LECS. If the LECS is disabled, no LE clients (LECs) will be able to join secured ELANs (because the ELAN's LES/BUS address must be supplied by the LECS in order for the LE clients to make a connection).

2. You do not need to change any of the defaults settings for the options on these screen. If you do wish to change any of them, do so now. Simply enter the option number first, followed by an "equals" (=) sign, then the desired value.
3. When you are finished setting the options, you must save the configuration to actually create the LECS. To do so, enter the following command:

**save**

But, if you wish to abort, simply enter the **cancel** command.

After entering the **save** command, a message similar to the following displays:

**Creating LECS on slot 2, port 1, please wait...**

## Modifying the LECS

Option 6 on the **lsmcfg** submenu (“Modify LECS”) is used to modify the configuration of an existing LECS.

Here is what the menu looks like before you enter any command:

- ```

1) Global elan name                elan1
2) Create LES/BUS
3) Modify LES/BUS
4) Delete LES/BUS
5) Create LECS
6) Modify LECS
7) Delete LECS
8) Add elan to LECS database
9) Delete elan from LECS database
10) Add policy to elan in LECS database
11) Delete policy from elan in LECS database
12) Exit configuration menu

```

Enter option :

1. To display the existing configuration of the LECS, enter the following command:

6

A screen similar to the following displays:

### Configuration for LECS at Slot 2 Port 1

- ```

1) Max Config Direct VCCs to LECS      {1 - 512}      : 128
2) Seconds before VCC declare idle     {1 - 43200}    : 60
3) Priority for ELAN name policies      {0 - 65535}    : 1
4) Priority for ELAN type policies      {0 - 65535}    : 0 - not used
5) Priority for ATM addr prefix policies {0 - 65535}    : 0 - not used
6) Priority for MAC address policies     {0 - 65535}    : 0 - not used
7) Priority for Max. Frame Size policies {0 - 65535}    : 0 - not used
8) Priority for Route Descriptor policies {0 - 65535}    : 0 - not used
9) Admin Status                        { Disable (1), Enable (2) } : Enable

```

Enter (option=value/save/cancel) :

This screen shows the parameters that were originally entered for this LECS. The meaning of the options at this screen is given earlier under the heading *Creating the LECS* on page 37-13.

2. If you want to make changes to any of these parameters, enter the desired option number first, followed by an “equals” (=) sign, then the desired value.
3. When you are finished changing the parameters for each option, you must save the changes you have made. To save changes, enter the following command:

**save**

But, if you wish to abort and discard changes, simply enter the **cancel** command.

### Deleting the LECS

Option 7 on the **lsmcfg** submenu (“Delete LECS”) is used to delete the existing LECS.

Here is what the menu looks like before you enter any command:

- |     |  |       |
|-----|--|-------|
| 1)  | Global elan name                         | elan1 |
| 2)  | Create LES/BUS                           |       |
| 3)  | Modify LES/BUS                           |       |
| 4)  | Delete LES/BUS                           |       |
| 5)  | Create LECS                              |       |
| 6)  | Modify LECS                              |       |
| 7)  | Delete LECS                              |       |
| 8)  | Add elan to LECS database                |       |
| 9)  | Delete elan from LECS database           |       |
| 10) | Add policy to elan in LECS database      |       |
| 11) | Delete policy from elan in LECS database |       |
| 12) | Exit configuration menu                  |       |

Enter option :

1. To delete the LECS, enter the following command:

7

A screen similar to the following displays:

Status of LECS at slot 2 port 1:	
State	: Operational
Time of last state change	: 12.34.56.55
Elapsed time since last change	: 00.00.04.44
Error Log	: no errors
Well-known address	: Registered with ATM switch

Delete this LECS ([N]/Y):

2. To answer “yes”, enter the following command (the default response is **N** for “no”):

Y

A message will appear informing you of the deletion.



## Adding ELANs to the LECS

Option 8 on the **lsmcfg** submenu (“Add elan to LECS database”) is used to add existing ELANs (LES/BUS pairs) to the LECS database.

Here is what the menu looks like before you enter any command:

- ```

1) Global elan name                               elan1
2) Create LES/BUS
3) Modify LES/BUS
4) Delete LES/BUS
5) Create LECS
6) Modify LECS
7) Delete LECS
8) Add elan to LECS database
9) Delete elan from LECS database
10) Add policy to elan in LECS database
11) Delete policy from elan in LECS database
12) Exit configuration menu

```

Enter option :

- First, you must specify that you want to add an existing ELAN to the LECS database. To do so, enter the following command:

8

A screen similar to the following displays:

- ```

1) ELAN name (32 chars max)                        :
2) Elan type {802.3 (1), 802.5 (2) }               : 802.3
3) Max Frame Size { 1516 (1), 4544 (2)              : 1516
   9234 (3), 18190 (4) }
4) Primary LES's ATM address                       :
   index  ATM address
   -----
5) Backup LES { No (1), Yes (2) }                  : No

```

Enter (option=value/save/cancel) :

- Enter the name of an existing ELAN. For example, if the name is “elan1”, you would enter the following command:

1=elan1

A screen similar to the following displays:

- ```

1) ELAN name (32 chars max)                        : elan1
2) Elan type {802.3 (1), 802.5 (2) }               : 802.3
3) Max Frame Size { 1516 (1), 4544 (2)              : 1516
   9234 (3), 18190 (4) }
4) Primary LES's ATM address                       :
   index  ATM address
   -----
   local 0000000000000000000000000000000020da8055fdd2
5) Backup LES { No (1), Yes (2) }                  : No

```

Enter (option=value/save/cancel) :

The fields on this screen have the following meanings:

**ELAN name {32 chars max}**

The name (a text string) given to this ELAN to identify it.

**Elan type {802.3 (1), 802.5 (2) }**

The assigned type of ELAN. Ethernet ELANs are 802.3 while Token Ring ELANs are 802.5.

**Max Frame Size {1516 (1), 4544 (2), 9234 (3), 18190 (4)}**

The maximum size, in octets, for the data frames sent to/from this ELAN. The default for Ethernet is 1516; for Token Ring, 9234. Token Ring ELANs can also support sizes of 4544 and 18190. To avoid packet loss, you should select a setting for the LECS which matches, or is a higher rate than, the maximum size used by the LE Clients on the ELAN.

**Primary LES's ATM address**

The ATM address of the Primary LES. This field is automatically filled by the program.

**Backup LES {No (1), Yes (2)}**

Used to specify whether a backup LES is in service for this ELAN. If you set this option to "yes", you will be prompted to enter the ATM address for the backup LES.

3. The ATM address of the ELAN has been automatically entered in Option 4 by the program. If you wish to change any of the values of any of the *other* options on this screen, do so now. To make a change, enter the option number first, followed by an "equals" (=) sign, then the desired value.
4. When you are finished setting all the options, you must save the configuration to record the changes you have made. To do so, enter the following command:

**save**

But, if you wish to abort out of the procedure, simply enter the **cancel** command.

After entering the **save** command, a message similar to the following displays:

**elan elan1 added to the LECS database**

## Deleting an ELAN from the LECS

Option 9 on the **lsmcfg** submenu (“Delete elan from LECS database”) is used to delete one or more ELANs that have been added to the LECS database.

Here is what the menu looks like before you enter any command:

- ```

1) Global elan name                               elan1
2) Create LES/BUS
3) Modify LES/BUS
4) Delete LES/BUS
5) Create LECS
6) Modify LECS
7) Delete LECS
8) Add elan to LECS database
9) Delete elan from LECS database
10) Add policy to elan in LECS database
11) Delete policy from elan in LECS database
12) Exit configuration menu

```

Enter option :

1. First, you must specify that you want to delete an ELAN from the LECS. If you did not use Option 1 to set a “global” ELAN name, you would enter the following command:

9

A screen similar to the following displays:

Enter (elan name) :

2. To proceed to delete “elan1” from the LECS, enter the following command:

elan1

A screen similar to the following displays:

Remove elan elan2 from LECS database (n)? :

3. To answer “yes”, enter the following command (the default response is **N** for “no”):

Y

A message will appear to tell you if there was any problem with the deletion.

If the deletion was successful, you will simply be returned to the **lsmcfg** menu:

LSM configuration for slot 2, port 1

- ```

1) Global elan name                               elan1
2) Create LES/BUS
3) Modify LES/BUS
4) Delete LES/BUS
5) Create LECS
6) Modify LECS
7) Delete LECS
8) Add elan to LECS database
9) Delete elan from LECS database
10) Add policy to elan in LECS database
11) Delete policy from elan in LECS database
12) Exit configuration menu

```

Enter option :

### Adding Policies to ELANs in the LECS

Option 10 on the **lsmcfg** submenu (“Add policy to elan in LECS database”) is used to add policies to the ELANs you have added to the LECS database. The available policies are: ELAN name, ELAN type, ATM address prefix, MAC address, maximum frame size, and route descriptor. By setting any one of these policies, you can control which LAN Emulation Clients (LECs), and consequently which Groups and VLANs, are allowed by the LECS to join the identified ELAN. You can use any or all of the policy options to set up multiple criteria for a LEC’s acceptance into an ELAN.

Here is what the menu looks like before you enter any command:

- |     |                                          |       |
|-----|------------------------------------------|-------|
| 1)  | Global elan name                         | elan1 |
| 2)  | Create LES/BUS                           |       |
| 3)  | Modify LES/BUS                           |       |
| 4)  | Delete LES/BUS                           |       |
| 5)  | Create LECS                              |       |
| 6)  | Modify LECS                              |       |
| 7)  | Delete LECS                              |       |
| 8)  | Add elan to LECS database                |       |
| 9)  | Delete elan from LECS database           |       |
| 10) | Add policy to elan in LECS database      |       |
| 11) | Delete policy from elan in LECS database |       |
| 12) | Exit configuration menu                  |       |

Enter option :

1. First, you must specify that you want to add a policy to an ELAN in the LECS. If you did not use Option 1 to set a “global” ELAN name, you would enter the following command:

10

A screen similar to the following displays:

Enter (elan name) :

2. Enter the name of an existing ELAN. For example, if the name is “elan1”, you would enter the following command:

elan1

A screen similar to the following displays:

Add policy value to elan ‘elan1’

- |                                              |      |
|----------------------------------------------|------|
| 1) By Elan name { No (1), Yes (2) }          | : No |
| 2) By Elan type { No (1), Yes (2) }          | : No |
| 3) By ATM address prefix { No (1), Yes (2) } | : No |
| 4) By MAC address { No (1), Yes (2) }        | : No |
| 5) By Max. Frame size { No (1), Yes (2) }    | : No |
| 6) By Route Descriptor { No (1), Yes (2) }   | : No |

Enter (option=value/exit) :

The fields on this screen have the following meanings:

#### By Elan name {No (1), Yes (2)}

If set to “yes”, enters a policy value of “by ELAN name.” Only those LAN Emulation Clients (LECs) which match this policy will be allowed to join the specified ELAN.

**By Elan type {No (1), Yes (2)}**

If set to “yes”, enters a policy value of “by ELAN type.” Only those LAN Emulation Clients (LECs) which match this policy will be allowed to join the specified ELAN.

**By ATM address prefix {No (1), Yes (2)}**

If set to “yes”, enters a policy value of “by ATM address prefix.” Only those LAN Emulation Clients (LECs) which match this policy will be allowed to join the specified ELAN.

**By MAC address {No (1), Yes (2)}**

If set to “yes”, enters a policy value of “by MAC address.” Only those LAN Emulation Clients (LECs) which match this policy will be allowed to join the specified ELAN.

**By Max. Frame size {No (1), Yes (2)}**

If set to “yes”, enters a policy value of “by Maximum frame size.” Only those LAN Emulation Clients (LECs) which match this policy will be allowed to join the specified ELAN.

**By Route Descriptor {No (1), Yes (2)}**

If set to “yes”, enters a policy value of “by Route descriptor.” Only those LAN Emulation Clients (LECs) which match this policy will be allowed to join the specified ELAN.

3. To add policies, for example “By Elan type”, to the criteria for the specified ELAN, you would enter the following command:

**2=2**

A screen similar to the following displays:

**Enter elan type:**

4. To specify that Ethernet must be used, you would enter the following command:

**802.3**

A screen similar to the following displays:

**policy added to LECS database for elan ‘elan1’**

**Add policy value to elan ‘elan1’**

|                                              |       |
|----------------------------------------------|-------|
| 1) By Elan name { No (1), Yes (2) }          | : No  |
| 2) By Elan type { No (1), Yes (2) }          | : Yes |
| 3) By ATM address prefix { No (1), Yes (2) } | : No  |
| 4) By MAC address { No (1), Yes (2) }        | : No  |
| 5) By Max. Frame size { No (1), Yes (2) }    | : No  |
| 6) By Route Descriptor { No (1), Yes (2) }   | : No  |

**Enter (option=value/exit) :**

5. If you wish to change any of the values of any of the other options on this screen, you can do so now. Simply enter the option number first, followed by an “equals” (=) sign, then the desired value.

6. To exit and save changes, enter the following command:

**exit**

## Deleting Policies from ELANs in the LECS

Option 11 on the **lsmcfg** submenu (“Delete policy from elan in LECS database”) is used to delete one or more policies already associated with the ELANs in the LECS database.

Here is what the menu looks like before you enter any command:

- |     |                                          |       |
|-----|------------------------------------------|-------|
| 1)  | Global elan name                         | elan1 |
| 2)  | Create LES/BUS                           |       |
| 3)  | Modify LES/BUS                           |       |
| 4)  | Delete LES/BUS                           |       |
| 5)  | Create LECS                              |       |
| 6)  | Modify LECS                              |       |
| 7)  | Delete LECS                              |       |
| 8)  | Add elan to LECS database                |       |
| 9)  | Delete elan from LECS database           |       |
| 10) | Add policy to elan in LECS database      |       |
| 11) | Delete policy from elan in LECS database |       |
| 12) | Exit configuration menu                  |       |

Enter option :

1. First, you must specify that you want to delete a policy from an ELAN in the LECS. If you did not use Option 1 to set a “global” ELAN name, you would enter the following command:

11

A screen similar to the following displays:

Enter (elan name) :

2. To delete a policy from an ELAN named “elan1”, you’d enter the following command:

elan1

A screen similar to the following displays:

Delete policy value from elan ‘elan1’

- |                                              |       |
|----------------------------------------------|-------|
| 1) By Elan name { No (1), Yes (2) }          | : No  |
| 2) By Elan type { No (1), Yes (2) }          | : Yes |
| 3) By ATM address prefix { No (1), Yes (2) } | : No  |
| 4) By MAC address { No (1), Yes (2) }        | : No  |
| 5) By Max. Frame size { No (1), Yes (2) }    | : No  |
| 6) By Route Descriptor { No (1), Yes (2) }   | : No  |

Enter (option=value/exit) :

3. To delete the policy of “By Elan type”, you would enter the following command:

2=1

A screen similar to the following displays:

Enter elan type:

4. To specify the type to be deleted is Ethernet, you would enter the following command:

802.3

5. To exit and save changes, enter the following command:

exit

# Displaying a List of LES/BUS Pairs

The **lslb** command on the LANE Service Menu (see *The LANE Service Menu (LSM)* on page 37-4) is used to display existing LES/BUS pairs.

To display a list of all the LES/BUS pairs configured on a given physical interface, enter the following command (the example command asks for the list related to slot 2, port 1):

**lslb 2/1**

A screen similar to the following displays:

| ELAN Type (E=Ethernet/802.3, T=Token Ring/802.5)                                                                     |    |           |                                          |
|----------------------------------------------------------------------------------------------------------------------|----|-----------|------------------------------------------|
| LES-BUS State (UP=Up, ID=Idle, ND=Net Down, ER=Error/Down, **=Other; Work with specific LES-BUS to see actual state) |    |           |                                          |
|                                                                                                                      |    | ELAN Name | LES ATM Addr                             |
| E                                                                                                                    | UP | elan1     | 000000000000000000000000000020da8055fdd2 |

The fields on this screen have the following meanings:

## ELAN Type

Indicates the type of ELAN for this entry in the list. The possible entries are “E” for Ethernet and “T” for Token Ring.

## LES-BUS State

Indicates the operating state of this ELAN. The possible entries are “UP” for up and operating; “ID” for idle; “ND” for network down; “ER” for error or down; and “\*\*” for other types of errors (which can be displayed using the **vlb** command).

## ELAN Name

Shows the text string you entered as the name for this ELAN.

## LES ATM Addr

Shows the ATM address of this ELAN in the LAN Emulation Server.

# Displaying LES/BUS Pair Status

The **vlb** command on the LANE Service Menu (see *The LANE Service Menu (LSM)* on page 37-4) is used to display information about the status and configuration of a given LES/BUS pair on a given physical interface.

To display information about a specific LES/BUS pair (for example, one named “elan1” configured on slot 2, port 1), you would enter the following command:

```
vlb 2/1 elan1
```

A screen similar to the following displays:

|                                     |                                        |
|-------------------------------------|----------------------------------------|
| ELAN Name:                          | elan1                                  |
| ELAN Type:                          | Ethernet                               |
| # of Proxy LEC's:                   | 2                                      |
| # of Non-Proxy LEC's:               | 0                                      |
| LES ATM Address:                    | 0000000000000000000000000020da8055fdd2 |
| <b>-Status-</b>                     |                                        |
| LES-BUS State:                      | OPERATIONAL                            |
| Major Reason LES-BUS was last Down: | none                                   |
| Minor Reason LES-BUS was last Down: | none                                   |
| LES-BUS State last changed at:      | 00.48.57.23 (System Up Time)           |
| LES-LEC Status Table changed at:    | 00.51.44.51 (System Up Time)           |
| BUS-LEC Status Table changed at:    | 00.51.44.64 (System Up Time)           |
| <b>-Current Configuration-</b>      |                                        |
| LES-BUS Enabled/Disabled:           | Enabled                                |
| ELAN Type: (S2)                     | Ethernet                               |
| Max Frame Size: (S3)                | 1516                                   |
| Control Timeout: (S4)               | 120                                    |
| Max Frame Age: (S5)                 | 1                                      |
| Redundancy:                         | Disabled                               |

The fields on this screen have the following meanings:

## ELAN Name

Shows the text string you entered as the name for this ELAN.

## ELAN Type

Indicates the type of this ELAN. The possible entries are “Ethernet” and “Token Ring.”

## # of Proxy LEC's

Indicates the number of “proxy” LEC's.

## # of Non-Proxy LEC's

Indicates the number of “non-proxy” LEC's.

## LES ATM Address

Shows the ATM address of this ELAN in the LAN Emulation Server.



**LES-BUS State**

Indicates the operational status of this ELAN.

**Major Reason LES-BUS was last Down**

Indicates the reasons why LES/BUS services went down.

**Minor Reason LES-BUS was last Down**

Indicates any additional information about why the LES/BUS services went down.

**LES-BUS State Last changed at**

Indicates the system time when the LES-BUS state last changed.

**LES-LEC Status Table changed at**

Indicates the system time when the LES-LEC Status Table last changed.

**BUS-LEC Status Table changed at**

Indicates the system time when the BUS-LEC Status Table last changed.

**LES-BUS Enabled/Disabled**

Indicates whether this LES/BUS has been set to the “enabled” or the “disabled” state.

**ELAN Type**

Indicates the type of this ELAN. The possible entries are “Ethernet” and “Token Ring.”

**MAX Frame Size**

Indicates the maximum data frame size, in octets, for the data frames sent to/from this ELAN.

**Control Timeout**

Indicates the time period, in seconds, specified for the timing-out of most request/response control frames.

**MAX Frame Age**

Indicates the number of seconds allowed for the BUS to transmit the frame. If the age is exceeded, the BUS will discard the frame.

**Redundancy**

Indicates whether the redundancy options has been enabled or disabled for this LES/BUS.

## Displaying LES/BUS Pair Statistics

The **vlbs** command on the LANE Service Menu (see *The LANE Service Menu (LSM)* on page 37-4) is used to display operational statistics for a LES/BUS pair.

To do so for an ELAN named “elan1”, you would enter the following command:

```
vlbs 2/1 elan1
```

A screen similar to the following displays:

```
Statistics for LES/BUS:
ATM Forum LES MIB Statistics:

joinOK:                                0
verNotSup:                             0
invalidReqParam:                        0
dupLanDest:                             0
dupAtmAddr:                             0
insRes:                                 0
accDenied:                              0
invalidReqId:                           0
invalidLanDest:                         0
invalidAtmAddr:                         0
badPkts:                                0
outRegFails:                            0
leArpIn:                                0
leArpFwd:                               0
Other Statistics:
leArpAnswers:                           0
leArpRspFwd:                            0
topologyFwd:                            0
narpFwd:                                0
flushRspFwd:                            0
outJoinFails:                           0
regOK:                                  0
unRegOK:                                0
outUnRegFails:                          0
proxyLecs:                              0
nonProxyLecs:                           0
macAddrMappings:                        0
rdMappings:                             0
atmAddrMappings:                        0
joinRetransmits:                        0
joinParmChanges:                        0
joinTimeouts:                           0
reRegs:                                 0
ctlDirRefused:                          0
ctlDirReleased_err:                     0
ctlDistFailure:                         0
ctlDistReleased_err:                    0
ctlDistPartyReleased_err:               0
redundancyVccRefused:                   0
redundancyVccReleased:                  0
redundancyVccFailure:                   0
oam_droppedFrames:                      0
invalidSize_droppedFrames:               0
invalidMarker_droppedFrames:             0
invalidProtocol_droppedFrames:           0
verNotSup_droppedFrames:                 0
invalidLecid_droppedFrames:              0
unknownLecid_droppedFrames:              0
invalidOpcode_droppedFrames:             0
dupJoin_droppedFrames:                   0
incompleteSourceJoin_droppedFrames:      0
incompleteTargetJoin_droppedFrames:      0
noProxy_droppedFrames:                   0
```

The fields on this screen have the following meanings:

**joinOK**

Indicates the number successful Join responses sent out by the LAN Emulation Server.

**verNotSup**

Indicates the number of version not supported errors.

**invalidReqParam**

Indicates the number of invalid request parameters errors.

**dupLanDest**

Indicates the number of duplicate LAN destination errors.

**dupAtmAddr**

Indicates the number of duplicate ATM address errors.

**insRes**

Indicates the number of insufficient resources to grant errors.

**accDenied**

Indicates the number of access denied for security reasons errors.

**invalidReqId**

Indicates the number of invalid LEC ID errors.

**invalidLanDest**

Indicates the number of invalid LAN destination errors.

**invalidAtmAddr**

Indicates the number of invalid ATM address errors.

**badPkts**

Indicates the number of malformed ATM ARP requests.

**outRegFails**

Indicates the number of registration failures sent out by this LES.

**leArpIn**

Indicates the total number of LE\_ARP\_REQUEST frames the LES has accepted since its last initialization.

### **leArpFwd**

Indicates the number of LE\_ARP\_REQUESTs that the LES forwarded onto the clients (either via the control distribute or individually over each control direct) rather than answering directly. This may be due to implementation decision (forward all requests) or because the resolution to the request did not reside in the LES's LE ARP cache.

### **leArpAnswers**

Indicates the number of ARP requests answered by LES.

### **leArpRspFwd**

Indicates the number of ARP responses forwarded by LES.

### **topologyFwd**

Indicates the number of topology frames forwarded by LES.

### **narpFwd**

Indicates the number of NARP frames forwarded by LES.

### **flushRspFwd**

Indicates the number of flush response frames forwarded by LES.

### **outJoinFails**

Indicates the number of Join responses transmitted with unsuccessful status values, including retransmissions.

### **regOK**

Indicates the number of successful registration responses sent by LES, includes reregistrations.

### **unRegOK**

Indicates the number of successful unregistration responses sent by LES.

### **outUnRegFails**

Indicates the number of unregistration responses transmitted with unsuccessful status values.

### **proxyLecs**

Indicates the number of Proxy LECs currently joined to LES.

### **nonProxyLecs**

Indicates the number of Non-Proxy LECs currently joined to LES.

**regMacAddr**

Indicates the number of MAC address mappings currently in the database.

**regRd**

Indicates the number of route descriptor mappings currently in the database.

**regAtmAddr**

Indicates the number of unique ATM addresses currently in mapping database.

**joinRetransmits**

Indicates the number of Join response retransmissions.

**joinParmChanges**

Indicates the number of LEC ELAN memberships terminated because parms changed on subsequent Join request.

**joinTimeouts**

Indicates the number of Join timeouts.

**reRegs**

Indicates the number of reregistrations.

**ctlDirRefused**

Indicates the number of Control Direct VCC call setup requests rejected by the LES for any reason.

**ctlDirReleased\_err**

Indicates the number of Control Direct VCCs released by LEC/network with cause code indicating error.

**ctlDistFailure**

Indicates the number of Control Distribute VCC requests made by LES that failed for any reason (includes calls to first and subsequent parties).

**ctlDistReleased\_err**

Indicates the number of Control Distribute VCCs released by LEC/network due to error (this is release of entire point-to-multipoint VCC, not just one party).

**ctlDistPartyReleased\_err**

Indicates the number of times call to party on Control Distribute VCC was released by LEC/network with cause code indicating error.

### **redundancyVccRefused**

Indicates the number of redundancy VCCs refused by the LES.

### **redundancyVccReleased**

Indicates the number of redundancy VCCs released by the LES.

### **redundancyVccFailure**

Indicates the number of redundancy VCC failures.

### **oam\_droppedFrames**

Indicates the number of OAM frames dropped by the LES.

### **invalidSize\_droppedFrames**

Indicates the number of frames dropped by LES due to frame size being invalid for a control frame.

### **invalidMarker\_droppedFrames**

Indicates the number of frames dropped by LES due to invalid marker.

### **invalidProtocol\_droppedFrames**

Indicates the number of frames dropped by LES due to invalid protocol.

### **verNotSup\_droppedFrames**

Indicates the number of frames dropped by LES due to incorrect version number.

### **invalidLecid\_droppedFrames**

Indicates the number of frames dropped by LES due to unknown LECID (these are NARP and topology requests).

### **unknownLecid\_droppedFrames**

Indicates the number of frames dropped by LES due to unknown LECID (these are ARP and FLUSH responses).

### **invalidOpcode\_droppedFrames**

Indicates the number of frames dropped by LES due to invalid opcode.

### **dupJoin\_droppedFrames**

Indicates the number of duplicate Join requests dropped by LES because processing of the original request had not been completed.

**incompleteSourceJoin\_droppedFrames**

Indicates the number of frames dropped by LES because source LEC had not completed the JOIN phase.

**incompleteTargetJoin\_droppedFrames**

Indicates the number of frames dropped by LES because target LEC had not completed the JOIN phase.

**noProxy\_droppedFrames**

Indicates the number of “unknown” ARP requests dropped by LES because the ELAN had no proxy LEC members.

# Displaying LES/BUS Configuration

The **vlbc** command on the LANE Service Menu (see *The LANE Service Menu (LSM)* on page 37-4) is used to display the configuration of a LES/BUS pair.

To do so for an ELAN named “elan1”, you would enter the following command:

```
vlbc 2/1 elan1
```

A screen similar to the following displays:

|                                  |                 |
|----------------------------------|-----------------|
| <b>LES-BUS Enabled/Disabled:</b> | <b>Enabled</b>  |
| <b>ELAN Type: (S2)</b>           | <b>Ethernet</b> |
| <b>Max Frame Size: (S3)</b>      | <b>1516</b>     |
| <b>Control Timeout: (S4)</b>     | <b>120</b>      |
| <b>Max Frame Age: (S5)</b>       | <b>1</b>        |
| <b>Redundancy:</b>               | <b>Disabled</b> |

This screen shows the same configuration information as is displayed by the **vlb** command:

## LES-BUS Enabled/Disabled

Indicates whether this LES/BUS has been set to the “enabled” or the “disabled” state.

## ELAN Type

Indicates the type of this ELAN. The possible entries are “Ethernet” and “Token Ring.”

## MAX Frame Size

Indicates the maximum data frame size, in octets, for the data frames sent to/from this ELAN.

## Control Timeout

Indicates the time period, in seconds, specified for the timing-out of most request/response control frames.

## MAX Frame Age

Indicates the number of seconds allowed for the BUS to transmit the frame. If the age is exceeded, the BUS will discard the frame.

## Redundancy

Indicates whether the redundancy options has been enabled or disabled for this LES/BUS.



# Displaying LECs in a LES/BUS Pair

The **vlec** command on the LANE Service Menu (see *The LANE Service Menu (LSM)* on page 37-4) is used to display a list of LAN Emulation Clients (LECs) that are related to a given LES/BUS pair.

To display LEC information related to a specific LES/BUS pair (for example, one named “elan1” configured on slot 2, port 1), you would enter the following command:

```
vlec 2/1 elan1
```

A screen similar to the following displays:

Number of LEC's to display: 1  
LEC-LES and LEC-BUS State (UP=Up, ID=Idle, --. --.  
\*\*=Other; Show specific LEC to see actual) v v

| LEC Primary ATM Address                      | Proxy | LEC ID | State<br>LES BUS |    | #ATM<br>Adrs | #Reg<br>MACs |
|----------------------------------------------|-------|--------|------------------|----|--------------|--------------|
| 0000000000000000000000000000000020da8055fdd2 | Y     | 0001   | UP               | UP | 1            | 1            |

The fields on this screen have the following meanings:

**LEC Primary ATM Address**

Shows the Primary ATM address of this LEC.

**Proxy**

Indicates whether or not this LEC is a proxy.

**LEC ID**

Indicates the LEC ID of this LEC.

**State LES**

Indicates the operational state of the LES for this LEC.

**State BUS**

Indicates the operational state of the BUS for this LEC.

**#ATM Adrs**

Indicates the number of ATM addresses for this LEC.

**#Reg MACs**

Indicates the number of registered MACs for this LEC.

# Displaying MAC Addresses for a LES/BUS Pair

The **vmac** command on the LANE Service Menu (see *The LANE Service Menu (LSM)* on page 37-4) is used to display a list of registered MAC addresses for a LES/BUS pair.

To display registered MAC information related to a specific LEC (for example, one named “elan1” configured on slot 2, port 1 with an ID of 0001), you would enter the following command:

```
vmac 2/1 elan1 0001
```

A screen similar to the following displays:

| Number of Registered MAC's to display: 1 |                                        |      |           |
|------------------------------------------|----------------------------------------|------|-----------|
| Registered<br>MAC Address                | Registering ATM Address                | Type | LEC<br>ID |
| 0020da81f8d4                             | 0000000000000000000000000020da8055fdd2 | R    | 0001      |

The fields on this screen have the following meanings:

## Registered MAC Address

Shows the Registered MAC address of this LEC.

## Registering ATM Address

Indicates the ATM address of the LEC which registered the MAC.

## Type

Indicates the database entry types. Possible values are “**R**” for Registered which means the entry was registered by the LEC. and “**S**” for Static Volatile which means the entry was created by the network manager.

## LEC ID

Indicates the LE Client identifier for this entry in the table.

## Displaying Registered Route Descriptor for a LES/BUS Pair

The **vrđ** command on the LANE Service Menu (see *The LANE Service Menu (LSM)* on page 37-4) is used to display the registered route descriptor for a LES/BUS pair.

To display registered route descriptor information related to a specific LES/BUS pair (for example, one named “elan1” configured on slot 2, port 1), you would enter the following command:

**vrđ 2/1 elan1**

A screen similar to the following displays:

| Number of Route Descriptors to display: 1 |                                        |      |        |
|-------------------------------------------|----------------------------------------|------|--------|
| Route Descriptors                         | Registering ATM Address                | Type | LEC ID |
|                                           | 0000000000000000000000000020da8055fdd2 | R    | 0001   |

The fields on this screen have the following meanings:

### Route Descriptors

Indicates the route descriptor associated with the corresponding ATM addresses.

### Registering ATM Address

Indicates the ATM address of the LEC that registered the route descriptor.

### Type

Indicates the database entry types. Possible values are “**R**” for Registered which means the entry was registered by the LEC. and “**S**” for Static Volatile which means the entry was created by the network manager.

### LEC ID

Indicates the LEC ID for this entry in the table.

# Displaying Detailed LEC Information

The **vlecd** command on the LANE Service Menu (see *The LANE Service Menu (LSM)* on page 37-4) is used to display detailed LAN Emulation Client (LEC) information by LEC ID. To use this command, you will need to know the LEC ID you want to look at.

To display information for a specific LEC (for example, one that is part of “elan1” configured on slot 2, port 1 with an ID of 0001), you would enter the following command:

```
vlecd 2/1 elan1 0001
```

A screen similar to the following displays:

|                          |                                        |
|--------------------------|----------------------------------------|
| LEC ID:                  | 0x0001                                 |
| LEC ATM Address:         | 0000000000000000000000000020da8055fdd2 |
| Proxy:                   | Yes                                    |
| LEC State at LES:        | OPERATIONAL                            |
| Entered LES State at:    | 00.12.17.44 (System Up Time)           |
| LEC State at BUS:        | OPERATIONAL                            |
| Entered BUS State at:    | 00.12.17.73 (System Up Time)           |
| Control Direct Vcc:      | OPERATIONAL 0/274                      |
| Control Distribute Vcc:  | OPERATIONAL 0/275                      |
| Multicast Send Vcc:      | OPERATIONAL 0/276                      |
| Multicast Forward Vcc:   | OPERATIONAL 0/277                      |
| MAC Address in Join Req: | 0020da:81f8d4                          |
| # ATM Address Mappings:  | 1                                      |
| # MAC Address Mappings:  | 1                                      |

The fields on this screen have the following meanings:

### LEC ID

Indicates the LEC ID for which the subsequent information is being displayed.

### LEC ATM Address

Indicates the ATM address of the LEC.

### Proxy

Indicates whether or not this LEC is a “proxy.”

### LEC State at LES

Indicates the state of the LEC in regards to the LES.

### Entered LES State at

Shows the system time when this LEC entered the LES state.

### LEC State at BUS

Indicates the state of the LEC in regards to the BUS.

### Entered BUS State at

Shows the system time when this LEC entered the BUS state.

**Control Direct VCC**

Indicates the bi-directional point-to-point virtual channel connection to the LES from the LEC for sending control traffic.

**Control Distribute VCC**

Indicates the uni-directional point-to-point or point-to-multipoint control virtual channel connection to the LEC from the LES for distributing control traffic.

**Multicast Send VCC**

Indicates the bi-directional point-to-point virtual channel connection to the BUS from the LEC to send multicast and initial unicast data.

**Multicast Forward VCC**

Indicates the uni-directional point-to-point or point-to-multipoint virtual channel connection from the BUS to the LEC for distributing data from the BUS.

**MAC Address in Join Req**

Indicates the MAC address in the Join request, if present.

**#ATM Address Mappings**

Indicates the number of ATM address mappings for this LEC.

**#MAC Address Mappings**

Indicates the number of MAC address mappings for this LEC.

# Displaying LECS Status

The **vlecs** command on the LANE Service Menu (see *The LANE Service Menu (LSM)* on page 37-4) is used to display the status of the LECS.

To display the status of the LECS for a specific physical interface (for example, for slot 2, port 1), you would enter the following command:

**vlecs 2/1**

A screen similar to the following displays:

**LECS status at slot 2, port 1**

|                                        |                                                   |
|----------------------------------------|---------------------------------------------------|
| <b>State:</b>                          | <b>Operating normally (88)</b>                    |
| <b>Time of last state change:</b>      | <b>00.49.26.41</b>                                |
| <b>Elapsed time since last change:</b> | <b>00.02.50.83</b>                                |
| <b>Error Log:</b>                      | <b>No error (0)</b>                               |
| <b>Local ATM address:</b>              | <b>3903488001bc900001000100010020da7e79cdc2</b>   |
| <b>Well-known address:</b>             | <b>470079000000000000000000000000a03e00000100</b> |

The fields on this screen have the following meanings:

**State**

Indicates the operating status of the LECS.

**Time of last state change**

Indicates the system time at which the last state change occurred.

**Elapsed time since last change**

Indicates the elapsed time since the last state change.

**Error Log**

Describes the error that caused the LECS to enter the “Down due to Error” state. This information is used for diagnostic purposes.

**Local ATM address**

Indicates the ATM address of the LECS.

**Well-known address**

Indicates the “Well-known” ATM address specified for the LECS.

## Displaying LECS Statistics

The **vlec** command on the LANE Service Menu (see *The LANE Service Menu (LSM)* on page 37-4) is used to display statistics related to the LECS.

To display statistics related to the LECS for a specific physical interface (for example, for slot 2, port 1), you would enter the following command:

```
vlec 2/1
```

A screen similar to the following displays:

**LECS status at slot 2, port 1**

**Num ELAN(s) configured in the LECS database: 2**

|                            |      |
|----------------------------|------|
| Num configured VCCs        | : 1  |
| Num accepted VCC           | : 46 |
| Num Rejected VCC           | : 0  |
| Num VCCs dropped by LECS   | : 0  |
| Num VCCs dropped by caller | : 45 |
| Times exceeded Max VCC     | : 0  |
| LECS discarded frames      | : 0  |

**LECS responses by status**

Success( 0) : 1

No Configuration(20) : 89

The fields on this screen have the following meanings:

### **Num ELAN(s) configured in the LECS database**

Indicates the number of ELANS currently in the LECS database.

### **Num configured VCCs**

Indicates the number of configured Virtual Channel Connections.

### **Num accepted VCC**

Indicates the number of accepted Virtual Channel Connections.

### **Num Rejected VCC**

Indicates the number of rejected Virtual Channel Connections.

### **Num VCCs dropped by LECS**

Indicates the number of Virtual Channel Connections dropped by the LECS.

### **Num VCCs dropped by caller**

Indicates the number of Virtual Channel Connections dropped by the calling station.

### **Times exceeded Max VCC**

Indicates the number of times the Maximum number of VCCs limit was exceeded.

### **LECS discarded frames**

Indicates the number of frames discarded by the LECS.

### **LECS responses by status (Success)**

Indicates the number of LECS responses in regards to the “Success” status condition.

### **LECS responses by status (No configuration)**

Indicates the number of LECS responses in regards to the “No Configuration” status condition.



# Displaying LECS Configuration

The **vlecsc** command on the LANE Service Menu (see *The LANE Service Menu (LSM)* on page 37-4) is used to display the configuration of the LECS.

To display the configuration of the LECS for a specific physical interface (for example, for slot 2, port 1), you would enter the following command:

**vlecsc 2/1**

A screen similar to the following displays:

**Configuration parameters for LECS at slot 2, port 1**

|                                                     |              |
|-----------------------------------------------------|--------------|
| <b>Maximum number of config direct VCCs to LECS</b> | <b>: 128</b> |
| <b>Seconds before VCC declared idle</b>             | <b>: 60</b>  |
| <b>Number of policy type enabled</b>                | <b>: 1</b>   |

The fields on this screen have the following meanings:

**Maximum number of config direct VCCs to LECS**

Indicates the maximum number of simultaneous VCCs (Virtual Channel Connections) that the LECS can support at one time.

**Seconds before VCC declared idle**

Indicates the number of seconds before the LECS releases an idle VCC. Releases will only occur after the maximum number of direct VCCs (as shown above) has been reached.

**Number of policy type enabled**

Indicates the number of different policy types that have been enabled for LECS.

Note that the above configuration parameters can be changed using the **lsmcfg** command.

# Displaying ELANs in the LECS

The **velan** command on the LANE Service Menu (see *The LANE Service Menu (LSM)* on page 37-4) is used to display a list of the ELANs configured in the LECS database.

To display the number of ELANs currently in the LECS for a specific physical interface (for example, for slot 2, port 1), you would enter the following command:

**velan 2/1**

A screen similar to the following displays:

**ELAN(s) in the LECS database:**

| Type     | MFS   | ELAN name |
|----------|-------|-----------|
| =====    | ===== | =====     |
| Ethernet | 1516  | 'elan1'   |

The fields on this screen have the following meanings:

**Type**

Indicates the type of this ELAN. The possible entries are “Ethernet” and “Token Ring.”

**MFS**

Indicates the maximum data frame size, in octets, for the data frames sent to/from this ELAN.

**ELAN name**

Shows the text string you entered as the name for this ELAN.

## Displaying ELAN Policies in the LECS

The **vpolicy** command on the LANE Service Menu (see *The LANE Service Menu (LSM)* on page 37-4) is used to display the policy values assigned to an ELAN in the LECS.

To display the policies assigned to a specific ELAN in the LECS (for example, for an ELAN named "elan1" in the LECS for slot 2, port 1), you would enter the following command:

```
vpolicy 2/1 elan1
```

A screen similar to the following displays:

```
ELAN name => LES
=====
'elan1'

=> 0000000000000000000000000020da8055fdd2

+++++++

ELAN type => LES
=====
* No ELAN types assigned to ELAN 'elan1'

+++++++

ATM address => LES
=====
* No ATM addresses assigned to ELAN 'elan1'

+++++++

<MAC addresses displayed using Ethernet bit order>

MAC address => LES
=====
* No MAC addresses assigned to ELAN 'elan1'

+++++++

Frame size => LES
=====
* No max frame sizes assigned to ELAN 'elan1'

+++++++

Route descriptor => LES
=====
* No route descriptors assigned to ELAN 'elan1'

+++++++
```

This screen shows a listing of the policies that have been added for the specified ELAN. All of the possible categories of policies is shown even if they have not been used.

