CISCO SYSTEMS

Doc. No. 78-4057-01 Rev. A0

Software Configuration Note Version 2.1

Introduction

The 2.1 software release includes the following feature enhancements:

- Support of the UNI 3.1 signalling ATM Forum Standard

    — Supports backward compatibility with ATM switches for User Network Interface version 3.1. The version, 3.0 or 3.1, is negotiated on start-up by Interim Local Management Interface (ILMI) upon start-up and requires no configuration.

- Learn and Lock (MAC Address Port Security)

    — This feature provides added security by monitoring and controlling switch port access. When enabled, a port is set up to learn a single MAC address and to lock out input from any address other than that learned address.

- Port Fast Configuration

    — This addition to Spanning Tree Protocol reduces the time necessary to transition a spanning tree port from Blocked to Forwarding mode.

- ATM LAN Emulation Client/Server Functionality

    — This enhancement provides the ability to create ATM LANE Client/ Server functionalities on a Catalyst 3000 series system.

- SSRP (Simple Server Redundancy Protocol)

    — Provides additional LECS and LES components as backup LECS and secondary LES.

- VLAN LEC Autocreation Enable

    — With this feature, the automatic creation of VLAN LECs can be suppressed.

Learn and Lock

Learn and Lock, also known as MAC Address Port Security, allows an Ethernet port in a Catalyst 3000 series switch to block input to an Ethernet or Fast Ethernet port when the MAC address of a station attempting to access the port is different from the MAC address learned on or configured for that port. When a Catalyst 3000 series switch receives a packet, the switch compares the source address of that packet to the secure source address learned by or configured for that port (see Step 5, in the following steps, for information on Static Address Learning). When a source MAC address, other than that learned by or configured for a port is detected, the port is disabled and an SNMP trap is sent.
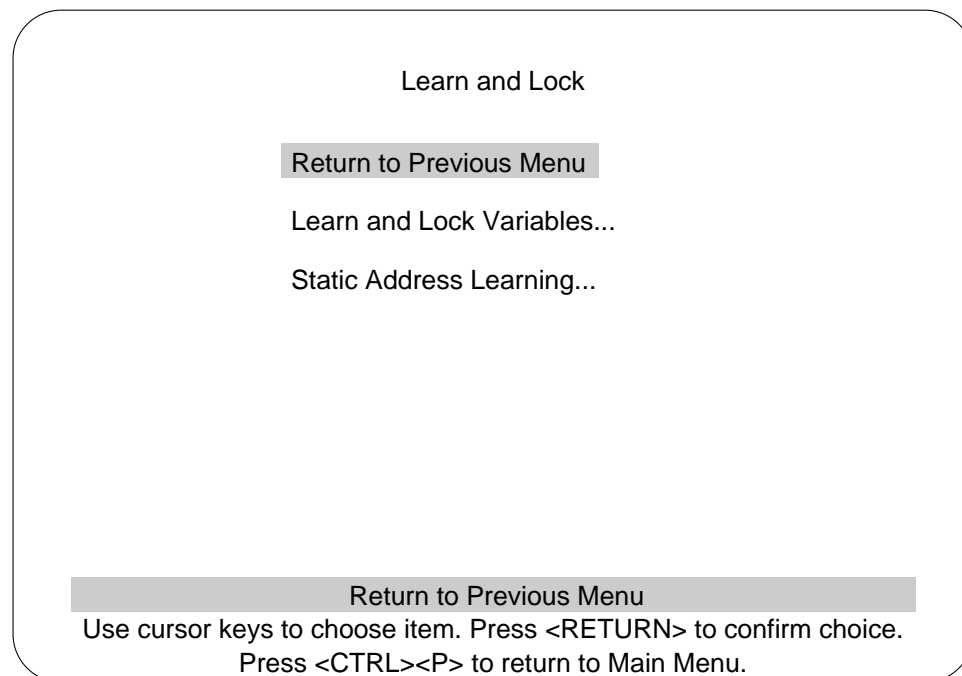

Note   Learn and Lock does not apply to trunk ports where the source addresses change frequently.

Note   If the Learn and Lock feature is enabled, the port should be connected to an end node. A port should not be connected to a hub or a router or a device that accepts several addresses.
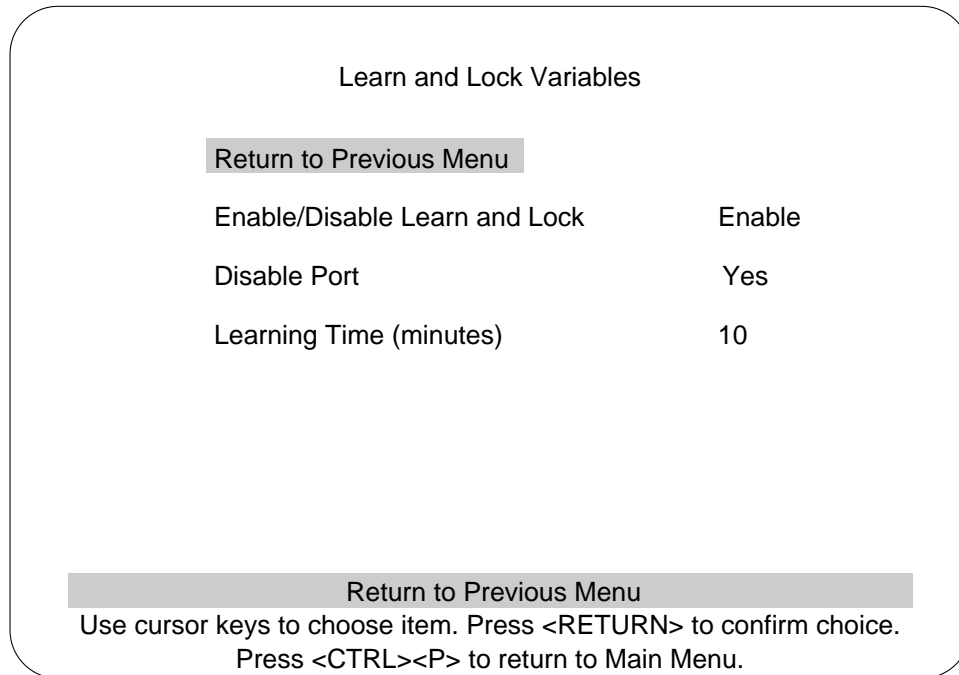

Procedure

To enable Learn and Lock at a specific port, perform the following steps:

Step 1   Access the main Configuration menu and select the heading Learn and Lock.


```
                        Learn and Lock

              Return to Previous Menu

              Learn and Lock Variables...

              Static Address Learning...




                    Return to Previous Menu
        Use cursor keys to choose item. Press <RETURN> to confirm choice.
                  Press <CTRL><P> to return to Main Menu.
```

Step 2   Select the Learn and Lock Variables heading. Use this menu to enable or disable Learn and Lock (see the following Learn and Lock Variables menu screen).

Step 3 To change the variables in the Learn and Lock Variables menu, use the cursor keys to choose the item and press RETURN.

```
                    Learn and Lock Variables

     Return to Previous Menu

     Enable/Disable Learn and Lock        Enable

     Disable Port                         Yes

     Learning Time (minutes)              10




                  Return to Previous Menu
     Use cursor keys to choose item. Press <RETURN> to confirm choice.
              Press <CTRL><P> to return to Main Menu.
```

H8532

Step 4 When Learn and Lock is enabled port learning options can be configured from the Static Address Learning menu.

Note After an address is Learned and Locked on a port and that same address is used on another port, the address for the first port will not be automatically deleted. The first address must be deleted manually.

Step 5   Return to the Learn and Lock menu and select the heading Static Address Learning. In the following Static Address Learning menu example:

- Port 1 is still in the learning state

- Port 2 is disabled due to the discovery of an illegal MAC address

- Port 3 is disabled because the learning time expired

- Port 4 is disabled by the Port Configuration menu

- Port 5 has learned an address and is locked from further learning

```
                        Static Address Learning

    Port            MAC Address        Status            Time Left (Min)

    1               000000 000000      Learning                7
    2               080020 716c3f      Disabled                0
    3               069302 d48f82      Disabled                0
    4               port disabled by user
    5               084020 716230      Learned/Locked          0




     Return  More  Change/Re-enable  Clear/Re-enable  Clear All/Re-enable
                        Return to Previous Menu
    Use cursor keys to choose item. Press <RETURN> to confirm choice.
                Press <CTRL><P> to return to Main Menu.
```

H8532

Step 6   From the Static Address Learning menu you can clear a learned address and restart address learning or statically enter an address and therefore specify the source MAC address the port is authorized to accept.

- Changing or clearing an address would reenable the port if the port was disabled due to Learn and Lock. (Clearing the address restarts the learning timer.)

- These options are not available on the ports that are disabled from the Port Configuration menu.

- Conversely, if a port is disabled due to Learn and Lock, it can not be enabled from the Port Configuration menu.

Port Fast Configuration

When spanning tree is enabled, the Port Fast feature reduces a port's transition time from blocking to forwarding. (For a detailed explanation of the features of spanning tree, see Chapter 7 in the *Installation and Configuration Guide* for the Catalyst 3000 series switches.)

When a port link is enabled, spanning tree will place the port in Blocking mode to prevent a loop from forming. If a loop does not form, spanning tree will change the Blocking mode to:

1 Listening

2 Learning

3 Forwarding

Forwarding allows traffic to enter and leave the port. The transition time from Blocking to Forwarding can average 30 seconds. Using Port Fast, as soon as the port's link is up, the port will go directly to Forwarding mode. If a loop should form after the port enters Forwarding mode, spanning tree changes the port's state from Forwarding to Blocking mode. Port Fast does not affect any other feature of spanning tree.

Use the following steps and menus to configure Port Fast:

Step 1 Using the console, access the Configuration menu and select the Spanning Tree menu.

```
                    Spanning Tree - VLAN01


        Return to Previous Menu
        Participate in Spanning Tree              Yes
        Switch Priority                           32768
        Switch Hello Time (in Seconds)            2
        Switch Maximum Message Age (in Seconds)   20
        Switch Forward Delay (in Seconds)         15
        Port Priority...
        Port Path Cost...
        Port Fast Mode...
        Current Spanning Tree Information




                    Display the Port Fast Menu
        Use cursor keys to choose item. Press <RETURN> to confirm choice.
                 Press <CTRL><P> to return to Main Menu.
```

H8532

Step 2 At the Spanning Tree menu, select the Port Fast menu. The following menu is displayed:

Port Fast Mode menu:

```
                           Port Fast Mode

                    Port                    Fast Mode
                    1                       Disabled
                    2                       Enabled
                    3                       Enabled
                    4                       Enabled
                    5                       Disabled
                    6                       Enabled
                    7                       Enabled
                    8                       Disabled
                    9                       Enabled
                    10                      Disabled
                    11                      Disabled

         Return    More     Change
         Enter port number to change: 7
                 Disabled        Enabled
         _____
                         Enable port
         Use cursor keys to choose item. Press <RETURN> to confirm choice.
                  Press <CTRL><P> to return to Main Menu.
```

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Step 3   Select a port.

Step 4   Select Disabled or Enabled

Port Fast Restrictions

Observe the following restrictions when using Port Fast configuration:

- Port Fast does not apply to trunk ports

    — Any request to set a trunk port to Port Fast mode from the console or SNMP will be rejected

- If an ISL port is enabled with Port Fast and is configured into a trunk, Port Fast will be disabled internally

    — If the ISL port is removed from the trunk, Fast Port is enabled again

ATM LAN Emulation Client/Server Functionality

ATM is a connection-oriented technology providing point-to-point and point-to-multicast circuit networking. Legacy LANs are connection-less and shared medium based technologies. ATM Forum has standardized LAN Emulation protocols to emulate a broadcast environment such as IEE802.3 Ethernet over an ATM network. Each emulated LAN consists of a set of LAN Emulation clients(LECs) and a single LAN Emulation service. The LAN Emulation service consists of LAN Emulation Configuration Server(LECS), a LAN Emulation Server(LES) and a Broadcast and Unknown Server(BUS). Communication among LECs and the LAN Emulation Service takes place over ATM virtual channel connections(VCCs). Each LEC establishes control direct VCCs to the LES and multicast VCCs to the BUS for emulating a LAN over an ATM network.

Using software release 2.1, a Catalyst 3000 series WS-X3006A ATM module can function as one of the following ATM configurations:

- LAN Emulation Configuration Server (LECS)

- LAN Emulation Server/Broadcast And Unknown Server (LES/BUS)

- LES/BUS *and* also as a LECS

- LAN Emulation Client (LEC)

System Requirements For Software Release 2.1

The following is a list of requirements necessary to run software release 2.1 on a Catalyst 3000 series switch:

- 1024 kb flash memory.

- 8 Megabyte DRAM option.

- 2.0 boot image loaded.

Note If using a Cisco LS-1010 ATM switch in your topology, the LS-1010 must be running software release 11.1(4) or above.

If using a router as a LANE Server or a LANE Client, the router must be running a minimum version of router code that supports LANE.

The following sections describe configurations for ATM Client/Server functions. New ATM configuration menus referencing specific ATM configurations are displayed as they are referenced. Standard menus such as the Configuration menu are displayed and described in the Installation and Configuration Guide.

LECS Configuration

This section covers the step by step process for configuring an ATM card in a Catalyst 3000 series switch to provide LAN Emulation Configuration Server (LECS) functionality on an ATM network.

Step 1   Power up the Catalyst 3000 series switch running software release 2.1.

Step 2   Access the configuration menus in the following order:

- Configuration

- ATM Configuration

- ATM LANE Global Configuration

```
              Box 3 ATM port 21 LANE Global Configuration

  Return to Previous Menu

  Operation Mode          LECS

  Configuration Type      ILMI

  ATM NSAP Prefix         00.000000000000000000000000

  TFTP Download Configuration...

  Current LECS ATM Address  49.00060405060708090A0B0C0D.0080240C2C65.FF
                                                             (MASTER)
  Currently Active Database    new

  Additional LECS ATM Addresses Info...

  Redundant LECS Servers Info...



   Return  More  Change/Re-enable  Clear/Re-enable  Clear All/Re-enable
                       Return to Previous Menu
     Use cursor keys to choose item. Press <RETURN> to confirm choice.
                 Press <CTRL><P> to return to Main Menu.
```

H8532

Step 3   Set the Operation Mode option to LECS.

Step 4   Return to the Configuration menu.

Step 5   Access the Reset (options) menu. Select Reset.

Use the following steps to configure the LECS, either from the console, or by way of rebooting the system using TFTP download.

Configuring the LECS from the Console

Note: This feature is only available on the Catalyst 3100 and 3200 platforms

Step 1   Access the following menus:

- Configuration

- ATM Configuration

- LANE Configuration Server

```
            LANE Configuration Server Menu
      Return to Previous Menu
      LECS Database Configuration...

              LANE Configuration Database Listing

      Database Name
      defaultdb




      [Return]   Create   Edit    Delete

              Return to Previous Menu
      Use cursor keys to choose item. Press <RETURN> to confirm choice.
              Press <CTRL><P> to return to Main Menu.
```

H8532
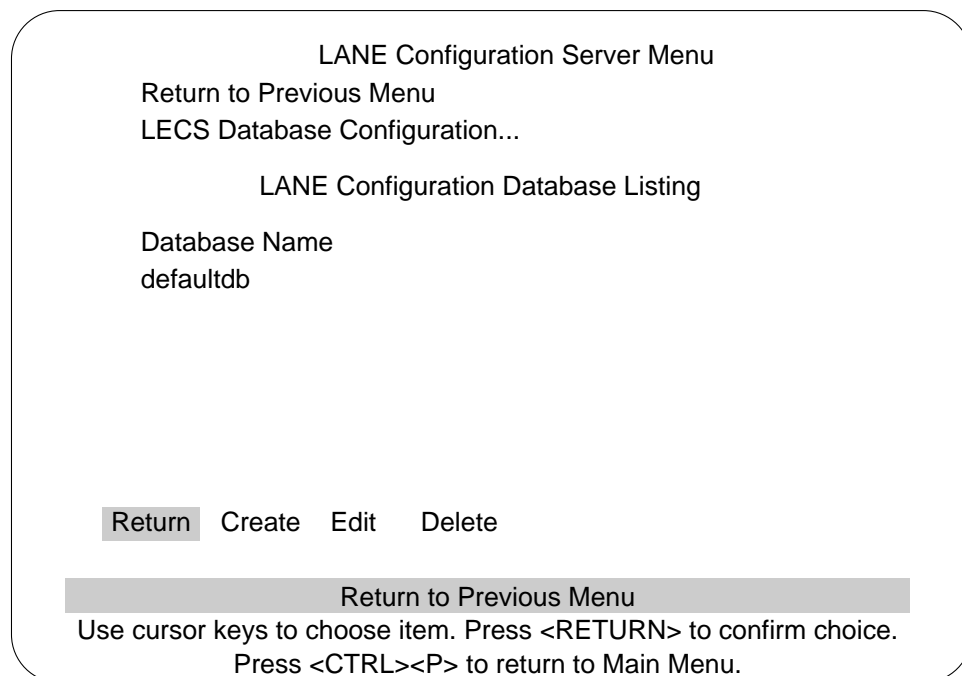
Step 2   Use either the existing *defaultdb* database, or create one of your own with the Create menu option.

Step 3   Select Edit for the chosen database. At the next level of the menu, use the Create option to create an entry for each VLAN you want to support on this LECS.

A LES address needs to be associated with each of the VLAN ids entered in the LECS database.The following steps describe that association.

Step 4   Access the LANE Configuration Database menu.

The LANE Configuration Database menu:

```
                    LANE Configuration Database -- <defaultdb>


 Return to Previous Menu
  Default ELAN Name          defaultdb

  ELAN Configuration List        Current LES Address
  default                    49.00060405060708090A0B0C0D.0080240B2E50.FE
  VLAN01                     49.00060405060708090A0B0C0D.0080240B2E51.FE
  VLAN02                     49.00060405060708090A0B0C0D.0080240B2E52.FE
  VLAN03                     49.00060405060708090A0B0C0D.0080240B2E53.FE
  VLAN04                     49.00060405060708090A0B0C0D.0080240B2E54.FE
  VLAN05                     49.00060405060708090A0B0C0D.0080240B2E55.FE
  VLAN06                     49.00060405060708090A0B0C0D.0080240B2E56.FE
  VLAN07                     49.00060405060708090A0B0C0D.0080240B2E57.FE
  VLAN08                     49.00060405060708090A0B0C0D.0080240B2E58.FE
  VLAN09                     49.00060405060708090A0B0C0D.0080240B2E59.FE
  More           Edit
                       Return to Previous Menu
     Use cursor keys to choose item. Press <RETURN> to confirm choice.
                Press <CTRL><P> to return to Main Menu.
```
H8532

Step 5   Select the Edit option in the LANE Configuration Database menu and enter the name of one of the VLANs you created in this database. This will place you into another menu, the ELAN Configuration menu.

```
                       ELAN Configuration Menu -- <VLAN01>

           Return to Previous Menu
           Status                 Unrestricted
           Server Connection Timeout    0
           LES ATM Address List...
           LANE Client MAC Address List..
           LANE Client ATM Address List..




                       Return to Previous Menu
     Use cursor keys to choose item. Press <RETURN> to confirm choice.
                Press <CTRL><P> to return to Main Menu.
```
H8532

Step 6   Select the LES ATM Address List option.

Step 7   Select the Insert option. The following menu, LES ATM Address, is presented.

The LES ATM Address menu:

```
            LES ATM Addresses -- < VLAN01 >

Index               LES ATM Address                VCC
 1    49.00060405060708090A0B0C0D.0080240B4891.FE   NOT CONNECTED

                    Return to Previous Menu
      Use cursor keys to choose item. Press <RETURN> to confirm choice.
              Press <CTRL><P> to return to Main Menu.
```

H8532

Step 8 Calculate and enter the LES address for the chosen VLAN (use the instructions in the Configuring the LECS Using A TFTP Database section for information on calculating this address). Assign an index number to the address entry and press return.

Step 9 Repeat Step 5 to Step 7 for each VLAN which needs to be supported by the LECS.

Configuring the LECS Using A TFTP Database

If you want to enable multiple VLAN support on the LECS, additional configuration is required. In order to support multiple VLANs on the LECS, an external database file will need to be created and placed on a TFTP server so that it can be downloaded automatically by the LECS when it boots up. Use the following steps to create this database file. If you do not wish to enable VLANs other than the default VLAN, skip to the end of this section.

In order to create entries in this database file, you will need to calculate the ESI portion (byte 13 through 19) of the LES ATM addresses for each of the VLANs which need to be supported. Use the following steps to calculate these addresses:

Step 1 Add the sub-interface number (in hex), as shown in the following example, to the 6 Byte MAC address for the ATM interface. The 6 Byte MAC address is found in the following order of menus:

- Statistics
- ATM Port/Info Statistics
- ATM Board Information

The ATM Board MAC Address is to the right of the heading Base MAC Address. The following is an example of the calculation of the ESI address:

ATM Interface MAC address   +   Sub-Interface Number   =   New LES ESI Address

    0080240B4890   +   A (10 decimal)   =   0080240B489A

Step 2   Structure the LES 20 Byte address by:

- Appending the new ESI address to the ATM prefix.

- Appending this combination of new ESI address and ATM prefix with .FE

The resulting 20 byte address should be in the same format (ATM prefix, .LES ESI address, .FE) as shown in the following example:

     13 Byte ATM prefix   6 Byte ESI   1 Byte FE suffix

49.00060405060708090A0B0C0D.0080240B489A.FE

Step 3   On your TFTP server directory, create a new file for storing the LECS database so that it can be downloaded on Catalyst switch bootup.

The following statement must appear at the top of the Database File:

lane database <desired database name>

Example:

lane database mydata

This command indicates that the LAN Emulation database in this TFTP downloadable file is named mydata.

Step 4   Define each VLAN you wish to use and associate it with the LES ATM address for this VLAN. The following syntax is used to make this designation:

name <VLAN name> server-atm-address <40 byte LES ATM address>

Example:

name VLAN10 server-atm-address 49.00060405060708090A0B0C0D.0080240B489A.FE

Where VLAN10 is the actual VLAN name that is associated with the LES address (49.00060405060708090A0B0C0D.0080240B489A.FE) on the LES+BUSserver. This type of entry is required for each VLAN supported by the LECS. Repeat Step 2 for each VLAN defined so that a unique LES ATM address is created for each VLAN.

Step 5   The following statement must appear after the last LES VLAN entry in the database:

default-name <name of default VLAN>

Example:

default-name default

This defines the default VLAN name as default on this system.

The following example is what the downloadable database file should look like (includes two more VLAN examples with the same naming convention):

lane database mydata

name default server-atm-address 49.00060405060708090A0B0C0D.0080240B4890.FE

name VLAN05 server-atm-address 49.00060405060708090A0B0C0D.0080240B4895.FE

name VLAN10 server-atm-address 49.00060405060708090A0B0C0D.0080240B489A.FE

default-name default

Step 6   If your topology was configured with a redundant LES, the entry for each of the supported VLANs would need to be repeated, specifying the ATM address of the redundant LES for this VLAN.

The following is an example of multiple entries for VLAN01:

lane database mydata

name VLAN10 server-atm-address 49.00060405060708090A0B0C0D.0080240B489A.FE

name VLAN10 server-atm-address 48.010101010101010101010101010.00802400503A.FE

The above entries indicate that the LES associated with the 49.00060405060708090A0B0C0D prefix is the first one to be specified for VLAN10 and the entry involving prefix 48.010101010101010101010101010 is the second to be specified. This represents the order in which the LECS will look for a LES+BUS server in order to enable all of the defined VLANs.

Step 7   Configure the LECS so that it loads the correct LECS database as created in the file on the TFTP Server (the database name was *mydata* in the previous example). Access the following menus:

- Configuration

- ATM Configuration

- LANE Global Configuration

```
                 Box 3 ATM port 21 LANE Global Configuration

  Return to Previous Menu

  Operation Mode            LECS

  Configuration Type        ILMI

  ATM NSAP Prefix              00.00000000000000000000000000

  TFTP Download Configuration...

  Current LECS ATM Address   49.00060405060708090A0B0C0D.0080240C2C65.FF
                                                              (MASTER)
  Currently Active Database     new

  Additional LECS ATM Addresses Info...

  Redundant LECS Servers Info...


    Return  More  Change/Re-enable  Clear/Re-enable  Clear All/Re-enable
                        Return to Previous Menu
    Use cursor keys to choose item. Press <RETURN> to confirm choice.
                  Press <CTRL><P> to return to Main Menu.
```

Step 8   At the LANE Global Configuration menu, select the Currently Active Database field. This field should contain the correct database name as specified in the database file (for instance, using the previous example, the field would contain *mydata*).

Step 9   Configure the options for automatic download. Using the console, access the following menus:

- Configuration

- ATM Configuration

- LANE Global Configuration

- TFTP Download Configuration

The TFTP Download Configuration menu:

```
                        TFTP Download Configuration


     Return to Previous Menu
         Load file from TFTP          Yes
         Download file name           lanedb3
         TFTP Server Address          172.20.32.134
         Download VLAN                default






                       Return to Previous Menu
     Use cursor keys to choose item. Press <RETURN> to confirm choice.
              Press <CTRL><P> to return to Main Menu.
```

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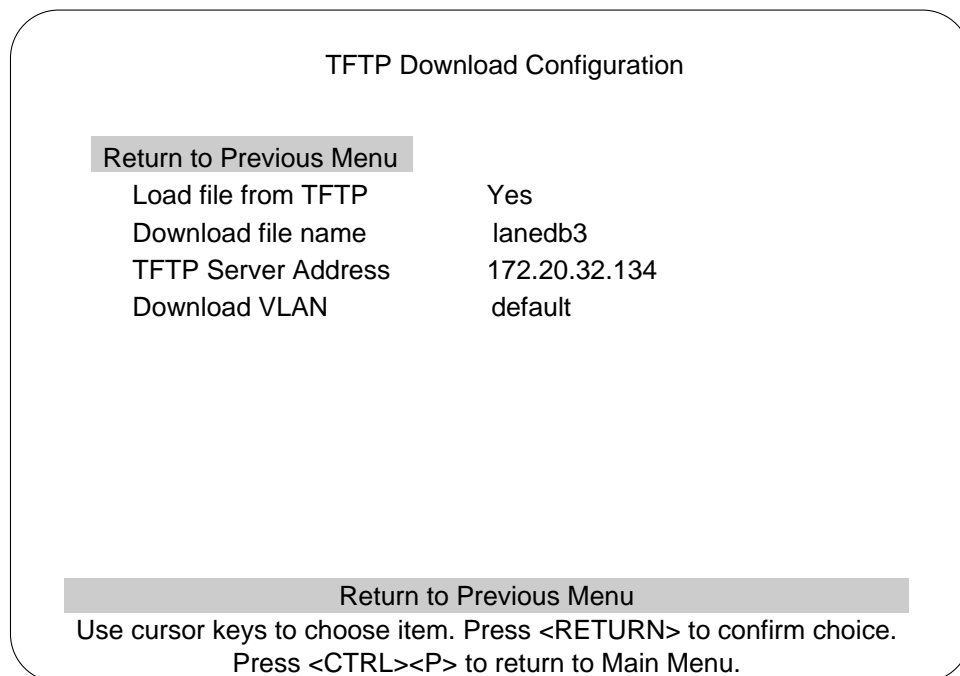
The options to configure for automatic download are:

- Select Load File From TFTP and enter Yes

- At Download File Name, enter the file name of the created database (including the path, if necessary)

- At TFTP Server Address, enter the correct Internet Protocol (IP) address of the server where the database file is located

Ensure that the Catalyst 3000 series switch configured for LECS is connected to the IP network and that it has connectivity to the server where the database file is resident. See the section on IP addresses in Chapter 7 in the appropriate Catalyst 3000 series *Installation and Configuration Guide* for more information on configuring an IP address on the switch.

Step 10   Configure the correct ATM address of the LECS into the ATM switch being used. You will need to calculate the ESI portion of this address. From the console access the following menus:

- Configuration

- Switch Information (or Stack Information for Stack configurations)

Step 11   Retrieve the system MAC address. To this address, add a value of hex 0x20 and the slot number where the configured ATM interface resides (slot number value must be in hex).

System Base MAC Address + Fixed Value of 0x20 + ATM Slot Number = LECS ESI Address

   00802415CA50   +   0x20   + 0x15 (21 decimal) =   00802415CA85

Step 12   Use the ATM prefix, LECS ESI Address, and a selector byte value of FF to form the ATM address for LECS. The new address format is shown in the following example:

   <ATM Prefix>.<LECS ESI Address>.FF

49.00060405060708090A0B0C0D.00802415CA85.FF

Restart the Catalyst 3000 series switch. The database file will be automatically downloaded after the menu interface becomes available.

LES / BUS Configuration

Use the following steps to configure the ATM interface of a Catalyst 3000 series switch to act as a LAN Emulation Server (LES)/ Broadcast and Unknown Server (BUS):

Step 1   From the console, access the following menus:

- Configuration
- ATM Configuration
- ATM LANE Global Configuration

Step 2   Set the Operation Mode option to LES/BUS. Return to the Configuration menu.

Step 3   Return to Main menu

Step 4   Access the Reset (options) menu and select Reset.

Enabling the Support of Certain Vlans on the LES+BUS

Enabling support for certain VLANs on the LES+BUS can be done two ways:

- Manually enabling VLANs from the console
- TFTP downloading the VLAN enabled database information

The following sections describe how to enable VLANs on the LES+BUS.

Enabling VLANs from the Console

Note This feature only available on Catalyst 3100 and 3200 systems

---

Step 1 Access the following menus:

- Configuration
- ATM Configuration
- LANE Server Configuration.

Step 2 For each VLAN which you would like supported by the LES+BUS:

- Enter a sub-interface number
- Enter VLAN name exactly as it is configured on the LECS
- Enable the VLAN.

Note The sub-interface number entered in this screen corresponds to the sub-interface number used for each of the LES ATM addresses in the LECS database.

Step 3 Use the cursor keys to go back up to the Sub-Interface field to choose another number.

Step 4 Repeat this process for each VLAN the LES+BUS needs to support.

Enabling VLANs Automatically Using TFTP Downloadable Database

Step 1 In the TFTP directory of an accessible server, create a new file for the purpose of storing the LES+BUS s VLAN enable database.

Step 2 Using the following format, enter each of the VLANs that need to be supported by the LES+BUS:

lane server-bus ethernet<VLAN name><Slot Number of ATM card><Sub-interface number>

Example:

lane server-bus ethernet VLAN05 21 5

In this example, VLAN05 is the specific VLAN identifier in this entry, 21 represents the physical slot number where the ATM card configured for the LES+BUS is located, and 5 represents the sub-interface number as it is defined on the LECS.

Step 3 Create an entry for each VLAN to be supported.

Step 4 Save and close the file.

Step 5 From the systems console screen, access the following menus:

- Configuration
- ATM Configuration
- ATM LANE Global Configuration

Modify the TFTP download configuration in the following ways:

- Enabled
- Configured for the correct server path and file name of the database
- The IP address of the server is set correctly.

This will allow the database download utility to automatically download the LES+BUS database each time the system is booted up.

Step 6 Return to the Reset menu and select Reset so that the database will be loaded.

Step 7 After the Catalyst 3000 series switch has reset, access the following menus:

- Configuration
- ATM Configuration
- LANE Server/BUS Configuration

Step 8 Check each VLAN id to ensure that the database was properly configured and downloaded. To access the different VLANs, go to the sub-interface field and enter the sub-interface number of the VLAN you want to verify.

LANE Server/BUS Configuration menu:

```
                  Box 3 ATM port 21 LANE Server/BUS Configuration


 Return to Previous Menu
 Sub-interface                 0
 ELAN Name                     default
 LES/BUS Enable Status         Enabled
 Configuration Type            ILMI
 Preferred LECS ATM address  00.000000000000000000000000.000000000000.00
 Preferred ATM prefix          00.000000000000000000000000
 Delete Sub-interface
 LES/BUS Status                operational
 LES ATM Address               49.00060405060708090A0B0C0D.0080240B4150.FE
 BUS ATM Address               49.00060405060708090A0B0C0D.0080240B4150.FD
 Actual LECS ATM Address       49.00060405060708090A0B0C0D.0080240C2C65.FF
 Actual Prefix for LES/BUS     49.00060405060708090A0B0C0D
 LAN Type                      802.3    Max data frame size        1516
 Control Time Out              150 sec  Maximum frame age          1
    LES Info...       BUS Info...      ELAN's Info...       Clients Info...
                         Return to Previous Menu
      Use cursor keys to choose item. Press <RETURN> to confirm choice.
                Press <CTRL><P> to return to Main Menu.
```

H8532

Selecting LES Info at the LANE Server/BUS Configuration menu takes you to the LANE Server Information menu. This menu displays the active LANE Clients connected to the LES.

```
                  Box 4 ATM port 21 LANE Server Information


Vlan name: default, Config Server(LECS): vcd 153
Control distribute: vcd 123, 9 member(s), 12819 packet(s)

Client State: Init, Conn, Waiting, Adding, Joined, Operational, Terminatin C-Direct

Lecid State Vcd  Proxy Packets    Client's ATM address
1       O    108  P     2         49.00060405060708090A0B0C0D.0080240B8510.00
2       O    132  P     12808     49.00060405060708090A0B0C0D.0080240B5490.00
3       O    252  P     5         49.00060405060708090A0B0C0D.0080240B23D0.00
4       O    263  P     2         49.00060405060708090A0B0C0D.0080240B2D10.00
5       O    266  P     2         49.00060405060708090A0B0C0D.0080240B47D0.00
6       O    269  P     2         49.00060405060708090A0B0C0D.0080240B2DD0.00
7       O    284  P     2         49.00060405060708090A0B0C0D.0080240B2A50.00
8       O    287  P     2         49.00060405060708090A0B0C0D.0080240AE810.00


  Return   More
                     Return to Previous Menu
     Use cursor keys to choose item. Press <RETURN> to confirm choice.
                Press <CTRL><P> to return to Main Menu.
```
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Selecting BUS Info at the LANE Server/BUS Configuration menu takes you to the LANE BUS Information menu. This menu shows the active LANE Clients that are connected to the BUS.

```
                  Box 4 ATM port 21 LANE BUS Information
     Vlan name: default, Multicast Forward: vcd 131, 9 member(s), 99041 packet(s)


    MC-Send
Lecid Vcd   Packets    Client's ATM address
 1    130   489        49.00060405060708090A0B0C0D.0080240B8510.00
 2    145   97963      49.00060405060708090A0B0C0D.0080240B5490.00
 3    257   465        49.00060405060708090A0B0C0D.0080240B23D0.00
 4    264   24         49.00060405060708090A0B0C0D.0080240B2D10.00
 5    267   21         49.00060405060708090A0B0C0D.0080240B47D0.00
 6    270   22         49.00060405060708090A0B0C0D.0080240B2DD0.00
 7    285   19         49.00060405060708090A0B0C0D.0080240B2A50.00
 8    288   20         49.00060405060708090A0B0C0D.0080240AE810.00
 9    299   19         49.00060405060708090A0B0C0D.0080240B7CD0.00


  Return   More
                     Return to Previous Menu
     Use cursor keys to choose item. Press <RETURN> to confirm choice.
                Press <CTRL><P> to return to Main Menu.
```
H8532

Selecting ELAN's Info at the LANE Server/BUS Configuration menu takes you to the LANE BUS Information menu. This menu lists the ELAN name, LES address, and the number of LANE Clients that are operational on each ELAN.

```
                    Box 4 ATM port 21 VLAN LES Information

ELAN                    LES NSAP                                   Member
default         49.00060405060708090A0B0C0D.0080240B2E50.FE  9
VLAN01          49.00060405060708090A0B0C0D.0080240B2E51.FE  5
VLAN02          49.00060405060708090A0B0C0D.0080240B2E52.FE  4
VLAN03          49.00060405060708090A0B0C0D.0080240B2E53.FE  3
VLAN04          49.00060405060708090A0B0C0D.0080240B2E54.FE  3
VLAN05          49.00060405060708090A0B0C0D.0080240B2E55.FE  3
VLAN06          49.00060405060708090A0B0C0D.0080240B2E56.FE  3
VLAN07          49.00060405060708090A0B0C0D.0080240B2E57.FE  3
VLAN08          49.00060405060708090A0B0C0D.0080240B2E58.FE  3
VLAN09          49.00060405060708090A0B0C0D.0080240B2E59.FE  3
VLAN10          49.00060405060708090A0B0C0D.0080240B2E5A.FE  3
VLAN11          49.00060405060708090A0B0C0D.0080240B2E5B.FE  2
VLAN12          49.00060405060708090A0B0C0D.0080240B2E5C.FE  1

   Return   More

                    Return to Previous Menu
   Use cursor keys to choose item. Press <RETURN> to confirm choice.
              Press <CTRL><P> to return to Main Menu.
```

H8532

Selecting Client's Info at the LANE Server/BUS Configuration menu takes you to the LANE Server Client Information menu. This menu displays the LANE Server Client information.

```
          LANE Server Client (LEC Id = 1 ) Information
ATM NSAP                          MAC Address
49.00060405060708090A0B0C0D.008024B8510.00   008024b8510














   Return   More

                    Return to Previous Menu
   Use cursor keys to choose item. Press <RETURN> to confirm choice.
              Press <CTRL><P> to return to Main Menu.
```
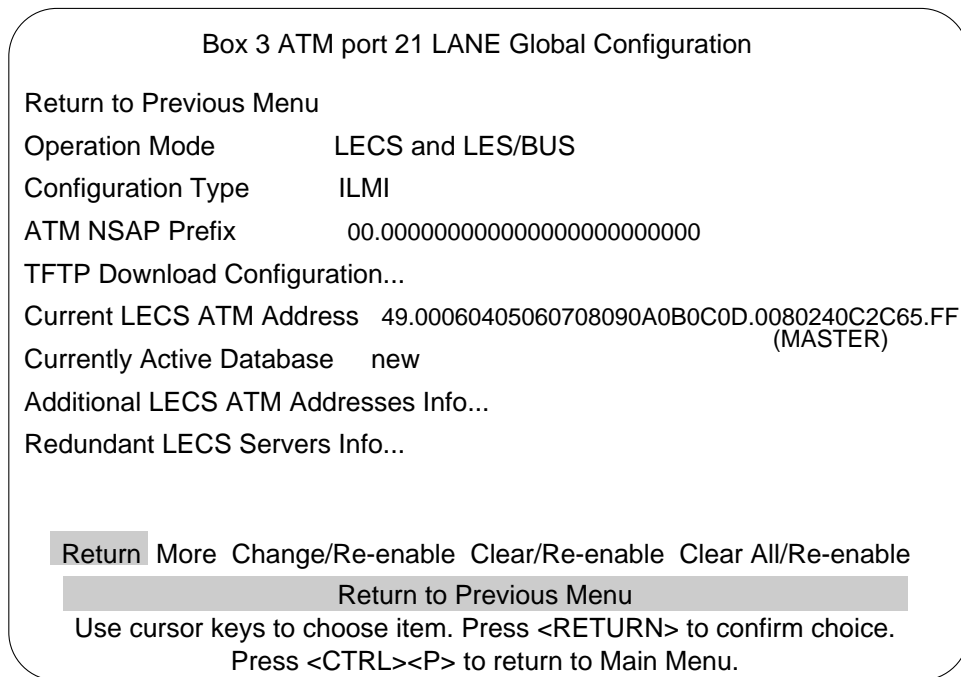
H8532

LES / BUS and LECS Configuration

In order to configure an ATM interface of a Catalyst 3000 series system to function as both a LES+BUS and a LECS, the following steps are necessary to configure the system:

Step 1   Power up the un-initialized Catalyst 3000 series switch running software release 2.1.

Step 2   Access the following menus:

- Configuration

- ATM Configuration

- ATM LANE Global Configuration

The ATM LANE Global Configuration menu:

```
              Box 3 ATM port 21 LANE Global Configuration

   Return to Previous Menu

   Operation Mode            LECS and LES/BUS

   Configuration Type        ILMI

   ATM NSAP Prefix             00.000000000000000000000000

   TFTP Download Configuration...

   Current LECS ATM Address   49.00060405060708090A0B0C0D.0080240C2C65.FF
                                                    (MASTER)
   Currently Active Database    new

   Additional LECS ATM Addresses Info...

   Redundant LECS Servers Info...




     Return  More  Change/Re-enable  Clear/Re-enable  Clear All/Re-enable
                         Return to Previous Menu
      Use cursor keys to choose item. Press <RETURN> to confirm choice.
                  Press <CTRL><P> to return to Main Menu.
```

H8532

Step 3   Set the Operation Mode option to LECS and LES+BUS.

Step 4   Access the Reset (options) menu. Select Reset the switch without running diagnostics.

Step 5   Depending upon your configuration, follow the steps in the section Configuring the LECS from the Console, to configure the LECS using the console OR follow the steps in the section, Configuring the LECS Using A TFTP Database, to configure the LECS using TFTP.

Step 6   Depending upon your configuration, follow the steps in the section Enabling VLANs from the Console to enable the VLANs from the console OR follow the steps in the section, Enabling VLANs Automatically Using TFTP Downloadable Database to enable the VLANs using TFTP.

Note   *Important Note:* When configuring an ATM interface to be both LES+BUS and LECS and choosing to use TFTP database downloading, the same file must be used to house the database information for both the LECS and the LES+BUS (in that order)

LEC Configuration

The following steps are necessary to configure and activate LAN Emulation clients on the Catalyst 3000 series switch:

Step 1 Power up the Catalyst 3000 series switch unit running software release 2.1.

Note Use the following steps to enable multiple VLANs on the LEC. To enable only the default VLAN, proceed to the last step.

Step 2 Access the following menus:

- Configuration
- VLAN and VTP Configuration
- VTP VLAN Configurations

Step 3 From the VTP VLAN Configurations menu select the Add Option. While still in the VTP VLAN Configuration menu, you are prompted to enter a VLAN index number.

The VTP VLAN Configurations menu:

```
                    VTP VLAN Configurations

    VLAN Name              ID      VLAN Name              ID
     default               1        Appletalk             78
     building A control    3        fddi-default          1002
     building B control    4        token-ring-default    1003
     building G control    5        fddinet-default       1004
     engineering           6        trnet-default         1005
     tech pubs             7
     test Network 1        8
     test Network 2        10
     test Network 3        11
     main IPX network      20
     sub-IPX network A     25
     sub-IPX network B     26
     sub-IPX network C     27

       Return      More     Change...     Add...      Delete

                    Return to previous menu
       Use cursor keys to choose item.  Press <RETURN> to confirm choice.
                 Press <CTRL><P> to return to Main Menu.
```

Step 4 Choose a number between 2 and 1001 and enter that number.

A new screen, VTP VLAN Parameter Configuration, will show the selected VLAN ID number. Just below this number is a field which stores the VLAN name for this VLAN index ID.

The VTP VLAN Parameter Configuration menu:

```
                    VTP VLAN Parameter Configuration

            Return to Previous Menu

            VLAN ID            3
            VLAN Name          building A control

            State              Operational
            Type               Ethernet
            MTU                1500
            SAID               3
            Ring Number        0
            Bridge Number      0
            Spanning Tree Type  N/A
            Parent VLAN        0
            TB VLAN 1          0
            TB VLAN 2          0




                    Display VLAN Configurations Menu
      Use cursor keys to choose item.  Press <RETURN> to confirm choice.
                Press <CTRL><P> to return to Main Menu.
```
H8526

Step 5   Access the VLAN Name field and enter the VLAN name you wish to install on this system.

Step 6   Repeat Step 4 and Step 5 for each VLAN that is to be installed.

Note   This routine is case sensitive. Enter the VLAN name exactly as used throughout the network. Repeat steps 4 and 5 for all the VLANs you wish to create.

Step 7   When you are finished defining new VLAN names, select the return option to return to the VTP and VLAN sub-menu.

It is now necessary to associate at least one physical ethernet port with each VLAN so that the system will build the circuit from the LEC to the LES.

Step 8   Access the following menus:

  - Configuration

  - VLAN and VTP Configuration

  - Local VLAN Port Configuration

The Local VLAN Port Configuration menu:

```
                   Box 1 - Local VLAN Port Configuration


      Port        Mode        VLAN
       1          Static      VLAN01
       2          Static      VLAN02
       3          Static      VLAN03
       4          Static      VLAN04
       5          Static      VLAN05
       6          Static      VLAN06
       |           |           |
       |           |           |
       |           |           |
      16          Static      VLAN16
      17          Trunk       default VLAN01 VLAN02 VLAN03
      21          Trunk       default VLAN01 VLAN02 VLAN03

               Return          More        Change
                     Return to previous menu
      Use cursor keys to choose item. Press <RETURN> to confirm choice.
            Press <CTRL><P> to return to Main Menu.
```

H8705

Step 9   At the Local VLAN Port Configuration menu, move the cursor to the right to select the Change option and enter the desired port number. Press RETURN.

Step 10   Using the cursor keys, move the cursor to the appropriate VLAN identifier you wish to associate with the selected port. When the cursor is on the correct identifier, press the SPACE key once to move the selection asterisk to this choice. Press RETURN.

Step 11   Repeat this process for each port you wish to associate with a VLAN. Each of the affected VLANs should now come up on this LEC.

Step 12   From the same menu, select the Change option and enter the slot number of the ATM card configured as the client. When the VLAN selection screen is shown, select each VLAN you want supported over this ATM trunk and press the SPACE key to enable it (apparent by an asterisk). Exit this menu.

Step 13   Verify that the LEC connection has been established by viewing the LANE Client Configuration menu. To view the LANE Client Configuration menu, access the following menus:

- Configuration

- ATM Configuration

- LANE Client Configuration

The LANE Client Configuration menu:

```
                Box 1 ATM port 21 LANE Client Configuration

 Return to Previous Menu

Configuration Type              ILMI
Preferred ATM Address for LECS 00.00000000000000000000000.000000000000.00
Preferred ATM Prefix for LEC    00.000000000000000000000000

Actual ATM Address of LECS    49.00060405060708090A0B0C0D.008024185F45.FF
Actual ATM Prefix of LEC      49.00060405060708090A0B0C0D
LAN Type                802.3     Forward delay time             15 sec
Max data frame size     1516      Expected LE_ARP response time  1 sec
Idle Timeout            0 sec     Flush timeout                  4 sec
Control Time Out        30 sec    Connection completion timeout   4 sec
Max retry count         1         VTP state                       Enabled
LE_ARP aging time       300 sec   ELAN Table...


                     Return to Previous Menu
       Use cursor keys to choose item. Press <RETURN> to confirm choice.
                Press <CTRL><P> to return to Main Menu.
```

Step 14   Verify that the proper LECS address is reported in the Actual ATM Address of LECS field.

Step 15   While still in the LANE Client Configuration menu, select the ELAN Table heading (lower right section of the menu) to view the VLAN connection status. Ensure that each VLAN that was enabled in Step 4 through Step 11 of this section show a LEC state of Up.

LANE Simple Server Redundancy (LANE SSRP)

The LANE SSRP feature provides additional, redundant LECS and LES components. The additional LECS is called a Backup LECS and the additional LES is called a secondary LES.

If the current Master LECS stops functioning, a Backup LECS becomes the new Master.

If the current primary LES stops functioning, a secondary LES becomes the new primary.

The following sections explain how LECS Master/Backup and LES primary/secondary work.

Note   ILMI support is required to use the SSRP feature.

Master LECS

The Master LECS is the first active LECS from the top of the list of LECS addresses configured in the ATM switch. The Backup LECSs are the remaining standby LECSs in the list.

A Backup LECS becomes the Master LECS when the Master loses connectivity to the already established connections in the ATM network, including the VCC to the Backups. The first active Backup in the ATM LECSs list becomes the Master. This new Master becomes active as soon as it establishes VCCs to the LECSs below it in the address list.

Anytime an LECS detects that an LECS above it in the list has established VCC to it, then the lower LECS becomes a Backup and lets the higher, active LECS become the Master. The Backup then tears down the VCC to all of the LESs.

As soon as the VCC to an LES from LECS is torn down, the LES establishes a VCC to the new Master and reconfirms all of the LANE Clients by issuing configuration requests. If an LEC is not confirmed, the LES tears down VCCs to that LEC and the LEC reinitiates connection to the ATM network.

When the Backup becomes the Master, it affects the LES and LECs in the ATM network in the following ways:

- When the LES loses the VCC to the current Master LECS, it establishes VCC to the LECS which became the new Master and then reconfirms the validity of all the LANE Clients with the new Master using the LANE Configure Request packets.

- If any of the LECs are not confirmed with the new Master LECS, the LES tears down connections to this LEC, causing the LEC to reinitiate the join procedures by:

  — Connecting to the Master

  — Requesting the LES address

  — Sending a join request to the LES.

Primary LES

Note   The concept of primary and secondary for an LES is used only for explanation purposes. The terms are not used for display or configuration.

The primary LES is the first active LES in the list from the top of LES addresses for an ELAN in the LECS database. The secondary LESs are the remaining standby LESs in the list.

An active LES is always operational and ready to accept LECs if the LEC wishes to use this LES.

When the primary LES becomes ineffective and tears down its VCC to the LECS, it also tears down VCCs to all the LECs. As soon as an LEC loses its VCCs to the LES, it reinitiates the connection procedures by issuing the LANE Configure Request to the LECS and obtains the active LES address which is considered the new primary LES.

As soon as the Master LECS knows that an LES above the current primary LES has established VCC, it tears down the VCC to the current primary LES which in turn, drops all of the VCCs to the LECs which were associated with it. Once an LEC loses VCCs to the LES, it initiates the connection procedures by obtaining the LES address from the LECS which provides the new primary LES address to the LEC.

Limitations

- The SSRP feature cannot be used with LES/BUS servers supplied by non-Cisco vendors. When using the LES/BUS from other vendors, the LECS address list in the ATM switch should contain one entry only so that the SSRP feature will not be activated.

- An LEC may not know if a new LECS has become a Master LECS if the LES confirms the validity of the LEC with the new Master LECS successfully. If the reconfirmation is not successful, then this LEC loses the VCCs to the LES and it has to reinitiate the connection procedure.

ATM Statistics

The following are examples of ATM Statistics menus with various types of information. Explanations of the different types of VCCs follow these menus. For a complete explanation of Statistic menus see the Catalyst 3000 series Installation and Configuration Guide.

An example of a display for channel information in LEC mode:

```
                      Box 4 Port 21 ATM Channel Statistics

VCC Id  VCC Type    TX frames   TX bytes  RX frames   RX bytes  RX errors
0:5      Signalling      20281     339665      20258     589940          0
0:16     ILMI            11419     723785      11397     793851          0
0:257   CDr-VLAN01         490      53398          1        108          0
0:266   CDt-VLAN01           0          0       1025     104059          0
0:267   CDr-default        242      26616          1        108          0
0:268   CDt-default         44      25006        908      99984          0
0:269   MS-default      103555     610664          0          0          0
0:270   MF-default           0          0      52157     201416          0
0:271   MS-VLAN01       104073    5034163          0          0          0
0:272   MF-VLAN01            0          0      51875      41418          0
0:278   DD-[4,7]         30490    9851918      30798     909462          0
0:279   DD-[4,4]         60960      38053      61511     909464          0


   Return    More     Show     Reset channel     Reset all

                    Return to Previous Menu
       Use cursor keys to choose item. Press <RETURN> to confirm choice.
                  Press <CTRL><P> to return to Main Menu.
```

An example of a display for channel information in LECS mode:

```
                   Box 4 Port 21 ATM Channel Statistics

VCC Id  VCC Type    TX frames   TX bytes  RX frames   RX bytes  RX errors
0:5     Signalling      15145     159936      15145     407708          0
0:16    ILMI             7987     466642       7987     573809          0
0:52    CONFIG- 23          0          0          0          0          0
0:53    CONFIG- 24          0          0          0          0          0
0:54    CONFIG- 25          0          0          0          0          0
0:55    CONFIG- 26          7        756          7        756          0
0:56    CONFIG- 27          8        864          8        864          0




   Return    More     Show     Reset channel     Reset all

                    Return to Previous Menu
    Use cursor keys to choose item. Press <RETURN> to confirm choice.
             Press <CTRL><P> to return to Main Menu.
```

H8532

An example of a display for channel information in LES mode:

```
                   Box 5 Port 21 ATM Channel Statistics


VCC Id  VCC Type    TX frames   TX bytes  RX frames   RX bytes  RX errors
0:269   MS-default     103555     610664          0          0          0
0:270   MF-default          0          0      52157     201416          0
0:271   MS-VLAN01      104073      41631          0          0          0
0:272   MF-VLAN01           0          0      51875      41418          0
0:278   DD-[4,7]        30490     851918      30798      09462          0
0:279   DD-[4,4]        60960      80537      61511      09464          0
0:280   DD-[4,5]        30374      13837      30705     903680          0




   Return    More     Show     Reset channel     Reset all

                    Return to Previous Menu
    Use cursor keys to choose item. Press <RETURN> to confirm choice.
             Press <CTRL><P> to return to Main Menu.
```

H8532

An example of a display for channel information in LES mode:

```
              Box 5 Port 21 ATM Channel Statistics


VCC Id  VCC Type    TX frames   TX bytes  RX frames   RX bytes  RX errors
0:5     Signalling     15033     164544     15033     399728         0
0:16    ILMI           22139    1504829     22139    1505232         0
0:87    Di-  3,  54        0          0         0          0         0
0:88    Di-  4,  55        0          0         0          0         0
0:89    Di-  1,  56        7        756         7        756         0
0:90    Di-  0,  57        8        864         8        864         0
0:91    Di-  1,  58        1        108         2        216         0
0:92    Di-  0,  59        1        108         2        216         0
0:93    Di-  0,  60        1        108         3        312         0
0:94    Dt-  1,  61     1123     124643         0          0         0
0:95    Di-  0,  62        1        108       134       8400         0
0:96    Dt-  0,  63     1008     110784         0          0         0
0:97    Ms-  1,  64        0          0        16       3287         0

  Return    More    Show    Reset channel    Reset all

                  Return to Previous Menu
   Use cursor keys to choose item. Press <RETURN> to confirm choice.
               Press <CTRL><P> to return to Main Menu.
```

H8532

Explanation of Client Mode VCC Types

The Client end of a Control Direct channel has the VCC type of CDr-xxx. The xxx is the ELAN name of the VLAN the client is joined to. (The other end of the channel is the LES for the ELAN)

A Control distribute channel has the VCC type CDt-xxx. The xxx is the same as above. (The other end would be the LES for that ELAN.)

A Multicast Send channel has the VCC type of MS-xxx. The xxx is the same as above. (The other end would be the BUS for that ELAN.)

A Multicast forward channel has the VCC type MF-xxx. (The other end is the BUS for that ELAN.)

Data direct channels between clients would have the VCC type DD-xxx.

Explanation of Server Mode VCC Types

VCCs whose local ends are a LECS on the switch have the VCC type Config-xx. The xx is the VC number (not VCI) of the channel. The other end will usually be an LES for one of the ELANs. Such channels also exist between the LECS and Clients but these usually are not reported because of short transitions.

LES ends of Control direct channels have the VCC type Di-m,n. The m is the subinterface for this LES and n is the VC number (not VCI).

LES ends of Control distribute channels have the VCC type Dt-m,n (m,n is the same as above).

BUS ends of Multicast Send channels have the VCC type Ms-m,n. the m is the subinterface for this BUS and n is the VC number.

BUS ends of Multicast forward channels have the VCC type Mf-m,n. The m,n are the same as above.

In all cases there will also be one signalling channel and one ILMI channel. These are between the CAT3000 ATM interface and the ATM switch it is connected to.

VLAN LEC Autocreation Enable

With 2.1 software release, a parameter has been added to the LEC Client Configuration display. This parameter is called VLAN LEC Autocreation. Previously LECs were automatically created whenever a VLAN appears on the Stack and that VLAN has a local port assigned to it. LECs need to be specifically enabled before they will be on the VLAN.

The VLAN LEC Autocreation controls the creation of LECs via the VLAN-allow mask configured from the Local VLAN Port Configuration function. This menu is accessed through the VLAN and VTP Configuration menu. When VLAN LEC autocreation is enabled, VLANs are allowed by default as they appear. (New VLANs are always allowed by default on an ISL trunk). When VLAN LEC autocreation is disabled, VLANs are disallowed by default as they appear. To allow the creation of the LEC when autocreation is disabled, access the VLAN Port Configuration Menu and enable the VLAN on the ATM Trunk port.

VLAN LEC autocreation also determines whether the default Ethernet VLAN can be disabled. When VLAN LEC autocreation is disabled, the default Ethernet VLAN can also be disabled (normally enabled by default). When VLAN LEC autocreation is enabled, the default Ethernet VLAN automatically becomes enabled and cannot be disabled.

Obtaining Service and Support

For service and support for a product purchased from a reseller, contact the reseller. Resellers offer a wide variety of Cisco service and support programs, which are described in the section "Service and Support" in the information packet that shipped with your product.

Note If you purchased your product from a reseller, you can access Cisco Connection Online (CCO) as a guest. CCO is Cisco Systems' primary, real-time support channel. Your reseller offers programs that include direct access to CCO's services.

For service and support for a product purchased directly from Cisco, use CCO.

Cisco Connection Online

CCO is Cisco Systems' primary, real-time support channel. SMARTnet customers and partners can self-register on CCO to obtain additional information and services.

Note If you purchased your product from a reseller, you can access CCO as a guest. Your reseller offers programs that include direct access to CCO's services.

Available 24 hours a day, 7 days a week, CCO provides a wealth of standard and value-added services to Cisco's customers and business partners. CCO services include product information, product documentation, software updates, release notes, technical tips, the Bug Navigator, configuration notes, brochures, descriptions of service offerings, and download access to public and authorized files.

CCO serves a wide variety of users through two interfaces that are updated and enhanced simultaneously: a character-based version and a multimedia version that resides on the World Wide Web (WWW). The character-based CCO supports Zmodem, Kermit, Xmodem, FTP, and Internet

e-mail, and it is excellent for quick access to information over lower bandwidths. The WWW version of CCO provides richly formatted documents with photographs, figures, graphics, and video, as well as hyperlinks to related information.

You can access CCO in the following ways:

- WWW: http://www.cisco.com

- WWW: http://www-europe.cisco.com

- WWW: http://www-china.cisco.com

- Telnet: cco.cisco.com

- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and connection rates up to 28.8 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact cco-help@cisco.com. For additional information, contact cco-team@cisco.com.

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