Understanding LE_ARP Verification in ATM LANE Environments

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Introduction

LAN emulation clients (LECs) follow address resolution procedures to learn which ATM address to use to reach a destination MAC address on a remote Ethernet segment reachable over the LAN emulation (LANE) cloud. Typically, a remote Catalyst switch that acts as a LEC proxy owns the ATM address. Once the LEC learns the MAC to ATM address mapping, it stores this mapping as an entry in its dynamic LAN Emulation Address Resolution Protocol (LE_ARP) cache.

Every five minutes, a LEC verifies the LE_ARP entry and ensures that the mapping between the MAC and ATM addresses is still valid. This process allows the LEC to learn a new MAC to ATM address mapping if the remote LEC does not support LE_NARP, which is an explicit message of a new or changed mapping. The LEC simply sends an LE−ARP request to the LES and consults the LE−ARP response to determine whether the cached entry is still valid.

The purpose of this document is to illustrate the complete address resolution process, which includes the IP to MAC mapping, the MAC to ATM mapping, and LE−ARP verification.

Prerequisites

Requirements

There are no specific requirements for this document.

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

Address Resolution

When two Ethernet users on the same IP network need to communicate over a LANE cloud, we complete two address resolution processes:

- IP to MAC mapping − IP ARP
- MAC to ATM mapping − LE_ARP

Just as a PC builds a dynamic IP ARP cache, a LANE client builds a dynamic LE−ARP cache.

In other words, LE ARP is not the same as IP ARP. IP ARP maps IP addresses (Layer 3) to Ethernet MAC addresses (Layer 2); LE ARP maps ELAN MAC addresses (Layer 2) to ATM addresses (also Layer 2).

These two sections discuss each address resolution process in more detail.

IP to MAC Mapping

This topology illustrates the IP ARP process over a LANE cloud.

In this example, host A pings host B. Both hosts are Ethernet−attached PCs connected to Catalysts that contain ATM modules.

1. Host A initiates a ping to Host B, which has an IP address of 100.1.1.2. Before the ping packet can be sent, Host A needs an IP ARP entry for the Host B. Host A sends an IP ARP request packet, which contains a destination MAC address of FFFF.FFFF.FFFF in the Ethernet header.
2. Catalyst A receives the broadcast and forwards it out all ports in the same VLAN, which includes the ATM port. LEC A receives the broadcast and sends it over the Multicast Send virtual channel connection (VCC) to the broadcast and unknown server (BUS), to which all broadcasts and multicasts are sent.
3. The BUS receives the IP ARP packet and sends it over the Multicast Forward to other LECs in the same ELAN.
4. LEC B receives the broadcasted IP ARP packet, and Catalyst B forwards it out all ports in the same VLAN, which includes the port to which Host B is attached. Importantly, Catalyst B adds an entry for Host A in its bridging or MAC address table.
5. Host B receives the IP ARP request, recognizes its IP address in the data portion of the ARP packet, and builds an IP ARP reply packet.
6. Catalyst B receives the IP ARP reply and determines that the destination MAC address in the Ethernet header is for Host A. After it consults its MAC address table, Catalyst B determines that it needs to send the IP ARP reply over the ATM port.
7. LEC B sends the IP ARP reply over the Multicast Send to the BUS.
8. The BUS forwards this frame through the Multicast Forward to all other LECs in the same ELAN.
9. LEC A receives the IP ARP reply. Catalyst A checks the destination MAC address, sees it is for Host

A, and forwards the reply packet out the Ethernet port to Host A.

10. Now that Host A knows Host B's MAC address, it can send a complete ping packet to Host B.

The LEC on Catalyst A continues to forward data frames over the BUS until a Data Direct VC is established to the LEC on Catalyst B through the LE_ARP process.

MAC to ATM Mapping

LANE clients (LECs) send and receive both control frames and data frames. Control frames are frames that do not carry data, but rather are used to establish VCs between the LANE client and LANE servers or between two LANE clients.

LE_ARP frames are control frames that a LEC uses to resolve destination MAC addresses to ATM addresses. This is the format of this frame:

Name of Field	Function
MARKER	Control frame = 0xFF00
PROTOCOL	ATM LAN Emulation protocol = 0x01
VERSION	ATM LAN Emulation protocol version = 0x01
OP−CODE	Type of control frame: 0x0006 LE_ARP_REQUEST 0x0106 LE_ARP_RESPONSE
STATUS	In request: 0x0000 (always) In response: 0x0000 = Success
TRANSACTION−ID	Arbitrary value supplied by the requester and returned by the responder.
REQUESTOR−LECID	ID of LEC, which issues the LE_ARP_REQUEST.
FLAGS	Two−byte field, with each bit that has a meaning of set. The least significant bit in this field represents the remote address field. When set to 1 (0x0001), it indicates that the TARGET−LAN−DESTINATION is not registered with the LES.
SOURCE−LAN−DESTINATION	Source MAC address from data frame that triggered this LE−ARP sequence. Can be encoded with "not present" LAN destination tag.
TARGET−LAN−DESTINATION	

	Destination unicast MAC address for which an ATM address is sought.
SOURCE−ATM−ADDRESS	ATM address of the LEC, which originates the LE_ARP_REQUEST.
RESERVED	In request: 0x00 (always). In response: ignored.
TARGET−ATM−ADDRESS	In request: 0x00. In response: ATM address of LEC responsible for the destination MAC in the LE_ARP_RESPONSE.

A LEC builds a local LE_ARP table that includes dynamic entries added when the LEC needs to find the ATM address that corresponds to a MAC address. A LEC also can have static, preconfigured entries.

These are the steps of the LE_ARP process:

1. The LEC sends an LE_ARP_REQUEST to the LES over the Control Direct VCC.
2. The LES forwards the LE_ARP_REQUEST to other LECs in the ELAN through the Control Distribute VCC.
3. The destination LEC receives the LE_ARP_REQUEST, checks the switch's CAM table, recognizes the MAC address responds with its ATM address, and responds with an LE_ARP_RESPONSE back to the LES through the Control Direct.
4. The LES forwards the LE_ARP response over the Control Distribute VCC back to the source LEC.
5. The source LEC adds the MAC address−ATM address pair to its LE_ARP cache.
6. The source LEC uses signals to establish a Data Direct VCC to the destination LEC and sends frames to the destination MAC through the Data Direct VCC.

With a Data Direct VCC to the destination, the source LEC no longer sends the data frames over the VCCs of the Broadcast and Unknown Server.

Understanding LE−ARP Verification

An LEC uses the verification process to update its LE_ARP cache and ensure that the cached entries are still valid. Verification compares the full 20 bytes of the ATM address in the reply with the existent LE_ARP cached entry.

An LEC uses one of the two methods to verify an entry:

- It receives an LE_ARP_RESPONSE or LE_NARP_REQUEST for the unicast MAC address. It uses the information in the response to overwrite any current information in the LE−ARP entry.
- It learns the unicast MAC address from an inbound data frame on a DATA DIRECT VC. An LEC does not alter the current information in the LE_ARP entry.

LANE defines a timer called the Aging Time, which specifies the number of seconds that the LEC maintains an LE_ARP entry in its cache without verification. The specification defines values between 10 and 300

seconds. Cisco uses the default value of 300 seconds. Cisco ATM interfaces implement the Aging Time through the a_process_arp_age_timer, which is illustrated below in the sample output of the **debug lane packet** command. The arp_age_timer is started when the LE_ARP response is obtained; in other words, it is created after the entry is resolved, rather than when the LE_ARP entry is created. The Aging Time period applies to all non−permanent MAC addresses learned from an LE_ARP_RESPONSE.

LE_ARP verification occurs whether or not the LEC sent or received traffic to the destination MAC address within the Aging Time period. When the Aging Time expires, the LEC cannot use the expired LE_ARP entry until it completes verification, but, within LE_ARP verification, the LEC continues to use the LE_ARP entry to pass the data traffic.

The least significant bit of the flags field of an LE_ARP frame is called the remote address field. Since a Cisco LES simply forwards the LE_ARP response obtained from a LEC and does not build its own LE_ARP cache, a destination LEC (such as Catalyst 5000 ATM module) sets the remote address flag when it responds with an LE_ARP response.

An LEC also learns about a MAC address when it observes the source MAC address field of frames received on a Data Direct VCC. These LE_ARP entries use one of two timers that depend on the state of the LEC's topology change flag:

- When this flag is set, such entries are aged with the forward delay time.
- When this flag is clear, such entries are aged with the Aging Time parameter.

Understanding LE_ARP Entry States

An LE_ARP entry follows a state machine, in which the entry moves through several states before it becomes active. These are some of the states:

State	State
DIRECT	LEC or LES successfully resolved the entry when it received a valid LE_ARP_RESPONSE and created a DATA DIRECT VCC to the destination ATM address.
RESOLVED_NOVC	LEC or LES successfully resolved the entry, but it does not have a DATA DIRECT VCC to the destination ATM address.
REVERIFYING	LEC sent a request for an LE_ARP entry within verification. LEC waits for the response from the remote LEC.
RESOLVED	LEC or LES successfully resolved the entry and tries to establish the DATA DIRECT VCC.

Images that support LANE QoS use a different set of states than non−QoS LANE images. For QoS images, the states are LEC_MAC_NSAP_FLOOD, LEC_MAC_NSAP_RESOLVED, and LEC_MAC_NSAP_REVERIFYING.

In summary, when an LE_ARP_RESPONSE is received, the Aging Timer or arp_age_timer starts. The entry times out in five minutes (the verification time). When the timer expires, the LEC sends an LE_ARP_REQUEST if the entry is in the DIRECT state. If the entry is in another state, it is deleted.

After the LE_ARP_REQUEST is sent, the LE_ARP entry moves to the REVERIFYING state, and the arp_control_timer starts. If this timer expires before the LEC receives an LE_ARP_RESPONSE, the LEC retries the LE_ARP_REQUEST. If again there is no response, the LEC deletes the LE_ARP entry.

Within this process, if the **debug lane client packet** command is enabled on the subinterface, it produces this verification−related output:

```
Mar  8 00:23:19.550: LEC ATM1/0.3: deleting LE−ARP, state DIRECT, for 00a0.ccd1.fe9f (entry
Mar  8 00:23:23.754: LEC ATM1/0.3: deleting LE−ARP, state RESOLVED_NOVC, for 0002.1724.843
```

Hardware and Software Used

This sample configuration uses this hardware and software:

- Catalyst 5000 with a Supervisor III that runs 5.5(8) and WS−X5158 ATM module that runs 11.3(11)WA4(14b) 3.2(15).
- 7507 with an ATM Interface Processor (AIP) and Cisco IOS 12.1(7).

Sample Configuration

Catalyst 5000 LANE Module (LANE Client)

```
interface ATM0
 atm preferred phy A
 atm pvc 1 0 5 qsaal
 atm pvc 2 0 16 ilmi
!
interface ATM0.1 multipoint
 lane client ethernet 100 test
```

```
ATM#show lane client
LE Client ATM0.1  ELAN name: test  Admin: up  State: operational
Client ID: 2                LEC up for 10 seconds
ELAN ID: 0
Join Attempt: 456
Last Fail Reason: Control Direct VC being released
HW Address: 0030.40a7.b830   Type: ethernet            Max Frame Size: 1516  VLANID: 100
ATM Address: 47.00918100000000E01E2EEC01.003040A7B830.01
 VCD  rxFrames  txFrames  Type       ATM Address
   0         0         0  configure  47.00918100000000E01E2EEC01.00E01E2EEC05.00
1222         1         8  direct     47.00918100000000E01E2EEC01.00E01E2EEC03.00
1223         7         0  distribute 47.00918100000000E01E2EEC01.00E01E2EEC03.00
1224         0         5  send       47.00918100000000E01E2EEC01.00E01E2EEC04.00
```

```
1225         1         0  forward    47.009181000000000E01E2EEC01.00E01E2EEC04.00
1233         1         2  data       47.009181000000000E01E2EEC01.003071D31000.01
```

LS1010 (LANE Server and LECS)

```
atm lecs-address-default 47.0091.8100.0000.00e0.1e2e.ec01.00e0.1e2e.ec05.00 1
atm address 47.0091.8100.0000.00e0.1e2e.ec01.00e0.1e2e.ec01.00
atm router pnni
 no aesa embedded-number left-justified
 node 1 level 56 lowest
  redistribute atm-static
!
!
lane database sample
  name test server-atm-address 47.009181000000000E01E2EEC01.00E01E2EEC03.00
!
!
interface ATM13/0/0
 no ip address
 no ip directed-broadcast
 logging event subif-link-status
 lane config auto-config-atm-address
 lane config database sample
 lane server-bus ethernet test
```

```
Switch#show lane config
LE Config Server ATM13/0/0 config table: sample
Admin: up State: operational
LECS Mastership State: active master
list of global LECS addresses (34 seconds to update):
47.009181000000000E01E2EEC01.00E01E2EEC05.00  <-------- me
ATM Address of this LECS: 47.009181000000000E01E2EEC01.00E01E2EEC05.00 (auto)
 vcd  rxCnt  txCnt  callingParty
 127      1      1  47.009181000000000E01E2EEC01.00E01E2EEC03.00 LES test 0 active
cumulative total number of unrecognized packets received so far: 0
cumulative total number of config requests received so far: 3
cumulative total number of config failures so far: 0

Switch#show lane server
LE Server ATM13/0/0, Elan name: test, Admin: up, State: operational
Master/Backup: Master, Type: ethernet, Max Frame Size: 1516
locally set elan-id: not set
elan-id obtained from LECS: not set
ATM address: 47.009181000000000E01E2EEC01.00E01E2EEC03.00
LECS used: 47.009181000000000E01E2EEC01.00E01E2EEC05.00 connected, vcd 126
control distribute: vcd 131, 2 members, 735 packets
proxy/ (ST: Init, Conn, Waiting, Adding, Joined, Operational, Reject, Term)
lecid ST vcd    pkts Hardware Addr  ATM Address
   1P O  130      10 0030.71d3.1000 47.009181000000000E01E2EEC01.003071D31000.01
   2P O  136     727 0030.40a7.b830 47.009181000000000E01E2EEC01.003040A7B830.01
```

7500 (LANE Client)

```
interface ATM0/0
 no ip address
 no atm ilmi-keepalive
 pvc 0/5 qsaal
 !
 pvc 0/16 ilmi
 !
!
interface ATM0/0.1 multipoint
 ip address 100.1.1.1 255.255.255.0
```

```
 lane client ethernet test
```

```
7500#show lane client
LE Client ATM0/0.1  ELAN name: test  Admin: up  State: operational
Client ID: 1                LEC up for 8 hours 53 minutes 4 seconds
ELAN ID: 0
Join Attempt: 58
Known LE Servers: 1
Last Fail Reason: Config VC being released
HW Address: 0030.71d3.1000   Type: ethernet            Max Frame Size: 1516
ATM Address: 47.00918100000000E01E2EEC01.003071D31000.01
 VCD  rxFrames  txFrames  Type       ATM Address
   0         0         0  configure  47.00918100000000E01E2EEC01.00E01E2EEC05.00
  59         1        19  direct     47.00918100000000E01E2EEC01.00E01E2EEC03.00
  60     15011         0  distribute 47.00918100000000E01E2EEC01.00E01E2EEC03.00
  61         0       556  send       47.00918100000000E01E2EEC01.00E01E2EEC04.00
  62     61512         0  forward    47.00918100000000E01E2EEC01.00E01E2EEC04.00
  67         6         5  data       47.00918100000000E01E2EEC01.003040A7B830.01
```

Show and Debug Commands

- Recall that communication over a LANE network requires IP to MAC mapping and MAC to ATM mapping. Use the **show ip arp** command to see the IP to MAC mapping.

```
7500#sh ip arp
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  10.10.10.5             -   0000.0c95.8260  ARPA   BVI1
Internet  100.1.1.1              -   0030.71d3.1000  ARPA   ATM0/0.1
Internet  100.1.1.2              0   0030.40a7.bbff  ARPA   ATM0/0.1
```

- Use the **show lane le−arp** command to see the MAC to ATM mapping.

```
7500#show lane le−arp
Active le−arp entries: 1
Hardware Addr   ATM Address                                VCD  Interface
0030.40a7.bbff  47.00918100000000E01E2EEC01.003040A7B830.01   63  ATM0/0.1
```

- Use the **show cam dynamic** command to see the MAC to ATM mapping from the perspective of the Catalyst Supervisor.

```
5000−1.3 (enable) show cam dynamic 4/1
* = Static Entry. + = Permanent Entry. # = System Entry. R = Router Entry.
X = Port Security Entry

VLAN  Dest MAC/Route Des  [CoS]  Destination Ports or VCs / [Protocol Type]
————  ——————————————————  —————  ————————————————————————————————————
100   00−30−71−d3−10−00          4/1 VCD:11 VPI:0 VCI:127 Type: LANE Data Direct [AL
Total Matching CAM Entries Displayed = 1
```

- Use the **debug lane client packet** command to view the steps of the LE_ARP verification procedure.

```
*Jun 20 09:07:20.535: LEC ATM0/0.1: action A_PROCESS_ARP_AGE_TIMER
! −− Cisco ATM interfaces implement the Aging Timer via a_process_arp_age_timer.
*Jun 20 09:07:20.535: LEC ATM0/0.1: sending LANE_ARP_REQ on VCD 59
! −− LEC sends a verification LE_ARP_REQUEST over the Control Direct VCC (VCD 59).
*Jun 20 09:07:20.535: LEC ATM0/0.1:   LECID             1
*Jun 20 09:07:20.535: LEC ATM0/0.1:   SRC ATM address     47.00918100000000E01E2EEC0
*Jun 20 09:07:20.535: LEC ATM0/0.1:   TARGET MAC address  0030.40a7.bbff
*Jun 20 09:07:20.535: LEC ATM0/0.1:   TARGET ATM address  00.000000000000000000000000
*Jun 20 09:07:20.535: LEC ATM0/0.1:   Flags              0x0
*Jun 20 09:07:20.535: LEC ATM0/0.1:   num of TLVs          0
*Jun 20 09:07:20.535: LEC ATM0/0.1: state ACTIVE event UNKNOWN => ACTIVE
*Jun 20 09:07:20.535: LEC ATM0/0.1: received LANE_ARP_REQ on VCD 60
! −− LEC receives its own LE_ARP_REQUEST over the Control Distribute (VCD 60), recog
```

```
its own LECID in the packet, and drops the packet.
*Jun 20 09:07:20.535: LEC ATM0/0.1:   LECID             1
*Jun 20 09:07:20.535: LEC ATM0/0.1:   SRC ATM address     47.00918100000000E01E2EEC0
*Jun 20 09:07:20.535: LEC ATM0/0.1:   TARGET MAC address  0030.40a7.bbff
*Jun 20 09:07:20.535: LEC ATM0/0.1:   TARGET ATM address  00.000000000000000000000000
*Jun 20 09:07:20.535: LEC ATM0/0.1:   Flags              0x0
*Jun 20 09:07:20.535: LEC ATM0/0.1:   num of TLVs          0
*Jun 20 09:07:20.535: LEC ATM0/0.1: action A_SEND_ARP_RSP
*Jun 20 09:07:20.535: LEC ATM0/0.1: state ACTIVE event LEC_CTL_ARP_REQ => ACTIVE
*Jun 20 09:07:20.587: LEC ATM0/0.1: received LANE_ARP_RSP on VCD 60
! -- LEC receives the true LE_ARP_RESPONSE from the remote LEC over the
Control Distribute and resets the Aging Timer.
*Jun 20 09:07:20.587: LEC ATM0/0.1:   LECID             1
*Jun 20 09:07:20.587: LEC ATM0/0.1:   SRC ATM address     47.00918100000000E01E2EEC0
*Jun 20 09:07:20.587: LEC ATM0/0.1:   TARGET MAC address  0030.40a7.bbff
*Jun 20 09:07:20.587: LEC ATM0/0.1:   TARGET ATM address  47.00918100000000E01E2EEC0
*Jun 20 09:07:20.587: LEC ATM0/0.1:   Flags              0x1
*Jun 20 09:07:20.587: LEC ATM0/0.1:   num of TLVs          0
*Jun 20 09:07:20.587: LEC ATM0/0.1: action A_PROCESS_ARP_RSP
*Jun 20 09:07:20.587: LEC ATM0/0.1: state ACTIVE event LEC_CTL_ARP_RSP => ACTIVE
```

Comments on the Configuration

- The configurement of a LANE client on a Catalyst switch differs from configuration on a router in that you specify the VLAN number to which the ELAN is bound.

```
ATM(config-subif)#lane client ethernet ?
  <1-1005>  VLAN ID

ATM(config-subif)#lane client ethernet 100 ?
  WORD  Name of the emulated LAN
  <cr>
```

- Execute the **set vlan** command to create the VLAN on the Catalyst switch.

```
5000-1.3 (enable) set vlan 100 name test
Vlan 100 configuration successful
```

- In the output of the **show port** command, the ATM port appears as a trunk that carries all VLANs.

```
5000-1.3 (enable) show port 4/1
Port  Name       Status     Vlan     Level  Duplex Speed Type
----- ---------- ---------- -------- ------ ------ ----- ------------
 4/1             connected  trunk    normal  full   155  OC3 MMF ATM
Port   ifIndex
-----  -------
 4/1   1878
```

- A Cisco router ATM interface is not automatically configured with the QSAAL and Interim Local Management Interface (ILMI) VCs. (The same is true for Catalyst 5000 ATM modules as of Cisco IOS® software release 12.0(16)W5(21)). Ensure that these VCs are created with these commands:

```
7500-1.5(config-if)#pvc 0/5 ?
  ilmi   Configure the management PVC for this interface
  qsaal  Configure the signalling PVC for this interface
  <cr>
7500-1.5(config-if)#pvc 0/5 qsaal
7500-1.5(config-if-atm-vc)#exit
7500-1.5(config-if)#pvc 0/16 ilmi
```

- After you configure the ILMI VC, the ATM interface registers the LEC's address and prints this message. Use the **show lane client** command to ensure that the LEC has a complete 20−byte ATM address.

```
1w1d: %LANE−6−INFO: ATM0/0: ILMI prefix add event received
7500−1.5#show lane client
LE Client ATM0/0.1  ELAN name: test  Admin: up  State: lecsConnect
Client ID: unassigned
Join Attempt: 4
Known LE Servers: 0
HW Address: 0030.71d3.1000   Type: ethernet            Max Frame Size: 1516
ATM Address: 47.00918100000000E01E2EEC01.003071D31000.01
```

- The **clear atm vc {vcd#}** command brings down a switched VC. Any peer client MAC addresses associated with the VC will be deleted from the LE_ARP cache.
- When a LES and LECS are configured on the same LS1010, the LES does not become operational until it establishes VCCs with the LECS. Use the **atm lecs−address−default** command to configure the LS1010 to send the LECS's address to the LES through ILMI.

Understanding * Entries

An LE_ARP entry with a "*" character next to the VCD indicates that the LEC uses the BUS VCs to send frames to the correspondent MAC address. Typically, an all−0s ATM address appears in this entry and indicates that the LEC cannot resolve the MAC to ATM mapping. (When the LE_ARP entry is created and is in FLOOD state, the ATM address also is all 0s). If an LE_ARP entry shows a valid ATM address marked with *, the LEC resolved the MAC to ATM mapping, but it did not establish a DATA DIRECT VCC to the destination MAC with signaling. In order to troubleshoot this problem, enable signaling debugs.

These are the steps that lead to a * entry:

- In this sample output, the 7500 receives a RELEASE message to bring down the DATA DIRECT VCC.

```
*Jun 20 09:07:43.731: LEC ATM0/0.1: received RELEASE
*Jun 20 09:07:43.731: LEC ATM0/0.1:   callid            0x61BC5228
*Jun 20 09:07:43.731: LEC ATM0/0.1:   cause code        16
*Jun 20 09:07:43.731: LEC ATM0/0.1: action A_PROCESS_RELEASE
*Jun 20 09:07:43.731: LEC ATM0/0.1: sending RELEASE_COMPLETE
*Jun 20 09:07:43.731: LEC ATM0/0.1:   callid            0x61BC5228
*Jun 20 09:07:43.731: LEC ATM0/0.1:   cause code        31
*Jun 20 09:07:43.731: LEC ATM0/0.1: state ACTIVE event LEC_SIG_RELEASE => ACTIVE
*Jun 20 09:07:43.735: LEC ATM0/0.1: state ACTIVE event LEC_TIMER_TYPE_ARP_CONTROL =>
```

- The output of the **show lane client** command confirms that the Catalyst no longer has a DATA DIRECT VCC to the LEC.

```
7500# show lane client
LE Client ATM0/0.1  ELAN name: test  Admin: up  State: operational
Client ID: 1                LEC up for 20 minutes 20 seconds
ELAN ID: 0
Join Attempt: 58
Known LE Servers: 1
Last Fail Reason: Config VC being released
HW Address: 0030.71d3.1000   Type: ethernet            Max Frame Size: 1516
ATM Address: 47.00918100000000E01E2EEC01.003071D31000.01
 VCD  rxFrames  txFrames  Type       ATM Address
   0         0         0  configure  47.00918100000000E01E2EEC01.00E01E2EEC05.00
  59         1         7  direct     47.00918100000000E01E2EEC01.00E01E2EEC03.00
  60       588         0  distribute 47.00918100000000E01E2EEC01.00E01E2EEC03.00
  61         0        29  send       47.00918100000000E01E2EEC01.00E01E2EEC04.00
```

```
  62      1801         0  forward    47.00918100000000E01E2EEC01.00E01E2EEC04.00
```

- The **show lane le−arp** command confirms that the LE_ARP entry is now marked with the * character.

```
7500#show lane le−arp

Active le−arp entries: 1

Hardware Addr   ATM Address                                    VCD  Interface
0030.40a7.bbff  47.00918100000000E01E2EEC01.003040A7B830.01   61* ATM0/0.1
```

- When the Aging Timer next expires, the LEC determines that the LE_ARP entry is not in the active state and deletes the entry.

```
*Jun 20 09:11:41.047: LEC ATM0/0.1: action A_PROCESS_ARP_AGE_TIMER
*Jun 20 09:11:41.047: LEC ATM0/0.1: deleting LE−ARP, state RESOLVED_NOVC, for 0030.4
*Jun 20 09:11:41.047: LEC ATM0/0.1: nsap 47.00918100000000E01E2EEC01.003040A7B830.01
```

- Use the **show lane le−arp** command to confirm that the LEC deleted the LE_ARP entry.

```
7500#show lane le−arp

Active le−arp entries: 0
```

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