Chapter 8
Configuring ANCP

This chapter describes how to configure Access Node Control Protocol (ANCP), also known as Layer 2 Control (L2C), for IP multicast on an E-series router; it contains the following sections:

Overview

Access Node Control Protocol (ANCP), also known as Layer 2 Control (L2C), is based on a subset of the General Switch Management Protocol (GSMP), as defined in the GSMPv3 Base Specification (draft-ietf-gsmp-v3-base-spec-07.txt). GSMP is a general purpose protocol used to control a label switch.

GSMP enables a controller to establish and release connections across the switch, add and delete leaves on a multicast connection, manage switch ports, request configuration information, request and delete reservation of switch resources, and request statistics. It also enables the switch to inform the controller of asynchronous events such as a link going down.

Deploying value-added services across digital subscriber line (DSL) access networks requires special attention to quality of service (QoS) and service control. This control depends on tighter coordination between network elements in the broadband access network while not causing added burden to the operations support system (OSS) layer.

ANCP is an extension to GSMPv3 that functions as a control plane between a service-oriented layer 3 edge device (the Broadband Remote Access Server) and a layer 2 access node. In this role, ANCP performs QoS-related, service-related, and subscriber-related operations. These operations include the following:

- Dynamic discovery of the access topology and enabling an authentication server to retrieve this information
- Subscriber and service data retrieval from the OSS by the Broadband Remote Access Server (B-RAS) and sending that information to the access node to simplify service management (referred to as line configuration)
- An optimized, layer 2 multicast (IGMP) replication
- On-demand access-line testing (ANCP Operation, Administration, and Maintenance)

JUNOSe software supports the use of RADIUS attributes to monitor ANCP-related information, such as upstream and downstream data rates. For information about using RADIUS attributes see *JUNOSe Broadband Access Configuration Guide, Chapter 3, Configuring RADIUS Attributes*.

Access Topology Discovery

Many queuing or scheduling mechanisms must avoid congestion within the access network while contending with multiple flows and distinct QoS requirements. These mechanisms require that B-RAS devices obtain information about the access network topology, the links within that network, and their rates.

Operations support systems cannot enforce the consistency of this gathered information in a reliable and scalable way. ANCP discovery enables the automated discovery of the access network topology, resolving this problem.

Line Configuration

Following access topology discovery, the B-RAS can query a subscriber management OSS component (for example, a RADIUS server) to retrieve subscriber authorization data. This type of query is typically managed by the B-RAS, but in some cases (for example, DSL-related enforcement) it can be useful to push service information to the access node for local enforcement of the corresponding subscriber line. Using the line configuration feature provides a more flexible way to achieve this on-demand service.

NOTE: JUNOSe software supports only a CLI version of this feature.

Transactional Multicast

IP multicasting in access networks often involves an access server replicating the same multicast stream to multiple subscribers. This type of replication wastes access bandwidth when multiple subscribers access network services using the same access node. The amount of multicast replication is based on the number of subscribers, rather than the number of access nodes.

The access node sending a single copy of the multicast stream to a specific access node is a more efficient use of the bandwidth. Using this method, the access node performs the multicast replication for subscribers that reside beyond the access node.

ANCP transactional multicast enables the E-series router to set up a multicast replication state in the access node. In Asynchronous Transfer Mode (ATM) access networks, the B-RAS can use the ANCP to set up point-to-multipoint cross-connects in the access nodes.

OAM

A simple solution based on ANCP provides B-RAS with an access-line test capability. When enabled through the CLI, the B-RAS uses an ANCP message to trigger the access-node to perform a loopback test on the local loop (between the access node and the CPE). The access node reports the results of the test by means of another ANCP message.

Platform Considerations

Configuring ANCP is supported on all E-series routers.

For information about the modules supported on E-series routers:

- See the *ERX Module Guide* for modules supported on ERX-7xx models, ERX-14xx models, and the ERX-310 router.
- See the *E120 and E320 Module Guide* for modules supported on the E120 router and the E320 router.

References

For more information about ANCP, see the following resources:

- GSMP extensions for layer2 control (L2C) Topology Discovery and Line Configuration—draft-wadhwa-gsmp-l2control-configuration-00.txt (July 2006 expiration)
- IGMP-based Multicast Forwarding ("IGMP Proxying")—draft-ietf-magma-igmp-proxy-00.txt (May 2002 expiration)
- GSMPv3 Base Specification—draft-ietf-gsmp-v3-base-spec-07.txt (March 2006 expiration)

Configuring ANCP

ANCP uses several global-level configuration commands to enable ANCP to function on the router.

Creating a Listening TCP Socket for ANCP

Use the **l2c ip listen** command to create a listening TCP socket for ANCP. ANCP monitors port 6068 for ANCP TCP connection requests.

l2c ip listen

- Use to create a listening TCP socket in the current virtual router context.
- Example

  host1(config)#**l2c ip listen**

- Use the **no** version to remove the listening TCP socket and stop any new sessions from being established. The **no** version does not terminate any existing GSMP sessions.

Accessing L2C Configuration Mode for ANCP

Use the **l2c** command to launch the L2C Configuration (config-l2c) mode for ANCP. In this mode, you can define session timeout values and access the L2C Neighbor Configuration mode to configure an ANCP neighbor.

l2c

- Use to launch the L2C Configuration (config-l2c) mode for ANCP.
- Example

  host1(config)#**l2c**
  host1(config-l2c)#

- Use the **no** version to remove all ANCP configurations.

Defining the ANCP Session Timeout

In L2C Configuration (config-l2c) mode, you can use the **session-timeout** command to specify the ANCP session timeout value. The timer range is 1–25 seconds with a default value of 25 seconds.

session-timeout

- Use to define the ANCP session timeout value (in seconds).
- Example

  host1(config-l2c)#**session-timeout 10**

- Use the **no** version to revert the session timeout to its default setting, 25 seconds.

Configuring ANCP Interfaces

ANCP uses several interface-level configuration commands. These commands provide the ability to define GSMP input and output labels associated with the interface and specify the number of branches the ANCP end user can support.

l2c end-user-id

- Use to create the GSMP output label associated with the interface. In addition to the label, this command also specifies the access node using the neighbor keyword.
- Example

  host1(config-if)#**l2c end-user-id out_subscriber_port_6 neighbor ACCESS_NODE_1**

- Use the **no** version to remove the output label association.

l2c max-branches

- Use to specify the maximum number of branches the ANCP end user can have.
- Example

  host1(config-if)#**l2c max-branches 5**

- Use the **no** version to return the maximum number of branches to its default value, unlimited branches.

l2c peer-attachment-id

- Use to create the GSMP input label associated with the interface.
- Example

  host1(config-if)#**l2c peer-attachment-id in_multicast_port_5**

- Use the **no** version to remove the input label association.

Configuring ANCP Neighbors

From the L2C Configuration mode (config-l2c), you can access the L2C Neighbor Configuration mode, from which you can create and manage ANCP neighbors.

Accessing L2C Neighbor Configuration Mode for ANCP

Use the **neighbor** command to create an ANCP neighbor and access the L2C Neighbor Configuration (config-l2c-neighbor) mode.

neighbor

- Use to create an ANCP neighbor and access the L2C Neighbor Configuration (config-l2c-neighbor) mode.
- Example

  host1(config-l2c)#**neighbor ACCESS-NODE-1**
  host1(config-l2c-neighbor)#

- Use the **no** version to remove a specific ANCP neighbor configuration or, by omitting the neighbor name, all ANCP neighbor configurations.

Defining an ANCP Neighbor

The L2C Neighbor Configuration mode enables you to define an ANCP neighbor by specifying a neighbor ID and the maximum number of branches that the neighbor can have.

id

- Use to specify the ANCP neighbor ID in the L2C Neighbor Configuration (config-l2c-neighbor) mode.
- Example

  host1(config-l2c)#**neighbor**
  host1(config-l2c-neighbor)#**id 1234.5678.9123**

- Use the **no** version to remove the neighbor ID.

max-branches

- Use to specify the maximum number of branches the ANCP neighbor can have.
- Example

  host1(config-l2c-neighbor)#**max-branches 50**

- Use the **no** version to return the maximum number of branches to its default value, unlimited branches.

Limiting Discovery Table Entries

You use the **max-discovery-table-entries** command to specify the maximum number of discovery table entries that a neighbor can have.

Using this command to change the maximum number of entries when an already greater number of current entries exists in the discovery table does not remove any existing entries. Instead, future entries are prevented. For example, if the current table contains 5000 entries, and you specify a maximum of 4000 entries, the software does not remove any existing entries from the table. The software prevents any new entries until the number of table entries falls below the specified maximum.

max-discovery-table-entries

- Use to specify the maximum number of discovery table entries a neighbor can have in the range 1–64000 entries.
- Example

  host1(l2c-neighbor)#**max-discovery-table-entries 4000**

- Use the **no** version to return the maximum number of discovery table entries to its default value, 10,000 entries.

Clearing ANCP Neighbors

You can clear an existing ANCP neighbor using the **clear l2c** command.

clear l2c neighbor

- Use to reset a specific GSMP neighbor session.
- Example

  host1#**clear l2c neighbor ACCESS_NODE_1**

- There is no **no** version.

Configuring Topology Discovery

You use the **discovery-mode** command to enable the dynamic discovery of access topology. When ANCP discovery is enabled, an authentication server (like RADIUS) retrieves upstream and downstream access loop information from the configured access node.

For information about configuring RADIUS, see *JUNOSe Broadband Access Configuration Guide, Chapter 3, Configuring RADIUS Attributes*.

discovery-mode

- Use to enable ANCP discovery for a neighbor.
- Example

  host1(l2c-neighbor)#**discovery-mode**

- Use the **no** version to disable discovery mode.

Configuring ANCP for QoS Adaptive Mode

The system can QoS adjust VLAN and ATM VC downstream rates received from ANCP when you enable QoS adaptive mode by issuing the **qos-adaptive-mode** command.

When QoS adaptive mode is enabled, ANCP dynamically creates QoS parameter instances associated with the QoS downstream rate application. ANCP also determines the value the system uses when recalculating the QoS shaping rate. The values of the parameter instances track the bandwidth of the local loop that is communicated by ANCP.

Issuing the **clear l2c neighbor** command removes all QoS parameter instances associated with the neighbor, including those associated with the QoS downstream rate and QoS cell mode applications.

Similarly, issuing the **clear l2c discovery-table** command without specifying an entry removes all QoS parameter instances associated with the neighbor. Specifying an entry in the table removes the QoS parameter instance associated with that entry.

After clearing ANCP entries or neighbor sessions, the system recreates the QoS parameter instances when QoS adaptive mode is enabled and ANCP learns the rates again.

For more information about the QoS downstream rate application and QoS parameters, see *JUNOSe Quality of Service Configuration Guide, Chapter 29, Configuring the Downstream Rate Using QoS Parameters*.

clear l2c discovery-table

- Use to clear all entries or a specified entry from the topology discovery table associated with the neighbor.
- Example

  host1#**clear l2c discovery-table neighbor ACCESS_NODE_1**

- There is no **no** version.

qos-adaptive-mode

- Use to enable the QoS adaptive mode for ANCP.
- QoS adaptive mode enables the system to shape VLAN and ATM VC downstream rates received from ANCP by dynamically creating QoS parameter instances associated with the ANCP (L2C) downstream application.
- Example

  host1(config-l2c)#**qos-adaptive-mode**

- Use the **no** version to disable QoS adaptive mode for the system.

Triggering ANCP Line Configuration

Use the **l2c line-configuration** command to trigger line configuration to the access node. Issuing this command sends a GSMP port management message to the access node. This message enables the B-RAS to configure a service profile name on an access loop.

NOTE: Before issuing the **l2c line-configuration** command, a profile must already be configured locally on the access node.

l2c line-configuration

- Use to trigger a GSMP port management message to the access node. This message enables the B-RAS to configure a service profile name on an access loop.
- Example

  host1#**l2c line-configuration interface atm 2/0.11 profile1**

- There is no **no** version.

Adjusting the Data Rate Reported by ANCP for DSL Lines

When a DSLAM calculates the data rate, it ignores additional headers on the DSL line. When ANCP reports the upstream data rate (L2C Type 4 Sub-type 129) or the downstream data rate (L2C Type 4 Sub-type 130), it includes the headers in its calculation and therefore reports a slightly higher value. This discrepancy causes the QoS shaping rate to be slightly higher than the actual rate.

You can use the **adjustment-factor** command to set a percentage value ANCP applies to the data rate to generate a more accurate value that is reported to AAA whenever AAA requests the data rate from ANCP.

ANCP does not report the calculated data rate to RADIUS or to L2TP.

adjustment-factor

- Use to configure a QoS adjustment factor that is applied to the upstream data rate and downstream data rate reported by ANCP for a DSL type. The adjustment factor is used to generate an accurate QoS shaping rate.
- The factor is applied for all subscribers that use the specified DSL line type
- Example

  host1(config-l2c)#**adjustment-factor adsl1 45**
  host1(config-l2c)#**adjustment-factor adsl2 55**
  host1(config-l2c)#**adjustment-factor adsl2+ 67**
  host1(config-l2c)#**adjustment-factor vdsl 91**
  host1(config-l2c)#**adjustment-factor vdsl2 55**
  host1(config-l2c)#**adjustment-factor sds 12**

- Use the **no** version to restore the default condition, wherein no adjustment factor is applied to the ANCP-reported value. This command has the same effect as applying an adjustment factor of 100 to a DSL line type.

Configuring Transactional Multicast for IGMP

By using ANCP, IGMP is no longer terminated or proxied at the access node. Instead, IGMP passes through the access node transparently. B-RAS terminates both the data PVC and IGMP. After any user permission verification, B-RAS may instruct the access node (using GSMP) to establish a multicast branch for the subscriber port.

ANCP works with a special IGMP session to collect OIF mapping events in a scalable manner. For additional information about configuring IGMP and about OIF mapping, see *JUNOSe Multicast Routing Configuration Guide, Chapter 6, Configuring IGMP*.

Creating an IGMP Session for ANCP

Use the **l2c ip oif** command to create an IGMP session for ANCP. This session enables ANCP to listen to OIF mappings and, in turn, convey cross connect events to the appropriate ANCP neighbor (access node).

l2c ip oif

- Use to create an IGMP session at the virtual router within the context.
- Example

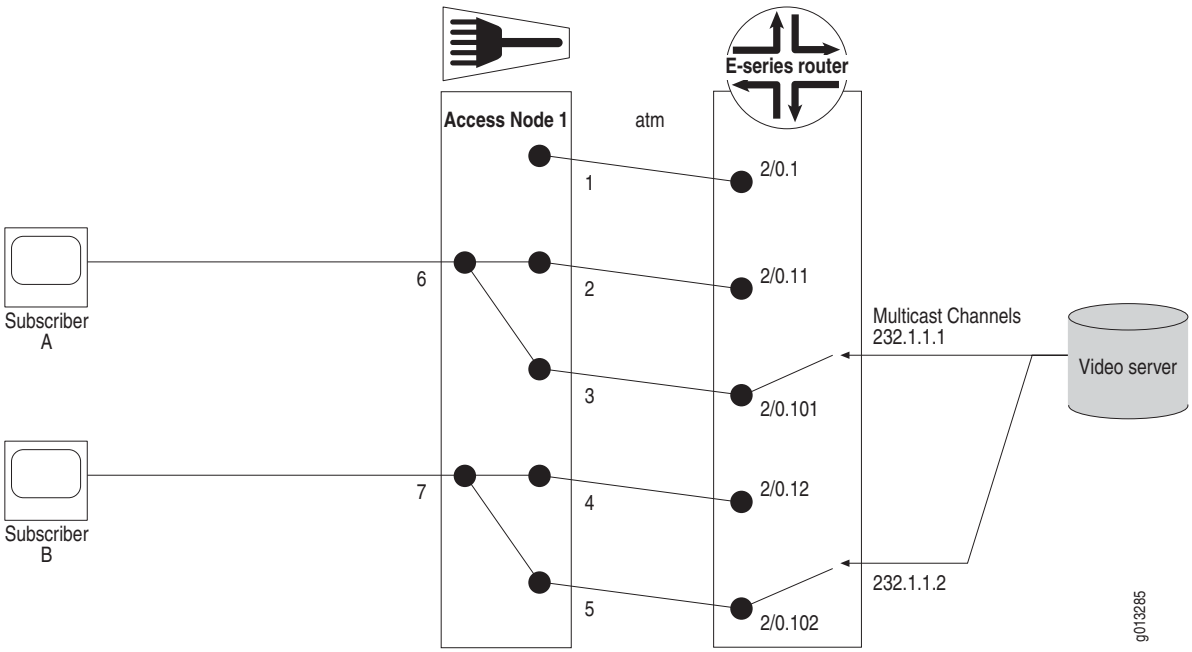
  host1(config)#**l2c ip oif**

- Use the **no** version to remove the IGMP session.

ANCP IGMP Configuration Example

In the following example (Figure 18), two subscribers access individual multicast channels through cross connections (branches) that occur on the access node.

Figure 18: Using ANCP with an Access Node



To configure the example, use the following general procedures:

NOTE: This example provides general information for configuring ANCP mapping. For detailed information about creating OIF maps, see *Configuring Transactional Multicast for IGMP* on page 220.

1. Configure an OIF map for the access node that maps each multicast group to an outgoing interface.
2. Define ANCP parameters.

3. Enable ANCP to listen to OIF mapping events from IGMP in this virtual router.

4. Create a listening TCP socket in the virtual router (TCP port 6068).

5. Define ANCP neighbor parameters.

NOTE: The ID is a 48 bit quantity that identifies the ANCP neighbor.

6. Configure the ANCP multicast labels (input labels) on the corresponding outgoing interfaces.

7. Configure the ANCP output labels, the neighbor information on the subscriber interfaces, and apply the OIF map.

   When Subscriber A requests to join 232.1.1.1, ANCP transmits an add branch message with the corresponding input and output labels that cross-connect port 3 and port 6 on Access Node 1.

Complete Configuration Example

The following example contains the commands used to configure ANCP. You can customize and use this example in your own network.

You can copy the text into a text editor and modify it (removing all prompts and changing values) for immediate use or save the modified example as a script (.scr) file. Script files allow you to execute commands as though they were entered at the terminal. For information about creating and executing script files, see *JUNOSe System Basics Configuration Guide, Chapter 2, Command-Line Interface*.

```
!Configure an OIF map
host1(config)#ip igmp oif-map OIFMAP atm 2/0.101 232.1.1.1 10.1.1.1
host1(config)#ip igmp oif-map OIFMAP atm 2/0.102 232.1.1.2 10.1.1.2
!Define ANCP parameters
host1(config)#l2c
host1(config-l2c)#session-timeout 15
!Enable ANCP to listen to OIF mapping events from IGMP in this virtual router
host1(config)#l2c ip oif
!Create a listening TCP socket in the virtual router
host1(config)#l2c ip listen
!Define ANCP neighbor parameters.
host1(config-l2c)#neighbor ACCESS_NODE_1
host1(config-l2c-neighbor)#id 09af.15bc.3156
!Configure ANCP multicast labels on the corresponding outgoing interfaces
host1(config)#interface atm 2/0.101
host1(config-interface)#ip igmp version passive
host1(config-interface)#l2c peer-attachment-id “in_multicast_port_3”
host1(config)#interface atm 2/0.102
host1(config-interface)#ip igmp version passive
host1(config-interface)#l2c peer-attachment-id “in_multicast_port_5”
!Configure ANCP output labels, neighbor information, and apply OIF map
host1(config)#interface atm 2/0.11
host1(config-interface)#ip igmp apply-oif-map OIFMAP
host1(config-interface)#l2c end-user-id “out_subscriber_port_6” neighbor
ACCESS_NODE_1
```

```
host1(config)#interface atm 2/0.12
host1(config-interface)#ip igmp apply-oif-map OIFMAP
host1(config-interface)#l2c end-user-id “out_subscriber_port_7” neighbor
ACCESS_NODE_1
```

Triggering ANCP OAM

The **l2c oam** command provides an access-line test and rudimentary fault isolation capability for the B-RAS. Issuing this command triggers the access node to perform a loopback test on the local-loop (between the access-node and the CPE). The B-RAS generates a GSMP port management message to the neighbor specifying the access line identifier on the access node and OAM test characteristics desired by the B-RAS (for example, the number of cells/message to generate and the timeout period). The access node responds with the result of the triggered loopback test by means of a GSMP port management message. For example, when using an ATM-based local-loop, the ANCP operation can trigger the access node to generate ATM (F4/F5) loopback cells on the local loop.

l2c oam

- Use to trigger the access node to run a local loopback test on the specified interface.
- Field descriptions
  - Request status—Status of the OAM request (succeeded or failure)
  - Response code—Code that returned with the OAM response
  - DEFAULT RESPONSE—Response string (if any) that was included in the OAM response
- Example 1

  host1#**l2c oam interface atm 4/1.103**

  request succeeded
  0x503 : DSL line status showtime.
  DEFAULT RESPONSE

- Example 2

  host1#**l2c oam neighbor accessnode_1002 end-user-id enduser_1002**

  request succeeded
  0x503 : DSL line status showtime.
  DEFAULT RESPONSE

- There is no **no** version.

Monitoring ANCP

You can display ANCP information with the following commands.

show adjustment-factor

- Use to display the configured values for the adjustment factor applied to the upstream data rate and downstream data rate reported by ANCP for each DSL type. The adjustment factor is used to generate an accurate QoS shaping rate.
- Field descriptions
  - L2C QoS Adjustment Rates—List of all DSL types and the corresponding adjustment factor for each
  - ADSL1—Adjustment factor for the ADSL1 DSL type
  - ADSL2—Adjustment factor for the ADSL2 DSL type
  - ADSL2 + —Adjustment factor for the ADSL2 + DSL type
  - VDSL—Adjustment factor for the VDSL DSL type
  - VDSL2—Adjustment factor for the VDSL2 DSL type
  - SDS—Adjustment factor for the SDS DSL type
- Example 1—Displays the adjustment factor for each DSL type

```
host1(config-l2c)#show adjustment-factor
  L2C QoS Adjustment Rates:
  ADSL1:  45
  ADSL2:  55
  ADSL2+: 100
  VDSL:   100
  VDSL2:  55
  SDS:    100
```

- Example 2—Displays the adjustment factor for a specific DSL type verification criteria

```
host1(config-l2c)#show adjustment-factor vdsl2
  VDSL2:11
```

show l2c

- Use to display information about the ANCP configuration on the router.
- Field descriptions
  - Current timeout—Configured session timeout (in seconds)
  - Qos adaptive mode—Whether QoS adaptive mode is enabled (true) or disabled (false)
- Example

```
host1#show l2c
L2C:
  Current session timeout: 25 seconds
  Qos adaptive mode: false
```

show l2c discovery-table

- Use to display ANCP discovery table entries.
- Use the optional **delta** keyword to display baseline statistics.
- Field descriptions
  - Neighbor—Neighbor name
  - Access-Loop-Id—Access loop identifier
  - Down/Upstream (kbps)—Downstream and upstream rates, in Kbps
  - State—State of the access loop, UP or DOWN
  - Actual-Data-Rate-Upstream—Actual upstream data rate, in Kbps
  - Actual-Data-Rate-Downstream—Actual downstream data rate, in Kbps
  - Attainable-Data-Rate-Upstream—Attainable upstream data rate for this line, in Kbps
  - Attainable-Data-Rate-Downstream—Attainable downstream data rate for this line, in Kbps
  - Line-State—State of the access loop (SHOWTIME or IDLE)
  - Dsl-Type—Type of DSL
  - Total Line Attributes—Total number of line attributes reported
- Example 1

```
host1#show l2c discovery-table brief
   Neighbor             Access-Loop-Id          Down/UpStream(kbps) State
--------------- ---------------------------- ------------------- -----
ACCESSNODE_10   Accessnode_10 atm 2/2:0.0      8064/1184           UP
ACCESSNODE_10   Accessnode_10 atm 2/32:0.0     8064/1184           UP
ACCESSNODE_10   Accessnode_10 atm 2/33:0.0     8064/1184           DOWN
ACCESSNODE_10   Accessnode_10 atm 2/34:0.0     8064/1184           DOWN
```

- Example 2—Topology discovery table for a particular end-user-id

```
host1#show l2c discovery-table end-user-id "Accessnode_10 atm 2/3:0.0"
Access-Loop-Id: Dslam_10 atm 2/3:0.0     UP
  Neighbor: ACCESSNODE_10
  Actual-Data-Rate-Upstream: 1152(kbps)
  Actual-Data-Rate-Downstream: 8064(kbps)
  Attainable-Data-Rate-Upstream: 1176(kbps)
  Attainable-Data-Rate-Downstream: 9376(kbps)
  Line-State: 1(SHOWTIME)
  Dsl-Type: 0(Invalid transmission type)
  Total Line Attributes: 6
```

- Example 3—Topology discovery table for a particular neighbor

```
host1#show l2c discovery-table neighbor "Accessnode_10"
Access-Loop-Id: Dslam_10 atm 10/5:0.0    DOWN
  Neighbor: DSLAM_10
  Line-State: 2(IDLE)
  Dsl-Type: 0(Invalid transmission type)
  Total Line Attributes: 2
Access-Loop-Id: Dslam_10 atm 10/6:0.0    DOWN
  Neighbor: DSLAM_10
  Line-State: 2(IDLE)
  Dsl-Type: 0(Invalid transmission type)
  Total Line Attributes: 2
```

```
Access-Loop-Id: Dslam_10 atm 10/7:0.0    DOWN
  Neighbor: DSLAM_10
  Line-State: 2(IDLE)
  Dsl-Type: 0(Invalid transmission type)
  Total Line Attributes: 2
Access-Loop-Id: Dslam_10 atm 2/0:0.0     UP
  Neighbor: DSLAM_10
  Actual-Data-Rate-Upstream: 1184(kbps)
  Actual-Data-Rate-Downstream: 8064(kbps)
  Attainable-Data-Rate-Upstream: 1184(kbps)
  Attainable-Data-Rate-Downstream: 9408(kbps)
  Line-State: 1(SHOWTIME)
  Dsl-Type: 0(Invalid transmission type)
  Total Line Attributes: 6
```

show l2c label

- Use to display information about known ANCP labels on the router.
- Use the **neighbor-input** keyword to display labels for input ports.
- Use the **neighbor-output** keyword to display labels for output ports.
- Use the **brief** keyword to show limited information.
- Field descriptions
  - Interface—Interface on which ANCP is configured
  - End-User-Id—Output label associated with the interface
  - Neighbor—Neighbor associated with the interface
  - Max-Branches—Maximum number of branches to which the ANCP interface can subscribe
  - Peer-Attach-Id—Input label associated with the interface
- Example 1

```
host1#show l2c label
Interface: ATM2/0.300
  End-User-Id: Accessnode_10 atm2/2:0.0
  Neighbor: accessnode _1002
  Max-Branches: 5

Interface: ATM2/0.301
  End-User-Id: Accessnode_10 atm2/3:0.0
  Neighbor: accessnode_1002
  Max-Branches: 5

Interface: ATM2/0.302
  End-User-Id: Accessnode_10 atm2/4:0.0
  Neighbor: accessnode _1002
  Max-Branches: 5

Interface: ATM2/0.303
  End-User-Id: Accessnode_10 atm2/5:0.0
  Neighbor: accessnode _1004
  Max-Branches: 5

Interface: ATM2/0.304
  End-User-Id: Accessnode_10 atm2/6:0.0
  Neighbor: accessnode _1004
  Max-Branches: 5
```

- Example 2

```
host1#show l2c label brief
        Interface                       End-User-Id                      Neighbor
-------------------------        -------------------------        ----------------
ATM4/0.300                        Accessnode_10 atm2/2:0.0         accessnode_1002
ATM4/0.301                        Accessnode_10 atm2/3:0.0         accessnode_1002
ATM4/0.302                        Accessnode_10 atm2/4:0.0         accessnode_1002
ATM4/0.303                        Accessnode_10 atm2/5:0.0         accessnode_1004
ATM4/0.304                        Accessnode_10 atm2/6:0.0         accessnode_1004

Interface                          Peer-Attach-Id
-------------------------    -------------------------
ATM4/0.11                    Accessnode_10 atm3/2:0.10
ATM4/0.12                    Accessnode_10 atm3/3:0.10
ATM4/0.13                    Accessnode_10 atm3/4:0.10
ATM4/0.14                    Accessnode_10 atm3/5:0.10
```

- Example 3

```
host1#show l2c label neighbor-input brief
        Interface                Peer-Attach-Id
-------------------------    -------------------------
ATM4/0.11                    Accessnode_10 atm3/2:0.10
ATM4/0.12                    Accessnode_10 atm3/3:0.10
ATM4/0.13                    Accessnode_10 atm3/4:0.10
ATM4/0.14                    Accessnode_10 atm3/5:0.10
```

show l2c neighbor

- Use to display information about all known ANCP neighbors or specified ANCP neighbors on the router along with their configurations.
- Use the **brief** keyword to display limited information.
- Use the **summary** keyword to display the number of active neighbors.
- Field descriptions
  - Neighbor Name—Name associated with the neighbor
  - Neighbor Id—ID associated with the neighbor
  - Maximum Branches—Maximum number of branches this neighbor can have
  - Topology Discovery—Whether topology discovery is enabled (true) or disabled (false)
  - Maximum Discovery Entries—Maximum number of discovery table entries allowed
  - Ip address—IP address of the neighbor
  - TCP port—TCP port associated with this neighbor
  - Connection Time—Date and time at which this neighbor was connected
  - Add Branches Sent—Number of add branch messages sent to this neighbor
  - Delete Branches Sent—Number of delete branch messages sent to this neighbor
  - Line-configurations—Number of line configurations sent to this neighbor

- OAM Loopback Requests Sent—Number of OAM loopback requests sent to this neighbor
- OAM Loopback Responses Received—Number of OAM loopback responses received from this neighbor
- Protocol State—Protocol state of this neighbor
- Number of configured neighbors—Number of configured ANCP neighbors
- Number of Neighbors in GSMP_ESTAB state—Number of ANCP neighbors that are in an established GSMP state
- Number of neighbors in GSMP_EMPTY state—Number of ANCP neighbors that are in an unestablished GSMP state

- Example 1

```
host1#show l2c neighbor name accessnode_1002
Neighbor Name: accessnode_1002
  Neighbor Id: 0abc.0abc.1002
  Maximum Branches: 10
  Topology Discovery: true
  Maximum  Discovery Entries: 10000
  Ip address: 1.1.1.2
  TCP port: 1025
  Connection Time: 03/02/2006 11:06:16
  Add Branches Sent: 0
  Delete Branches Sent: 0
  Line-configurations: 0
  OAM Loopback Requests Sent: 0
  OAM Loopback Responses Received: 0
  Protocol State: GSMP_ESTAB
```

- Example 2

```
host1#show l2c neighbor brief
        Name           Mac Address     Remote Address   Protocol State
-------------------- ---------------- ---------------- ----------------
accessnode1          0abc.0abc.0abc   null             EMPTY
```

- Example 3

```
host1(config)#show l2c neighbor summary
L2C:
  Number of configured Neighbors: 1
  Number of Neighbors in GSMP_ESTAB state: 1
  Number of neighbors in GSMP_EMPTY state: 0
```

show l2c statistics

- Use to display information about the ANCP statistics.
- Field descriptions
  - Current session timeout—Configured session timeout (in seconds)
  - Discovery—State of topology discovery (Enabled or Disabled)
  - Number of configured routers—Number of ANCP configured routers
  - Number of neighbors—Number of ANCP neighbors
  - Number of active neighbors—Number of active ANCP neighbors

- Number of end-user-ids—Number of ANCP end user IDs (output labels)
- Number of peer-attachment-ids—Number of ANCP peer attachment IDs (input labels)
- Number of add-branches—Number of ANCP branches added
- Number of delete-branches—Number of ANCP branches deleted

- Example

```
host1#show l2c statistics
L2C:
Current session timeout: 25 seconds
  Discovery: Enabled
  Number of configured routers: 1
  Number of neigbhors: 5
  Number of active neighbors: 1
  Number of end-user-ids: 25
  Number of peer-attachment-ids: 39
  Number of add-branches: 0
  Number of delete-branches: 0
```