CHAPTER 5

Configuring the LANE and IP Over ATM Clients

This chapter describes how to configure the LAN Emulation and Internet Protocol (IP) over asynchronous transfer mode (ATM) clients on the LightStream 1010 ATM switch. The LAN Emulation and IP over ATM connection can only be used to manage the LightStream 1010 switch.

Note For definitions of all commands discussed in this chapter, refer to the *LightStream 1010 ATM Switch Command Reference* publication.

Configuration Task List

To configure the LAN Emulation and IP over ATM, complete the tasks in the following sections:

- Configure IP Over ATM Example
- Configure LAN Emulation Client Example
- Map a Protocol Address to a PVC

Configure IP Over ATM Example

This section describes configuring a port on a switch to allow a classical IP-over-ATM connection to the switch CPU.

The following sections describe configuring the LightStream 1010 ATM switch in either an SVC or PVC environment:

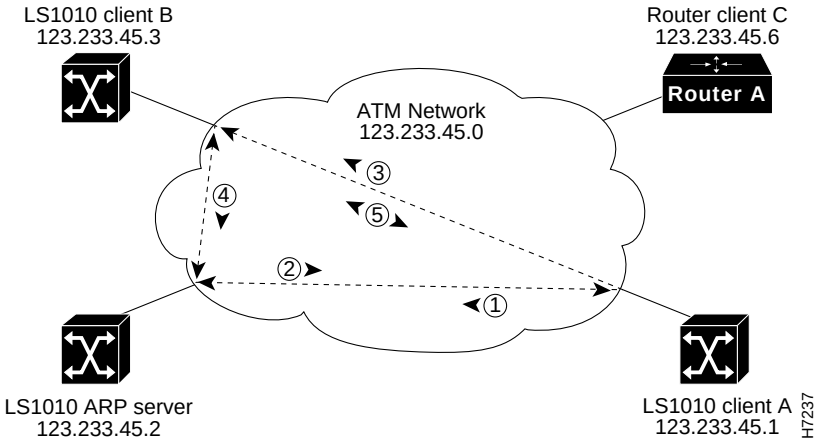
- Configure Classical IP over ATM in a SVC Environment
- Configure Classical IP over ATM in a PVC Environment

Configure Classical IP over ATM in a SVC Environment

This section describes classical IP over ATM in an SVC environment. It requires a network administrator to configure only the device's own ATM address and that of a single ATM ARP server into each client device.

Figure 5-1 describes the steps needed to set up a classical IP over ATM connection between LightStream 1010 ATM switch client A and client B.

Figure 5-1 Example of Classical IP Over ATM Connection Setup



Step 1 The initial IP packet sent by client A triggers a request to the ARP server to look up the IP address and the corresponding ATM address of client B in the ARP server ARP table.

Step 2 The ARP server sends back a response to client A with the matching ATM address.

Step 3 Client A uses the ATM address it just obtained from the ARP server to setup an SVC directly to client B.

Step 4 When client B replies with an IP packet to client A, it also triggers a query to the ARP server.

Note When client B receives the ATM address for client A, it usually discovers it already has a call set up to client A's ATM address and will not set up another call.

Step 5 Once the connection is known to both clients, they communicate directly over the SVC.

In Cisco's implementation, the ATM ARP client tries to maintain a connection to the ATM ARP server. The ATM ARP server can tear down the connection, but the client attempts once each minute to bring the connection back up. No error messages are generated for a failed connection, but the client will not route packets until the ATM ARP server is connected and translates IP network addresses.

For each packet with an unknown IP address, the client sends an ATM ARP request to the ARP server. Until that address is resolved, any IP packet routed to the ATM interface will cause the client to send another ATM ARP request.

The LightStream 1010 ATM switch may be configured as an ATM ARP client to work with any ATM ARP server conforming to RFC 1577. Alternatively, one of the LightStream 1010 ATM switches in a logical IP subnet (LIS) may be configured to act as the ATM ARP server itself. In that case, it automatically acts as a client as well. To configure classical IP and ARP in an SVC environment, perform one of the following tasks:

- Configure as an ATM ARP Client
- Configure as an ATM ARP Server

Configure as an ATM ARP Client

In an SVC environment, configure the ATM ARP mechanism on the interface by performing the following tasks starting in global configuration mode:

Task		Command
Step 1	At the privileged EXEC prompt, enter configuration mode from the terminal.	**configure**[1] [**terminal**]
Step 2	Select the interface to be configured.	**interface atm 2/0/0**[.*sub_inter #*]
Step 3	Specify the NSAP ATM address of the interface. or Specify the end-system-identifier address of the interface.	**atm nsap-address** *nsap-address* **atm esi-address** *esi-address*
Step 4	Specify the IP address of the interface.	**ip address** *address mask*
Step 5	Specify the ATM address of the ATM ARP server.	**atm arp-server nsap** *nsap-address*
Step 6	Exit interface configuration mode.	**exit**
Step 7	Configure a static route through the switch to the CPU interface. See the following note.	**atm route** {*addr-prefix*[2]} **atm 2/0/0 internal**

1. This command is documented in the *LightStream 1010 ATM Switch Command Reference* publication.
2. First 19-bytes of NSAP address.

Note You only need to specify a static route in Step 7 when configuring an ARP client using NSAP address.

Using NSAP Address Example

The following example configures CPU interface 2/0/0 of client A, in Figure 5-1, as the following:

- ATM ARP client with NSAP address—47.0091.8100.0000.1111.1111.1111.1111.1111.1111.00
- IP address—123.322.45.1
- subnet mask—255.255.255.0
- ARP server NSAP address—47.0091.8100.0000.1111.1111.1111.2222.2222.2222.00
- internal static route configured with NSAP address—47.0091.8100.0000.1111.1111.1111.1111.1111.1111.00—to ATM interface 2/0/0

```
Switch(config)#interface atm 2/0/0
Switch(config-if)#$dress 47.0091.8100.0000.1111.1111.1111.1111.1111.1111.00
Switch(config-if)#ip address 123.233.45.1 255.255.255.0
Switch(config-if)#$dress 47.0091.8100.0000.1111.1111.1111.2222.2222.2222.00
Switch(config-if)#exit
Switch(config)#$0.0000.1111.1111.1111.1111.1111.1111 atm 2/0/0 internal
```

Note In the previous example some of the commands extended beyond the single line of the screen and the command line shifted ten spaces to the left. The dollar sign ($) indicates the command line has shifted.

Using ESI Example

The following example configures CPU interface 2/0/0 of client A, in Figure 5-1, as the following:

- ATM ARP client with end system identifier—0041.0b0a.1081.40
- IP address—123.233.45.1
- subnet mask—255.255.255.0
- ARP server NSAP address—47.0091.8100.0000.1111.1111.1111.2222.2222.2222.00

```
Switch(config)#interface atm 2/0/0
Switch(config-if)#atm esi-address 0041.0b0a.1081.40
Switch(config-if)#ip address 123.233.45.1 255.255.255.0
Switch(config-if)#$7.0091.8100.0000.1111.1111.1111.2222.2222.2222.00
Switch(config-if)#exit
Switch(config)#
```

Note In the previous example one command extended beyond the single line of the screen and the command line shifted ten spaces to the left. The dollar sign ($) indicates the command line has shifted.

Configure as an ATM ARP Server

Cisco's implementation of the ATM ARP server supports a single, nonredundant server per logical IP subnetwork (LIS) and supports one ATM ARP server per subinterface. Thus, a single LightStream 1010 ATM switch can support multiple ARP servers by using multiple interfaces.

To configure the ATM ARP server, complete the following tasks starting in global configuration mode:

Task		Command
Step 1	At the privileged EXEC prompt, enter configuration mode from the terminal.	**configure**[1] [**terminal**]
Step 2	Select the interface to be configured.	**interface atm 2/0/0**[.*sub_inter #*]
Step 3	Specify the NSAP ATM address of the interface. or Specify the end-system-identifier address of the interface.	**atm nsap-address** *nsap-address* **atm esi-address** *esi-address*
Step 4	Configure the switch as an ARP server.	**atm arp-server self**
Step 5	Specify the IP address of the interface.	**ip address** *address mask*
Step 6	Configure the ATM ARP server optional idle timer.	**atm arp-server time-out** *minutes*[2]
Step 7	Exit interface configuration mode.	**exit**
Step 8	Configure a static route through the switch to the CPU interface. See the following note.	**atm route** {*addr-prefix*[3]} **atm 2/0/0 internal**

1. This command is documented in the *LightStream 1010 ATM Switch Command Reference* publication.
2. When you use this form of the **atm arp-server** command, it indicates that this interface will perform the ATM ARP server functions. When you configure the ATM ARP client (as described earlier), the **atm arp-server** command is used—with a different keyword and argument—to identify a different ATM ARP server to the client.
3. First 19-bytes of NSAP address.

You can designate the current LightStream 1010 ATM switch as the ATM ARP server in Step 5 by adding the keyword **self**.

Note You only need to specify a static route in Step 7 when configuring an ARP client using NSAP address.

The idle timer interval is the number of minutes a destination entry listed in the ATM ARP server's ARP table can be idle before the server takes any action to time out the entry.

Example

The following example configures CPU interface 2/0/0 of the ARP server, in Figure 5-1, as the following:

- ATM ARP client with end system identifier—0041.0b0a.1081.40
- IP address—123.233.45.2
- subnet mask—255.255.255.0

```
Switch(config)#interface atm 2/0/0
Switch(config-if)#atm esi-address 0041.0b0a.1081.40
Switch(config-if)#atm arp-server self
Switch(config-if)#ip address 123.233.45.2 255.255.255.0
Switch(config-if)#exit
```

show arp Command Example

To show the IP over ATM interface configuration, use the following command:

Task	Command
Show the ATM interface ARP configuration.	**show atm arp**
Show the ATM map list configuration.	**show atm map**

Example

In the following example the **show atm arp** command displays the configuration of the switch interface 2/0/0:

```
Switch#show atm arp

Note that a '*' next to an IP address indicates an active call

      IP Address        TTL     ATM Address
ATM2/0/0:
    * 10.0.0.5          19:21   47009181005670000000000112200410b0a108140

Switch#
```

The following example displays the map-list configuration of the switch static map and IP over ATM interfaces:

```
Switch#show atm map
Map list ATM2/0/0_ATM_ARP : DYNAMIC
arp maps to NSAP 36.0091810000000003D5607900.0003D5607900.00
        , connection up, VPI=0 VCI=73, ATM2/0/0
ip 5.1.1.98 maps to NSAP 36.0091810000000003D5607900.0003D5607900.00
        , broadcast, connection up, VPI=0 VCI=77, ATM2/0/0

Map list ip : PERMANENT
ip 5.1.1.99 maps to VPI=0 VCI=200

Switch#
```

Configure Classical IP over ATM in a PVC Environment

This section describes classical IP over ATM in a PVC environment. The ATM Inverse ARP mechanism is applicable to networks that use PVCs, where connections are established but the network addresses of the remote ends are not known. A server function is *not* used in this mode of operation.

In a PVC environment, configure the ATM Inverse ARP mechanism by performing the following tasks, starting in global configuration mode:

Task		Command
Step 1	At the privileged EXEC prompt, enter configuration mode from the terminal.	**configure**[1] [**terminal**]
Step 2	Select the interface to be configured.	**interface atm 2/0/0**
Step 3	Specify the IP address of the interface.	**ip address** *address mask*
Step 4	Create a PVC and enable Inverse ARP on it.	**atm pvc** *vpi vci* **encap aal5snap** [**inarp** *minutes*]

1. This command is documented in the *LightStream 1010 ATM Switch Command Reference* publication.

Repeat Step 4 for each PVC you want to create.

The **inarp** *minutes* interval specifies how often Inverse ARP datagrams are sent on this virtual circuit. The default value is 15 minutes.

Note The ATM ARP and Inverse ATM ARP mechanisms work with IP only. All other protocols require **map-list** command entries to operate.

Example

The following example configures CPU interface 2/0/0 to use IP over ATM encapsulation as follows:

- IP address—11.11.11.11
- to ATM PVC—VPI=0 VCI=100
- AAL5SNAP encapsulation
- inverse ARP set to ten minutes

- to ATM interface 0/0/0 VPI=50 VCI=100

```
Switch(config)#interface atm 2/0/0
Switch(config)#ip address 11.11.11.11
Switch(config-if)#atm pvc 0 100 encap aal5snap inarp 10 interface atm 0/0/0 50 100
```

show arp Command Example

To show the IP over ATM interface configuration use the following command:

Task	Command
Show the ATM interface ARP configuration.	**show atm map**

Example

The following example displays the map-list configuration of the switch static map and IP over ATM interfaces:

```
Switch#show atm map
Map list yyy : PERMANENT
ip 1.1.1.2 maps to VPI=0 VCI=200

Map list zzz : PERMANENT

Map list a : PERMANENT

Map list 1 : PERMANENT

Map list ATM2/0/0_ATM_ARP : DYNAMIC
arp maps to NSAP 47.009181005670000000001122.00410B0A1081.40
        , connection up, VPI=0 VCI=85, ATM2/0/0
ip 10.0.0.5 maps to NSAP 47.009181005670000000001122.00410B0A1081.40
        , broadcast, ATM2/0/0

Switch#
```

Configure LAN Emulation Client Example

This section describes configuring a LAN Emulation (LANE) client connection from the LightStream 1010 switch in the headquarters building to the CPU port 2/0/0 of the switch.

Note This connection may be used for switch management only.

Interface 2/0/0 configured as a LANE client will allow configuration of the switch from a remote host.

To configure interface 2/0/0 as a LANE client on the LightStream 1010 switch requires configuring the LANE client as described in the following section.

Using the atm lane client ethernet Command Description

To configure the interface 2/0/0 as a LANE client on LightStream 1010 switch, use the following EXEC commands using the **no** form of these commands to disable:

Task		Command
Step 1	At the privileged EXEC prompt, enter configuration mode from the terminal.	**configure**[1] [**terminal**]
Step 2	Specify the address to the LECS.	**atm lecs-address** *lecs-address*
Step 3	Select the interface to be configured.	**interface atm 2/0/0**[.*sub_inter #*]
Step 4	Specify an ATM address, and override the automatic ATM address assignment for the LANE client.	**lane client-atm-address** *atm-address-template*
Step 5	Configure a LANE client on the specified subinterface.	**lane client ethernet** [*elan-name*]

1. This command is documented in the *LightStream 1010 ATM Switch Command Reference* publication.

Example

The following example configures the LAN emulation configuration server ATM address = 47.0091.0000..., switches to interface configuration mode to configure ATM CPU interface 2/0/0, ATM address = .0800.200C.1001.**, Ethernet LANE client at interface 2/0/0 as an Ethernet connection, with the name = mis,:

```
Switch(config)# atm lecs-address 47.0091.0000.0000.0000.0000.0000.0000.00
Switch(config)# interface atm 2/0/0
Switch(config-if)# lane client-atm-address...0800.200C.1001.**
Switch(config-if)# lane client ethernet mis
```

show lane client Example

To show the LANE client configuration use the following command:

Task	Command
Show the LAN emulation client configuration.	**show lane client**

Example

The following example displays the LAN emulation client of the LightStream 1010 switch:

```
Switch#show lane client
LE Client ATM2/0/0  ELAN name: alpha  Admin: up  State: operational
Client ID: 2
HW Address: 0061.3e5b.bb02   Type: ethernet            Max Frame Size: 1516
ATM Address: 47.00918100000000613E5BBB01.000011112222.00

 VCD  rxFrames  txFrames  Type       ATM Address
   0         0         0  configure  47.33330000000000000000000.000111222333.00
 104         1        11  direct     47.33330000000000000000000.001122334455.00
 105        15         0  distribute 47.33330000000000000000000.001122334455.00
 106         0        10  send       47.33330000000000000000000.000000111111.00
 107        19         0  forward    47.33330000000000000000000.000000111111.00
 108         5         6  data       47.00918100000000613E5BBB01.00000C523BC8.00

Switch#
```

Map a Protocol Address to a PVC

The ATM interface supports a static mapping scheme that identifies the ATM address of remote hosts or switches. This IP address is specified as a PVC or as an NSAP address for SVC operation. Configuration for both PVC and SVC map lists are described in the following sections:

- PVC Based Map-List Configuration
- SVC Based Map-List Configuration

PVC Based Map-List Configuration

This section describes how to map a PVC to an address, which is a required task if you are configuring a PVC.

You enter mapping commands as groups. You first create a map list and then associate it with an interface. Begin the following tasks in global configuration mode:

Task		Command
Step 1	At the privileged EXEC prompt, enter configuration mode from the terminal.	**configure**[1] [**terminal**]
Step 2	Enable IP host based routing.	**ip host-routing**
Step 3	Specify an ATM interface and enter interface configuration mode.	**interface atm** *card/sub_card/port* [*.sub_inter #*]
Step 4	Enter the IP address and subnet mask associated with this interface.	**ip** *A.B.C.D mask*
Step 5	Enter the map group name associated with this PVC.	**map-group** *name*
Step 6	Configure the PVC.	**atm pvc** *vpi vci* **[encap** *aal5lane aal5mux aal5snap***]** [**upc** *upc*] [**pd** *pd*] [**rx-cttr** *index*] [**tx-cttr** *index*] **interface atm** *card/subcard/port*[*.sub_inter #*] *vpi vci* [**upc** *upc*]
Step 7	Exit interface configuration mode.	**exit**
Step 8	Configure an IP route to the router.	**ip route** *A.B.C.D mask [A.B.C.D|atm|ethernet|null]*
Step 9	Create a map list by naming it, and enter map-list configuration mode.	**map-list** *name*
Step 10	Associate a protocol and address to a specific virtual circuit.	[**ip** *A.B.C.D*] [**arp** *atm-nsap atm-vc*] [**cdp** *atm-nsap atm-vc*] [**compressedtcp** *A.B.C.D*] **exit-class**
Step 11	Exit map-list configuration mode.	**exit-class**

1. This command is documented in the *LightStream 1010 ATM Switch Command Reference* publication.

You can create multiple map lists, but only one map list can be associated with an interface. Different map lists can be associated with different interfaces.

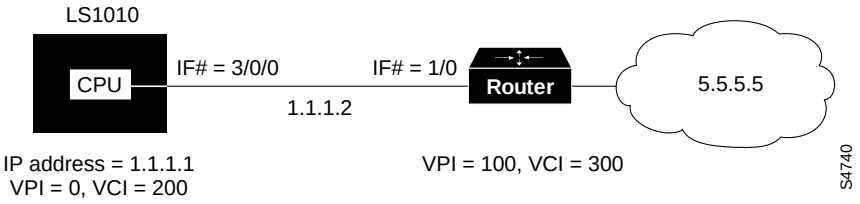
Example

Figure 5-2 describes configuring the following PVC map list:

- IP host-based routing is enabled.
- ATM CPU interface 2/0/0 is configured with IP address 1.1.1.1 and a subnet mask.
- An internal cross-connect PVC is configured from the CPU interface to ATM interface 3/0/0.

- An IP route is created between the switch and the router.
- A map group is assigned with the name yyy.
- A map list is created with the name yyy then associated to the IP network connection 1.1.1.2 and ATM VC 200 is configured on ATM interface 3/0/0.

Figure 5-2 PVC Map List Configuration Example



Following is an example of the commands used to configure the map list in Figure 5-2.

```
Switch(config)#ip host-routing
Switch(config)#interface atm 2/0/0
Switch(config-if)#ip address 1.1.1.1 255.0.0.0
Switch(config-if)#map-group yyy
Switch(config-if)#atm pvc 0 200 encap aal5snap interface atm 3/0/0 100 300
Switch(config-if)#exit
Switch(config)#ip route 1.1.1.1 255.0.0.0 1.1.1.2
Switch(config)#map-list yyy
Switch(config-map-list)#ip 1.1.1.2 atm-vc 200
Switch(config-map-list)#end
Switch#
```

show atm map Example

To show the map list interface configuration use the following command:

Task	Command
Show the ATM interface map list configuration.	**show atm map**

Example

The following example displays the map list configuration of the LightStream 1010 switch at interface 2/0/0:

```
Switch#show atm map
Map list yyy : PERMANENT
ip 1.1.1.2 maps to VPI=0 VCI=200

Switch#
```

SVC Based Map-List Configuration

This section describes how to map an SVC to an NSAP address, which is a required task if you are configuring an SVC.

You enter mapping commands as groups. You first create a map list and then associate it with an interface. Begin the following tasks in global configuration mode:

Task		Command
Step 1	At the privileged EXEC prompt, enter configuration mode from the terminal.	**configure**[1] [**terminal**]
Step 2	Enable IP host based routing.	**ip host-routing**
Step 3	Specify an ATM interface and enter interface configuration mode.	**interface atm** *card/sub_card/port* [*.sub_inter #*]
Step 4	Enter the IP address and subnet mask associated with this interface.	**ip** *A.B.C.D mask*
Step 5	Configure interface NSAP address.	**atm nsap-address** *20-octet NSAP address*
Step 6	Enter the map group name associated with this PVC.	**map-group** *name*
Step 7	Exit interface configuration mode.	**exit**
Step 8	Create a map list by naming it, and enter map-list configuration mode.	**map-list** *name*
Step 9	Associate a protocol and address to a specific virtual circuit.	[**ip** *A.B.C.D*] [**arp** *atm-nsap atm-vc smds*] [**cdp** *atm-nsap atm-vc smds*] [**compressedtcp** *A.B.C.D*] **exit-class**
Step 10	Exit map-list configuration mode.	**exit-class**

1. This command is documented in the *LightStream 1010 ATM Switch Command Reference* publication.

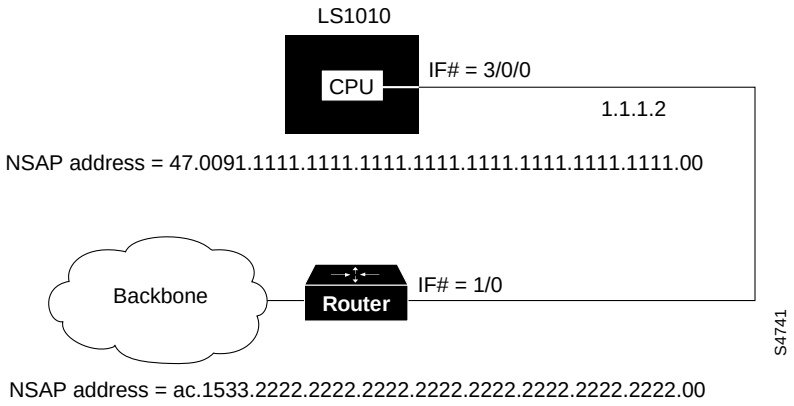
You can create multiple map lists, but only one map list can be associated with an interface. Different map lists can be associated with different interfaces.

Example

Figure 5-3 describes configuring the following SVC map list:

- IP host-based routing is enabled.
- ATM CPU interface 2/0/0 is configured with IP address 1.1.1.1 and a subnet mask.
- ATM CPU interface 2/0/0 is configured with NSAP address 47.0091.1111.1111.1111.1111.1111.1111.1111.1111.00.
- A map group is assigned with the name zzz.
- A map list is created with the name zzz then associated NSAP address ac.1533.2222.2222.2222.2222.2222.2222.2222.2222.2222.2222.00.

Figure 5-3 SVC Map List Configuration Example



Following is an example of the commands used to configure the map list in Figure 5-3.

```
Switch(config)#ip host-routing
Switch(config)#interface atm 2/0/0
Switch(config-if)#ip address 1.1.1.1 255.0.0.0
Switch(config-if)#map-group zzz
Switch(config-if)#atm nsap-address 47.0091.1111.1111.1111.1111.1111.1111.1111.1111.00
Switch(config-if)#exit
Switch(config)#ip route 1.1.1.1 255.0.0.0 1.1.1.2
Switch(config)#map-list zzz
Switch(config-map-list)#ip 1.1.1.2 atm-nsap ac.1533.2222.2222.2222.2222.2222.2222.2222.2222.00
Switch(config-map-list)#end
Switch#
```

show atm map Example

To show the map list interface configuration use the following command:

Task	Command
Show the ATM interface map list configuration.	**show atm map**

Example

The following example displays the map list configuration of the LightStream 1010 switch at interface 2/0/0:

```
Switch#show atm map

Map list yyy : PERMANENT
ip 1.1.1.1 maps to VPI=0 VCI=200
ip 1.1.1.2 maps to VPI=0 VCI=200

Map list zzz : PERMANENT

Switch#
```