APPENDIX A

VLAN Considerations

This appendix describes configuration issues to consider before setting up the Cisco ATM SBus adapter for online operation. The Cisco ATM SBus adapter is designed to be installed in a Sun system running either the SunOS or Solaris operating system.

VLAN Overview

A virtual LAN (VLAN) is an arbitrary grouping of nodes on the network. This grouping promotes efficient use of network resources and facilitates productive entry of repetitive network transactions.

The ATM network technology—with its connection orientation, physical link and speed independence, and ability to provide guaranteed quality of service (much like circuits)—is an enabler for new applications. Additionally, ATM is useful for improving the quality and performance of current computing applications. To be effective, however, the ATM network must be compatible with existing applications.

Conceptually, a virtual LAN allows the network administrator to structure, separate, or partition an ATM network to match the structure and organization used by existing protocols and applications. These structures in existing LANs are, for example, subnets in IP networks or broadcast domains in bridged networks. These logical structures typically have been closely linked to physical network elements; a single LAN segment is a broadcast domain, and if connected to a router LAN port, is often also an IP subnet.

When multiple LAN segments are bridged together, the bridged segments still “see” all broadcast and multicast traffic on each LAN that is physically connected to the bridges and shared media hubs. The number of stations or LAN segments that can be bridged without exceeding practical broadcast traffic loads is limited. Networks must be divided into subnets; the subnet structure is limited by the physical LAN structure.

In ATM networks, the connection-oriented nature of the switching technology and the use of dedicated media per port differs from the shared media notion that is common in hubs. There is no inherent relationship between the physical location of a node and the subnet, broadcast domain, or similar protocol group of which it is a member. A virtual LAN allows the use of subnets and similar concepts where appropriate.

A node can be configured using software to become a member of one or more virtual LANs. In this way, nodes can be arbitrarily connected together to form heterogeneous network(s).

IP Over ATM

This version of the Cisco ATM SBus adapter software supports the IP over ATM protocol. Future versions will additionally support LAN emulation.

Connections

There are two connection types within ATM:

- PVC—Permanent virtual circuits
- SVC—Switched virtual circuits

Permanent Virtual Circuit (PVC)

A permanent virtual circuit (PVC) requires that a permanent connection be established between each pair of ATM end points. Permanent connections are statically configured using the Cisco ATM SBus Adapter utility. Virtual path identifier (VPI) and virtual circuit identifier (VCI) tables must be set up in switches and in terminals.

Switched Virtual Circuit (SVC)

A switched virtual circuit (SVC) connection is dynamically configured using signaling software. An SVC connection allows the ATM switch and the workstation to exchange signaling messages. Signaling messages are exchanged using a predefined signaling channel; the VPI is set to 0, and the VCI is set to 5.

SVCs provide more efficient use of resources and universal connectivity. Unlike PVC connections, SVCs support automated administration and do not require a network management system for configuration of the channel. In fact, an administrator of the ATM address is the only management required for SVC operation.

Signaling

Signaling provides a mechanism for SVC connections to link endpoint devices. This allows for dynamic communication between the switch and the workstation.

A predefined signaling channel is opened where VPI=0 and VCI=5.

Logical IP Subnets

PVCs are configured for multiple hosts in a Logical IP Subnet (LIS). Their configuration must be individually maintained on each ATM switch and host.

SVCs are more convenient when it comes to configuring IP over ATM subnets. However, an ATM ARP server must be configured for each LIS, and UNI signaling must be deployed on every IP ATM end point member in the LIS.

When PVCs and SVCs are both supported (as they are in this product), IP subnets may be constructed over arbitrary ATM network topologies. For example, although each would require its own ATM ARP server, two logical IP subnets can be constructed on a single ATM switch, and each subnet could be built with both PVC and SVC connections.

Setting Up a Virtual LAN

To set up a virtual LAN, virtual LAN is treated just like a standard LAN. It consists of an ARP server and a connection table for each host. In addition, a set of parameters are needed for each virtual LAN to determine its operation. To create an operational virtual LAN, one needs to:

- Initialize the virtual LAN.
- Set up an ARP server for the virtual LAN on either a CIsco 7000/AIP or an AMT host.
- Set up a connection table as needed for PVC connections for the virtual LAN.

Each virtual LAN must be properly configured and associated with appropriate services tables if necessary, as follows:

- For PVC operation, both the ARP table and connection table must be generated.
- For SVC operation without an ARP server, an ARP table must be generated.
- For SVC operation with an ARP server, neither table needs to be set up. This is the normal situation.

Note Refer to the "VLAN Configuration" section in the "Using the ATM SBus Adapter Utility" chapter to implement virtual LAN(s) specifically tailored to meet your objectives.

ATM Layer

There is one ATM layer for each physical interface. The ATM layer acts as an interface between the adapter and other network devices.

ATM Layer Statistics

Certain objects and attributes represent aggregate statistics across all VPCs and VCCs on the local ATM UNI. These counters are then aggregated across the entire ATM UNI, and accumulated over time. All counters are 32 bits that wrap around.

The ATM Layer statistics can be used for the following purposes:

- Identify problems that affect UNI performance:
  - Loss due to bit errors
  - Unavailable link connections
- Aid in troubleshooting and diagnosis of problems.
- Collect traffic engineering data (that is, trends over time).

ARP Server

Each virtual LAN (VLAN) requires an ARP server. The ARP server is vital because it is the instrument source end stations will enlist to identify the ATM address of network endpoints.

When passed an IP address, the ARP server scans its table and returns the corresponding ATM address of a registered end point device.

Address Registration Information

In order to establish an ATM connection at the UNI, both the user and the network must know the ATM address(es) which are in effect at that UNI. These ATM addresses are then available for signaling messages sent by the user.

Address registration procedures provide the means for the dynamic exchange of addressing information between the user and the network at the UNI, at initialization and at other times as required. Through this dynamic exchange, the user and network can agree on the ATM address(es) in effect.

IP Address

One or more IP addresses must be assigned to the ATM adapter. This assignment will enable the adapter to communicate with other devices on the network using the TCP/IP protocol.

When dynamically configuring a virtual LAN (using atmstat), you will be prompted for the IP address(es) to associate with the Cisco ATM adapters that are installed in the workstation. VLAN configuration may optionally be performed by editing the configuration file (etc/catmlancfg.db) with a text editor.

Subnet Mask

Along with the IP address, a subnet mask must be defined for the ATM network. The subnet mask is used to distinguish between the portion of an IP address that identifies the network and the part that identifies the network nodes (hosts or routers). The driver obtains the subnet masks from the /etc/init/netmasks file.

The subnet mask is used by routers, bridges, and other network devices in order to route packets to the proper location. The network part of the IP address tells the device whether the destination for the packet is on the same network or a different one. Once the correct network for the packet is identified, the host portion is used to determine the packet's endpoint (destination or source).

Virtual Path Connections

A point-to-point Virtual Path Connection (VPC) extends between two ATM UNI endpoints that terminate the connection. On the local ATM Layer interface the VPC is identified uniquely by the VPI value.

Configuration information relates to the QoS parameters for the VPC local endpoint.

Virtual Channel Connections

A point-to-point virtual channel connection (VCC) extends between two ATM UNI endpoints that terminate the connection. On the local ATM Layer interface, the VCC is identified uniquely by the VPI and VCI values.

Encapsulation

RFC 1483 describes a variety of data encapsulation methods. Encapsulation is a method of carrying connectionless interconnect traffic, such as bridged and routed protocol data units (PDUs), over an ATM network.

The Cisco ATM SBus adapter currently supports LLC encapsulation for multiplexing protocols over a single ATM virtual circuit (VC). To send multiple protocols over a single VC, a Logical Link Control (LLC) header is prefixed onto the PDU. An LLC header identifies the protocol of the PDU.

Data Packet Size

- MAXMTU (Maximum MTU size): The maximum size of a data packet
- Range: <0-9188>
- Default: [9188]

Timeout Values

- VCC Timeout—If this timeout is triggered, a VCC entry is deleted from the connection table.
  - Range: <120-3600>
  - Default: [1200]
- Incomplete Timeout—If this timeout is triggered, this indicates that the request for a MAC or ATM address failed to get a response and is therefore unknown.
  - Range: <5-300>
  - Default: [60]
- Complete Timeout—If this timeout is triggered, this forces the ARP Table for the virtual LAN to verify the MAC or ATM address for each address in the table.
  - Range: <120-3600>
  - Default: [1200]

- Server Inactive Timeout. If this timeout is triggered, the connection to the ARP server is terminated (if connection is inactive for the specified period).
  - Range: <15-3600>
  - Default: [60]

Quality of Service

Multiple virtual LANs are supported for each physical link connected into the subsystem. This enables multiple subnets to share the same physical link. As such, the subnets are capable of a different quality of service (that is, dissimilar traffic characteristics) for each VLAN.

The total aggregate traffic is 155 Mbps. On a per VLAN basis, the traffic characteristics are configured by setting the peak data rate, average data rate, and burst size. The actual speed is parcelled as necessary for packet transmission by dividing the number of VLANs and taking into consideration the traffic characteristics for each VLAN.

Peak Data Rate

When choosing a peak data rate, consider the following parameters:

- Range: <1-136>.
- Default: [136].
- The value is given in Mbits per second.
- The maximum actual data rate for a 155-Mbps ATM physical link is 136 Mbps.

Average Data Rate

When choosing an average data rate (average number of cells that can be sent), consider the following implications:

- This value must be below the peak rate.
- Range: <1-136>.
- Default: [136].

Maximum Burst Size

When choosing a maximum burst size (maximum number of cells that can be sent at the peak rate), consider the following parameters:

- Range: <1-255>.
- Default: [10].
- When the average data rate equals the peak data rate; maximum burst size is not used.