CHAPTER 6

Asynchronous Transfer Mode "ATM"

This chapter describes the level of support that Cisco ANA provides for ATM and IMA, as follows:

Technology Description

ATM

ATM is a cell-switching and multiplexing technology that combines the benefits of circuit switching (guaranteed capacity and constant transmission delay) with those of packet switching (flexibility and efficiency for intermittent traffic). It provides Data Link (Layer 2) services with scalable bandwidth from a few megabits per second (Mbps) to many gigabits per second (Gbps), which usually run over Synchronous Optical NETwork/Digital Hierarchy (SONET/ SDH) Physical (Layer 1) links.

ATM networks consist of ATM switches interconnected by point-to-point ATM links or Interfaces and are fundamentally connection-oriented, which means that a virtual channel (VC) must be set up across the ATM network prior to any data transfer.

IMA

Inverse Multiplexing over ATM (IMA) involves inverse multiplexing and demultiplexing of ATM cells in a cyclical fashion among physical links grouped to form a higher bandwidth and logical link. The rate of the logical link is approximately the sum of the rate of the physical links in the IMA group. Streams of cells are distributed in a round-robin manner across the multiple T1/E1 links and reassembled at the destination to form the original cell stream. Sequencing is provided using IMA Control Protocol (ICP) cells.

The ATM cell stream received from the ATM layer is distributed on a cell by cell basis across the multiple links within the IMA group. At the far end, the receiving IMA unit reassembles the cells from each link on a cell-by-cell basis and recreates the original ATM cell stream and passed to the ATM layer.

Inventory and Information Model Objects (IMOs)

This section includes the following tables:

- ATM Interface (IAtm)
- ATM Virtual Connection (IAtmVc)
- Inverse Multiplexing for ATM (IMA) Group (IIMAGroup)
- ATM Traffic Descriptor (IAtmTrafficDescriptor)
- ATM Traffic Shape Descriptor (IAtmTrafficShapingDescriptor)

ATM Interface

The following Data Link layer ATM Interface object aggregates multiple ATM Virtual Connections by its VC Table attributes. It is bound by its Containing Termination Points attribute to a Physical Layer Interface, and is primarily being accessed by the Virtual Connection Switching Entity and VC Encapsulation Multiplexer bound by its Contained Connection Termination Points attribute. It is also being accessed by Virtual Connection Switching Entity.

Table 6-1 ATM Interface (IAtm)

Attribute Name	Attribute Description
ATM Address	ATM 20 byte address (*Address Prefix* | *MAC Address* | *Address Selector*)
Interface Type	ATM interface type (*N/A, Private UNI, Public UNI, Private NNI, Public NNI, NNI, UNI, STI, Unconfigured, VNNI, VUNI, EVNNI, EVUNI, VP TRUNK UNI*)
VP and VC Ranges	Numeric ranges of the allowed VPI/VCI values
VC Table	Array of ATM Virtual Connections
Cross Connect Table	Array of Virtual Cross Connections
IANA Type	IANA type of the sub/layer
Containing Termination Points	Underlying termination points (connection or physical)
Contained Connection Termination Points	Bound Connection Termination Points

ATM Virtual Connection

The following Data Link layer ATM Virtual Connection object, is bound by its Containing Termination Points attribute to a Data Link layer ATM Interface object, and is primarily accessed by the Virtual Cross Connection and Data Link layer VC Encapsulation, however it is not bound to any of them by any of its attributes.

Table 6-2 ATM Virtual Connection (IAtmVc)

Attribute Name	Attribute Description
Virtual Channel Identifier	Virtual Channel Identifier (VCI)
Virtual Path Identifier	Virtual Path Identifier (VPI)
Shaping Profile	Shaping profile (ATM Traffic Shape Descriptor)
Discarded and Received Input Data Counters	Discarded and received input octets and reassembled packets counters
Dropped and Forward Output Data Counters	Dropped and forward output octets and reassembled packets counters
Ingress Traffic Descriptor	Ingress traffic descriptor (ATM Traffic Descriptor)
Egress Traffic Descriptor	Egress traffic descriptor (ATM Traffic Descriptor)
Administrative Status	Administrative status (*Unknown, Up, Down*)
Operational Status	Operational status (*Unknown, Up, Down*)
IANA Type	IANA type of the sub/layer
Containing Termination Points	Underlying termination points (connection or physical)
Contained Connection Termination Points	Bound Connection Termination Points

Inverse Multiplexing for ATM (IMA) Group

The following Inverse Multiplexing for ATM (IMA) Group object, multiplex multiple Digital Signalling 1 Physicals, which it is bound to by its Containing Termination Points attribute, into a single Data Link layer ATM Interface, by which it is accessed.

Table 6-3 Inverse Multiplexing for ATM (IMA) Group (IIMAGroup)

Attribute Name	Attribute Description
Description	IMA port description
Speed	Group aggregated speed
Administrative Status	Administrative status (*Unknown, Up, Down, Testing*)
Operational Status	Operational status (*Unknown, Up, Down, Testing, Dormant, Not Presented*)
Operational Status Last Change	Date of last operational status change

Table 6-3 Inverse Multiplexing for ATM (IMA) Group (IIMAGroup) (continued)

Attribute Name	Attribute Description
IANA Type	IANA type of the sub/layer
Containing Termination Points	Underlying termination points (Digital Signalling 1 Physicals)

ATM Traffic Descriptor

The following ATM Traffic Descriptor object describes traffic of a single ATM Virtual Connection, which it is being aggregated by a Traffic Descriptor Container object (see Common (Shared by Several)).

Table 6-4 ATM Traffic Descriptor (IAtmTrafficDescriptor)

Attribute Name	Attribute Description
Traffic Descriptor Type	ATM traffic descriptor type (*Null, Best Effort, No CLP and no SCR, CLP with no tagging and no SCR, CLP with tagging and no SCR, No CLP with SCR, CLP with no tagging and with SCR, CLP with tagging and with SCR, CLP with no tagging and with MCR, CLP-transparent with no SCR, CLP-transparent with SCR, No CLP with tagging and no SCR, No CLP and no SCR with CDVT, No CLP with SCR and CDVT, No CLP and no SCR with CDVT, No CLP with SCR and CDVT*)
Service Category	ATM service category (*Unknown, UBR, UBR1, UBR2, CBR, CBR1, CBR2, CBR3, ABR, RT VBR, NRT VBR, VBR, VBR1RT, VBR2RT, VBR3RT, VBR1NRT, VBR2NRT, VBR3NRT, GFR*)
Cell Loss Priority	Cell loss priority (*Unknown, True, False*)
Cell Delay Variation	Cell delay variation
Cell Delay Variation Tolerance	Cell delay variation tolerance
Maximum High Priority and Aggregate Burst Sizes	Maximum high priority and aggregate (CLP=0 and CLP=0+1) burst sizes
Minimum High Priority and Aggregate Cell Rates	Minimum high priority and aggregate (CLP=0 and CLP=0+1) cell rates
Sustainable High Priority and Aggregate Cell Rates	Sustainable high priority and aggregate (CLP=0 and CLP=0+1) cell rates
Peak High Priority and Aggregate Cell Rates	Peak high priority and aggregate (CLP=0 and CLP=0+1) cell rates
Name	Traffic descriptor name
Index	Traffic descriptor index

ATM Traffic Shape Descriptor

The following ATM Traffic Shape Descriptor object describes the traffic shape of a single ATM Virtual Connection and is being aggregated by a Traffic Descriptor Container object (see Common (Shared by Several)).

Table 6-5 ATM Traffic Shape Descriptor (IAtmTrafficShapingDescriptor)

Attribute Name	Attribute Description
Maximum Burst Size	Maximum burst sizes
Sustainable and Peak Cell Rates	Sustainable and peak cell rates
Cell Delay Variation	Cell delay variation
State	Descriptor state (*Null, Enabled, Disabled*)
Buffer Size	Buffer size
Cell Loss Priority Discarded Size	Cell loss priority discarded size
Name	Traffic descriptor name
Index	Traffic descriptor index

Vendor Specific Inventory and Information Model Objects

Vendor specific Information Model Objects are implemented only for specific devices of the vendor.

The following sections describe the objects of specific vendors:

- Lucent's ATM Trunk Interface
- Cisco or Lucent's ATM Logical Interface
- Cisco or Lucent's ATM Trunk Virtual Connection
- Cisco or Lucent's ATM Soft Permanent Virtual Connection
- Alcatel's ASAM ATM Interface
- ECI's HiFocus ATM Interface
- Alcatel's ASAM ATM Traffic Descriptor
- ECI's HiFocus ATM Traffic Descriptor
- Lucent's WAN Switch ATM Traffic Descriptor
- Alcatel's ATM Access Traffic Descriptor
- Alcatel's ASAM Access Traffic Descriptor

Lucent's ATM Trunk Interface

Lucent's ATM Trunk Interface Data Link layer object aggregates multiple ATM Virtual Connections, which it is bound to by its VC Table attributes. It is bound by its Containing Termination Points attribute to a Physical Layer Interface, and is primarily accessed by a Virtual Connection Switching Entity bound by its Contained Connection Termination Points attribute.

Table 6-6 Lucent's ATM Trunk Interface (IAtmTrunk)

Attribute Name	Attribute Description
Same as ATM Interface (*IAtm*) - see Table 6-1 on page 6-2.	

Cisco or Lucent's ATM Logical Interface

Cisco or Lucent's ATM Logical Interface Data Link layer object aggregates multiple ATM Virtual Connections, which it is bound to by its VC Table attributes. It is bound by its Containing Termination Points attribute to a Physical Layer Interface, and is primarily accessed by a Virtual Connection Switching Entity and Data Link layer VC Encapsulation bound by its Contained Connection Termination Points attribute.

Table 6-7 Cisco or Lucent's ATM Logical Interface (IAtmLogicalPort/Trunk)

Attribute Name	Attribute Description
Resource Management Cell Termination	Resource management cell termination (*Unknown*, *CCRM Only*, *CCRM & BCM*)
Resource Management Cell Generation	Resource management cell generation (*Unknown*, *None*, *CCRM*, *BCM*)
Effective Check	Effective check (*Unknown*, *No*, *Yes*)
Input and Output Capacities	Input and output capacities
Administrative Status	Administrative status (*Null*, *Up*, *Down*, *Testing*)
Operational Status	Operational status (*Null*, *Up*, *Down*, *Testing*, *Unknown*, *Dormant*, *Not Present*)
Same as ATM or ATM Trunk Interface - see Table 6-1 on page 6-2.	

Cisco or Lucent's ATM Trunk Virtual Connection

Cisco or Lucent's ATM Trunk Virtual Connection and Cisco or Lucent's ATM Soft Permanent Virtual Connection Data Link layer objects, are bound by their Containing Termination Points attributes to an ATM Interface object, and are primarily accessed by a Virtual Cross Connection object, although they are not bound to it by any of their attributes.

Table 6-8 Cisco or Lucent's ATM Trunk Virtual Connection (IAtmTrunkVc)

Attribute Name	Attribute Description
Destination Description	Destination party description
Same as ATM Virtual Connection (*IAtmVc*) - see Table 6-2 on page 6-3.	

Cisco or Lucent's ATM Soft Permanent Virtual Connection

Table 6-9 Cisco or Lucent's ATM Soft Permanent Virtual Connection (IAtmSpVc)

Attribute Name	Attribute Description
Remote Virtual Channel Identifier	Remote virtual channel identifier (*VCI*)
Remote Virtual Path Identifier	Remote virtual path iIdentifier (*VPI*)
Remote Network Service Access Point	Remote network service access point (*NSAP*), which is the destination ATM address
Same as ATM Virtual Connection (*IAtmVc*) - see Table 6-2 on page 6-3.	

Alcatel's ASAM ATM Interface

Alcatel's ASAM ATM Interface and ECI's HiFocus ATM Interface Data Link layer objects aggregate multiple ATM Virtual Connections, which they are bound to by their VC Table attributes. They are bound by their Containing Termination Points attributes to a Physical Layer Interface, and are primarily accessed by Virtual Connection Switching Entity and Data Link layer VC Encapsulation objects bound by their Contained Connection Termination Points attributes.

Table 6-10 Alcatel's ASAM ATM Interface (IAsamAtm)

Attribute Name	Attribute Description
CAC Traffic Descriptor	Connection Admission Control (CAC) traffic descriptor (Alcatel's ASAM ATM Traffic Descriptor)
Access Traffic Descriptor	Access traffic descriptor (Alcatel's ASAM Access Traffic Descriptor)
Same as ATM Interface (*IAtm*) - see Table 6-1 on page 6-2.	

ECI's HiFocus ATM Interface

Table 6-11 ECI's HiFocus ATM Interface (IHiFocusAtm)

Attribute Name	Attribute Description
CAC Traffic Descriptor	Connection Admission Control (CAC) traffic descriptor (ECI's HiFocus ATM Traffic Descriptor)
Access Traffic Descriptor	Access traffic descriptor (Alcatel's ATM Access Traffic Descriptor)
Same as ATM Interface (*IAtm*) - see Table 6-1 on page 6-2.	

Alcatel's ASAM ATM Traffic Descriptor

The following objects—Alcatel's ASAM ATM Traffic Descriptor, ECI's HiFocus ATM Traffic Descriptor, Lucent's WAN Switch ATM Traffic Descriptor and Lucent's WAN Switch ATM Traffic Descriptor describe traffic of a single ATM Virtual Connection, and are aggregated by a Traffic Descriptor Container object.

Table 6-12 Alcatel's ASAM ATM Traffic Descriptor (IAsamAtmTrafficDescriptor)

Attribute Name	Attribute Description
User VP and VC Ranges	Numeric ranges of the allowed user VPI/VCI values
Same as ATM Traffic Descriptor (*IAtmTrafficDescriptor*) - see Table 6-4 on page 6-4.	

ECI's HiFocus ATM Traffic Descriptor

Table 6-13 ECI's HiFocus ATM Interface (IHiFocusAtm)

Attribute Name	Attribute Description
Service Category	ATM service category (*Unspecified*)
Same as ATM Traffic Descriptor (*IAtmTraffic Descriptor*) - see Table 6-4 on page 6-4.	

Lucent's WAN Switch ATM Traffic Descriptor

Table 6-14 Lucent's WAN Switch ATM Traffic Descriptor (ILucentWANSwitchAtmTrafficDescriptor)

Attribute Name	Attribute Description
Priority	Connection pPriority
Type	Connection type
Same as ATM Traffic Descriptor (*IAtmTrafficDescriptor*) - see Table 6-4 on page 6-4.	

Alcatel's ATM Access Traffic Descriptor

Alcatel's ATM Access Traffic Descriptor object describes access traffic of a single ATM Virtual Connection, and is aggregated by a Traffic Descriptor Container.

Table 6-15 Alcatel's ATM Access Traffic Descriptor (IAtmAccessTrafficDescriptor)

Attribute Name	Attribute Description
Scope	Access scope (*Null*, *Local*, *Network*)
Maximum Active VPCs and VCCs	Maximum active virtual path and virtual channel connections
Maximum Supported VPI and VCI Bits	Maximum supported virtual path and virtual channel bits
Generic Flow Control Mode	Generic flow control mode (*Null*, *UNI*, *NNI*)

Table 6-15 Alcatel's ATM Access Traffic Descriptor (IAtmAccessTrafficDescriptor)

Police Mode	Police mode (*Null*, *None*, *VC Only*, *All*)
Name	Traffic descriptor name
Index	Traffic descriptor index

Alcatel's ASAM Access Traffic Descriptor

Alcatel's ASAM Access Traffic Descriptor object describes access traffic of a single ATM Virtual Connection, and is aggregated by a Traffic Descriptor Container.

Table 6-16 Alcatel's ASAM Access Traffic Descriptor (IAsamAccessTrafficDescriptor)

Attribute Name	Attribute Description
Maximum Supported VPCs and VCCs	Maximum supported virtual path and virtual channel connections
Maximum Active VPI and VCI Bits	Maximum active virtual path and virtual channel bits
Same as ATM Access Traffic Descriptor (*IAtmAccessTrafficDescriptor*) - see Table 6-15 on page 6-8.	

Network Topology

The discovery of Asynchronous Transfer Mode (ATM) Data Link layer topology is done by searching for the same set of active ATM Virtual Connections in any remote side's ATM port VCs table related to the same type of the local ATM port. This topology is also applied to the underlying physical links.

In particular it looks for harmony between the VCs tables of participating ports based on the lowest active VCs (registry default to 3).

Further verification is done by matching the VC traffic signature of these ports using Cisco's confidential scheme, which requires a substantial traffic amount in order to function correctly.

This mechanism support configuration that have on both sides either the same VCs or the same VPs. However it does not support a mixture of VCs on one side and VPs on the other one.

Service Alarms

The following alarms are supported for this technology:

- Cloud Problem
- Discard Input Packets/Normal Discard Input Packets
- Dropped Output Packets/Normal Dropped Output Packets
- Link Down/Link Up
- Port Down/Port Up
- Receive Utilization/Receive Utilization Normal
- Transmit Utilization/Transmit Utilization Normal

Note Note that these alarms, apart from the Cloud Problem, are related to the underlying Physical Interface (see Chapter 19, "Common (Shared by Several)").

Note For a detailed description of these alarms and for information about correlation see the *Cisco Active Network Abstraction Fault Management User Guide, 3.6.*