CHAPTER 8

Technology Support Introduction

Part 2—Technology Support and Information Model Objects outlines the level of functionality that Cisco ANA provides for each technology it supports. This chapter covers the following topics:

Note Part 2 describes *general* Cisco ANA capabilities for each technology covered. The specific level of support provided for a particular technology on an individual Cisco ANA Virtual Network Element (VNEs) can vary. For details on technology support on individual VNEs, see Part 1—Cisco VNEs.

Supported Technologies

Table 8-1 lists the technologies supported in this version of the product.

Cisco ANA provides different levels of support for each technology. The fact that a specific technology is listed in Table 8-1 does not imply that every aspect of every relevant standard is represented and supported. For details on the level of support provided for each technology, see the description for that technology in the chapter listed in the "Chapter Reference" column.

In addition to supporting specific technologies, Cisco ANA:

- Relies on several abstract modeling components used throughout product. For details, see Chapter 34, "Common Components."
- Uses common approaches to discovering and modeling network topologies. For details, see Chapter 35, "Cisco ANA VNE Topology."

Table 8-1 Supported Technologies

Technology Family	Technology Group	Technology	Chapter Reference
Network (Layer 3)	IP	IP (including IPv6)	Chapter 9, "Internet Protocol"
		Address Resolution Protocol (ARP)	
		Hot Standby Router Protocol (HSRP)	
		Generic Routing Encapsulation (GRE)	
		6vPE	
	Routing Protocols	Border Gateway Protocol (BGP), Multiprotocol extensions (MP-BGP), external BGP (eBGP)	Chapter 10, "Routing Protocols"
		Open Shortest Path First (OSPF)	
		Enhanced Interior Gateway Routing Protocol (EIGRP)	
		Routing Information Protocol (RIP)	
		Intermediate System to Intermediate System (IS-IS)	
	VRF	Virtual Routing and Forwarding (VRF)	Chapter 11, "Virtual Routing and Forwarding"
		VRF-Lite (Multi-VRF)	
	BFD	Bidirectional Forwarding Detection	Chapter 12, "Bidirectional Forwarding Detection"
	SBC	Session Border Controller	Chapter 13, "Session Border Controller"
Hybrid Network/ Data Link (Layers 3 and 2)	MPLS	Multiprotocol Label Switching (MPLS)	Chapter 14, "Multiprotocol Label Switching"
		Label Distribution Protocol (LDP)	
	MPLS TE	Multiprotocol Label Switching Traffic Engineering (MPLS TE)	Chapter 15, "Multiprotocol Label Switching Traffic Engineering"
		MPLS TE Fast Reroute (MPLS TE FRR)	
	PWE3	Pseudowire Emulation Edge to Edge (PWE3)	Chapter 16, "Pseudowire Emulation Edge to Edge"
		TDM PW	
		ATM over Pseudowire (ATM PW)	
		PW-to-TE Tunnel Mapping	

Table 8-1 Supported Technologies (continued)

Technology Family	Technology Group	Technology	Chapter Reference
Data Link/MAC (Layer 2)	Ethernet	Ethernet (IEEE 802.3)	Chapter 17, "Ethernet (IEEE 802.3)"
		VLAN (IEEE 802.1Q)	
		QinQ (IEEE 802.1ad)	
		LAG (IEEE 802.3ad)	
		Ethernet Channel	
		STP (IEEE 802.1D)	
		RSTP (IEEE 802.1w)	
		PvSTP	
		MST (IEEE 802.1s)	
		SVI	
		VTP	
		REP	
		CFM	
		VPLS	
		H-VPLS	
	ATM	ATM	Chapter 18, "Asynchronous Transfer Mode"
		IMA	
		IP over ATM (MPoA 1483R)	
		Ethernet over ATM (MPoA 1483B)	
	Frame Relay	Frame Relay	Chapter 19, "Frame Relay"
	ISDN	Integrated Services Digital Network (ISDN)	Chapter 20, "Integrated Services Digital Network"
	PPP	Point To Point Protocol (PPP)	Chapter 21, "Point-to-Point Protocol"
	HDLC	High-Level Data Link Control (HDLC)	Chapter 22, "High-Level Data Link Control"
	L2TP	Layer 2 Tunnel Protocol (L2TP)	Chapter 23, "Layer 2 Tunnel Protocol"
	CDP	Cisco Discovery Protocol	Chapter 24, "Discovery Protocols"
	LLDP	Link Layer Discovery Protocol	
	Local Switching	Local Switching	Chapter 25, "Local Switching"

Table 8-1 Supported Technologies (continued)

Technology Family	Technology Group	Technology	Chapter Reference
Physical Layer (Layer 1)	xDSL	Digital Subscriber Line (xDSL)	Chapter 26, "Digital Subscriber Line"
	IPoDWDM	Internet Protocol over Dense Wave Division Multiplexing (IPoDWDM)	Chapter 27, "Internet Protocol Over Dense Wave Division Multiplexing"
	SONET/SDH	SONET/SDH	Chapter 28, "SONET/SDH"
	TDM/DSx	TDM	Chapter 29, "TDM/DSx"
		DSx	
		T3/E3	
		Channelized T3, OC3, DS3 interface	
		1588 Clocking	
		SyncE Clocking	
	Serial	Serial	Chapter 30, "Serial"
Other	Security	Access Control Lists (ACLs)	Chapter 31, "Access Control Lists"
	Hardware	Physical Containment	Chapter 32, "Physical Components"
		Logical Containment	Chapter 33, "Logical Components"

Networking-Related IMOs

Networking-related Information Model Objects (IMOs) represent the networking aspects of a network element (NE). The two major categories of IMOs are termination points and forwarding components.

Termination Points

Termination points represent the endpoints of a connection. A termination point may represent a physical endpoint (for example, a port connector) or a connection endpoint (such as an ATM layer of a port). A connection endpoint can also be called a network interface.

Termination points are related by containment. The following attributes express those containment relationships:

- Contained Connection Termination Point—Points to all upper-layer termination points bound to this termination point.
- Containing Termination Points—Points to all lower-layer termination points to which this termination point is bound.

The relation between termination points may represent one of the following:

- Type of hardware. For example:

  A SONET/SDH port with a fiber-optic connector is represented by two IMOs:

  - Port Connector IMO—Represents the fiber-optic connector.
  - SonetSdh IMO—Represents the SONET/SDH port.

The Port Connector IMO contains the SonetSdh IMO. This containment relationship is represented as follows:

- The Port Connector IMO points to the SonetSdh IMO with the Contained Connection Termination Point attribute.
- The SonetSdh IMO points to the Port Connector IMO with the Containing Termination Point attribute.

- Configuration. For example:

  An Ethernet port configured with an IP address (and, optionally, other network-layer attributes) is represented by two IMOs:

  - Ethernet Interface IMO—Represents the Ethernet layer of the port.
  - IP Interface IMO—Represents the network-layer aspect, including the IP address configured on the port.

  The Ethernet Interface IMO contains the IP Interface IMO. This containment relationship is represented as follows:

  - The Ethernet Interface IMO points to the IP Interface IMO with the Contained Connection Termination Point attribute.
  - The IP Interface IMO points to the Ethernet Interface IMO with the Containing Termination Point attribute.

- State. For example:

  An active PPP connection running on top of ATM VC is represented by two IMOs:

  - Atm Vc IMO—Represents the ATM VC.
  - Vc Based Encapsulation IMO—Represents the PPPoA encapsulation.

  The Atm Vc IMO contains the Vc Based Encapsulation IMO. This containment relationship is represented as follows:

  - The Atm Vc IMO points to the IP Vc Based Encapsulation IMO with the Contained Connection Termination Point attribute.
  - The Vc Based Encapsulation IMO points to the Atm Vc IMO with the Containing Termination Point attribute.

Note The relationship between termination points may be restricted to specific termination point types, based on how the technology is implemented. For example, a physical layer IMO may not contain an IP Interface IMO, which represents the network layer interface.

Forwarding Components

Forwarding components represent components that perform some type of forwarding function between termination points. Among other things, forwarding components can represent routing, bridging, and switching components in the NE.

Each forwarding component has a logical association with the termination points for which it does the forwarding. This relationship is expressed by the logical associations attribute of the forwarding component IMO. An example of such a relationship would be the logical association between an IVcSwitchingEntity IMO representing the ATM/FR switching fabric and the IAtm/IFrameRelay IMOs representing the relevant ATM/FR ports.

Note The support level of each network technology can be varied. The support level is reflected in its related IMOs with their attributes, network topology, and fault and alarm correlation, as described in each of this Guide's technology chapters and in the Common Components chapter.

The polling intervals for the relationship between the termination points, as well as between them and the various forwarding components, are more complex than can be uniformly expressed, so they are marked as Not Applicable (N/A) in their corresponding Polling Interval columns. This applies to Containing Termination Points, Contained Connection Termination Points, and Logical Sons attributes of an IMO.

Scheme Values

The Scheme column of each IMO table can have the following values:

- IPCore
- Product
- Any
- N/A—This value is populated as part of the creation of the IMO, not by polling the device.

Polling Interval Values

The Polling Interval column of each IMO table can have the following values:

- Status
- Configuration
- System
- Topology Layer 1 (Topology L1)
- Topology Layer 2 (Topology L2)
- N/A—Not every property has a polling interval. Some properties are created from the results of multiple queries, and there is no specific polling for them.

For more information about polling intervals, see the *Cisco Active Network Abstraction 3.7 Administrator Guide*.