CHAPTER 11

Physical Technologies

This chapter describes the level of support that Cisco ANA provides for physical technologies, as follows:

Technology Description

SONET/SDH

Synchronous Optical NETwork (SONET) together with Synchronous Digital Hierarchy (SDH) were originally standardized for connecting one fiber system to another at the optical level in order to forms a single international standard for fiber interconnects between telephone networks of different countries. Today it is a widely deployed, mature enabling technology used in providing high speed, large-scale IP networks, which combines high bandwidth capacity with efficient link utilization, making it a major building block for accommodating a fast growing IP infrastructure both in the core and on the edge.

SONET/SDH is capable of accommodating a variety of transmission rates and applications by defining a technology for carrying many signals of different capacities through a synchronous, flexible, optical hierarchy. This is accomplished by means of a byte-interleaved multiplexing scheme, which simplifies multiplexing, and offers end-to-end network management. It is a layered protocol with the following four separate layers: Photonic, Section, Line and Path, all within the Physical Layer (1) of the Open System Interconnection (OSI) reference model.

SONET/SDH networks consist of Path Terminating Elements (PTE), which represent the Physical Layer (1) Interfaces as well as Add/Drop Multiplexers (ADM) or Digital Cross Connect Systems (DCS) and Regenerators interconnected by point-to-point SONET/SDH links called Sections and are fundamentally connection-oriented, which means that a Virtual Channel (VC) must be set up across the SONET/SDH network prior to any data transfer.

POS

Packet over SONET/SDH (PoS) is a Data Link (Layer 2) technology that uses PPP (RFC 1661) in HDLC like framing (RFC 1662) encapsulation over SONET/SDH framing. POS interface supports SONET/SDH level alarm processing, performance monitoring, synchronization, and protection switching, which enables seamless interoperation with existing SONET infrastructures and provides the capability to migrate to IP+Optical networks without the need for legacy SONET infrastructures.

DSx

Digital Signals (DSx) Hierarchy refers to the rate and format of digital telecommunication circuits, as part of the North American Digital Hierarchy. DS is related to the T designations; however DS refers to multiplexing techniques while the T designations refer to the underlying equipment and signalling.

There are various DS levels: DS0/Fractional T1 (64Kbps), which represents a single voice telephone call, DS1/T1 (1.544Mbps), which defines how to multiplex 24 DS0, DS2/T2 (6.312Mbps) and DS3/T3 (44.736Mbps), which define how to multiplex 4 and 28 DS1 respectively, onto the same circuit.

Note These Physical Technologies are being supported only as the underlying Physical Layer in conjunction with other Data Link technology layers such as ATM and Packet Over SONET/SDH (POS).

Inventory and Information Model Objects (IMOs)

This section includes the following tables:

- SONET/SDH Physical (ISonetSdh)
- Digital Signalling 0 Bundle Interface
- Digital Signalling 1 Physical
- Digital Signalling 3 Physical

SONET/SDH Physical

The following Physical layer SONET/SDH object, is bound by its Containing Termination Points attribute to a Port Connector object, and is primarily accessed by the Data Link layer such as Asynchronous Transfer Mode “ATM” and Frame Relay “FR” interfaces as well as the Packet Over SONET/SDH (POS) interface (implemented using Point To Point Protocol Encapsulation) bound by its Contained Connection Termination Points attribute.

Table 11-1 SONET/SDH Physical (ISonetSdh)

Attribute Name	Attribute Description
Specific Type	Specific type (*Null, SONET/SDH Mux, OC3, OC12, OC24, OC48, OC192, STM1, STM4, STM16, STM64*)
Loop Back Type	Loop back type (*Null, Cell, Payload, Diag, Line, None, Other, Path, Metalic, Non Metalic, Serial, Parallel, Local, Internal, Network, Inward, Dual, Remote, Inbound Local, No Loop, Facility Loop, Terminal Loop, Other Loop*)
Scrambling Mode	Scrambling mode (*Null, On, Off, Payload, Frame, Payload* and *Frame*)
Same as **Physical Layer** (*IPhysicalLayer*)	

Digital Signalling 0 Bundle Interface

The following Data Link layer Digital Signalling 0 Bundle Interface object, is bound by its Containing Termination Points attribute to either Digital Signalling 1 Physical or Digital Signalling 3 Physical Layer objects, and is primarily accessed by the Data Link layer such as the ATM Interface and the Frame Relay Interface bound by its Contained Connection Termination Points attribute.

Table 11-2 Digital Signalling 0 Bundle Interface (IDS0Bundle)

Attribute Name	Attribute Description
Bundled Time Slots	Bundled time slots (DS1 channels)
Bundle Location	Bundle location/index
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

Digital Signalling 1 Physical

The following Physical layer Digital Signalling 1 Physical and Digital Signalling 3 Physical objects, are bound by their Containing Termination Points attribute to a Port Connector object, and are primarily accessed by the Data Link layer such as the ATM Interface and the Frame Relay Interface as well as Digital Signalling 0 Bundle Interface bound by its Contained Connection Termination Points attribute.

Table 11-3 Digital Signalling 1 Physical (IDS1Pdh)

Attribute Name	Attribute Description
Framing Type	Framing type (*Null, OTHER, ESF, ANSI ESFf, D4, E1, E1 CRC, E1 MF, E1 CRC MF, UNFRAMED, E1 UNFRAMED, DS2 M12, E2, E1 Q50, E1 Q50 CRC, ANSI SF, E1 CAS CRC4, E1 CAS No CRC4, E1 No CAS CRC4, E1 No CAS No CRC4, E1 Unstructured, T1 Unstructured, CLEAR CHANNEL*)

Table 11-3 Digital Signalling 1 Physical (IDS1Pdh) (continued)

Cell Mapping Type	Cell mapping type (*Null, PLCP, HEC, HCS, Direct, ADM*)
Loop Back Type	Loop back type (*Null, Cell, Payload, Diag, Line, None, Other, Path, Metalic, Non Metalic, Serial, Parallel, Local, Internal, Network, Inward, Dual, Remote, Inbound Local, No Loop*)
Scrambling Mode	Scrambling mode (*Null, On, Off*)
Same as **Physical Layer** (*IPhysicalLayer*)	

Digital Signalling 3 Physical

Table 11-4 Digital Signalling 3 Physical (IDS3Pdh)

Attribute Name	Attribute Description
Framing Type	Framing type (*Null, Other, M23, SYNTRAN, CBIT, Clear Channel, E3 Other, E3 Framed, Unframed, E3 Unframed, ITU-T G.804, ITU-T G.832, M13*)
Cell Mapping Type	Cell mapping type (*Null, PLCP, HEC, HCS, Direct, ADM*)
Loop Back Type	Loop back type (*Null, Cell, Payload, Diag, Line, None, Other, Path, Metalic, Non Metalic, Serial, Parallel, Local, Internal, Network, Inward, Dual, Remote, Inbound Local, No Loop*)
Scrambling Mode	Scrambling mode (*Null, On, Off*)
Same as **Physical Layer** (*IPhysicalLayer*)	

Network Topology

The discovery of Synchronous Optical NETwork/Digital Hierarchy (SONET/SDH) as well as Digital Signals (DSx) hierarchy physical layer topology is unsupported and is manually (statically) configured by the system administrator.

However, it is used in conjunction with the Data Link layer above it, such as ATM, for discovering its physical topology, while further verifying it by matching the traffic signature of these ports using Cisco's confidential scheme, which requires a substantial traffic amount in order to function correctly.

Service Alarms

The following alarms are supported for this technology:

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