OptiX OSN 2500 Intelligent Optical Transmission System
V100R010

Product Overview

Issue   08

Date   2012-06-30

HUAWEI TECHNOLOGIES CO., LTD.

Huawei Technologies Co., Ltd.

About This Document

Related Versions

The following table lists the product versions related to this document.

Product Name	Version
OptiX OSN 2500	V100R010

Intended Audience

This document describes the OptiX OSN 2500 in the terms of network application, functions, hardware and software structure, and features.

The intended audiences of this document are:

- Network Planning Engineer
- Data Configuration Engineer
- System Maintenance Engineer

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
⚠ DANGER	Indicates a hazard with a high level of risk, which if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazard with a medium or low level of risk, which if not avoided, could result in minor or moderate injury.
⚠ CAUTION	Indicates a potentially hazardous situation, which if not avoided, could result in equipment damage, data loss, performance degradation, or unexpected results.
☞ TIP	Indicates a tip that may help you solve a problem or save

Symbol	Description
	time.
☐ NOTE	Provides additional information to emphasize or supplement important points of the main text.

GUI Conventions

The GUI conventions that may be found in this document are defined as follows.

Convention	Description
Boldface	Buttons, menus, parameters, tabs, window, and dialog titles are in **boldface**. For example, click **OK**.
>	Multi-level menus are in **boldface** and separated by the ">" signs. For example, choose **File** > **Create** > **Folder**.

Change History

Updates between document issues are cumulative. Therefore, the latest document issue contains all updates made in previous issues.

Updates in Issue 08 (2012-06-30) Based on Product Version V100R010

This document is the eighth release of the product version V100R010. Based on the release 07, the following contents are added or optimized:

- The description about TN12OBU1 boards is deleted from topic "Boards".
- A bug is fixed in section "Service Access Capacity".

Updates in Issue 07 (2011-06-30) Based on Product Version V100R010

This document is the seventh release of the product version V100R010. Based on the release 06, the following contents are added or optimized:

- No content is added or modified for product version V100R010.

Updates in Issue 06 (2011-01-20) Based on Product Version V100R010

This document is the sixth release of the product version V100R010. Based on the release 05, the following contents are added or optimized:

- No content is added or modified for product version V100R010.

Updates in Issue 05 (2010-11-05) Based on Product Version V100R010

This document is the fifth release of the product version V100R010. Based on the release 04, the following contents are added or optimized:

- The description of ECC ping and traceroute is added into the "OAM Information Interworking" chapter.
- The description of N2EFT8 and N2EFT8A boards is added into the "Classification of the Boards" chapter.

Updates in Issue 04 (2010-06-20) Based on Product Version V100R010

This document is the fourth release of the product version V100R010. Based on the release 03, the following contents are added or optimized:

Based on version V100R010C00, version V100R010C01 has the following new functions and features:

- The "AAA Management Mode" and "Accounting Management" chapters are added.

Updates in Issue 03 (2010-03-31) Based on Product Version V100R010

This document is the third release of the product version V100R010. Based on the release 02, the following contents are added or optimized:

- The "License" section is added.

Updates in Issue 02 (2010-02-12) Based on Product Version V100R010

This document is the second release of the product version V100R010. Based on the release 01, the following contents are added or optimized:

- The "Power Consumption and Weight of Each Board" section is modified.

Updates in Issue 01 (2009-12-30) Based on Product Version V100R010

This document is the first release of the product version V100R010. Based on the document release of the product version V100R009, the following contents are added or optimized:

- The N1EFP0 board is added.
- The structure of the "Power Consumption and Weight of Each Board" section is optimized.

Updates in Issue 07 (2010-07-20) Based on Product Version V100R009

This document is the seventh release of the product version V100R009. Based on the release 06, the following contents are added or optimized:

- The description in "Package Loading" is changed.
- The technical specifications in this document are optimized.
- The inter-document links in "Syslog Management" are deleted.

Updates in Issue 06 (2010-03-31) Based on Product Version V100R009

This document is the sixth release of the product version V100R009. Based on the release 05, the following contents are added or optimized:

- The structure of the "Data Features" section is optimized.
- The "High Precise Timing" section is deleted.

Updates in Issue 05 (2009-12-30) Based on Product Version V100R009

This document is the fifth release of the product version V100R009. Based on the release 04, the following contents are added or optimized:

- The structure of the "Power Consumption and Weight of Each Board" section is optimized.

Updates in Issue 04 (2009-08-30) Based on Product Version V100R009

This document is the fourth release of the product version V100R009. Based on the release 03, the following contents are added or optimized:

- In section "OAM Information Interworking", the DCC resource allocation modes of Q5CXL is modified for the V100R009C04 product version.

- In section "SDH Processing Boards", the interface type of N1SLT1 board is modified.

- In sections "Environmental Specification" and "Environment Requirement", the description of the specifications is modified.

- In section "Specifications of the Subrack", the typical power consumption and the typical configuration are modified.

- The description of "1000BASE-EX" is changed to "1000BASE-VX".

- The slot layouts are optimized.

- In section "Microwave Radio Performance", the description and the structure are optimized.

- In section "High Precise Timing", the description of theories and applications are optimized.

Updates in Issue 03 (2009-06-30) Based on Product Version V100R009

This document is the third release of the product version V100R009. Based on the release 02, the following contents are added or optimized:

- The Q3SAP board is deleted.

- The CF card supported by the Q5CXL board is deleted.

- The N1IDL4A and N1IDQ1A board are added for the V100R009C04 product version.

- The boards supporting the enhanced subrack and the related description are added.

- The maximum supporting capacity of the STM-16 MSP ring in the "MSP Ring" is modified.

- The slot valid for the N3SLQ41 board is changed.

- Several bugs in this document of the previous release are fixed.

Updates in Issue 02 (2009-03-30) Based on Product Version V100R009

This document is the second release of the product version V100R009. Based on the release 01, the following contents are added or optimized:

- The N3SLT1, N3SLD41, N3SLN, Q2SLD41, and Q5CXLD41 boards are deleted.

- The slots supported by the N2EFS4 and N3EFS4 boards are changed.

- Several bugs in this document of the previous release are fixed.

Updates in Issue 01 (2009-01-15) Based on Product Version V100R009

This document is the first release of the product version V100R009. Based on the document release of the product version V100R008, the following contents are added or optimized:

- The N1IFSD1, N1RPWR, N3SLT1, N3SLO1, N3SLN, N3SLD41, N3SLQ41, N1RPC01, N1RPC02N5EFS0, N3EFS4, N3EGS2, N4EGS4, N2EGT2, N1EFS0A, N1EMS2, N1ETF8A, N1EFF8A, Q5CXLLN, Q5CXLD41, Q5CXLQ41, Q3SAP and N1FANB boards are added.

- The following sections are added: "Microwave Technology" and "High-Precision Timing".

- The following sections are deleted: "DCN Features", "Clock" and "Basic Principle".

- The mapping between boards and slots in the "Hardware" section are optimized.

Contents

1 Network Application

The OptiX OSN 2500 intelligent optical transmission system (hereinafter referred to as the OptiX OSN 2500) developed by Huawei is the next-generation intelligent optical transmission equipment.

The OptiX OSN 2500 integrates the following technologies to transmit voice and data services on the same platform with high efficiency:

- Synchronous digital hierarchy (SDH)
- Plesiochronous digital hierarchy (PDH)
- Ethernet
- RPR(Resilient Packet Ring)
- Asynchronous transfer mode (ATM)
- Storage area network (SAN)
- Wavelength division multiplexing (WDM)
- Digital data network (DDN)
- Automatically switched optical network (ASON)
- Microwave Technology

Figure 1-1 shows the appearance of the OptiX OSN 2500.

Figure 1-1 Appearance of the OptiX OSN 2500

The OptiX OSN 2500 is used at the access layer and the convergence layer of a metropolitan area network (MAN). The OptiX OSN 2500 can also be networked with the following equipment to optimize the investment for customers:

- OptiX OSN 9500
- OptiX OSN 7500
- OptiX OSN 3500
- OptiX OSN 3500 II
- OptiX OSN 2500 REG
- OptiX OSN 1500
- OptiX 2500+$_{(Metro\ 3000)}$
- OptiX 155/622H$_{(Metro\ 1000)}$

Figure 1-2 shows the application of the OptiX OSN 2500 in a transmission network.

Figure 1-2 Network application of the OptiX OSN 2500
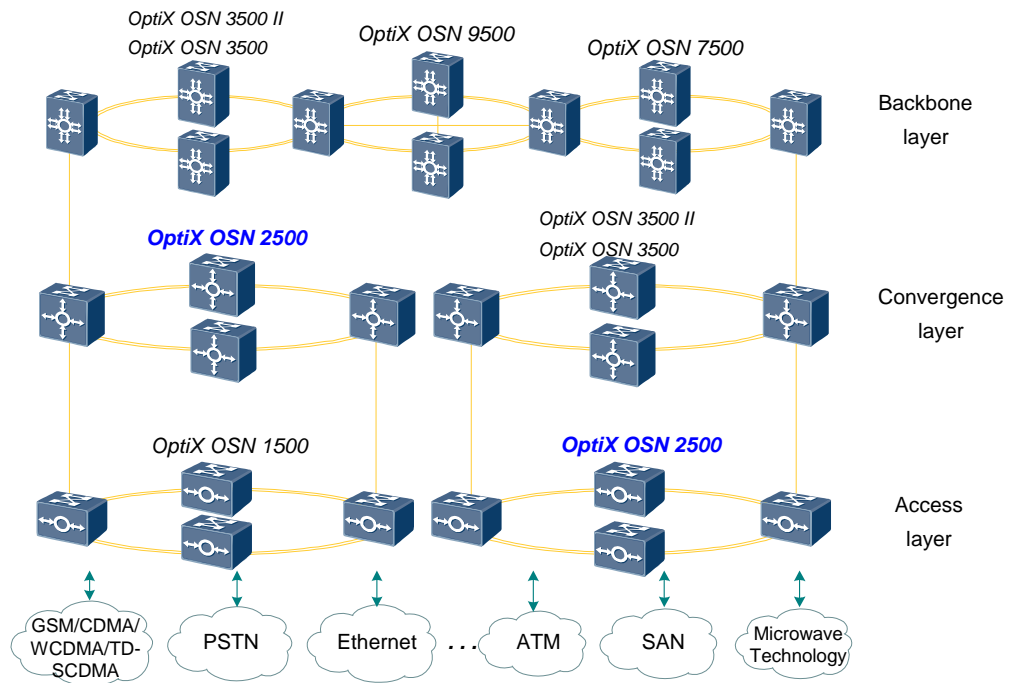
Global System for Mobile Communications (GSM)

Code Division Multiple Access (CDMA)

Wideband Code Division Multiple Access (WDMA)

Time Division-Synchronous Code Division Multiple Access (TD-SCDMA)

Public Switched Telephony Network (PSTN)

Storage Area Network (SAN)

Ethernet
Microwave Technology

2 Functions

About This Chapter

The equipment has many functions.

The capacity covers the cross-connect capacity, slot access capacity and microwave capacity.

The supported services are SDH services, PDH services and many other services.

The interfaces include service interfaces, administration and auxiliary interfaces.

The OptiX OSN 2500 supports topologies such as chain, ring, tangent rings, intersecting rings, ring with chain, dual node interconnection (DNI), hub, and mesh at the STM-1/STM-4/STM-16/ level.

The equipment provides equipment level protection and network level protection.

The OptiX OSN 2500 supports the REG function.

The OptiX OSN 2500 provides a set of stand-alone ASON software system to realize the intelligent management of services and bandwidth resources.

The equipment supports a built-in WDM technology, which enables the transmission of several wavelengths in one fiber.

The OptiX OSN 2500 supports the built-in microwave boards of intermediate frequency. It can work with the outdoor unit (ODU) of the OptiX RTN 600 to achieve wireless service transmission.

2.10 Access of AC Power Supply

An uninterrupted power module (UPM) system supports the access of the 110 V/220 V power, and converts 110 V/220 V AC power into -48 V DC power to supply power to the equipment.

2.11 Synchronization

The The OptiX OSN 2500 only supports the traditional clock synchronization.

2.12 OAM Information Interworking

The OptiX OSN 2500 supports OAM information interworking.

2.13 OAM

The OptiX OSN 2500 provides the OAM functions at the equipment layer and network layer.

2.14 License

The product of this version is released with a license. That is, customers can obtain corresponding rights committed by the supplier based on the license certificate.

2.15 Security Management

The NMS uses many schemes to ensure the security of the OptiX OSN 2500 NE.

2.1 Capacity

The capacity covers the cross-connect capacity, slot access capacity and microwave capacity.

2.1.1 Cross-Connect Capacity

Different cross-connect boards have different cross-connect capacities.

Table 2-1 lists the cross-connect boards and the corresponding cross-connect capacities supported by the OptiX OSN equipment.

Table 2-1 Cross-connect capacity of the OptiX OSN 2500

Board	Higher Order Cross-Connect Capacity	Lower Order Cross-Connect Capacity	Access Capacity of a Single Subrack	Remarks
Q2/Q3CX L series	20 Gbit/s (128x128 VC-4s)	20 Gbit/s (128x128 VC-4s, which are equivalent to 384x384 VC-3s or 8064x8064 VC-12s)	18.75 Gbit/s (120x120 VC-4s)	-
Q5CXL series	For the new backplane: 60 Gbit/s (384x384 VC-4s) For the old	20 Gbit/s (128x128 VC-4s, which are equivalent to 384x384 VC-3s or 8064x8064 VC-12s)	For the new backplane: 22.5 Gbit/s (144x144 VC-4s) For the old	-

Board	Higher Order Cross-Connect Capacity	Lower Order Cross-Connect Capacity	Access Capacity of a Single Subrack	Remarks
	backplane: 20 Gbit/s (128x128 VC-4s)		backplane: 18.75 Gbit/s (120x120 VC-4s)	

2.1.2 Microwave Capacity

The number of IFSD1 boards that can be configured for different types of the equipment is different. Hence, the number of microwave directions supported by different types of the equipment is also different.

Table 2-2 lists the maximum number of IF boards and the maximum number of microwave directions supported by different types of the equipment.

Table 2-2 Microwave capacity of the equipment

Equipment Type	Maximum Number of Configured IF Boards	Maximum Supported Microwave Capacity (Channel)
OptiX OSN 2500	5	10

2.2 Service

The supported services are SDH services, PDH services and many other services.

2.2.1 Service Type

The OptiX OSN 2500 can process the following types of services : SDH, PDH, Ethernet, RPR, ATM, DDN and SAN/Video services.

For details about the supported types of services, see Table 2-3.

Table 2-3 Types of services supported by the OptiX OSN 2500

Service Type	Description
SDH services	• Standard SDH services: STM-1/STM-4/STM-16 • Standard SDH contiguous concatenation services: VC-4-4c/VC-4-8c/VC-4-16c/AU-3 • Standard SDH virtual concatenation services: VC-4-Xv (X≤64), VC-3-Xv (X≤192), VC-12-Xv (X≤63) • SDH services with FEC: 2.666 Gbit/s

Service Type	Description
PDH services	• E1/T1 service • E3/T3 service • E4 service **NOTE** With the E13/M13 function, the equipment can perform multiplexing and demultiplexing between E1/T1 signals and E3/T3 signals.
Ethernet services	Ethernet service transmission on the platforms of Ethernet over SDH (EoS) and Ethernet over PDH (EoP) • Ethernet private line (EPL) service • Ethernet virtual private line (EVPL) service • Ethernet private LAN (EPLAN) service • Ethernet virtual private LAN (EVPLAN) service
RPR services	• EVPL service • EVPLAN service
ATM services	• Constant bit rate (CBR) service • Real-time variable bit rate (rt-VBR) service • Non real-time variable bit rate (nrt-VBR) service • Unspecified bit rate (UBR) service • Unspecified bit rate plus (UBR+) service
DDN services	• N x 64 kbit/s (N=1-31) service • Framed E1 service
SAN/Video services	• Fiber channel (FC) service • Fiber connection (FICON) service • Enterprise systems connection (ESCON) service • Digital video broadcast - asynchronous serial interface (DVB-ASI) service

2.2.2 Service Access Capacity

The capacity of services that the OptiX OSN 2500 can access varies according to the type and quantity of the configured boards.

Table 2-4 lists the maximum capacity of the OptiX OSN 2500 for accessing different services. The maximum capacity refers to the maximum number of services that is supported, when only one specific type of service is accessed.

Table 2-4 Maximum service access capacity of the OptiX OSN 2500

Service Type	Maximum Number of Services Supported by a Single Subrack
STM-16 standard or concatenated services	9

Service Type	Maximum Number of Services Supported by a Single Subrack
STM-16 (FEC) services	7
STM-4 standard or concatenated services	36
STM-1 standard services	92
STM-1 (electrical) services	34
E4 services	16
E3/T3 services	57
E1 services	252
T1 services	252
FE services	88
GE services	28
STM-4 ATM services	7
STM-1 ATM services	28
ESCON services	20
FICON/FC100 services	9
FC200 services	4
DVB-ASI services	20
N x 64 kbit/s services (N: 1-31)	32
Framed E1 services	32

2.3 Interface

The interfaces include service interfaces, administration and auxiliary interfaces.

2.3.1 Service Interfaces

Service interfaces include the SDH service interfaces, PDH service interfaces and several other service interfaces.

Interface Types

Table 2-5 lists the service interfaces of OptiX OSN 2500.

Table 2-5 Service interfaces of the OptiX OSN 2500.

Interface Type	Description
SDH service interface	STM-1 electrical interfaces: SMB connectors and SAA connectors
	STM-1 optical interfaces: I-1, Ie-1, S-1.1, L-1.1, L-1.2, Ve-1.2
	STM-4 optical interfaces: I-4, S-4.1, L-4.1, L-4.2, Ve-4.2
	STM-16 optical interfaces: I-16, S-16.1, L-16.1, L-16.2, L-16.2Je, V-16.2Je, U-16.2Je (CXL16 does not provide L-16.2Je, V-16.2Je, U-16.2Je optical interfaces)
	STM-16 optical interfaces (FEC): Ue-16.2c, Ue-16.2d, Ue-16.2f
	STM-16 optical interfaces that comply with ITU-T G.692 can output fixed wavelength from 191.1 THz to 196.0 THz.
PDH service interface	75/120-ohm E1 electrical interfaces: DB44 connectors
	100-ohm T1 electrical interfaces: DB44 connectors
	75-ohm E3, T3 and E4 electrical interfaces: SMB connectors
Ethernet service interface	10/100BASE-TX, 100BASE-ZX, 100BASE-VX, 100BASE-LX, 100BASE-FX, 1000BASE-VX, 1000BASE-SX, 1000BASE-LX, 1000BASE-ZX, 1000BASE-T
DDN service interface	RS449, EIA530, EIA530-A, V.35, V.24, X.21, and framed E1 interface
ATM service interface	STM-1 ATM optical interfaces: Ie-1, S-1.1, L-1.1, L-1.2, Ve-1.2
	STM-4 ATM optical interfaces: S-4.1, L-4.1, L-4.2, Ve-4.2
	E3 interfaces: E3 services are accessed by the E3 board
	IMA E1 interfaces: IMA E1 services are accessed by the E1 board
Storage area network (SAN)/Video service interface	FC100, FICON, FC200, ESCON, or DVB-ASI service optical interfaces

📖 **NOTE**

Ue-16.2c, Ue-16.2d, Ue-16.2f, L-16.2Je, V-16.2Je, U-16.2Je, Ve-1.2, and Ve-4.2 are optical technical specifications specified by Huawei.

Optical Module Types

The OptiX OSN 2500 supports SFP, eSFP, and single-fiber bidirectional optical modules.

When the board is equipped with a single-fiber bidirectional optical module, the fiber connected to the optical module can transmit and receive optical signals. Thus, a lot of optical fiber resources are saved.

📖 **NOTE**

In the case of different single-fiber bidirectional optical modules, the transmit or receive wavelengths are different. Thus, the single-fiber directional optical modules at the two ends must be of the same type.

For details about optical modules, see Pluggable Optical Module in *Hardware Description*.

2.3.2 Administration and Auxiliary Interfaces

The equipment provides several types of administration and auxiliary interfaces.

Table 2-6 lists the types of administration and auxiliary interfaces provided by the OptiX OSN 2500.

Table 2-6 Administration and auxiliary interfaces provided by the OptiX OSN 2500

Interface Type	Description
Administration interface	Serial network management/management interface (OAM/F&f)
	Four serial broadcast data interfaces (S1-S4)
	One 64 kbit/s codirectional data path interface (F1)
	One Ethernet interface (10M/100M) for network management (ETH)
	One administration serial interface (F&f)
	One commissioning interface (COM)
Orderwire interface	One orderwire phone interface (PHONE)
	Two SDH NNI voice interfaces (V1 and V2)
	Two SDH NNI signaling interfaces (S1 and S2, used with two broadcast data interfaces)
Clock interface	Two 120-ohm clock input/output interfaces in 2048 kbit/s or 2048 kHz clock mode
	Two 75-ohm clock input interfaces and two clock output interfaces in 2048 kbit/s or 2048 kHz clock mode
	Supports external and line synchronization outputs.
Alarm interface	Four-output interface for the alarm indicators on the cabinet
	Four-input cascading interface for the alarm indicators on the cabinet
	Eight-input and four-output alarm interface
	Four-output alarm cascading interface
Microwave IF interface	One coaxial cable connects to one ODU. Each board provides two cables to separately connect two ODUs.
	Two -48 VDC power input interfaces.

2.4 Networking Topology

The OptiX OSN 2500 supports topologies such as chain, ring, tangent rings, intersecting rings, ring with chain, dual node interconnection (DNI), hub, and mesh at the STM-1/STM-4/STM-16/ level.

The OptiX OSN 2500 supports the separate and hybrid configuration of the following types of NEs:

- Terminal multiplexer (TM)
- Add/drop multiplexer (ADM)
- Multiple add/drop multiplexer (MADM)

The OptiX OSN 2500 can be interconnected with Huawei OSN, DWDM, and Metro equipment series, to provide a complete transmission network solution.

- The OptiX OSN 2500 can be used with another OptiX OSN equipment to provide a complete ASON solution. This solution covers all the layers including the backbone layer, the convergence layer, and the access layer.
- Through an SDH interface or a GE interface, the OptiX OSN 2500 can be interconnected with the WDM equipment.
- Through an SDH, PDH, Ethernet, ATM, or DDN interface, the OptiX OSN 2500 can be interconnected with the OptiX Metro equipment.

2.5 Protection

The equipment provides equipment level protection and network level protection.

2.5.1 Equipment Level Protection

The OptiX OSN 2500 supports several equipment level protection schemes.

Table 2-7 shows the equipment level protection provided by the OptiX OSN 2500.

Table 2-7 Equipment level protection

Object Protected	Protection Scheme
PDH	TPS
DDN	TPS
Ethernet processing unit	TPS/PPS/BPS/LAG/DLAG hot backup
ATM	1+1 hot backup
Cross-connect and timing unit	1+1 hot backup
SCC unit	1+1 hot backup
Arbitrary bit rate wavelength conversion	Intra-board protection (dual fed and

Object Protected	Protection Scheme
unit	selective receiving) and inter-board protection (1+1 hot backup)
Protection for the Microwave unit	1+1 HSB/FD/SD and N+1 backup
power interface unit	1+1 hot backup, 1:N centralized backup
Intelligent Fans unit	The power supply modules are of mutual backup for the two fan modules.
Board Under Abnormal Conditions	Power-Down Protection During Software Loading, Overvoltage or Undervoltage Protection for Power Supply and Board Temperature Detection
NOTE The OptiX OSN 2500 supports the coexistence of two different service types of TPS protection groups.	

2.5.2 Network Level Protection

The OptiX OSN 2500 supports several network level protection schemes.

Table 2-8 lists the network level protection schemes supported by the OptiX OSN 2500.

Table 2-8 Network level protection schemes supported by the OptiX OSN 2500

Network Level Protection	Protection Scheme
SDH protection	Linear MSP
	MSP ring
	Subnetwork connection protection (SNCP), subnetwork connection multi-protection (SNCMP) and subnetwork connection tunnel protection (SNCTP)
	Dual-node interconnection (DNI) protection
	Fiber-shared virtual trail protection
	Optical-path-shared MSP
Ethernet protection	Resilient packet ring (RPR) protection
	Link capacity adjustment scheme (LCAS) protection
	Link state pass through (LPT) protection
	SPT/RSTP protection
	Multiple spanning tree protocol (MSTP) protection
ATM protection	VP-Ring/VC-Ring protection

2.6 Board REG Function

The OptiX OSN 2500 supports the REG function.

The OptiX OSN 2500 supports the hybrid application of ADM and REG. See Figure 2-1.

Figure 2-1 Hybrid application of ADM and REG
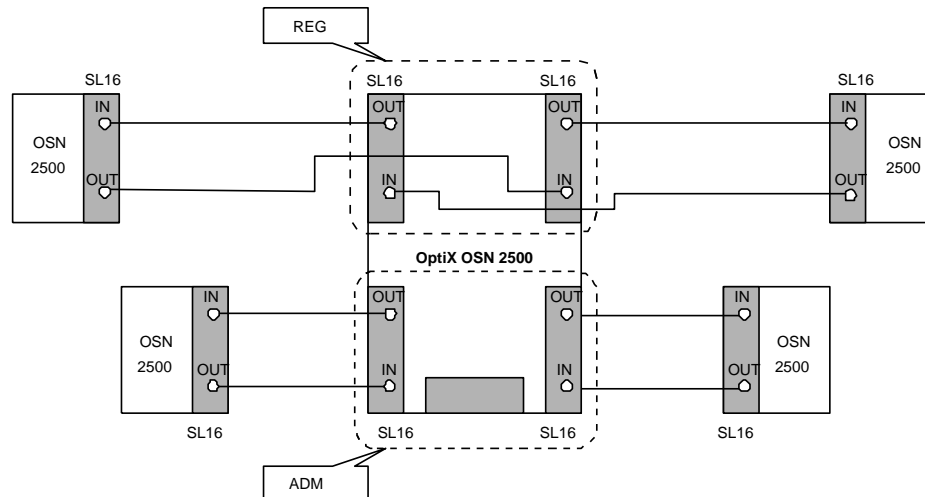
For the information about valid slots and optical interfaces supported by the board, see SDH Processing Boards.

2.7 ASON Features

The OptiX OSN 2500 provides a set of stand-alone ASON software system to realize the intelligent management of services and bandwidth resources.

The ASON features of the OptiX OSN 2500 are as follows:

- Supports automatic end-to-end service configuration.
- Supports service level agreement (SLA).
- Supports mesh networking, mesh protection, and shared mesh restoration trails.
- Provides traffic engineering control to realize traffic balance across the network and improve the bandwidth utilization.
- Provides distributed mesh protection including real-time rerouting and pre-configuration.
- Supports end-to-end service protection, improving the scalability of the network.

📖 **NOTE**

The ASON software can be enabled or disabled on the OptiX OSN 2500 as required. If the ASON software is not enabled, the OptiX OSN 2500 does not support the ASON features described in this document.

2.8 Built-in WDM Technology

The equipment supports a built-in WDM technology, which enables the transmission of several wavelengths in one fiber.

The OptiX OSN 2500 provides the built-in WDM technology. The functions of the equipment are as follows:

- Any four adjacent standard DWDM wavelengths that comply with ITU-T G.694.1 can be added or dropped.

- Supports standard CWDM wavelengths, which can be multiplexed or demultiplexed.

- The optical terminal multiplexer (OTM) or the optical add/drop multiplexer (OADM) station that adds or drops four wavelengths is supported. Concatenation is supported, and thus multiple waves can be added or dropped.

- The conversion between client-side signal wavelengths and ITU-T G.692 compliant standard wavelengths is supported. During the conversion, all the signals are transparently transmitted.

- Intermediate ports are provided for expansion. When intermediate ports are cascaded with other OADM boards, the expansion of add/drop channels is realized.

- Supports the STM-16 high-density colored optical interface, which realizes the direct interconnection between the equipment and the optical multiplexer equipment. Thus, the optical fiber resources are saved.

- Supports the 10 Gbit/s DWDM wavelength-tunable optical interface.

- Supports the remote optical pumping amplifier (ROPA) system to transmit signals over a long distance.

- Supports the remote optical pumping amplifier (ROPA) system to transmit signals over a long distance.

- Supports the intelligent power adjustment (IPA) function.

2.9 Microwave Technology

The OptiX OSN 2500 supports the built-in microwave boards of intermediate frequency. It can work with the outdoor unit (ODU) of the OptiX RTN 600 to achieve wireless service transmission.

In the case of the OptiX OSN 2500, the service signals are transmitted on the basis of the microwave transmission flow shown in Figure 2-2.

Figure 2-2 Processing flow of the service signals
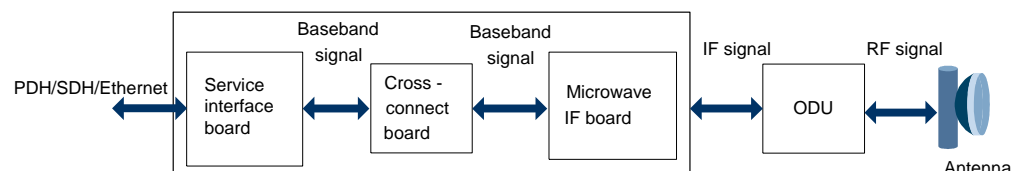
The OptiX OSN 2500 supports the following microwave functions:

- Software programmed radio (SPR) function. The microwave capacity and modulation mode can be set through software.

- Microwave frames based on TU and STM-1. The air interface is used for the product to interconnect with the other OptiX OSN products that adopt the microwave frames based on TU and STM-1 or to interconnect with the OptiX RTN 600.

- HP ODU (that is, standard power ODU) and SP ODU (that is, high power ODU).

- 1+1 protection and N+1 protection.

- Microwave lower order SNCP.

- Automatic transmit power control (ATPC) function.

2.10 Access of AC Power Supply

An uninterrupted power module (UPM) system supports the access of the 110 V/220 V power, and converts 110 V/220 V AC power into -48 V DC power to supply power to the equipment.

The output power of a single EPS75-4815AF power system is 1700 W. The EPS75-4815AF power system is 3U high. Figure 2-3 shows the appearance of the EPS75-4815AF power system.

Figure 2-3 Appearance of the EPS75-4815AF power system

The UPM power box can be directly installed in the 19-inch cabinet or the ETSI cabinet.

The storage batteries of the UPM work with one EPS75-4815AF power system. When the external AC power system supplies power normally, the batteries store power. When the 110 V/220 V AC power supply is interrupted, the batteries can supply power for 3 to 4 hours. To supply power to the OptiX OSN equipment, only one power system is required to be connected to the batteries.

The standard maximum configuration of each EPS75-4815AF power system includes five rectifier modules and one monitoring module.

☐ **NOTE**

The batteries do not belong to the EPS75-4815AF. Hence, the batteries need to be configured separately. If the batteries are required, a battery cabinet is provided generally or a dedicated space in the equipment cabinet is reserved for the batteries.

Table 2-9 provide the functions and features of the UPM.

Table 2-9 Functions and features of the EPS75-4815AF power system

Function and Feature	EPS75-4815AF
Hot-swappable function	The AC/DC rectifier module of the UPM is hot-swappable. When you replace a faulty rectifier module, the other rectifier module can still work normally. Therefore, the maintainability of the system is improved.
Storage battery protection function	The UPM provides the storage battery protection function. When the mains supply is interrupted, the power system of the equipment automatically switches to the storage battery, which ensures that the equipment operates normally. The battery module provides a capacity of 40 to 500 Ah. The default capacity is 65 Ah.
Loading capacity	The loading capability of each rectifier module is 800 W.
Lightning-proof function	The rectifier module is embedded with the lightning-proof protector. The rectifier module can bear ±5 lightning-simulated surges with an 8/20 µs current waveform at the amplitude of 5 kA. When the lightning current enters the rectifier module along with the power cable, install category-C and category-B light arresters before you connect the AC mains supply to the power system to prevent the overvoltage caused by the direct lightning strike from damaging the rectifier module.

2.11 Synchronization

The The OptiX OSN 2500 only supports the traditional clock synchronization.

2.12 OAM Information Interworking

The OptiX OSN 2500 supports OAM information interworking.

Any of the following methods can be adopted for the OptiX OSN 2500 to transparently transmit the OAM information of the third-party equipment, or for the third-party equipment to transparently transmit the OAM information of the OptiX OSN 2500.

- HWECC
- IP over DCC
- OSI over DCC

- DCC transparent transmission through 2 Mbit/s external clock interfaces

📖 NOTE

The OptiX OSN equipment supports ECC ping and traceroute functions for fast locating of faults on ECC channels.

Table 2-10 lists the DCC resource allocation modes supported by the OptiX OSN 2500.

Table 2-10 DCC allocation modes of the OptiX OSN 2500

DCC Allocation		Q2CXL	Q3CXL	Q5CXL
Channel type		Supports the D1-D1, D1-D3 and D4-D12 channel types.		
Operation mode	Mode 1	Supports 40 D1-D3 channels.	Supports 80 D1-D3 channels.	Supports 40 D1-D3 channels.
	Mode 2	Supports 10 D1-D3 channels. Supports 10 D4-D12 channels.	Supports 20 D1-D3 channels. Supports 20 D4-D12 channels.	Supports 10 D1-D3 channels. Supports 10 D4-D12 channels.
	Mode 3	Supports 22 D1-D3 channels. Supports 6 D4-D12 channels.	Supports 44 D1-D3 channels. Supports 12 D4-D12 channels.	Supports 22 D1-D3 channels. Supports 6 D4-D12 channels.
	Mode 4	Supports 28 D1-D3 channels. Supports 4 D4-D12 channels.	Supports 32 D1-D3 channels.	Supports 28 D1-D3 channels. Supports 4 D4-D12 channels.
	Mode 5	Supports 12 D1-D1 channels. Supports 36 D1-D3 channels.	Supports 12 D1-D1 channels. Supports 76 D1-D3 channels.	Supports 12 D1-D1 channels. Supports 36 D1-D3 channels.
	Mode 6	Supports 12 D1-D1 channels. Supports 12 D1-D3 channels. Supports 8 D4-D12 channels.	Supports 12 D1-D1 channels. Supports 22 D1-D3 channels. Supports 18 D4-D12 channels.	Supports 12 D1-D1 channels. Supports 12 D1-D3 channels. Supports 8 D4-D12 channels.
Protocol type		Supports HWECC, IP, and OSI protocols.		
Default mode		Mode 1		

The Q3CXL, Q5CXL board can also provide two 2 Mbit/s external clock interfaces, which can be used to transparently transmit DCC information.

2.13 OAM

The OptiX OSN 2500 provides the OAM functions at the equipment layer and network layer.

The OptiX OSN 2500 provides the following OAM functions at the equipment layer:

- Alarm and performance management: supports the reporting of alarms and performance events. The user can discover and locate the faults on the equipment and on the network in a timely manner.

- Laser and optical power management: supports the optical power management at the SDH optical interface and the automatic laser shutdown (ALS) function.

- Fault locating and equipment maintenance: provides multiple maintenance measures such as PRBS, ETH-OAM, and TCM. The user can monitor, debug, troubleshoot the equipment conveniently.

- Expansion and upgrade: supports the network expansion through board replacement. Supports the in-service software upgrade by using the simulation package loading, diffusion loading, and hot patch loading methods.

The OAM functions provided by the OptiX OSN 2500 at the network layer can be realized by using the NMS.

2.14 License

The product of this version is released with a license. That is, customers can obtain corresponding rights committed by the supplier based on the license certificate.

After you purchase the license, you need to load or update the license file.

- At the deployment phase: You can configure or use the new features of this version only after the license file of this version is loaded.

- At the maintenance phase: You can query the license status and use period on the NMS; you need to apply for a new license after the SCC boards are replaced; the services with the features controlled can be queried and deleted but cannot be added, modified, or enabled after the licence expires; you need to purchase a new license if the features that you purchase are increased.

If the SCC boards are replaced, the equipment serial number (ESN) of the license will be changed, and the license continues to be valid but will expire after 60 days. During the 60-day period, the functions of the license are fully provided, but a warning will be displayed, prompting you to apply for a new license. Therefore, after the working SCC boards are replaced, it is recommended that you immediately apply for a new license and load the license file onto the SCC boards.

In the case of the license of this version, the features are not controlled. Therefore, you can use all the features supported by this version after you obtain the authorization of this license.

 NOTE

By default, the version license function is disabled.

2.15 Security Management

The NMS uses many schemes to ensure the security of the OptiX OSN 2500 NE.

- Authentication Management

- Authorization Management

- Network Security Management

- System Security Management

- Log Management

For the details of security management, refer to the *Security Management*.

3 Hardware

About This Chapter

The equipment can house several types of boards and can reside in several types of cabinets.

3.1 Cabinet

The OptiX OSN 2500 can be installed in an ETSI cabinet or a 19-inch standard cabinet.

3.2 Subrack

The subrack consists of slots and boards that can be configured.

3.2.1 Structure

The OptiX OSN 2500 subrack has a one-layer structure. The subrack consists of the processing board area, interface board area, auxiliary interface area, power supply area, and fan area.

Figure 3-1 shows the structure of the OptiX OSN 2500 subrack.

Figure 3-1 Structure of the OptiX OSN 2500 subrack
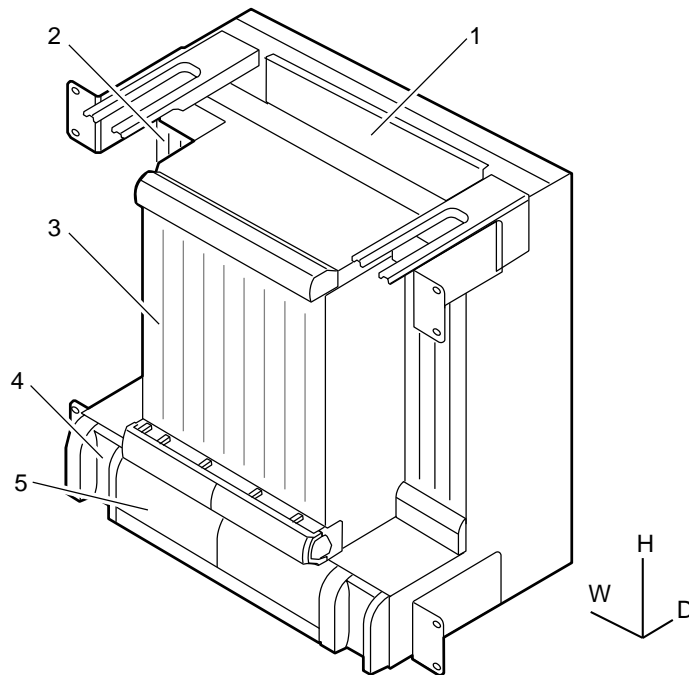
1. Auxiliary interface area	2. Interface board area
3. Processing board area	4. Power supply area
5. Fan area	

The functions of the areas are as follows:

- Auxiliary interface area: This area provides the alarm interfaces, orderwire phone interface, management and maintenance interfaces, and clock interfaces.

- Interface board area: This area houses the tributary interface boards and Ethernet interface boards of the OptiX OSN 2500.

- Processing board area: These areas house the line signal processing boards, tributary signal processing boards, Ethernet signal processing boards, auxiliary processing boards, and SCC unit, cross-connect unit, and line unit integrated boards of the OptiX OSN 2500.

- Fan area: This area houses two fan modules, which dissipate heat generated by the equipment.

- Power supply area: This area houses two PIUs, which are used to supply power to the subrack.

📖 **NOTE**

If a label that contains "Enhanced Subrack" is affixed to the equipment, it indicates that the subrack uses a backplane of the later version.

📖 **NOTE**

The interface board is also called the access board or transit board. The interface board provides physical interfaces for optical signals and electrical signals, and transmits the optical signals or electrical signals to the corresponding processing board.

3.3 Boards

The equipment supports different types of boards.

3.3.1 Classification of the Boards

The boards are classified into SDH boards, PDH boards, data boards, WDM boards, and auxiliary boards according to the functions of the boards.

SDH Boards

📖 NOTE

For details on the board version replacement relationship between boards, see Board Version Replacement in the *Hardware Description*.

The OptiX OSN 2500 supports the SDH boards that operate at the STM-16, STM-4, and STM-1 rates.

Table 3-1 lists the SDH boards that the OptiX OSN 2500 supports.

Table 3-1 SDH boards that the OptiX OSN 2500 supports

Board	Description	Board	Description
N1SL16, N2SL16, N3SL16	1xSTM-16 optical interface board	N1SLQ1, N2SLQ1	4xSTM-1 optical interface board
N1SL16A, N2SL16A, N3SL16A	1xSTM-16 optical interface board	N1SLQ1A	4xSTM-1 optical interface board
N1SF16	1xSTM-16 optical interface board with the out-band forward error correction (FEC) function	R1SLQ1	4xSTM-1 optical interface board (divided slot)
N1SL4, N2SL4, N1SL4A	1xSTM-4 optical interface board	N1SL1, N2SL1	1xSTM-1 optical interface board
R1SL4	1xSTM-4 optical interface board (divided slot)	N1SL1A	
N1SLQ4, N2SLQ4, N1SLQ4A	4xSTM-4 optical interface board	R1SL1	1xSTM-1 optical interface board (divided slot)
N1SLD4, N2SLD4, N1SLD4A	2xSTM-4 optical interface board	N1SEP1	2xSTM-1 line processing board when the interfaces are available on the front panel 8xSTM-1 line processing board when the interfaces are available on the corresponding interface board

Board	Description	Board	Description
R1SLD4	2xSTM-4 optical interface board (divided slot)	N2SLO1, N3SLO1	8xSTM-1 optical interface board
N1SLT1	12xSTM-1 optical interface board	N3SLQ41	4xSTM-4/STM-1 optical interface board
N1OU08	8xSTM-1 optical/ electrical interface board (LC)	N2OU08	8xSTM-1 optical interface board (SC)
N1EU04	4xSTM-1 electrical interface board	N1EU08	8xSTM-1 electrical interface board

PDH Boards

The OptiX OSN 2500 supports the PDH boards that operate at different rates and have different impedances.

Table 3-2 lists the PDH boards that the OptiX OSN 2500 supports.

Table 3-2 PDH boards that the OptiX OSN 2500 supports

Board	Description	Board	Description
R1PD1, R2PD1	32xE1 service processing board	N1PD3, N2PD3	6xE3/T3 service processing board
N1PQ1, N2PQ1	63xE1 service processing board	N2PQ3	12xE3/T3 service processing board
N1PQM	63xE1/T1 service processing board	N1DX1	DDN service accessing and converging board
N1PL3, N2PL3	3xE3/T3 service processing board	N1DXA	DDN service converging and processing board
N1PL3A	3xE3/T3 service processing board (The interfaces are available on the front panel.)	N1SPQ4, N2SPQ4	4xE4/STM-1 electrical processing board
N2PL3A	3xE3/T3 service processing board (The interfaces are available on the front panel.)	N1MU04	4xE4/STM-1 electrical interface board
N1D75S	32xE1 switching access board (75 ohms)	N1D34S	6xE3/T3 switching access board
N1C34S	3xE3/T3 switching access board	N1D12S	32xE1/T1 switching access board (120 ohms)
N1D12B	32xE1/T1 access board (120 ohms)	N1DM12	DDN service interface board
N1TSB4	4-channel electrical interface protection switching board	N1TSB8	8-channel electrical interface protection switching board

EoS/EoP Boards

The OptiX OSN 2500 supports EoS boards with the transparent transmission and switching functions.

Table 3-3 lists the EoS/EoP Boards that the OptiX OSN 2500 supports.

Table 3-3 EoS/EoP Boards that the OptiX OSN 2500 supports

Board	Description	Board	Description
R1EFT4	4xFE transparent transmission board (divided slot)	N1EMS4	4xGE and 16xFE transparent transmission and converging board
N1EFT8, N2EFT8	8xFE or 16xFE transparent transmission board	N1EMS2	2xGE and 16xFE transparent transmission and converging board
N1EFT8A, N2EFT8A	8xFE transparent transmission board	N1EGT2, N2EGT2	2xGE transparent transmission board
N1EFS0, N2EFS0, N4EFS0, N5EFS0	8xFE switching and processing board	N1EFS0A	16xFE switching and processing board
N1EFS4, N2EFS4, N3EFS4	4xFE switching and processing board	N1EGS4, N3EGS4, N4EGS4	4xGE switching and processing board
N2EGS2, N3EGS2	2xGE switching and processing board	N1MST4	4-port multi-service transparent transmission board
N1EFF8, N1EFF8A	8x100M Ethernet optical interface board	N1ETF8, N1ETF8A	8x100M Ethernet twisted pair interface board
N1ETS8	8x10/100M Ethernet twisted pair interface switching board	-	-
N1EFP0	8-port PDH-based Ethernet switching and processing board	-	-

ATM Boards

The OptiX OSN 2500 supports multiple ATM boards.

Table 3-4 lists the ATM boards that the OptiX OSN 2500 supports.

Table 3-4 ATM boards that the OptiX OSN 2500 supports

Board	Description	Board	Description
N1ADQ1	4xSTM-1 ATM service processing board	N1ADL4	1xSTM-4 ATM service processing board
N1IDQ1, N1IDQ1A	4xSTM-1 ATM service processing board	N1IDL4, N1IDL4A	1xSTM-4 ATM service processing board

RPR Boards

The OptiX OSN 2500 supports multiple RPR boards.

Table 3-5 lists the RPR Boards that the OptiX OSN 2500 supports.

Table 3-5 RPR Boards that the OptiX OSN 2500 supports

Board	Description	Board	Description
N2EGR2	2xGE ring processing board	N2EMR0	12xFE and 1xGE ring processing board

Cross-Connect Boards and System Control Boards

The OptiX OSN 2500 supports the SCC unit, cross-connect unit, and line unit integrated boards that are at different rates.

Table 3-6 lists the SCC unit, cross-connect unit, and line unit integrated boards that the OptiX OSN 2500 supports.

Table 3-6 SCC unit, cross-connect unit, and line unit integrated boards that the OptiX OSN 2500 supports

Board	Description
Q2CXL1, Q3CXL1	1xSTM-1 SCC unit, cross-connect unit, timing unit, and line unit integrated board
Q2CXL4, Q3CXL4	1xSTM-4 SCC unit, cross-connect unit, timing unit, and line unit integrated board
Q2CXL16, Q3CXL16	1xSTM-16 SCC unit, cross-connect unit, timing unit, and line unit integrated board
Q5CXLLN	1xSTM-16/STM-4/STM-1 SCC unit, cross-connect unit, timing unit, and line unit integrated board
Q5CXLQ41	4xSTM-4/STM-1 SCC unit, cross-connect unit, timing unit, and line unit integrated board

Auxiliary Boards

The OptiX OSN 2500 supports auxiliary boards such as the system auxiliary interface board and fan board.

Table 3-7 lists the auxiliary boards that the OptiX OSN 2500 supports.

Table 3-7 Auxiliary boards that the OptiX OSN 2500 supports

Board	Description	Board	Description
Q1SAP, Q2SAP	System auxiliary processing unit	N1FAN	Fan board
Q1SEI	Signal extended interface board	-	-

WDM Boards

The OptiX OSN 2500 supports WDM boards such as the optical add/drop multiplexing board and optical amplifier board.

Table 3-8 lists the WDM boards the OptiX OSN 2500 supports.

Table 3-8 WDM boards the OptiX OSN 2500 supports

Board	Description	Board	Description
TN11CMR2	2-channel optical add/drop multiplexing board	N1MR2B	2-channel optical add/drop multiplexing board
TN11CMR4	4-channel optical add/drop multiplexing board	N1MR2C	2-channel optical add/drop multiplexing board
TN11MR2	2-channel optical add/drop multiplexing board	N1LWX	Arbitrary bit rate wavelength conversion board
TN11MR4	4-channel optical add/drop multiplexing board	TN11OBU1	Optical booster amplifier board
N1MR2A	2-channel optical add/drop multiplexing board	N1FIB	Filter isolating board

Microwave Boards

The OptiX OSN 2500 supports microwave boards such as the microwave IF board and microwave power board.

Table 3-9 lists the microwave boards that the OptiX OSN 2500 supports.

Table 3-9 Microwave boards that the OptiX OSN 2500 supports

Board	Description
N1IFSD1	Dual-port IF board
N1RPWR	6-channel ODU power board

Optical Amplifier Boards and Dispersion Compensation Boards

The OptiX OSN 2500 supports multiple optical amplifier boards.

Table 3-10 lists the optical amplifier boards that the OptiX OSN 2500 supports.

Table 3-10 Optical amplifier boards that the OptiX OSN 2500 supports

Board	Full Name	Board	Full Name
N1BPA, N2BPA	Optical booster and pre-amplifier board	N1RPC01	Forward Raman driving board (external)
N1BA2	Optical booster amplifier board	N1RPC02	Backward Raman driving board (external)
N1COA, 61COA, 62COA	Case-shaped optical amplifier	-	-

Power Boards

The OptiX OSN 2500 supports power boards such as the UPM and power interface board.

Table 3-11 lists the power boards that the OptiX OSN 2500 supports.

Table 3-11 Power boards that the OptiX OSN 2500 supports

Board	Description
UPM	Uninterruptible power module
Q1PIU and Q1PIUA	Power interface board

4 Technical Specifications

About This Chapter

The technical specifications provide the specifications of the optical interfaces, electrical interfaces and environment.

The overall specifications of the equipment include the packet switching capability, TDM cross-connect capability, specifications of the cabinet, specifications of the subrack, power supply parameters, laser safety class, electromagnetic compatibility (EMC), and environmental specifications.

This section lists the power consumption and weight of each board of the OptiX OSN series equipment.

4.1 Overall Specifications of the Equipment

The overall specifications of the equipment include the packet switching capability, TDM cross-connect capability, specifications of the cabinet, specifications of the subrack, power supply parameters, laser safety class, electromagnetic compatibility (EMC), and environmental specifications.

4.1.1 Specifications of the Cabinet

The technical specifications of the cabinet include the dimensions, weight, number of permitted subracks, and PDU.

Table 4-1 lists the technical specifications of the ETSI cabinet.

Table 4-1 Technical specifications of the ETSI cabinet

Dimensions (mm)	Weight (kg)	Number of Permitted Subracks
600 (W) x 300 (D) x 2000 (H) (T63)	58	2

Dimensions (mm)	Weight (kg)	Number of Permitted Subracks
600 (W) x 300 (D) x 2000 (H) (N63E)	41	2
600 (W) x 600 (D) x 2000 (H) (N66T)	71	2
600 (W) x 600 (D) x 2000 (H) (T66)	80	2
600 (W) x 300 (D) x 2200 (H) (T63)	63	3
600 (W) x 300 (D) x 2200 (H) (N63E)	45	3
600 (W) x 600 (D) x 2200 (H) (N66T)	76	3
600 (W) x 600 (D) x 2200 (H) (T66)	85	3
600 (W) x 300 (D) x 2600 (H) (T63)	73	4
600 (W) x 600 (D) x 2600 (H) (T66)	101	4

NOTE

Both the N63E cabinet and N66T cabinet are available in two heights, namely, 2000 mm and 2200 mm. If the cabinet that is 2600 mm high is required, add an enclosure frame that is 400 mm high on a cabinet that is 2200 mm high.

The DC power distribution unit (PDU) is located on the top of a cabinet and is used to provide power to the equipment. Table 4-2 lists the technical specifications of the PDU.

Table 4-2 Technical specifications of the PDU

Board	Dimensions (mm)	Single-Cabinet Input Voltage (V)	Single-Cabinet Output Voltage (V)	Output Current (A)
N1PDU	530 (W) x 97 (D) x 133 (H)	-48 (DC)	-38.4 to -57.6	• 4x20 A • 4x32 A
		-60 (DC)	-48 to -72	

NOTE
- Two power inputs that back up each other need to be provided, and they work in load-sharing mode.
- In the telecommunications room, it is required that the PDU needs to provide power supply for an entire subrack. In this case, normal power supply can be guaranteed when either of the power inputs fails.

📖 **NOTE**

The number of subracks that a cabinet can house is determined by the subrack power consumption and the number of PDU inputs/outputs.

4.1.2 Specifications of the Subrack

The technical specifications of the subrack include the dimensions, weight, and maximum power consumption.

Table 4-3 lists the technical specifications of the OptiX OSN 2500 subrack.

Table 4-3 Technical specifications of the OptiX OSN 2500 subrack

Dimensions (mm)	Weight (kg)
447 (W) x 295 (D) x 472 (H)	17 (net weight of the subrack that is not installed with boards or fans)

Table 4-4 lists the maximum power consumption of the OptiX OSN 2500 subrack.

Table 4-4 Maximum power consumption of the OptiX OSN 2500 subrack

Subrack Type	Maximum Power Consumption[a]	Fuse Capacity	Typical Configuration	
			Typical Power Consumption	Typical Configuration
General OptiX OSN 2500 subrack	400 W	15 A	222 W	• One Q2SAP board • Two Q2CXL16 (S-16.1, LC) boards • Two N1SL4A (S-4.1, LC) boards • One N1SLQ1A (S-1.1, LC) board • Two N2PQ1 boards • One N1EFT8A board • Two Q1PIU boards
Enhanced OptiX OSN 2500 subrack	650 W	20 A	313 W	• One Q2SAP board • Two Q2CXL16 (S-16.1, LC) boards • Two N1SL4A (S-4.1, LC) boards • Two N2PQ1 boards • Four N4EGS4 boards • Two Q1PIUA boards
a: The maximum power consumption refers to the maximum power consumption configuration that the subrack can support and the maximum heat dissipation capability of				

Subrack Type	Maximum Power Consumption[a]	Fuse Capacity	Typical Configuration	
			Typical Power Consumption	Typical Configuration
the subrack. In the actual application, the value is much higher than the power consumption of the subrack in typical configuration.				

📖 **NOTE**

When the cabinet is fully loaded, the maximum power consumption is the sum of the maximum power consumption of all subracks and the maximum power consumption of other configuration.

In the case of transmission equipment, power consumption is generally transformed into heat consumption. Hence, heat consumption (BTU/h) and power consumption (W) can be converted to each other in the formula: Heat consumption (BTU/h) = Power consumption (W) / 0.2931 (Wh).

Table 4-5 lists the predicted reliability specifications of the OptiX OSN equipment.

Table 4-5 Equipment predicted reliability

System Availability	Mean Time to Repair (MTTR)	Mean Time Between Failures (MTBF)
0.9999967	2 hours	69.64 years

4.1.3 Power Supply Parameters

This section describes the parameters for the equipment.

Table 4-6 lists the power supply parameters.

Table 4-6 Power supply parameters

Item	Specification
Power supply mode	DC power supply
Nominal voltage	-48 V or -60 V
Voltage range	-38.4 V to -57.6 V or -48 V to -72 V
Maximum current	15 A/20 A[a]
a: This value indicates the maximum current of the equipment when the enhanced subrack (650 W) is used.	

4.2 Power Consumption and Weight of Each Board

This section lists the power consumption and weight of each board of the OptiX OSN series equipment.

lists the power consumption and weight of each board.

Table 4-7 Power consumption and weight of each board

Board	Power Consumption (W)	Weight (kg)	Board	Power Consumption (W)	Weight (kg)
SDH boards					
N1SLQ41	12	0.6	N1SLD4	17	0.6
N1SF64A	33(the OptiX OSN 3500/3500 II supports) 26(the OptiX OSN 7500 supports)	1.1	N2SLD4	15	1.0
N1SF64	33(the OptiX OSN 3500/3500 II/2500 REG supports) 26(the OptiX OSN 7500 supports)	1.1	R1SLD4	11	0.5
N1SL64A	40	1.1	N1SL4A	17	0.6
N1SL64	30(the OptiX OSN 3500/3500 II/2500 REG supports) 22(the OptiX OSN 7500 supports)	1.1	N1SL4	17	0.6
N2SL64	32	1.1	N2SL4	15	1.0
T2SL64	40	1.1	R1SL4	10	0.5
N1SF16	26	1.1	R3SL4	11	0.5
N1SLO16	38	1.0	N1SEP1	17	1.0
N1SLQ16	20	0.9	N1SLH1	27	1.0
N2SLQ16	35	1.3	N1SLT1	22	1.3
N1SLD16	23	0.9	N2SLO1	26	1.1
N1SL16A	20	0.6	N3SLO1	20	1.2

Board	Power Consumption (W)	Weight (kg)	Board	Power Consumption (W)	Weight (kg)
N2SL16A	20	1.1	N1SLQ1A	15	1.0
N3SL16A	22	0.9	N1SLQ1	15	1.0
N1SL16	19	1.1	N2SLQ1	15	1.0
N2SL16	19	1.1	R1SLQ1	12	0.4
N3SL16	22	1.1	N1SL1A	17	0.6
N1SLQ4A	17	1.0	N1SL1	17	0.6
N1SLQ4	17	1.0	N2SL1	14	1.0
N2SLQ4	16	1.0	R1SL1	10	0.3
N1SLD4A	17	0.6	R3SL1	11	0.3
T2SL64A	40	1.1	N3SLQ41	16	0.7
N1EU08	11	0.4	N1EU04	6	0.4
N1OU08	6	0.4	N2OU08	6	0.4
N4SLD64	20	1.2	N4SFD64	37	1.1
N4SLO16	21	1.0	N4SL64	15(the OptiX OSN 3500/3500 II supports) 14(the OptiX OSN 7500 supports)	1.1
N4SLQ16	12	0.7	N4SF64	26(the OptiX OSN 3500/3500 II supports) 25(the OptiX OSN 7500 supports)	1.2
N3SLH41	49	1.5	N1SLD64	41	1.2
R3SL1	11	0.2	R3SL4	11	0.6
PDH boards					
N1SPQ4	24	0.9	N2PL3	12	0.9
N2SPQ4	24	0.9	N1PQM	22	1.0
N1DXA	10	0.8	N1PQ1	19	1.0
N1DX1	15	1.0	N2PQ1	13	1.0
N1PQ3	13	0.9	R1PD1	15	0.6

Board	Power Consumption (W)	Weight (kg)	Board	Power Consumption (W)	Weight (kg)
N1PD3	19	1.1	R2PD1	15	0.6
N2PD3	12	1.1	R3PD1	8	0.4
N1PL3A	15	1.0	N1PL1	7	0.5
N2PL3A	12	0.9	R1PL1	7	0.5
N1PL3	15	1.0	N2PQ3	13	0.9
N1DM12	0	0.4	N1TSB8	0	0.3
N1TSB4	3	0.3	N1MU04	2	0.4
N1C34S	0	0.3	R1L12S	5	0.3
N1D34S	0	0.4	N1D12B	0	0.3
N1D75S	0	0.4	N1L75S	3	0.3
N1D12S	0	0.4	-	-	-
Data boards					
N1MST4	26	0.9	N2EFS4	30	1.0
N1IDQ1	41	1.0	N3EFS4	18	0.6
N1IDL4	41	1.0	N1EFS0A	32	0.7
N1ADQ1	41	1.0	N1EFS0	35	1.0
N1ADL4	41	0.9	N2EFS0	35	1.0
N1EAS2	70	1.2	N4EFS0	35	1.0
N1EMR0	47	1.2	N5EFS0	22	0.6
N2EGR2	40	1.1	N1EGT2	29	0.9
N1EGS4A	53	1.1	N2EGT2	15	0.9
N1EGS4	70	1.1	N1EFT8A	26	1.0
N3EGS4	70	1.1	N1EFT8	26	1.0
N4EGS4	34	0.7	N1EFT4	14	0.5
N1EMS4	65	1.1	N1EFT8	26	1.0
N1EMS2	40	0.8	N1EFT4	14	0.5
N2EGS2	43	1.0	R1EFT4	14	0.5
N3EGS2	25	0.6	N2EMR0	50	1.2
N1EFS4	30	1.0	N1ETF8A	11	0.4

Board	Power Consumption (W)	Weight (kg)	Board	Power Consumption (W)	Weight (kg)
N1ETS8	0	0.4	N1EFF8A	15	0.4
N1EFP0	22	0.6	N2EFT8A	26	1.0
N1EGSH	82	1.2	N2EFT8	26	1.0
N1EFF8	6	0.4	N1ETF8	2	0.4
N3EAS2	Room temperature (25°C): 83	1.1	N1IDL4A	46	1.5
Microwave boards					
N1IFSD1	24	1.1	N1RPWR	45	1.4
WDM boards					
N1FIB	0	0.4	N1MR2B	0	1.0
N1MR2A	0	1.0	N1MR2	0	0.9
N1LWX	30	1.1	N1CMR4	0	0.9
N1MR4	0	0.9	N1CMR2	0	0.8
N1MR2C	0	1.0	-	-	-
Cross-Connect and system control boards					
N1CRG	12	0.9	T1EXCSA	53	1.9
N1XCE	25	1.5	N1EXCSA	62	2.0
N1IXCSB	94	0.8	T1GXCSA	41	1.8
T1IXCSA	140	2.4	N1GXCSA	27	1.8
N1IXCSA	94	2.1	R1CXLQ41	48	1.0
N1SXCSB	63	1.8	Q6CXLQ41	48	1.5
T1SXCSA	96	2.2	R1CXLD41	48	1.0
N1SXCSA	63	2.0	R1CXLLN	48	1.0
N1UXCSB	65	2.0	Q6CXLLN	48	1.5
T1UXCSA T2UXCSA	69	2.1	Q2CXL16	40	1.1
N1UXCSA	65	2.0	Q3CXL16	46	1.2
Q2CXL1	40	1.1	Q2CXL4	40	1.1

Board	Power Consumption (W)	Weight (kg)	Board	Power Consumption (W)	Weight (kg)
Q3CXL1	46	1.1	Q3CXL4	46	1.2
R2CXLLN R2CXLQ41	28	1.0	Q5CXLLN Q5CXLQ41	32	1.0
N2PSXCSA	80	1.2	-	-	-
N1GSCC	10	0.9	N2GSCC	20	0.9
N3GSCC	20	0.9	N1FXCSA	107	1.6
T1PSXCSA	95	1.4	N4GSCC	19	1.0
Auxiliary boards					
N1FANA	19	1.2	R1AMU	8	0.5
XE1FAN	16	1.5	R1AUX	19	1.0
XE3FAN	10	1.2	R2AUX	19	1.0
R1FAN	20	0.8	Q1AUX	10	0.5
Q1SEI	10	0.9	N1AUX	19	1.0
N1SEI	1	0.9	T1AUX	3	0.4
Q1SAP	20	0.7	T1EOW	13	0.5
Q2SAP	25	1.0	R1EOW	10	0.4
Optical amplifier boards and dispersion compensation boards					
N1DCU	0	0.4	62COA	75	8.0
N2DCU	0	0.4	N1COA	10	3.5
N1RPC02	110	4.2	N1BPA	20	1.0
N1RPC01	70	4.0	N2BPA	11	1.2
61COA	10	3.5	N1BA2	20	1.0
TN11OBU101	16	1.3	TN11OBU102	18	1.3
Power interface boards					
R1PIUA	2	0.5	N1PIU	8	1.2
R1PIUB	4	0.4	Q2PIU	2	0.3
R1PIUC	5	0.5	Q1PIU	8	1.3

Board	Power Consumption (W)	Weight (kg)	Board	Power Consumption (W)	Weight (kg)
N1PIUA	3	0.5	R1PIU	2	0.4
T1PIU	8	1.3	UPM	-	15
N1PIUB	6	0.6	T1PIUB	6	0.5

A Glossary

Numerics

1+1 backup	A backup method in which two components mirror each other. If the active component goes down, the standby component takes over services from the active component to ensure that the system service is not interrupted.
1:N protection	An architecture that has N normal service signals, N working SNCs/trails, and one protection SNC/trail. It may have one extra service signal.
3G	See 3rd generation.
3R	reshaping, retiming, regenerating
3rd generation (3G)	The third generation of digital wireless technology, as defined by the International Telecommunications Union (ITU). Third generation technology is expected to deliver data transmission speeds between 144 kbit/s and 2 Mbit/s, compared to the 9.6 kbit/s to 19.2 kbit/s offered by second generation technology.

A

A/D	analog/digit
AAA	See Authentication, Authorization and Accounting.
AAL	See ATM Adaptation Layer.
AAL2	ATM Adaptation Layer Type 2
AAL5	ATM Adaptation Layer Type 5
ABR	See available bit rate.
ACAP	See adjacent channel alternate polarization.
ACH	associated channel header
ACL	See access control list.
ACL rule	A rule for controlling the access of users.
ADM	add/drop multiplexer
AF	See assured forwarding.

AGC	automatic gain control
AIO	asynchronous input/output
AIS	alarm indication signal
AIS insertion	Insertion of AIS in a channel with excessive errors to indicate that it is unavailable. For a line board, it can be set whether to insert AIS when there are excessive errors in the B1, B2 and B3 bytes. For tributary board at the E1/T1 level, it can be set whether to insert AIS when there are excessive errors in BIP-2. For tributary board at the E3 level or higher, it can be set whether to insert AIS when there are excessive errors in the B3 byte.
ALS	See automatic laser shutdown.
AM	See adaptive modulation.
AMI	See alternate mark inversion.
ANSI	See American National Standards Institute.
APD	See avalanche photodiode.
APID	access point identifier
APS	automatic protection switching
APS 1+1 protection	A protection architecture that comprises one protection facility and one working facility and performs switchover by using the Automatic Protection Switching (APS) protocol. Normally, signals are sent only over the working facility. If an APS switchover event is detected by the working facility, services are switched over to the protection facility.
ARP	See Address Resolution Protocol.
AS	See autonomous system.
ASCII	American Standard Code for Information Interchange
ASK	amplitude shift keying
ATM	asynchronous transfer mode
ATM Adaptation Layer (AAL)	An interface between higher-layer protocols and Asynchronous Transfer Mode (ATM). The AAL provides a conversion function to and from ATM for various types of information, including voice, video, and data.
ATM protection group	Logically bound ATM VP network/subnetwork connections that share the same physical transmission channel. In the VP Group (VPG), a pair of VP connections (working connection and its protective connection) is used for monitoring the automatic protection switching, called monitoring connections (APS VPCs). If the monitoring connections switch over, the whole VPG will switch over to quicken the ATM protection switching (as quick as the protection switching of the SDH layer).
ATPC	See automatic transmit power control.
AU	See administrative unit.
AUG	See administrative unit group.
AWG	arrayed waveguide grating

Address Resolution Protocol (ARP)	An Internet Protocol used to map IP addresses to MAC addresses. It allows hosts and routers to determine the link layer addresses through ARP requests and ARP responses.
American National Standards Institute (ANSI)	An organization that defines U.S standards for the information processing industry. ANSI participates in defining network protocol standards.
Authentication, Authorization and Accounting (AAA)	A mechanism for configuring authentication, authorization, and accounting security services. Authentication refers to the verification of user identities and the related network services; authorization refers to the granting of network services to users according to authentication results; and accounting refers to the tracking of the consumption of network services by users.
access	A link between the customer and the telecommunication network. Many technologies, such as the copper wire, optical fiber, mobile, microwave and satellite, are used for access.
access control list (ACL)	A list of entities, together with their access rights, which are authorized to have access to a resource.
access layer	A layer that connects the end users (or last mile) to the ISP network. The access layer devices are cost-effective and have high-density interfaces. In an actual network, the access layer includes the devices and cables between the access points and the UPEs.
access point	Any entity that has station functionality and provides access to the distribution services, via the wireless medium (WM) for associated stations.
accumulation	The sum of the service usage, consumption, and recharge fees of a subscriber.
active link	A link in the link aggregation group, which is connected to the active interface.
active mode	A working mode of EFM OAM. The discovery and remote loopback can only be initiated by the interface in the active mode.
adaptive modulation (AM)	A technology that is used to automatically adjust the modulation mode according to the channel quality. When the channel quality is favorable, the equipment uses a high-efficiency modulation mode to improve the transmission efficiency and the spectrum utilization of the system. When the channel quality is degraded, the equipment uses the low-efficiency modulation mode to improve the anti-interference capability of the link that carries high-priority services.
adjacency	A portion of the local routing information which pertains to the reachability of a single neighbor ES or IS over a single circuit. Adjacencies are used as input to the Decision Process for forming paths through the routing domain. A separate adjacency is created for each neighbor on a circuit, and for each level of routing (i.e. level 1 and level 2) on a broadcast circuit.
adjacent channel alternate polarization (ACAP)	A channel configuration method, which uses two adjacent channels (a horizontal polarization wave and a vertical polarization wave) to transmit two signals.
adjacent concatenation	A situation where the virtual containers (VC) to carry concatenated services in SDH are consecutive in terms of their service in the frame structures, so that they use the same path overhead (POH).
administrative unit (AU)	The information structure which provides adaptation between the higher order path layer and the multiplex section layer. It consists of an information payload (the higher order VC) and an AU pointer which indicates the offset of the payload

	frame start relative to the multiplex section frame start.
administrative unit group (AUG)	One or more administrative units occupying fixed, defined positions in an STM payload. An AUG consists of AU-4s.
advanced ACL	An ACL that defines ACL rules based on the source addresses, target addresses, protocol type, such as TCP source or target port, the type of the ICMP protocol, and message codes.
aggregated link	Multiple signaling link sets between two nodes.
aging time	The time to live before an object becomes invalid.
air interface	The interface between the cellular phone set or wireless modem (usually portable or mobile) and the active base station.
alarm	A message reported when a fault is detected by a device or by the network management system during the process of polling devices. Each alarm corresponds to a recovery alarm. After a recovery alarm is received, the status of the corresponding alarm changes to cleared.
alarm box	A device that reflects the status of an alarm in visual-audio mode. The alarm box notifies you of the alarm generation and alarm severity after it is connected to the Signaling Network Manager server or client and the related parameters are set.
alarm cascading	The shunt-wound output of the alarm signals of several subracks or cabinets.
alarm correlation analysis	A process to analyze correlated alarms. For example, if alarm 2 is generated within five seconds after alarm 1 is generated, and it complies with the conditions defined in the alarm correlation analysis rule, you can either mask the alarm or raise the level of alarm 2 according to the behavior defined in the alarm correlation rule.
alarm filtering	An alarm management method. Alarms are detected and reported to the NMS system, and whether the alarm information is displayed and saved is decided by the alarm filtering status. An alarm with the filtering status set to "Filter" is not displayed and saved on the NMS, but is monitored on the NE.
alarm indication	A function that indicates the alarm status of an NE. On the cabinet of an NE, there are four indicators in different colors indicating the current alarm status of the NE. When the green indicator is on, the NE is powered on. When the red indicator is on, a critical alarm is generated. When the orange indicator is on, a major alarm is generated. When the yellow indicator is on, a minor alarm is generated. The ALM alarm indicator on the front panel of a board indicates the current status of the board.
alarm inversion mode	A mode for an NE that indicates whether the port is automatically restored to the normal status after the service is accessed or the fault is removed. There are three alarm inversion modes: normal, revertible and non-revertible.
alarm notification	When an error occurs, the performance measurement system sends performance alarms to the destination (for example, a file and/or fault management system) designated by users.
alarm suppression	An alarm management method. Alarms that are set to be suppressed are not reported from NEs any more.
alternate mark inversion (AMI)	A synchronous clock encoding technique which uses bipolar pulses to represent logical 1 values.
analog signal	A signal in which information is represented with a continuously variable physical quantity, such as voltage. Because of this constant changing of the wave shape with

regard to its passing a given point in time or space, an analog signal might have a virtually indefinite number of states or values. This contrasts with a digital signal that is expressed as a square wave and therefore has a very limited number of discrete states. Analog signals, with complicated structures and narrow bandwidth, are vulnerable to external interference.

assured forwarding (AF)	One of the four per-hop behaviors (PHB) defined by the Diff-Serv workgroup of IETF. It is suitable for certain key data services that require assured bandwidth and short delay. For traffic within the bandwidth limit, AF assures quality in forwarding. For traffic that exceeds the bandwidth limit, AF degrades the service class and continues to forward the traffic instead of discarding the packets.
attack	An attempt to bypass security controls in a system with the mission of using that system or compromising it. An attack is usually accomplished by exploiting a current vulnerability.
attenuation	Reduction of signal magnitude or signal loss, usually expressed in decibels.
attenuator	A device used to increase the attenuation of an Optical Fiber Link. Generally used to ensure that the signal at the receive end is not too strong.
automatic laser shutdown (ALS)	A technique (procedure) to automatically shutdown the output power of laser transmitters and optical amplifiers to avoid exposure to hazardous levels.
automatic transmit power control (ATPC)	A method of adjusting the transmit power based on fading of the transmit signal detected at the receiver
autonomous system (AS)	A network set that uses the same routing policy and is managed by the same technology administration department. Each AS has a unique identifier that is an integer ranging from 1 to 65535. The identifier is assigned by IANA. An AS can be divided into areas.
availability	A capability of providing services at any time. The probability of this capability is called availability.
available bit rate (ABR)	A kind of service categories defined by the ATM forum. ABR only provides possible forwarding service and applies to the connections that does not require the real-time quality. It does not provide any guarantee in terms of cell loss or delay.
avalanche photodiode (APD)	A semiconductor photodetector with integral detection and amplification stages. Electrons generated at a p/n junction are accelerated in a region where they free an avalanche of other electrons. APDs can detect faint signals but require higher voltages than other semiconductor electronics.
average delay	A performance indicator indicating the average RTT of multiple ping operations or other probe operations. It is expressed in milliseconds.

B

B-ISDN	See broadband integrated services digital network.
BA	booster amplifier
BBE	background block error
BC	boundary clock
BCD	binary coded decimal

BDI	See backward defect indication.
BDI packet	A packet used to notify the upstream LSR of the failure event which has occurred on the downstream LSR through the reverse LSP. The BDI packet can be used in the 1:1/N protective switchover service.
BE	See best effort.
BER	bit error rate
BFD	See Bidirectional Forwarding Detection.
BGP	Border Gateway Protocol
BIP	See bit interleaved parity.
BIP-8	See bit interleaved parity-8.
BIP-X	bit interleaved parity-X
BITS	See building integrated timing supply.
BMC	best master clock
BNC	See bayonet-neill-concelman.
BOM	bill of material
BPDU	See bridge protocol data unit.
BPS	board protection switching
BSC	See base station controller.
BSS	base station subsystem
BTS	base transceiver station
BWS	backbone wavelength division multiplexing system
Bidirectional Forwarding Detection (BFD)	A simple Hello protocol, similar to the adjacent detection in the route protocol. Two systems periodically send BFD detection messages on the channel between the two systems. If one system does not receive the detection message from the other system for a long time, you can infer that the channel is faulty. Under some conditions, the TX and RX rates between systems need to be negotiated to reduce traffic load.
backbone network	A network that forms the central interconnection for a connected network. The communication backbone for a country is WAN. The backbone network is an important architectural element for building enterprise networks. It provides a path for the exchange of information between different LANs or subnetworks. A backbone can tie together diverse networks in the same building, in different buildings in a campus environment, or over wide areas. Generally, the backbone network's capacity is greater than the networks connected to it.
backplane	An electronic circuit board containing circuits and sockets into which additional electronic devices on other circuit boards or cards can be plugged.
backup	A periodic operation performed on the data stored in the database for the purposes of database recovery in case that the database is faulty. The backup also refers to data synchronization between active and standby boards.
backward defect	A function that the sink node of a LSP, when detecting a defect, uses to inform the

indication (BDI)	upstream end of the LSP of a downstream defect along the return path.
bandwidth	A range of transmission frequencies that a transmission line or channel can carry in a network. In fact, it is the difference between the highest and lowest frequencies the transmission line or channel. The greater the bandwidth, the faster the data transfer rate.
base station area	An area of radio coverage consisting of cells served by one or more Base Transceiver Stations (BTSs) in the same base station site.
base station controller (BSC)	A logical entity that connects the BTS with the MSC in a GSM/CDMA network. It interworks with the BTS through the Abis interface, the MSC through the A interface. It provides the following functions: radio resource management, base station management, power control, handover control, and traffic measurement. One BSC controls and manages one or more BTSs in an actual network.
baseband	A form of modulation in which the information is applied directly onto the physical transmission medium.
bayonet-neill-concelman (BNC)	A connector used for connecting two coaxial cables.
bearer	An information transmission path with defined capacity, delay and bit error rate.
bearer network	A network used to carry the messages of a transport-layer protocol between physical devices.
best effort (BE)	A traditional IP packet transport service. In this service, the diagrams are forwarded following the sequence of the time they reach. All diagrams share the bandwidth of the network and routers. The amount of resource that a diagram can use depends of the time it reaches. BE service does not ensure any improvement in delay time, jitter, packet loss ratio, and high reliability.
best-effort service	A unitary and simple service model. Without being approved, but after notifying the network, the application can send any number of packets at any time. The network tries its best to send the packets, but delay and reliability cannot be ensured. Best-Effort is the default service model of the Internet. It can be applied to various networks, such as FTP and E-Mail. It is implemented through the First In First-Out (FIFO) queue.
bit error	An incompatibility between a bit in a transmitted digital signal and the corresponding bit in the received digital signal.
bit interleaved parity (BIP)	A method of error monitoring. With even parity an X-bit code is generated by equipment at the transmit end over a specified portion of the signal in such a manner that the first bit of the code provides even parity over the first bit of all X-bit sequences in the covered portion of the signal, the second bit provides even parity over the second bit of all X-bit sequences within the specified portion, and so on. Even parity is generated by setting the BIP-X bits so that there is an even number of 1s in each monitored partition of the signal. A monitored partition comprises all bits which are in the same bit position within the X-bit sequences in the covered portion of the signal. The covered portion includes the BIP-X.
bit interleaved parity-8 (BIP-8)	Consists of a parity byte calculated bit-wise across a large number of bytes in a transmission transport frame. Divide a frame is into several blocks with 8 bits (one byte) in a parity unit and then arrange the blocks in matrix. Compute the number of "1" or "0" over each column. Then fill a 1 in the corresponding bit for the result if the number is odd, otherwise fill a 0.

blacklist	A method of filtering packets based on their source IP addresses. Compared with ACL, the match condition for the black list is much simpler. Therefore, the black list can filter packets at a higher speed and can effectively screen the packet sent from the specific IP address.
bound path	A parallel path with several serial paths bundled together. It improves the data throughput capacity.
bridge	A device that connects two or more networks and forwards packets among them. Bridges operate at the physical network level. Bridges differ from repeaters because bridges store and forward complete packets, while repeaters forward all electrical signals. Bridges differ from routers because bridges use physical addresses, while routers use IP addresses.
bridge protocol data unit (BPDU)	The data messages that are exchanged across the switches within an extended LAN that uses a spanning tree protocol (STP) topology. BPDU packets contain information on ports, addresses, priorities and costs and ensure that the data ends up where it was intended to go. BPDU messages are exchanged across bridges to detect loops in a network topology. The loops are then removed by shutting down selected bridges interfaces and placing redundant switch ports in a backup, or blocked, state.
bridging	The action of transmitting identical traffic on the working and protection channels simultaneously.
broadband integrated services digital network (B-ISDN)	A standard defined by the ITU-T to handle high-bandwidth applications, such as voice. It currently uses the ATM technology to transmit data over SONNET-based circuits at 155 to 622 Mbit/s or higher speed.
broadcast	A means of delivering information to all members in a network. The broadcast range is determined by the broadcast address.
broadcast address	A network address in computer networking that allows information to be sent to all nodes on a network, rather than to a specific network host.
broadcast domain	A group of network stations that receives broadcast packets originating from any device within the group. The broadcast domain also refers to the set of ports between which a device forwards a multicast, broadcast, or unknown destination frame.
building integrated timing supply (BITS)	In the situation of multiple synchronous nodes or communication devices, one can use a device to set up a clock system on the hinge of telecom network to connect the synchronous network as a whole, and provide satisfactory synchronous base signals to the building integrated device. This device is called BITS.
built-in WDM	A function which integrates some simple WDM systems into products that belong to the OSN series. That is, the OSN products can add or drop several wavelengths directly.
burst	A process of forming data into a block of the proper size, uninterruptedly sending the block in a fast operation, waiting for a long time, and preparing for the next fast sending.

C

CAC	See connection admission control.

CAR	committed access rate
CAS multiframe	A multiframe set up based on timeslot 16. Each CAS multiframe contains 16 E1 PCM frames. Among the 8 bits of timeslot 16 in the first frame, the first 4 bits are used for multiframe synchronization. The multiframe alignment signal (MFAS) for synchronization is 0000. The last 4 bits are used as the not multiframe alignment signal (NMFAS). The NMFAS is XYXX. For the other 15 frames, timeslot 16 is used to transmit exchange and multiplexing (E&M) signaling corresponding to each timeslot.
CBR	See constant bit rate.
CBS	See committed burst size.
CC	See continuity check.
CCDP	See co-channel dual polarization.
CCS	See Common Channel Signaling.
CDVT	cell delay variation tolerance
CE	See customer edge.
CES	See circuit emulation service.
CFM	connectivity fault management
CFR	cell fill rate
CIR	committed information rate
CIST	See Common and Internal Spanning Tree.
CLEI	common language equipment identification
CLK	clock card
CLNP	connectionless network protocol
CLP	See cell loss priority.
CMI	coded mark inversion
CO	central office
CPU	See central processing unit.
CR	connection request
CRC	See cyclic redundancy check.
CRC-4 multiframe	A multiframe recommended by ITU-T G.704 and set up based on the first bit of timeslot 0. The CRC-4 multiframe is different from the CAS multiframe in principle and implementation. Each CRC-4 multiframe contains 16 PCM frames. Each CRC-4 multiframe consists of two CRC-4 sub-multiframes. Each CRC-4 sub-multiframe is a CRC-4 check block that contains 2048 (256 x 8) bits. Bits C1 to C4 of a check block can check the previous check block.
CSA	Canadian Standards Association
CSES	consecutive severely errored second

CSF	Client Signal Fail
CSMA/CD	See carrier sense multiple access with collision detection.
CST	See common spanning tree.
CTC	common transmit clock
CV	connectivity verification
CV packet	A type of packet that is generated at the frequency of 1/s on the source end LSR of an LSP, and is terminated on the destination end LSR of the LSP. A CV packet is transmitted from the source end LSR to the destination LSR along the LSP. A CV packet contains the unique identifier (TTSI) of the LSP so that all types of abnormalities on the path can be detected.
CW	control word
CWDM	See coarse wavelength division multiplexing.
Common Channel Signaling (CCS)	A signaling system used in telephone networks that separates signaling information from user data. A specified channel is exclusively designated to carry signaling information for all other channels in the system.
Common and Internal Spanning Tree (CIST)	The single spanning tree jointly calculated by STP and RSTP, the logical connectivity using MST bridges and regions, and MSTP. The CIST ensures that all LANs in the bridged local area network are simply and fully connected.
Coordinated Universal Time (UTC)	The world-wide scientific standard of timekeeping. It is based upon carefully maintained atomic clocks and is kept accurate to within microseconds worldwide.
cabinet	Free-standing and self-supporting enclosure for housing electrical and/or electronic equipment. It is usually fitted with doors and/or side panels which may or may not be removable.
cable distribution plate	A component, which is used to arrange cables in order.
cable tie	A tape used to bind cables.
carrier	An organization that has telecom network resources and can provide communications service.
carrier sense multiple access with collision detection (CSMA/CD)	Carrier sense multiple access with collision detection (CSMA/CD) is a computer networking access method in which: • A carrier sensing scheme is used. • A transmitting data station that detects another signal while transmitting a frame, stops transmitting that frame, transmits a jam signal, and then waits for a random time interval before trying to send that frame again.
cell loss priority (CLP)	A field in the ATM cell header that determines the probability of a cell being dropped if the network becomes congested. Cells with CLP = 0 are insured traffic, which is unlikely to be dropped. Cells with CLP = 1 are best-effort traffic, which might be dropped.
central processing unit (CPU)	The computational and control unit of a computer. The CPU is the device that interprets and executes instructions. The CPU has the ability to fetch, decode, and execute instructions and to transfer information to and from other resources over the computer's main data-transfer path, the bus.
centralized alarm	The alarms of all the hosts connecting to the Operation and Maintenance Unit

(OMU).

channel	A telecommunication path of a specific capacity and/or at a specific speed between two or more locations in a network. Channels can be established through wire, radio (microwave), fiber or a combination of the three. The amount of information transmitted per second in a channel is the information transmission speed, expressed in bits per second. For example, b/s, kb/s, Mb/s, Gb/s, and Tb/s.
channel spacing	The center-to-center difference in frequency or wavelength between adjacent channels in a WDM device.
check criteria	A set of rules for checking and analyzing device echo information. The check criteria for an alarm collection item need to be set through the configuration file.
circuit emulation service (CES)	A function with which the E1/T1 data can be transmitted through ATM networks. At the transmission end, the interface module packs timeslot data into ATM cells. These ATM cells are sent to the reception end through the ATM network. At the reception end, the interface module re-assigns the data in these ATM cells to E1/T1 timeslots. The CES technology guarantees that the data in E1/T1 timeslots can be recovered to the original sequence at the reception end.
clock selection	An algorithm used for selecting the best clock for clock synchronization. For different peers (multiple servers or peers configured for a client), a peer sends clock synchronization packets to each server or passive peer. After receiving the response packets, it uses the clock selection algorithm to select the best clock.
clock source	A device that provides standard time for the NTP configuration.
clock synchronization	Also called frequency synchronization. The signal frequency traces the reference frequency, but the start point does not need to be consistent.
clock tracing	The method to keep the time on each node synchronized with a clock source in a network.
co-channel dual polarization (CCDP)	A channel configuration method, which uses a horizontal polarization wave and a vertical polarization wave to transmit two signals. The Co-Channel Dual Polarization has twice the transmission capacity of the single polarization.
coarse wavelength division multiplexing (CWDM)	A signal transmission technology that multiplexes widely-spaced optical channels into the same fiber. CWDM widely spaces wavelengths at a spacing of several nm. CWDM does not support optical amplifiers and is applied in short-distance chain networking.
collision	A condition in which two packets are being transmitted over a medium at the same time. Their interference makes both unintelligible.
committed burst size (CBS)	A parameter used to define the capacity of token bucket C, that is, the maximum burst IP packet size when the information is transferred at the committed information rate. This parameter must be larger than 0. It is recommended that this parameter should be not less than the maximum length of the IP packet that might be forwarded.
common spanning tree (CST)	A single spanning tree that connects all the MST regions in a network. Every MST region is considered as a switch; therefore, the CST can be considered as their spanning tree generated with STP/RSTP.
composite service	An aggregation of a series of services relevant to each other.
conference	An IP multimedia session that have two or more participants. Each conference has a focus and can be identified uniquely.

congestion	An extra intra-network or inter-network traffic that results in a decrease in network service efficiency.
congestion management	A flow control measure to solve the problem of network resource competition. When the network congestion occurs, it places packets into the queue for buffer and determines the packet forwarding order.
connection	An association of transmission channels or telecommunication circuits, switching and other functional units set up to provide for the transfer of signals between two or more network points, to support a single communication.
connection admission control (CAC)	A control process in which the network takes actions in the call set-up phase (or call re-negotiation phase) to determine which connection request is admitted.
connection point	A reference point where the output of a trail termination source or a connection is bound to the input of another connection, or where the output of a connection is bound to the input of a trail termination sink or another connection. The connection point is characterized by the information which passes across it. A bidirectional connection point is formed by the association of a contradirectional pair.
connectionless	Pertaining to a method of data presentation. The data has a complete destination address and is delivered by the network on a best-effort basis, independent of other data being exchanged between the same pair of users.
constant bit rate (CBR)	A kind of service categories defined by the ATM forum. CBR transfers cells based on the constant bandwidth. It is applicable to service connections that depend on precise clocking to ensure undistorted transmission.
container	A set of hardware or software devices. In software domain, it refers to the environment variables and processes. In hardware domain, it refers to a type of topology node that contains nodes, usually refers to one device with multiple frames; each node stands for a frame.
continuity check (CC)	Ethernet CFM can detect the connectivity between MEPs. The detection is achieved after MEPs transmit Continuity Check Messages (CCMs) periodically.
control VLAN	A VLAN that transmits only protocol packets.
control channel	The channel used to transmit digital control information from the base station to a cell phone or vice-versa.
convergence layer	A "bridge" between the access layer and the core layer. The convergence layer provides the convergence and forwarding functions for the access layer. It processes all the traffic from the access layer devices, and provides the uplinks to the core layer. Compared with the access layer, the convergence layer devices should have higher performance, fewer interfaces and higher switching rate. In the real network, the convergence layer refers to the network between UPEs and PE-AGGs.
cooling system	The system that controls or influences climate by decreasing the air temperature only.
core layer	A layer that functions as the backbone of high speed switching for networks and provides high speed forwarding communications. It has a backbone transmission structure that provides high reliability, high throughput, and low delay. The core layer devices must have a good redundancy, error tolerance, manageability, adaptability, and they support dual-system hot backup or load balancing technologies. In a real network, the core layer includes the IP/MPLS backbone network consisting of NPEs and backbone routers.

correlation	The similarities when two random processes vary with time.
corruption	The alteration of the information in IMS networks for the purpose of deception. For example, attackers corrupt the correct charging information to evade being charged.
cross-connection	The connection of channels between the tributary board and the line board, or between line boards inside the NE. Network services are realized through the cross-connections of NEs.
crossover cable	A twisted pair patch cable wired in such a way as to route the transmit signals from one piece of equipment to the receive signals of another piece of equipment, and vice versa.
crystal oscillator	An oscillator that produces electrical oscillations at a frequency determined by the physical characteristics of a piezoelectric quartz crystal.
customer edge (CE)	A part of BGP/MPLS IP VPN model. It provides interfaces for direct connection to the Service Provider (SP) network. A CE can be a router, switch, or host.
cutover	To migrate the data of an application system to another application system, which then provides services.
cyclic redundancy check (CRC)	A procedure used in checking for errors in data transmission. CRC error checking uses a complex calculation to generate a number based on the data transmitted. The sending device performs the calculation before transmission and includes it in the packet that it sends to the receiving device. The receiving device repeats the same calculation after transmission. If both devices obtain the same result, it is assumed that the transmission was error free. The procedure is known as a redundancy check because each transmission includes not only data but extra (redundant) error-checking values.

D

D/A	digital-analog converter
DB	database
DC	direct current
DC-C	See DC-return common (with ground).
DC-I	See DC-return isolate (with ground).
DC-return common (with ground) (DC-C)	A power system, in which the BGND of the DC return conductor is short-circuited with the PGND on the output side of the power supply cabinet and also on the line between the output of the power supply cabinet and the electric equipment.
DC-return isolate (with ground) (DC-I)	A power system, in which the BGND of the DC return conductor is short-circuited with the PGND on the output side of the power supply cabinet and is isolated from the PGND on the line between the output of the power supply cabinet and the electric equipment.
DCC	See data communications channel.
DCE	See data circuit-terminating equipment.
DCF	data communication function

DCM   See dispersion compensation module.

DCN   See data communication network.

DDF   digital distribution frame

DDN   See digital data network.

DHCP   See Dynamic Host Configuration Protocol.

DLAG   See distributed link aggregation group.

DM   See delay measurement.

DNI   dual node interconnection

DRDB   dynamic random database

DS interior node   A DS node located at the center of a DS domain. It is a non-DS boundary node.

DS node   A DS-compliant node, which is subdivided into DS boundary node and ID interior node.

DSCP   differentiated services code point

DSL   See digital subscriber line.

DSLAM   See digital subscriber line access multiplexer.

DSP   digital signal processing

DTE   See data terminal equipment.

DTR   data terminal ready

DVB   digital video broadcasting

DVB-ASI   digital video broadcast-asynchronous serial interface

DVMRP   See Distance Vector Multicast Routing Protocol.

DWDM   See dense wavelength division multiplexing.

Distance Vector Multicast Routing Protocol (DVMRP)   An Internet gateway protocol mainly based on the RIP. The protocol implements a typical dense mode IP multicast solution. The DVMRP protocol uses IGMP to exchange routing datagrams with its neighbors.

Dynamic Host Configuration Protocol (DHCP)   A client-server networking protocol. A DHCP server provides configuration parameters specific to the DHCP client host requesting, generally, information required by the host to participate on the Internet network. DHCP also provides a mechanism for allocation of IP addresses to hosts.

data backup   A method that is used to copy key data to the standby storage area, to prevent data loss in the case of damage or failure in the original storage area.

data circuit-terminating equipment (DCE)   The equipment that provides the signal conversion and coding between the data terminal equipment (DTE) and the line. A DCE is located at a data station. The DCE may be separate equipment, or an integral part of the DTE or intermediate equipment. The DCE may perform other functions that are normally performed at the network end of the line.

data communication network (DCN)   A communication network used in a TMN or between TMNs to support the data communication function.

data communications channel (DCC)	The data channel that uses the D1–D12 bytes in the overhead of an STM-N signal to transmit information about operation, management, maintenance and provision (OAM&P) between NEs. The DCC channels that are composed of bytes D1–D3 are referred to as the 192 kbit/s DCC-R channel. The other DCC channels that are composed of bytes D4–D12 are referred to as the 576 kbit/s DCC-M channel.
data flow	A process that involves processing the data extracted from the source system, such as filtering, integration, calculation, and summary, finding and solving data inconsistency, and deleting invalid data so that the processed data meets the requirements of the destination system for the input data.
data mapping	An algorithm that is used to convert the data between heterogeneous data models.
data restoration	A method for retrieving data that is lost due to damage or misoperations.
data terminal equipment (DTE)	A user device composing the UNI. The DTE accesses the data network through the DCE equipment (for example, a modem) and usually uses the clock signals produced by DCE.
datagram	A kind of protocol data unit (PDU) which is used in Connectionless Network Protocol (CLNP), such as IP datagram, UDP datagram.
defect	A limited interruption in the ability of an item to perform a required function.
delay measurement (DM)	The time elapsed since the start of transmission of the first bit of the frame by a source node until the reception of the last bit of the loopbacked frame by the same source node, when the loopback is performed at the frame's destination node.
demodulation	In communications, the means by which a modem converts data from modulated carrier frequencies (waves that have been modified in such a way that variations in amplitude and frequency represent meaningful information) over a telephone line. Data is converted to the digital form needed by a computer to which the modem is attached, with as little distortion as possible.
dense wavelength division multiplexing (DWDM)	The technology that utilizes the characteristics of broad bandwidth and low attenuation of single mode optical fiber, employs multiple wavelengths with specific frequency spacing as carriers, and allows multiple channels to transmit simultaneously in the same fiber.
designated port	A port defined in the STP protocol. On each switch that runs the STP protocol, the traffic from the root bridge is forwarded to the designated port. The subnet connected to the STP switch receives the data traffic from the root bridge. All the ports on the root bridge are designated ports. On each subnet, there is only one designated port. When a network topology is stable, only the root port and the designated port forward traffic. Other non-designated ports are in the blocking state, and they receive STP packets, but does not forward user traffic.
destruction	A process during which the information and resources in a network are changed unexpectedly and the meanings of the information and resources are deleted or changed.
digital data network (DDN)	A high-quality data transport tunnel that combines the digital channel (such as fiber channel, digital microwave channel, or satellite channel) and the cross multiplex technology.
digital modulation	A method that controls the changes in amplitude, phase, and frequency of the carrier based on the changes in the baseband digital signal. In this manner, the information can be transmitted by the carrier.

digital network	A telecommunication network where information is first converted into distinct electronic pulses and then transmitted to a digital bit stream.
digital signal	A signal in which information is represented by a limited number of discrete states number of discrete states (for example, high and low voltages) rather than by fluctuating levels in a continuous stream, as in an analog signal. In the pulse code modulation (PCM) technology, the 8 kHz sampling frequency is used and a byte contains 8 bits in length. Therefore, a digital signal is also referred to as a byte-based code stream. Digital signals, with simple structures and broad bandwidth, are easy to shape or regenerate, and are not easily affected by external interference.
digital subscriber line (DSL)	A technology for providing digital connections over the copper wire or the local telephone network. DSL performs data communication over the POTS lines without affecting the POTS service.
digital subscriber line access multiplexer (DSLAM)	A network device, usually situated in the main office of a telephone company that receives signals from multiple customer Digital Subscriber Line (DSL) connections and puts the signals on a high-speed backbone line using multiplexing techniques.
dispersion	The dependence of refraction on the wavelength of light. Different wavelengths are transmitted in an optical medium at different speeds. Wavelengths reach the end of the medium at different times. As a result, the light pulse spreads and the dispersion occurs.
dispersion compensation module (DCM)	A module, which contains dispersion compensation fibers to compensate for the dispersion of transmitting fiber.
distributed link aggregation group (DLAG)	A board-level port protection technology used to detect unidirectional fiber cuts and to negotiate with the opposite end. Once a link down failure occurs on a port or a hardware failure occurs on a board, the services can automatically be switched to the slave board, achieving 1+1 protection for the inter-board ports.
domain	A logical subscriber group based on which the subscriber rights are controlled.
dotted decimal notation	A format of IP address. IP addresses in this format are separated into four parts by a dot "." with each part is in the decimal numeral.
download	To obtain data from an upper-layer device or the server.
downstream	In an access network, the direction of transmission toward the subscriber end of the link.
dual-ended switching	A protection operation method which takes switching action at both ends of the protected entity (for example, "connection", "path"), even in the case of a unidirectional failure.
dual-polarized antenna	An antenna intended to simultaneously radiate or receive two independent radio waves orthogonally polarized.

E

E-Aggr	See Ethernet aggregation.
E-LAN	See Ethernet local area network.
E-Line	See Ethernet line.

EA	encryption algorithm
EBS	See excess burst size.
ECC	See embedded control channel.
EDFA	See erbium-doped fiber amplifier.
EEPROM	See electrically erasable programable read-only memory.
EF	See expedited forwarding.
EFCI	explicit forward congestion indication
EFM	Ethernet in the First Mile
EFM OAM	Ethernet in the first mile OAM
EIA	See Electronic Industries Alliance.
EIR	See excess information rate.
EMC	See electromagnetic compatibility.
EMI	See electromagnetic interference.
EMS	element management system
EPD	early packet discard
EPL	See Ethernet private line.
EPLAN	See Ethernet private LAN service.
ERPS	Ethernet ring protection switching
ESC	See electric supervisory channel.
ESCON	See enterprise system connection.
ESD	electrostatic discharge
ESN	See equipment serial number.
ETS	European Telecommunication Standards
ETSI	See European Telecommunications Standards Institute.
EVC	Ethernet virtual connection
EVPL	See Ethernet virtual private line.
EVPLAN	See Ethernet virtual private LAN service.
EXP	See experimental bits.
Electronic Industries Alliance (EIA)	An association based in Washington, D.C., with members from various electronics manufacturers. It sets standards for electronic components. RS-232-C, for example, is the EIA standard for connecting serial components.
EoD	See Ethernet over dual domains.
Ethernet	A LAN technology that uses Carrier Sense Multiple Access/Collision Detection. The speed of an Ethernet interface can be 10 Mbit/s, 100 Mbit/s, 1000 Mbit/s or 10000 Mbit/s. An Ethernet network features high reliability and is easy to

maintain.

Ethernet aggregation (E-Aggr)	A type of Ethernet service that is based on a multipoint-to-point EVC (Ethernet virtual connection).
Ethernet line (E-Line)	A type of Ethernet service that is based on a point-to-point EVC (Ethernet virtual connection).
Ethernet local area network (E-LAN)	A type of Ethernet service that is based on a multipoint-to-multipoint EVC (Ethernet virtual connection).
Ethernet over dual domains (EoD)	A type of boards. EoD boards bridge the PSN and TDM networks, enabling Ethernet service transmission across PSN and TDM networks.
Ethernet private LAN service (EPLAN)	A type of Ethernet service provided by SDH, PDH, ATM, or MPLS networks. This service is carried over a dedicated bridge and point-to-multipoint connections.
Ethernet private line (EPL)	A type of Ethernet service that is provided with dedicated bandwidth and point-to-point connections on an SDH, PDH, ATM, or MPLS server layer network.
Ethernet virtual private LAN service (EVPLAN)	A type of Ethernet service provided by SDH, PDH, ATM, or MPLS networks. This service is carried over a shared bridge and point-to-multipoint connections.
Ethernet virtual private line (EVPL)	A type of Ethernet service provided by SDH, PDH, ATM, or MPLS networks. This service is carried over a shared bridge and point-to-point connections.
European Telecommunications Standards Institute (ETSI)	A standards-setting body in Europe. Also the standards body responsible for GSM.
eSFP	enhanced small form-factor pluggable
egress	The egress LER. The group is transferred along the LSP consisting of a series of LSRs after the group is labeled.
electric supervisory channel (ESC)	A technology that implements communication among all the nodes and transmission of monitoring data in an optical transmission network. The monitoring data of ESC is introduced into DCC service overhead and is transmitted with service signals.
electrically erasable programable read-only memory (EEPROM)	A type of EPROM that can be erased with an electrical signal. It is useful for stable storage for long periods without electricity while still allowing reprograming. EEPROMs contain less memory than RAM, take longer to reprogram, and can be reprogramed only a limited number of times before wearing out.
electromagnetic compatibility (EMC)	A condition which prevails when telecommunications equipment is performing its individually designed function in a common electromagnetic environment without causing or suffering unacceptable degradation due to unintentional electromagnetic interference to or from other equipment in the same environment.
electromagnetic interference (EMI)	Any electromagnetic disturbance that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics/electrical equipment.
embedded control channel (ECC)	A logical channel that uses a data communications channel (DCC) as its physical layer, to enable transmission of operation, administration, and maintenance (OAM) information between NEs.
emergency maintenance	A type of measure taken to quickly rectify an emergency fault to recover the proper running of the related system or device and to reduce losses.

encapsulation	A technology for layered protocols, in which a lower-level protocol accepts a message from a higher-level protocol and places it in the data portion of the lower-level frame. Protocol A's packets have complete header information, and are carried by protocol B as data. Packets that encapsulate protocol A have a B header, an A header, followed by the information that protocol A is carrying. Note that A could equal to B, as in IP inside IP.
engineering label	A mark on a cable, a subrack, or a cabinet for identification.
enterprise system connection (ESCON)	A path protocol which connects the host with various control units in a storage system. It is a serial bit stream transmission protocol. The transmission rate is 200 Mbit/s.
entity	A part, device, subsystem, functional unit, equipment, or system that can be considered individually.
equalization	A method of avoiding selective fading of frequencies. Equalization can compensate for the changes of amplitude frequency caused by frequency selective fading.
equipment serial number (ESN)	A string of characters that identify a piece of equipment and ensures correct allocation of a license file to the specified equipment. It is also called "equipment fingerprint".
erbium-doped fiber amplifier (EDFA)	An optical device that amplifies the optical signals. The device uses a short length of optical fiber doped with the rare-earth element Erbium and the energy level jump of Erbium ions activated by pump sources. When the amplifier passes the external light source pump, it amplifies the optical signals in a specific wavelength range.
error tolerance	The ability of a system or component to continue normal operation despite the presence of erroneous inputs.
event	Anything that takes place on the managed object. For example, the managed object is added, deleted, or modified.
excess burst size (EBS)	A parameter related to traffic. In the single rate three color marker (srTCM) mode, the traffic control is achieved by the token buckets C and E. Excess burst size is a parameter used to define the capacity of token bucket E, that is, the maximum burst IP packet size when the information is transferred at the committed information rate. This parameter must be larger than 0. It is recommended that this parameter should be not less than the maximum length of the IP packet that might be forwarded.
excess information rate (EIR)	The bandwidth for excessive or burst traffic above the CIR; it equals the result of the actual transmission rate without the safety rate.
exercise switching	An operation to check whether the protection switching protocol functions properly. The protection switching is not really performed.
expedited forwarding (EF)	The highest order QoS in the Diff-Serv network. EF PHB is suitable for services that demand low packet loss ratio, short delay, and broad bandwidth. In all the cases, EF traffic can guarantee a transmission rate equal to or faster than the set rate. The DSCP value of EF PHB is "101110".
experimental bits (EXP)	A field in the MPLS packet header, three bits long. This field is always used to identify the CoS of the MPLS packet.
extended ID	The number of the subnet that an NE belongs to, for identifying different network segments in a WAN. The physical ID of an NE is comprised of the NE ID and

extended ID.

external cable	The cables and optical fibers which are used for connecting electrical interfaces and optical interfaces of one cabinet to interfaces of other cabinets or peripherals.
external links	The links between the current Web site and other Web sites. Generally, external links refer to links from other Web sites to the current Web site.
extract	To read the data required by the destination system from the source system.

F

F1 byte	The user path byte, which is reserved for the user, but is typically special for network providers. The F1 byte is mainly used to provide the temporary data or voice path for special maintenance objectives. It belongs to the regenerator section overhead byte.
FAQ	frequently asked question
FC	See fiber channel.
FDB	flash database
FDD	See frequency division duplex.
FDDI	See fiber distributed data interface.
FDI	See forward defect indication.
FDI packet	See forward defect indication packet.
FDV	See frame delay variation.
FE	See fast Ethernet.
FE port	See fast Ethernet port.
FEC	See forward error correction.
FFD	fast failure detection
FFD packet	A path failure detection method independent from CV. Different from a CV packet, the frequency for generating FFD packets is configurable to satisfy different service requirements. By default, the frequency is 20/s. An FFD packet contains information the same as that in a CV packet. The destination end LSR processes FFD packets in the same way for processing CV packets.
FICON	See Fiber Connect.
FIFO	first in first out queuing
FLR	See frame loss ratio.
FPGA	See field programmable gate array.
FPS	See fast protection switching.
FR	See frame relay.
FRU	field replaceable unit

FTN	FEC to NHLFE
FTP	File Transfer Protocol
Fiber Connect (FICON)	A new generation connection protocol which connects the host to various control units. It carries single byte command protocol through the physical path of fiber channel, and provides higher rate and better performance than ESCON.
fairness	A feature in which for any link specified in a ring network, the source node is provided with certain bandwidth capacities if the data packets transmitted by the source node are constrained by the fairness algorithm.
fast Ethernet (FE)	Any network that supports transmission rate of 100 Mbit/s. The Fast Ethernet is 10 times faster than 10BaseT, and inherits frame format, MAC addressing scheme, MTU, and so on. Fast Ethernet is extended based on the IEEE802.3 standard, and it uses the following three types of transmission media: 100BASE-T4 (4 pairs of phone twisted-pair cables), 100BASE-TX (2 pairs of data twisted-pair cables), and 100BASE-FX (2-core optical fibers).
fast Ethernet port (FE port)	The port that provides a rate of 100 Mbit/s.
fast protection switching (FPS)	A type of pseudo wire automatic protection switching (PW APS). When the working PW is faulty, the source transmits services to the protection PW and the sink receives the services from the protection PW. FPS generally works with the interworking function (IWF) to provide end-to-end protection for services.
fault	A failure to implement the function while the specified operations are performed. A fault does not involve the failure caused by preventive maintenance, insufficiency of external resources or intentional settings.
fault alarm	A type of alarm caused by hardware and/or software faults, for example, board failure, or by the exception that occurs in major functions. After handling, a fault alarm can be cleared, upon which the NE reports a recovery alarm. Fault alarms are of higher severity than event alarms.
fault detection	The process of determining that a fault has occurred.
fault notification	A process wherein a fault is notified. For example, when a fault occurs on the local interface, the local interface notifies the peer of the fault through OAMPDUs. The local interface then records the fault in the log, and reports it to the NMS.
feeder	1. A radio frequency transmission line interconnecting an antenna and a transmitter or receiver. 2. For an antenna comprising more than one driven element, a radio frequency transmission Line interconnecting the antenna input and a driven element.
fiber channel (FC)	A high-speed transport technology used to build storage area networks (SANs). Fiber channel can be on the networks carrying ATM and IP traffic. It is primarily used for transporting SCSI traffic from servers to disk arrays. Fiber channel supports single-mode and multi-mode fiber connections. Fiber channel signaling can run on both twisted pair copper wires and coaxial cables. Fiber channel provides both connection-oriented and connectionless services.
fiber distributed data interface (FDDI)	A standard developed by the American National Standards Institute (ANSI) for high-speed fiber-optic local area networks (LANs). FDDI provides specifications for transmission rates of 100 megabits (100 million bits) per second on networks based on the token ring network.

fiber trough	A trough that is used for routing fibers.
fiber/cable	General name of optical fiber and cable. It refers to the physical entities that connect the transmission equipment, carry transmission objects (user information and network management information) and perform the transmission function in the transmission network. The optical fiber transmits optical signal, while the cable transmits electrical signal. The fiber/cable between NEs represents the optical fiber connection or cable connection between NEs. The fiber/cable between SDH NEs represents the connection relationship between NEs. At this time, the fiber/cable is of optical fiber type.
field programmable gate array (FPGA)	A type of semi-customized circuit used in the application specific integrated circuit (ASIC) field. It is developed on the basis of the programmable components, such as the PAL, GAL, and EPLD. It not only remedies the defects of customized circuits but also overcomes the disadvantage of the original programmable components in terms of the limited number of gate arrays.
firewall	A combination of a series of components set between different networks or network security domains. By monitoring, limiting, and changing the data traffic across the firewall, it masks the interior information, structure and running state of the network as much as possible to protect the network security.
fixed bandwidth	The bandwidth that is fully reserved and is allocated periodically in a GPON system to ensure the quality of cell transmission. If a T-CONT is provided with a fixed bandwidth and does not transmit cells, the OLT can still allocate/assign the fixed bandwidth. Therefore, idle cells are transmitted to the upstream OLT from the ONU/ONT.
flash memory	A type of special electrically erasable programmable read-only memory (EEPROM) and can be erased and rewritten in blocks at a time instead of only one byte. The data stored in flash memory will not be lost if the flash memory is powered off.
flooding	A type of incident, such as insertion of a large volume of data, that results in denial of service.
flow	An aggregation of packets that have the same characteristics. On the network management system or NE software, flow is a group of classification rules. On boards, it is a group of packets that have the same quality of service (QoS) operation.
flow queue	The same type of services of a user is considered one service flow. HQoS performs queue scheduling according to the services of each user. The service flows of each user are classified into four FQs, namely, CS, EF, AF, and BE. CS is assigned a traffic shaping percentage for Priority Queuing (PQ); EF, AF, and BE are assigned weights for Weighted Fair Queuing (WFQ). The preceding two scheduling modes occupy a certain bandwidth each; they can act at the same time without interfering each other.
forward defect indication (FDI)	A packet generated and traced forward to the sink node of the LSP by the node that first detects defects. It includes fields to indicate the nature of the defect and its location. Its primary purpose is to suppress alarms being raised at affected higher level client LSPs and (in turn) their client layers.
forward defect indication packet (FDI packet)	A packet that responds to the detected failure event. It is used to suppress alarms of the upper layer network where failure has occurred.
forward error correction	A bit error correction technology that adds the correction information to the payload at the transmit end. Based on the correction information, the bit errors

(FEC)	generated during transmission are corrected at the receive end.
fragmentation	A process of breaking a packet into smaller units when transmitting over a network node that does not support the original size of the packet.
frame delay variation (FDV)	A measurement of the variations in the frame delay between a pair of service frames, where the service frames belong to the same CoS instance on a point to point ETH connection.
frame loss ratio (FLR)	A ratio, is expressed as a percentage, of the number of service frames not delivered divided by the total number of service frames during time interval T, where the number of service frames not delivered is the difference between the number of service frames arriving at the ingress ETH flow point and the number of service frames delivered at the egress ETH flow point in a point-to-point ETH connection.
frame relay (FR)	A packet-switching protocol used for WANs. Frame relay transmits variable-length packets at up to 2 Mbit/s over predetermined, set paths known as PVCs (permanent virtual circuits). It is a variant of X.25 but sacrifices X.25's error detection for the sake of speed.
free-run mode	An operating condition of a clock, the output signal of which is strongly influenced by the oscillating element and not controlled by servo phase-locking techniques. In this mode the clock has never had a network reference input, or the clock has lost external reference and has no access to stored data, that could be acquired from a previously connected external reference. Free-run begins when the clock output no longer reflects the influence of a connected external reference, or transition from it. Free-run terminates when the clock output has achieved lock to an external reference.
frequency division duplex (FDD)	An application in which channels are divided by frequency. In an FDD system, the uplink and downlink use different frequencies. Downlink data is sent through bursts. Both uplink and downlink transmission use frames with fixed time length.
full rate	A type of data transmission rate. The service bandwidth can be 9.6 kbit/s, 4.8 kbit/s, or 2.4 kbit/s.
fully loaded	A state that indicates that all slots of a piece of equipment are in use, that is, the equipment has no vacant slots.
fuse	A safety device that protects an electric circuit from excessive current, consisting of or containing a metal element that melts when current exceeds a specific amperage, thereby opening the circuit.

G

G-ACH	generic associated channel header
GAL	generic associated channel header label
GCC	general communication channel
GCRA	generic cell rate algorithm
GE	See gigabit Ethernet.
GFC	generic flow control
GFP	See Generic Framing Procedure.

GNE	See gateway network element.
GPS	See Global Positioning System.
GRE	See Generic Routing Encapsulation.
GSM	See Global System for Mobile Communications.
GTS	See generic traffic shaping.
GUI	graphical user interface
Generic Framing Procedure (GFP)	A framing and encapsulation method which can be applied to any data type. It has been standardized by ITU-T SG15.
Generic Routing Encapsulation (GRE)	A mechanism for encapsulating any network layer protocol over any other network. GRE is used for encapsulating IP datagrams tunneled through the Internet. GRE serves as a Layer 3 tunneling protocol and provides a tunnel for transparently transmitting data packets.
Global Positioning System (GPS)	A global navigation satellite system. It provides reliable positioning, navigation, and timing services to worldwide users.
Global System for Mobile Communications (GSM)	The second-generation mobile networking standard defined by European Telecommunications Standards Institute (ETSI). It is aimed at designing a standard for global mobile phone networks. The standard allows a subscriber to use a phone globally. GSM consists of three main parts: mobile switching subsystem (MSS), base station subsystem (BSS), and mobile station (MS).
gain	The difference between the optical power from the input optical interface of the optical amplifier and the optical power from the output optical interface of the jumper fiber, which expressed in dB.
gateway	A device that connects two network segments using different protocols. It is used to translate the data in the two network segments.
gateway network element (GNE)	A network element that is used for communication between the NE application layer and the NM application layer.
general flow control	A flow control that is applicable to the A interface, C/D interface, and trunks and can be achieved by integrating multiple function modules. It is adopted when the traffic is heavy, or location update and authentication of multiple subscribers are performed after the system restarts. It can efficiently prevent system breakdown caused by link congestion or CPU overload.
generic traffic shaping (GTS)	A traffic control measure that proactively adjusts the output speed of the traffic. This is to adapt the traffic to network resources that can be provided by the downstream router to avoid packet discarding and congestion.
gigabit Ethernet (GE)	A collection of technologies for transmitting Ethernet frames at a rate of a gigabit per second, as defined by the IEEE 802.3z standard. GE is compatible with 10 Mbit/s and 100 Mbit/s Ethernet. It runs at 1000 Mbit/s. Gigabit Ethernet uses a private medium, and it does not support coaxial cables or other cables. It also supports the channels in the bandwidth mode. If Gigabit Ethernet is, however, deployed to be the private bandwidth system with a bridge (switch) or a router as the center, it gives full play to the performance and the bandwidth. In the network structure, Gigabit Ethernet uses full duplex links that are private, causing the length of the links to be sufficient for backbone applications in a building and campus.
ground terminal	A connection terminal on a communication device. It is used to connect the device

with ground cables, maintaining a tight connection between the device and the grounding electrode.

H

HCS	higher order connection supervision
HD-SDI	See high definition-serial digital interface signal.
HDB3	high density bipolar of order 3 code
HDLC	High-Level Data Link Control
HDTV	See high definition television.
HEC	See header error control.
HPA	high order path adaptation
HPT	higher order path termination
HQoS	See hierarchical quality of service.
HSDPA	See High Speed Downlink Packet Access.
HSI	high-speed Internet
High Speed Downlink Packet Access (HSDPA)	A modulating-demodulating algorithm put forward in 3GPP R5 to meet the requirement for asymmetric uplink and downlink transmission of data services. It enables the maximum downlink data service rate to reach 14.4 Mbit/s without changing the WCDMA network topology.
hang up	A call processing mode used by an attendant to end the conversation with a user.
hardware loopback	A connection mode in which a fiber jumper is used to connect the input optical interface to the output optical interface of a board to achieve signal loopback.
header error control (HEC)	A field within the ATM frame whose purpose is to correct any single bit error in the cell Header and also to detect any multi-bit errors. It actually performs a CRC check in the first four header bits and also at the receiving end.
hello packet	The commonest packet which is periodically sent by a router to its neighbors. It contains information about the DR, Backup Designated Router (BDR), known neighbors and timer values.
hierarchical quality of service (HQoS)	A type of QoS that controls the traffic of users and performs the scheduling according to the priority of user services. HQoS has an advanced traffic statistics function, and the administrator can monitor the usage of bandwidth of each service. Hence, the bandwidth can be allocated reasonably through traffic analysis.
high definition television (HDTV)	A type of TV that is capable of displaying at least 720 progressive or 1080 interlaced active scan lines. It must be capable of displaying a 16:9 image using at least 540 progressive or 810 interlaced active scan lines.
high definition-serial digital interface signal (HD-SDI)	High definition video signal transported by serial digital interface.
historical performance data	The performance data that is stored in the history register or that is automatically reported and stored on the NMS.

hop	A network connection between two distant nodes. For Internet operation a hop represents a small step on the route from one main computer to another.
hot patch	A patch that is used to repair a deficiency in the software or add a new feature to a program without restarting the software and interrupting the service. For the equipment using the built-in system, a hot patch can be loaded, activated, confirmed, deactivated, deleted, or queried.

I

IANA	See Internet Assigned Numbers Authority.
IC	See integrated circuit.
ICC	ITU carrier code
ICMP	See Internet Control Message Protocol.
ICP	IMA Control Protocol
IDU	See indoor unit.
IEEE	See Institute of Electrical and Electronics Engineers.
IETF	See Internet Engineering Task Force.
IF	See intermediate frequency.
IGMP	See Internet Group Management Protocol.
IGMP snooping	A multicast constraint mechanism running on a layer 2 device. This protocol manages and controls the multicast group by listening to and analyzing Internet Group Management Protocol (IGMP) packets between hosts and Layer 3 devices. In this manner, the spread of the multicast data on layer 2 network can be prevented efficiently.
IGP	See Interior Gateway Protocol.
ILM	incoming label map
IMA	See inverse multiplexing over ATM.
IMA frame	A control unit in the IMA protocol. It is a logical frame defined as M consecutive cells, numbered 0 to M-l, transmitted on each of the N links in an IMA group.
IP	Internet Protocol
IP address	A 32-bit (4-byte) binary digit that uniquely identifies a host (computer) connected to the Internet for communication with other hosts in the Internet by transferring packets. An IP address is expressed in dotted decimal notation, consisting of decimal values of its 4 bytes, separated by periods (,), for example, 127.0.0.1. The first three bytes of an IP address identify the network to which the host is connected, and the last byte identifies the host itself.
IPA	See intelligent power adjustment.
IPTV	See Internet Protocol television.
IPv4	See Internet Protocol version 4.

IPv6	See Internet Protocol version 6.
IS-IS	See Intermediate System to Intermediate System.
ISDN	integrated services digital network
ISO	International Organization for Standardization
ISP	See Internet service provider.
IST	internal spanning tree
ITC	independent transmit clock
ITU	See International Telecommunication Union.
ITU-T	See International Telecommunication Union-Telecommunication Standardization Sector.
IWF	Interworking Function
Institute of Electrical and Electronics Engineers (IEEE)	A society of engineering and electronics professionals based in the United States but boasting membership from numerous other countries. The IEEE focuses on electrical, electronics, computer engineering, and science-related matters.
Interior Gateway Protocol (IGP)	A routing protocol that is used within an autonomous system. The IGP runs in small-sized and medium-sized networks. The commonly used IGPs are the routing information protocol (RIP), the interior gateway routing protocol (IGRP), the enhanced IGRP (EIGRP), and the open shortest path first (OSPF).
Intermediate System to Intermediate System (IS-IS)	A protocol used by network devices (routers) to determine the best way to forward datagram or packets through a packet-based network.
International Telecommunication Union (ITU)	A United Nations agency, one of the most important and influential recommendation bodies, responsible for recommending standards for telecommunication (ITU-T) and radio networks (ITU-R).
International Telecommunication Union-Telecommunication Standardization Sector (ITU-T)	An international body that develops worldwide standards for telecommunications technologies. These standards are grouped together in series which are prefixed with a letter indicating the general subject and a number specifying the particular standard. For example, X.25 comes from the "X" series which deals with data networks and open system communications and number "25" deals with packet switched networks.
Internet Assigned Numbers Authority (IANA)	A department operated by the IAB. IANA delegates authority for IP address-space allocation and domain-name assignment to the NIC and other organizations. IANA also maintains a database of assigned protocol identifiers used in the TCP/IP suite, including autonomous system numbers.
Internet Control Message Protocol (ICMP)	A network-layer (ISO/OSI level 3) Internet protocol that provides error correction and other information relevant to IP packet processing. For example, it can let the IP software on one machine inform another machine about an unreachable destination. See also communications protocol, IP, ISO/OSI reference model, packet (definition 1).
Internet Engineering Task Force (IETF)	A worldwide organization of individuals interested in networking and the Internet. Managed by the Internet Engineering Steering Group (IESG), the IETF is charged with studying technical problems facing the Internet and proposing solutions to the Internet Architecture Board (IAB). The work of the IETF is carried out by various working groups that concentrate on specific topics such as routing and security.

	The IETF is the publisher of the specifications that led to the TCP/IP protocol standard.
Internet Group Management Protocol (IGMP)	One of the TCP/IP protocols for managing the membership of Internet Protocol multicast groups. It is used by IP hosts and adjacent multicast routers to establish and maintain multicast group memberships.
Internet Protocol television (IPTV)	A system in which video is transmitted in IP packets. Also called "TV over IP", IPTV uses streaming video techniques to deliver scheduled TV programs or video-on-demand (VOD). Unlike transmitting over the air or through cable to a TV set, IPTV uses the transport protocol of the Internet for delivery and requires either a computer and software media player or an IPTV set-top box to decode the images in real time.
Internet Protocol version 4 (IPv4)	The current version of the Internet Protocol (IP). IPv4 utilizes a 32bit address which is assigned to hosts. An address belongs to one of five classes (A, B, C, D, or E) and is written as 4 octets separated by periods and may range from 0.0.0.0 through to 255.255.255.255. Each IPv4 address consists of a network number, an optional subnetwork number, and a host number. The network and subnetwork numbers together are used for routing, and the host number is used to address an individual host within the network or subnetwork.
Internet Protocol version 6 (IPv6)	An update version of IPv4, which is designed by the Internet Engineering Task Force (IETF) and is also called IP Next Generation (IPng). It is a new version of the Internet Protocol. The difference between IPv6 and IPv4 is that an IPv4 address has 32 bits while an IPv6 address has 128 bits.
Internet service provider (ISP)	An organization that offers users access to the Internet and related services.
inbound	Data transmission from the external link to the router for the routers that support the NetStream feature.
indicator	Description of a performance feature collected from the managed devices by the performance collector.
indoor unit (IDU)	The indoor unit of the split-structured radio equipment. It implements accessing, multiplexing/demultiplexing, and intermediate frequency (IF) processing for services.
input jitter tolerance	The maximum amplitude of sinusoidal jitter at a given jitter frequency, which, when modulating the signal at an equipment input port, results in no more than two errored seconds cumulative, where these errored seconds are integrated over successive 30-second measurement intervals.
insertion loss	The loss of power that results from inserting a component, such as a connector, coupler, or splice, into a previously continuous path.
integrated circuit (IC)	A combination of inseparable associated circuit elements that are formed in place and interconnected on or within a single base material to perform a microcircuit function.
intelligent power adjustment (IPA)	A mechanism used to reduce the optical power of all the amplifiers in an adjacent regeneration section in the upstream to a safety level if the system detects the loss of optical signals on the link. If the fiber is broken, the device performance degrades, or the connector is not plugged well, the loss of optical signals may occur. With IPA, maintenance engineers will not be hurt by the laser sent out from the slice of broken fiber.

interleaving	A process of systematically changing the bit sequence of a digital signal, usually as part of the channel coding, in order to reduce the influence of error bursts that may occur during transmission.
intermediate frequency (IF)	The transitional frequency between the frequencies of a modulated signal and an RF signal.
inverse multiplexing over ATM (IMA)	A technique that involves inverse multiplexing and de-multiplexing of ATM cells in a cyclical fashion among links grouped to form a higher bandwidth logical link whose rate is approximately the sum of the link rates.

J

jitter	Short waveform variations caused by vibration, voltage fluctuations, and control system instability.
jumper	A connection wire for connecting two pins.

K

K byte	A general designation of K1 byte and K2 byte in the SDH.

L

L2 switching	The switching based on the data link layer.
L2VPN	Layer 2 virtual private network
LACP	See Link Aggregation Control Protocol.
LACPDU	Link Aggregation Control Protocol data unit
LAG	See link aggregation group.
LAN	See local area network.
LAPS	Link Access Protocol-SDH
LB	See loopback.
LBM	See loopback message.
LBR	See loopback reply.
LC	Lucent connector
LCAS	See link capacity adjustment scheme.
LCN	local communications network
LCT	local craft terminal
LDP	Label Distribution Protocol
LED	See light emitting diode.

LER	See label edge router.
LIFO	See last in first out.
LIU	logical interface unit
LL	logical link
LLC	See logical link control.
LLID	local loopback ID
LM	See loss measurement.
LOC	loss of continuity
LOM	loss of multiframe
LOP	loss of pointer
LOS	See loss of signal.
LP	lower order path
LPA	low order path adaptation
LPT	link-state pass through
LSP	See label switched path.
LSR	See label switching router.
LT	linktrace
LTM	See linktrace message.
LTR	See linktrace reply.
LU	line unit
Layer 2 switching	A data forwarding method. In a LAN, a network bridge or 802.3 Ethernet switch transmits and distributes packet data based on the MAC address. Since the MAC address is at the second layer of the OSI model, this data forwarding method is called Layer 2 switching.
Link Aggregation Control Protocol (LACP)	A method of bundling a group of physical interfaces together as a logical interface to increase bandwidth and reliability. For related protocols and standards, refer to IEEE 802.3ad.
label	A short identifier that is of fixed length and local significance. It is used to uniquely identify the FEC to which a packet belongs. It does not contain topology information. It is carried in the header of a packet and does not contain topology information.
label distribution	Packets with the same destination address belong to an FEC. A label out of an MPLS label resource pool is allocated to the FEC. LSRs record the relationship of the label and the FEC. Then, LSRs sends a message and advertises to upstream LSRs about the label and FEC relationship in message. The process is called label distribution.
label edge router (LER)	A device that sits at the edge of an MPLS domain, that uses routing information to assign labels to datagrams and then forwards them into the MPLS domain.

label space	Value range of the label allocated to peers.
label switched path (LSP)	A sequence of hops (R0...Rn) in which a packet travels from R0 to Rn through label switching mechanisms. A label-switched path can be chosen dynamically, based on common routing mechanisms or through configuration.
label switching router (LSR)	Basic element of an MPLS network. All LSRs support the MPLS protocol. The LSR is composed of two parts: control unit and forwarding unit. The former is responsible for allocating the label, selecting the route, creating the label forwarding table, creating and removing the label switch path; the latter forwards the labels according to groups received in the label forwarding table.
laser	A component that generates directional optical waves of narrow wavelengths. The laser light has better coherence than ordinary light. The fiber system takes the semi-conductor laser as the light source.
last in first out (LIFO)	A play mode of the voice mails, the last voice mail is played firstly.
layer	A concept used to allow the transport network functionality to be described hierarchically as successive levels; each layer being solely concerned with the generation and transfer of its characteristic information.
license	A permission that the vendor provides for the user with a specific function, capacity, and duration of a product. A license can be a file or a serial number. Usually the license consists of encrypted codes. The operation authority granted varies with the level of the license.
light emitting diode (LED)	A display and lighting technology used in almost every electrical and electronic product on the market, to from a tiny on/off light to digital readouts, flashlights, traffic lights and perimeter lighting. LEDs are also used as the light source in multimode fibers, optical mice and laser-class printers.
line rate	The maximum packet forwarding capacity on a cable. The value of line rate equals the maximum transmission rate capable on a given type of media.
linear MSP	linear multiplex section protection
link aggregation group (LAG)	An aggregation that allows one or more links to be aggregated together to form a link aggregation group so that a MAC client can treat the link aggregation group as if it were a single link.
link capacity adjustment scheme (LCAS)	LCAS in the virtual concatenation source and sink adaptation functions provides a control mechanism to hitless increase or decrease the capacity of a link to meet the bandwidth needs of the application. It also provides a means of removing member links that have experienced failure. The LCAS assumes that in cases of capacity initiation, increases or decreases, the construction or destruction of the end-to-end path is the responsibility of the network and element management systems.
link monitoring	A mechanism for an interface to notify the peer of the fault when the interface detects that the number of errored frames, errored codes, or errored frame seconds reaches or exceeds the specified threshold.
link protection	Protection provided by the bypass tunnel for the link on the working tunnel. The link is a downstream link adjacent to the point of local repair (PLR). When the PLR fails to provide node protection, the link protection should be provided.
linktrace message (LTM)	The message sent by the initiator MEP of 802.1ag MAC Trace to the destination MEP. LTM includes the Time to Live (TTL) and the MAC address of the destination MEP2.

linktrace reply (LTR)	For 802.1ag MAC Trace, the destination MEP replies with a response message to the source MEP after the destination MEP receives the LTM, and the response message is called LTR. LTR also includes the TTL that equals the result of the TTL of LTM minus 1.
load balancing	The distribution of activity across two or more servers or components in order to avoid overloading any one with too many requests or too much traffic.
load sharing	A device running mode. Two or more hardware units can averagely share the system load based on their processing capabilities when they are operating normally. When a hardware unit fails, the other units fulfill the tasks of the faulty unit on the precondition for guaranteeing system performance, for example, few call loss.
loading	A process of importing information from the storage device to the memory to facilitate processing (when the information is data) or execution (when the information is program).
local MEP	An MEP of a device on a network enabled with Ethernet CFM.
local area network (LAN)	A network formed by the computers and workstations within the coverage of a few square kilometers or within a single building. It features high speed and low error rate. Ethernet, FDDI, and Token Ring are three technologies used to implement a LAN. Current LANs are generally based on switched Ethernet or Wi-Fi technology and running at 1,000 Mbit/s (that is, 1 Gbit/s).
logical interface	An interface that does not exist physically and comes into being through configuration. It can also exchange data.
logical link control (LLC)	According to the IEEE 802 family of standards, Logical Link Control (LLC) is the upper sublayer of the OSI data link layer. The LLC is the same for the various physical media (such as Ethernet, token ring, WLAN).
loopback (LB)	A troubleshooting technique that returns a transmitted signal to its source so that the signal or message can be analyzed for errors. The loopback can be a inloop or outloop.
loopback message (LBM)	The loopback packet sent by the node that supports 802.2ag MAC Ping to the destination node. LBM message carries its own sending time.
loopback reply (LBR)	A response message involved in the 802.2ag MAC Ping function, with which the destination MEP replies to the source MEP after the destination MEP receives the LBM. The LBR carries the sending time of LBM, the receiving time of LBM and the sending time of LBR.
loss measurement (LM)	A method used to collect counter values applicable for ingress and egress service frames where the counters maintain a count of transmitted and received data frames between a pair of MEPs.
loss of signal (LOS)	No transitions occurring in the received signal.
low-pass filter	A filter designed to transmit electromagnetic frequencies below a certain value, while excluding those of a higher frequency.
lower subrack	The subrack close to the bottom of the cabinet that contains several subracks.
lower threshold	A lower performance limit which when exceeded by a performance event counter will trigger a threshold-crossing event.

M

MA	maintenance association
MAC	See Media Access Control.
MAC address	A link layer address or physical address. It is six bytes long.
MAC address aging	A function that deletes MAC address entries of a device when no packets are received from this device within a specified time period.
MADM	multiple add/drop multiplexer
MAN	See metropolitan area network.
MBS	maximum burst size
MCF	message communication function
MCR	minimum cell rate
MD	See maintenance domain.
MDP	message dispatch process
ME	See maintenance entity.
MEG	maintenance entity group
MEL	maintenance entity group level
MEP	See maintenance entity group end point.
MFAS	See multiframe alignment signal.
MIP	See maintenance entity group intermediate point.
MLD	See multicast listener discovery.
MP	maintenance point
MPID	maintenance point identification
MPLS	See Multiprotocol Label Switching.
MPLS TE	multiprotocol label switching traffic engineering
MPLS VPN	See multiprotocol label switching virtual private network.
MPLS-TP	See transport profile for multiprotocol label switching.
MS	multiplex section
MSA	multiplex section adaptation
MSB	most significant bit
MSOH	multiplex section overhead
MSP	See multiplex section protection.
MST	See multiplex section termination.

MST region	See Multiple Spanning Tree region.
MSTI	See multiple spanning tree instance.
MSTP	See Multiple Spanning Tree Protocol.
MTBF	See mean time between failures.
MTIE	maximum time interval error
MTTR	See mean time to repair.
MTU	See maximum transmission unit.
MUX	See multiplexer.
Media Access Control (MAC)	A protocol at the media access control sublayer. The protocol is at the lower part of the data link layer in the OSI model and is mainly responsible for controlling and connecting the physical media at the physical layer. When transmitting data, the MAC protocol checks whether to be able to transmit data. If the data can be transmitted, certain control information is added to the data, and then the data and the control information are transmitted in a specified format to the physical layer. When receiving data, the MAC protocol checks whether the information is correct and whether the data is transmitted correctly. If the information is correct and the data is transmitted correctly, the control information is removed from the data and then the data is transmitted to the LLC layer.
Multicast Routing Protocol	A protocol used to set up and maintain multicast routes, and to correctly and effectively forward multicast packets. The multicast route is used to set up a loop-free transmission path from the source to multiple receivers, that is, the multicast distribution tree.
Multiple Spanning Tree Protocol (MSTP)	A protocol that can be used in a loop network. Using an algorithm, the MSTP blocks redundant paths so that the loop network can be trimmed as a tree network. In this case, the proliferation and endless cycling of packets is avoided in the loop network. The protocol that introduces the mapping between VLANs and multiple spanning trees. This solves the problem that data cannot be normally forwarded in a VLAN because in STP/RSTP, only one spanning tree corresponds to all the VLANs.
Multiple Spanning Tree region (MST region)	A region that consists of switches that support the MSTP in the LAN and links among them. Switches physically and directly connected and configured with the same MST region attributes belong to the same MST region.
Multiprotocol Label Switching (MPLS)	A technology that uses short tags of fixed length to encapsulate packets in different link layers, and provides connection-oriented switching for the network layer on the basis of IP routing and control protocols. It improves the cost performance and expandability of networks, and is beneficial to routing.
main topology	A basic component of a human-machine interface. It is the default client interface of the NMS and intuitively displays the structure of a network, NEs on the network, subnets in the network as well as the NE communication and running status, reflecting the overall network running status.
maintenance domain (MD)	The network or the part of the network for which connectivity is managed by connectivity fault management (CFM). The devices in a maintenance domain are managed by a single Internet service provider (ISP).
maintenance entity (ME)	An ME consists of a pair of maintenance entity group end points (MEPs), two ends of a transport trail, and maintenance association intermediate points (MIPs) on the

trail.

maintenance entity group end point (MEP)	An end point of a MEG, which is able to initialize and stop the transmission of OAM data packets for fault management and performance monitoring.
maintenance entity group intermediate point (MIP)	An intermediate point in a MEG, which is able to forward OAM packets and respond to some OAM packets, but unable to initiate the transmission of OAM packets or perform any operations on network connections.
management information	The information that is used for network management in a transport network.
maximum transmission unit (MTU)	The largest packet of data that can be transmitted on a network. MTU size varies, depending on the network—576 bytes on X.25 networks, for example, 1500 bytes on Ethernet, and 17,914 bytes on 16 Mbit/s token ring. Responsibility for determining the size of the MTU lies with the link layer of the network. When packets are transmitted across networks, the path MTU, or PMTU, represents the smallest packet size (the one that all networks can transmit without breaking up the packet) among the networks involved.
mean time between failures (MTBF)	The average time between consecutive failures of a piece of equipment. It is a measure of the reliability of the system.
mean time to repair (MTTR)	The average time that a device will take to recover from a failure.
measurement period	The interval for NEs to report measurement results to the Network Management System (NMS).
medium	A physical medium for storing computer information. A medium is used for data duplication and keeping the data for some time. Original data can be obtained from a medium.
member	A basic element for forming a dimension according to the hierarchy of each level. Each member represents a data element in a dimension. For example, January 1997 is a typical member of the time dimension.
metropolitan area network (MAN)	A network that interconnects users with computer resources in a geographic area or region larger than that covered by even a large LAN but smaller than the area covered by an WAN. The term is applied to the interconnection of networks in a city into a single larger network (which may then also offer efficient connection to a wide area network). It is also used to mean the interconnection of several local area networks by bridging them with backbone lines. The latter usage is also sometimes referred to as a campus network.
microwave	The portion of the electromagnetic spectrum with much longer wavelengths than infrared radiation, typically above about 1 mm.
mirroring	The duplication of data for backup or to distribute network traffic among several computers with identical data.
monitor link	A port association solution developed as a supplementary to smart link.
monitoring	A method that an inspector uses to inspect a service agent. By monitoring a service agent, an inspector can check each detailed operation performed by the service agent during the conversation and operate the GUI used by the service agent. The inspector helps the service agent to provide better service.
mounting	An auxiliary or associated condition or component of a device.
mounting ear	A piece of angle plate with holes in it on a rack. It is used to fix network elements

or components.

multicast	A process of transmitting data packets from one source to many destinations. The destination address of the multicast packet uses Class D address, that is, the IP address ranges from 224.0.0.0 to 239.255.255.255. Each multicast address represents a multicast group rather than a host.
multicast listener discovery (MLD)	A protocol used by an IPv6 router to discover the multicast listeners on their directly connected network segments, and to set up and maintain member relationships. On IPv6 networks, after MLD is configured on the receiver hosts and the multicast router to which the hosts are directly connected, the hosts can dynamically join related groups and the multicast router can manage members on the local network.
multiframe alignment signal (MFAS)	A distinctive signal inserted in every multiframe or once in every n multiframes, always occupying the same relative position within the multiframe, and used to establish and maintain multiframe alignment.
multiple spanning tree instance (MSTI)	A type of spanning trees calculated by MSTP within an MST Region, to provide a simply and fully connected active topology for frames classified as belonging to a VLAN that is mapped to the MSTI by the MST Configuration. A VLAN cannot be assigned to multiple MSTIs.
multiplex section protection (MSP)	A function, which is performed to provide capability for switching a signal between and including two multiplex section termination (MST) functions, from a "working" to a "protection" channel.
multiplex section termination (MST)	A function, which is performed to generate the MSOH during the process of forming an SDH frame signal and terminates the MSOH in the reverse direction.
multiplexer (MUX)	Equipment which combines a number of tributary channels onto a fewer number of aggregate bearer channels, the relationship between the tributary and aggregate channels being fixed.
multiplexing	A procedure by which multiple lower order path layer signals are adapted into a higher order path or the multiple higher order path layer signals are adapted into a multiplex section.
multiprotocol label switching virtual private network (MPLS VPN)	An Internet Protocol (IP) virtual private network (VPN) based on the multiprotocol label switching (MPLS) technology. It applies the MPLS technology for network routers and switches, simplifies the routing mode of core routers, and combines traditional routing technology and label switching technology. It can be used to construct the broadband Intranet and Extranet to meet various service requirements.

N

N+1 protection	A radio link protection system composed of N working channels and one protection channel.
NAS	network access server
NC	See NTP client.
NE ID	An ID that indicates a managed device in the network. In the network, each NE has a unique NE ID.
NGN	See next generation network.

NHLFE	next hop label forwarding entry
NLP	normal link pulse
NM	network management
NMC	network management center
NNI	network-to-network interface
NP	See network processor.
NPC	See network parameter control.
NPE	network provider edge
NRT-VBR	non-real-time variable bit rate
NRZ	non-return to zero
NRZ code	non-return-to-zero code
NRZI	non-return to zero inverted
NSAP	See network service access point.
NSF	non-stop forwarding
NTP	Network Time Protocol
NTP client (NC)	A bottom-level device in the time synchronization network. An NTP client obtains time from its upper-level NTP server without providing the time synchronization service. Compared with the top-level NTP server, the middle-level NTP server sometimes is called an NTP client.
network layer	Layer 3 of the seven-layer OSI model of computer networking. The network layer provides routing and addressing so that two terminal systems are interconnected. In addition, the network layer provides congestion control and traffic control. In the TCP/IP protocol suite, the functions of the network layer are specified and implemented by IP protocols. Therefore, the network layer is also called IP layer.
network parameter control (NPC)	During communications, UPC is implemented to monitor the actual traffic on each virtual circuit that is input to the network. Once the specified parameter is exceeded, measures will be taken to control. NPC is similar to UPC in function. The difference is that the incoming traffic monitoring function is divided into UPC and NPC according to their positions. UPC locates at the user/network interface, while NPC at the network interface.
network processor (NP)	An integrated circuit which has a feature set specifically targeted at the networking application domain. Network Processors are typically software programmable devices and would have generic characteristics similar to general purpose CPUs that are commonly used in many different types of equipment and products.
network segment	A part of an Ethernet or other network, on which all message traffic is common to all nodes, that is, it is broadcast from one node on the segment and received by all others.
network service	A service that needs to be enabled at the network layer and maintained as a basic service.
network service access point (NSAP)	A network address defined by ISO, through which entities on the network layer can access OSI network services.

network storm	A phenomenon that occurs during data communication. To be specific, mass broadcast packets are transmitted in a short time; the network is congested; transmission quality and availability of the network decrease rapidly. The network storm is caused by network connection or configuration problems.
next generation network (NGN)	A packet-based network aimed to address requirement of various services. It adopts an integrated and open network framework. In NGN, services are separated from call control; call control is separated from bearer. In this way, services are independent of network. NGN can provide various services, such as voice services, data services, multimedia services or the integration of several services.
noise figure	A measure of degradation of the signal-to-noise ratio (SNR), caused by components in a radio frequency (RF) signal chain. The noise figure is defined as the ratio of the output noise power of a device to the portion thereof attributable to thermal noise in the input termination at standard noise temperature T0 (usually 290 K). The noise figure is thus the ratio of actual output noise to that which would remain if the device itself did not introduce noise. It is a number by which the performance of a radio receiver can be specified.
non-GNE	See non-gateway network element.
non-gateway network element (non-GNE)	A network element that communicates with the NM application layer through the gateway NE application layer.

O

O&M	operation and maintenance
OA	optical amplifier
OADM	See optical add/drop multiplexer.
OAM	See operation, administration and maintenance.
OAMPDU	operation, administration and maintenance protocol data unit
OAU	See optical amplifier unit.
OC	ordinary clock
OCP	optical channel protection
OCS	optical core switching
ODF	optical distribution frame
ODU	See outdoor unit.
OFS	out-of-frame second
OHA	overhead access
OHP	overhead processing
OLT	optical line terminal
ONU	See optical network unit.
OPEX	operating expense

OPU	optical channel payload unit
OSC	See optical supervisory channel.
OSI	See open systems interconnection.
OSN	optical switch node
OSNR	See optical signal-to-noise ratio.
OSPF	See Open Shortest Path First.
OTDR	See optical time domain reflectometer.
OTM	optical terminal multiplexer
OTN	optical transport network
OTU	See optical transponder unit.
OTUk	optical channel transport unit-k
Open Shortest Path First (OSPF)	A link-state, hierarchical interior gateway protocol (IGP) for network routing. Dijkstra's algorithm is used to calculate the shortest path tree. It uses cost as its routing metric. A link state database is constructed with the network topology which is identical on all routers in the area.
offline	Pertaining to the disconnection between a device or a service unit and the system or the network, or no running of a device and service unit.
online	A state indicating that a computer device or program is activated and is ready for operations, and can communicate with a computer or can be controlled by the computer.
open systems interconnection (OSI)	A framework of ISO standards for communication between different systems made by different vendors, in which the communications process is organized into seven different categories that are placed in a layered sequence based on their relationship to the user. Each layer uses the layer immediately below it and provides a service to the layer above. Layers 7 through 4 deal with end-to-end communication between the message source and destination, and layers 3 through 1 deal with network functions.
operation, administration and maintenance (OAM)	A group of network support functions that monitor and sustain segment operation, activities that are concerned with, but not limited to, failure detection, notification, location, and repairs that are intended to eliminate faults and keep a segment in an operational state and support activities required to provide the services of a subscriber access network to users/subscribers.
optical add/drop multiplexer (OADM)	A device that can be used to add the optical signals of various wavelengths to one channel and drop the optical signals of various wavelengths from one channel.
optical amplifier unit (OAU)	A board that is mainly responsible for amplifying optical signals. The OAU can be used in both the transmitting direction and the receiving direction.
optical attenuator	A passive device that increases the attenuation in a fiber link. It is used to ensure that the optical power of the signals received at the receive end is not extremely high. It is available in two types: fixed attenuator and variable attenuator.
optical connector	A component normally attached to an optical cable or a piece of apparatus to provide frequent optical interconnection/disconnection of optical fibers or cables.

optical fiber	A thin filament of glass or other transparent material, through which a signal-encoded light beam may be transmitted using total internal reflection.
optical interface	A component that connects several transmit or receive units.
optical network unit (ONU)	A form of Access Node that converts optical signals transmitted via fiber to electrical signals that can be transmitted via coaxial cable or twisted pair copper wiring to individual subscribers.
optical signal-to-noise ratio (OSNR)	The ratio of signal power and noise power in a transmission link. OSNR is the most important index of measuring the performance of a DWDM system. OSNR = signal power/noise power.
optical splitter	A passive component, which is used for splitting and sending optical power to multiple ONUs connected by an optical fiber. In a GPON system that consists of the OLT, ONU, splitter, and optical fibers, according to the split ratio, the optical signal over the optical fiber connected to the OLT is splitted into multiple channels of optical signals and send each channel to each ONU. Split ratio determines how many channels of optical signals an optical fiber can be split to.
optical supervisory channel (OSC)	A technology that uses specific optical wavelengths to realize communication among nodes in optical transmission network and transmit the monitoring data in a certain channel.
optical time domain reflectometer (OTDR)	A device that sends a very short pulse of light down a fiber optic communication system and measures the time history of the pulse reflection to measure the fiber length, the light loss and locate the fiber fault.
optical transponder unit (OTU)	A device or subsystem that converts the accessed client signals into the G.694.1/G.694.2-compliant WDM wavelength.
orderwire	A channel that provides voice communication between operation engineers or maintenance engineers of different stations.
outdoor unit (ODU)	The outdoor unit of the split-structured radio equipment. It implements frequency conversion and amplification for radio frequency (RF) signals.

P

P2MP	point-to-multipoint
P2P	See point-to-point service.
PA	power amplifier
PADR	PPPoe active discovery request
PBS	See peak burst size.
PCB	See printed circuit board.
PCM	See pulse code modulation.
PCR	See peak cell rate.
PCS	physical coding sublayer
PDH	See plesiochronous digital hierarchy.

PDU	See power distribution unit.
PE	See provider edge.
PGND cable	A cable which connects the equipment and the protection grounding bar. Usually, one half of the cable is yellow, whereas the other half is green.
PHB	See per-hop behavior.
PIM-DM	Protocol Independent Multicast - Dense Mode
PIM-SM	Protocol Independent Multicast - Sparse Mode
PKT	partition knowledge table
PLL	See phase-locked loop.
PM	performance monitoring
PMD	polarization mode dispersion
POH	path overhead
POS	See packet over SDH/SONET.
PPD	partial packet discard
PPI	PDH physical interface
PPP	Point-to-Point Protocol
PPPoE	Point-to-Point Protocol over Ethernet
PPS	port protection switching
PQ	See priority queuing.
PRBS	See pseudo random binary sequence.
PRC	primary reference clock
PSD	See power spectrum density.
PSN	See packet switched network.
PSTN	See public switched telephone network.
PSU	power supply unit
PT	payload type
PTI	payload type indicator
PTN	packet transport network
PTP	Precision Time Protocol
PVC	permanent virtual channel
PVID	See port default VLAN ID.
PVP	See permanent virtual path.
PW	See pseudo wire.

PWE3	See pseudo wire emulation edge-to-edge.
packet discarding	A function of discarding the packets from unknown VLAN domain or broadcast packets. Packet Discarding is used to prevent the situation where unknown packets or broadcast packets use the bandwidth on a link, improving the reliability of service transmission.
packet forwarding	An action performed by a router to forward a received datagram, where the destination IP address does not match the IP address of the router, to another router or destination host on the router list.
packet loss	The discarding of data packets in a network when a device is overloaded and cannot accept any incoming data at a given moment.
packet over SDH/SONET (POS)	A MAN and WAN technology that provides point-to-point data connections. The POS interface uses SDH/SONET as the physical layer protocol, and supports the transport of packet data (such as IP packets) in MAN and WAN.
packet rate	The number of bits or bytes passed within a specified time. It is expressed in bits/s or bytes/s.
packet switched network (PSN)	A telecommunications network that works in packet switching mode.
packet switching	A network technology in which information is transmitted by means of exchanging packets and the bandwidth of a channel can be shared by multiple connections.
paired slots	Two slots of which the overheads can be passed through by using the bus on the backplane.
parity bit	A check bit appended to an array of binary digits to make the sum of all the binary digits, including the check bit, always odd or always even.
parity check	A method for character level error detection. An extra bit is added to a string of bits, usually a 7-bit ASCII character, so that the total number of bits 1 is odd or even (odd or even parity). Both ends of a data transmission must use the same parity. When the transmitting device frames a character, it counts the numbers of 1s in the frame and attaches the appropriate parity bit. The recipient counts the 1s and, if there is parity error, may ask for the data to be retransmitted.
parts replacement	A maintenance operation of removing a faulty part or a part to be examined from a running device and then installing a new part.
passive mode	A working mode of EFM OAM. An interface in the passive mode cannot initiate the discovery and remote loopback.
patch	An independent software unit used for fixing the bugs in software.
peak burst size (PBS)	A parameter that is used to define the capacity of token bucket P, that is, the maximum burst IP packet size when the information is transferred at the peak information rate. This parameter must be larger than 0. It is recommended that PBS should be not less than the maximum length of the IP packet that might be forwarded. See also CIR, CBS, and PIR.
peak cell rate (PCR)	The maximum rate at which an ATM connection can accept cells.
peer	BGP speakers that exchange information with each other.
per-hop behavior (PHB)	IETF Diff-Serv workgroup defines forwarding behaviors of network nodes as per-hop behaviors (PHB), such as, traffic scheduling and policing. A device in the network should select the proper PHB behaviors, based on the value of DSCP. At

present, the IETF defines four types of PHB. They are class selector (CS), expedited forwarding (EF), assured forwarding (AF), and best-effort (BE).

performance alarm	An alarm generated when the actual result of a measurement entity equals the predefined logical expression for threshold or exceeds the predefined threshold.
performance parameters	The performance parameters identify some indexes to scale the general performance of the system. The indexes include the number of managed nodes, number of supported clients and log database capacity. The parameters are sorted into static parameters, dynamic parameters and networking bandwidth parameters.
performance register	The memory space for performance event counts, including 15-min current performance register, 24-hour current performance register, 15-min historical performance register, 24-hour historical performance register, UAT register and CSES register. The object of performance event monitoring is the board functional module, so every board functional module has a performance register. A performance register is used to count the performance events taking place within a period of operation time, so as to evaluate the quality of operation from the angle of statistics.
performance threshold	A limit for generating an alarm for a selected entity. When the measurement result reaches or exceeds the preset alarm threshold, the performance management system generates a performance alarm.
permanent virtual path (PVP)	Virtual path that consists of PVCs.
phase	The relative position in time within a single period of a signal.
phase-locked loop (PLL)	A circuit that consists essentially of a phase detector which compares the frequency of a voltage-controlled oscillator with that of an incoming carrier signal or reference-frequency generator; the output of the phase detector, after passing through a loop filter, is fed back to the voltage-controlled oscillator to keep it exactly in phase with the incoming or reference frequency.
physical layer	Layer 1 in the Open System Interconnection (OSI) architecture; the layer that provides services to transmit bits or groups of bits over a transmission link between open systems and which entails electrical, mechanical and handshaking.
physical link	The link between two physical network elements (NEs). When the user creates NEs or refreshes the device status, the system automatically creates the physical link according to the topology structure information on the device. The remark information of a physical link can be modified, but the physical link cannot be deleted.
ping	A method used to test whether a device in the IP network is reachable according to the sent ICMP Echo messages and received response messages.
ping test	A test that is performed to send a data packet to the target IP address (a unique IP address on the device on the network) to check whether the target host exists according to the data packet of the same size returned from the target host.
plesiochronous digital hierarchy (PDH)	A multiplexing scheme of bit stuffing and byte interleaving. It multiplexes the minimum rate 64 kit/s into the 2 Mbit/s, 34 Mbit/s, 140 Mbit/s, and 565 Mbit/s rates.
point-to-point service (P2P)	A service between two terminal users. In P2P services, senders and recipients are terminal users.
pointer	An indicator whose value defines the frame offset of a virtual container with

respect to the frame reference of the transport entity on which this pointer is supported.

polarization	A kind of electromagnetic wave, the direction of whose electric field vector is fixed or rotates regularly. Specifically, if the electric field vector of the electromagnetic wave is perpendicular to the plane of horizon, this electromagnetic wave is called vertically polarized wave; if the electric field vector of the electromagnetic wave is parallel to the plane of horizon, this electromagnetic wave is called horizontal polarized wave; if the tip of the electric field vector, at a fixed point in space, describes a circle, this electromagnetic wave is called circularly polarized wave.
policy	A set of rules that are applied when the conditions for triggering an event are met.
policy template	A template that is used to define the calculation rules of a charging event, for example, rating, debiting and accumulating. A policy template may contain the parameters to be instantiated. They can be used when the attributes of the condition judgment, calculation method, and action functions are carried out.
polling	A mechanism for the NMS to query the agent status and other data on a regular basis.
port default VLAN ID (PVID)	A default VLAN ID of a port. It is allocated to a data frame if the data frame carries no VLAN tag when reaching the port.
port priority	The priority that is used when a port attaches tags to Layer 2 packets. Packets received on ports with higher priorities are forwarded preferentially.
power adjustment	A method for dynamically and properly assigning power according to the real-time status of a wireless network. When an AP runs under an AC for the first time, the AP uses its maximum transmit power. When getting reports from its neighbors (that is, other APs that are detected by the AP and managed by the same AC), the AP determines to increase or decrease its power according to the report conclusion.
power box	A direct current power distribution box at the upper part of a cabinet, which supplies power for the subracks in the cabinet.
power control	A process in which the MS or BS uses certain rules to adjust and control the transmit power according to the change in the channel condition and the power of the received signal.
power distribution unit (PDU)	A unit that performs AC or DC power distribution.
power module	A module that provides power supply to other boards or modules.
power off	An operation that switches off devices during upgrade or expansion.
power on	To start up a computer; to begin a cold boot procedure; to turn on the power
power spectrum density (PSD)	The power layout of random signals in the frequency domain.
printed circuit board (PCB)	A board used to mechanically support and electrically connect electronic components using conductive pathways, tracks, or traces, etched from copper sheets laminated onto a non-conductive substrate.
priority queuing (PQ)	A queue scheduling algorithm based on the absolute priority. According to the PQ algorithm, services of higher priorities are ensured with greater bandwidth, lower latency, and less jitter. Packets of lower priorities must wait to be sent till all packets of higher priorities are sent. In this manner, services of higher priorities are

processed earlier than others.

private line	A line, such as a subscriber cable and trunk cable, which are leased by the telecommunication carrier and are used to meet the special user requirements.
protection path	A specific path that is part of a protection group and is labeled protection.
provider edge (PE)	A device that is located in the backbone network of the MPLS VPN structure. A PE is responsible for managing VPN users, establishing LSPs between PEs, and exchanging routing information between sites of the same VPN. A PE performs the mapping and forwarding of packets between the private network and the public channel. A PE can be a UPE, an SPE, or an NPE.
pseudo random binary sequence (PRBS)	A sequence that is random in a sense that the value of an element is independent of the values of any of the other elements, similar to real random sequences.
pseudo wire (PW)	An emulated connection between two PEs for transmitting frames. The PW is established and maintained by PEs through signaling protocols. The status information of a PW is maintained by the two end PEs of a PW.
pseudo wire emulation edge-to-edge (PWE3)	An end-to-end Layer 2 transmission technology. It emulates the essential attributes of a telecommunication service such as ATM, FR or Ethernet in a packet switched network (PSN). PWE3 also emulates the essential attributes of low speed time division multiplexing (TDM) circuit and SONET/SDH. The simulation approximates to the real situation.
public switched telephone network (PSTN)	A telecommunications network established to perform telephone services for the public subscribers. Sometimes it is called POTS.
pulse	A variation above or below a normal level and a given duration in electrical energy.
pulse code modulation (PCM)	A method of encoding information in a signal by changing the amplitude of pulses. Unlike pulse amplitude modulation (PAM), in which pulse amplitude can change continuously, pulse code modulation limits pulse amplitudes to several predefined values. Because the signal is discrete, or digital, rather than analog, pulse code modulation is more immune to noise than PAM.

Q

QA	Q adaptation
QAM	See quadrature amplitude modulation.
QPSK	See quadrature phase shift keying.
QinQ	A layer 2 tunnel protocol based on IEEE 802.1Q encapsulation. It add a public VLAN tag to a frame with a private VLAN tag to allow the frame with double VLAN tags to be transmitted over the service provider's backbone network based on the public VLAN tag. This provides a layer 2 VPN tunnel for customers and enables transparent transmission of packets over private VLANs.
QoS	See quality of service.
quadrature amplitude modulation (QAM)	Both an analog and a digital modulation scheme. It conveys two analog message signals, or two digital bit streams, by changing (modulating) the amplitudes of two carrier waves, using the amplitude-shift keying (ASK) digital modulation scheme or amplitude modulation (AM) analog modulation scheme. These two waves,

usually sinusoids, are out of phase with each other by 90 ° and are thus called quadrature carriers or quadrature components — hence the name of the scheme.

quadrature phase shift keying (QPSK)

A modulation method of data transmission through the conversion or modulation and the phase determination of the reference signals (carrier). It is also called the fourth period or 4-phase PSK or 4-PSK. QPSK uses four dots in the star diagram. The four dots are evenly distributed on a circle. On these phases, each QPSK character can perform two-bit coding and display the codes in Gray code on graph with the minimum BER.

quality of service (QoS)

A commonly-used performance indicator of a telecommunication system or channel. Depending on the specific system and service, it may relate to jitter, delay, packet loss ratio, bit error ratio, and signal-to-noise ratio. It functions to measure the quality of the transmission system and the effectiveness of the services, as well as the capability of a service provider to meet the demands of users.

R

RADIUS   See Remote Authentication Dial-In User Service.

RAI   remote alarm indication

RDI   remote defect indication

RED   See random early detection.

REG   See regenerator.

REI   remote error indication

RF   See radio frequency.

RIP   See Routing Information Protocol.

RMEP   remote maintenance association end point

RNC   See radio network controller.

ROPA   See remote optical pumping amplifier.

RP   rendezvous point

RPR   resilient packet ring

RS232   A asynchronous transfer mode that does not involve hand-shaking signal. It can communicate with RS232 and RS422 of other stations in point-to-point mode and the transmission is transparent. Its highest speed is 19.2kbit/s.

RS422   The specification that defines the electrical characteristics of balanced voltage digital interface circuits. The interface can change to RS232 via the hardware jumper and others are the same as RS232.

RSL   See received signal level.

RSOH   regenerator section overhead

RSSI   See received signal strength indicator.

RST   regenerator section termination

RSTP	See Rapid Spanning Tree Protocol.
RTN	radio transmission node
RTP	See Real-Time Transport Protocol.
Rapid Spanning Tree Protocol (RSTP)	An evolution of the Spanning Tree Protocol, providing for faster spanning tree convergence after a topology change. The RSTP protocol is backward compatible with the STP protocol.
Real-Time Transport Protocol (RTP)	A type of host-to-host protocol used in real-time multimedia services such as Voice over IP (VoIP) and video.
Remote Authentication Dial-In User Service (RADIUS)	A security service that authenticates and authorizes dial-up users and is a centralized access control mechanism. RADIUS uses the User Datagram Protocol (UDP) as its transmission protocol to ensure real-time quality. RADIUS also supports the retransmission and multi-server mechanisms to ensure good reliability.
RoHS	restriction of the use of certain hazardous substances
Routing Information Protocol (RIP)	A simple routing protocol that is part of the TCP/IP protocol suite. It determines a route based on the smallest hop count between source and destination. RIP is a distance vector protocol that routinely broadcasts routing information to its neighboring routers and is known to waste bandwidth.
radio frequency (RF)	A type of electric current in the wireless network using AC antennas to create an electromagnetic field. It is the abbreviation of high-frequency AC electromagnetic wave. The AC with the frequency lower than 1 kHz is called low-frequency current. The AC with frequency higher than 10 kHz is called high-frequency current. RF can be classified into such high-frequency current.
radio network controller (RNC)	A piece of equipment in the RNS which is in charge of controlling the use and the integrity of the radio resources.
radio propagation model	An empirical mathematical formulation for the characterization of radio wave propagation as a function of frequency, distance and other conditions. A single model is usually developed to predict the behavior of propagation for all similar links under similar constraints.
random early detection (RED)	A packet loss algorithm used in congestion avoidance. It discards the packet according to the specified higher limit and lower limit of a queue so that global TCP synchronization resulting from traditional tail drop can be prevented.
rate limiting	A traffic management technology used to limit the total rate of packet sending on a physical interface or a Tunnel interface. Rate limiting is directly enabled on the interface to control the traffic passing the interface.
real-time variable bit rate (rt-VBR)	A parameter intended for real-time applications, such as compressed voice over IP (VoIP) and video conferencing. The rt-VBR is characterized by a peak cell rate (PCR), sustained cell rate (SCR), and maximum burst size (MBS). You can expect the source device to transmit in bursts and at a rate that varies with time.
reboot	To start the system again. Programs or data will be reloaded to all boards.
received signal level (RSL)	The signal level at a receiver input terminal.
received signal strength indicator (RSSI)	The received wide band power, including thermal noise and noise generated in the receiver, within the bandwidth defined by the receiver pulse shaping filter, for TDD within a specified timeslot. The reference point for the measurement shall be

	the antenna
receiver sensitivity	The minimum acceptable value of average received power at point R to achieve a 1 x 10-12 BER (The FEC is open).
recognition	Consumer awareness of having seen or heard an advertising message.
reference clock	A kind of stable and high-precision autonous clock providing frequencies for other clocks for reference.
reflectance	The ratio of the reflected optical power to the incident optical power.
regeneration	The process of receiving and reconstructing a digital signal so that the amplitudes, waveforms and timing of its signal elements are constrained within specified limits.
regenerator (REG)	A piece of equipment or device that regenerates electrical signals.
relay	An electronic control device that has a control system and a system to be controlled. The relay of the telepresence system is used to control the power of telepresence equipment and is controlled by the telepresence host.
remote optical pumping amplifier (ROPA)	A remote optical amplifier subsystem designed for applications where power supply and monitoring systems are unavailable. The ROPA subsystem is a power compensation solution to the ultra-long distance long hop (LHP) transmission.
reservation	An action that the charging module performs to freeze a subscriber's balance amount, free resources, credits, or quotas before the subscriber uses services. This action ensures that the subscriber has sufficient balance to pay for services.
resistance	The ability to impede (resist) the flow of electric current. With the exception of superconductors, all substances have a greater or lesser degree of resistance. Substances with very low resistance, such as metals, conduct electricity well and are called conductors. Substances with very high resistance, such as glass and rubber, conduct electricity poorly and are called nonconductors or insulators.
resource sharing	A physical resource belonging to two or more protection subnetworks.
response	A message that is returned to the requester to notify the requester of the status of the request packet.
robustness	The ability of a system to maintain function even with changes in internal structure or external environment.
rollback	A return to a previous condition through cancellation of a certain operation.
root alarm	An alarm directly caused by anomaly events or faults in the network. Some lower-level alarms always accompany a root alarm.
route	The path that network traffic takes from its source to its destination. In a TCP/IP network, each IP packet is routed independently. Routes can change dynamically.
router	A device on the network layer that selects routes in the network. The router selects the optimal route according to the destination address of the received packet through a network and forwards the packet to the next router. The last router is responsible for sending the packet to the destination host. Can be used to connect a LAN to a LAN, a WAN to a WAN, or a LAN to the Internet.
routing	The determination of a path that a data unit (frame, packet, message) traverses from source to destination.

routing protocol	A formula used by routers to determine the appropriate path onto which data should be forwarded.
rt-VBR	See real-time variable bit rate.

S

S1 byte	A byte to transmit network synchronization status information. On an SDH network, each NE traces hop by hop to the same clock reference source through a specific clock synchronization path, realizing synchronization on the entire network. If a clock reference source traced by an NE is missing, this NE will trace another clock reference source of a lower level. To implement protection switching of clocks in the whole network, the NE must learn about clock quality information of the clock reference source it traces. Therefore, ITU-T defines S1 byte to transmit network synchronization status information. It uses the lower four bits of the multiplex section overhead S1 byte to indicate 16 types of synchronization quality grades. Auto protection switching of clocks in a synchronous network can be implemented using S1 byte and a proper switching protocol.
SAN	storage area network
SAToP	Structure-Agnostic Time Division Multiplexing over Packet
SC	square connector
SCR	sustainable cell rate
SD	See signal degrade.
SD trigger flag	A signal degrade trigger flag that determines whether to perform a switching when SD occurs. The SD trigger flag can be set by using the network management system.
SD-SDI	See standard definition-serial digital interface signal.
SDH	See synchronous digital hierarchy.
SDP	serious disturbance period
SDRAM	See synchronous dynamic random access memory.
SELV	safety extra-low voltage
SEMF	synchronous equipment management function
SES	severely errored second
SETS	SDH equipment timing source
SF	See signal fail.
SFP	small form-factor pluggable
SFTP	See Secure File Transfer Protocol.
SHDSL	See single-pair high-speed digital subscriber line.
SMSR	side mode suppression ratio
SNC	subnetwork connection

SNCMP	subnetwork connection multipath protection
SNCP	subnetwork connection protection
SNCTP	subnetwork connection tunnel protection
SNMP	See Simple Network Management Protocol.
SNR	See signal-to-noise ratio.
SOH	section overhead
SONET	See synchronous optical network.
SPE	See superstratum provider edge.
SSL	See Secure Sockets Layer.
SSM	See Synchronization Status Message.
SSMB	synchronization status message byte
SSU	synchronization supply unit
STD	system target decoder
STP	Spanning Tree Protocol
SVC	switched virtual connection
Secure File Transfer Protocol (SFTP)	A network protocol designed to provide secure file transfer over SSH.
Secure Sockets Layer (SSL)	A security protocol that works at a socket level. This layer exists between the TCP layer and the application layer to encrypt/decode data and authenticate concerned entities.
Simple Network Management Protocol (SNMP)	A network management protocol of TCP/IP. It enables remote users to view and modify the management information of a network element. This protocol ensures the transmission of management information between any two points. The polling mechanism is adopted to provide basic function sets. According to SNMP, agents, which can be hardware as well as software, can monitor the activities of various devices on the network and report these activities to the network console workstation. Control information about each device is maintained by a management information block.
Synchronization Status Message (SSM)	A message that carries quality levels of timing signals on a synchronous timing link. Nodes on an SDH network and a synchronization network acquire upstream clock information through this message. Then the nodes can perform proper operations on their clocks, such as tracing, switching, or converting to holdoff, and forward the synchronization information to downstream nodes.
security	Protection of a computer system and its data from harm or loss. A major focus of computer security, especially on systems accessed by many people or through communication lines, is preventing system access by unauthorized individuals.
security service	A service, provided by a layer of communicating open systems, which ensures adequate security of the systems or of data transfer.
self-healing	A function of establishing a replacement connection by network without the network management connection function. When a connection failure occurs, the replacement connection is found by the network elements and rerouted depending

on network resources available at that time.

serial port	An input/output location (channel) that sends and receives data to and from a computer's CPU or a communications device one bit at a time. Serial ports are used for serial data communication and as interfaces with some peripheral devices, such as mice and printers.
service flow	An MAC-layer-based unidirectional transmission service. It is used to transmit data packets, and is characterized by a set of QoS parameters, such as latency, jitter, and throughput.
service level	The level of service quality of an evaluated party in a specified period, determined by an evaluating party.
service protection	A measure that ensures that services can be received at the receive end.
session	A logical connection between two nodes on a network for the exchange of data. It generally can apply to any link between any two data devices. A session is also used simply to describe the connection time.
shaping	A process of delaying packets within a traffic stream to cause it to conform to specific defined traffic profile.
signal degrade (SD)	A signal indicating that associated data has degraded in the sense that a degraded defect condition is active.
signal fail (SF)	A signal indicating that associated data has failed in the sense that a near-end defect condition (non-degrade defect) is active.
signal-to-noise ratio (SNR)	The ratio of the amplitude of the desired signal to the amplitude of noise signals at a given point in time. SNR is expressed as 10 times the logarithm of the power ratio and is usually expressed in dB (Decibel).
signaling	The information exchange concerning the establishment and control of a telecommunication circuit and the management of the network.
single-ended switching	A protection operation method that takes switching action only at the affected end of the protected entity (for example, trail, subnetwork connection), in the case of a unidirectional failure.
single-pair high-speed digital subscriber line (SHDSL)	A symmetric digital subscriber line technology developed from HDSL, SDSL, and HDSL2, which is defined in ITU-T G.991.2. The SHDSL port is connected to the user terminal through the plain telephone subscriber line and uses trellis coded pulse amplitude modulation (TC-PAM) technology to transmit high-speed data and provide the broadband access service.
single-polarized antenna	An antenna intended to radiate or receive radio waves with only one specified polarization.
slicing	Dividing data into the information units proper for transmission.
smooth upgrade	Process of upgrading the system files without service interruption
span	The physical reach between two pieces of WDM equipment. The number of spans determines the signal transmission distance supported by a piece of equipment and varies according to transmission system type.
standard definition-serial digital interface signal (SD-SDI)	Standard definition video signal transported by serial digital interface.

static ARP	A protocol that binds some IP addresses to a specified gateway. The packet of these IP addresses must be forwarded through this gateway.
static route	A route that cannot adapt to the change of network topology. Operators must configure it manually. When a network topology is simple, the network can work in the normal state if only the static route is configured. It can improve network performance and ensure bandwidth for important applications. Its disadvantage is as follows: When a network is faulty or the topology changes, the static route does not change automatically. It must be changed by the operators.
statistical multiplexing	A multiplexing technique whereby information from multiple logical channels can be transmitted across a single physical channel. It dynamically allocates bandwidth only to active input channels, to make better use of available bandwidth and allow more devices to be connected than with other multiplexing techniques.
steering	A protection switching mode defined in ITU-T G.8132, which is applicable to packet-based T-MPLS ring networks and similar to SDH transoceanic multiplex section protection (MSP). In this mode, the switching is triggered by the source and sink nodes of a service.
stress	The force, or combination of forces, which produces a strain; force exerted in any direction or manner between contiguous bodies, or parts of bodies, and taking specific names according to its direction, or mode of action, as thrust or pressure, pull or tension, shear or tangential stress.
subnet	A type of smaller networks that form a larger network according to a rule, for example, according to different districts. This facilitates the management of the large network.
subnet mask	The technique used by the IP protocol to determine which network segment packets are destined for. The subnet mask is a binary pattern that is stored in the client machine, server or router matches with the IP address.
superstratum provider edge (SPE)	Core devices that are located within a VPLS full-meshed network. The UPE devices that are connected with the SPE devices are similar to the CE devices. The PWs set up between the UPE devices and the SPE devices serve as the ACs of the SPE devices. The SPE devices must learn the MAC addresses of all the sites on UPE side and those of the UPE interfaces that are connected with the SPE. SPE is sometimes called NPE.
suppress	To forbid the printing of the paper bill of an account that meets certain conditions during the bill run.
suspension	A specific state in the life cycle of a subscriber. A subscriber in this state can neither make calls nor receive calls.
switching capacity	The backplane bandwidth or switching bandwidth. The switching capacity is the maximum data that can be processed by the interface processor of a switch and the data bus. The backplane bandwidth indicates the overall data switching capability of a switch, in Gbit/s.
switching priority	A priority of a board that is defined for protection switching. When several protected boards need to be switched, a switching priority should be set for each board. If the switching priorities of the boards are the same, services on the board that fails later cannot be switched. Services on the board with higher priority can preempt the switching resources of that with lower priority.
synchronous digital hierarchy (SDH)	A transmission scheme that follows ITU-T G.707, G.708, and G.709. It defines the transmission features of digital signals such as frame structure, multiplexing mode,

	transmission rate level, and interface code. SDH is an important part of ISDN and B-ISDN. It interleaves the bytes of low-speed signals to multiplex the signals to high-speed counterparts, and the line coding of scrambling is used only for signals. SDH is suitable for the fiber communication system with high speed and a large capacity since it uses synchronous multiplexing and flexible mapping structure.
synchronous dynamic random access memory (SDRAM)	A new type of DRAM that can run at much higher clock speeds than conventional memory. SDRAM actually synchronizes itself with the CPU's bus and is capable of running at 100 MHz, about three times faster than conventional FPM RAM, and about twice as fast as EDO DRAM or BEDO DRAM. SDRAM is replacing EDO DRAM in computers.
synchronous optical network (SONET)	A high-speed network that provides a standard interface for communications carriers to connect networks based on fiber optical cable. SONET is designed to handle multiple data types (voice, video, and so on). It transmits at a base rate of 51.84 Mbit/s, but multiples of this base rate go as high as 2.488 Gbit/s.

T

TCI	tag control information
TCM	tandem connection monitor
TCN	topology change notification
TCP	See Transmission Control Protocol.
TCP/IP	Transmission Control Protocol/Internet Protocol
TDC	tunable dispersion compensator
TDM	See time division multiplexing.
TE	terminal equipment
TFTP	See Trivial File Transfer Protocol.
TIM	trace identifier mismatch
TLV	See type-length-value.
TM	See terminal multiplexer.
TMN	See telecommunications management network.
TOD	time of day
TPID	tag protocol identifier
TPS	See tributary protection switching.
TPS protection	The equipment level protection that uses one standby tributary board to protect N tributary boards. When a fault occurs on the working board, the SCC issues the switching command, and the payload of the working board can be automatically switched over to the specified protection board and the protection board takes over as the working board. After the fault is rectified, the service is automatically switched to the original board.
TSD	trail signal degrade

TTI	trail trace identifier
TTL	See time to live.
TTSI	See trail termination source identifier.
TU	tributary unit
TU-LOP	tributary unit loss of pointer
TUG	tributary unit group
Tc	committed rate measurement interval
Telnet	A standard terminal emulation protocol in the TCP/IP protocol stack. Telnet allows users to log in to remote systems and use resources as if they were connected to a local system. Telnet is defined in RFC 854.
ToS	type of service
Transmission Control Protocol (TCP)	The protocol within TCP/IP that governs the breakup of data messages into packets to be sent using Internet Protocol (IP), and the reassembly and verification of the complete messages from packets received by IP. A connection-oriented, reliable protocol (reliable in the sense of ensuring error-free delivery), TCP corresponds to the transport layer in the ISO/OSI reference model.
Trivial File Transfer Protocol (TFTP)	A small and simple alternative to FTP for transferring files. TFTP is intended for applications that do not need complex interactions between the client and server. TFTP restricts operations to simple file transfers and does not provide authentication. TFTP is small enough to be contained in ROM to be used for bootstrapping diskless machines.
tail drop	A congestion management mechanism, in which packets arrive later are discarded when the queue is full. This policy of discarding packets may result in network-wide synchronization due to the TCP slow startup mechanism.
tangent ring	A concept borrowed from geometry. Two tangent rings have a common node between them. The common node often leads to single-point failures.
telecommunications management network (TMN)	A protocol model defined by ITU-T for managing open systems in a communications network. An architecture for management, including planning, provisioning, installation, maintenance, operation and administration of telecommunications equipment, networks and services.
terminal multiplexer (TM)	A device used at a network terminal to multiplex multiple channels of low rate signals into one channel of high rate signals, or to demultiplex one channel of high rate signals into multiple channels of low rate signals.
threshold	An amount, limit or level on a scale. Changes will occur with a threshold reached.
threshold alarm	The alarm occurs when the monitored value exceeds the threshold.
threshold crossing alarm	An alarm generated when a threshold is crossed.
throughput	The maximum transmission rate of the tested object (system, equipment, connection, service type) when no packet is discarded. Throughput can be measured with bandwidth.
throughput capability	The data input/output capability of the data transmission interface.
time division multiplexing	A multiplexing technology. TDM divides the sampling cycle of a channel into time slots (TSn, n=0, 1, 2, 3…), and the sampling value codes of multiple signals

(TDM)	engross time slots in a certain order, forming multiple multiplexing digital signals to be transmitted over one channel.
time to live (TTL)	A technique used in best-effort delivery systems to prevent packets that loop endlessly. The TTL is set by the sender to the maximum time the packet is allowed to be in the network. Each router in the network decrements the TTL value when the packet arrives, and discards any packet if the TTL counter reaches zero.
timer	Symbolic representation for a timer object (for example, a timer object may have a primitive designated as T-Start Request). Various MAC entities utilize timer entities that provide triggers for certain MAC state transitions.
timestamp	The current time of an event that is recorded by a computer. By using mechanisms such as the Network Time Protocol (NTP), a computer maintains accurate current time, calibrated to minute fractions of a second.
token bucket algorithm	The token bucket is a container for tokens. The capacity of a token bucket is limited, and the number of tokens determines the traffic rate of permitted packets. The token bucket polices the traffic. Users place the tokens into the bucket regularly according to the preset rate. If the tokens in the bucket exceed the capacity, no tokens can be put in. Packets can be forwarded when the bucket has tokens, otherwise they cannot be transferred till there are new tokens in the bucket. This scheme adjusts the rate of packet input.
topology	The configuration or layout of a network formed by the connections between devices on a local area network (LAN) or between two or more LANs.
topology discovery	A technique to accurately determine the exact layout of a network using a few assumptions about the network architecture and simple tools.
trTCM	See two rate three color marker.
traceroute	A program that prints the path to a destination. Traceroute sends a sequence of datagrams with the time-to-live (TTL) set to 1,2, and so on, and uses ICMP time exceeded messages that return to determine routers along the path.
traffic	The product of the number of calls made and received and the average duration of each call in a measurement period.
traffic classification	A function that enables you to classify traffic into different classes with different priorities according to some criteria. Each class of traffic has a specified QoS in the entire network. In this way, different traffic packets can be treated differently.
traffic policy	A full set of QoS policies formed by association of traffic classification and QoS actions.
traffic shaping	A way of controlling the network traffic from a computer to optimize or guarantee the performance and minimize the delay. It actively adjusts the output speed of traffic in the scenario that the traffic matches network resources provided by the lower layer devices, avoiding packet loss and congestion.
traffic statistics	An activity of measuring and collecting statistics of various data on devices and telecommunications networks. With the statistics, operators can be aware of the operating status, signaling, users, system resource usage of the devices or networks. The statistics also help the operators manage the device operating, locate problems, monitor and maintain the networks, and plan the networks.
trail management function	A network level management function of the network management system. This function enables you to configure end-to-end services, view graphic interface and visual routes of a trail, query detailed information of a trail, filter, search and locate

a trail quickly, manage and maintain trails in a centralized manner, manage alarms and performance data by trail, and print a trail report.

trail termination source identifier (TTSI)	A TTSI uniquely identifies an LSP in the network. A TTSI is carried in the connectivity verification (CV) packet for checking the connectivity of a trail. If it matches the TTSI received by the sink point, the trail has no connectivity defect.
transaction	A business between a carrier and customer, such as payment and account adjustment.
transfer	A process of transferring the account balance of an account to another account.
transit	A packet is transmitted along an LSP consisting of a series of LSRs after the packet is labeled. The intermediate nodes are named transits.
transit node	All the nodes except the master node on an RRPP ring.
transmission delay	The period from the time when a site starts to transmit a data frame to the time when the site finishes the data frame transmission. It consists of the transmission latency and the equipment forwarding latency.
transmit power control	A technical mechanism used within some networking devices in order to prevent too much unwanted interference between different wireless networks.
transparent transmission	A process during which the signaling protocol or data is not processed in the content but encapsulated in the format for the processing of the next phase.
transport profile for multiprotocol label switching (MPLS-TP)	MPLS-TP is an extension to MPLS in terms of forwarding, OAM, reliability, NMS and control plane protocol standardized by IETF to provide sufficient transport functionality.
tray	A component that can be installed in the cabinet for holding chassis or other devices.
tributary loopback	A fault can be located for each service path by performing loopback to each path of the tributary board. There are three kinds of loopback modes: no loopback, outloop, and inloop.
tributary protection switching (TPS)	A function that uses a standby tributary processing board to protect N tributary processing boards.
trunk	Physical communications line between two offices. It transports media signals such as speech, data and video signals.
trunk link	A link used to transport VLAN communication between two switches.
trunk port	A switch port used to connect to other switches. The trunk port can connect to only the trunk link. Only VLANs allowed to pass through a trunk port can be configured on the trunk port.
tunnel	A channel on the packet switching network that transmits service traffic between PEs. In VPN, a tunnel is an information transmission channel between two entities. The tunnel ensures secure and transparent transmission of VPN information. In most cases, a tunnel is an MPLS tunnel.
tunnel ID	A group of information, including the token, slot number of an outgoing interface, tunnel type, and location method.
twisted pair cable	A type of cable that consists of two independently insulated wires twisted around one another for the purposes of canceling out electromagnetic interference which can cause crosstalk. The number of twists per meter makes up part of the

specifications for a given type of cable. The greater the number of twists is, the more crosstalk is reduced.

two rate three color marker (trTCM)	An algorithm that meters an IP packet stream and marks its packets based on two rates, Peak Information Rate (PIR) and Committed Information Rate (CIR), and their associated burst sizes to be either green, yellow, or red. A packet is marked red if it exceeds the PIR. Otherwise it is marked either yellow or green depending on whether it exceeds or does not exceed the CIR.
type-length-value (TLV)	An encoding type that features high efficiency and expansibility. It is also called Code-Length-Value (CLV). T indicates that different types can be defined through different values. L indicates the total length of the value field. V indicates the actual data of the TLV and is most important. TLV encoding features high expansibility. New TLVs can be added to support new features, which is flexible in describing information loaded in packets.

U

UART	universal asynchronous receiver/transmitter
UAS	unavailable second
UAT	See unavailable time event.
UBR	unspecified bit rate
UBR+	Unspecified Bit Rate Plus
UDP	See User Datagram Protocol.
UNI	See user-to-network interface.
UPC	See usage parameter control.
UPE	user-end provider edge
UPI	user payload identifier
UPM	uninterruptible power module
UPS	uninterruptible power supply
UTC	See Coordinated Universal Time.
User Datagram Protocol (UDP)	A TCP/IP standard protocol that allows an application program on one device to send a datagram to an application program on another. User Datagram Protocol (UDP) uses IP to deliver datagram. UDP provides application programs with the unreliable connectionless packet delivery service. There is a possibility that UDP messages will be lost, duplicated, delayed, or delivered out of order. The destination device does not confirm whether a data packet is received.
unavailable time event (UAT)	An event that is reported when the monitored object generates 10 consecutive severely errored seconds (SES) and the SESs begin to be included in the unavailable time. The event will end when the bit error ratio per second is better than 10-3 within 10 consecutive seconds.
unicast	The process of sending data from a source to a single recipient.
unknown multicast packet	A packet for which no forwarding entry is found in the multicast forwarding table.

uplink	A transmission channel through which radio signals or other signals are transmitted to the central office.
uplink tunnel	GTP Tunnel from the Mobile Node to the SGSN.
upload	An operation to report some or all configuration data of an NE to the NMS. The configuration data then covers the configuration data stored at the NMS side.
upper limit	The maximum consumption amount that a carrier sets for a subscriber in a bill cycle. If the consumption amount if a subscriber exceeds the maximum consumption amount that the carrier sets, the OCS still deducts the maximum consumption amount that the carrier sets.
upstream	In an access network, the direction that is far from the subscriber end of the link.
upstream board	A board that provides the upstream transmission function. Through an upstream board, services can be transmitted upstream to the upper-layer device.
usage parameter control (UPC)	During communications, UPC is implemented to monitor the actual traffic on each virtual circuit that is input to the network. Once the specified parameter is exceeded, measures will be taken to control. NPC is similar to UPC in function. The difference is that the incoming traffic monitoring function is divided into UPC and NPC according to their positions. UPC locates at the user/network interface, while NPC at the network interface.
user-to-network interface (UNI)	The interface between user equipment and private or public network equipment (for example, ATM switches).

V

V-NNI	virtual network-network interface
V-UNI	See virtual user-network interface.
V.24	The physical layer interface specification between DTE and DCE defined by the ITU-T. It complies with EIA/TIA-232.
VAS	See value-added service.
VB	virtual bridge
VBR	See variable bit rate.
VC trunk	See virtual container trunk.
VCC	See virtual channel connection.
VCCV	virtual circuit connectivity verification
VCG	See virtual concatenation group.
VCI	virtual channel identifier
VCTRUNK	A virtual concatenation group applied in data service mapping, also called the internal port of a data service processing board.
VIP	very important person
VLAN	virtual local area network

VLAN mapping	A technology that enables user packets to be transmitted over the public network by translating private VLAN tags into public VLAN tags. When user packets arrive at the destination private network, VLAN mapping translates public VLAN tags back into private VLAN tags. In this manner, user packets are correctly transmitted to the destination.
VLAN mapping table	One of the properties of the MST region, which describes mappings between VLANs and spanning tree instances.
VLAN stacking	A technology that adds a VLAN tag to each incoming packet. The VLAN stacking technology implements transparent transmission of C-VLANs in the ISP network to realize the application of Layer 2 Virtual Private Network (VPN).
VP	See virtual path.
VPI	See virtual path identifier.
VPLS	See virtual private LAN service.
VPN	virtual private network
VRRP	See Virtual Router Redundancy Protocol.
VSI	virtual switch interface
Virtual Router Redundancy Protocol (VRRP)	A protocol used for multicast or multicast LANs such as an Ethernet. A group of routers (including an active router and several backup routers) in a LAN is regarded as a virtual router, which is called a backup group. The virtual router has its own IP address. The host in the network communicates with other networks through this virtual router. If the active router in the backup group fails, one of the backup routers in this backup group becomes active and provides routing service for the host in the network.
VoIP	See voice over IP.
value-added service (VAS)	A service provided by carriers and service providers (SPs) together for subscribers based on voice, data, images, SMS messages, and so on. Communication network technologies, computer technologies, and Internet technologies are used to provide value-added services.
variable bit rate (VBR)	One of the traffic classes used by ATM (Asynchronous Transfer Mode). Unlike a permanent CBR (Constant Bit Rate) channel, a VBR data stream varies in bandwidth and is better suited to non real time transfers than to real-time streams such as voice calls.
virtual channel connection (VCC)	A VC logical trail that carries data between two end points in an ATM network. A point-to-multipoint VCC is a set of ATM virtual connections between two or multiple end points.
virtual circuit	A channel or circuit established between two points on a data communications network with packet switching. Virtual circuits can be permanent virtual circuits (PVCs) or switched virtual circuits (SVCs) .
virtual concatenation group (VCG)	A group of co-located member trail termination functions that are connected to the same virtual concatenation link
virtual container trunk (VC trunk)	The logical path formed by some cascaded VCs.
virtual fiber	The fiber that is created between different devices. A virtual fiber represents the

optical path that bears SDH services in a WDM system.

virtual path (VP)	A bundle of virtual channels, all of which are switched transparently across an ATM network based on a common VPI.
virtual path identifier (VPI)	The field in the Asynchronous Transfer Mode (ATM) cell header that identifies to which virtual path the cell belongs.
virtual private LAN service (VPLS)	A type of point-to-multipoint L2VPN service provided over the public network. VPLS enables geographically isolated user sites to communicate with each other through the MAN/WAN as if they are on the same LAN.
virtual user-network interface (V-UNI)	A virtual user-network interface, works as an action point to perform service classification and traffic control in HQoS.
voice over IP (VoIP)	An IP telephony term for a set of facilities used to manage the delivery of voice information over the Internet. VoIP involves sending voice information in a digital form in discrete packets rather than by using the traditional circuit-committed protocols of the public switched telephone network (PSTN).
voltage drop	The voltage developed across a component or conductor by the flow of current through the resistance or impedance of that component or conductor.

W

WAN	See wide area network.
WCDMA	See Wideband Code Division Multiple Access.
WDM	wavelength division multiplexing
WFQ	See weighted fair queuing.
WLAN	See wireless local area network.
WRED	See weighted random early detection.
WRR	weighted round robin
WTR	See wait to restore.
Web LCT	The local maintenance terminal of a transport network, which is located at the NE management layer of the transport network.
Wideband Code Division Multiple Access (WCDMA)	A standard defined by the ITU-T for the third-generation wireless technology derived from the Code Division Multiple Access (CDMA) technology.
wait to restore (WTR)	The number of minutes to wait before services are switched back to the working line.
wavelength	The distance between successive peaks or troughs in a traveling wave, that is, the distance over which a wave is transmitted within a vibration period.
wavelength protection group	Data for describing the wavelength protection structure. Its function is similar to that of the protection subnet for SDH NEs. The wavelength path protection can work only with the correct configuration of the wavelength protection group.
weighted fair queuing (WFQ)	A fair queue scheduling algorithm based on bandwidth allocation weights. This scheduling algorithm allocates the total bandwidth of an interface to queues,

according to their weights and schedules the queues cyclically. In this manner, packets of all priority queues can be scheduled.

weighted random early detection (WRED)	A packet loss algorithm used for congestion avoidance. It can prevent the global TCP synchronization caused by traditional tail-drop. WRED is favorable for the high-priority packet when calculating the packet loss ratio.
wide area network (WAN)	A network composed of computers which are far away from each other which are physically connected through specific protocols. WAN covers a broad area, such as a province, a state or even a country.
wireless local area network (WLAN)	A hybrid of the computer network and the wireless communication technology. It uses wireless multiple address channels as transmission media and carriers out data interaction through electromagnetic wave to implement the functions of the traditional LAN.
working path	A path allocated to transport the normal traffic.
working service	A specific service that is part of a protection group and is labeled working.
wrapping	A protection switching mode defined in ITU-T G.8132, which is applicable to packet-based T-MPLS ring networks and similar to SDH two-fiber bidirectional multiplex section protection (MSP). In this mode, the switching is triggered by the node that detects a failure. For details, see ITU-T G.841.

X

X.21	ITU-T standard for serial communications over synchronous digital lines. It is mainly used in Europe and Japan.
X.25	A data link layer protocol. It defines the communication in the Public Data Network (PDN) between a host and a remote terminal.

Y

Y.1731	The OAM protocol introduced by the ITU-T. Besides the contents defined by IEEE802.1ag, ITU-T Recommendation Y.173 also defines the following combined OAM messages: Alarm Indication Signal (AIS), Remote Defect Indication (RDI), Locked Signal (LCK), Test Signal, Automatic Protection Switching (APS), Maintenance Communication Channel (MCC), Experimental (EXP), and Vendor Specific (VSP) for fault management and performance monitoring, such as frame loss measurement (LM), and delay measurement (DM).