AAL
ATM Adaption Layers—The ATM Adaption Layers are the layers above the ATM layer. They adapt non-ATM bit streams into ATM cells and perform functions such as error checking and correction. The ATM Adaptation Layers are AAL1, AAL2, AAL 3/4, and AAL5.

AAL5
ATM Adaptation Layer 5—AAL5 is the simplest of the ATM Adaptation Layers and provides a connectionless datagram delivery service most commonly used for transporting IP over an ATM network.

AAL5 SDU
AAL5 Service Delivery Unit—The AAL5 SDU contains the AAL5 payload (the IP packet) and the AAL5 overhead. It is always an even multiple of 48 bytes long and is segmented for delivery in ATM cells.

ABR
Area border router—An OSPF router that has interfaces configured in more than one area.

ABR
Available bit rate service—The service provided by AAL3/4 on ATM networks. It is a connection-oriented data service and is rarely used.

ACK
Acknowledgment—In general, an ACK is the way a protocol confirms that it has received the transmitted data. In TCP, ACK is a single-bit flag indicating the receipt of a TCP data segment. The acknowledgment number is a 32-bit field in the header and indicates the number of the next consecutive byte expected in the data stream.

Adjacency
An adjacency is a relationship between two routers indicating that they have discovered each other and are able to perform routing or label distribution operations.

Adjacency database
The adjacency database is built and maintained through the exchange of periodic Hello messages and is used to keep track of all other directly connected routers.

Administrative group
A 32-bit mask assigned by the network administrator that can be used to characterize links for traffic engineering. Assigning administrative groups is also known as link coloring.

ADSL
Asymmetric Digital Subscriber Line—A technology used to provide high-speed Internet service over existing copper infrastructure originally used for POTS.

ADSPEC object
An RSVP object optionally used in the Path message to carry additional information about the path. In the case of RSVP-TE, it can be used to carry path MTU information.

AIS
Alarm indication signal—An AIS is a code sent downstream in a digital network to indicate that a traffic-related defect has been detected.

ANSI
American National Standards Institute—A private non-profit organization that

oversees the development of standards in the United States.

Anycast

An anycast address is a unicast address used by more than one host. A packet addressed to an anycast address is delivered to the nearest host as determined by the routing protocol.

Apipe

A type of VPWS that provides a point-to-point ATM service. Also known as an ATM VLL service.

ARP

Address Resolution Protocol—A TCP/IP protocol used to map an IP address to an Ethernet MAC address.

ARPANET

Advanced Research Projects Agency network—Generally considered the first operational packet-switched network. First operational with four nodes in the United States in 1969, it eventually evolved into today's Internet.

AS

Autonomous system—A network or group of networks and networking equipment under a common administration. BGP is designed to route between autonomous **systems.**

ASBR

Autonomous system boundary router—A router that connects the OSPF routing domain with another routing domain.

ATM

Asynchronous Transfer Mode—ATM is a standard for cell switching that uses 53-byte cells (5-byte header and 48-byte payload) as a basic unit of transfer. ATM networks can carry traffic for multiple service types (e.g., voice, video, and data).

BA

Behavior aggregate—A collection of packets with the same DiffServ codepoint crossing a link in a specific direction.

Backbone router

An OSPF router that has at least one interface in Area 0 (may be an intra-area router or an ABR).

Bandwidth

Bandwidth is transmission capacity measured in hertz (analog) or bits per second (digital). The greater the bandwidth, the more information can be sent over a circuit or transmission medium in a given time.

BC

Bandwidth constraint—The allocation of bandwidth to class type in MPLS DiffServ-aware TE.

BDR

Backup designated router—See designated router.

BECN

Backward explicit congestion notification—A bit in the Frame Relay header indicating that traffic flowing in the opposite direction is experiencing congestion. An endpoint receiving frames with BECN set could reduce its transmission rate to avoid packet drops.

Bellman-Ford algorithm

The algorithm used by a distance vector protocol such as RIP in which a router

passes a copy of its routing table periodically to all its neighbors. The routers do not have a complete topological view of the network; they only know the best next-hop to the destination.

BFD

Bidirectional forwarding detection—Used to detect failures on the link and can be enabled on static routes and other protocols such as OSPF and IS-IS.

BGPv4

Border Gateway Protocol version 4—BGPv4 provides many features to control traffic flows between autonomous systems and is the exterior gateway protocol currently used on the Internet. It is defined in RFC 4271.

Bit

A bit is the smallest amount of information that can be transmitted on a digital network. It can have one of two values: zero or one. A combination of bits can indicate an alphabetic character or a numeric digit, or perform signaling, switching, or other functions.

Black-hole route

A black-hole route is an IP route without a next-hop address. Any packets matched by the black-hole route are silently discarded.

BNG

Broadband Network Gateway—The service provider device used as the logical IP gateway for residential subscribers.

Broadcast

A broadcast message is sent to all devices or nodes in a network, rather than only to specific devices. It also refers to the address of all devices in a network.

Byte

A byte is a group of 8 bits, also called one octet.

CAC

Connection Admission Control—The set of actions taken by the network during the connection setup phase to determine whether a connection request can be accepted or should be rejected based on the resources available.

CAS

Channel Associated Signaling—CAS is a form of signaling used in the PSTN whereby signaling information is carried in the data channel.

CBR

Constant bit rate service—The service provided by AAL1 on an ATM network. It is a connection-oriented service with minimal delay, jitter, and data loss and is intended for the transport of traditional voice circuits.

CCITT

Comité Consultatif International Téléphonique et Télégraphique—CCITT was renamed ITU-T in 1993.

CE

Customer edge—CE devices are the switches or routers in a customer's network that connect to the provider edge routers (PEs).

CESoPSN

Circuit Emulation Service over Packet Switched Network—CESoPSN pseudowires transport multiple DS0 channels from a T1 or E1 circuit and are defined in RFC 5086

CFI

Canonical format indicator—A single-bit flag in the Ethernet VLAN tag field that

is always set to zero for Ethernet switches. CFI is used for compatibility between Ethernet type and Token Ring networks.

Checksum

The checksum is the sum of a specified set of data calculated for the purpose of error detection. A checksum value is usually included with a data packet so that the receiver can compare it with the calculated checksum and confirm that the data was not altered.

CIDR

Classless Interdomain Routing—CIDR is an enhancement to IP routing protocols that replaces the older addressing system of classful addressing based on classes A, B, and C. Routing protocols that support CIDR include a subnet mask as part of the prefix in routing updates.

Circuit-based network

Contains a collection of devices with point-to-point connections, each of which may contain many circuits (data is transmitted on individual circuits and may include a circuit identifier).

Circuit ID

Circuit identifier—A value carried in the packet header that indicates the circuit to which the packet belongs.

Classless addressing

Exclusive use of the subnet mask to indicate the size of an IP network.

CLI

Command-line interface—A text-based user interface used to configure a router such as the 7750 SR (in contrast to a graphical user interface, or GUI).

CLP bit

Cell loss priority bit—The CLP bit is used by ATM to indicate a cell of lower priority than one without the CLP bit set. It is more likely to be dropped if congestion is encountered downstream. Similar to the Frame Relay DE bit.

CMTS

cable modem termination system

CO

Central of ice—A building used by a service provider or telephone company to house telecommunications and networking equipment.

Convergence time

The length of time from when there is a change in the network topology to the point when all of the routers in the network have updated their routing table to reflect the new topology.

Core router

A router with high-speed interfaces capable of forwarding large quantities of data, but with very limited or no service-level knowledge.

CPAM

Control Plane Assurance Manager—The Alcatel-Lucent 5650 CPAM is a route analytics device integrated with the 5620 Service Aware Manager (SAM) to deliver real-time visualization, surveillance, and troubleshooting for dynamic IP/MPLS networks and services.

CPE

Customer premise equipment—Customer-owned telecommunications equipment at customer premises used to terminate or process information from the public

network.

Cpipe

A type of VPWS that emulates a point-to-point TDM circuit.

CPM

Control Processor Module— The CPM is the processor that handles the control plane functions of the 7750 SR.

CRC

Cyclic redundancy check—A CRC is an error-detection scheme for bit-oriented data communications protocols used to check the integrity of a block of data. A CRC checks the integrity of a received frame using a polynomial calculation based on the content of the frame. This value is matched with the value included in a field appended to the frame (FCS field in an Ethernet frame).

CSMA/CD

Carrier Sense Multiple Access with Collision Detection—The method of accessing a LAN specified in IEEE 802.3. A device listens until no signals are detected (carrier sense), then transits and checks to see if more than one signal is present (collision detection). If a signal is detected, each device backs off and waits briefly before attempting transmission again. CSMA/CD is used in Ethernet LANs.

CSNP

Complete Sequence Number PDU—A PDU used in IS-IS to ensure database synchronization.

CSPF

Constrained shortest path first—An algorithm similar to SPF that finds the shortest route to a destination that meets the specified constraints. CSPF is used to calculate the path for traffic-engineered LSPs.

CT

Class type—Allows the definition of an aggregate bandwidth to be allocated to a group of LSPs when the MPLS DiffServ-aware TE model is in use.

Customer ID

A value associated with every service on the 7750 SR that can be used to group together a number of services for reporting purposes.

DA

Destination address—The address of the system meant to receive a packet or **frame.**

DBD

Database description—The OSPF DBD packet advertises a summary of all LSAs that the advertising router has in its link-state database (it is essentially an index of the LSDB).

DE

Discard eligible—A bit in the Frame Relay header to indicate that this frame has a higher eligibility to be dropped if congestion is encountered. Similar to the ATM CLP bit.

De-multiplex

In an IP/MPLS network, this represents the operation of delivering the data arriving at the egress router to the appropriate service based on the service label.

Detour LSP

A protection LSP used with the MPLS fast reroute one-to-one model. A detour LSP protects only one LSP.

Dif Serv
Dif erentiated Services—DiffServ groups traffic flows with similar QoS requirements into a behavior aggregate that receives the same treatment by the network.
Dijkstra algorithm
See SPF (Shortest path first).
DIS
Designated Intermediate System—In IS-IS, the DIS is the IS (Intermediate System) or router on a broadcast LAN that is designated to generate link-state PDUs on behalf of the LAN as the pseudonode.
DIX
Digital-Intel-Xerox—The original version of an Ethernet frame.
DLCI
Data link connection identifier—The circuit identifier used in a Frame Relay **network.**
DMP
Detour merge point—A point at which detour LSPs used in the fast reroute **one-to-one model can be merged for optimization purposes.**
DR
Designated router—The OSPF router connected to a broadcast LAN that is responsible for generating the Network LSA for the LAN
DS1
Digital Signal 1—A digital circuit with a total bandwidth or transmission speed of 1.544 Mb/s. It is designed to support 24-voice conversations each encoded at 64 kb/s. Also referred to as a T1 circuit.
DSCP
Dif erentiated Services Code Point—A 6-bit value encoded in the TOS field of an IP packet header. It identifies the DiffServ class of service that the packet should receive.
DSLAM
Digital subscriber line access multiplexer
E-1
E-carrier 1—A digital circuit with a total bandwidth or transmission speed of 2.024 Mb/s. It provides 32 time slots at 64 kb/s each. One time slot is used for framing, and another may be used for signaling, providing a capacity of 30 or 31 voice circuits.
EBGP
External Border Gateway Protocol—A BGP session established between routers in different ASs.
ECMP
Equal cost multi-path routing—Allows traffic to be distributed across multiple paths when there is more than one path of equal cost.
ECN
Explicit congestion notification—Allows the signaling of congestion information in an IP network. ECN uses the two least significant bits of the TOS field.
EFCI
Explicit forward congestion indication—A bit in the PT field of the ATM cell header used to indicate that congestion was encountered by the cell.

eLER
egress label edge router—The router at the end of the LSP. It receives labeled packets from the MPLS domain, removes the labels, and forwards the unlabeled packets outside the MPLS domain.
Encapsulation
Encapsulation is the process of adding header (and possibly trailer) information to the data to be transported.
End system
An end system is device intended to send and receive data on the network. Usually, an end system is a customer device such as a computer.
Epipe
A type of VPWS that provides a point-to-point Ethernet service. Also known as an Ethernet VLL service.
ERO
EXPLICIT_ROUTE object—Object that may be used in a Path message to specify the route to be followed by the LSP. Hops may be specified as strict or loose hops.
Ethernet
The Ethernet protocol is a data link layer protocol for interconnecting computer equipment into CSMA/CD LANs, jointly developed by Xerox, Digital Equipment Corporation, and Intel. This standard forms the basis for IEEE 802.3. The Ethernet protocol specifies how data is placed on, and retrieved from, a common transmission medium.
Ethertype
A field in the Ethernet frame header that is used to indicate the type of payload of the Ethernet frame. For example, an Ethernet frame carrying an IP packet has an Ethertype value of hex 0x0800.
Explicit null label
The explicit null label has a value of 0 for IPv4 and 2 for IPv6 and is signaled only by an egress LER. Because this is the last hop on the MPLS network, this label can be simply POPped by the egress router without any lookup.
Facility backup
Two fast reroute modes are possible: one-to-one detour and facility backup. Facility backup uses a bypass tunnel to provide protection for many LSPs. The bypass tunnel is routed to the next-hop router for link protection and to the next-hop router for node protection.
FCS
Frame check sequence—The FCS is a field at the end of a Layer 2 frame used to detect transmission errors. The CRC calculation is performed by the sender, and the result is stored in the FCS field. The receiver performs the same calculation and compares the result with the contents of the FCS. If they are different, the frame is discarded.
FDB
Forwarding database—The forwarding database is a table maintained by an Ethernet switch or a VPLS to identify which port should be used to reach the destination address for the frame.
FEC
Forwarding Equivalence Class—An FEC defines a group of packets to be forwarded over the same path with the same forwarding treatment.

FECN
Forward explicit congestion notification—A bit in the Frame Relay header that indicates that congestion was encountered on a link by this frame.
FF
Fixed Filter—When FF mode is used, each LSP::Path in the RSVP-TE tunnel receives its own bandwidth allocation.
FIB
Forwarding information base—The forwarding information base, also known as the route table, is used by an IP router to determine the next-hop to which the IP packet should be forwarded.
Floating static route
An additional static route to a destination that can be used as a backup to the original route.
Flooding
Flooding is the technique used by a routing protocol to ensure that routing information reaches all routers in the routing domain.
Flow label
A field in the IPv6 header that indicates that a packet belongs to a specific data flow of an upper-layer protocol or application.
Fpipe
A type of VPWS that provides a point-to-point Frame Relay connection. An fpipe is also known as a Frame Relay VLL service.
FR
Frame Relay—Frame Relay is a standard data transmission protocol used to provide Wide Area Network connections.
FRR
Fast reroute—Fast Reroute is a method of link and node resiliency used by MPLS. Its objective is to provide failover in less than 50 milliseconds.
FTTH
Fiber to the home
Full duplex
A transmission medium is considered to be full duplex if data can be transmitted in both directions at the same time.
GRE
Generic routing encapsulation—A method for encapsulating data based on encapsulating data with an additional IP header. GRE is typically used in a VPN service network when there are routers in the transport network that do not support MPLS label switching.
Half-duplex
A transmission medium is defined as half-duplex if only one system can transmit at a time.
Hertz
A measure of frequency indicating the number of cycles per second.
Hex
Hexadecimal—Base 16 numbering system in which the digits between 10 and 15 are represented by the letters A through F. Hexadecimal numbers provide a more concise representation of binary numbers and are used for entities such as IPv6 addresses, MAC addresses, and protocol identifiers. In this book, the hexadecimal

number 8A4 would be written as 0x8A4.

Hierarchy

Hierarchical networking entails splitting a large domain into smaller subdomains. Routing occurs only within subdomains and between domains, resulting in a simpler SPF calculation.

Hitless

A network change is said to be hitless if it does not result in the loss of any traffic. For example, MBB (make-before-break) is a hitless operation because the new LSP is signaled successfully before traffic is switched to it.

Holding time

The length of time a device should wait for a Hello PDU before considering the adjacency to be down.

Hop

The number of hops in a path indicates the number of full or fractional links a path traverses to get from source to destination. Each link is one hop.

HTTP

Hypertext Transfer Protocol—Hypertext transfer protocol is a protocol for exchanging files (text, graphic images, sound, video, and other multimedia files) that is the basis of the Web.

Hub

A hub is a simple connecting device in a network that joins communication lines, in a star configuration. Unlike a bridge, a hub acts as a simple repeater and does not do any intelligent forwarding of data.

Hyperaggregation

A condition common in traditional IP routing that results in link congestion for some paths and link underutilization for other paths through the network.

IANA

Internet Assigned Numbers Authority—The IANA is the body that oversees the assignment of IP addresses, AS numbers, domain names, and other Internet protocol addresses.

IAP LSA

Intra-Area Prefix LSA—IAP LSAs carry all the IPv6 prefix information for the area. Each router generates an IAP LSA for its reachable destinations, and the DR generates one to carry the prefix information for a broadcast link.

ICANN

Internet Corporation for Assigned Names and Numbers—Operates IANA.

ICMP

Internet Control Message Protocol—ICMP provides an echo service (ping) and the reporting of delivery errors in an IPv4 network.

ICMPv6

Internet Control Message Protocol version 6—ICMPv6 provides the functions of an echo service and reporting of delivery errors in IPv6 similar to those provided in IPv4 by ICMP.

IEEE

Institute of Electrical and Electronics Engineers—The IEEE is a worldwide engineering publishing and standards-making body. It is the organization responsible for defining many of the standards used in the computer, electrical, and electronics industries.

IEP LSA
Inter-Area Prefix LSA—An IEP is used to flood prefix information between areas in an OSPFv3 network. Similar to a Type 3 LSA in an OSPFv2 network.
IER LSA
Inter-Area Router LSA—An IER is used to provide reachability information for an ASBR in an OSPFv3 network. Similar to a Type 4 LSA in an OSPFv2 network.
IES
Internet Enhanced Service—In a network of 7750 SRs, an IES provides the customer with a Layer 3 IP interface to send and receive IP traffic.
IETF
Internet Engineering Task Force—IETF is responsible for defining the Internet protocols. It is an open standards organization with no formal membership requirements. Standards are published as RFCs and are available at no cost.
IGMP
Internet Group Management Protocol —A protocol used between hosts and multicast routers on a single physical network to establish hosts' membership in specific multicast groups. IGMPv2 is described in RFC 2236.
IGP
Interior gateway protocol—IGP is a generic term referring to any routing protocol, for example, OSPF or IS-IS, used to exchange routing within an autonomous system.
IHL
IP header length—A field in the IP header that indicates the number of 32-bit words that form the IP header.
iLER
ingress label edge router—The MPLS router at the start of an LSP. It receives unlabeled packets from outside the MPLS domain, applies an MPLS label to the packets, and forwards the labeled packets into the MPLS domain.
Implicit null label
The implicit null label is used by the egress LER to signal the penultimate, or second last, router that the label should be popped and forwarded unlabeled to the egress. A value of 3 is used to signal implicit null, but this value never appears in a packet as an actual label.
Intra-area router
A router that only has neighbors in its area (all of its interfaces are in the same **area).**
IOM
Input/Output Module—A hardware module 7750 SR that provides the data plane function. It contains the MDAs and forwards labeled or unlabeled packets as well as performing Layer 3 traffic management.
IP
Internet Protocol—The network layer protocol underlying the Internet. It provides an unreliable, connectionless, packet delivery service and allows large, geographically diverse networks of computers to communicate with each other quickly and economically over a variety of physical links. Usually referred to as **IPv4.**
IP forwarding
The processing of packets by the router to send them to the next-hop router.

(Often used interchangeably with the term IP routing.)

Ipipe

A VPWS that provides IP interworking capabilities between different Layer 2 technologies.

IPv4

Internet Protocol version 4—The version of IP in use since the 1970s. IPv4 addresses are 32 bits.

IPv6

Internet Protocol version 6—The successor to IPv4. IPv6 addresses are 128 bits.

IS-IS

Intermediate System to Intermediate System—An OSI routing protocol that was adapted for use in IP networks.

ISP

Internet service provider—A business or organization that provides external connectivity to the Internet for consumers or businesses.

ITU-T

International Telecommunication Union–Telecommunication Standardization Sector—ITU-T coordinates international telecommunications standards. Its members are national countries as well as public and private sector companies.

Jitter

Jitter is the variation in delay for packets in a data stream.

L2

Layer 2—The data link layer of the OSI model. It includes protocols that define a standardized method for encoding and transmitting data on a physical medium. Examples of Layer 2 protocols include Ethernet, ATM, and Frame Relay.

L3

Layer 3—The third layer in the OSI model. Layer 3 protocols are responsible for the end-to-end delivery of data across the network. IP is the Layer 3 protocol used in the Internet.

Labeled packet

A packet into which an MPLS label has been encoded.

LAN

Local Area Network—A system designed to interconnect computing devices over a restricted geographical area (usually a couple of kilometers at the maximum). Ethernet is the most popular LAN protocol.

LDP

Label Distribution Protocol—LDP is a label distribution protocol for MPLS that works in conjunction with the network IGP. As routers become aware of new destination prefixes through their IGP, they advertise labels for these destinations. LSPs signaled with LDP always follow the path determined by the IGP.

LER

Label edge router—Routers at the edge of the MPLS network that add or remove labels. LERs have one or more interfaces outside the MPLS domain and are capable of handling labeled and unlabeled packets.

Level 1 LAN Hello

Used to form Level 1 adjacencies on an IS-IS broadcast network.

Level 2 LAN Hello

Used to form Level 2 adjacencies on an IS-IS broadcast network.

LFIB
Label forwarding information base—The LDP labels that correspond to the best IGP route are transferred from the LIB to the LFIB and used for switching packets.
LIB
Label information base—All MPLS labels that are locally generated with LDP and those received from other devices are stored in the LIB.
Link coloring
Technique used to identify specific links and then ask for a traffic-engineered LSP that includes only links of a specific color or one that avoids links of a specific color. Link coloring is another name for administrative groups.
Link protection
For fast reroute, the two protection options are node protection and link protection. Link protection means that the PLR finds a route that bypasses the immediate downstream link.
LIR
Local Internet registries—After receiving address blocks from the five RIRs, the local Internet registries further distribute the address blocks to service providers or large organizations.
Loopback address
A loopback address is assigned to a virtual interface on a router such as the 7750 SR. Because loopback interfaces are not bound to a physical port, they are always reachable and often used for communication protocols between two routers. The system interface exists by default on the 7750 SR and is used by control protocols to communicate with the router.
LSA
Link-state advertisement—LSAs contain the data used by OSPF to distribute topology information and used for the SPF calculation. Similar to an LSP in IS-IS. The complete collection of LSAs from the routing domain makes up the OSPF link-state database.
LSDB
Link-state database—Used by link-state routing protocols such as OSPF and IS-IS. The LSDB contains the most recent topology information sent by all link-state routers in the network.
LSP
Label switched path—The path over which a packet travels by label switching in an MPLS network.
LSP
Link-state packet—A generic term used in this book to refer to the packets used by OSPF and IS-IS to flood topology information throughout the network. In OSPF these are LSAs or LSUs, and in IS-IS they are LSPs.
LSP
Link-state PDU—An IS-IS packet that carries the local topology information for a router, similar to an OSPF LSA. The complete collection of LSPs from the routing domain makes up the IS-IS link-state database.
LSP::Path
In an RSVP-TE tunnel there may be multiple LSP::Paths that each have a unique LSP ID but share the same Tunnel ID. The LSP::Paths are used to provide redundancy and are also created whenever a new LSP is signaled for the tunnel.

LSR
Label switch router—An LSR is a router located in the middle of an MPLS network that forwards labeled packets by label swapping.
LSR
Link-state request—An LSR is the message used by OSPF to request updated copies of specific LSAs.
LSU
Link-state update—An LSU is the message used by OSPF to transmit LSAs to its neighbors. An LSU may contain multiple LSAs.
LTE
Long Term Evolution—The next generation of cellular technology, also known as 4G wireless. An LTE network uses IP exclusively for transmission of voice and **data.**
MAC
Media Access Control—One of the subprotocols within the IEEE802.3 (Ethernet) protocol. The MAC protocol defines medium sharing, packet formatting, addressing, and error detection. A MAC address is a globally unique, 6-byte address that identifies an Ethernet interface.
MAM
Maximum Allocation Model—The MPLS DiffServ TE model in which bandwidth is allocated discretely to different CTs and cannot be shared between CTs.
MAN
Metropolitan Area Network—A network largely restricted to a single metropolitan area, hence somewhere in geographical size between an LAN and a WAN.
MBB
Make-before-break—An operation in which a new LSP::Path is established and declared active before the previous one is torn down.
MDA
Media Dependant Adapter—MDAs are 7750 SR modules that are housed in IOMs and in which a physical interface terminates. An MDA determines the Layer 2 technology that will be used on the link.
MDU
Multi dwelling unit—An MDU is a small switch or router installed by a service provider in an office or apartment building. The MDU supports the connection of several customers to the service provider network with one or two high-speed uplink connections.
Mesh SDP
A mesh SDP floods frames received from a SAP or from a spoke SDP but does not flood frames received from another mesh SDP.
Metric
The numerical value used by the routing protocol to calculate the best route to a destination. Depending on the routing protocol, the metric is usually a hop count or a cost assigned to the network link.
MLD
Multicast Listener Discovery—Protocol to determine multicast group listeners used in IPv6. Performs similar functions to IGMP in IPv4.
MP
Merge point—The point at which traffic on a protection LSP merges back onto the

protected LSP.

MP-BGP

Multiprotocol BGP—A version of BGP enhanced to support additional address families.

MPLS

Multiprotocol Label Switching—MPLS supports the delivery of highly scalable, differentiated, end-to-end IP and VPN services. Packets arriving at the MPLS network have a label added and are then forwarded across the network by label switching.

MSO

Multiservice operator—A cable operator that provides multiple services such as high-speed Internet, video, and voice.

MT

Multi-topology—A routing protocol instance that supports routing over multiple, distinct topologies. For example, when multi-topology IS-IS is used for the exchange of IPv6 routes, the IPv6 prefixes and topology are treated as distinct.

MTU

Maximum transmission unit—MTU is the largest unit of data that can be transmitted over a particular interface type in one packet. The MTU can change from one network hop to the next.

Multicast

A multicast address provides an address for a group of hosts.

ND

Neighbor Discovery—An IPv6 protocol that can be used by a host to discover the addresses of its neighbors, similar to ARP in IPv4.

Network layer

See Layer 3.

Next-next-hop

In facility backup FRR, the node protect bypass tunnel is always calculated to the router two hops downstream from the PLR. This is sometimes called the nextnext-hop router.

Node protection

For fast reroute, the two protection options are node protection and link protection. Node protection means that the PLR finds a route that bypasses the immediate downstream node.

NSAP

Network Service Access Point—An NSAP is an OSI network address.

NSFNET

National Science Foundation network—The largest component of the Internet backbone during the early 1990s. The NSFNET was the first major step in moving from the single-backbone structure of ARPANET to the distributed structure of the Internet today.

NSSA

Not-so-stubby-area—An OSPF stub area that contains an ASBR.

OAM

Operations, administration, and maintenance—A group of network management functions that provide network fault indication, performance information, and data and diagnosis functions.

OC-1

Optical Carrier 1—The basic SONET optical transmission rate of 51.84 Mb/s.

One-to-one detour

Two fast reroute modes are possible: one-to-one detour and facility backup. A one-to-one detour provides protection for a single LSP. The one-to-one detour is calculated as the best route to the tail-end router that avoids the next downstream link or router.

OLT

Optical line terminator

ONT

Optical network terminator

OSI

Open Systems Interconnection—The OSI reference model is a seven-layer model for network architecture. The model was developed by ISO and CCIT (now ITU-T). From top to bottom, the seven layers are Application, Presentation, Session, Transport, Network, Data Link, and Physical layers.

OSPF

Open Shortest Path First—Dynamic, link-state routing protocol that responds quickly to network topology changes. It uses an algorithm that builds and calculates the shortest path to all known destinations.

OUI

Organizationally Unique Identifier—A 24-bit number that identifies the manufacturer of an Ethernet adapter. The number is purchased from the IEEE, who ensure its global uniqueness. The vendor then adds a unique 24-bit suffix to create a MAC address.

Outer label

The MPLS transport label used for label switching across the network.

P router

A router in the core of the service provider network, typically an LSR that is not service-aware.

Payload

When referring to a network transmission, the payload refers to the information actually useful to the receiver, as opposed to overhead data in the header.

PDU

Protocol data unit—PDU is the term for a unit of data in the OSI model. An IP packet would be known as a network PDU and an Ethernet frame a data link PDU.

PE router

A router at the edge of the service provider network (typically an LER), which connects to customer edge routers.

PHP

Penultimate hop popping—The removal (popping) of the top label on a packet's label stack at the penultimate (second last) router in an LSP, rather than at the egress node.

Ping

An ICMP echo message and its reply. Often used in IP networks to test the reachability of a network device.

Pipe mode

When an MPLS network operates in pipe mode, the MPLS routers are effectively invisible from the perspective of the end-to-end connection.

PLR
Point of local repair—For RSVP-TE fast reroute, the router immediately upstream from a failure that repairs the primary LSP::Path by switching traffic to the protection LSP.
Point-to-point
A point-to-point connection is defined as a connection in which there is only one neighbor.
POS
Packet over SONET/SDH—POS is a standard method of transporting native network layer packets such as IP directly on SONET interfaces using HDLC-like framing and simple link protocols like PPP.
PPP
Point-to-Point Protocol—PPP is an IETF standard protocol that allows a computer to use TCP/IP with a standard telephone line and a high-speed modem to establish a link between two (and only two) terminal installations. PPP is also used for POS.
Preamble
Ethernet is an asynchronous communications protocol because the transmission of a frame can occur at any time. The preamble is required to identify the beginning of the Ethernet frame. The preamble is a 56-bit pattern of alternating ones and **zeroes.**
P-bits
Priority bits—A 3-bit value in the Ethernet header that specifies a frame's priority or class of service.
Protected LSP
The primary LSP::Path that is protected with FRR.
Protection LSP
An LSP that protects the protected LSP.
Protocol preference
A value associated with each routing protocol on the 7750 SR. The protocol preference determines which protocol to use in the event that two routing protocols present the same route to the Routing Table Manager. The route from the routing protocol with the lower preference is preferred.
PSB
Path State Block—The PSB contains the RSVP-TE session information as well as the original Path message used to signal the LSP.
Pseudonode
An imaginary router on an IS-IS broadcast LAN that is a neighbor of all other routers on the LAN. The DIS originates an LSP for the pseudonode.
Pseudowire
A pseudowire emulates a Layer 2 point-to-point connection over an IP/MPLS network as defined in RFC 3985. Also known as VPWS or VLL.
PSN
Packet switched network—A data-transmission network that uses packet-switching techniques. Unlike circuit switching, packet switching allocates multiplexing and switching resources only when data is present. There are public and private packet-switched networks.
PSNP

Partial Sequence Number PDU—A PDU sent by an IS-IS router to ensure synchronization of link-state databases throughout the network.

PSTN

Public Switched Telephone Network—The network of the world's telephone system, including local, long distance, and international phone companies.

PVC

Permanent virtual circuit—A PVC is a Frame Relay or ATM end-to-end logical connection that extends between two user/network interfaces. A single PVC may pass through several Frame Relay or ATM switching nodes.

Q-in-Q

The Q-in-Q encapsulation type adds an additional IEEE 802.1Q tag to tagged packets entering the network producing a double-tagged frame.

QoS

Quality of service—The ability of a network to recognize different service requirements of different application traffic flowing through it and to comply with SLAs negotiated for each application service, while attempting to maximize network resource utilization.

Raw mode

When a pseudowire is operating in raw mode (configured with vc-type ethernet), the service-delimiting VLAN tags are stripped at the ingress and are not carried across the pseudowire.

RD

Route distinguisher—In a VPRN, the RD is an additional string added to a customer's routes so that they can be distinguished from other customer's routes in the service provider network.

RDM

Russian Dolls Model—An MPLS DiffServ model in which unused bandwidth assigned to a higher CT can be used by a lower CT.

Resignal timer

An MPLS timer that controls the interval at which the router tries to find a more optimum path for established LSPs.

Retry timer

Set on individual LSPs and controls the interval at which the router tries to establish an LSP.

Revertive behavior

The behavior of network protocols when a failure is resolved.

RFC

Request for Comments—RFCs are the documents that define the Internet standards. They are freely available.

RIB

Routing Information Base—The RIB is a database in which the information for a single routing protocol is stored.

RID

Router ID—A value used by a routing protocol to uniquely identify each router in the routing domain.

RIP

Routing Information Protocol—An interior gateway protocol defined in RFC 2453 and based on the distance vector algorithm.

RIRs
Regional Internet registries—After receiving address blocks from IANA, the five RIRs distribute address blocks to the local internet registries (LIRs).
RRO
RECORD_ROUTE object—Object that may optionally be included in the RSVP-TE Path message to record the hops used for the LSP.
RSB
Resv State Block—The RSB contains RSVP-TE session information including the original Resv message used to signal the LSP and the label allocated for the LSP.
RSVP
Resource Reservation Protocol—RSVP was originally developed by routers to allow an application to reserve network resources by sending a request to all nodes along the path of the flows.
RSVP-TE
Resource Reservation Protocol–Traffic Engineering—An extension of the original RSVP that allows MPLS routers to request bandwidth resources and labels for an LSP.
RT
Route target—The RT is an extended community string attached to VPN routes that identifies which routes are to be exported from MP-BGP into the VRF at a local PE.
RTM
Route Table Manager—The RTM is a process on the 7750 SR that selects routes from each routing protocol based on protocol preference to build the FIB.
SA
Source address—The address of the device transmitting a frame.
SAP
Service Access Point—Term used by Alcatel-Lucent to describe the subscriber's point of interface to an IP/MPLS service network. The SAP may be a physical port or may specify a port and encapsulation ID such as a VLAN tag value.
SAR
Segmentation and reassembly—In an ATM network, the process of constructing the AAL SDU from the service data stream and then converting it to ATM cells (segmentation). At the egress of the ATM network, the reassembly process constructs the AAL SDU and re-creates the service data stream.
SAToP
Structure Agnostic TDM over Packet—SAToP pseudowires transport unstructured T1 or E1 circuits and are defined in RFC 4553.
Scalability
In a network, the relative ability of control protocols to operate efficiently as the size of the network increases.
SDH
Synchronous Digital Hierarchy—SDH is an ITU-T standard for fiber optic transmission of high-speed digital traffic. SDH defines a physical interface, optical line rates, frame format, and an OAM protocol. The base rate is 155.52 Mb/s (STM -1), and higher rates are multiples of the base rate. SDH is an international standard that is technically consistent with SONET, used in North America. The SDH STM-1 is equivalent to the SONET STS-3c.

SDP
Service Distribution Point—A term used by Alcatel-Lucent to identify a logical representation of the IP/MPLS transport tunnel that will be used to deliver the service data to the egress PE.
SDU
Service Delivery Unit—In an OSI network, the unit of information from an upper-layer protocol that defines a service request to a lower-layer protocol. The SDU becomes the payload of the lower-layer PDU.
Service label
Inner label used between endpoints (the ingress and egress PE routers) to identify the VPN service to which the packet belongs.
Service router
A scalable, full-function IP/MPLS router such as the Alcatel-Lucent 7750 SR that supports the full range of service types, many customers, and additional service management capabilities.
Service tunnel
The tunnel represented by the service labels signaled end-to-end by the two PEs that are the service endpoints.
SF/CPM
Switch Fabric/Control Processor Module—The SF/CPM is the card in the 7750 SR that supports the router control plane functions. Routing, label distribution, and network management functions are handled by the CPM. The switch fabric provides line rate switching between the IOM cards.
SFD
Start frame delimiter—The SFD occurs after the preamble in an Ethernet frame and is always 10101011. It indicates the beginning of the actual Ethernet frame.
SLA
Service level agreement—A contractual agreement between a service provider and customer stipulating the minimum standards of service.
SONET
Synchronous Optical Network—SONET is an ANSI standard for fiber optic transmission of high-speed digital traffic. SONET defines a physical interface, optical line rates known as OC signals, frame format, and an OAM protocol. The base rate is 51.84 Mb/s (OC-1), and higher rates are multiples of the base rate. SONET is a North American standard that is technically consistent with SDH, which is international.
SONET/SDH
Synchronous Optical Network/Synchronous Digital Hierarchy—The most widely used technology for long-distance optical transmission. SONET/SDH was designed for the transport of traditional voice traffic and provides a foundation for both POS and ATM.
SPF
Shortest path first—SPF is an algorithm used by IS-IS and OSPF to make routing decisions based on the state of network links (also known as the Dijkstra algorithm).
Spoke SDP
A spoke SDP floods frames received from a SAP, a spoke SDP, or a mesh SDP.
SRLG

Shared Risk Link Group—SRLG information can be used by CSPF to calculate paths for secondary LSPs and fast reroute detours that ensure path diversity from the primary path.

SSH

Security shell protocol for cli access

Static route

Route information that is administratively configured rather than learned from a dynamic routing protocol such as OSPF or IS-IS.

STM-1

Synchronous Transport Module, level 1—STM-1 defines the basic frame in an SDH network. It is 19,440 bytes and is transmitted 8,000 times per second for a transmission rate of 155.52 Mb/s. The STM-1 is essentially equivalent to the STS3c SONET frame.

STP

Spanning Tree Protocol—STP is used by Ethernet bridges and switches to detect and logically remove duplicate paths to create a loop-free Layer 2 topology.

STS-1

Synchronous Transport Signal 1—STS-1 is the basic frame in a SONET network. It is one-third the STM-1 frame (6,480 bytes) and is transmitted 8,000 times per second for a transmission rate of 51.84 Mb/s.

STS-3c

Synchronous Transport Signal 3 (concatenated)—The STS-3c frame is exactly three times the size of an STS-1 (the same size as an STM-1 or an STS-3), but unlike STS-3, it does not contain multiplexed STS-1 frames. A concatenated service is used for services such as ATM or POS where multiplexing of lower rates is not required.

Stub area

An OSPF area that does not allow external route advertisements. A default route is advertised into the stub area instead.

Subnet mask

A 32-bit-long sequence of ones followed by a sequence of zeroes. The ones correspond to the network component of the IP address, and the zeroes correspond to the host component.

Summarization

The process of representing a contiguous group of longer IP prefixes with a shorter one. Summarization is usually performed between areas or routing domains.

T1

T-carrier 1—A digital circuit with a total bandwidth or transmission speed of 1.5444 Mb/s. It is designed to support 24-voice conversations each encoded at 64 kb/s. Also referred to as a DS1 and used mainly in North America and Japan.

Tagged mode

When a pseudowire is operating in tagged mode (configured with vc-type vlan), the service-delimiting VLAN tags are carried across the pseudowire.

Targeted LDP

See T-LDP.

TC

Traffic Class—A 3-bit field in the MPLS header used to indicate QoS handling. Originally known as the EXP field, it was renamed as TC in RFC 5462.

TCP
Transmission Control Protocol—TCP enables two hosts to establish a connection and exchange streams of data over an IP network. TCP guarantees delivery of data and also guarantees that packets will be delivered in the same order in which they were sent.

TDM
Time division multiplexing—TDM is a process of sharing a communication channel among several users by allowing each to use the channel for a given period of time in a defined, repeated sequence. TDM is the technique used to multiplex traditional voice circuits on a higher capacity link such as a T1 or E1.

TE
Traffic engineering—The process of selecting a path across the network that meets specific bandwidth or administrative constraints, rather than simply relying on the path selected by the IGP.

TE class
Defines a specific pairing of a CT with a preemption priority.

TED
Traffic engineering database—The TED is used by OSPF-TE and IS-IS-TE to store the traffic engineering information for the network.

T-LDP
Targeted LDP—A version of LDP that is used by two endpoints of a Layer 2 VPN service to exchange labels for that service.

TLV
Type–length–value—A flexible method of defining the data fields in a protocol message. Type identifies the specific data field that the TLV contains; length specifies the length in bytes of the TLV and thus permits a variable length value field; and value contains the actual data to be carried in the TLV.

Topology
Topology is the arrangement, map, or plan of a network, its components, and their interconnection.

TOS
Type of service—An 8-bit field in the IP packet header that can be interpreted as a 3-bit IP precedence value or 6-bit DSCP value. This value is used to identify the level of service that a packet receives in the network.

Totally stubby area
An OSPF area that does not receive any Summary LSAs. The link-state database of routers in a totally stubby area contains only Router and Network LSAs from the area and a Summary LSA for the default route.

Traceroute
A utility similar to ping that determines the route taken (each hop) from a source endpoint to a destination endpoint.

Transit network
A transit network carries traffic that neither originates in nor is destined to the local network.

Transit LSR
Any intermediate router in the MPLS network between the ingress and egress LERs. A transit router swaps the incoming label for an outgoing label and forwards labeled packets to the next router along the LSP.

Transport label
The outer label used to label-switch the user packet across an MPLS network.
Transport tunnel
The LSP used to transport the service data.
TTL
Time-to-live—A field in the IP header that is effectively a hop count. TTL is decremented by each router, and if the value reaches zero, the packet is discarded.
Tunnel
A method of encapsulating data for transmission across a network without any reference to the header of the original packet. An MPLS LSP acts as a tunnel because data arriving at the ingress is encapsulated with an MPLS label and then switched across the network without any reference to the fields of the original packet.
Tunnel ID
An RSVP-TE tunnel is identified by its Tunnel ID. It may comprise several distinct LSP::Paths, each with a distinct LSP ID.
UBR
AAL5 unspecified bit rate service—The service provided by AAL5 on ATM networks. It is a simple, connectionless data service commonly used for transporting IP traffic.
UDP
User Datagram Protocol—A connectionless transport layer protocol belonging to the Internet protocol suite. In contrast to TCP, UDP does not guarantee reliability or ordering of the packets.
UNI
User network interface—UNI defines the interface point between a private ATM network and the public carrier ATM network.
Unicast address
A unicast address provides an address for a single host.
Uniform mode
When operating in uniform mode, MPLS routers act as if they were routers in the overall end-to-end connection.
VBR
AAL2 variable bit rate service—The service provided by AAL2 on ATM networks. It is a connection-oriented service with variable bit rates and a bounded delay. VBR is intended for compressed voice or video traffic and may have realtime constraints (vbr-rt) or not (vbr-nrt).
VC
Virtual circuit—In an MPLS network, a virtual circuit is a communications link that behaves like a dedicated P2P circuit, even though it is not. Data packets are delivered to the user in guaranteed sequential order, as if they were sent over a true P2P circuit.
VC ID
Virtual circuit identifier—The VC ID is used by T-LDP to identify a pseudowire. The VC ID must be the same at each end of the pseudowire for it to become operational.
VCC
Virtual channel connection—The VCC represents the end-to-end connection in an ATM network. It is defined by the VPI and VCI values.

VCI
Virtual channel identifier—The VCI is part of the address of a VCC and is contained in a 16-bit field in the ATM cell header. A VCI value is assigned for one hop only; each switch cross-connects cells from one VC to the next, reassigning the VCI value.
VID
VLAN identifier—A 12-bit value that identifies the VLAN that the frame belongs to.
VLAN
Virtual LAN—A logical group of network devices that appear to be on the same Ethernet LAN, regardless of their physical location.
VLAN trunking
VLAN trunking allows the transmission of traffic from multiple VLANs on a single port. A VID is assigned to each VLAN, and by using consistent VID values on all switches, the VLAN can be extended across multiple switches.
VLL
Virtual Leased Line—A Layer 2 point-to-point service also known as a Virtual Private Wire Service (VPWS). A VLL is a pseudowire service used to transport Layer 2 traffic such as Ethernet over an IP/MPLS core as if it were a native Ethernet connection.
VPI
Virtual path indicator—The VPI is an 8-bit field in the ATM cell header that is part of the VCC. A VPI value is assigned for one hop only; each switch cross-connects cells from one VPI to the next, reassigning the VPI value.
VPLS
Virtual Private LAN Services—VPLS is a class of VPN that allows the connection of multiple sites in a single bridged Ethernet domain over a provider IP/MPLS network.
VPN
Virtual Private Network—A way to provide network links between a customer's different locations as if they were connected by dedicated, private links. A VPN is usually provisioned over a service provider's core such as an IP/MPLS network that provides VPN services to other customers.
VPRN
Virtual Private Routed Network—VPRN is a class of VPN that allows the connection of multiple sites in a routed domain over a provider managed IP/MPLS network.
VPWS
Virtual Private Wired Service—A VPWS is a point-to-point Layer 2 service implemented on an IP/MPLS network that emulates a leased line. Also known as a VLL.
VRF
VPN routing and forwarding table—The virtual router on the PE router that contains the customer's routes for a VPRN. Each PE has a VRF for each VPRN service provisioned on the router.
VS
Virtual switch—The VPLS instance on each PE router is often referred to as a virtual switch because it emulates the behavior of an Ethernet switch.

WAN
Wide Area Network—A geographically dispersed, long-haul telecommunications network that provides a network interconnection between widely separated locations.
Web
World Wide Web—A logical collection of computer systems connected to the Internet that provide documents and other services using HTTP