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Network Terms Glossary
Version 1.0

AAL
ATM Adaptation Layer.

Abstract Node
An abstraction used in describing an explicit route. It may be a network element, a group of network elements sharing an address prefix, or an Autonomous System. An abstract node consisting of exactly one network element is called a simple abstract node.

Actual Private Network
A term invented for comparison with virtual private network (VPN).

Adjacent
Having a direct logical link. Either directly connected physically, or connected using an approach that makes intervening devices transparent in a logical context—for example, tunneling.

Administrative Partitioning
Logically configuring, monitoring, and managing the various domains (areas) of a network.

AF
Assured Forwarding

AFI
Address Family Identifier

Aggregation
Grouping or bundling traffic requiring similar forwarding. Distinct from merging, generally, because it may be desirable to separate aggregate traffic at some point without having to resort to a routing decision at L3 for all packets within the aggregate.

ANSI
American National Standards Institute. A membership organization that coordinates the development of U.S. voluntary national standards in both the private and public sectors.

Application Layer
The software in the OSI protocol stack (layer 7 of 7) that provides the starting point of the communications session.

AQUA™
Hyperchip's Adaptive Queue Utilization Algorithm. A congestion avoidance algorithm with fine-grain flow granularity to guarantee multi-service performance in an IP/MPLS network.

ARTS
Aggregate Route-based IP Switching

ARP
Address Resolution Protocol

AS
Autonomous System

ACM
Association for Computing Machinery. The ACM is the world's first educational and, scientific computing society. With more than 80,000 members worldwide, a dynamic series of authoritative publications, a comprehensive Digital Library, a wide range of special interest groups (SIGs), and an outstanding array of conferences, workshops and forums.

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ASIC

Application Specific Integrated Circuit. A chip that is custom designed for a specific application rather than a general-purpose chip such as a microprocessor. The use of ASICs improve performance over general-purpose CPUs, because ASICs are "hardwired" to do a specific job - and do not incur the overhead of fetching and interpreting stored Instructions.

Assured Forwarding

A per-hop behavior (PHB) defined for DiffServ that provides for four classes of PHB, each having three levels of drop precedence. Assured Forwarding also requires that packets within a class not be reordered, regardless of the drop precedence. Assured Forwarding does not define a quantifiable value for delay or delay variation of packets forwarded.

Asymmetric Digital Subscriber Line (ADSL)

A protocol for Internet access, where fast downstream is required, but slow upstream is acceptable.

ATM Asynchronous Transfer Mode.

A network technology based on fixed cell sizes (i.e. 53 bytes) that supports realtime voice and video as well as data. The topology uses switches that establish a logical circuit from end to end, which guarantees a quality of service (QoS) for that transmission. ATM performs its functions at layer 2 of the OSI model and converts its cells into SONET frames (OC-3, OC-12, etc.) or T-carrier frames (DS1, DS3) to go out over the wire; ATM serves as the backbone between points of presence (POPS), and is also used at the NAP and MAE interconnecting points.

ATM Switch

ATM switches are used in large networks, including Internet backbones. This model has a 40 Gbps backplane that supports 16 OC-48 (2.4 Gbps) ports.

Autonomous System

In interdomain routing, an administrative domain identified with an AS number.

Available Bit Rate (ABR)

A QOS level guaranteeing a minimum rate of data transfer with the possibility of higher rates if available.

Availability

The measure of a system's non-interrupted uptime.

Backbone

The central part of a network that handles aggregated traffic, employing the highest-speed transmission paths in the network and usually also run the longest distance. Smaller network segments are attached to the backbone.

Bandwidth The transmission capacity of a communications network, computer bus or computer channel. It is expressed in bits per second, bytes per second or in Hertz (cycles per second).

Behavior Aggregate (BA)

IP packets that require the same Differentiated Services behavior at the point where they are crossing a link.

Benes topology

A multi-stage switching architecture commonly associated with circuit-switching environments

Best effort

The transmission of information through a network by using any retaining bandwidth not used elsewhere. No guarantees a're provided in terms of a minimum level of service. _

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Border Gateway Protocol (BGP)

An exterior gateway routing protocol used in routing between administrative domains. Currently version 4 is in use.

Bit

Binary Digit. The units--0 or 1--Used in the binary numbering system. Digital communications networks use bits to represent information, whether text, graphics, audio, or video. A bit is the building block of digital information --the equivalent of a single base pair in a genome's DNA.

Bit Error Rate (BER)

A measure of the accuracy of information transmitted in a system, calculated as the number of incorrect bits divided by the total number of bits transmitted.

Bit rate

The speed of information transfer - the number of bits that can be transmitted each second (the number of on-off laser flashes possible per second).

Bit-Rate Transparency

A feature of a device enabling it to handle optical signals regardless of their bit-rates.

bps

bits Per Second. The measurement of the speed of data transfer in a communications system.

Bps

Bytes Per Second. A measurement of the speed of data transfer in a byte-oriented system such as a computer's peripheral bus or a data storage system.

Broadband

A descriptive term for evolving digital technologies that provide consumers a signal-switched facility offering integrated access to voice, high-speed data service, video-demand services, and interactive delivery services.

Byte

The common unit of computer storage from micro to mainframe. It is made up of eight binary digits (bits). A byte holds the equivalent of a single character, such as the letter A~ a dollar sign or decimal point.

Carrier-Class

Refers to a level of reliability for hardware and software components used in high-speed, high-traffic networks such as used by telcos and ISPs.

Cell

An envelope for data, as in an ATM cell.

Cell Loss Priority

A bit in the AAL5 ATM header indicating that the cell can be dropped earlier under congested conditions.

Cell Switch

A network device that switches fixed packets, such as an ATM switch. Contrast with frame switch.

CLI

Command Line Interface. Any interface between the user and the command processor, that allows you to enter commands from the keyboard for execution by the operating system.

Connectionless

A protocol that does not require a connection to be in place in order to send information between two locations,

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Connection-Oriented

A protocol that must establish a connection between two devices before it can begin to send information between them.

Conservative Retention Mode

Labels are requested and retained only when needed for a specific next hop. Unnecessary labels are immediately released.

Constant Bit Rate (CBR)

A COS level giving a fixed and guaranteed amount of network capacity to a circuit, useful for time-sensitive information such as voice.

Content Addressable Memory

A memory device that allows a key to be compared to the contents of all memory locations at the same time. Content addressable memory is roughly a hardware analogue of a software hashing algorithm.

Convergence

The act of combining multiple different networks (such as ATM, Frame Relay, Voice) onto a single high performance and cost-effective network (such as IP).

Core IP System™

A More than just a router, a Hyperchip Core IP System is purpose-built to accommodate the constant fluctuations at the core, with quality and reliability applied to every aspect of the system, ensuring sustainable profitability.

Core Router

A router that forwards packets to computer hosts within a network (but not between networks). A core router is sometimes contrasted with an edge router, which routes packets between a self-contained network and other outside networks along a network backbone.

CPCS

Common Part Convergence Sublayer.

CPE

Customer premises (or provided) equipment.

CR-LDP

Constraint-based Routing Label Distribution Protocol.

CRTC

Canadian Radio-television and Telecommunications Commission is an independent agency responsible for regulating Canada's broadcasting and telecommunications systems.

Data Link Connection Identifier

Used in Frame Relay to identify a circuit connection between adjacent Frame Relay switches.

Data link layer (DLL)

The services in the OSI protocol stack (layer 2 of 7) that manage node-to-node transmission.

Data Link Protocol

The protocol that controls the transmission of a unit of data from one node to another (OSI layer 2). It is responsible for ensuring that the bits received are the same as the-bits sent.

Denial of Service Attack

An assault on a network that floods it with so many additional requests that regular traffic is either slowed or completely interrupted. Unlike a virus or worm, which can cause severe damage to databases, a denial of service attack interrupts network service for some period. A distributed denial of service (DDOS) attack uses multiple computers throughout the network that it has previously infected. The computers act as "zombies" and work together to send out bogus messages, thereby increasing the amount of phony traffic.

DLCI
Data Link Connection Identifier

Differentiated Services (DiffServ)
An OF standard for providing different classes of service based on some common sets of assumptions about queuing behavior on a hop-by-hop basis. Because the basis for specific treatment is explicitly carried in packets, rather than--requiring local storage of packet classification information, this approach to providing quality of service (QoS) is often referred to as "less state-full" than, for example, the Integrated Services QoS model.

Discard Eligibility (DE)
A bit in the Frame Relay header indicating that the frame can be discarded under congested conditions.

DOD
Downstream on-demand label distribution (mode)

Domain Of (Label) Significance
The portion of a network consisting of logically connected logical interfaces with a common knowledge of the significance (meaning) of a label. A label only has meaning upon arrival at a logical interface if that interface was represented in the process during which the meaning was originally negotiated.

DOS
A condition in which a system can no longer respond to normal requests. See Denial Of Service Attack.

Downstream
in the direction of expected traffic flow. Applies to traffic that is part of a specific forwarding equivalence class.

Downstream Label Allocation
Label negotiation fn which the downstream LSR determines what label will be used. This is the only currently supported approach.

Downstream On-Demand Label Distribution Mode
Labels are allocated and provided to the upstream peer only when requested. This mode is most useful when the upstream LSR is using conservative label retention or is not merge capable (or, as is likely, both).

Downstream Unsolicited Label Distribution Mode
Labels are allocated and provided to the upstream peer at any time (typically in conjunction with advertisement of a new route). Most useful when the upstream neighbor is using liberal retention mode.

DS
Digital Signal. A classification of digital circuits. The DS technically refers to the rate and format of the signal, while the T designation refers to the equipment providing the signals. in practice, "DS" and "T" are used synonymously; for example, DS1 and T1, DS3 and T3.

DSCP
Differentiated Services Code (Control) Point DU Downstream unsolicited label distribution (mode)

DWDM
Dense Wave-Division Multiplexing -- see WDM

Dynamic Routing
The ability for a router to forward data via a different route based on the current conditions of the communications circuits. For example, it can adjust for overloads^od traffic or failing lines and is much more flexible than static routing, which uses a fixed forwarding path.

ECN
Explicit Congestion Notification

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Edge Router

Also called an "access router," it is a router that sits at the periphery (edge) of a network in contrast with a core router that is in the middle of a network. Edge routers and core routers are relative terms. They are all just routers, but of different size and capacity. One tier's core router is another tier's edge router. The ratio of edge routers to core routers is a scalability issue and network design consideration.

Egress

The point at which a data flow exits from a computing device (node, router, switch, etc.), i.e. port.

Ethernet

The most widely-used LAN access method, which is defined by the IEEE 802.3 standard.

Expedited Forwarding

A per-hop behavior defined for DiffServ that requires a network node to provide a well.-defined minimum departure rate service for a configurable departure rate such that if Incoming traffic is conditioned not to exceed this minimum departure rate, packets are effectively not queued within the node. Expedited Forwarding ensures that, for conditioned traffic, the delay at any node is bounded and quantifiable.

Explicit Route

A route specified as a nonempty list of hops that must be part of the route used. If an explicit route is strict, only specified hops may be used. If an explicit route is loose, all specified hops must be included, in order, in the resulting path, but the path is otherwise unrestricted.

Extranet

From the perspective of a private network, any other network, including all other networks.

FANP

Flow Attribute Notification Protocol

Fast Ethernet

An Ethernet format that has a 100-Mbps transfer rate over unshielded twisted pair (UTP) cable with a length limit of 100m (100Base-T).

Fault Isolation

immediately activating backup subsystems upon failure eliminating effects on forwarding and/or neighboring routers.

FCC

Federal Communications Commission. The U.S. government agency that regulates interstate communications including wire, cable, radio, TV and satellite.

FEC

Forwarding equivalence class. A description of the criteria used to determine that a set of packets is to be forwarded in an equivalent fashion (along the same logical LSP). Forwarding equivalence classes are defined in the base LDP specification and may be extended through the use of additional parameters (such as is the case with CR-LDP). FECs are also represented in other label distribution protocols.

FF

Fixed Filter. A reservation style that is useful in establishing a point-to-point LSP from one ingress to one egress LSR.

FIB

Forwarding information base.

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Fiber Optics

Communications systems that use optical fibers as waveguides for transmitting data as pulses of light. Fiber-optic transmission became widely used in the 1980s when the long-distance carriers created nationwide systems for carrying voice conversations digitally over optical fibers. Over time, all transmission systems may become fiber optic-based, and the internals of computers may be made of optical circuits rather than electrical circuits.

Fibre Channel

A high-speed transmission technology that can be used as a front-end communications network, a back-end storage network, or both at the same time.

Filtering Database

Used in some bridging technologies to determine what interfaces an L2 frame will not be forwarded on.

Flooding

The process of forwarding data on all, or most, interfaces in order to ensure that the receiver gets at least one copy.

Flow Control

In communications, the Management of transmission between two devices. It deals with the timing of signals and enables slower-speed devices to communicate with higher-speed ones. There are various techniques, but all are designed to ensure that the receiving station is ready to accept the next block of data before the sending station sends it.

Forwarding Database

Information used to make a forwarding determination.

Forwarding Determination

The process used to determine the interface to be used to forward data. This process may or may not be directly driven by a route determination.

Forwarding Equivalence

Ensures the packet forwarding performance (from physical ingress to egress) of logical routing entities is functionally equivalent to that which would occur in a collection of smaller physical routers being emulated by the logical routers.

Frame

A message encapsulation generally consisting of a DLL header, and a payload - frequently consisting of at least part of a network-layer packet-and (possibly) a trailer. Normally encapsulated by physical-layer framing.

Frame Relay (FR)

A high-speed packet encapsulation protocol used in wide area networks (WANs). Providing a granular service of up to DS3 speed (45 Mbps), it has become very popular for LAN to LAN connections across long distances.

Frame Switch

A network device that switches variable-length packets from sender to receiver. Ethernet, Token Ring and FDDI switches are examples. Contrast with cell switch.

Frame Switching

Using frame switches to speed up network traffic. When a 10BaseT Ethernet hub is replaced with an Ethernet frame switch, each sending and receiving pair of stations obtains the full bandwidth of the network.

FTN

FEC-to-NHLFE map, used to insert unlabeled packets onto an LSP.

File Transfer Protocol.

A protocol used to transfer files over a TCP/IP network (Internet, UNIX, etc.). It includes functions to log onto the network, list directories and copy files. Unlike e-mail programs in which graphics and program files have to be "attached," FTP is designed to handle binary files directly and does not add the overhead of encoding and decoding the data.

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Graceful restart

With the aid of neighboring routers, the system continues to forward packets even though it is restarting (usually as a result of a process error or similar occurrence))

GMPLS

Generalized Multiprotocol Label Switching - In a WDM optical networking system, it is the ability to route a data transmission based on the wavelength of light that carries it. The routing device only analyzes wavelengths (light frequencies) to make its forwarding decision rather than inspecting fields within each packet. GMPLS adds numerous enhancements to MPLS in order to support optical networks. Originally known as Multiprotocol Lambda Switching, the "L" in the acronym MPLS was the Greek lambda. See MRS, lambda and WDM.

GSMP

General (or Generic) Switch Management Protocol.

Hard State

State information that remains valid until explicitly invalidated.

Header

The first part of the data flow, which contains controlling data, such as originating and destination stations, message type and priority level.

HeliOS™

HeliOS, taken from Greek mythology's Sun God, is the core of the Hyperchip PBR-1280 core IP system. Advancing the functionality of standard routing operating systems, HeliOS brings the attributes of distributed control processing, resiliency, and scalability to the world of routing protocols.

Helix™ Controller Card (HCC)

Hyperchip's Helix Controller Card (HCC) is responsible for executing all configured routing protocol sub-systems (OSPF, ISIS, BGP, etc.), creating a forwarding database from discovered routes (based on configured policies, access lists, QoS information, statistical requirements, traffic engineering, etc.), and updating the forwarding databases on the line cards as required.

Hitless Failover

Upon software failures, it is the transparent switchover to a backup task that does not affect the network as all routing adjacencies and forwarding performance are maintained (i.e. no packet loss) .

Hitless Upgrades

New software loads are installed, verified, and made operational on the system without any noticeable (negative) impact

Hop Count

The number of point-to-point links in a transmission path. Since each link is terminated at a network device such as a router or gateway, the processing performed within the device to determine how to forward the packet adds overhead to the transmission.

Host

In network architectures, a client station (user's machine) is considered a host, because it is a source of information to the network in contrast to a device such as a router or switch that directs traffic.

Hot swap

To pull out a component from a system and plug in a new one while the power is still on and the unit is still operating. Redundant systems can be designed to allow the hot swapping of drives, circuit boards, power supplies, and virtually anything that is duplicated within the system.

Hub

A central connecting device in a network that joins communications lines together in a star configuration.

Hyperchip™

A global company with a customer and partnership base that spans three continents.

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Hyperchip Matrix™

Hyperchip Matrix™ is the switch fabric ASIC, a 16x16 "intelligent" crossbar switch, which contains embedded memory, arbitration, and processing for improved performance and stability,

Hyperchip Matrix™ Card (HMC)

The Hyperchip Matrix™ resides on the Hyperchip Matrix™ Card (HMC).

Hyperchip™ Line Card (HLC)

The Hyperchip™ Line Cards (HLCs) support full line-rate forwarding of both IP and MPLS packets, and support forwarding protocols included unicast and multicast IPv4, IPv6 and MPLS.

Hyperchip™ Optical Interconnect Module (OIM)

The Optical Interconnect Modules (OIMs) simplify interconnections between chassis', using parallel optical transceivers.

ICMP

Internet Control Message Protocol

IEEE

Institute of Electrical and Electronics Engineers. A membership organization that includes engineers, scientists and students in electronics and allied fields. Through its members, the IEEE is a leading authority in technical areas ranging from computer engineering, biomedical technology and telecommunications, to electric power, aerospace and consumer electronics, among others.

IEC

International Engineering Consortium is a nonprofit organization dedicated to catalyzing technology and business progress worldwide in a range of hightechnology industries and their university communities.

IETF

Internet Engineering Task Force is a non-membership, open, voluntary standards organization dedicated to identifying problems and opportunities in IP data networks and proposing technical solutions to the Internet community.

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IFMP

Epsilon's Flow Management Protocol

IGP

Interior gateway protocol

ILM

incoming Label Map

Implicit Null Label

A label value given to an upstream neighbor when it is desirable to have that LSR pop one label prior to forwarding the packet. This behavior is commonly referred to as penultimate hop pop (PHP).

Incoming Label Map

Used to find the NHLFE for determining forwarding information for a labeled packet.

Independent Control Mode

Mode in which an LSR allocates and provides labels to upstream peers at any time. This mode may be used, for instance, when routing is used to drive label distribution and it is desirable to supply applicable labels to routing peers at about the same time as new routes are advertised.

Infrastructure

The fundamental structure of a system or organization. The basic, fundamental architecture of any system (electronic, mechanical, social, political, etc.) determines how it functions and how flexible it is to meet future requirements.

Ingress

The point at which a data flow enters a computing device (nodes, Router; switch, etc.), i.e. port

Integrated Services (IntServ)

An IETF quality-of-service standard. In essence, QoS is assured based on signaling end-to-end service requirements using a common signaling protocol. (RSVP is the only common end-to-end protocol currently defined for this purpose.) These service requirements are then mapped to specific queuing parameters for each specific medium type that may be present in such an end-to-end service. The use of CAC and traffic disciplining techniques allows this approach to effectively guarantee a requested service requirement. Because packets are classified to determine what level of service they require, and the classification information must be retained at each node, this QoS approach is often referred to as the "state-full" QoS model.

Interdomain Routing

Routing between administrative domains. Supported currently by BGP version 4.

Interface

Physical or logical end point of a link between devices.

Internet

The Internet is made up of computers in more than 100 countries covering commercial, academic and government endeavors. Originally developed for the U.S. military, the Internet became widely used for academic and commercial research. Today, the Internet has become commercialized into a worldwide information highway, providing information on every subject known to humankind. In 1995, the Internet was turned over to large commercial Internet providers (ISPs), such as MCI, Sprint and UUNET, which took responsibility for the backbones and have increasingly enhanced their capacities ever since. Regional ISPs link into these backbones to provide lines for their subscribers, and smaller ISPs hook either directly into the national backbones or into the regional ISPs.

Internet Service Provider (ISP)

Provider of an access service to the Internet, usually for a charge. Access service charges may be flat rate or based on either rate or usage. Service providers make up the Internet through complex tiering and peering relationships.

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Interoperability

The ability of two or more hardware devices or two or more software routines to work together. For example, routers and switches in a network require interoperability. The term is more often used with hardware than with software.

Intranet

A Web site for internal use that serves the employees of the enterprise. Although intranet pages may link to the Internet, an intranet is not a site accessed by the general public.

IP

Internet Protocol. The IP part of the TCP/IP communications protocol. IP implements the network layer (layer 3) of the protocol, which contains a network address and is used to route a messages. IP accepts "packets" from the layer 4 transport protocol (TCP or UDP), adds its own header to it and delivers a "datagram" to the layer 2 data link protocol. It may also break the packet into fragments to support the maximum transmission unit (MTU) of the network.

IP address

An address used in an IP network, given in a so-called "dotted decimal" notation (eg., "129.67.219.9").

IP Gateway

A device that converts data into the IP protocol. It often refers to a voice-to-IP device that converts an analog voice stream, or a digitized version of the voice, into IP packets.

IP Multicast

Transmitting data from a single node to a group of selected users at the same time on a TCP/IP network (internal, intranet or Internet). It is used for streaming audio and video over the network, but is also good for downloading a file to multiple users. IP multicast saves network bandwidth, because the, files are transmitted as one data stream over the backbone and only split apart to the target stations by the router at the end of the path:

I-PNNI

Integrated PNNI

IP SAN

An IP SAN is a storage area network (SAN) based on the Internet Protocol (IP) usually over Gigabit Ethernet rather than on the Fibre Channel framework of the traditional SAN.

IP Telephony

The two-way transmission of audio over an IP network. When used in a private intranet or WAN, it is generally known as "voice over IP," or "VoIP." When the public Internet is the transport vehicle, it is referred to as "Internet telephony," however, both terms are used synonymously.

Ipv4

The current version of the IP protocol that uses 32-bit addressing.

Ipv6

A network packet routing protocol that uses 128-bit address. IPV6 is an enhanced version of Internet protocol version (4 IPv4), that was developed primarily to correct shortcomings of IPV4 such as the 32 to bit address that limited the maximum number of devices that could be addresses and to extend the capabilities of IP to meet the demands of the, future such as improved quality of service (QoS) capabilities.

IS-IS

One of the most commonly used routing protocols, the intermediate System-to-Intermediate System protocol (IS-IS) is based on a routing method known as DECnet Phase V routing, in which routers known as intermediate systems exchange data about routing using a single metric to determine the network topology. IS-IS was developed by the international Organization for Standardization (ISO) as part of their Open Systems Interconnection (OSI) model. The first versions of IS-IS were used to manage routing within ISO Connectionless Network Protocol (CLNP) networks.

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ISDN

Integrated Services Digital Network. An international telecommunications standard for transmitting voice, video and data over digital lines running at 64 Kbps.

jitter

A flicker or fluctuation in a transmission signal or display image. The term is used in several ways, but it always refers to some offset of time and space from the norm. For example, in a network transmission, jitter would be a bit arriving either ahead or behind a standard clock cycle or, more generally, the variability of the arrival timing of packets.

Label

A fixed-size field contained in a message header that may be used as an exact-match key in determining how to forward a protocol data unit.

Label Distribution

Process by which labels are negotiated between peer LSRs.

LDP

Label Distribution Protocol

Label Edge Router (LER)

A term often used to indicate an LSR that is able to provide ingress to and egress from an LSP. In individual implementations, this tends to be a function of the capabilities of device interfaces more than of the overall device.

Label Stack

Successive labels in an MPLS shim header in order from the top to the bottom of the stack.

Label Swapping Replacing an input label with a corresponding output label.

Label-Switched Path (LSP)

Path along which labeled packets are forwarded. Packets forwarded using any label are forwarded along the same path as other packets using the same label.

Label Switching

Switching based on use of labels.

LC-ATM

Label switching controlled-ATM

LC-FR

Label switching controlled-Frame Relay

Label Switching Router (LSR)

A device that participates in one or more routing protocols and uses the route information derived from routing protocol exchanges to drive LSP setup and maintenance. Such a device typically distributes labels to peers and uses these labels (when provided as part of data presented for forwarding) to forward label-encapsulated L3 packets. In general, an LSR may or may not be able to forward non-label-encapsulated data and provide ingress/egress to LSPs (that is, to perform what is frequently referred to as the label edge router, or LER, function).

Lambda

The Greek letter "L," which is used as a symbol for "wavelength." A lambda is a particular frequency of light, and the term is widely used in optical networking. Sending "multiple lambdas" down a fiber is the same as sending "multiple frequencies" or "multiple colors." See WDM

Lambda Switching

Sometimes called photonic switching, or wavelength switching is the technology used in optical networking to switch individual wavelengths of light onto separate paths for specific routing of information. See GMPLS

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LAN

Local Area Network. A communications network that serves users within a confined geographical area. It is made up of servers, workstations, a network operating system and a communications link.

LAN Switch

A network device that cross connects stations or LAN segments. LAN switches are available for Ethernet, Fast Ethernet, Token Ring and FDDI. A LAN switch is also known as a frame switch. ATM switches are generally considered a category by themselves. Network switches are increasingly replacing shared media hubs in order to increase bandwidth.

Latency

The time between initiating a request for data and the beginning of the actual data transfer. Channel latency is the time it takes for a computer channel to become unoccupied in order to transfer data. Network latency is the time between subsequent packets.

Layer

A protocol that interacts with other protocols to provide all the necessary transmission services.

Layer 2

In networking, the communications protocol that contains the physical address of a client or server station. It is called the data link layer or MAC layer and contains the address inspected by a bridge or switch. Layer 2 processing is faster than layer 3 processing because less analysis of the packet is required.

Layer 2 Switch

A network device that forwards traffic based on MAC layer (Ethernet or Token Ring) addresses.

Layer 3

In networking, the communications protocol that contains the logical address of a client or server station. It is called the network layer and contains the address (IP, IPX, etc.) inspected by a router that forwards it through the network. Layer 3 contains a type field so that traffic can be prioritized and forwarded based on message type as well as network destination. Since layer 3 provides more filtering capabilities, it also adds more overhead than layer 2 processing.

Layer 3 Switch

A network device that forwards traffic based on layer 3 information at very high speeds. As more routing lookup functions are moved from software into the ASIC chips, layer 3 switches inspect each packet just like a router at high speed without using proprietary cut-through methods. If a layer 3 switch supports packet-by-packet inspection and supports routing protocols, it is called a "routing switch" or "switch router," which simply means "fast router."

Layer 4

A communications protocol responsible for establishing a connection and ensuring that all data has arrived safely. It is defined in layer 4 of the OSI model. Often, the term transport protocol implies transport services, which includes the lower level data link protocol that moves packets from one node to another. See OSI and transport services.

Layer 4 switch

A network device that integrates routing and switching by forwarding traffic at layer 2 speed using layer 4 and layer 3 information. When packets are inspected at layer 4, the sockets can be analyzed and decisions can be made based on the type of application being serviced.

Liberal Retention Mode L

Labels are retained whenever received. This mode is useful when the ability to change quickly to a new LSP is desirable; however, it may result in unacceptable memory consumption for LSRs with many interfaces.

Link

Physical or logical connection between two end points.

LIS

Logical IP subnet

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Logical interface

An interface associated with a specific encapsulation. Data arriving at the corresponding physical (or lowerlevel logical) interface that is encapsulated for a specific logical interface is de-encapsulated and delivered to that logical interface.

Logical Routing

Allows carriers to support multiple logical routers within a single physical system.

MAC Layer

Media Access Control layer. The protocol that controls access to the physical transmission medium on a LAN. The MAC layer is built into the network adapter. Common MAC layer standards are the CSMA/CD architecture used in Ethernet and the token passing methods used in Token Ring, FDDI and MAP. The MAC layer is synonymous with the data link layer in the OSI model.

MAE

Metropolitan Area Exchange. Originally known as Metropolitan Area Ethernets, MAEs are major network access points (NAPS) on the Internet. See NAP.

MAN

Metropolitan Area Network. A communications network that covers a geographic area such as a city or suburb.

Merging

A key function in making MPLS scalable in the number of labels consumed at each LSR. Merging is the process by which packets from multiple sources are typically delivered to a single destination or destination prefix. It is distinct from aggregation in that (in most cases) the decision to merge traffic implies that the possibility of being required to separate the merged traffic at a later point is not significant at the point where merging is being done.

Metro Ethernet Forum

A non-profit organization chartered with the mission of accelerating the adoption of optical Ethernet as the technology of choice in metro networks worldwide. The Forum is comprised of leading service providers, major incumbent local exchange carriers, top network equipment vendors and other prominent networking companies that share an interest in metro Ethernet.

MIB

Management Information Base

MPLS

Multiprotocol Label Switching. In an MPLS network, incoming packets are assigned a "label" by a "label edge router (LER)". Packets are forwarded along a "label switch path (LSP)" where each "label switch router (LSR)" makes forwarding decisions based solely on the contents of the label. At each hop, the LSR strips off the existing label and applies a new label which tells the next hop how to forward the packet.

MPLS Fast Reroute

A traffic engineering technique that enables a node to quickly adapt to a link failure.

MPLS and Frame Relay Alliance

An international industry organization dedicated to advancing the recognition and acceptance of MPLS and Frame Relay technologies in the global telecom industry.

MPOA

Multi-Protocol over ATM

Multicast

A communications service where a single message or information transmission contains an address (code) that is designated-for-several devices (nodes) in a network. Devices must contain the matching code to successfully receive or decode the message, .:

Multiplexor

in communications, a device that merges several lowspeed transmissions into one high-speed transmission and vice versa.

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Multiservice Switch

A network switch that not only handles data, but adequately supports the realtime transmission of voice and video.

NAP

Network Access Point. A junction point where major Internet service providers interconnect with each other. Also known as Internet Exchanges (IXs), connection at one or more of these NAPS means "connected to the Internet."

Network

The transmission channels interconnecting all client and server stations as well as all supporting hardware and software.

Network Architecture

The design of a communications system, which includes the hardware, software, access methods and protocols used. It also defines the method of control; for example, whether computers can act independently or are controlled by other computers monitoring the network.

Network Layer

Layer 3 of the OSI model; the layer between the data-link and transport layers. Normally encapsulated in one or more data-link layer frames.

Network Management

monitoring an active communications network in order to diagnose problems and gather statistics for administration and fine tuning.

Network Topology

The pattern of interconnection between nodes; for example, a bus, ring or star configuration.

Next Hop Label Forwarding Information Entry (NHLFE)

Contains all of the information needed to forward a labeled packet to the next hop. This information includes push, pop, or swap instructions; the new label (or labels in the event that multiple pushes are called for); the output interface; and other information that may be needed to forward the packet to the next hop.

NHRP

Next Hop Resolution Protocol

NHS

Next Hop Server

NLRI

Network Layer Reachability Information

Node

A network junction or connection point.

Non-blocking

The ability of a signal to reach its destination without interference or delay. In a non-blocking switch, all ports can run at full wire speed without any loss of packets or cells, and overloading of one port will not block traffic to other ports.

Non-stop forwarding

Also know as protocol extensions, these are extensions to BGP, OSPE, ISIS and MPLS used to notify peer routers to continue forwarding and receiving packets, even though the route processor is not working.

Non-stop routing

Uses back-up route controller to maintain all pertinent state information and maintain adjacencies with surrounding routers.

OA

Ordered Aggregate

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OA&M

OA&M (operations, administration, and management) is a general term used to describe the costs, tasks involved, or other aspects of operating, administering, and managing something such as a computer network.

OC

Optical Carrier. The transmission speeds defined in the SONET specification. OC defines transmission by optical devices.

Service Speed(Mbps)

OC-1 51.84

OC-3 155.52

OC-12 622.08

OC-48 2488.32

OC-192 9953.78

OC-768 38813,12

OIF

The Optical Internetworking Forum is a non-profit organization As the only industry group uniting packet and voice networks, the OIF helps advance the standards and methods of optical networks. The mission of the Optical internetworking Forum (OIF) is to foster the development and deployment of interoperable products and services for data switching and routing using optical networking technologies. With the goal of promoting worldwide compatibility of optical internetworking products, the OIF actively supports and extends the work of national and international standards bodies. Formal liaisons have been established with the ATM Forum, IEEE 802.3 HSSG and the IETF.

Open Source

Free source code of a program, which is made available to the development community at large. The rationale is that a broader group of programmers will ultimately produce a more useful and more bug-free product for everyone, especially because more people will be reviewing the code. Peer review is considered one of the most important safeguards to prevent buggy code, but is often not given enough, if any, attention by software companies. Peer review is a natural byproduct of open source projects.

Optical Fiber

A thin glass fiber designed for light transmission, capable of transmitting trillions of bits per second.

Optoelectronic devices

Devices converting electrical energy to optical energy or vice-versa.

Ordered Aggregate

The set of Behavior Aggregates that share an ordering constraint. For example, a set of PHB values that can be ordered relative to one another, such as AF drop precedences within an AF lass.

Ordered Control Mode

Mode in which an LSR only allocates and provides labels to art upstream peer when it is either the egress for the resulting LSP or it has received a label from downstream for the resulting LSP.

OSA

optical Society of America was organized to increase and diffuse the knowledge of optics, pure and applied; to promote the common interests of investigators of optical problems, of, designers, and of users of optical apparatus of all kinds,. and to encourage cooperation among them. The purposes of the Society are scientific, technical, and educational.

OSI

Open System Interconnection. An ISO standard for worldwide communications that defines a framework for implementing protocols in seven layers. Control is passed from one layer to the next, starting at the application layer in one station, proceeding to the bottom layer, over the channel to the next station and back up the hierarchy. Most of the functionality in the OSI model exists in all communications systems, although two or three OSI layers may be incorporated into one.

OSPF

Open Shortest Path First. An Internet routing protocol used to provide topology information to all routers within a network domain for use when determining the optimal routing (shortest path) through the network. OSPF can also use network loading and bandwidth cost when determining the optimal routing path through the network. Routers within an OSPF domain continuously update their stored maps of the network by swapping information with each other.

Packet

A message encapsulation consisting of a network-layer header and payload.

Packet Switching

An approach used to forward L3 packets from an input L3 logical interface to an output L3 logical interface that may reasonably be optimized for hardware switching-similar to switching at the data-link layer.

PAR

PNNI augmented routing

Penultimate Hop Pop (PHP)

A process by which the peer immediately upstream of the egress LSR is asked to pop a label prior to forwarding the packet to the egress LSR. Using LDP, this is done by assigning the special value of the implicit Null label. This allows the egress to push the work of popping the label to its upstream neighbor, possibly allowing for a more optimal processing of the remaining packet. Note that this can be done because once the label has been used to determine the next-hop information for the last hop, the label is no longer useful. Using PHP is helpful because it allows the packet to be treated as an unlabeled packet by the last hop. Using PHP, it is possible to implement an "LSR" that never uses labels.

Per-Hop Behavior (PHB)

A Differentiated Services behavioral definition. A PHB is defined at a node by the combination of a Differentiated Services Code Point (DSCP) and a set of configured behaviors.

PHB scheduling class

The nonempty set of per-hop behaviors that apply to the Behavior Aggregates belonging to a given Ordered Aggregate.

PCI

Peripheral Component Interconnect. A peripheral bus commonly used in PCs, Macintoshes and workstations. It was designed primarily by Intel and first appeared on PCs in late 1993. PCI provides a high-speed data path between the CPU and peripheral devices (video, disk, network, etc.).

PDU

Protocol Data Unit PE Provider Edge

Physical Layer

The services in the OSI protocol stack (layer 1 of 7) that provide the transmission of bits over the network medium.

Piggyback

Intuitive term for the use of routing, or routing-related, protocols to carry labels.

PNNI

Private Network-to-Network Interface

POP

In a label-switching context, the process of removing the top-level label (the label at the head of the label stack) from the label stack.

Pop

Point of Presence. The point at which a line from a long distance carrier (IXC) connects to the line of the local telephone company or to the user. The local company is not involved. For online services and Internet providers, the POP is the local exchange users dial into via modem.

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PoS

Packet Over SONET. A metropolitan area network (MAN) or wide area network (WAN) transport technology that carries IP packets directly over SONET transmission without any data link facility such as ATM in between. Packet over SONET is intended to transmit data at the highest rates possible, because SONET has a smaller packet header overhead than ATM.

Port

A pathway into and out of the computer or a network device such as a switch or router.

PPP

Point-to-Point Protocol. A data link protocol that provides dial-up access over serial lines. It can run on any full-duplex link from POTS to ISDN to high-speed lines (T1, T3, etc.). Developed by the Internet Engineering Task Force in 1991, it has become popular for Internet access as well as a method for carrying higher level protocols.

PPTP

Point-to-Point Tunneling Protocol. A protocol that encapsulates other protocols for transmission over an IP network. For example, it can be used to send NetWare IPX packets over the Internet. Due to its RSA encryption, PPTP is also used to create a private network (VPN) within the public Internet. Remote users can access their corporate networks via any ISP that supports PPTP on its servers.

Protocol Data Unit

A unit of data used in specific protocol interactions. It may be generically described as 'a format for encapsulation and forwarding of protocol messages between protocol entities. Messages may span multiple PDUs, a single PDU may contain multiple messages, and PDUs may be nested.

PSC

PHB scheduling class

PSTN

Public Switched Telephone (Telephony) Network

Push

In a label-switching context, the process of adding a new top-level label (which becomes the new label at the head of the label stack) to the label stack.

PVC

Permanent virtual circuit

Quality Of Service (QoS)

Specific handling or treatment of packets, often in an end-to-end service. Best-effort (also sometimes referred to as "worst-effort") is currently the lowest level of packet treatment, other than an "unconditional drop" service. Currently, there are two models for providing QoS in an IP network: Integrated Services (IntServ) and Differentiated Services (DiffServ).

RED

Random Early Detection. Congestion avoidance in packet-switched networks. The gateway detects incipient congestion by computing the average queue size. Connections of congestion are notified either by dropping packets arriving at the gateway or by setting a bit in packet headers. When the average queue size exceeds a preset threshold, the gateway drops or marks each arriving packet with a certain probability, where the exact probability is a function of the average queue size.

Redundancy

Refers to network devices that take on the processing or transmission load when other units fail.

RIP

Routing Information Protocol. A widely-used protocol for managing router information within a self-contained network such as a corporate local area network or an interconnected group of such LANs. For larger, more complicated networks, RIP's transmission of the entire routing table every 30 seconds may put a heavy amount of extra traffic in the network. The major alternative to RIP is the Open Shortest Path First Protocol (OSPF).

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Route-Class Accounting

Route-class accounting is a capability to count the volume of traffic that's forwarded to a destination based on the routing table entry used to forward the traffic on a network interface. One or more routing table entries might be aggregated together to describe a particular class of destinations. The means of aggregating routing table entries into classes is done dynamically by the application of a policy specification. The dynamic nature of this means that if the network topology changes, and the path to a destination changes, that route may become a member of a different class of routes based on how the policy is configured (e.g., by BGP-next hop, etc.)

Route Computation

The process by which routers compute entries for a route table. Route table entries are subsequently used in route determination.

Route Determination

The process of selecting a route based on header information in packets and route table entries established previously via route computation.

Route Domain Partitioning

Logically or physically dividing a network into multiple routing areas to support various routing requirements (example transit, peering, core, etc.)

Router

A device that forwards data packets from one network to another. Based on routing tables and routing protocols, routers read the network address in each transmitted frame and make a decision on how to send it based on the most expedient route (traffic load, line costs, speed, bad lines, etc.).

Routing

A scheme for selecting one of many possible paths.

Routing Protocols

A formula used by routers to determine the appropriate path onto which data should be forwarded. The routing protocol also specifies how routers report changes and share information with the other routers in the network that they can reach. A routing protocol allows the network to dynamically adjust to changing conditions, otherwise all routing decisions have to be predetermined and remain static.

RSVP

Reservation Protocol. RSVP is a quality of service (QoS) protocol that is used to control the amount of bandwidth dedicated to packet flow for specific communication sessions in a packet data network. RSVP is primarily used in real-time communication sessions (such as voice over packet).

SAFI

Subsequent Address Family Identifier

SAN

Storage Area Network. A back-end network connecting storage devices via peripheral channels such as SCSI, SSA, ESCON and Fibre Channel. There are two ways of implementing SANS: centralized and decentralized. A centralized SAN ties multiple hosts into a single storage system, which is a RAID device with large amounts of cache and redundant power supplies. The cabling distances allow for local as well as campus-wide and metropolitan-wide hookups over peripheral channels rather than an overburdened network. SCSI distances have also been extended. Using fiber, Gigalabs' SCSI switches can communicate over 20 km. This centralized storage topology is commonly employed to tie a server cluster together for failover.

SAN

System or Server Area Network. A high-speed networking architecture used to connect processors and I/O subsystems together.

Scalability

Refers to how much a system can be expanded. The term by itself implies a positive capability. For example, "the device is known for its scalability" means that it can be made to serve a larger number of users without breaking down or requiring major changes in procedure.

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Session Layer

The services in the OSI protocol stack (layer 5 of 7) that initiates and manages the communications session.

SHARE

Hyperchip's SHaping And Resources Equalization Protocol guarantees non-blocking traffic delivery across the switching fabric on a per class of service granularity via back-pressure/feedback mechanism within the switch fabric.

Shared Explicit

Reservation style in which path resources are explicitly shared among multiple senders and receivers. Useful when it is desirable to increase reservation resources or establish a new reservation without double-booking resources.

Shim Header

An encoding of the MPLS label stack. Present for all media when a label stack is in use. (The presence of the label stack is indicated either by protocol numbers or connection identifiers in the L2 encapsulation.)

SIP

SIP is an application layer protocol that uses text format messages to setup, manage, and terminate multimedia communication sessions. SIP is a simplified version of the ITU H.323 packet multimedia system. SIP is defined in RFC 2543.

SITA

Switching IP Through ATM

Slow-Path Forwarding

Used to refer to processing of exception packets in which the packet is handled via direct intervention of a system CPU resource that is not normally used in fast-path (optimized) forwarding.

SNMP

Simple Network Management Protocol. A standard protocol used to communicate management information between the network management stations (NMS) and the agents (ex. routers, switches, network devices) in the network elements.

SOC

A switch-on-a-chip is a network - typically a storage network - switch (a device that channels incoming data flow from any of multiple input ports to the output port appropriate for its destination) that is built into a single microchip (integrated circuit).

Soft State

State information that becomes out of date if not refreshed.

SONET

Synchronous Optical NETwork. A fiber-optic transmission system for high-speed digital traffic. Employed by telephone companies and common carriers, SONET speeds range from 51 megabits to multiple gigabits per second. SONET is an intelligent system that provides advanced network management and a standard optical interface. It uses a self-healing ring architecture that is able to reroute traffic if a line goes down. SONET backbones are widely used to aggregate lower-speed T1 and T3 lines.

Source Route

An explicit route specified from the source toward the destination.

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Space/time

The following units of measure are used to define storage and transmission capacities.

Space Bits/bytes

Kilo(K) Thousand

Mega(M) Million

Giga(G) Billion

Tera(T) Trillion

Peta(P) , Quadrillion

Exa(E) quintillion ~"

Zetta(Z) Sextillion .

Yotta(Y) Septillion

Time Fraction/sec

Millisecond (ms)Thousandth

Microsecond(Ns)Millionth

Nanosecond(ns)Billionth

Picosecond (ps)Trillionth

Storage/channel capacity measured in:

CPU word size bits

Bus size bits

Disk, tape bytes

memory capacity bytes

SIMM/DIMM bytes

Memory chip bits

Transmission speed measured in:

Network channel bits/sec

Disk transfer rate bytes/sec

Disk access time ms

Memory access time ns

Machine cycle Ns, ns

Instruction execution Ns, ns

Transistor switching ns, ps, fs

STII

Internet Stream Protocol version

Svc

switched virtual circuit

Switch

A mechanical or electronic device that directs the flow of electrical or optical signals from one side to the other.

Switch Fabric

The internal interconnect architecture used by a switching device, which redirects the data coming in on one of its ports out to another of its ports.

Switching

Ushering input data or messages more or less directly to an output; typically based on a simplistic recognition mechanism (such as an exact match of a fixed-length field).

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TCP/IP

Transmission Control Protocol/Internet Protocol. TCP/IP is a routable protocol, which means that all messages contain not only the address of the destination station, but the address of a destination network. This allows TCP/IP messages to be sent to multiple networks within an organization or around the world, hence its use in the worldwide Internet. Every client and server in a TCP/IP network requires an IP address, which is either permanently assigned or dynamically assigned.

TDP

Tag Distribution Protocol

TE

Traffic engineering. The ability to guarantee performance in a network for a certain amount of capacity for a certain amount of time. It implies the ability to analyze the current traffic load and dynamically make the changes necessary to accommodate the new stream of data.

Time to live (TTL)

A field in an IP packet header that will be decreased by one every time the packet passes through an IP router in the network, until it reaches zero and the packet is then discarded.

TLV

Type-Length-Value

TIA

Telecommunications Industry Association. A membership organization founded in 1988 that sets telecommunications standards worldwide. It was originally an EIA working group that was spun off and merged with the U.S. Telecommunications Suppliers Association (USTSA), sponsors of the annual SUPERCOMM conferences.

TM

Traffic Management

Topology

A topology (from Greek topos meaning place) is a description of any kind of locality in terms of its layout. In communication networks, a topology is a usually schematic description of the arrangement of a network, including its nodes and connecting lines. There are two ways of defining network geometry: the physical topology and the logical (or signal) topology.

Transport services

The collective functions of layers 1 through 4 of the OSI model.

Type-Length-Value

An object description with highly intuitive meaning; that is, the object consists of three fields: type, length, and value. Type gives the semantic meaning of the value, length gives the number of bytes in the value field (which may be fixed by the type), and value consists of length bytes of data in a format consistent with type. This object format is used in LDP and several other protocols.

Upstream

Direction from which traffic is expected to arrive. Applies to a specific forwarding equivalence class.

Upstream Label Allocation

A scheme by which the upstream peer is allowed to select the label that will be used in forwarding labeled traffic for a specific forwarding equivalence class. Not currently supported in MPLS.

VPN

Virtual Private Network. A private network that is configured within a public network. VPNs enjoy the security of a private network via access control and encryption, while taking advantage of the economies of scale and built-in management facilities of large public networks.

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WAN

Wide Area Network. A communications network that covers a wide geographic area, such as state or country. A LAN (local area network) is contained within a building or complex, and a MAN (metropolitan area network) generally covers a city or suburb.

WDM

Wavelength Division Multiplexing. A technology that uses multiple lasers and transmits multiple light signals simultaneously over a single optical fiber. Each signal travels within its unique color band, which is modulated by the data (text, voice, video, etc.). WDM enables the existing fiber infrastructure of the telephone companies and other carriers to be dramatically increased.

WRED

Weighted Random Early Detection. WRED combines the capabilities of the RED algorithm with IP Precedence to provide for preferential traffic handling of higher priority packets. WRED can selectively discard lower priority traffic when an interface/port begins to get congested and provide differentiated performance characteristics for different classes of service.