Glossary

Numerics

224.0.0.5 The All OSPF Routers multicast IP address, listened for by all OSPF routers.

224.0.0.6 The All OSPF DR Routers multicast IP address, listened for by DR and BDR routers.

2-Way In OSPF, a neighbor state that signifies that the other router has reached the basic neighbor status, having passed the parameter and bidirectional visibility check.

6to4 Tunnel An Internet transition mechanism for migrating from IPv4 to IPv6, a system that allows IPv6 packets to be transmitted over an IPv4 network (generally the IPv4 Internet) without the need to configure explicit tunnels by embedding the IPv4 tunnel endpoint address into the IPv6 address of hosts behind that endpoint.

802.1Q The IEEE standardized protocol for carrying VLAN membership information in Ethernet frames to implement VLAN trunking.

802.1Q-in-Q A mechanism used to tag the original 802.1Q traffic with another 802.1Q tag, effectively allowing 802.1Q-tagged traffic to be enclosed into and carried within another VLAN. It allows a service provider to support transparent VLAN services with multiple customers, even if the customers use overlapping VLAN numbers.

A

ABR See *Area Border Router*.

Ack In TCP, one of header flags indicating that the Acknowledgment number in the TCP header is valid and shall be processed. In EIGRP, a packet type that is used to acknowledge reliable EIGRP packets, namely Update, Query, Reply, SIA-Query, and SIA-Reply. Acks do not require an Ack themselves.

active A state for a route in an EIGRP topology table that indicates that the router is actively sending Query messages for this route, attempting to validate and/or learn the current best route to that subnet.

address family Addressing format as used by a particular routed protocol, and its particular use in the device operation. For example, IPv4 unicast address family refers to the IPv4 addressing and the use of this addressing information to deliver unicast-addressed packets.

Address Resolution Protocol Defined in RFC 826, a protocol used on LANs so that an IP host can discover the MAC address of another device that is using a particular IP address.

adjacency Often used synonymously with *neighbor*, but with emphasis on the fact that all required parameters match, allowing routing updates to be exchanged between the routers.

adjacency table A table used by CEF that holds preconstructed frame headers for each adjacent IP host to whom or through whom packets can be forwarded.

adjacent Any OSPF neighbor for which the database synchronization process has completed.

AFI (Authority and Format Identifier) The first octet of an ISO OSI NSAP address indicating its format and structure.

AFT (Address Family Translation) AFT involves the translation of an address from one IP address family to another.

aggregate route Another term for *summary route*; however, *aggregation* is a term used often in relation to BGP, hinting at the possibility that the resulting aggregate route's mask can be shorter than the natural classful mask, in effect aggregating multiple classful networks.

All OSPF DR Routers The multicast IP address 224.0.0.6, listened for by DR and BDR routers.

All OSPF Routers The multicast IP address 224.0.0.5, listened for by all OSPF routers.

Alternate role An 802.1w RSTP port role. An Alternate port is a possible replacement port for the Root Port. If the current Root Port fails, the Alternate port receiving the best resulting BPDUs will be promoted to the Root Port and moved to Forwarding state rapidly.

area In OSPF and IS-IS, a contiguous part of a network in which all member routers share the complete and detailed topology information.

Area Border Router An OSPF router that connects to the backbone area and to one or more nonbackbone areas.

ARP See *Address Resolution Protocol*.

ASBR (Autonomous System Boundary Router) An OSPF router that redistributes routes from some other source into OSPF.

ATTached bit A flag in an IS-IS Link State PDU indicating whether the originating router has a working connection to another area, that is, whether it can be used as a backbone router to reach other areas.

authentication With routing protocols, the process by which the router receiving a routing update determines whether the routing update came from a trusted router.

autonegotiation Ethernet process by which devices attached to the same cable negotiate their speed and the duplex settings over the cable.

B

backbone A part, or a subdomain, of a network that provides interconnection between different network areas. In OSPF, Area 0 serves as the backbone. In IS-IS, the backbone is the contiguous subdomain of the network consisting of Level-2-capable routers.

backbone area Area 0; the area that provides communication between other areas and to which all other OSPF areas must connect.

Backup Designated Router (BDR) In OSPF, a router that is prepared to take over for the designated router.

Backup role An 802.1w RSTP port role. A Backup Port is a possible replacement port for the Designated Port of the same switch on a common segment. If the current Designated Port fails, the Backup Port will be promoted to the Designated Port and moved to the Forwarding state gradually (the transition is not rapid; rather, it is driven by the forward_delay timer).

BDR See *Backup Designated Router*.

Blocking state An 802.1D STP port state in which the port does not send or receive frames or learn MAC addresses, except for listening for received Hello BPDUs.

BOOTP (Boot Protocol) A standard (RFC 951) protocol, a predecessor to DHCP, by which a LAN-attached host can dynamically broadcast a request for a server to assign it an IP address, along with other configuration settings, including a subnet mask and default gateway IP address.

BPDU Guard Cisco-proprietary STP feature in which a switch port monitors for STP BPDUs of any kind, err-disabling the port upon receipt of any BPDU.

broadcast address An address describing all possible receivers on a LAN. On Ethernet, the broadcast MAC address is FF:FF:FF:FF:FF:FF. In IPv4, the broadcast address is an IP address in which all host bits are set to 1.

broadcast domain A set of all devices that receive broadcast frames originating from any device within the set. Devices in the same VLAN are in the same broadcast domain.

broadcast subnet When subnetting a Class A, B, or C network, the subnet for which all subnet bits are binary 1. The broadcast address in this subnet is numerically equal to the broadcast address of the former unsubnetted Class A, B, or C network.

C

CEF (Cisco Express Forwarding) An optimized Layer 3 forwarding path through a router or a multilayer switch. CEF optimizes routing table lookup by creating a special, easily searched structure based on the contents of the IP routing table, and preconstructs frame headers for directly connected end hosts and next hops. The forwarding information is called the Forwarding Information Base (FIB), and the frame rewrite information is called the adjacency table.

CIDR (Classless Inter-Domain Routing) Defined in RFCs 1517–1520, a scheme to help reduce Internet routing table sizes by removing the classful address semantics and administratively allocating large blocks of consecutive IP network numbers to ISPs for use in different global geographies. CIDR results in large blocks of networks that can be summarized, or aggregated, into single routes.

circuit ISO OSI term for an interface.

CIST (Common and Internal Spanning Tree) A spanning tree in MST created by joining together the Common Spanning Tree interconnecting individual MST regions with the Internal Spanning Tree within each of these regions.

classful IP addressing A particular semantics of IP addresses in which ranges, also called *classes*, of IP addresses were defined by convention and each class was assigned an implicit, also called *classful*, network mask. When a network was allocated from a class to a customer, the entire network according to the *classful* mask was always allocated; there were no provisions to allocate a smaller or a larger subnet.

classless IP addressing A particular semantics of IP addresses in which addressing information is always accompanied by an explicitly specified mask (alternatively called a prefix length), and the former address classes including their implicit netmasks and related limitations are ignored.

community port With private VLANs, a switched port associated with a particular secondary community VLAN.

community VLAN With private VLANs, a secondary VLAN in which the ports can send and receive frames with each other, with promiscuous ports and with trunks, but not with ports in other secondary VLANs.

component route A term used in this book to refer to a route that is included in a larger summary route.

control plane A conceptual component of a network device that is responsible for creating, updating, and exchanging information that controls the device operation over data flows. As an example, in IP routing, the control plane refers to the building of IP routing tables by IP routing protocols.

counting to infinity An intrinsic routing loop resolution property of distance-vector protocols. If a next hop to a particular destination suddenly advertises an increased metric, routers using this next hop will accept the advertisement immediately and update their metrics accordingly. In a routing loop, routers derive their metrics from each other in sequence, causing the metric to increment with each update, eventually arriving at a maximum allowed value after which the routing protocol no longer accepts the advertisement, finally breaking the routing loop.

crossover cable Copper cable with RJ-45 connectors in which the transmit and receive pairs are swapped on one end of the cable, allowing the interconnection of devices whose own sockets are connected identically to each other. A light crossover cable version exchanges pins 1,2 with pins 3,6. A full crossover cable also exchanges pins 4,5 with pins 7,8.

CSMA/CD (Carrier Sense Multiple Access with Collision Detection) A media-access mechanism where devices ready to transmit data first check the channel for a carrier. If no carrier is sensed for a specific period of time, a device can transmit. If two devices transmit simultaneously, a collision occurs and is detected by all transmitting devices. This collision subsequently causes each device to stop the transmission and back off for a random period of time before attempting to retransmit the data.

CSNP (Complete Sequence Number PDU) An IS-IS packet type used in the link-state database synchronization procedure between routers.

CST (Common Spanning Tree) A single instance of STP that is applied to multiple VLANs, typically when using the 802.1Q trunking standard. Particularly in MST, CST refers to the spanning tree that interconnects individual MST regions and provides interoperation with non-MST regions.

D

data plane A conceptual component of a network device that performs the actual operation over data flows. As an example, in IP routing, this term refers to the process of forwarding packets through a router.

DD (Database Description) A type of OSPF packet used to exchange LSA headers during the initial topology exchange so that a router knows a list of its neighbor's LSAs including their versions. Sometimes called *DBD*.

dead time/interval With OSPF, the timer used to determine when a neighboring router has failed, based on a router not receiving any OSPF messages, including Hellos, in this timer period.

default route A route that is used for forwarding packets when the packet does not match any more specific routes in the IP routing table.

Designated Port With Spanning Tree Protocol, the single port on each LAN segment from which the best Hello BPDU is forwarded.

DHCP (Dynamic Host Configuration Protocol) A standard (RFC 2131) protocol by which a host can dynamically broadcast a request for a server to assign to it an IP address, along with other configuration settings, including a subnet mask and default gateway IP address. DHCP provides a great deal of flexibility and functionality compared with RARP and BOOTP.

DHCPv6 A network protocol that is used for configuring IPv6 hosts with IP addresses, IP prefixes, and/or other configuration required to operate on an IPv6 network.

Dijkstra Alternate name for the SPF algorithm, named for its inventor, Edsger W. Dijkstra.

DIS (Designated Intermediate System) An IS-IS router role analogous to OSPF Designated Router. A DIS is responsible for representing a multiaccess network segment in the link-state database and assists in the link-state database synchronization of routers connected to the multiaccess segment.

Disabled state An 802.1D STP port state in which the port has been administratively disabled.

Discarding state An 802.1w RSTP port state in which the port is not forwarding or receiving; covers 802.1D port states disabled, blocking, and listening.

distance vector The underlying fundamental principle of a class of routing protocols, based on the fact that for a routed network to converge in a finite time, it is sufficient for each router to advertise just a list (a vector) of known networks and its own distance to each of them.

distribution list A Cisco IOS configuration tool for routing protocols by which routing updates can be filtered.

domain ISO OSI term for autonomous system.

DR (Designated Router) With PIM on a multiaccess network, the PIM router with the highest IP address on the subnet. PIM DR is responsible for acting on behalf of directly connected hosts with respect to the PIM-SM protocol (sends Joins and Prunes as the result of IGMP signaling, and performs the Register process for local multicast senders). With OSPF, the OSPF router that wins an election among all current neighbors. The DR is responsible for flooding on the subnet, and for creating and flooding the type 2 LSA for the subnet.

DR election The process by which neighboring OSPF routers examine their Hello messages and elect the DR. The decision is based on priority (highest), or RID (highest) if priority is a tie.

DROther The term that describes a router that is neither the DR nor the BDR on a subnet that elects a DR and BDR.

DSL (Digital Subscriber Line) A common Internet access service type for residential and business customers.

DSP (Domain Specific Part) A specific portion of an ISO OSI NSAP address local to the domain, usually containing information about the internal structure of the domain, identification of a host, and a requested network service.

DTP (Dynamic Trunking Protocol) A Cisco-proprietary protocol used to dynamically negotiate whether the devices on an Ethernet segment want to form a trunk and, if so, which type (ISL or 802.1Q).

DUAL (Diffusing Update Algorithm) In EIGRP, DUAL is a finite state machine that decides how topology changes should be handled, when a diffusing computation should be started, and how its results should be processed.

E

E1 route An OSPF external route for which internal OSPF cost is added to the cost of the route as it was redistributed into OSPF.

E2 route An OSPF external route for which internal OSPF cost is not added to the cost of the route as it was redistributed into OSPF.

EIGRP stub router A router that should not be used to forward packets between other routers. An EIGRP stub router does not propagate EIGRP-learned routes, responds to Queries in a limited way, and instructs other routers not to send it Query packets.

encapsulation The process of taking a datagram and adding layer-specific headers and optionally trailers to create a new datagram.

encapsulation replication Form of a SPAN session that retains the original encapsulation of monitored frames including VLAN tags, if any.

ERSPAN (Encapsulated Remote Switched Port ANalyzer) Technology for remote monitoring of switched ports, utilizing GRE tunnels to carry the monitored traffic across a routed network to a remote monitoring destination.

ES (End System) An ISO OSI term for an end host.

external route From the perspective of one routing protocol, a route that was learned from a different source by using route redistribution.

F

fast switching An optimized Layer 3 forwarding path through a router. Fast switching optimizes routing table lookup by creating a special, easily searched table of known flows between hosts (essentially a route lookup cache).

FD (Feasible Distance) With EIGRP, the lowest known distance to a particular destination since the last time the destination transitioned from Active to Passive state, in other words, the historical minimum of the distance to that destination.

feasibility condition With EIGRP, a sufficient condition for loop freedom. If, for a particular destination, a neighbor's Reported Distance is strictly less than the destination's Feasible Distance, the neighbor provides a loop-free path.

feasible successor With EIGRP, for a particular destination, any neighboring router that satisfies the feasibility condition and thus provides a loop-free path.

FED (Forwarding Engine Driver) / FFM (Forwarding and Feature Manager) In IOS-XE, the Control plane and Data plane separation are provided through Forward and Feature Manager, or FFM. FFM provides a set of APIs to the Control plane processes. FFM programs the Data plane through the Forward Engine Driver, or FED, and maintains the forwarding state for the system.

FIB (Forwarding Information Base) In CEF, Forwarding Information Base is an optimized copy of the Routing Information Base organized for rapid lookups, either as a tree-based software structure in RAM in software routers or downloaded into TCAM on multilayer switches.

flash updates See *triggered updates*.

flooding scope In OSPF, the part of a network into which a particular LSA type can be flooded. OSPFv2 uses two flooding scopes, area-local and autonomous system, with an added link-local scope for specific opaque LSA types. OSPFv3 uses link-local, area-local, and autonomous system flooding scopes as part of its basic operation.

Flushed after timer A per-route timer in RIP that is reinitialized each time an update about a route has been received from its next hop. If the next hop ceases to advertise the network and the Flushed after timer reaches its limit, the router flushes the route from the routing table.

Forward Delay timer An STP timer that dictates how long a port should stay in the listening state and the learning state.

Forwarding state An 802.1D STP port state in which the port sends and receives data frames.

full duplex Ethernet feature in which a NIC or Ethernet port can both transmit and receive at the same instant in time. It can be used only when there is no possibility of collisions. Loopback circuitry on NICs is disabled to use full duplex.

full SPF calculation An SPF calculation as a result of changes inside the same area as a router, for which the SPF run must examine the full LSDB.

full update A routing protocol feature by which the routing update includes the entire set of routes, even if some of or all the routes are unchanged.

fully adjacent Any OSPF neighbor for which the database flooding process has completed.

G

gateway of last resort The notation in a Cisco IOS IP routing table that identifies the route used by that router as the default route.

Get In the context of SNMP, the Get command is sent by an SNMP manager, to an agent, requesting the value of a single MIB variable identified in the request. The Get request identifies the exact variable whose value the manager wants to retrieve. Introduced in SNMPv1.

GetBulk In the context of SNMP, the GetBulk command is sent by an SNMP manager, to an agent, requesting the values of multiple variables. The GetBulk command allows retrieval of complex structures, like a routing table, with a single command, as well as easier MIB walking.

GetNext In the context of SNMP, the GetNext command is sent by an SNMP manager, to an agent, requesting the value of a single MIB variable. The GetNext request identifies a variable for which the manager wants the variable name and value of the next MIB leaf variable in sequence.

GLBP (Gateway Load Balancing Protocol) A Cisco-proprietary feature by which multiple routers can provide interface IP address redundancy, as well as cause a set of clients to load-balance their traffic across multiple routers inside the GLBP group.

going active EIGRP jargon meaning that EIGRP has placed a route into active status.

Goodbye An EIGRP message that is used by a router to notify its neighbors when the router is gracefully shutting down.

graceful restart As defined in RFC 3623, graceful restart allows for uninterrupted forwarding in the event that an OSPF router's OSPF routing process must restart. The router does this by first notifying the neighbor routers that the restart is about to occur; the neighbors must be RFC 3623 compliant, and the restart must occur within the defined grace period.

graceful shutdown A feature in routing protocols allowing a router to inform its neighbors about its impending deactivation. The neighbors can react to this indication immediately, instead of waiting for the Hold or Dead intervals to expire.

H

half duplex Ethernet feature in which a NIC or Ethernet port can only transmit or receive at the same instant in time, but not both. Half duplex is required when a possibility of collisions exists.

Hello A periodic message used in several protocols to advertise a device's presence on a network, discover neighbors, perform configuration parameter verification, establish adjacencies, and monitor neighbor liveliness. Protocols such as EIGRP, OSPF, IS-IS, PIM, and LDP use Hello signaling.

hello interval With some routing protocols, the time period between successive Hello messages.

Hello timer An STP timer that dictates the interval at which the Root switch generates and sends Hello BPDUs.

HO-DSP (High Order Domain Specific Part) A specific portion of an ISO OSI NSAP address local to the domain, usually containing information about the internal structure of the domain, such as area number, down to but not including the identification of a host and the requested network service.

Hold timer With EIGRP, the timer used to determine when a neighboring router has failed, based on a router not receiving any EIGRP messages, including Hellos, in this timer period.

Holddown timer With RIP, a per-route timer (default 180 seconds) that begins when a route has not been advertised by its next hop for a period longer than the Invalid after timer. During the time the Holddown timer runs for a route, this route is advertised as unreachable, any updates regarding the route are ignored, and the routing table entry is not modified.

HSRP (Hot Standby Router Protocol) A Cisco-proprietary feature by which multiple routers can provide interface IP address redundancy so that hosts using the shared, virtual IP address as their default gateway can still reach the rest of a network even if one or more routers fail.

I

I/G bit Individual/Group bit. The least significant bit in the most significant octet of an Ethernet MAC address. Its value implies that the address is a unicast MAC address (binary 0) or a group address (binary 1). Note that in Ethernet, individual octets are transmitted in reverse order of bits, starting with the least-significant bit. The I/G bit will therefore be the first bit of the MAC address a NIC will see.

IDI (Initial Domain Identifier) A specific portion of an ISO OSI NSAP address identifying the domain where the host resides.

IDP (Initial Domain Part) A specific portion of an ISO OSI NSAP address comprising the AFI and IDI fields.

IIH (IS-IS Hello) Hello packet used in IS-IS between routers.

inferior BPDU Out of two BPDUs being compared, the one that is "worse," that is, the one that contained a higher numerical value in the first field that broke the tie (the fields are compared in the sequence Root Bridge ID, Root Path Cost, Sending Bridge ID, and Sending Port ID).

Inform In the context of SNMP, the Inform command is sent by an SNMP manager to communicate a set of variables, and their values, to another SNMP manager. The main purpose is to allow multiple managers to exchange MIB information, and work together, without requiring each manager to individually use Get commands to gather the data.

input event Any occurrence that could change a router's EIGRP topology table, including a received Update or Query, change in interface metrics, a failed interface, or the loss of a neighbor.

Inside Global address A NAT term describing the IP address of a host located in the inside part of the network, as seen by hosts in the outside part of the network (inside host's IP address after possible translation).

Inside Local address A NAT term describing the IP address of a host located in the inside part of the network, as seen by other hosts in the inside part of the network (inside host's true IP address).

instance ID A field in OSPFv3 packet headers, allowing multiple independent instances of OSPFv3 to be run over a single link.

internal router In OSPF and IS-IS, a router whose interfaces are all located in the same single area.

Invalid after timer A per-route timer that is reset and begins after an update about a route has been received from its next hop. If the updates about the route from its next hop cease to be received and the Invalid after timer reaches its limit, the route is declared invalid and the Holddown timer starts for this route.

IP forwarding The process of forwarding packets through a router. Also called *IP routing*.

IP prefix list A Cisco IOS configuration tool that can be used to match routing updates based on a base network address, a prefix, and a range of possible masks used inside the values defined by the base network address and prefix.

IP routing The process of forwarding packets through a router. Also called *IP forwarding*.

IPv4 Version 4 of the IP protocol, which is the generally deployed version worldwide (at press time) and uses 32-bit IP addresses.

IPv6 The latest version of the Internet Protocol (IP), the communications protocol that provides an identification and location system for computers on networks and routes traffic across the Internet. IPv6 was developed by the Internet Engineering Task Force (IETF) to deal with the long-anticipated problem of IPv4 address exhaustion.

IS (Intermediate System) An ISO OSI term for a router.

ISATAP (Intra-Site Automatic Tunnel Addressing Protocol) An IPv6 transition mechanism meant to transmit IPv6 packets between dual-stack nodes on top of an IPv4 network.

ISH (Intermediate System Hello) A PDU sent from routers toward end hosts to provide gateway discovery function.

ISL (Inter-Switch Link) Cisco-proprietary VLAN trunking protocol.

isolated port With private VLANs, a switched port associated with a particular secondary isolated VLAN.

isolated VLAN With private VLANs, a secondary VLAN in which the ports can send and receive frames only with trunks and promiscuous ports in the associated primary VLAN.

K

K-value In EIGRP, configurable integer constants used in the composite metric calculation formula. Different K values correspond to different metric components (K1 controls bandwidth, K2 controls bandwidth and load, K3 controls delay, K4 and K5 control reliability, and K6 controls extended metric components), allowing EIGRP to ignore or take into account individual metric components and modify their weight.

L

LACP (Link Aggregation Control Protocol) Defined in IEEE 802.1AX, defines a messaging protocol used to negotiate the dynamic creation of PortChannels (EtherChannels) and to choose which ports can be placed into an EtherChannel.

Layer 2 protocol tunneling Additional feature related to 802.1Q-in-Q, allowing the tunneling of Layer 2 control protocols such as CDP, STP, and VTP across a VLAN-based network.

lead content engine The content engine in a WCCP cluster that determines how traffic will be distributed within the cluster.

Learning state An 802.1D STP transitory port state in which the port does not send or receive frames, but does learn the source MAC addresses from incoming frames.

Level 1 routing In IS-IS, routing between hosts within the same area.

Level 2 routing In IS-IS, routing between hosts in different areas.

Level 2 subdomain A contiguous part of the network consisting of Level-2-capable routers, allowing inter-area communication and thus forming the backbone.

limiting query scope An effort to reduce the query scope with EIGRP, using route summarization or EIGRP stub routers.

link-state routing protocol Any routing protocol that uses the concept of using the SPF algorithm with an LSDB to compute routes.

Listening state An 802.1D STP transitory port state in which the port does not send or receive frames, and does not learn MAC addresses, but still sends and receives BPDUs to determine its role in the spanning-tree topology.

local computation An EIGRP router's reaction to an input event, leading to the use of the current successor or a feasible successor without going active on a route.

Loop Guard Protects against problems caused by unidirectional links between two switches. Watches for loss of received Hello BPDUs, in which case it transitions to a loop-inconsistent state instead of transitioning to a forwarding state.

loopback circuitry A feature of Ethernet NICs. When the NIC transmits an electrical signal, it "loops" the transmitted electrical current back onto the receive pair. By doing so, if another NIC transmits a frame at the same time, the NIC can detect the overlapping received electrical signals and sense that a collision has occurred.

LSA (Link State Advertisement) The OSPF data structure that describes topology information.

LSA flooding The process of successive neighboring routers exchanging LSAs such that all routers have an identical LSDB for each area to which they are attached.

LSA type A definition that determines the data structure and information implied by a particular LSA.

LSAck (Link-State Acknowledgment) A type of OSPF packet used to acknowledge LSU packets.

LSDB (link-state database) The data structure used by OSPF routers to hold LSAs.

LSP (Label Switched Path) The combination of MPLS labels and links over which a packet will be forwarded over an MPLS network, from the point of ingress to the MPLS network to the point of egress.

LSP (Link State PDU) In IS-IS, a packet type that carries topological, addressing, and possibly other information about the router that has originated it. LSPs and their contents are stored in LSDB and processed during SPF computation.

LSP fragmentation In IS-IS, a process of originating a Link State PDU in several fragments if its size exceeds the MTU of router's interfaces. IS-IS LSPs can only be fragmented by their originating router.

LSRefresh Link-State Refresh. A timer that determines how often the originating router should reflood an LSA, even if no changes have occurred to the LSA.

LSU (Link-State Update) A type of OSPF packet, used to communicate LSAs to another router.

M

Maxage An OSPF timer that determines how long an LSA can remain in the LSDB without having heard a reflooded copy of the LSA.

MaxAge timer An STP timer that dictates the maximum time until a BPDU stored on a port can expire.

MD5 (Message Digest 5) A widely used cryptographic hash function producing 128-bit results, used to verify the integrity of transmitted data and provide authentication information while protecting the shared secret that was used to compute the authentication information.

metric With routing protocols, the measurement of favorability that determines which entry will be installed in a routing table if more than one router is advertising that exact network and mask.

MIB (Management Information Base) The definitions for a particular set of data variables, with those definitions following the SMI specifications. See also *SMI*.

MIB walk In SNMP, the process of a manager using successive GetNext and GetBulk commands to discover the exact MIB structure supported by an SNMP agent. The process involves the manager asking for each successive MIB leaf variable.

MIB-I The original standardized set of generic SNMP MIB variables, defined in RFC 1158.

MIB-II The most recent standardized set of generic SNMP MIB variables, defined in RFC 1213 and updated in RFCs 2011 through 2013.

MLS (Multilayer Switching) A process whereby a switch, when making a forwarding decision, uses not only Layer 2 logic but also other OSI layer equivalents as well.

monitor session The command used to initialize a SPAN or RSPAN session on a Catalyst switch.

MST (Multiple Spanning Trees) Defined in IEEE 802.1s, a specification for multiple STP instances when using 802.1Q trunks.

multicast address An address describing a group of receivers. On Ethernet, multicast MAC addresses have their first octet as an odd number. In IPv4, the range of multicast addresses is 224.0.0.0/4. In IPv6, the range of multicast addresses is FF00::/8.

N

Named Mode A new style of EIGRP process configuration in which a process is identified by its verbal name, and all EIGRP-related configuration is contained within this named process section.

NAT (Network Address Translation) Defined in RFC 1631, a method of translating IP addresses in headers with the goal of allowing multiple hosts to share single public IP addresses, thereby reducing IPv4 public address depletion.

native VLAN The one VLAN on an 802.1Q trunk for which the endpoints do not add the 4-byte 802.1Q tag when transmitting frames in that VLAN, and to which they assign received frames without an 802.1Q tag.

neighbor With EIGRP, a router sharing the same primary subnet, with which Hellos are exchanged, parameters match, and with which routes can be exchanged. With OSPF, any other router, sharing a common data link, with which a router exchanges Hellos, and for which the parameters in the Hello pass the parameter-check process.

neighbor state A state variable kept by a router for each known neighbor or potential neighbor.

NET (Network Entity Title) A specific type of ISO OSI NSAP address in which the Network Selector octet value is 0x00. NET is a complete address of a host without specifying any particular network service.

network type A characteristic of OSPF interfaces that determines whether a DR election is attempted, whether or not neighbors must be statically configured, and the default Hello and Dead timer settings.

Next Hop field With a routing update, or routing table entry, the portion of a route that defines the next router to which a packet should be sent to reach the destination subnet. With routing protocols, the Next Hop field can define a router other than the router sending the routing update.

NLPID (Network Layer Protocol ID) A field in the RFC 2427 header that is used as a Protocol Type field to identify the type of Layer 3 packet encapsulated inside a Frame Relay frame. Also a TLV type used by IS-IS to advertise the routed protocols supported on a router.

NSAP (Network Service Access Point) ISO OSI Layer 3 address format.

NSSA (not-so-stubby area) A type of OSPF stub area that, unlike stub areas, can inject external routes using its own ASBR but does not receive external routes from the backbone area.

NTP (Network Time Protocol) An Internet standard (RFC 1305) that defines the messages and modes used for IP hosts to synchronize their time-of-day clocks.

NTP client mode An NTP mode in which an NTP host adjusts its clock in relation to an NTP server's clock.

NTP server mode An NTP mode in which an NTP host does not adjust its clock, but in which it sends NTP messages to clients so that the clients can update their clocks based on the server's clock.

NTP symmetric active mode An NTP mode in which two or more NTP servers mutually synchronize their clocks.

O

offset list A Cisco IOS configuration tool for RIP and EIGRP for which the list matches routes in routing updates, and adds a defined value to the sent or received metric for the routes. The value added to the metric is the *offset*.

Outside Global address A NAT term describing the IP address of a host located in the outside part of the network, as seen by other hosts in the outside part of the network (outside host's true IP address).

Outside Local address A NAT term describing the IP address of a host located in the outside part of the network, as seen by hosts in the inside part of the network (outside host's IP address after possible translation).

Overload bit A flag in an IS-IS Link State PDU. If set, it indicates that the router should not be considered as a transit router in the SPF calculation; only directly connected networks on that router shall be considered.

overloading Another term for *Port Address Translation*.

P

PAgP (Port Aggregation Protocol) A Cisco-proprietary messaging protocol used to negotiate the dynamic creation of EtherChannel bundles and to choose which ports can be placed into an EtherChannel bundle.

partial SPF calculation An SPF calculation for which a router does not need to run SPF for any LSAs inside its area, but instead runs a very simple algorithm for changes to LSAs outside its own area.

partial update A routing protocol feature by which the routing update includes only routes that have changed rather than the entire set of routes.

passive A state for a route in an EIGRP topology table that indicates that the router believes that the route is stable, and it is not currently looking for any new routes to that subnet.

PAT (Port Address Translation) A NAT term describing the process of multiplexing TCP and UDP flows, based on port numbers, to a small number of public IP addresses. Also called *NAT overloading*.

poison reverse Loop-prevention technique used in distance-vector routing protocols, the full name is Split Horizon with Poisoned Reverse. Under this technique, a network will be explicitly advertised as unreachable over the interface that is used to reach that network.

polarization In CEF load balancing, the undesirable effect of a path selection function producing the same result for all data flows that have already been load balanced, preventing these flows from ever being load balanced again.

policy routing Cisco IOS router feature by which a route map determines how to forward a packet, typically based on information in the packet other than the destination IP address.

PortFast Cisco-proprietary STP feature in which a switch port, known to not have a bridge or switch attached to it, transitions from the disabled to forwarding state without using any intermediate states.

PPPoE (Point-to-Point Protocol over Ethernet) An encapsulation protocol and related control protocol that allows creating and carrying PPP sessions over Ethernet. Very often used in DSL deployments.

prefix A numeric value between 0 and 32 for IPv4, or 0 and 128 for IPv6 (inclusive) that defines the number of beginning bits in an IP address for which all IP addresses in the same group have the same value. Alternative: The number of binary 1s beginning a subnet mask, written as a single decimal value, used as a more convenient form of representing the subnet mask.

prefix list A Cisco IOS configuration tool that can be used to match routing updates based on a base network address, a prefix, and a range of possible masks used inside the values defined by the base network address and prefix.

prefix suppression In OSPF, a feature that prevents prefixes on transit links from being advertised.

priority In OSPF, an administrative setting, included in Hellos, that is the first criterion for electing a DR. The highest priority wins, with values from 1 to 255, with priority 0 meaning that a router cannot become DR or BDR.

private addresses RFC 1918–defined IPv4 network numbers that are not assigned as public IP address ranges, and are not routable on the Internet. Intended for use inside enterprise networks.

private VLAN A Cisco switch feature that allows separation of ports as if they were in separate VLANs, while allowing the use of a single IP subnet for all ports.

process switching A Layer 3 forwarding path through a router that does not optimize the forwarding path through the router.

promiscuous port With private VLANs, a port that can send and receive frames with all other ports in the private VLAN and associated secondary VLANs.

proxy ARP A router feature used when a router sees an ARP request searching for an IP host's MAC, when the router believes that the IP host could not be on that LAN because the host is in another subnet. If the router has a route to reach the subnet where the ARP-determined host resides, the router replies to the ARP request with the router's MAC address.

pseudonode In OSPF and IS-IS, the concept of representing a multiaccess network as a standalone node (a pseudonode) in the link-state database. OSPF represents each multiaccess network by a corresponding type 2 LSA. IS-IS generates a standalone Link State PDU.

PSNP (Partial Sequence Number PDU) An IS-IS packet type used in the link-state database synchronization procedure between routers.

PVST+ (Per-VLAN Spanning Tree Plus) A Cisco-proprietary STP implementation, created many years before IEEE 802.1s and 802.1w, that speeds convergence and allows for one STP instance for each VLAN.

Q

quartet A set of four hex digits listed in an IPv6 address. Each quartet is separated by a colon.

query An EIGRP message that is used to ask neighboring routers to verify their route to a particular subnet. Query messages require an Ack.

query scope The characterization of how far EIGRP Query messages flow away from the router that first notices a failed route and goes active for a particular subnet.

R

RARP (Reverse ARP) A standard (RFC 903) protocol by which a LAN-attached host can dynamically broadcast a request for a server to assign it an IP address. See also *ARP*.

RD (reported distance) In EIGRP, the metric (distance) of a route as reported by a neighboring router.

RD (Route Distinguisher) A 64-bit extension to the BGP NLRI field, used by MPLS for the purpose of making MPLS VPN customer routes unique to BGP and its operation in spite of the possibility of overlapping IPv4 address spaces in different customer networks.

remote VLAN The destination VLAN for an RSPAN session.

Reply An EIGRP message that is used by neighbors to reply to a query. Reply messages require an Ack.

Response In the context of SNMP, the Response command is sent by an SNMP agent, back to a manager, in response to any of the three types of Get requests, or in response to a Set request. It is also used by a manager in response to a received Inform command from another SNMP manager. The Response holds the value(s) of the requested variables.

RIB (Routing Information Base) The basic, unoptimized routing table on a router that serves as a master copy of routing information used to build CEF FIB. RIB can also refer to internal routing tables maintained by individual routing protocols. Routes in these per-protocol internal routing tables can be used in the routing protocol operation, and best routes can be offered to the router's routing table manager.

RID (router ID) The 32-bit number used to represent a router in a particular protocol. OSPF, EIGRP, BGP, and LDP are examples of protocols that make use of router IDs.

Root Guard Cisco-proprietary STP feature in which a switch port monitors for incoming superior Hellos, and reacts to a superior Hello by putting the port into the root-inconsistent blocking state to prevent any switch connected to that port from becoming root.

Root Port The single port on each nonroot switch upon which the best resulting Hello BPDU is received.

route map A configuration tool in Cisco IOS that allows basic programming logic to be applied to a set of items. Often used for decisions about what routes to redistribute, and for setting particular characteristics of those routes—for example, metric values.

route poisoning The process of sending an infinite-metric route in routing updates when that route fails.

route redistribution The process of taking routes known through one routing protocol and advertising those routes with another routing protocol.

Route Tag field A field within a route entry in a routing update, used to associate a generic number with the route. It is used when passing routes between routing protocols, allowing an intermediate routing protocol to pass information about a route that is not natively defined to that intermediate routing protocol. Frequently used for identifying certain routes for filtering by a downstream routing process.

routed interface An interface on a Cisco IOS–based switch that is treated as if it were an interface on a router.

RPVST+ (Rapid Per-VLAN Spanning Tree Plus) The combination of PVST+ and Rapid Spanning Tree. It provides subsecond convergence time and is compatible with PVST+ and MSTP.

RSPAN (Remote Switched Port Analyzer) A method of collecting traffic received on a switch port or a VLAN and sending it to specific destination ports on a switch other than the one on which it was received.

RSTP (Rapid Spanning Tree Protocol) Defined in IEEE 802.1w, a specification to enhance the 802.1D standard to improve the speed of STP convergence.

RTO (Retransmission Timeout) With EIGRP, a timer starts when a reliable (to be acknowledged) message is transmitted. For any neighbor(s) failing to respond in its RTO, the RTP protocol causes retransmission. RTO is calculated based on SRTT.

RTP (Reliable Transport Protocol) A protocol used for reliable multicast and unicast transmissions. Used by EIGRP.

S

SEL (Selector) Also known as Network Selector. The last octet of an ISO OSI NSAP address describing the requested network service on the host identified by the NSAP address. If the value of the SEL octet is 0x00, the NSAP address refers to the host as a unit, not to any particular network service, and is also called the Network Entity Title (NET).

sequence number In many protocols, the sequence number is a datagram number or a pointer into a data stream, used to facilitate ordered and optionally reliable delivery and datagram loss detection. In Weighted Fair Queuing, a term for the number assigned to a packet as it is enqueued into a WFQ. WFQ schedules the currently lowest SN packet next.

Set In the context of SNMP, the Set command is sent by an SNMP manager, to an agent, requesting that the agent set a single identified variable to the stated value. The main purpose is to allow remote configuration and remote operation, such as shutting down an interface by using an SNMP Set of an interface state MIB variable.

SLSM (static length subnet masking) A strategy for subnetting a classful network for which all masks/prefixes are the same value for all subnets of that one classful network.

SMI (Structure of Management Information) The SNMP specifications, standardized in RFCs, defining the rules by which SNMP MIB variables should be defined.

SNMP agent A process on a computing device that accepts SNMP requests, responds with SNMP-structured MIB data, and initiates unsolicited Trap messages back to an SNMP management station.

SNMP manager A process on a computing device that issues requests for SNMP MIB variables from SNMP agents, receives and processes the MIB data, and accepts unsolicited Trap messages from SNMP agents.

SNPA (Sub Network Point of Attachment) ISO OSI term for a Layer 2 address.

SPAN (Switched Port Analyzer) A method of collecting traffic received on a switch port or a VLAN and sending it to specific destination ports on the same switch.

SPF algorithm The algorithm used by OSPF and IS-IS to compute routes based on the LSDB.

SPF calculation The process of running the SPF algorithm against the LSDB, with the result being the determination of the current best route(s) to each subnet.

split horizon Instead of advertising all routes out a particular interface, the routing protocol omits the routes whose outgoing interface field matches the interface out which the update would be sent.

SRTT (Smoothed Round-Trip Time) With EIGRP, a purposefully slowly changing measurement of round-trip time between neighbors, from which the EIGRP RTO is calculated.

STP (Spanning Tree Protocol) Defined in IEEE 802.1D, a protocol used on LAN bridges and switches to dynamically define a logical network topology that allows all devices to be reached, but prevents the formation of loops.

straight-through cable Copper cable with RJ-45 connectors in which both ends of a cable use an identical pinout.

stub area An OSPF area into which external (type 5) LSAs are not introduced by its ABRs; instead, the ABRs originate and inject default routes into the area.

stub area type See *stub area*.

stub network A network/subnet to which only one OSPF router is connected.

stub router In EIGRP, a router that should not be used to forward packets between other routers. A stub router will not propagate EIGRP-learned routes and will respond to Queries in a limited way. Other routers will not send Query messages to a stub router. In OSPF, a router that should either permanently or temporarily not be used as a transit router. Can wait a certain time after the OSPF process starts, or after BGP notifies OSPF that BGP has converged, before ceasing to be a stub router.

stuck-in-active The condition in which a route has been in an EIGRP active state for longer than the router's Active timer.

subnet A subset of a classful IP network, as defined by a subnet mask, which is used to address IP hosts on the same Layer 2 network in much the same way as a classful network is used.

subnet broadcast address A single address in each subnet for which packets sent to this address will be broadcast to all hosts in the subnet. It is the highest numeric value in the range of IP addresses implied by a subnet number and prefix/mask.

subnet mask A dotted-decimal number used to help define the structure of an IP address. The binary 0s in the mask identify the host portion of an address, and the binary 1s identify either the combined network and subnet part (when thinking classfully) or the network prefix (when thinking classlessly).

subnet number A dotted-decimal number that represents a subnet. It is the lowest numeric value in the range of IP addresses implied by a subnet number and prefix/mask.

subnet zero When subnetting a Class A, B, or C address, the subnet for which all subnet bits are binary 0. The network address of this subnet is numerically identical to the address of the former unsubnetted Class A, B, or C network.

successor route With EIGRP, for a particular destination, a route through the successor, meaning a route whose total metric is the lowest available, and that uses a neighbor guaranteed to provide a loop-free path.

summary route A route that is created to represent one or more smaller component routes, typically in an effort to reduce the size of routing and topology tables.

superior BPDU Out of two BPDUs being compared, the one that is "better," that is, the one that contained a lower numerical value in the first field that broke the tie (the fields are compared in the sequence Root Bridge ID, Root Path Cost, Sending Bridge ID, and Sending Port ID).

switched interface An interface on a Cisco IOS–based switch that is treated as if it were an interface on a switch.

T

three-way handshake A process of establishing a communication relation in which both communication parties mutually and explicitly indicate their willingness to engage into the relation and acknowledge the other party's indication. The three-way handshake is used in several protocols including TCP, EIGRP (during initial adjacency creation), and IS-IS (during initial adjacency creation on point-to-point links).

TLV (Type-Length-Value) A particular format of storing and transmitting information of multiple types in a single datagram.

totally NSSA area A type of OSPF NSSA area for which neither external (type 5) LSAs are introduced, nor type 3 summary LSAs; instead, the ABRs originate and inject default routes into the area. External routes can be injected into a totally NSSA area by its own ASBR.

totally stubby area A type of OSPF stub area for which neither external (type 5) LSAs are introduced, nor type 3 summary LSAs; instead, the ABRs originate and inject default routes into the area. External routes cannot be injected into a totally stubby area.

transit network A network/subnet over which two or more OSPF routers have become neighbors, thereby being able to forward packets from one router to another across that network.

transit router A router that is allowed to receive a packet from an OSPF router and then forward the packet to another OSPF router.

Trap In the context of SNMP, the Trap command is sent by an SNMP agent, to a manager, when the agent wants to send unsolicited information to the manager. Trap is not followed by a Response message from the receiving SNMP manager.

Triggered Extensions to RIPv2 for On-Demand Circuits Defined in RFC 2091, the extensions define how RIP can send a full update once, and then send updates only when routes change, when an update is requested, or when a RIP interface changes state from down to up.

triggered updates A routing protocol feature for which the routing protocol sends routing updates immediately upon hearing about a changed route, even though it might normally only send updates on a regular update interval.

TTL (Time to Live) A field in the IP header that is decremented at each pass through a Layer 3 forwarding device.

U

U/L bit Universal/Local bit. The second least significant bit in the most significant byte of an Ethernet MAC address. A value of binary 0 implies that the address is a Universally Administered Address (UAA) (also known as a Burned-In Address [BIA]), and a value of binary 1 implies that the MAC address is a locally configured address.

UDLD (UniDirectional Link Detection) Cisco-proprietary protocol used to detect unidirectional link conditions and deactivate such links to prevent a switching loop from occurring.

unicast address An address describing a single receiver.

Update An EIGRP message that informs neighbors about routing information. Update messages require an Ack.

Update timer With RIP, the regular interval at which updates are sent. Each interface uses an independent timer, defaulting to 30 seconds.

V

variance An integer setting for EIGRP. Allows using paths provided by feasible successors as long as these are at most *variance* times longer than the corresponding shortest paths.

virtual IP address The IP address used by hosts as the default gateway in a VRRP configuration. This address is shared by two or more VRRP routers.

virtual link With OSPF, the encapsulation of OSPF messages inside IP, to a router with which no common subnet is shared, for the purpose of either mending partitioned areas or providing a connection from some remote area to the backbone area.

VLAN (virtual LAN) A group of devices on one or more LANs that are configured (using management software) so that they can communicate as if they were attached to the same wire, when, in fact, they are located on a number of different LAN segments. Because VLANs are based on logical instead of physical connections, they are extremely flexible.

VLAN filtering Removing unwanted VLANs from a Layer 2 path.

VLSM (variable-length subnet masking) A strategy for subnetting a classful network for which masks/prefixes are different for some subnets of that one classful network.

VRRP (Virtual Router Redundancy Protocol) A standard (RFC 3768) feature by which multiple routers can provide interface IP address redundancy so that hosts using the shared, virtual IP address as their default gateway can still reach the rest of a network even if one or more routers fail.

VRRP Master router The router in a VRRP group that is currently actively forwarding IP packets. Conceptually the same as an HSRP Active router.

VSL (Virtual Switch Link) An interchassis link carrying control and data traffic between a pair of Catalyst 4500 or 6500 series switches that are combined into a single network element using the Virtual Switching System technology. See also *VSS*.

VSS (Virtual Switching System) Cisco-proprietary technology that allows a pair of Catalyst 4500 or 6500 Series switches to be interconnected and combined into a single network element.

VTP pruning VTP process that prevents the flow of broadcasts and unknown unicast Ethernet frames in a VLAN from being sent to switches that have no ports in that VLAN.