Glossary

Numerics

10Base2
A specification for 802.3 Ethernet that uses 50Ω (ohm) coaxial cable. 10Base2 transmits data at 10Mbps using baseband signaling and is sometimes also called *thin-net*. It has a distance limit of 185 meters.

10Base5
A specification for 802.3 Ethernet that uses thick coaxial cable. 10Base5 transmits data at 10Mbps using baseband signaling and is sometimes also called *thick-net*. It has a distance limit of 500 meters.

10BaseF
Any of a group of baseband fiber optic implementations for 10Mbps 802.3 Ethernet. See also *10BaseFB*, *10BaseFL*, and *10BaseFP*.

10BaseFB
A baseband specification for 802.3 Ethernet that uses a fiber optic medium and runs at 10Mbps. It has a distance limitation of 2000 meters. 10BaseFB has special signaling properties that make it useful on trunk links.

10BaseFL
A baseband specification for 802.3 Ethernet that uses a fiber optic medium and runs at 10Mbps. It is an updated version of the earlier FOIRL standard and interoperates with that standard. It has a distance limitation of 2000 meters.

10BaseFP
A baseband specification for 802.3 Ethernet that uses a fiber optic medium and runs at 10Mbps. The FP stands for fiber-passive. It is intended for connecting end devices. It has a distance limitation of 500 meters.

10BaseT
A specification for 802.3 Ethernet that uses a twisted pair cable, Category 3 or higher. 10BaseT has a distance limit of 100 meters and runs at 10Mbps.

100BaseFx
A specification for 802.3 Fast Ethernet that uses a fiber optic cable of up to 400 meters in length. It runs at 100Mbps using baseband signaling.

100BaseT
A specification for 802.3 Fast Ethernet that uses a Category 5 or higher twisted-pair cable. 100BaseT has a distance limit of 100 meters and runs at 100Mbps.

100BaseT4
A specification for 802.3 Fast Ethernet that uses a Category 3 or higher twisted-pair cable. 100BaseT4 has a distance limit of 100 meters and runs at 100Mbps.

100BaseTX
A twisted-pair implementation of 802.3 Fast Ethernet that is similar to 100BaseT. 100BaseTX is also able to run over shielded twisted-pair cable.

100VG-AnyLAN
A 100Mbps networking standard developed by Hewlett Packard and standardized as 802.12. It is able to use a Category 3 or higher cable. 100VG-AnyLAN does not use the same congestion control mechanisms as Ethernet, but it was developed to run over the same cabling.

1000BaseT
An implementation of 802.3 Gigabit Ethernet that runs over an enhanced Category 5 cable. 1000BaseT uses baseband signaling and runs at 1000Mbps.

802.1
A core part of the IEEE set of specifications that deals with issues related to bridging. The 802.1 specifications are applicable to all IEEE standard LAN protocols such as Ethernet and Token Ring.

802.1d
The specific part of the 802.1 standard that deals with the Spanning Tree protocol. See *Spanning Tree*.

802.1q
The specific part of the 802.1 standard that deals with VLAN tagging. See *VLAN*.

802.2
A core part of the IEEE set of specifications that deals with Logical Link Control. The 802.2 specifications are applicable to all IEEE standard LAN protocols such as Ethernet and Token Ring.

802.3
The part of the IEEE set of specifications that deals with Ethernet. It defines the Physical Layer specifications, as well as Data Link Layer specifications for all Ethernet protocols.

802.5
The part of the IEEE set of specifications that deals with Token Ring. It defines the Physical Layer specifications, as well as Data Link Layer specifications for all Token Ring protocols.

802.11
The part of the IEEE set of specifications that deals with Wireless LANs. It defines the Physical Layer specifications, as well as Data link Layer specifications for all IEEE Wireless protocols.

802.11a
A specific physical implementation of the 802.11 Wireless LAN specification that uses the 5 GHz frequency band and operates at speeds of 72Mbps.

802.11b
A specific physical implementation of the 802.11 Wireless LAN specification that uses the 2.4 GHz frequency band and operates at speeds of 11Mbps.

A

AAL1
ATM Adaptation Layer 1. AAL1 is a specification for ATM networks that transmit data at a constant bit rate (CBR). AAL1 is useful for circuit-emulation applications.

AAL2
ATM Adaptation Layer 2. AAL2 is a specification for ATM networks that transmit data at a variable bit rate (VBR) such as packetized audio and video signals.

AAL3/4
ATM Adaptation Layer 3 and 4. AAL3/4 is similar to AAL2 except that it does not keep timing information intact through the network.

AAL5
ATM Adaptation Layer 5. AAL5 is a specification for ATM networks that transmit data at a variable bit rate (VBR) that is specifically suited to LAN protocols.

ABR
Area Border Router. In OSPF, an ABR is a router that acts as the gateway between two areas.

ABR
Available Bit Rate. In ATM networks, a Quality of Service specification in which cells are delivered on a best-effort basis.

Access Point
In wireless networking, the transmitter and receiver that acts as a hub for the BSS.

Address Resolution Protocol
See *ARP*.

Anycast
A Layer 3 concept in which the destination address specifies any of a set of possible specific destination devices. The network delivers the packet to one or more of these devices, but not necessarily to all of them.

AppleTalk
A set of routable protocols developed by the Apple Computer Corporation.

Area Border Router
See *ABR*.

ARP
Address Resolution Protocol. In TCP/IP networks, the ARP protocol provides the mechanism for devices to find Layer 2 MAC addresses associated with Layer 3 IP addresses.

ARP Cache
In TCP/IP networks, a table maintained by each device correlating Layer 2 MAC addresses with their associated Layer 3 IP addresses. This table of information is stored locally on each device and is called the ARP Cache. See also *ARP*.

ARPA
Advanced Research Projects Agency. ARPA is the research-and-development division of the US Department of Defense, which developed much of the core TCP/IP standards and set up the ARPANET.

ARPANET
An early predecessor to the modern public Internet. The ARPANET was the first large TCP/IP network. Devices in this network were addressed using the Class A address range `10.0.0.0`. This address range, now unregistered, is sometimes called the ARPANET range. See also *ARPA*.

AS
Autonomous System. In dynamic routing protocols, an Autonomous System is a region of a network that uses a single Interior Gateway Protocol.

ASBR
Autonomous System Boundary Router. In dynamic routing protocols, an ASBR is a router that forms the gateway between two or more different Autonomous Systems.

ASCII
American Standard Code for Information Interchange. A standard system for encoding character-based data using 8-bit bytes.

ATM
Asynchronous Transfer Mode. A network protocol in which very short "cells" of fixed size are relayed between switches over virtual circuits. ATM is capable of very high transfer rates and low latency. It is commonly used to emulate an Ethernet LAN by means of the LANE standard. See also *LAN*, *LANE*, and *ELAN*.

ATMARP
In ATM LAN emulation, the protocol that provides the ability to map Layer 2 MAC address information to Layer 3 IP addresses. See also *ATM* and *ARP*.

Attachment Unit Interface
See *AUI*.

AUI
Attachment Unit Interface. In 10Mbps Ethernet, AUI provides a generic physical-layer specification that allows the connection of a transceiver to give the desired physical connection. See also *MII* and *GMII*.

Autonomous System
See *AS*.

Autonomous System Border Router
See *ASBR*.

Available Bit Rate
See *ABR*.

B

Bandwidth
A networking term that specifies the nominal peak throughput of a link.

Baseband
In contrast to broadband, a baseband network medium uses only one carrier frequency. See also *Broadband*.

Basic Service Set
See *BSS*.

Beacon
In Token Ring networks, a frame that is sent to indicate that a serious physical problem has occurred.

BGP
Border Gateway Protocol. A particular exterior gateway protocol that is used extensively on the Internet. As with all exterior gateway protocols, it allows the dynamic exchange of routing information between Autonomous Systems. The current version of BGP is BGP Version 4, which is sometimes written BGP-4.

BIA
Burned-In Address. In Ethernet and Token Ring systems, the BIA is a globally unique MAC address that is specified in the hardware of the network interface card (NIC). See also *LAA*, *MAC*, and *NIC*.

Bluetooth
A wireless networking standard that is intended primarily as a cable replacement system. Bluetooth network links typically have a bandwidth of 1–2Mbps.

Border Gateway Protocol
See *BGP*.

bps
Bits Per Second. The transmission rates of various network media are usually represented in bps.

Bridge
A Layer 2 device that connects two or more distinct physical domains. In Ethernet networks, a bridge is used to break up collision domains, while in Token Ring, networks bridges break up token-passing regions. In both cases, the network segments on either side of a bridge belong to the same broadcast domain, however.

Broadband
A network medium that uses several carrier frequencies simultaneously. This medium allows a single cable to carry many different independent signals. See also *Baseband*.

Broadcast
A piece of packet data that is destined for all other devices taking part in the same Layer 2 network.

Broadcast Domain
The region of a network that a broadcast packet will cover. Broadcast domains cross through bridges, but they terminate at routers.

Broadcast and Unknown Server
See *BUS*.

BSS
Basic Service Set. In 802.11 wireless networks, a BSS is the equivalent of a LAN segment. It includes all devices that use a particular Access point for their LAN communications.

Buffer
Used as a noun, a piece of memory used to contain a packet that must be stored temporarily until it can be delivered. Used as a verb, buffering a packet means temporarily putting it in memory.

Burned-In Address
See *BIA*.

Bus
As a basic network topology, a bus is a linear network in which signals sent by each device are carried throughout the length of the network.

BUS
Broadcast and Unknown Server. In ATM LAN Emulation networks, the BUS is a device that is used to forward packets destined for broadcast or unknown addresses. It forwards these packets by means of the ATM multicast facilities.

C

Cable Plant
The set of all LAN wiring and connection panels in a building. This set includes both fiber and copper wiring.

Campus Area Network
A computer network that encompasses all Local Area Networking technology in a set of closely situated buildings.

CAN
See *Campus Area Network*.

Carrier Sense Multiple Access/Collision Avoidance
See *CSMA/CA*.

Carrier Sense Multiple Access/Collision Detection
See *CSMA/CD*.

Category 3 Cable
Also called Cat-3, a specification for unshielded twisted-pair copper cabling. It was commonly used for 10Mbps Ethernet and 4 and 16Mbps Token Ring networks. It can also be used for Fast Ethernet with the less common 100BaseT4 standard.

Category 5 Cable
Also called Cat-5, a specification for unshielded twisted-pair copper cabling. It can be used anywhere Category 3 cable is used, as well as for higher speed networks such as Fast Ethernet and, with limits, Gigabit Ethernet.

Category 5e Cable
Enhanced Category 5 Cable, also called Cat-5e. This specification is an updated version of the Category 5 Cable specification that includes features designed to make it appropriate for Gigabit Ethernet.

Category 6 Cable
Also called Cat-6, a further refinement on previous standards for unshielded twisted-pair copper cabling that is designed for higher-speed networks.

CAU
Controlled Access Unit. For Token Ring network, a CAU is a manageable version of a MAU. See also *MAU*.

CBR
Constant Bit Rate. In ATM Quality of Service, CBR is used for applications that require reliable delivery of cells with end-to-end clocking to ensure minimal jitter.

Cell
In ATM networking, the basic unit of data transmission. Each ATM cell consists of a 5-byte header followed by 48 bytes of data.

Channel Service Unit
See *CSU*.

CIDR
Classless Inter-Domain Routing. Defined in IETF RFCs 1518 and 1519, CIDR is a standard for addressing and routing in IP networks. It abandoned the earlier Class-based system in favor of being able to divide up ranges of 32-bit IP addresses at any bit.

Class of Service
See *COS*.

Classless Inter-Domain Routing
See *CIDR*.

Collision
In Ethernet networks, what happens when two devices attempt to send frames onto the same segment simultaneously.

Collision Domain
In 802.3 Ethernet networks, a network segment. The name comes from the fact that if any two devices in the same collision attempt to transmit simultaneously, they will cause a collision.

Concentrator
A Layer 2 device, such as a hub or a switch, that is used to connect several other devices or groups of devices into a larger network.

Constant Bit Rate
See *CBR*.

Controlled Access Unit
See *CAU*.

COS
Class of Service. In 802.1q VLAN tags, the COS field contains a code that specifies how the frame should be handled by the Quality of Service mechanisms in times of congestion.

CRC
Cyclic Redundancy Checksum.

CSMA/CA
Carrier Sense Multiple Access/Collision Avoidance. This is the name for the method that 802.11 wireless LAN protocols use to handle congestion. It is similar to the Ethernet CSMA/CD system except that it is not possible to reliably generate collision information in a wireless network.

CSMA/CD
: Carrier Sense Multiple Access/Collision Detection. This is the name for the method that 802.3 Ethernet uses to handle congestion. The name means that before any device attempts to transmit, it first listens for a carrier signal that would indicate that another device is already using the network. Then, if another device starts transmitting before the first device has finished transmitting, both devices detect the collision and send a jamming signal to prevent either packet from being partially received. They then both wait a random back-off period before trying again.

CSU
: Channel Service Unit. When connecting network equipment to WAN circuits, the CSU enables the connection of the user device, such as a router. See also *DSU*.

CSU/DSU
: See *CSU* and *DSU*.

Cyclic Redundancy Checksum
: See *CRC*.

D

Datagram
: A logical chunk of data that is sent through a network as a unit.

DCE
: Data Communications Equipment. When connecting a device to a network, particularly in serial-type connections, the DCE device represents a network end, which generally sends the clocking signals. See also *DTE*.

DECNET
: Digital Equipment Corporation Network. This is a group of communications protocols developed by the Digital Equipment Corporation.

DHCP
: Dynamic Host Configuration Protocol. This protocol allows end devices to learn their network configuration at boot time from a central server.

Differentiated Services
: Also called *diffserv*, this specification is a Quality of Service mechanism for TCP/IP. It defines a method of prioritizing IP packets relative to one another that uses the DSCP field in the IP header.

Diffserv
: See *Differentiated Services*.

Distance Vector Algorithm
: A Distance Vector Algorithm is one type of dynamic routing protocol. Every router in the Autonomous System using this protocol possesses a routing table that shows, for each route, a distance to the destination and a next-hop. This table is then shared with adjacent routers to keep the information current.

Distributed Services Control Point
: See *DSCP*.

DLSw
: Data Link Switching. This is a standard defined in RFC 1434 that makes it possible to tunnel unrouteable protocols such as SNA through TCP connections.

Domain Name Service
: See *DNS*.

DNS
: Domain Name Service. This network service provides a lookup database for converting between device names and IP addresses.

DSCP
: Distributed Services Control Point. In IP Quality of Service schemes for both IPv4 and IPv6, the DSCP is a field in the packet header that allows an application to mark high- or low-priority packets. The DSCP differs from the earlier IP TOS field in that it also includes the concept of drop precedence.

DSL
: Digital Subscriber Line. This method of delivering high-speed access uses telephone-grade copper wiring. There are several different variants such as ADSL, VDSL, and HDSL.

DSU
: Data Service Unit. Often used in conjunction with a CSU, a DSU makes the connection to the transmission facility, such as a T1 circuit. See also *CSU*.

DTE
: Data Terminal Equipment. When connecting a device to a network, particularly in serial-type connections, the network end generally sends the clocking signals. The DTE end represents the end device, which listens for these clocking signals. See also *DCE*.

DVMRP
: Distance Vector Multicast Routing Protocol. This protocol distributes IP Multicast routing information. It uses a Distance Vector algorithm.

E

Early Token Release
: See *ETR*.

EBCDIC
: Extended Binary Coded Decimal Interchange Code. This 8-bit encoding scheme for character data was developed by IBM. See also *ASCII*.

eBGP
: Exterior Border Gateway Protocol. This is the part of the BGP protocol that ASBR devices use to communicate with other ASBR devices from different Autonomous Systems.

EGP
: Exterior Gateway Protocol. Generically, an exterior gateway protocol is a dynamic routing protocol used to connect two or more Autonomous Systems. A good example is BGP. However, an older protocol called EGP performs a similar function.

EIGRP
: Enhanced Interior Gateway Protocol. Based on the earlier IGRP protocol, EIGRP is a dynamic routing protocol developed by Cisco systems. It uses a Distance Vector algorithm and is capable of providing dynamic routing for TCP/IP, IPX, and Appletalk.

ELAN
: Emulated LAN. In ATM LAN Emulation, an ELAN is the equivalent of a VLAN.

End Device
: Device that does not take part in any network functions such as bridging or routing.

ESS
: Extended Service Set. In 802.11 wireless LAN technology, an ESS is a collection of BSS units. It may or may not support roaming, depending on the architecture.

Ethernet
: A LAN technology defined by the IEEE in the 802.3 specification. In one common set of implementations, Ethernet uses a bus topology with the CSMA/CD collision mechanism for handling congestion. Alternatively, Ethernet can be configured as a star topology using full-duplex communication to avoid collisions.

Ethernet II
: Ethernet II is an older version of Ethernet that predates the more modern 802.3 specification, although it interoperates well with it. Almost all TCP/IP implementations use Ethernet II.

ETR
: Early Token Release. In Token Rings, Early Token Release is the ability of some devices to distribute a new token on the ring after they have finish sending but before they received confirmation that all of their frames were received.

Extended Service Set
: See *ESS*.

Exterior Gateway Protocol
: See *EGP*.

F

Fast Ethernet
: The 100Mbps Standard for 802.3 Ethernet. Fast Ethernet has been implemented on several different physical media including varieties of copper and fiber cabling.

FCS
: Frame Check Sequence. A Layer 2 checksum applied to Ethernet and Token Ring frames.

FDDI
: Fiber Distributed Data Interface. A 100Mbps fiber optic token-passing LAN system consisting of dual rings for redundancy.

Fiber Optic Inter-Repeater Link
: See *FOIRL*.

FIFO
: First In First Out. The simplest possible queuing algorithm puts every incoming piece of data into a linear queue and handles them in the order in which they arrived.

File Transfer Protocol
: See *FTP*.

Firewall
: A network security device. Essentially all commercial firewalls are used for securing TCP/IP data streams. Some operate at Layer 2, but most operate at Layer 3. Most firewalls are capable of hiding the internal structure of the network they protect.

FOIRL
: An early version of a fiber optic implementation for 802.3 Ethernet. FOIRL was later updated and replaced by the newer 10BaseFL standard. The acronym has remained in casual use and loosely refers to any fiber optic Ethernet implementation.

Frame
: In most Layer 2 networks (excluding ATM), the basic chunk of information. The networks generally include source and destination information (including the possibility of broadcast and multicast destinations). When transporting user-application data, a frame generally holds the packet from a higher-layer protocol. See also *Packet*.

Frame Check Sequence
: See *FCS*.

Frame Relay
: A Wide Area Network protocol that is capable of connecting one circuit to many other circuits. Frame Relay is a Non-Broadcast Multiple Access (NBMA) medium.

FTP
: File Transfer Protocol. FTP is one of the earliest applications built using TCP/IP. It uses a TCP connection and is capable of transferring an arbitrary stream of data from one host to another.

Full Duplex
: A Full Duplex link is one that is capable of sending and receiving data simultaneously.

G

Gateway
: A device that acts as an intermediate connection point in a network data stream. It terminates the session on one side and starts another on the other. To a Layer 2 network, a router is an example of a Gateway because it rewrites all of the MAC information in each frame received on one side before sending it to the other side. Similarly, special-purpose Gateway devices are capable of connecting different Layer 3 or higher protocols.

Gbps
: Gigabits per second. Equal to 1024 Megabits per second, or approximately one billion bits per second.

Gigabit Ethernet
: The 1000Mbps Standard for 802.3 Ethernet. Gigabit Ethernet has been implemented on several different physical media, including varieties of copper and fiber cabling.

Gigabit Media Independent Interface
: See *GMII*.

GMII
: Gigabit Media Independent Interface. A physical sublayer for Gigabit Ethernet that provides the ability to have a number of different possible physical media for a Gigabit Ethernet connection. See also *AUI* and *MII*.

H

Half Duplex
A link that is not able to send and receive data simultaneously. Consequently, in Half Duplex connections, it is necessary to wait until one is finished receiving data before any can be sent.

Hexadecimal
Base 16. The usual notation for hexadecimal is from 0 to 9, followed by A through F, where F represents the number 15. Hexadecimal is useful for representing the contents of 16-bit fields.

HSRP
Hot Standby Routing Protocol. This is a Cisco proprietary standard that allows two routers to possess the same IP and MAC addresses, but to have only one active at a time while the other is a backup. This way, if the primary device fails, the backup can take over for it quickly. See also *VRRP*.

HTTP
Hypertext Transfer Protocol. This TCP-based protocol is used by web browsers to transfer data from web servers.

Hub
Sometimes called a MAU in Token Ring networks, a Layer 2 device that allows connection of end devices into a network. In Ethernet networks, a hub is basically a multiport repeater.

Hub and Spoke
One of the basic network topologies. In this book, the term *star* is used instead to avoid confusion with the network device called a hub.

I

IANA
Internet Assigned Numbers Authority. This international organization is responsible for maintaining records of all well-known numbers associated with the Internet Protocol. This includes, for example, all IP addresses, all registered TCP and UDP port numbers, and all Autonomous System numbers.

iBGP
Interior Border Gateway Protocol. ASBR devices use this part of the BGP protocol to communicate with other ASBR devices within the same Autonomous System.

ICMP
Internet Control Message Protocol. A core part of the IP protocol used primarily for management and reporting network error conditions. ICMP plays a crucial role in allowing TCP protocols to adapt to MTU and congestion problems.

IEEE
Institute of Electrical and Electronics Engineers. The IEEE is an international standards body that develops and publishes standards for many things. Of particular interest for this book are the LAN standards embodied in the set of documents in the 802 series.

IETF
Internet Engineering Task Force. An organization consisting of many diverse groups whose mandate is the ongoing development and publication of Internet standards.

IGMP
Internet Group Management Protocol. IGMP is the protocol used by devices taking part in IP multicast applications to allow them to join and leave multicast groups.

IGP
Interior Gateway Protocol. An Interior Gateway Protocol is a dynamic routing protocol that operates within a single Autonomous System.

IGRP
Interior Gateway Routing Protocol. IGRP is a proprietary Interior Gateway Protocol developed by Cisco. It has been updated and effectively replaced by the more flexible and modern EIGRP protocol, also a Cisco proprietary protocol.

In-Band
Management or control information that is transmitted using the same physical and logical network pathways such as those used by application data.

Integrated Services
Also called *intserv*, a Quality of Service mechanism for TCP/IP. It is intended to offer a mechanism for giving specific applications guaranteed reserved bandwidth. It is normally used in conjunction with a bandwidth-reservation protocol such as RSVP.

Inter-Frame Gap
In Token Ring and Ethernet networks, as well as other networks, the Inter-Frame Gap is the time a device must wait after sending one frame and before sending the next.

Interior Gateway Protocol
See *IGP*.

Internet
Either the Public Internet or any private network of devices that use the Internet Protocol.

Internet Control Message Protocol
See *ICMP*.

Internet Engineering Task Force
See *IETF*

Intserv
See *Integrated Services*.

Internet Protocol
See *IP*.

Inverse Terminal Server
A device that has at least one LAN port and several low-speed RS-232 serial ports. These serial ports can be connected to various devices to access serial-based applications. Then it is possible to use the TCP/IP Telnet protocol to make an IP connection to these serial-attached devices, emulating a direct terminal connection. This connection device can be useful for legacy serial applications and for many network management applications.

IOS
Internetwork Operating System. In Cisco routers, the IOS software runs the device.

IP
Internet Protocol. Sometimes called TCP/IP, this a popular Layer 3 protocol. Its popularity is largely due to the growth of the public Internet.

IPsec
Internet Protocol Security. This set of protocols is used to provide additional security to the IP protocol suite.

IPv4
Internet Protocol Version 4. This is the current common standard for IP. The extra information is usually provided in this form to distinguish the existing standard from the newer IPv6 standard.

IPv6
Internet Protocol Version 6. This updated version of the IP protocol suite provides many enhancements over the existing version, IPv4. One of the most visible differences is the vastly expanded address space available in IPv6.

IPX
Internetwork Packet Exchange. This protocol was developed by Novell for its NetWare NOS. It is a routable Layer 3 protocol that shares several similarities with IP.

ISL
Inter-Switch Link. ISL is a Cisco proprietary standard for VLAN trunks.

ISO
International Organization for Standardization. The ISO is an international organization that develops and publishes standards relevant to many industries, including networking. The commonly used OSI model for network protocol is one of the ISO's many contributions to networking.

JKL

Jitter
The variation in packet-to-packet latency. Jitter causes distortion in real-time signals such as audio and video data streams.

Kbps
Kilobits per second. Equal to 1024 bits per second.

LAA
: Locally Administered Address. In Ethernet and Token Ring networks, it is often possible to override the globally unique MAC address that comes encoded onto a NIC (the BIA). The new address created this way is called an LAA.

LAN
: Local Area Network. A computer network confined to a relatively small geographical region such as a single building. The term blends gradually into the term Campus Area Network. However, as distances grow, it becomes increasingly difficult to use common LAN technology and the network tends to require the addition of long-haul technologies. At that point, it ceases to be considered a pure LAN.

LAN Emulation Client
: See *LEC*.

LAN Emulation Configuration Server
: See *LECS*.

LAN Emulation Server
: See *LES*.

LANE
: Local Area Network Emulation. LANE specifies a method for making an ATM network emulate the functioning of a large-scale LAN. To do this, it provides mechanisms for encapsulating LAN protocols, such as Ethernet, into the ATM cells. It also provides tools for creating and tearing down ATM virtual circuits (SVC) as they are required.

LAT
: Local Area Transport. This very old nonroutable protocol was developed by Digital Equipment Corporation. It is primarily intended to provide terminal access to mainframe computers over bridged networks.

Latency
: The time delay involved in sending a piece of information from one point on a network to another. Network latency includes only the transmission delays and does not consider any additional delays that take place within the end devices.

LEC
: LAN Emulation Client. In an ATM LANE environment, the LEC is the edge device that performs the encapsulation and switching of LAN protocols into the ATM network. Usually an ATM switch contains a number of Ethernet or other LAN ports.

LECS
: LAN Emulation Configuration Server. In an ATM LANE environment, this device keeps track of which devices belong to which ELAN. Usually just one LECS exists for each network, controlling all ELANs, although there could be a backup LECS.

Legacy equipment or protocols
: Unfortunately, this term is often used negatively to refer to equipment or protocols that are not at the cutting edge of current technology. However, more accurately, it refers to equipment or protocols that include deprecated features that are difficult to support.

LES
: LAN Emulation Server. In an ATM LANE environment, this device controls the functioning of a particular ELAN. There is only one LES for each ELAN.

Link State Advertisement
: See *LSA*.

LLC
: Logical Link Control. In the 802 protocol suite, a separate logical-link sublayer is defined in 802.2. This sublayer operates in conjunction with the various MAC sublayers, such as Ethernet and Token Ring, to create the Data Link Layer.

Local Area Network
: See *LAN*.

Locally Administered Address
: See *LAA*.

Logical Link Control
: See *LLC*.

Loopback
A logical port on a device that connects to the device itself. Loopback ports exist in the software of a device and provide a way to make a network connection from the device to itself without going onto the network. For routers in particular, it is useful for network management purposes because it provides a Layer 3 address that is always up regardless of which physical ports on the device are down.

LSA
Link State Advertisement. In Dynamic Routing Protocols that are based on a Link State Protocol, such as OSPF, individual routers do not distribute their entire routing tables (as do Distance Vector Protocols). Instead, they just distribute information about the states of their own links, plus the links of other devices they have heard about. This information is distributed by Link State Advertisements.

M

MAC
Media Access Control. In IEEE protocols such as Ethernet and Token Ring, the MAC sublayer to the Data Link Layer defines how devices access the medium. This definition includes any congestion-control mechanisms, such as token passing or collisions, as well as Layer 2 addressing. This Layer 2 addressing is often called the MAC Address.

MADCAP
Multicast Address Dynamic Client Allocation Protocol. This protocol was developed to support multicast IP applications. It is defined in RFC 2730. MADCAP allows the dynamic creation and destruction of temporary multicast groups.

MAN
Metropolitan Area Network. Usually in an urban area, a MAN is a network that allows communication between buildings that are up to a few kilometers apart. With this density and distance limitation it is possible to take advantage of high-speed network technology such as ATM and SONET.

MAU
Multistation Access Unit. In Token Ring networks, a MAU is a device that automatically handles the electrical insertion and removal of individual devices and provides the network pathways for device-to-device communication.

MBGP
Multicast Border Gateway Protocol. This exterior gateway protocol was built as a set of extensions to BGP to support routing of multicast traffic between Autonomous Systems.

Mbps
Megabits per second. Equal to 1024 Kilobits per second, or approximately one million bits per second.

Mean Time Between Failures
See *MTBF*.

Media Attachment Unit
See *MAU*.

Media Independent Interface
See *MII*.

Mesh
A basic network topology in which every device has a point-to-point link to every other device. A special variant of the meshed network is a partial mesh, in which many devices have point-to-point connections to many other devices, but where there isn't a full set of connections.

Metric
In a routing table, a number that represents a cost to get to the destination. In the simplest case, the metric simply represents the number of routing hops required to reach the destination. It can also represent a more sophisticated measure of distance based on the cost of sending the packet through each path.

Metropolitan Area Network
See *MAN*.

MIB
Management Information Base. In SNMP, the MIB is an organized table of data that describes the functioning of the device in detail. The table is organized in a tree structure.

MII
: Media Independent Interface. A physical sublayer for Fast Ethernet that provides the ability to have a number of different possible physical media for a Fast Ethernet connection. See also *AUI* and *GMII*.

Modem
: Modulator Demodulator. A modem is a device used to convert digital signals into analog electrical impulses for transmission through analog network equipment such as telephone lines. A second modem at the other end of the line converts these analog signals back to digital form. Modern modems contain many advanced features for noise reduction and data compression, which allows significantly higher effective bandwidth through the link.

MOSPF
: Multicast OSPF. MOSPF is a set of extensions to the OSPF protocol that allows it to act as a routing protocol for multicast traffic.

MPOA
: Multi-Protocol Over ATM. MPOA is an updated version of LANE that makes it more effective as a general LAN emulator by allowing it to carry any LAN protocol.

MTBF
: Mean Time Between Failures. In any complex system, it is necessary to treat random individual events, such as device failures, by means of statistical estimates. The MTBF represents how long, on average, a device of a particular type is expected to run continuously before it suffers a failure.

MTU
: Maximum Transmission Unit. This is the greatest packet size that can be transmitted over a given network link.

Multicast
: A signal that is sent to several, but not all, devices in a particular network region. To work properly, this signal implies that devices must be able to join multicast groups to receive those transmissions that are relevant to them.

Multimode Fiber
: There are two general types of fiber optic cable—multimode and single mode. Multimode is capable of supporting light signals of several different wavelengths. It can also operate with an inexpensive low-powered Light Emitting Diode (LED) to inject the signal, since these devices do not have pure single-wavelength light output. The lower costs coupled with lower power requirements means that multimode fiber is perfectly suited to shorter distances such as in a LAN.

Multistation Access Unit
: See *MAU*.

N

N+1 Redundancy
: In any system where a collection of N identical devices is required for the system to operate effectively, one additional device is added to the system in case one of the N fails. N+1 Redundancy is commonly used for redundant power supplies, as well as redundant trunk links in large networks.

NAT
: Network Address Translation. NAT means that IP addresses on one side of a device (usually a firewall, but the feature is available on many routers as well) are transparently rewritten as the packets are passed through to the other side. In many cases, the device rewrites other portions of the IP packet, such as TCP port numbers and sequence numbers, at the same time.

NBMA
: Non-Broadcast Multiple Access. Some Layer 2 network media are capable of supporting many devices simultaneously, but without having the capability to support broadcasts. This means that the broadcasts sent by one of the attached devices will not reach all of the other devices in the same media group. Such media are called NBMA.

NetBEUI
: NetBIOS Extended User Interface. This is a nonroutable Layer 2 protocol that is frequently used to carry NetBIOS packets. It is most commonly seen in workgroup products such as LAN Manager and Microsoft Windows products.

NetBIOS
: Network Basic Input/Output System. This is a simple higher-layer protocol that has frequently been used for building peer-to-peer file, print, and application-sharing services over LAN workgroups.

Netmask
: In IP, a binary string that is used to distinguish the network part of the address from the host part. Anywhere the bit pattern has a 1, the corresponding bit in the address is part of the network address. Conversely, the bits in the address that correspond to a 0 in the netmask are interpreted as belonging to the host part of the address.

Network Device
: Any device that performs basic network functions such as bridging, routing, or other gateway functions.

Network Interface Card
: See *NIC*.

Network Operating System
: See *NOS*.

NIC
: Network Interface Card. The physical component that allows any device to connect to the network.

NLSP
: Novell Link State Protocol. A dynamic routing protocol for IPX that is based on a Link State Protocol.

NNI
: Network to Network Interface. In ATM networks, there are two main types of connections. At the edges of the ATM network, switches connect to user devices through UNI links. The connections from switch to switch through the ATM network use NNI links.

NOS
: Network Operating System. A NOS is a system that facilitates basic network functions such as file and print sharing, although it could also include other application services.

NTP
: Network Time Protocol. This is an IP protocol that allows devices to synchronize their clocks with one another. Generally, at least one of the devices taking part in NTP for a given network is a master, and it is synchronized with an atomic clock or other reliable time source.

O

OC
: Optical Carrier. This represents a set of physical carrier protocols using fiber optic signal transmission. There are several OC protocols such as OC-3, OC-12, and OC-48. The number in each case represents the nominal bandwidth of the link. The actual bandwidth for each is found by multiplying this number by 51.84Mbps. For example, OC-3 runs at 155Mbps, OC-12 at 622Mbps, OC-48 at 2488Mbps (2.48Gbps), and OC-192 at 9953Mbps (roughly 10Gbps).

Octet
: An 8-bit byte. Network people tend to use the term octet to avoid possible confusion over the number of bits.

OSI
: Open System Interconnection. A set of standards, including the OSI model for network layers, defined by the ISO.

OSPF
: Open Shorted Path First. A Link State routing protocol for IP. OSPF is an open standard that is implemented by most network-hardware vendors.

OSPF Area
: In OSPF, it is necessary to break up the larger Autonomous System into smaller groups called areas. This breakup allows faster and more reliable convergence of the routing protocol.

OUI
: Organizationally Unique Identifier. In Ethernet MAC addresses, the first three bytes are called the OUI. This code specifies the vendor of the NIC and helps ensure that BIA MAC addresses are globally unique.

Out-of-Band
: Refers to management or control information that is transmitted using a different physical or logical network pathway from that used by application data.

P

Packet
: A basic Layer 3 unit of transmission.

Path Vector Algorithm
: A Path Vector Algorithm is a particular type of dynamic routing protocol used by BGP. In this protocol, each destination route is accompanied not by a single metric indicating the cost of this path, but by a detailed list of all Autonomous Systems that the path includes.

PDU
: Protocol Data Unit. A logical grouping of information.

PHB
: Per-Hop Behavior in QoS scheme.

PIM
: Protocol Independent Multicast. This dynamic routing protocol is used with multicast networking.

PIM-DM
: Protocol Independent Multicast Dense Mode. A particular flavor of the PIM protocol in which all routers in an Autonomous System are assumed to care about all multicast groups.

PIM-SM
: Protocol Independent Multicast Sparse Mode. A particular flavor of the PIM protocol in which only some routers in an Autonomous System are assumed to care about all multicast groups. This is generally much more difficult to handle in than Dense Mode.

Ping
: An application used to send ICMP echo-request packets to specified destination IP addresses and watch for the ICMP echo response. One often loosely refers to the ICMP echo request and response as *ping packets*, although this term is rather imprecise.

PNNI
: Private Network to Network Interface. In ATM networks, there are actually a few different ways to handle the communication between switches. PNNI is one method that is particularly useful in isolated private ATM network.

Policing
: When network congestion is encountered, dropping the excess packets is often necessary, particularly if their flow rate has exceeded the amount subscribed to. This process of discarding excess packets is called policing.

PPP
: Point-to-Point Protocol. A general Layer 2 protocol that is frequently used over point-to-point links such as serial connections.

PPPoE
: Point-to-Point Protocol over Ethernet. A special adaptation of PPP that allows the emulation of a point-to-point link on an Ethernet connection. A PPP connection can then run through this virtual link. This is a popular way of implementing DSL-based Internet connections.

Protocol Analyzer
: A device that is able to listen to and decode all of the traffic on a LAN segment. One of the most popular commercial protocol analyzers is called the Sniffer by Network Associates. Frequently, one hears protocol analyzers generically (and incorrectly) referred to as "sniffers."

Protocol Data Unit
: See *PDU*.

Proxy ARP
When an appropriately configured router receives an ARP request for a device that it knows (from its routing table) is on a different segment, it will respond to the ARP request on behalf on this device. It can then route the packet normally. This routing generally happens when the device sending the ARP request does not have an appropriate default gateway configured.

PVC
Permanent Virtual Circuit. In many packet-switching networks, such as ATM and Frame Relay, logical connections called Virtual Circuits are set up between end point devices. If this Virtual Circuit is permanently configured through the network, it is called a PVC.

QR

QoS
Quality of Service. This term refers to any of a number of different traffic-prioritization schemes that allow the network to treat different streams of data differently.

Quality of Service
See *QoS*.

Repeater
A device that amplifies, restores, and propagates network signals. In Ethernet networks, a repeater effectively extends a segment including both broadcasts and collisions. This extention is different from a bridge, which relays broadcasts, but not collisions. See also *Bridge*.

RFC
Request For Comments. The IETF publishes its standards, proposed standards, and recommended practices in the form of RFC documents. Each document is given a sequential-order number that is used when referring to the document.

RIF
Routing Information Field. Primarily in bridged networks, but also to a lesser extent in routed networks, it is possible for a frame to specify a RIF that indicates the path that it would like to take.

Ring
As a basic network topology, an architecture in which devices are connected to each of an upstream and a downstream neighbor device. These devices are connected in this way to form a circle so that following these neighbor-to-neighbor connections eventually leads back to the original device.

RIP
Routing Information Protocol. There are actually two distinct protocols called RIP discussed in this book. Both protocols are distance vector routing protocols. One is used for distributing TCP/IP routing information, and the other for IPX routing information.

RJ45
Registered Jack Type 45. RJ45 is standard modular jack and socket used for connecting network cables. In LAN applications, these jacks are primarily used with Category 3 and higher twisted-pair cabling, although there are other applications.

RMON
Remote Monitoring. Originally described in RFC 1271, RMON is a set of SNMP MIB extensions that are useful for many remote network management functions.

Roaming
In wireless technology, describes the ability to change association from one BSS or ESS to another.

Root Bridge
In Spanning Tree, the device at the center of the network. Every bridging device in the network looks for the shortest path to the Root Bridge to eliminate loops.

Router
A Router is a device that connects segments with different Layer 3 network addressing. It is able to forward packets between these segments based on Layer 3 information.

RPC
: Remote Procedure Call. An intermediate network layer that allows client-server applications to have a consistent framework. Two distinct popular implementations of this concept share the same name. One was developed by Sun Microsystems and the other by Microsoft.

RS-232
: One of the main standards for low-speed serial interfaces.

RSVP
: Resource Reservation Protocol. This protocol, described in RFC 2205, allows applications to request particular network resources such as bandwidth or latency characteristics.

RWHO
: Remote Who. A broadcast-based protocol developed for the early BSD UNIX platform that allowed each server on a segment to keep track of which users were logged in on which server.

S

SAP
: Service Advertisement Protocol. In IPX networks, SAP is the protocol that disseminates information about what servers provide which services.

SDLC
: Synchronous Data Link Control. This serial protocol was developed by IBM for use with SNA.

Service Advertisement Protocol
: See *SAP*.

Single Mode Fiber
: There are two general types of fiber optic cable—multimode and single mode. Single mode is capable of supporting light signals from only a narrow range of wavelengths. This means that it must operate with a more expensive higher-powered laser device to inject the signal, since these devices have a nearly pure, single-wavelength light output. The higher costs coupled with higher power requirements means that single mode fiber is perfectly suited to longer distances such as those in a campus or Metropolitan Area Network.

SLIP
: Serial Line Internet Protocol. SLIP is a standard for running IP over low-speed serial lines.

SNA
: Systems Network Architecture. SNA is a set of protocols developed by IBM.

SNAP
: Sub-Network Access Protocol. Defined in IEEE 802.2, SNAP is a Logical Link Control protocol that is used with Ethernet and Token Ring systems.

SNMP
: Simple Network Management Protocol. SNMP is a standard network-management protocol that provides the ability to monitor and configure network devices, as well as send alerts.

SONET
: Synchronous Optical Network. SONET is a high-speed optical-network architecture that is commonly used in Metropolitan Area Networks.

Spanning Tree
: A protocol and algorithm for ensuring that redundant Layer 2 connections are free from loops. Spanning Tree also enables backup links when primary links fail.

Split Horizon
: In dynamic routing protocols, refers to the constraint that devices should not send the same routing information back to the device from which they originally received that information.

SPX
: Sequenced Packet Exchange. In the Novell IPX protocol, SPX is a connection-based Layer 4 protocol.

Star
: As a basic network topology, represents the configuration where many devices all connect to a single central device. This configuration is also sometimes called Hub and Spoke.

STP
: Shielded Twisted Pair. A type of cabling in each run of cable contains a bundle of several strands of copper wire. The individual strands are separately insulated and are twisted around one another in pairs to improve the electrical impedance characteristics. The entire bundle is wrapped in a conducting sheath to provide further protection against electromagnetic radiation. See also *UTP*.

Subnet
: In IP networking, a contiguous group of addresses that represent a logical subset of a larger network. Subnet addresses are formed by combining the IP address for the larger network with a netmask to define the contiguous smaller range. See also *Supernet*.

Sub-Network Access Protocol
: See *SNAP*.

Supernet
: Similar to a subnet except that, instead of subdividing larger network numbers, a supernet consists of several contiguous networks joined together by means of a common netmask. See also *Subnet*.

SVC
: Switched Virtual Circuit. In many packet-switching networks such as ATM and Frame Relay, logical connections called Virtual Circuits are set up between end point devices. If this Virtual Circuit is dynamically set up and torn down by the network, it is called an SVC.

Switch
: A Layer 2 device that connects different Layer 1 or 2 network domains. It forwards frames between these different network domains based on Layer 2 addressing information. Many switches are capable of grouping these domains into VLANs.

T

T1 Circuit
: A long-haul network technology that is able to send data synchronously at 1554Mbps. T1 circuits are often broken up in distinct channels to create a *fractional T1*.

TCP
: Transmission Control Protocol. TCP is a connection-oriented Layer 4 protocol built on top of the IP Network Layer. It provides reliable delivery of packets across an IP network.

TCP/IP
: Transmission Control Protocol/Internet Protocol. TCP/IP refers to the suite of IP protocols to make a distinction from IP, which can just refer to the Layer 3 part of the protocol.

Telnet
: Telnet is a terminal-access program that runs over a TCP connection. It allows character-based interactive access to remote IP devices.

Terminal Server
: A device that has a number of low-speed serial ports and a LAN port. Terminal servers are used primarily to connect a number of character-based user terminals to a network.

TFTP
: Trivial File Transfer Protocol. TFTP is a simple file transfer protocol that is frequently used to download configuration information into devices at boot time.

Thick-net
: See *10Base5*.

Thin-net
: See *10Base2*.

Token
: In token-passing networks, a small frame. This frame is passed around the network from device to device. Only the device that is currently in possession of the token can transmit data onto the network.

Token Ring
: A standard LAN protocol that is defined in the IEEE document 802.5. It consists of a simple-ring topology where devices pass a small token frame from neighbor to neighbor to indicate permission to transmit data.

TOS
Type of Service. The TOS field is a standard component of the IP packet header. It is renamed as Distributed Services Control Point (DSCP) and used slightly differently in some implementations.

Traceroute
A program that sends out a series of probes to attempt to determine the actual path that the network provides to a particular destination. It is a useful troubleshooting tool.

Traffic Shaping
Refers to the technique of flattening out bursts of traffic by means of buffering some packets and dropping others.

Transceiver
Transmitter/Receiver. Referred to as a Media Attachment Unit (MAU) in some literature, this book uses the term Transceiver to avoid confusion with the Token Ring device mentioned in this glossary. A transceiver is generally a device that connects one network's physical medium to another. The most common implementations connect the generic physical sublayers such as AUI, MII, and GMII to specific physical implementations such as 10BaseT, 100BaseT, and 1000BaseT. But there are also transceivers that connect, for example, 100BaseT to 100BaseFx.

Transmission Control Protocol
See *TCP*.

Trap
In SNMP, an unsolicited packet sent from a device to its server, usually to indicate an error condition.

Trunk
A network link that is used to aggregate the traffic from several downstream sources into a single stream.

TTL
Time To Live. In IP networks the TTL field is a number between 0 and 255 that indicates how many more hops the packet can be forwarded through before it is dropped. The TTL field is used to limit scope in some multicast applications, and more generally, it helps break routing loops.

Tunnel
A general term that means that one protocol is carried inside of another temporarily. Tunnels are used to create connections between separate parts of a network. This is sometimes done because the tunneled protocol is not able to propagate through the intervening network for technical reasons. Tunnels are also frequently used for security reasons.

Type of Service
See *TOS*.

U

UBR
Unspecified Bit Rate. In ATM QoS, UBR means that packets are delivered on a "best-efforts" basis, with no guarantees of delivery or delay.

UDP
User Datagram Protocol. UDP is a non–connection oriented Layer 4 protocol built on top of the IP Network Layer. Because it is not connection oriented, it is not able to verify delivery of packets.

UNI
User to Network Interface. In ATM network, UNI specifies the connection point between the first ATM switch at the edge of the ATM network and the device that it connects to. This device may be an end device, or it may be an switch that provides both ATM and LAN interfaces. In many cases, the UNI device connects the ATM network to a port on a LAN router.

Unicast
A piece of data that is sent from one source to only one destination device.

User Datagram Protocol
See *UDP*.

UTP
Unshielded Twisted Pair. A type of cabling in each run of cable contains a bundle of several strands of copper wire. The individual strands are insulated separately and are twisted around one another in pairs to improve the electrical impedance characteristics. See also *STP*.

V

VBR
Variable Bit Rate. In ATM QoS, VBR specifies that the data stream is entitled to a particular average rate and well-defined burst properties.

VC
Virtual Circuit. In many packet-switching networks, such as ATM and Frame Relay, logical connections called Virtual Circuits are set up between end-point devices.

VCI
Virtual Channel Identifier. The VCI is a 16-bit number that appears in the ATM UNI cell header. The VCI defines a particular channel within a Virtual Path (see VPI) that together specify a particular VC.

Virtual Private Network
See *VPN*.

VLAN
Virtual Local Area Network. A VLAN is a logical grouping of devices. The switches that define a particular VLAN ensure that it is treated as a broadcast domain distinct from any other VLANs in the network.

VLSM
Variable Length Subnet Mask. When creating IP subnets, using VLSM means that not all of these subnets must be of equal size.

VPI
Virtual Path Identifier. The VPI is an 8-bit number that appears in the ATM UNI cell header. The VPI defines a bundle of Virtual Channels. See *VCI*.

VPN
Virtual Private Network. A VPN is a tunneled connection that is usually encrypted. It is used primarily to create a secure connection between two points that are separated by an untrusted network.

VRRP
Virtual Router Redundancy Protocol. This protocol is an open standard defined in RFC 2338. It allows two routers to possess the same IP and MAC addresses for redundancy. While only one router is active at a time, the other is capable of quickly becoming active in case it fails. See also *HSRP*.

WXYZ

WAN
Wide Area Network. As opposed to a LAN, a WAN is a network that can have extremely large geographic distances between devices. These distances are generally larger than an immediate metropolitan area and can be arbitrarily large.

WEP
Wired Equivalent Privacy. In 802.11 wireless networking, WEP defines the security standards used in making connections between an end device and an Access point.

Wide Area Network
See *WAN*.

X.25
An older packet-switching network technology. X.25 was similar in many ways to modern Frame Relay except that it operated at slower speeds and included more error-correction functions. X.25 VC's also tended to be switched (SVC) rather than permanent (PVC), as in Frame Relay.

XNS
Xerox Network System. XNS was an early suite of networking protocols that influenced the development of many later protocols, including both IP and IPX.