IEEE Standard Glossary of Computer Networking Terminology

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IEEE Std 610.7-1995

IEEE

Published by the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY 10017, USA.

June 30, 1995

SH94257

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IEEE Standard Glossary of Computer Networking Terminology

Sponsor

Standards Coordinating Committee of the IEEE Computer Society

Approved June 14, 1995

IEEE Standards Board

Abstract: Terms that pertain to data communications and networking, from the following areas, are defined: Data transmission, general communications, general networks, local area networks, network communications security, network errors, networking hardware, network management, network nodes, network signaling, open system architecture, packet, protocols, standards and standards organizations, telephony. The glossary is primarily a compilation of terms defined in individual IEEE standards, but also includes a number of common terms.
Keywords: computer glossary, computer networking, computer terminology

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The Institute of Electrical and Electronics Engineers, Inc.
345 East 47th Street, New York, NY 10017-2394, USA

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ISBN 1-55937-498-5

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Introduction

(This introduction is not a part of IEEE Std 610.7-1995, IEEE Standard Glossary of Computer Networking Terminology.)

As the computer field continues to expand, new terms are being generated and new meanings are being adopted for existing terms. The IEEE Computer Dictionary project (the 610 computer glossary series of documents) was undertaken to document this vocabulary. Its purpose is to identify terms currently in use in the computer field and to establish standard definitions for these terms. The dictionary is intended to serve as a useful reference for those in the computer field and for those who come into contact with computers, either through their work or in their everyday lives.

The completed dictionary will contain terms from each of the following areas: computer networking, software engineering, mathematics of computing, theory of computation, computer applications, artificial intelligence, data management, image processing and pattern recognition, modeling and simulation, computer graphics, computer hardware, computer languages, and computer security and privacy. This glossary contains the terms related to computer networking.

Every effort has been made to use definitions from established standards in this dictionary. However, when existing standards were found to be incomplete, unclear, or inconsistent with other entries in the dictionary, new, revised, or composite definitions have been developed.

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IEEE Standard Glossary of Computer Networking Terminology

1. Overview

1.1 Scope

This glossary defines terms that pertain to data communications and computer networking. It is primarily a compilation of terms defined in individual IEEE Standards—but also contains a number of common terms. Terms from the following areas are included:

Data transmission
General communications
General networks
Local area networks
Network communications security
Network errors
Networking hardware
Network management
Network nodes
Network signaling
Open system architecture
Packet
Protocols
Standards and standards organizations
Telephony

To be included in this standard glossary, a networking term meets at least one of the following criteria:

- Term has no commercial connotations, that is, completely non-proprietary.
- Product or item is owned by the U.S. Government and therefore in public knowledge and domain. For example, central office, postal telephone and telegraph (PTT).
- Proprietary terms that are based on the name of an inventor or geographical origin. For example, Aloha network, Hamming code, Karn's algorithm, Manchester encoding.
- Interfaces and technologies that are recognized, but not necessarily recommended, by national or international standards committees. For example, fiber distributed data interface (FDDI), network interface definition language (NIDL).
- Names of networks, techniques, and protocols in common usage. For example, carrier sense multiple access with collision detection (CSMA/CD), file transfer protocol (FTP), high-level data link control (HDLC).
- Standards that are specifically relevant and widely accepted in the networking arena. For example, X.25.

Some terms are the names of commercial products. Many times such products are first developed by a known organization, and then the product name is accepted as a generic description of all products performing similar functions. For this reason, this glossary does not, in most cases, attempt to identify the owner or developer of a product. The reader should exercise caution in drawing inferences concerning ownership, trademark, and copyright of names.

The inclusion of a term in this glossary is intended to associate that term with the computer industry and to define and identify its commonly accepted usage. This inclusion does not imply a preference for any product, technology, or standard over one that has not been included.

Every effort has been made to define standard usage as of the balloting of this standard. If the reader knows of additional networking terms that should be included in this glossary, it is suggested that such comments be addressed to the IEEE Standards Board, as instructed in the Introduction.

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1.2 Glossary structure

Entries in the glossary are arranged alphabetically. An entry may consist of a single word or a phrase. Phrases are given in their natural order rather than in reverse order. Blanks and numerals precede all other characters in alphabetizing. Hyphens and slashes are treated as blanks.

The following distinction is made between acronyms and abbreviations: An acronym is a combination of the first one (or few) letter(s) from two or more words in the term, put together to make a single term. An acronym does not have to be pronounceable. Generally, acronyms are capitalized. An abbreviation is a shortened version of a single word or anything that is not an acronym.

If a term has more than one definition, the definitions are numbered. The order of the definitions does not imply preference or frequency of use. In most cases, noun definitions are given first, followed by verb and adjective definitions as applicable. Examples and notes have been added to clarify selected definitions.

The following cross-references are used to show the relationship of a term to other terms in the glossary:

a) *Contrast with:* Refers to a term with an opposite or substantially different meaning.

b) *Syn:* Refers to a synonymous term.

c) *See also:* Refers to a related term.

d) *See:* Refers to a preferred term or to a term where the desired definition can be found.

The word "deprecated" indicates a term or definition whose use is discouraged because such use is obsolete, misleading, or ambiguous.

The following terms were proposed to be deleted for asymmetric compatibility:

kilo (k)

kilobits per second (kb/s)

megabits per second (Mb/s)

2. References

In those cases in which a definition is directly quoted from an existing dictionary or glossary, the following references shall apply:

IEEE Std 610.5-1990, IEEE Standard Glossary of Data Management Terminology (ANSI).[1]

IEEE 610.10-1994, Standard Glossary of Computer Hardware Terminology.[2]

IEEE Std 610.12-1990, IEEE Standard Glossary of Software Engineering Terminology (ANSI).

IEEE Std 1084-1986 (W1993), IEEE Standard Glossary of Mathematics of Computing Terminology.[3]

ISO/IEC 2382, Information Technology—Vocabulary, Parts 1-25.[4]

ISO/IEC 8802-3 : 1993 [ANSI/IEEE Std 802.3, 1993 Edition], Information technology—Local and metropolitan area networks—Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.[5]

ISO/IEC 8802-4 : 1990 [ANSI/IEEE Std 802.4, 1990 Edition], Information processing systems—Local area networks—Part 4: Token-passing bus access method and physical layer specifications.

ISO/IEC 8802-5 : 1992 [ANSI/IEEE Std 802.5, 1992 Edition], Information technology—Local and metropolitan area networks—Part 5: Token ring access method and physical layer specifications.

ISO/IEC 8802-6 : 1994 [ANSI/IEEE Std 802.6, 1994 Edition], Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 6: Distributed Queue Dual Bus (DQDB) access method and physical layer specifications.

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[1]IEEE publications are available from the Institute of Electrical and Electronics Engineers.

[2]As this standard goes to press, IEEE Std 610.10-1994 is approved but not yet published. The draft standard is, however, available from the IEEE. Contact the IEEE Standards Department at 1 (908) 562-3800 for status information.

[3]IEEE Std 1084-1986 has been withdrawn; however, copies can be obtained from Global Engineering, 15 Inverness Way East, Englewood, CO 80112-5704, USA, tel. (303) 792-2181.

[4]ISO/IEC publications are available from the ISO Central Secretariat, Case Postale 56, 1 rue de Varembé, CH-1211, Genève 20, Switzerland/Suisse. ISO/IEC publications are also available in the United States from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, USA.

[5]ISO/IEC [ANSI/IEEE] publications are available from the Institute of Electrical and Electronics Engineers.

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3. Terms and definitions

3.1 abnormal preamble: A preamble that does not match the synchronization pattern resulting in a packet error.

3.2 AC: Acronym for **acoustic coupler.**

3.3 access: **(1)** Any means of establishing logical or physical communication with a computer or communications system. **(2)** Any means of obtaining the use of such a system. **(3)** Any actions that result in a flow of information involving such a system. **(4)** That part of a public network connecting the customer premises to the public network switching system (central office).

3.4 accounting management: In networking, a management function defined for collecting and processing of data to evaluate resource consumption.

3.5 accredited standards committee (ASC): A standards developing committee whose procedures have been determined to meet ANSI's requirements for fairness, openness, and other attributes necessary for developing a consensus position on a proposed ANSI standard relating to a specific technology area.

3.6 ACK: Abbreviation for **acknowledgment.**

3.7 acknowledgment (ACK): *See:* **acknowledgment of a message.**

3.8 acknowledgment of a message (ACK): A reply transmitted by a receiving station to inform the sending station that a message has arrived and the message is error-free. *Syn:* **acknowledgment.** *Contrast with:* **negative acknowledgment.**

3.9 acoustic coupler (AC): A modem that interconnects a communicating device with a telephone handset.

3.10 adaptive equalizer: An electronic device for maximizing the signal quality on a transmission channel by monitoring the signal and adjusting the equalization. *Syn:* **automatic equalizer.**

3.11 adaptive routing: A routing strategy that dynamically adjusts path selection based on current network parameters.

3.12 address error: An error that occurs when a node recognizes its own address in a packet's improper source or destination information.

3.13 address field: A sequence of bits that identifies the intended destination or receiver of a transmission. *Note:* May be single-source, single-destination, or multiple-destination address.

3.14 alignment error: An error that occurs when a packet is not a multiple of eight bits. *Note:* It is only applicable to specific protocols.

3.15 all-segments broadcast: The transmission of a frame to all interconnected segments of a local area network. *See also:* **all-stations broadcast.**

3.16 all-stations broadcast: The transmission of a frame to all stations on a given local area network segment. *See also:* **all-segments broadcast.**

3.17 ALOHA network: A telecommunication network that uses a multi-access contention protocol, first developed for use in Hawaii.

3.18 alternate hierarchical routing: A routing strategy in which the traffic is routed through the lowest available level of the network hierarchy. *Note:* It uses a tree like structure of five classes: class 1—regional center, class 2—sectional center, class 3—primary center, class 4—toll center, and class 5—end office. *Syn:* **alternative hierarchical routing.**

3.19 alternate routing: A routing strategy that assigns a secondary communications path to a destination when the primary path is busy or unavailable. *Syn:* **alternative routing.**

3.20 alternative hierarchical routing: *See:* **alternate hierarchical routing.**

3.21 alternative routing: *See:* **alternate routing.**

3.22 AM: Acronym for **amplitude modulation.**

3.23 American National Standards Institute (ANSI): An organization that establishes and maintains standards for the information processing industry within the United States. [IEEE Std 610.10-1994][6]

[6]The numbers in brackets refer to the source document in the 610 series of computer glossary standards from which the definition was taken; a lower-case "a" after the number indicates that an editorial change was made in the definition for inclusion in this document.

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3.24 amplitude: The strength or volume of a periodic signal, usually measured in decibels.

3.25 amplitude jitter: A short term instability in the amplitude of a transmission signal. *See also:* **phase jitter.**

3.26 amplitude modulation (AM): A modulation technique in which a data signal is sent onto a carrier at a fixed frequency by raising and lowering the amplitude of the carrier. *See also:* **pulse amplitude modulation.**

3.27 amplitude shift keying: A modulation technique that encodes data by transmitting a signal at two different amplitudes representing binary digit one and binary digit zero. *See also:* **binary phase shift keying; frequency shift keying.**

3.28 analog data: Data in the form of continuous numerical properties represented by physical variables. *Contrast with:* **digital data.** [IEEE Std 1084-1986a]

3.29 analog signal: A continuously changing signal. *Contrast with:* **digital signal**. *See also:* **digitize.**

3.30 ANSI: Acronym for **American National Standards Institute.**

3.31 ANSI Standard: A standard approved by the American National Standards Institute (ANSI). Examples of ANSI standards include programming languages (C, FORTRAN, or COBOL), media formats (Hollerith cards), and interface standards (SCSI interfaces, device drivers). [IEEE Std 610.10-1994]

3.32 answer: To respond to a calling station, either automatically, under program control, or manually, to establish a connection between stations.

3.33 application layer: The seventh and highest layer of the seven-layer OSI model providing the only interface between the user and the application program. *Note:* It hides from the user the physical distribution of processors, communications media, and data resources while maximizing the utility of those resources. *See also:* **client layer; data link layer; entity layer; logical link control sublayer; medium access control sublayer; network layer; physical layer; presentation layer; session layer; sublayer; transport layer.**

3.34 ARQ: Acronym for **automatic repeat request.**

3.35 ASC: Acronym for **Accredited Standards Committee.**

3.36 ASC T1: A standards committee accredited by the American National Standards Institute organization that recommends standards for telecommunication.

3.37 ASC X3: A standards committee accredited by the American National Standards Institute organization that recommends standards for computers and information processing systems.

3.38 asynchronous transfer mode (ATM): A LAN WAN communications architecture that switches or relays small fixed length (53 octets) packets called cells. *Note:* Each cell has a 5 octet header and 48 octets of data.

3.39 asynchronous receiver/transmitter: *See:* **universal asynchronous receiver/transmitter.**

3.40 asynchronous transmission: A transmission in which each information character, word, or block is individually synchronized, and the transmission is controlled by start and stop bits at the beginning and end of each character. *Syn:* **start-stop transmission.** *Contrast with:* **synchronous transmission.**

3.41 ATM: Acronym for **Asynchronous Transfer Mode.**

3.42 attachment unit interface (AUI): In a local area network, the interface between the medium attachment unit (MAU) and the data terminal equipment (DTE) within a data station. *Note:* The AUI carries encoded signals and provides for duplex data transmission. [ISO/IEC 8802-3 : 1993]

3.43 attachment unit interface (AUI) cable: A cable that connects a workstation to a transceiver. *Note:* This term is contextually specific to IEEE Std 802.3, clause 7. *See also:* **coaxial cable; drop cable; transceiver cable.**

3.44 attended operation: A central office that normally has maintenance staff on duty.

3.45 attenuation: A loss or decrease of signal power in a transmission, usually measured in decibels.

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3.46 AUI: Acronym for **attachment unit interface.** *Note:* This term is contextually specific to IEEE Std 802.3, clause 7.

3.47 AUI cable: Abbreviation for **attachment unit interface cable.** *Note:* This term is contextually specific to IEEE Std 802.3, clause 7.

3.48 autoanswer: A capability of a terminal, modem, computer, or similar device to respond to an incoming call over the switched network, and to establish a data connection with a remote device without operator intervention. *See also:* **autodial.**

3.49 autodial: A capability of a terminal, modem, computer, or similar device to place a call over the switched network, and to establish a data connection without operator intervention. *See also:* **autoanswer**.

3.50 automatic equalizer: *See:* **adaptive equalizer.**

3.51 automatic repeat request (ARQ): A protocol that uses positive or negative acknowledgment with retransmission techniques to ensure reliability. *Note:* The sender automatically repeats the request if it does not receive an answer.

3.52 autonomous system: A collection of gateways and networks administered by one administrative entity.

3.53 b: Abbreviation for **bit.**

3.54 backbone network: A network designed to interconnect lower speed distribution channels, devices, or clusters of dispersed users.

3.55 backward supervision: The use of supervisory sequences from a secondary station or node to a primary station or node. *Contrast with:* **forward supervision**. [ISO/IEC 2382]

3.56 balanced (to ground): The state of impedance on a two-wire circuit when the impedance-to-ground of one wire is equal to the impedance-to-ground of the other wire. *Contrast with:* **unbalanced (to ground).** *See also:* **balun.**

3.57 balun: In networking, a passive device with distributed electrical constants used to couple a balanced system or device to an unbalanced system or device. For example, a transformer used to connect balanced twisted-pair cables to unbalanced coaxial cables. *Note:* Derived from "balance to unbalance" transformer.

3.58 bandwidth: The range of frequencies, expressed in hertz, that can pass over a given channel. *See also:* **pass band.**

3.59 barrel connector: A double-sided male coupling that interconnects two coaxial cables. *Contrast with:* **end connector.**

3.60 baseband coaxial system: A baseband system employing coaxial cables as a data transmission medium. At any point on the medium only one information signal at a time can be present without disruption. *Contrast with:* **baseband twisted-pair system.** [ISO/IEC 8802-3 : 1993a]

3.61 baseband signaling: The transmission of a signal at its original frequency, that is, not changed by modulation. *Note:* It can be an analog or a digital signal. *Contrast with:* **broadband signaling.**

3.62 baseband system: A system used for networking in which information is encoded, modulated, and impressed directly on the transmission medium. *Note:* Generally used for limited distance. *Contrast with:* **broadband system.** *See also:* **baseband coaxial system; baseband twisted-pair system.**

3.63 baseband twisted-pair system: A baseband system employing twisted-pair wiring cables as the transmission medium. *Contrast with:* **baseband coaxial system.**

3.64 baud: A unit of signaling speed, expressed as the number of times per second the signal can change the electrical state of the transmission line or other medium. *Note:* Depending on the encoding strategies, a signal event may represent a single bit, more, or less, than one bit. *Contrast with:* **bit rate; bits per second.** [IEEE Std 610.10-1994a]

3.65 baud rate: The rate of signal transitions per unit time, usually expressed in baud. *Note:* Often confused with bit rate. *Contrast with:* **bit rate; bits per second.** *See also:* **data signaling rate.** [IEEE Std 610.10-1994a]

3.66 Baudot code: A code for the transmission of data in which five data bits represent one character.

3.67 BCC: Acronym for **block check character.**

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3.68 bend radius: The radial distance of any arc formed by a bent cable, measured to the geometric center of the cable. *See also:* **minimum bend radius.**

3.69 BERT: Acronym for **bit error rate testing.**

3.70 binary digit (bit): **(1)** A unit of information that can be represented by either a zero or a one. *See also:* **byte; word.** [IEEE Std 610.12-1990] **(2)** The fundamental unit of digital communication; information is transmitted over networks as streams of units as in (1).

3.71 binary phase shift keying (binary PSK) (BPSK): A form of modulation in which binary data are transmitted by changing the carrier phase by 180°. *See also:* **amplitude shift keying; frequency shift keying.** [ISO/IEC 8802-3 : 1993]

3.72 binary PSK: Abbreviation for **binary phase shift keying.**

3.73 bit (b): Acronym for **binary digit.** *See also:* **block; byte; clocking bit; overhead bit; start bit; stop bit.** [IEEE Std 1084-1986, IEEE Std 610.5-1990, IEEE Std 610.12-1990]

3.74 bit error rate testing (BERT): The process of testing a data transmission channel using some predictable bit pattern so that the bits can be compared before and after the transmission to detect errors. *See also:* **block error rate testing.**

3.75 bit rate (BR): The rate of data throughput on the medium in bits per second or hertz, whichever is more appropriate to the context. *Syn:* **bit transfer rate.** *Contrast with:* **baud rate.** [ISO/IEC 8802-3 : 1993a]

3.76 bit stream: A continuous stream of bits transmitted over a channel with no separators between the character groups. [IEEE Std 610.10-1994]

3.77 bit stuffing: A method to insert extra bits in a bit stream to achieve transparency throughout the bit stream.

3.78 bit transfer rate: *See:* **bit rate.**

3.79 bits per second (b/s), (bps): A unit of data transmission speed, expressed as the number of bits transmitted per second. *Note:* IEEE Std 260.1-1993 specifies b/s as the SI unit symbol for bits per second. *Contrast with:* **baud rate.**

3.80 black: Pertains to the parts of a computer or communications system in which data being transmitted or manipulated is encrypted. *Contrast with:* **red.**

3.81 BLERT: Acronym for **block error rate testing.**

3.82 block: **(1)** A group of contiguous storage locations, computer program statements, records, words, characters, or bits that are treated as a unit. [IEEE Std 610.12-1990, IEEE Std 610.5-1990] **(2)** To form a group as in (1). **(3)** A circuit assemblage that functions as a unit. For example, a logic block within a sequential circuit. [IEEE Std 610.10-1994]

3.83 block character: *See:* **end of transmission block character.**

3.84 block check character (BCC): In longitudinal redundancy checking and cyclic redundancy checking, a character that is transmitted by the sender after each message block and is compared with a character computed by the receiver to determine if the transmission was successful.

3.85 block error rate testing (BLERT): The process of testing a data transmission channel using groups of information arranged into transmission blocks in a given message for error checking. *See also:* **bit error rate testing.**

3.86 bps: Abbreviation for **bits per second.**

3.87 BPSK: Acronym for **binary phase shift keying.**

3.88 BR: Acronym for **bit rate.**

3.89 branch point: *See:* **node.**

3.90 bridge: In networking, a device that connects two systems using the similar or identical data link layer protocols. *Note:* Bridges are independent of the protocol of the network layer and above. *Contrast with:* **gateway.** *See also:* **brouter; learning bridge; mail bridge; router.**

3.91 broadband coaxial system: A broadband system employing coaxial cables as a data transmission medium.

3.92 broadband LAN: A local area network in which information is transmitted on modulated carriers, allowing coexisting of multiple simultaneous

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services on a single physical medium by frequency division multiplexing. [ISO/IEC 8802-3 : 1993]

3.93 broadband signaling: The transmission of a signal in an analog form that may use frequency division multiplexing to allow multiple channels. *Contrast with:* **baseband signaling.**

3.94 broadband system: A system used for networking in which information is encoded, modulated onto a carrier, and pass band filtered or otherwise constrained to occupy only a limited frequency spectrum on the transmission medium. *Note:* Generally used for large amounts of voice, data, and video signals. *Contrast with:* **baseband system.**

3.95 broadcast: A technique that allows copies of a single packet from one node on a LAN to be passed to all possible nodes on a LAN. *Contrast with:* **multicast.**

3.96 broadcast address: A predefined address that denotes the set of all stations on a given local area network. *Notes:* 1) This allows a message to be "broadcast" to all users simultaneously. 2) For more information, see IEEE Std 802-1990.

3.97 brouter: A device that performs router and bridging functions. Also known as a routing bridge. *See also:* **bridge; gateway; router.**

3.98 burst error: In data communications, a series of consecutive errors in data transmission that tend to be grouped together, with a longer time interval separating multiple bursts.

3.99 burst mode: A mode of transmission by which a system can send a burst of data at higher speed for some period of time.

3.100 bus-ring topology: A topology where the stations are physically wired as a bus but logically act like a ring. Every station on the bus knows its logical predecessor and successor. Transmissions can be broadcast to all stations on the bus or addressed to another individual station. *Note:* This topology is employed in the IEEE Std 802.4 token bus. *See also:* **bus topology; loop topology; ring topology; star-bus topology; star-ring topology; star topology; tree topology.**

3.101 bus topology: A topology in which stations are attached to a common transmission medium, known as a bus; data propagate the length of the medium and are received by all stations. *See also:* **bus-ring topology; loop topology; ring topology; star-bus topology; star-ring topology; star topology; tree topology.**

3.102 busy hour: An hour-long window during which the communication traffic load is at its maximum for a given 24-hour period.

3.103 byte: **(1)** A group of adjacent binary digits operated upon as a unit and usually shorter than a computer word. *Note:* Although most people refer to a byte as having 8 bits used for data representation, hardware designers may add one or more parity bits to be used for error detection and correction. *See also:* **octet.** [IEEE Std 610.12-1990a] **(2)** An element of computer storage that can hold a group of bits as in (1). *See also:* **bit; word.** [IEEE Std 610.12-1990]

3.104 C conditioning: A North American term for a type of conditioning that controls attenuation, distortion, and delay distortion, thus making transmission impairments of a circuit lie within specified limits. *See also:* **D conditioning.**

3.105 cable: An assembly of one or more conductors within an enveloping protective sheath, constructed to allow use of the conductors separately or in groups. *See also:* **attachment unit interface cable; coaxial cable; drop cable; optical cable; transceiver cable; trunk cable; twinaxial cable.**

3.106 call back: A security procedure that verifies the identity of a terminal accessing a computer system by terminating the original connection and then reestablishing it by placing a new call to the terminal.

3.107 carrier: **(1)** A continuous frequency capable of being modulated or impressed with a signal. *Syn:* **carrier wave.** **(2)** An alternating current that oscillates at a fixed frequency, used to transmit a signal.

3.108 carrier frequency: A unique frequency of a carrier that is used to carry data. *Note:* It is measured in cycles per second or hertz.

3.109 carrier sense: In a local area network, an ongoing activity of a data station to detect whether another station is transmitting. [ISO/IEC 8802-3 : 1993]

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3.110 carrier sense multiple access with collision detection (CSMA/CD): A local area network access technique. When a station wants to gain access to the network, it listens for conflicting traffic and checks to see if the network is free. If the network is not free, it waits for a small amount of time and retries. *Note:* ISO/IEC 8802-3 : 1993 describes the CSMA/CD technique.

3.111 carrier system: A means for obtaining a number of channels over a single path, known as a carrier.

3.112 carrier wave: *See:* **carrier.**

3.113 CBEMA: Acronym for the **Computer and Business Equipment Manufacturers Association.**

3.114 CCITT: Acronym for **Consultative Committee on International Telegraphy and Telephony.**

3.115 CCITT Standard: A standard recommended by CCITT (Consultative Committee on International Telegraphy and Telephony). *Notes:* 1) CCITT recommendations are published by lettered series. For example, the X-series, for equipment and protocols used with computer networks. 2) CCITT Standards are now designated as ITU-T Standards. *See also:* **Consultative Committee on International Telegraphy and Telephony.**

3.116 CD: Acronym for **collision detection.**

3.117 cell: A packet with fixed length. *Notes:* 1) Each cell has a 5 octet header and 48 octets of data. 2) This definition is specific to asynchronous transfer mode (ATM). *See also:* **asynchronous transfer mode; cell relay.**

3.118 cell relay: A fast packet switching technology that provides a virtual circuit service for the transfer of cells. For example, asynchronous transfer mode is the most common type of cell relay. *See also:* **frame relay.**

3.119 cell switching: A technique used in data communications, in which messages are broken into fixed-size packets and forwarded to another party over the network. *Contrast with:* **packet switching.**

3.120 central office: A physical location where communications common carriers terminate customer lines and locate the switching devices that interconnect these lines. *See also:* **end office.** *Syn:* **exchange; local central office; telephone exchange.**

3.121 centralized computer network: A computer network in which a central node provides all network control functions and services to other nodes. *Contrast with:* **decentralized computer network.** *See also:* **distributed computer network.**

3.122 centralized polling: A polling technique in which a single, central authority controls access to transmission medium. Each station is invited to transmit periodically according to a scheme or list. *Contrast with:* **distributed polling.**

3.123 channel: **(1)** A one-way path for transmission of signals between two or more points; for example, a data channel. *See also:* **circuit; line; link.** [IEEE Std 610.10-1994a] **(2)** In data transmission, either one-way path, providing transmission in one direction only, or two-way path, providing transmission in two directions. *Syn:* **path. (3)** A band of frequencies dedicated to a certain service transmitted on the broadband medium. [ISO/IEC 8802-3 : 1993]

3.124 channel bank: A device that multiplexes high-speed communication circuits into lower-speed communication channels; used primarily to digitize analog voice transmission.

3.125 channel path: The routing, switching, and line links between an input-output channel and some peripheral device. *Note:* There may be multiple channel paths between a channel and a device. [IEEE Std 610.10-1994]

3.126 channel service unit (CSU): A device that performs transmit and receive filtering, signal shaping, longitudinal balance, voltage isolation, equalization, and remote loopback testing in a digital communications environment. *See also:* **data service unit.** *Syn:* **digital modem.**

3.127 character: A letter, digit, or other symbol that is used to represent information. [IEEE Std 610.12-1990]

3.128 chatter: A condition that results when transceiver electronics fail to shut down and the transceiver floods the network with random signals. *Syn:* **transceiver chatter.**

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3.129 check character: A character added to a group of characters to provide data redundancy to permit error detection and error correction.

3.130 checksum: A sum obtained by adding the digits in a numeral, or a group of numerals, usually without regard to meaning, position, or significance. This sum may be compared with a previously computed value to verify that no errors have occurred. [IEEE Std 1084-1986]

3.131 circuit: In networking, a means of communication of electrical or electronic signals between two points. *See also:* **channel; dial-up circuit; foreign exchange circuit; four-wire circuit; leased circuit; simplex circuit; telecommunication circuit; two-wire circuit.** *Syn:* **network.**

3.132 circuit-switched network: A switched network having the capability to switch lines in different configurations to establish a continuous pathway between the sender and the recipient.

3.133 circuit switching: In data communications, a method of communication in which a dedicated communications path is set up between two devices through one or more intermediate switching nodes. *See also:* **message switching; space-division switching; time-multiplexed switching.** *Syn:* **line switching.**

3.134 cladding: A layer that surrounds the glass core of an optical fiber.

3.135 client: In networking, a station or program requesting a service. *Contrast with:* **server.**

3.136 client layer: In the OSI model, refers to the data link and physical layers. *See also:* **application layer; data link layer; entity layer; logical link control sublayer; medium access control sublayer; network layer; physical layer; presentation layer; session layer; sublayer; transport layer.**

3.137 client-server: In a communications network, the client is the requesting device and the server is the supplying device. For example, the user interface could reside in the client workstation while the storage and retrieval functions could reside in the server database.

3.138 clocking bit: In asynchronous transmission, a bit that signals a synchronization event.

3.139 closed network: A network that prevents outside access by eliminating external connections and external entry or use. *Contrast with:* **open network.**

3.140 closed user group: A specified group of network users who are permitted communications among themselves but not with other network users.

3.141 coax: A colloquial reference to **coaxial cable.**

3.142 coaxial cable: A cable consisting of a central conductor and an outer, concentric conductor. *Contrast with:* **twinaxial cable.** *See also:* **AUI cable; core; drop cable; shield; transceiver cable; trunk cable.**

3.143 collision: **(1)** The condition when multiple packets/signals are observed simultaneously at a single point on the medium where the "listening" station is unable to function properly due to multiple signals being present. *See also:* **collision detect signal; collision detection; contention; forced collision.** **(2)** A condition that results from concurrent transmissions from multiple signal sources. [ISO/IEC 8802-3 : 1993]

3.144 collision detect signal: A signal provided by the physical layer to the data link layer, to indicate collision detection. *Note:* This term is contextually specific to IEEE Std 802.3.

3.145 collision detection (CD): The ability of a node to detect collision. *Note:* This term is contextually specific to IEEE Std 802.3.

3.146 collision enforcement: The emission of an encoded sequence by the transmitting node after a collision is detected, to ensure that all other transmitting nodes detect the collision. *Note:* This term is contextually specific to IEEE Std 802.3.

3.147 collision error: In networking, an indication that two or more nodes have attempted to transmit within the same time slot. *Note:* This term is contextually specific to IEEE Std 802.3.

3.148 collision presence (CP): The signal provided by the physical signaling sublayer to the physical medium attachment sublayer (within the data link layer) to indicate that multiple stations are contending for access to the transmission medium. [ISO/IEC 8802-3 : 1993]

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3.149 common carrier: *See:* **communications common carrier.**

3.150 communication line *: *See:* **telecommunication line.**
* Deprecated.

3.151 communications architecture: The hardware and software structure that facilitates the communications operations.

3.152 communications common carrier: In telecommunication, a public utility company that is recognized by an appropriate regulatory agency as having a vested interest in and responsibility for furnishing communications services to the general public. *Syn:* **common carrier.**

3.153 communications computer: A computer that is specially designed to be an interface between another computer or terminal and a network, or to control data flow in a network. *See also:* **concentrator; front-end computer; switching computer.** [IEEE Std 610.10-1994a]

3.154 communications controller: A dedicated computer that checks and manages data traffic through a network.

3.155 communications network: A network of communication circuits managed as a single unit. *See also:* **computer network; value-added network.**

3.156 communications processor: A computer that performs protocol (terminates one or more protocols layers) or network management functions.

3.157 communications security: The use of administrative, technical, or physical measures to deny unauthorized persons information from a computer or a communications network and to ensure the authenticity and integrity of such communications.

3.158 Computer and Business Equipment Manufacturers Association (CBEMA): The Secretariat for ASC X3-series standards on information technology. [IEEE Std 610.10-1994a]

3.159 computer network: A structured connection of computer systems and peripheral devices that exchange data as necessary to perform the specific function of the network. *See also:* **centralized computer network; decentralized computer network; distributed computer network; heterogeneous computer network; hierarchical computer network; homogeneous computer network.** [IEEE Std 610.10-1994a]

3.160 computer network architecture: The logical structure and the operating principles, including those concerning services, functions, and protocols, of a computer network. [IEEE Std 610.10-1994]

3.161 computer system: A system containing one or more computers, peripheral devices and associated software. *Syn:* **computing system.** [IEEE Std 610.12-1990a]

3.162 computing system: *See:* **computer system.**

3.163 concentrator: **(1)** A device that combines incoming messages into a single message or that extracts individual messages from the data set in a single transmission sequence. *Note:* The former process is called "concentration" and the latter, "deconcentration." **(2)** A communications computer that provides communications capability between many low speed asynchronous channels and one or more high-speed synchronous channels. *See also:* **data concentrator; multiplexer.** [IEEE Std 610.10-1994a] **(3)** A device in token ring networks that contains multiple interconnected trunk coupling units. [ISO/IEC 8802-5 : 1992]

3.164 conditioning: In telecommunication, a means to improve the performance of a line by reducing distortion and amplifying weak signals. For example, in telecommunication, line conditioning will bring attenuation, impedance, and delay characteristics to within set limits. *See also:* **C conditioning; D conditioning.** *Syn:* **line conditioning.**

3.165 configuration: The arrangement of a computer system, network, or component as defined by the number, nature, and interconnections of its constituent parts. [IEEE Std 610.12-1990]

3.166 configuration management: In networking, a management function that identifies, controls, collects data from, and provides data to, open network systems.

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3.167 congestion: In networking, a condition that occurs when the traffic exceeds the capacity of the network. *See also:* **fair queuing; source quench.**

3.168 connection-oriented service: A kind of delivery service where different virtual circuit configurations are used to transmit messages. *Syn:* **virtual circuit service.**

3.169 connectionless service: A kind of delivery service that treats each packet as a separate entity. Each packet contains all protocol layers and destination address at each intermediate node in the network. *Note:* Order of arrival of packets is not necessarily the same as order of transmission. *Syn:* **datagram.**

3.170 Consultative Committee on International Telegraphy and Telephony (CCITT): An international organization that studies and issues recommendations on issues related to communication technology. *Note:* In March 1993, the CCITT was reorganized and renamed to be the International Telecommunication Union (ITU) Telecommunications Standardization Sector (TSS). [IEEE Std 610.10-1994a]

3.171 contention: A condition that occurs when two or more devices simultaneously request the services of another device, network medium, or resource that can handle only one request at a time. *See also:* **collision.**

3.172 contention interval: *See:* **slot time.**

3.173 contention resolution: The management of contention for a communications resource so as to minimize collisions, resolve access order, and maximize utilization.

3.174 control field: A sequence of bits that identifies the type of frame being transmitted, and optionally, contains sequence or acknowledgment numbers.

3.175 convention: Any practice that is not formally standardized, but which is adopted by a group in a given situation. For example, programmers usually adopt the convention of indenting subordinate instructions in a routine so that the structure of the program is more easily visualized. *See also:* **standard.** [IEEE Std 610.10-1994]

3.176 core: **(1)** The central conductor element of a coaxial cable. *Note:* It is usually constructed of copper. **(2)** Single conductor in a cable (British usage).

3.177 CP: Acronym for **collision presence.**

3.178 CRC: Acronym for **cyclic redundancy check.**

3.179 crossbar switch: A switch having vertical and horizontal paths and an electromagnetically operated mechanical means for interconnection of any one vertical path with any one horizontal path. *See also:* **step-by-step switch.**

3.180 crossbar system: An automatic switching system in which the selecting mechanisms are crossbar switches, common circuits select and test the switching paths and control the operation of the selecting mechanism, and the method of operation is one in which the switching information is received and stored by controlling mechanisms that determine the operations necessary in establishing a telephone connection. *See also:* **electronic switching system; step-by-step system.**

3.181 crosstalk: **(1)** A type of noise characterized by unwanted coupling of a signal or the interaction of signals on two adjacent channels. *See also:* **near-end crosstalk.** **(2)** Undesired energy appearing in one signal path as a result of coupling from other signal paths. [ISO/IEC 8802-5 : 1992]

3.182 CSMA/CD: Acronym for **carrier sense multiple access with collision detection.** [ISO/IEC 8802-3 : 1993]

3.183 CSU: Acronym for **channel service unit.**

3.184 current: The flow of electrons within a wire or a circuit; measured in amperes.

3.185 cyclic redundancy check (CRC): A form of error check used to ensure the accuracy of transmitting a message. *Note:* The CRC is the result of a calculation carried out on the set of transmitted bits by the transmitter. The CRC is encoded into the transmitted signal with the data. At the receiver, the calculation creating the CRC may be repeated, and the result compared to that encoded in the signal. The calculations are chosen to optimize the error detection capability. *Contrast with:* **parity; parity check.** *See also:* **frame check sequence; frame check sequence error.**

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3.186 D conditioning: A North American term for a type of conditioning that controls harmonic distortion and signal-to-noise ratio, thus making transmission impairments lie within specified limits. *See also:* **C conditioning.**

3.187 DAA: Acronym for **direct access arrangement.**

3.188 data channel: *See:* **input-output channel.** [IEEE Std 610.10-1994]

3.189 data circuit: A circuit used to transmit data. *Syn:* **duplex circuit.**

3.190 data circuit-terminating equipment (DCE): A device that interfaces between the data terminal equipment (DTE) and the line.

3.191 data communication equipment (DCE): An equipment that transmits data from one point to another.

3.192 data communications: A data transfer between data source and data destination via one or more data links.

3.193 data concentrator: A concentrator that permits a common transmission medium to serve more data sources than there are channels available within the transmission medium.

3.194 data connection: The interconnection of two or more data circuits by means of switching equipment to enable data transmission to take place between DTEs. *See also:* **virtual data connection.**

3.195 data link: The assembly of parts of two data terminals that are controlled by a link protocol and an interconnecting data circuit to enable data to be transferred from a data source to a data sink. [ISO/IEC 2382]

3.196 data link escape (DLE) character: A transmission control character that changes the meaning of a limited number of contiguously following characters or coded representations to provide supplementary transmission control characters.

3.197 data link layer: The second layer of the OSI seven-layer model; provides error-free communication across the physical link. *Note:* This layer takes a bit stream from the physical layer, frames it into a data packet, appends leading and trailing headers for detection and correction of damaged packets and moves it to the network layer. It also performs the inverse operation on packets received from the network layer. *See also:* **application layer; client layer; data link layer; entity layer; logical link control sublayer; medium access control sublayer; network layer; physical layer; presentation layer; session layer; sublayer; transport layer.**

3.198 data multiplexer: A device that permits two or more data sources to share a common transmission medium.

3.199 data rate: *See:* **transfer rate.**

3.200 data service unit (DSU): A device that provides bipolar conversion functions to ensure proper signal shaping and adequate signal strength in a digital communications environment. *See also:* **channel service unit.**

3.201 data set: *See:* **modem.**

3.202 data signaling rate: The rate of data transmission, generally expressed as bits per second. *See also:* **baud rate.** [IEEE Std 610.10-1994]

3.203 data sink: The functional unit that accepts transmitted data. [ISO/IEC 2382] *Contrast with:* **data source.**

3.204 data source: The functional unit that originates data for transmission. [ISO/IEC 2382] *Contrast with:* **data sink.**

3.205 data station: *See:* **station**

3.206 data switch: A switch device that is designed to handle data communications rather than voice communications.

3.207 data switching exchange (DSE): In networking, the equipment installed at a single location to provide circuit switching, packet switching, or both functions. [ISO/IEC 2382]

3.208 data terminal equipment (DTE): A device that serves as a data source, a data sink, or both.

3.209 data transmission: The sending of data from one place to another.

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3.210 database server: On a network, a server that provides access to a database at the record level; that is, the server sends and locks only the records affected by a particular requestor. *See also:* **disk server; file server; mail server; network server; print server; terminal server.**

3.211 datagram: *See:* connectionless service.

3.212 dB: Abbreviation for **decibel.**

3.213 DB-9: The designation of a standard plug and jack set used in EIA/TIA-530-A [formerly RS-449] wiring. It has a 9-pin connector. *Note:* The connector is specific to ISO standard.

3.214 DB-25: The designation of a standard plug and jack set used in EIA/TIA-232-E [formerly RS-232-C] wiring. It has a 25-pin connector, with 13 pins in the top row and 12 in the bottom row. *Note:* The connector is specific to ISO standard.

3.215 DB-37: The designation of a standard plug and jack set used in EIA/TIA-530-A [formerly RS-449] wiring. It has a 37-pin connector. *Note:* The connector is specific to ISO standard.

3.216 DCE: (1) Acronym for data circuit-terminating equipment. (2) Acronym for data communication equipment.

3.217 DDD: Acronym for **direct distance dialing.**

3.218 de facto standard: A standard that is developed informally when a single entity develops a product or technology and, through success and imitation, that product or technology becomes so widely used that deviation causes compatibility problems or limits marketability. One such example is the Hayes modem handshake protocol. *Syn:* **defacto standard.** [IEEE Std 610.10-1994a]

3.219 decentralized computer network: A computer network in which control functions are distributed over several network nodes. *Contrast with:* **centralized computer network.** *See also:* **distributed computer network.**

3.220 decibel (dB): (1) A unit of measurement for the relative strength of a signal parameter such as power or voltage. [IEEE Std 610.10-1994] (2) The standard unit for expressing transmission gain or loss and relative power levels. Decibels indicate the ratio of power output to power input: $dB=10\log_{10}$ (Pout/Pin). *Note:* One decibel is 0.1 bel.

3.221 dedicated circuit: *See:* **leased circuit.**

3.222 dedicated line: *See:* **leased line.**

3.223 defacto standard: *See:* **de facto standard.**

3.224 deference: A process by which a data station delays its transmission when the channel is busy to avoid collision with ongoing transmissions.

3.225 delay distortion: A distortion on communication lines due to different speeds of signals at different frequencies in a given transmission medium. *Syn:* **phase distortion.**

3.226 delay time: In data communications, the wait time period between a signal sent and a signal received. *See also:* **propagation delay; time delay.**

3.227 demodulate: To receive signals transmitted over a communications computer; and to convert them into electrical pulses that can serve as inputs to a computer system. *Contrast with:* **modulate.**

3.228 demodulation: The reconversion of a modulated signal back into its original form by extracting the data from the modulated carrier. *Contrast with:* **modulation.**

3.229 demodulator-modulator: *See:* **modem.**

3.230 demultiplexer: An electronic switch with one input and several outputs. Encoded selection signals control which output is connected to the input. *Contrast with:* **multiplexer.**

3.231 demultiplexing: The separation from a common input into several outputs. For example, hardware may demultiplex signals from a transmission line based on time or carrier frequency to allow multiple, simultaneous transmissions across a single physical cable. *Contrast with:* **multiplexing.**

3.232 deterministic routing: A network routing strategy where the choice of destination drives the decision at each node, regardless of changing conditions in the network.

3.233 device: In networking, a unit that provides a means for inputting and outputting data over the transmission medium. *See also:* **station.**

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3.234 dial pulse: A means of pulsing that consists of regular, momentary interruptions of a direct or alternating current path in which the number of interruptions corresponds to the value of the digit or carrier.

3.235 dial-up circuit: A telecommunication circuit that is established and broken, under human or machine control, using the public switched network as the routing and transmission medium. *See also:* **foreign exchange circuit; four-wire circuit; leased circuit; simplex circuit; two-wire circuit.**

3.236 dial-up line: A line established on a circuit-switched network for public use. *Contrast with:* **leased line.**

3.237 digital data: Data in the form of discrete integral values. *Contrast with:* **analog data.** [IEEE Std 1084-1986a]

3.238 digital modem: *See:* **channel service unit.**

3.239 digital signal (DS): A discrete and/or discontinuous signal. *Contrast with:* **analog signal.** *See also:* **digitize.**

3.240 digital signal level: A hierarchy of transmission formats of digital signals.

3.241 digital signal level 1C (DS-1c): A digital transmission format in which forty eight digital signal level zero are time-division multiplexed together. *See also:* **T1C.**

3.242 digital signal level four (DS-4): A digital transmission format in which six digital signal level three are time-division multiplexed together. *See also:* **T4.**

3.243 digital signal level one (DS-1): A digital transmission format in which twenty-four digital signal level zero are time-division multiplexed together. *See also:* **T1.**

3.244 digital signal level three (DS-3): A digital transmission format in which seven digital signal level two are time-division multiplexed together. *See also:* **T3.**

3.245 digital signal level two (DS-2): A digital transmission format in which four digital signal level one are time-division multiplexed together. *See also:* **T2.**

3.246 digital signal level zero (DS-0): Fundamental transmission rate of the "digital signal level." *Note:* The data rate is 64 kb/s.

3.247 digital switching: A switching process in which connections are established by operations directly on the digital signals.

3.248 digital termination system (DTS): A form of local loop that connects private homes and/or business locations to the common carrier switching facility.

3.249 digitize: To convert an analog signal to a digital signal.

3.250 direct access arrangement (DAA): A circuit, typically used in modems, which allows a device to be connected to telephone lines.

3.251 direct distance dialing (DDD): A telephone exchange service that enables the telephone user to call long distance subscribers without operator assistance. *Syn:* **subscriber trunk dialing.**

3.252 disk server: On a network, a server that allows access to a disk storage device at the disk sector level; that is, the server sends absolute disk sectors to the requestor. *See also:* **database server; file server; mail server; network server; print server; terminal server.**

3.253 distortion: The change in waveform caused by outside interferences. *See also:* **delay distortion; end distortion; intermodulation distortion; phase distortion.**

3.254 distributed computer network: A network in which all node pairs are connected either directly or through redundant paths through intermediate nodes. *See also:* **centralized computer network; decentralized computer network.**

3.255 distributed polling: A polling technique in which all stations participate equally in the control of access to the transmission medium. *Contrast with:* **centralized polling.**

3.256 distributing frame: A structure for terminating permanent wires of a central office for permitting the easy change of connections between them by means of cross-connect wires.

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3.257 DLE character: Acronym for **data link escape character.**

3.258 drop cable: The small diameter flexible coaxial cable of the broadband medium that connects to a medium access unit. *See also:* **AUI cable; coaxial cable; transceiver cable; trunk cable.** [ISO/IEC 8802-3 : 1993]

3.259 DS: Acronym for **digital signal.**

3.260 DS-0: Acronym for **digital signal level zero.**

3.261 DS-1: Acronym for **digital signal level one.**

3.262 DS-1C: Acronym for **digital signal level one C.**

3.263 DS-2: Acronym for **digital signal level two.**

3.264 DS-3: Acronym for **digital signal level three.**

3.265 DS-4: Acronym for **digital signal level four.**

3.266 DSE: Acronym for **data switching exchange**.

3.267 DSU: Acronym for **data service unit.**

3.268 DTE: Acronym for **data terminal equipment.**

3.269 DTS: Acronym for **digital termination system.**

3.270 duplex circuit: *See:* **data circuit.**

3.271 duplex data circuit: A pair of associated transmit and receive channels that provide a means of two-way data communications. *See also:* **virtual circuit.**

3.272 duplex operation: A mode of operation of a data link or a data circuit in which data is transmitted in both directions simultaneously.

3.273 duplex transmission: Transmission in which data may be sent simultaneously in both directions on a transmission medium. *Contrast with:* **half-duplex transmission; simplex transmission.**

3.274 E-Mail: Abbreviation for **electronic mail.**

3.275 EACK: Acronym for **extended acknowledgment.**

3.276 ECC: Acronym for **error-correcting code.**

3.277 echo: **(1)** In a communication channel, noise characterized by undesired return of the transmitted signal back to the sender after a delay interval corresponding to the round-trip transmission time, caused by improper echo suppression or impedance mismatch. **(2)** A communication technique assuring that a word received at the termination point in a system is the same as the word originally transmitted. The received word is retransmitted to the sending device and matched to ensure that the original message was received properly.

3.278 echo check: An error control technique in which the receiving terminal or computer returns the original message to the sender to verify that the message was received correctly. *See also:* **echoplex.**

3.279 echoplex: An echo check applied to network terminals operating in duplex transmission to assure that data is received correctly at the other end.

3.280 ECSA: Acronym for **Exchange Carriers' Standards Association.**

3.281 EIA: Acronym for **Electronics Industries Association.**

3.282 EIA-232-D: *See:* **EIA/TIA-232-E.**

3.283 EIA-422-A: An EIA standard that specifies electrical characteristics for balanced transmission in which each of the main circuits has its own ground lead. *Note:* There is a 10 Mb/s limit on speed. *Syn:* **RS-422-A.**

3.284 EIA-423-A: An EIA standard that specifies electrical characteristics for unbalanced circuits using common or shared grounding techniques. *Note:* There is a 300 kb/s limit on speed. *Syn:* **RS-423-A.**

3.285 EIA/TIA-232-E: An EIA/TIA standard for asynchronous serial data communications between terminal devices, such as printers; computers; and communications devices, such as modems. *Note:* This standard defines a 25-pin (DB-25) connector and certain electrical and mechanical characteristics for interfacing computer equipment. There is a 20 kb/s limit on speed and 15 m (50 ft) cable limit. *Syn:* **EIA-232-D; RS-232; RS-232-C.**

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3.286 EIA/TIA-530-A: An EIA/TIA physical and mechanical standard that specifies cabling and connectors for EIA-422-A and EIA-423-A interfaces. This standard defines a 37-pin (DB-37) and 9-pin (DB-9) connector. *Syn:* **RS-449.**

3.287 eight-bit byte: *See:* **octet.**

3.288 either-way operation: *See:* **two-way alternate operation.**

3.289 electronic mail (EMAIL) (E-Mail): **(1)** A networking service that electronically provides all the basic services of traditional mail. *See also:* **mail exploder.** **(2)** A computerized store-and-forward system for electronic delivery of text memos and messages.

3.290 electronic signatures: The use of encryption techniques to authenticate a message as originating from a specific source, often utilizing a public key system.

3.291 electronic switching system (ESS): A type of telephone switching system that uses a special-purpose computer to direct and control the switching operation. *See also:* **crossbar system; step-by-step system.**

3.292 Electronics Industries Association (EIA): An organization that establishes and maintains standards for the electronics industries in the United States. [IEEE Std 610.10-1994a]

3.293 EMAIL: Abbreviation for **electronic mail.**

3.294 encapsulation: A technique used by layered protocols to carry foreign protocols in a network.

3.295 end connector: A female coupling which attaches to the ends of a coaxial cable section to interconnect sections. *Contrast with:* **barrel connector.**

3.296 end distortion: A distortion in the end of all marking pulses of start-stop teletypewriter signals from their proper positions in relation to the beginning of the start pulse.

3.297 end of transmission block (ETB) character: A transmission control character which indicates the end of a transmission block of data. *Syn:* **block character; transmission block character.**

3.298 end office: Class 5 office in the North American hierarchical routing plan; a switching center where subscriber's loops are terminated and where toll calls are switched through to called lines. *See also:* **central office; primary center; regional center; sectional center; toll center.** *Syn:* **local exchange; wire center.**

3.299 end point: A point at each end of a channel, line, or a circuit.

3.300 entity: In an open system, an element in a hierarchical division. *Note:* It has attributes that describe it, a name that identifies it, and an interface that provides management operations.

3.301 entity layer: In the OSI model, one of a collection of network-processing functions representing a level of a hierarchy of functions. *See also:* **application layer; client layer; data link layer; logical link control sublayer; medium access control sublayer; network layer; physical layer; presentation layer; session layer; sublayer; transport layer.**

3.302 equalization: The process of reducing the frequency and/or phase distortion of a circuit to compensate for the difference in attenuation and/or delay distortion.

3.303 equalizer: A device, such as a capacitor or resistor, inserted in a transmission line to improve its frequency response and thus compensate for distortion introduced by transmission facilities.

3.304 error: The difference between a computed, observed, or measured value or condition and the true, specified, or theoretically correct value or condition. For example: A difference of 30 m between a computed result and the correct result. *See also:* **burst error; frame check sequence error; parity error.** [IEEE Std 610.12-1990]

3.305 error-correcting code (ECC): A code containing redundant information that can be used to detect certain classes of errors and to restore a word, byte, character, quantity, or message to its correct representation. [IEEE Std 1084-1986]

3.306 error-detecting code: A code containing redundant information that can be used to detect certain classes of errors in a word, byte, character, quantity, or message. [IEEE Std 1084-1986]

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3.307 error control: A technique used to detect the presence of errors and add refinements to correct the detected errors. *See also:* **echo check.**

3.308 error rate: The ratio of the number of characters of a message incorrectly received to the total number of characters of the message received.

3.309 ESS: Acronym for **electronic switching system.**

3.310 ETB character: Acronym for **end of transmission block character.**

3.311 exception condition: A condition assumed by a secondary or remote station when it receives a command that it cannot execute, or when it receives data it cannot process.

3.312 exchange: *See:* **central office.**

3.313 exchange area: In North America, an area within which there is a single uniform set of charges for telephone service. An exchange area may be served by a number of end offices. *Note:* In Europe, the area of service of a single end office is an exchange area. A call between any two points within an exchange area is a local call.

3.314 Exchange Carriers' Standards Association (ECSA): The Secretariat for ASC T1, which develops the ASC T1's series of standards on telecommunication.

3.315 exchange service: In data communications, a service that permits interconnection of any two customers' stations through the use of the exchange system.

3.316 exchange system: In data communications, a system that controls the connection of incoming and outgoing lines.

3.317 extended acknowledgment (EACK): *See:* **selective acknowledgment.**

3.318 failure management: *See:* fault management.

3.319 fair queuing: In networking, a method for controlling congestion in a network node by restricting other nodes to an equal share of the node's bandwidth. *See also:* **source quench.**

3.320 fan-out box: A device that provides the capability to connect multiple devices to a single transceiver. *See also:* **tap.** *Syn:* **multi-port; multi-tap.**

3.321 fast packet switching: A packet switching technique in which formats and procedures are designed to minimize packet processing time. *See also:* **cell relay; frame relay.**

3.322 fault management: In networking, a management function that is defined for detecting, isolating, and recovering from abnormal network behavior. *Syn:* **failure management.**

3.323 FCC: Acronym for **U. S. Federal Communications Commission.**

3.324 FCS: Acronym for **frame check sequence.**

3.325 FDDI: Acronym for **fiber distributed data interface.**

3.326 FDM: Acronym for **frequency division multiplexing.**

3.327 FEC: Acronym for **forward error correction.**

3.328 fiber bundle: An assembly of unbuffered optical fibers, usually employed as a single transmission channel.

3.329 fiber distributed data interface (FDDI): An ANSI standard based on fiber optics configured in a dual, counter-rotating ring and operating at 125 million baud with a user data rate of 100 Mb/s. FDDI uses a token passing MAC so that it can operate on non-fiber media such as unshielded twisted pair. *Notes:* With the physical layer protocol overhead removed, the net throughput is 100 000 000 b/s and with the MAC overhead removed, the net throughput is less than 100 000 000 b/s. 2) For more information, refer to the specific ISO/IEC 9314 standard.

3.330 fiber optic cable: A cable containing one or more of the optical fibers. [ISO/IEC 8802-3 : 1993]

3.331 fiber optics: A technology that uses light as a digital information carrier. [IEEE Std 610.10-1994a]

3.332 file server: On a network, a server that provides access to requesters at the file level; that is, an entire file or a file segment is sent to a requestor. *See also:* **database server; disk server; mail server; network server; print server; terminal server.**

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3.333 file transfer protocol (FTP): A protocol for transferring files between computers.

3.334 fixed routing: A routing strategy for store-and-forward network, in which the next path to each specific destination is always the same at each point in the network.

3.335 FM: Acronym for **frequency modulation.**

3.336 forced collision: A collision that occurs when a packet is transmitted even when traffic is detected on the network and, therefore, the packet will collide with other packets already on the network.

3.337 foreign exchange (FX): An exchange that connects a customer's location to a remote customer.

3.338 foreign exchange circuit: A circuit that provides foreign exchange service. *See also:* **dial-up circuit; four-wire circuit; leased circuit; simplex circuit; two-wire circuit.**

3.339 foreign exchange service: A service that provides a connection between a customer and a central office other than the one that serves the exchange area in which the customer is located.

3.340 forward error correction (FEC): A technique that identifies errors incurred in transmission and allows corrections to be done at the receiving station without retransmission of the message. *See also:* **Hamming code.**

3.341 forward supervision: The use of supervisory sequences sent from a primary station or node to a secondary station or node. *Contrast with:* **backward supervision.** [ISO/IEC 2382]

3.342 four-wire circuit: A leased circuit in which two pairs of conductors are set up for a two-way transmission path. *See also:* **dial-up circuit; foreign exchange circuit; simplex circuit; two-wire circuit.**

3.343 four-wire terminating set: (1) An arrangement in which four-wire circuits are terminated on a two-wire basis for interconnection with two-wire circuits. **(2)** An arrangement by which a four-wire equivalent circuit is converted to a four-wire circuit.

3.344 frame: (1) A group of digits transmitted as a unit that carries a protocol data unit on a network. **(2)** A unit of transmission at the data link layer or, sometimes, the physical layer.

3.345 frame check sequence (FCS): A field in a bit-oriented protocol frame containing the remainder of the cyclic redundancy check calculation on the contents of the frame.

3.346 frame check sequence error: An error in which the frame check sequence value contained in a received frame does not match the frame check sequence value calculated by the receiver. *See also:* **cyclic redundancy check.**

3.347 frame relay: A fast packet switching technology that provides a virtual circuit service relaying variable-size frames but only employing physical layer and data link layer protocols. *See also:* **cell relay.**

3.348 frequency: The number of times per second that a wave cycle (one peak and one trough) repeats at a given amplitude.

3.349 frequency division multiplexing (FDM): A multiplexing technique for sharing a transmission channel wherein carrier signals of different frequencies are transmitted simultaneously.

3.350 frequency modulation (FM): A modulation technique in which a data signal is sent onto a carrier by modifying the transmitted frequency.

3.351 frequency shift keying (FSK): A modulation technique in which binary 0 and 1 are represented by two different frequencies. *See also:* **amplitude-shift keying; binary phase shift keying.**

3.352 frequency-derived channel: A channel obtained from multiplexing a channel by frequency division. [IEEE Std 610.10-1994]

3.353 front-end computer: A computer that interfaces between a group of terminals, communication links, and a host computer and performs communications, error checking code conversion, and other special purpose functions. *See also:* **communications computer.** *Syn:* **front-end processor.** [IEEE Std 610.10-1994a]

3.354 front-end processor: *See:* **front-end computer.**

3.355 FSK: Acronym for **frequency shift keying.**

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3.356 FTP: Acronym for **file transfer protocol.**

3.357 full duplex operation*: *See:* **two-way simultaneous operation.**
* Deprecated

3.358 full duplex transmission*: *See:* **duplex transmission.**
* Deprecated

3.359 functional grouping: A grouping of functions into sets such that all the functions within the same group are performed by a homogenous set of equipment. *Note:* Grouping is based upon equipment's function rather than upon the actual physical realization. One function may be spread over multiple physical boxes or one physical device may perform several functions.

3.360 functional model: An OSI management model that provides a conceptual and terminological framework for specific management functional areas.

3.361 functional unit: An entity of hardware and software, or both, capable of accomplishing a specified purpose.

3.362 FX: Acronym for **foreign exchange.**

3.363 gateway: (1) A dedicated computer that attaches to two or more networks and that routes packets from one to the other. (2) In networking, a device that connects two systems that use different protocols. *Contrast with:* **bridge.** *See also:* **mail gateway; router.**

3.364 Gaussian noise: Noise characterized by a wide frequency range with regard to the desired signal of communication channel, statistical randomness, and other stochastic properties.

3.365 GHz: Abbreviation for **gigahertz.**

3.366 gigahertz (GHz): A unit of frequency equal to 1 000 000 000 Hz, that is, 10^9 Hz.

3.367 Go-Back-N: A transmission scheme where the transmitter may send multiple PDUs without waiting for an acknowledgment. If the receiver indicates that an error occurred in a given PDU, the sender will retransmit the errored PDU and all subsequently transmitted PDUs. *Note:* In this scheme, the receiver will only accept PDUs in sequential order. *Contrast with:* **selective retransmission.**

3.368 half-duplex (HD or HDX) transmission: Transmission in which data may be sent in either direction but only in one direction at a time on a transmission medium. *Contrast with:* **duplex transmission; simplex transmission.**

3.369 Hamming code: Any of several error-correcting codes invented by the mathematician Richard Hamming, which use redundant information bits to detect and correct any single error in a transmitted character. [IEEE Std 1084-1986]

3.370 handshaking: The exchange of predetermined signals or control measures between two systems or system components upon initial exchanges. *Note:* When the connection is established, the two components acknowledge each other. [IEEE Std 610.10-1994]

3.371 HD: Acronym for half-duplex.

3.372 HDLC: Acronym for ISO's **high-level data link control protocol.**

3.373 HDX: Acronym for **half-duplex.**

3.374 headend: (1) A point where two or more half-duplex data paths are joined on the communications network. (2) The location in a broadband system that serves as the root for the branching tree comprising the physical medium; the point to which all inbound signals converge and the point from which all outbound signals emanate. [ISO/IEC 8802-3 : 1993]

3.375 header: The contiguous control bits preceding a frame, packet, block, or other data stream of bits that contain information about the message such as the address, type of frame, and/or sequencing. *Contrast with:* **trailer.**

3.376 header hub (HH): The highest-level hub in a hierarchy of hubs. The header hub broadcasts signals transmitted to it by lower-level hubs or DTEs, such that they can be received by all DTEs that may be connected to it, either directly or through intermediate hubs. *Note:* This term is contextually specific to IEEE Std 802.3, clause 12. [ISO/IEC 8802-3 : 1993]

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3.377 heartbeat: A signal or a message passed between cooperating processes to indicate continuing proper operations. *See also:* **signal quality error heartbeat.**

3.378 hertz (Hz): A unit of frequency, equal to one cycle per second. *See also:* **carrier frequency; gigahertz; megahertz.**

3.379 heterogeneous computer network: A computer network of different host computers, such as those of different manufacturers. *Contrast with:* **homogeneous computer network.**

3.380 heterogeneous LAN: A network of interconnected LANs of mixed media access control types. *Contrast with:* **homogeneous LAN.**

3.381 HH: Acronym for **header hub.** *Note:* This term is contextually specific to IEEE Std 802.3, clause 12.

3.382 hierarchical computer network: A computer network in which processing and control functions are performed at several levels by computers suited for the functions performed.

3.383 hierarchical routing: A routing based on a hierarchical addressing scheme. *Note:* There are five classes of telephony offices in the North America:

class 1 office: regional center
class 2 office: sectional center
class 3 office: primary center
class 4 office: toll center
class 5 office: end office

3.384 high-level data link control (HDLC) protocol: A standard protocol, defined by ISO, for bit-oriented, frame-delimited data communication protocol.

3.385 hold time: The total time that a trunk, channel, or circuit is occupied by a call.

3.386 homogeneous computer network: A computer network of similar host computers, such as those of one model by the same manufacturer. *Contrast with:* **heterogeneous computer network.**

3.387 homogeneous LAN: A network of interconnected LANs, all of which use the same media access control type. *Contrast with:* **heterogeneous LAN.**

3.388 host: *See:* **host computer.**

3.389 host computer: **(1)** The primary or controlling computer in a multiple computer installation. *Syn:* **host; host machine.** [IEEE Std 610.10-1994] **(2)** The primary or controlling processor in a multiprocessor computer or a computer with multiple processing elements, some of which may be dedicated to specific functions. For example, intelligent adapters; math coprocessors. *Syn:* **host processor.**

3.390 host interface: The interface between a communications network and a host computer. [IEEE Std 610.10-1994]

3.391 host machine: *See:* **host computer (1).**

3.392 host processor: *See:* **host computer (2).**

3.393 hub: **(1)** A device to which multiple LAN station lobes are connected. *Note:* Multiple hubs may be interconnected to create a single LAN. In some circumstances the hub may implement a part of the LAN protocols. *See also:* **bridge; gateway; router.** **(2)** A socket on a control panel or plugboard into which an electrical lead or plug wire may be connected in order to carry signals—particularly to distribute the signals over many other wires. **(3)** A device used to provide connectivity between DTEs. Hubs perform the basic functions of restoring signal amplitude and timing, collision detection and notification, and signal broadcast to lower-level hubs and DTEs. *Note:* Definition (3) is specific to IEEE Std 802.3, clause 12. [ISO/IEC 8802-3 : 1993]

3.394 hunt group: A series of telephone numbers in sequence that allows a calling party to connect with the first available line.

3.395 hybrid network: A local area network or wide area network that contains a mixture of topologies and access methods.

3.396 Hz: Abbreviation for **hertz.**

3.397 IC: Acronym for **interexchange carrier.**

3.398 IDL: Acronym for **idle.**

3.399 idle (IDL): A signal condition where no transition occurs on the transmission line. *Note:* Idle is used to define the time between packets. [ISO/IEC 8802-3 : 1993]

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3.400 IEC: Acronym for **interexchange carrier.**

3.401 IEEE: Acronym for **Institute of Electrical and Electronics Engineers.**

3.402 IEEE 802: *See:* **LAN/MAN Standards Committee.**

3.403 IEEE Standard: A standard published by the Institute of Electrical and Electronics Engineers.

3.404 IH: Acronym for **intermediate hub.** *Note:* This term is contextually specific to IEEE Std 802.3, clause 12.

3.405 impedance: The resistance to the flow of alternating current in a circuit.

3.406 impulse noise: Noise characterized by electrical pulses of high amplitude and narrow width, often originating from switching devices or electrical storms.

3.407 in-band signaling: The transmission of a signal using a frequency that is within the bandwidth of the information channel. *Syn:* **in-channel signaling.** *Contrast with:* **out-of-band signaling.**

3.408 in-channel signaling: *See:* **in-band signaling.**

3.409 in-house system: *See:* **in-plant system.**

3.410 in-plant system: A communications system whose parts, including remote terminals, may be all situated in one building or several buildings. *Syn:* **in-house system.**

3.411 inductance: A force that resists the sudden buildup of electric current. *Note:* Inductance can cause errors during transmission.

3.412 information source: *See:* **message source.**

3.413 input-output channel: A channel that handles the transfer of data between internal storage and peripheral equipment. *See also:* **input-output controller.** *Syn:* **data channel.** [IEEE Std 610.10-1994]

3.414 input-output controller (IOC): A controller that controls one or more input-output channels. *See also:* **input-output channel.** *Syn:* **peripheral controller.** [IEEE Std 610.10-1994]

3.415 insertion loss: The signal loss that results when a channel is inserted between a transmitter and a receiver, which is the ratio of the signal level delivered to a receiver before a channel is inserted to the signal level after the channel is inserted. [ISO/IEC 8802-5 : 1992]

3.416 Institute of Electrical and Electronics Engineers (IEEE): An international professional organization that is accredited by American National Standards Institute to develop standards for them. [IEEE Std 610.10-1994a]

3.417 interexchange carrier (IC) (IEC) (IXC): In the United States, a common carrier limited by law to carry telephone traffic between local exchange and transport areas.

3.418 interexchange channel (IXC): A direct channel or circuit between exchanges.

3.419 interface: **(1)** A shared boundary between two objects, such as devices, systems, or networks, across which information is passed. [IEEE Std 610.12-1990a] **(2)** Hardware or software that provides a point of communication between two or more processes, persons, or other physical entities. [IEEE Std 610.10-1994]

3.420 interLATA: In the United States, a collection of circuits that cross local access and transport area boundaries and are passed onto an interexchange carrier. *See also:* **intraLATA.**

3.421 intermediate hub (IH): A hub that occupies any level below the header hub in a hierarchy of hubs. *Note:* This term is contextually specific to IEEE Std 802.3, clause 12. [ISO/IEC 8802-3 : 1993]

3.422 intermediate system: In OSI context, an open system that performs a relay function that is neither the data source nor the data sink for a given instance of communication.

3.423 intermodulation distortion: An analog line impairment in which modulation on one channel or at one frequency distorts the modulation on another channel or frequency.

3.424 intermodulation noise: Noise characterized by the intermodulation of signals from two independent lines or separate components of the desired signal causing interference.

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3.425 International Organization for Standardization (ISO): An international organization that establishes and maintains standards for many different industries. [IEEE Std 610.10-1994a]

3.426 International Telecommunication Union–Telecommunications Standardization Sector (ITU–TSS): An international organization formerly known as Consultative Committee on International Telegraphy and Telephony (CCITT). *Note:* In March 1993 the CCITT was reorganized and renamed as ITU–TSS.

3.427 internetworking: The network communication that occurs among devices across multiple networks.

3.428 interoffice trunk: A trunk connecting two telephone offices.

3.429 intraLATA: In the United States, a collection of circuits that are totally within a single local access and transport area and are the sole responsibility of the local telephone company. *See also:* **interLATA.**

3.430 IOC: Acronym for **input-output controller.**

3.431 ISO: Acronym for **International Organization for Standardization.**

3.432 ISO Standard: A standard approved and published by International Organization for Standardization.

3.433 ITU–TSS: Acronym for **International Telecommunication Union–Telecommunications Standardization Sector (ITU–TSS).**

3.434 IXC: (1) Acronym for **interexchange carrier.** (2) Acronym for **interexchange channel.**

3.435 jabber: A condition wherein a station transmits for a period of time longer than the maximum permissible packet length, usually due to a fault condition. [ISO/IEC 8802-3 : 1993]

3.436 jabber control: The ability of a station to interrupt automatically the transmission of data and inhibit an abnormally-long output data stream. *Note:* This term is contextually specific to IEEE Std 802.3.

3.437 jack: A connecting device within a circuit to which one or more wires may be attached and which is arranged so that a plug may be attached. *See also:* **RJ-11; RJ-45.**

3.438 jam: (1) An external signal introduced deliberately into a transmission to prevent successful transmission. (2) A signal that carries a message that informs other stations that they must not transmit.

3.439 jitter: The time varying phase of a pulse train relative to the phase of the reference pulse train. *See also:* **amplitude jitter; phase jitter.**

3.440 junction point: *See:* **node.**

3.441 Ka-band: A range of high frequencies (20–30 GHz) allotted for satellite transmission.

3.442 Karn's algorithm: An algorithm that allows transport protocols to distinguish between good and bad round trip time samples, thus improving round trip estimation.

3.443 key distribution system: The manual or automated means by which cryptographic keys are communicated between nodes of a computer or communications system.

3.444 kHz: Acronym for **kilohertz.**

3.445 kilohertz (kHz): A unit of frequency equal to 1000 Hz, that is, 10^3 Hz.

3.446 Ku-band: A range of microwave frequencies (15–17 GHz) whose uses include satellite transmission.

3.447 LAN: Acronym for **local area network.**

3.448 LAN/MAN Standards Committee (LMSC): The IEEE standards committee that develops LAN and MAN standards. *Syn:* **IEEE 802.**

3.449 LAN/WAN communications architecture: A communications architecture that supports LAN and WAN networks.

3.450 LATA: Acronym for **local access and transport area.**

3.451 layer: In the OSI model, one of a collection of network-processing functions representing a level of a hierarchy of functions. *See also:*

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application layer; client layer; data link layer; entity layer; logical link control sublayer; medium access control sublayer; network layer; physical layer; presentation layer; session layer; sublayer; transport layer.

3.452 layered protocol: A protocol to follow the layering principle so that layer *n* at the destination machine receives exactly what layer *n* at the source machine sends.

3.453 learning bridge: A bridge that learns the location of attached stations by examining the address in the frames that it processes. *See also:* **mail bridge.**

3.454 leased circuit: A telecommunication circuit that provides a clear unbroken communications path from one station to another and that is always available for use. *See also:* **dial-up circuit; foreign exchange circuit; four-wire circuit; simplex circuit; two-wire circuit.** *Syn:* **dedicated circuit.**

3.455 leased line: A line contracted out for exclusive use from a common carrier. *Syn:* **dedicated line; private line.** *Contrast with:* **dial-up line.**

3.456 line: **(1)** A circuit connecting two or more devices. [IEEE Std 610.10-1994] **(2)** The portion of a data circuit that is external to data circuitry terminating equipment, and that either connects the data circuit-terminating equipment to one or more other data circuit-terminating equipment or connects the data switching exchange to other data switching exchanges. *See also:* **channel; link.**

3.457 line conditioning: *See:* **conditioning.**

3.458 line load: A measure of the maximum capacity that can be handled by a circuit or line.

3.459 line protocol: A protocol that uses a control program to perform data communication functions, such as moving the data between transmit and receive locations over network lines.

3.460 line switch: *See:* **step-by-step switch.**

3.461 line switching: *See:* **circuit switching.**

3.462 line switching system: *See:* **step-by-step system.**

3.463 link: A channel or a point-to-point line. *See also:* **circuit; line.** [IEEE Std 610.10-1994a]

3.464 link communication: A physical means of connecting one location to another for the purpose of transmitting and receiving information.

3.465 link protocol: In OSI, a protocol that ensures that the transmission of bits received are the same as the bits sent.

3.466 linkage product: A device that provides an interface between network segments such as gateways or bridges.

3.467 LLC sublayer: Acronym for **logical link control sublayer.**

3.468 LMSC: Acronym for **Local and Metropolitan Area Networks Standards Committee.**

3.469 load: **(1)** In computer operations, the amount of scheduled work to be performed on a computer system. *See also:* **line load.** [IEEE Std 610.10-1994] **(2)** In electronics, the amount of current drawn by a device. *Note:* This determines the "drive strength" of the circuit. *See also:* **loading.** [IEEE Std 610.10-1994]

3.470 load sharing: Distributing a given load among two or more computers on a network.

3.471 loading: Adding reactance in a circuit to minimize amplitude distortion. [IEEE Std 610.10-1994a]

3.472 local access and transport area (LATA): In the United States, a local geographic area in which a local telephone company is allowed to offer communications services. *See also:* **interLATA, intraLATA.**

3.473 local area network (LAN): A computer network in which communication is limited to a geographic span of a few kilometers. *Note:* The medium is generally of a wider bandwidth than that provided by commercial carrier, the packet length frequently is much larger than network propagation time, and the bit error rate in the physical medium is on the order of one bit in 10^8 or better. *See also:* **metropolitan area network; wide area network.** *Syn:* **local network.** *Contrast with:* **long haul network.**

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3.474 local central office: *See:* **central office.**

3.475 local exchange: *See:* **end office.**

3.476 local line: *See:* **local loop.**

3.477 local loop: A line connecting a subscriber's instrument or private branch exchange directly to the local end office. *Syn:* **local line; subscriber's loop.**

3.478 local network: *See:* **local area network.**

3.479 local systems environment: An environment in which information processing systems or resources are not conforming to the services and protocols of OSI. *Contrast with:* **OSI environment.**

3.480 logical device: In networking, an abstract specification of the operation of a physical device.

3.481 logical link control (LLC) sublayer: The upper sublayer of the data link layer of the seven-layer OSI model; provides media-independent functions and the logical connection between the stations within the local area network. *See also:* **application layer; client layer; data link layer; entity layer; medium access control sublayer; network layer; physical layer; presentation layer; session layer; sublayer; transport layer.**

3.482 login: The process of establishing communication with and verifying the authority to use a network or computer. *Syn:* **logon; sign-on.** *Contrast with:* **logoff.** [IEEE Std 610.10-1994]

3.483 logoff: The process of terminating communication with a computer. *Syn:* **logout; sign-off.** *Contrast with:* **login.** [IEEE Std 610.10-1994]

3.484 logon: *See:* **login.**

3.485 logout: *See:* **logoff.**

3.486 long haul network: A computer network most frequently used to transfer data over distances from several thousand feet to several thousand miles. *Contrast with:* **local area network.** *See also:* **metropolitan area network; wide area network.**

3.487 long packet: A packet with a length of over 1518 B. *Syn:* **over-sized packet.** *Contrast with:* **short packet.** [IEEE Std 610.10-1994]

3.488 longitudinal redundancy check (LRC): A parity check performed bit-wise on the rows of a string of characters represented in matrix form, with each bit for each character representing one column in the matrix. *Note:* The LRC is the comparison of the parity of the rows before and after an operation such as a magnetic tape read or transmission through a data communication channel. *See also:* **vertical redundancy check.**

3.489 loop topology: *See:* **ring topology.**

3.490 loopback test: A test for faults over a transmission medium in which received data is returned to the sending point and compared with the data sent, thus completing a loop.

3.491 LRC: Acronym for **longitudinal redundancy check.**

3.492 MAC sublayer: Acronym for **medium access control sublayer.**

3.493 mail bridge: A bridge that screens mail that is passing between two networks to ensure that the mail items meet administrative constraints. *See also:* **learning bridge.**

3.494 mail exploder: The part of an electronic mail delivery system that accepts a piece of mail and a list of addressees as input and sends a copy of the message to each addressee on the list.

3.495 mail gateway: A device that connects to two or more electronic mail systems, especially dissimilar mail systems on two different networks, and transfers mail messages between them.

3.496 mail server: On a network, a server that allows users to exchange mail messages. *See also:* **database server; disk server; file server; network server; print server; terminal server.**

3.497 main distribution frame (MDF): *See:* **wiring closet.**

3.498 main distribution function (MDF): *See:* **wiring closet.**

3.499 MAN: Acronym for **metropolitan area network.**

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3.500 management: A process that consists of functions such as planning, organizing, controlling and supervising, and is performed to set and meet the stated objectives.

3.501 management information model: A model that identifies the entities and their relationships that participate in managing an OSI environment.

3.502 Manchester encoding: A method of encoding data in which separate data and clock signals can be combined into a single, self-synchronizable data stream, suitable for transmission on a serial channel.

3.503 master station: A station that controls other terminals sharing multiple-access transmission medium on a multipoint circuit.

3.504 matrix of controls: In networking, a two-dimensional matrix that shows the relationship between all the controls in the communications network and the specific threats they mitigate.

3.505 MAU: Acronym for **medium attachment unit**. *Note:* This term is contextually specific to IEEE Std 802.3.

3.506 maximum transfer unit (MTU): The largest amount of data that can be transferred across a given physical network.

3.507 MDF: **(1)** Acronym for **main distribution frame.** **(2)** Acronym for **main distribution function.**

3.508 media: **(1)** A means of communication. [IEEE Std 610.10-1994] **(2)** Material on which information can be stored or transported. *Note:* Media is the plural form of medium. [IEEE Std 610.10-1994]

3.509 medium: In data communications, a path over which communication flows, such as coaxial cable; optical fiber. *Note:* Medium is the singular form of media. [IEEE Std 610.10-1994]

3.510 medium access control (MAC) sublayer: The lower sublayer of the data link layer of seven-layer OSI model; provides topology-dependent functions between the physical layer and the logical link control sublayer. *See also:* **application layer; client layer; data link layer; entity layer; logical link control sublayer; network layer; physical layer; presentation layer; session layer; sublayer; transport layer.**

3.511 medium attachment unit (MAU): In a local area network, a device used in a data station to couple the data terminal equipment (DTE) to the transmission medium. *Note:* This term is contextually specific to IEEE Std 802.3. [ISO/IEC 8802-3 : 1993]

3.512 megahertz (MHz): A unit of frequency equal to 1 000 000 Hz, that is, 10^6 Hz.

3.513 message: An ordered series of characters used to convey information.

3.514 message sink: The part of a communications system that is the final destination of a message. *Contrast with:* **message source.**

3.515 message source: The part of a communications system from which a message originates. *Syn:* **information source.** *Contrast with:* **message sink.**

3.516 message switching: In data communications, a method of transporting messages by receiving, storing, and forwarding complete messages over communications networks. *See also:* **circuit switching; space-division switching; time-multiplexed switching.**

3.517 metropolitan area network (MAN): A computer network in which the geographic span is generally 5–50 km and operates at speeds greater than 1 Mb/s with physical layer data error ratio comparable to a LAN. *See also:* **local area network; long haul network; wide area network.**

3.518 MHz: Abbreviation for **megahertz.**

3.519 microwave: Pertaining to the portion of the radio frequency spectrum above 1 GHz. *See also:* **microwave link.**

3.520 microwave link: A communications system in which information is conveyed by microwave transmissions.

3.521 minimum bend radius: The curvature to which a cable can be bent without sustaining damage or significant degradation of performance.

3.522 misaligned frame: A frame that erroneously includes a fragmentary byte and that contains a frame check sequence error. *Note:* This term is contextually specific to IEEE Std 802.3.

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3.523 modem: (1) A device that performs modulation and demodulation functions necessary to transmit signals over communication lines. *Note:* This term originated as an abbreviation for modulator-demodulator. *See also:* **acoustic coupler.** *Syn:* **data set; demodulator-modulator; modulator-demodulator.** (2) A device that transforms a digital signal received into an analog signal and vice versa.

3.524 modulate: (1) To convert voice or data signal for transmission over a communications network. *Contrast with:* **demodulate**. (2) To vary one or more attributes of a carrier (amplitude, frequency, phase) such that the frequency information in the modulating signal can be recovered by its inverse process.

3.525 modulation: The process of changing or regulating the characteristics of a carrier that is vibrating at a certain amplitude and frequency so that the variations represent meaningful information. *Contrast with:* **demodulation.**

3.526 modulator: A device that converts a signal into a modulated signal that is suitable for transmission.

3.527 modulator-demodulator: *See:* **modem.**

3.528 MTU: Acronym for **maximum transfer unit.**

3.529 multi-access contention protocol: The protocol used on the Aloha network by which a station transmits a message at will and then listens for an acknowledgment. If no ACK is received within a randomly selected timeout interval, the message is re-transmitted.

3.530 multi-mode optical fiber: An optical fiber that has a relatively large core in which the light bounces off the walls of the core. This results in multiple signal paths through the fiber which limits the maximum signaling rate more and more as the fiber length increases. *See also:* **single-mode optical fiber.**

3.531 multi-port: *See:* **fan-out box.**

3.532 multi-tap: *See:* **fan-out box.**

3.533 multicast: A technique that allows copies of a single packet to be passed to a selected subset of all possible destinations. *Contrast with:* **broadcast.**

3.534 multidrop: Pertaining to a communication arrangement where several devices share a common transmission channel. *Contrast with:* **multipoint.** *See also:* **point-to-point.**

3.535 multilevel network subject: A network subject that causes information to flow through a network at two or more security levels without risk of compromise by transmitting sensitivity labels along with the data. *Contrast with:* **single-level network subject.**

3.536 multiplexer (MUX): (1) A device that allows the transmission of a number of different signals simultaneously over a single channel or transmission facility. *Syn:* **multiplexor.** (2) A device capable of interleaving the events of two or more activities or of distributing the events of an interleaved sequence to their respective activities. *Contrast with:* **demultiplexer.**

3.537 multiplexing: Subdivision of a common channel to make two or more channels by splitting the frequency band transmitted by the common channel into narrower bands, by allotting this common channel to several different information channels, or by other means, one at a time. *Contrast with:* **demultiplexing.** *See also:* **frequency division multiplexing; synchronous time division multiplexing; time compression multiplexing; time division multiplexing; time division bus switching; time multiplexed switching.**

3.538 multiplexor: *See:* **multiplexer.**

3.539 multipoint: Pertaining to a circuit or a communication arrangement where one line connects several stations. *Contrast with:* **multidrop**. *See also:* **point-to-point.**

3.540 multipoint connection: A connection between two data stations using one or more intermediate stations.

3.541 MUX: Abbreviation for **multiplexer.**

3.542 N-type: A constant impedance connector compatible with certain coaxial cables.

3.543 NAK: Acronym for **Negative Acknowledgment.**

3.544 NCP: Acronym for **network control program.**

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3.545 near-end crosstalk (NEXT): Crosstalk that is propagated in a distributed channel in the direction opposite to the direction of the propagation of the signal in the disturbing channel and is measured at or near the source of the disturbing signal. *Note:* This term is also defined in IEEE Std 802.3, clauses 12 and 14. [ISO/IEC 8802-5 : 1992]

3.546 negative acknowledgment (NAK): A reply transmitted by a receiving station to inform the sending station that an error in data has been detected. *Contrast with:* **acknowledgment of a message.**

3.547 net: (1) One complete circuit connecting at least one output to at least one input. *Note:* Must be some form of conductor such as a wire. [IEEE Std 610.10-1994] (2) Abbreviation for **network.** [IEEE Std 610.10-1994]

3.548 network (net): (1) An arrangement of components, or nodes, and interconnecting branches. *See also:* **centralized computer network; circuit-switched network; communications network; computer network; decentralized computer network; distributed computer network; packet switching network; private network; public circuit-switched network; public data network; public packet switching network; public switched network; software defined network; store-and-forward switched network; switched network; value-added network.** [IEEE Std 610.10-1994a] (2) *See:* **circuit.** [IEEE Std 610.10-1994]

3.549 network control program (NCP): A software program that deals with the operation of a front-end computer or communications controller.

3.550 network hierarchy: In data communications, a network with a single computer having control over all the nodes connected to it.

3.551 network interface controller: A communication device which permits the connection of information processing devices to a network.

3.552 network interface definition language (NIDL): A model, proposed by the Institute of Electrical and Electronics Engineers, for parallel processing and logical process partitioning across a distributed computer network.

3.553 network layer: The third layer of the seven-layer OSI model; responsible for establishing routes between the sending and receiving stations. *Note:* This layer appends and removes routine headers on the data packets, selects paths for them, and regulates their flow to prevent congestion. The network layer may use intermediate systems. *See also:* **application layer; client layer; data link layer; entity layer; logical link control sublayer; medium access control sublayer; physical layer; presentation layer; session layer; sublayer; transport layer.**

3.554 network management: In networking, a management function defined for monitoring, controlling, and coordinating the resources which allow communication to take place. *See also:* **accounting management; configuration management; fault management; performance management; security management.**

3.555 network management environment: An environment in which information processing system or resources communicate conforming to the services and protocols of network management.

3.556 network management protocol: A protocol in which objects can be accessed in a network management environment.

3.557 network management system: A system that monitors, controls, and coordinates the resources to facilitate communication. *See also:* **accounting management; configuration management; fault management; performance management; security management.**

3.558 network object: In computer security, a passive entity on a computer network that contains or receives information. For example: a data file, video display, clock, or printer. *Contrast with:* **network subject.**

3.559 network operations center: A center that is responsible for the operational aspects of a network. *Note:* Among these are monitoring and controlling, trouble-shooting, user-assistance.

3.560 network server: On a network, a server that provides special network applications to all users at the network level; that is, it allows all users to share files more easily and have larger file storage areas available for their use. *See also:* **database server; disk server; file server; mail server; print server; terminal server.**

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3.561 network service: An application, such as file transfer protocol, available on a network.

3.562 network subject: In computer security, an active entity on a computer network that causes information to flow through the network or changes the network state. For example, a processor or program operating in support of a process or user requirement. *See also:* **multilevel network subject; single-level network subject.** *Contrast with:* **network object.**

3.563 NEXT: Acronym for **near-end crosstalk.**

3.564 NIDL: Acronym for **network interface definition language.**

3.565 no-backoff error: A transmission state that results from a transceiver transmitting when there is no carrier, and without waiting for the necessary delay.

3.566 nodal point: *See:* **node.**

3.567 node: **(1)** In networking, a point or a junction in a transmission system where lines or trunks from one or more systems meet. *Syn:* **branch point; junction point; nodal point; vertex.** **(2)** In data communications, a device or station that implements some part of the communication protocol.

3.568 noise: **(1)** Any unwanted disturbance in a system, such as random variations in voltage or current, or extra bits in data. **(2)** Any unwanted variation in a signal. *See also:* **crosstalk; Gaussian noise; impulse noise; intermodulation noise; white noise.**

3.569 object: An abstraction of a physical or logical resource.

3.570 octet: A byte composed of 8 bits. *Syn:* **eight-bit byte.** [IEEE Std 610.10-1994]

3.571 off-hook: In regard to a telephone set, activated—that is, a telephone set is in use. The off-hook condition indicates a "busy" condition to incoming calls. *Contrast with:* **on-hook.**

3.572 on-hook: In regard to a telephone set, deactivated—that is, a telephone set is not in use. *Contrast with:* **off-hook.**

3.573 one-way-only operation: A mode of operation of a data link in which data may be transmitted in a preassigned direction over one channel. *See also:* **two-way alternate operation; two-way simultaneous operation.** *Syn:* **simplex operation.**

3.574 open network: A network that can be accessed from computers or terminals external to the network, using dial-up or dedicated lines, or other means. *Contrast with:* **closed network.**

3.575 open systems interconnection (OSI) model: A computer network architecture model proposed as a standard model by the International Organization for Standardization. The model consists of seven layers, each consisting of entities, or sets of functions performed on bits, frames, packets, or messages. *Note:* Enables any OSI-compatible computer or device to communicate with any other OSI-compliant computer or device for a meaningful exchange of information. *Syn:* **OSI Reference model.**

3.576 optical cable: A cable in which one or more of the conductors is an optical fiber, multiple fibers, or a fiber bundle fabricated to meet optical, mechanical, and environmental specifications. *Syn:* **optical fiber bundle; optical fiber cable.**

3.577 optical fiber: A filament-shaped optical waveguide made of dielectric materials.

3.578 optical fiber bundle: *See:* **optical cable.**

3.579 optical fiber cable: *See:* **optical cable.**

3.580 organizational model: An OSI management model that describes the distribution of management controls in the OSI environment.

3.581 OSI: Acronym for **open systems interconnection.**

3.582 OSI environment: An environment in which information processing system or resources communicate conforming to the services and protocols of OSI. *Contrast with:* **local systems environment.**

3.583 OSI model: Acronym for **open systems interconnection model.**

3.584 OSI reference model: *See:* **open systems interconnection model.**

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3.585 out-of-band signaling: The transmission of a signal using a frequency that is within the pass band of the transmission facility but outside a frequency range normally used for data transmission. *Contrast with:* **in-band signaling.**

3.586 over-sized packet: *See:* **long packet.**

3.587 overhead bit: In data communications, additional bits transmitted for control framing, synchronization, and error checking purposes.

3.588 PABX: Acronym for private automatic branch exchange. *See:* **private branch exchange.**

3.589 packet: A unit of data of some finite-size that is transmitted as a unit. *Note:* Usually consists of a header containing control information such as a sequence number, the network address of the station that originated the packet, and the network address of the packet's destination. *See also:* **long packet; short packet.** [IEEE Std 610.10-1994]

3.590 packet assembler/disassembler (PAD): A protocol conversion device that performs packet assembly/disassembly. *Note:* Generally refers to a terminal multiplexer device that connects hosts and terminals on a network.

3.591 packet assembly/disassembly (PAD): The process of dividing a message into packets for transmission over a packet switching network and then reassembling the packets in the original message.

3.592 packet data network: *See:* **packet switching network.**

3.593 packet error: An error that occurs when a packet is lost in the network. *See also:* **abnormal preamble; address error; alignment error; type error.**

3.594 packet switched network: *See:* **packet switching network.**

3.595 packet switching: A technique used in data communications in which messages are broken into finite-size packets and are forwarded to the other party over the network. Packets may vary in size so long as the size does not exceed the maximum size convention for the local network or protocol in use. *Note:* The packets need not travel the same path. At the end of the circuit, the packets are reassembled into the messages and are then passed on to the receiving terminals. *Contrast with:* **cell switching.** *See also:* **fast packet switching; virtual circuit.**

3.596 packet switching network: A network that uses packet switching techniques for transmission of data. *Syn:* **packet data network; packet switched network.**

3.597 PAD: (1) Acronym for **packet assembler/disassembler.** (2) Acronym for **packet assembly/disassembly.**

3.598 PAM: Acronym for **pulse amplitude modulation.**

3.599 parallel transmission: In data communications, the simultaneous transmission of all the bits making up a character or byte where each bit travels on a different path. *Contrast with:* **serial transmission.**

3.600 parity: The value, even or odd, of the sum of a string of binary digits. For example, the parity of the string 0000111101001 is even. *Contrast with:* **cyclic redundancy check.** *See also:* **parity bit; parity check; parity error.**

3.601 parity bit: An extra bit attached to a byte, character string, or word, used to enable detection of transmission errors. Based on system convention, the bit is set making the number of ones in a grouping of bits either always even or always odd. *Note:* This permits detection of bit groupings containing single errors. [IEEE Std 610.10-1994a]

3.602 parity check: An error detecting code that uses the parity bit(s). *Contrast with:* **cyclic redundancy check.** *See also:* **longitudinal redundancy check; vertical redundancy check.**

3.603 parity error: An error that occurs when the parity bit of a string is found to be incorrect.

3.604 pass band: A range of frequencies transmitted to a terminal at low attenuation. *See also:* **bandwidth.**

3.605 path: *See:* **channel; channel path.**

3.606 PAX: Acronym for **private automatic exchange.**

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3.607 PBX: Acronym for **private branch exchange.**

3.608 PCM: Acronym for **pulse code modulation.**

3.609 PDM: Acronym for **pulse duration modulation.** *See:* **pulse width modulation.**

3.610 PDN: Acronym for **public data network.**

3.611 PDU: Acronym for **protocol data unit.**

3.612 peer-to-peer communication: (1) Communication between two or more processes or programs by which both computers can exchange data freely. *Note:* Any physical differences between the computers are rendered transparent to the application. (2) Communication between two or more network nodes in which either node can initiate sessions, and is able to poll or answer to polls.

3.613 performance management: In networking, a management function defined for controlling and analyzing the throughput and error rate of the network.

3.614 peripheral controller: *See:* **input-output controller.**

3.615 permanent virtual circuit (PVC): A virtual circuit that is established at service subscription time and always connects the same two user end points. *Note:* Bandwidth on a PVC is always available but lacks the flexibility of dynamically connecting to different end users. *See also:* **switched virtual circuit.**

3.616 permissive connection: A connection in which non-voice information can be sent over the voice communications network. *See also:* **programmable connection; RJ-45.**

3.617 phase distortion: *See:* **delay distortion.**

3.618 phase jitter: An instability in the phase of a transmission signal. *See also:* **amplitude jitter.**

3.619 phase modulation (PM): A modulation technique in which a data signal is sent onto a fixed carrier frequency by modifying the phase of the carrier.

3.620 physical layer: The first layer of the seven-layer OSI model; responsible for transporting bits between adjacent systems. *Note:* This layer accepts a bit stream, called a frame, from the data link layer and places it on the media. It also performs the inverse operation of extracting a bit stream from the physical media and passes it to the data link layer. This layer describes mechanical and electrical characteristics of the connection, as well as the required interchange circuits. *See also:* **application layer; client layer; data link layer; entity layer; logical link control sublayer; medium access control sublayer; network layer; presentation layer; session layer; sublayer; transport layer.**

3.621 physical medium attachment (PMA) sublayer: The portion of the MAU that contains the functional circuitry. [ISO/IEC 8802-3 : 1993]

3.622 physical layer signaling (PLS) sublayer: The portion of the physical layer, contained within the DTE, that provides the logical and functional coupling between the MAU and the data link layer. [ISO/IEC 8802-3 : 1993]

3.623 PICS: Acronym for **protocol implementation conformance statement.**

3.624 piggybacking: A technique in which an acknowledgment of a previously received protocol data unit is carried within an outgoing protocol data unit.

3.625 pinboard: *See:* **plugboard.**

3.626 ping-pong transmission technique: *See:* **time-compression multiplexing.**

3.627 PLS sublayer: Acronym for **physical layer signaling sublayer.**

3.628 plugboard: A printed circuit board into which plugs or pins may be placed to control the operation of equipment. *See also:* **jack.** *Syn:* **pinboard.** [IEEE Std 610.10-1994a]

3.629 PM: Acronym for **phase modulation.**

3.630 PMA: Acronym for **physical medium attachment.**

3.631 point of presence (POP): The point at which the local telephone company terminates subscribers' circuits for long distance dial-up or leased line communications.

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3.632 point-to-point: Pertaining to a channel, line, or a circuit that has only two end points. *See also:* **multidrop; multipoint.**

3.633 point-to-point configuration: A network configuration in which two communicating stations are connected by a point-to-point channel.

3.634 polling: A technique for sharing a multiple-access transmission medium, where devices cannot transmit until they have received implicit or explicit permission. *See also:* **centralized polling; distributed polling.**

3.635 polyvinyl chloride (PVC): An insulator in cable coatings and coaxial cable foam compositions.

3.636 POP: Acronym for **point of presence.**

3.637 port: The physical interconnection point or an access point for a communication link.

3.638 port protection system: A computer security mechanism used to protect dial-up communication lines from unauthorized use, often requiring special passwords or using call-back procedures. *Syn:* **secure modem.**

3.639 postal telephone and telegraph (PTT): Common carriers that are owned by the government and in which the government is the sole monopoly supplier of communication facilities.

3.640 postamble: In networking, a sequence of bits appended after the last bit of the frame check sequence. *See also:* **abnormal preamble; preamble.** [ISO/IEC 8802-3 : 1993a]

3.641 PPM: Acronym for **pulse position modulation.**

3.642 preamble: In networking, a sequence of bits at the start of each new transmission to allow synchronization of clocks and other physical layer circuitry at other stations. *Note:* [ISO/IEC 8802-3 : 1993] standard defines a 64-bit preamble. *See also:* **abnormal preamble; postamble.**

3.643 presentation layer: The sixth layer of the seven-layer OSI model; responsible for general user services related to the representation of user data. *Note:* This layer provides compression, encryption, character and file conversion on messages from the application layer. *See also:* **application layer; client layer; data link layer; entity layer; logical link control layer; medium access control sublayer; network layer; physical layer; session layer; sublayer; transport layer.**

3.644 primary center: Class 3 office in the North American hierarchical routing plan; a control center connecting toll centers of the telephone system together. *See also:* **end office; regional center; sectional center; toll center.**

3.645 primary station: The station that, at any given instant, has the right to select and to transmit information to a secondary station and the responsibility to insure information transfer. *See also:* **secondary station.**

3.646 print server: On a network, a server that is dedicated to queuing and sending printer output from the networked computers to a shared printer. *See also:* **database server; disk server; file server; mail server; network server; terminal server.**

3.647 private automatic branch exchange (PABX): *See:* **private branch exchange.**

3.648 private automatic exchange (PAX): A telephone exchange that provides private telephone service to an organization and does not allow calls to be transmitted to or from the public telephone network.

3.649 private branch exchange (PBX): A telephone exchange on the user's premises, providing a switching facility for telephones on extension lines within the premises and access to the public telephone network. *Syn:* **private automatic branch exchange.**

3.650 private line: *See:* **leased line**

3.651 private line service: A service in which the customer leases a circuit, not connected to the public switched telephone network, for the customer's exclusive use.

3.652 private network: A network established and operated by a private organization in which the customer leases circuits and, sometimes, switching capacity for the customer's use. *Contrast with:* **public data network.** *See also:* **software defined network.**

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3.653 programmable connection: A connection in which information is sent over data type circuits. *See also:* **permissive connection; RJ-11.**

3.654 propagation delay: In networking, the delay time between when a signal enters a channel and when it is received. *See also:* **time delay.**

3.655 protocol: **(1)** A formal set of conventions governing the format and relative timing of message exchange in a computer system. [IEEE Std 610.10-1994] **(2)** A set of semantic and syntactic rules that determine the behavior of functional units in achieving meaningful communication. [IEEE Std 610.10-1994]

3.656 protocol access: A protocol that is adopted at a specified reference point between a user and a network to enable the user to employ the services and/or facilities of that network.

3.657 protocol converter: A dedicated device that translates the protocol native to an end-user device into a different protocol, allowing communication with another end-user device. *Note:* A protocol converter converts the message formats so both systems are compatible.

3.658 protocol data unit (PDU): A block of data that is exchanged between two devices using a protocol.

3.659 protocol entity: An entity that provides one or more service access points for use by higher-level entities.

3.660 protocol implementation conformance statement (PICS): A statement of which capabilities and options have been implemented for a given open systems interconnection protocol.

3.661 protocol stack: The hierarchy of protocols used in a computer network architecture.

3.662 PSN: Acronym for **public switched network.**

3.663 PSTN: Acronym for **public switched telephone network.**

3.664 PTT: Acronym for **postal telephone and telegraph.**

3.665 public circuit-switched network: A public data network using circuit-switching techniques.

3.666 public data network (PDN): A network established and operated by communications common carriers or telecommunications administrations for the specific purpose of providing low error-rate data transmission services to the public. *See also:* **public circuit-switched network; public packet switching network; public switched network.** *Syn:* **public data transmission service.** *Contrast with:* **private network.**

3.667 public data transmission service: *See:* **public data network.**

3.668 public key system: An encryption system using a combination of a public encryption key and a private decryption key to provide message security or authentication. *See also:* **electronic signatures.**

3.669 public packet switching network: A public data network that uses packet switching techniques.

3.670 public switched network (PSN): A public data network in which dedicated communications paths are established for customers.

3.671 public switched telephone network (PSTN): A network of a complete public telephone system, including telephones, lines and exchanges.

3.672 public telephone network: A network of public telephone system. *See also:* **public switched telephone network.**

3.673 pulse: A variation in the value of a magnitude which is short in relation to the time schedule of interest, the final value being the same as the initial value. *Note:* In digital logic circuits, a pulse is usually a voltage. [IEEE Std 610.10-1994]

3.674 pulse amplitude modulation (PAM): A form of pulse modulation in which the amplitude of a pulse carrier is varied.

3.675 pulse carrier: A series of identical pulses intended for modulation.

3.676 pulse code modulation (PCM): A modulation technique in which an analog signal is converted to a bit stream for transmission.

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3.677 pulse duration modulation (PDM): *See:* **pulse width modulation.**

3.678 pulse modulation: The encoding of information by varying the basic characteristics of a sequence of pulses, such as width, duration, amplitude, phase or the number of pulses. *See also:* **pulse amplitude modulation; pulse code modulation; pulse duration modulation; pulse position modulation; pulse width modulation.** [IEEE Std 610.10-1994a]

3.679 pulse position modulation (PPM): A form of pulse modulation in which the position in time of a pulse is varied, without modifying the pulse duration, to convey information.

3.680 pulse string: *See:* **pulse train.**

3.681 pulse stuffing: A method in which pulses are inserted into a stream of pulses to achieve synchronization between two digital communications systems.

3.682 pulse train: A series of pulses with similar characteristics. *Syn:* **pulse string.**

3.683 pulse width modulation (PWM): A form of pulse modulation in which the duration of the pulse carrier is varied. *Syn:* **pulse duration modulation.**

3.684 PVC: (1) Acronym for **polyvinyl chloride.** (2) Acronym for **permanent virtual circuit.**

3.685 PWM: Acronym for **pulse width modulation.**

3.686 QAM: Acronym for **quadrature amplitude modulation.**

3.687 quadrature amplitude modulation (QAM): A modulation technique that uses variations in signal amplitude and phase to represent data-encoded symbols as a number of states.

3.688 rate center: In the United States, a defined geographic location used by telephone companies to determine distance measurements for interLATA and intraLATA mileage rates.

3.689 record: A set of related data items treated as a unit. For example, in stock control, the data for each invoice could constitute one record. [IEEE Std 610.12-1990]

3.690 red: Pertains to the parts of a computer or communications system in which data being transmitted or manipulated is not encrypted. *Contrast with:* **black.**

3.691 regenerative repeater: A repeater whose function is to re-time and re-transmit the received signal impulses that have been restored to their original strength.

3.692 regional center: Class 1 office in the North American hierarchical routing plan; a control center connecting sectional centers of the telephone system. *See also:* **end office; primary center; sectional center; toll center.**

3.693 reliability: (1) The characteristic of equipment or software that relates to the integrity of the system and ability to maintain trouble-free operations to insure against failure. (2) The ability of an item to perform a required function under stated conditions for a stated period of time. *Note:* The term reliability is also used as a reliability characteristic denoting a probability of success, or a success ratio.

3.694 remote computer system: A computer system located at some remote site and connected via a communications network to one or more other systems. [IEEE Std 610.10-1994]

3.695 repeater: A device that restores signals to their original shape and transmission level at the physical layer only.

3.696 ring: A signal transmitted on a telephone line to indicate an incoming call.

3.697 ring topology: A topology in which stations are attached to repeaters in a ring fashion. *Note:* Every station has a predecessor and a successor for network transmissions. *See also:* **bus-ring topology; bus topology; star-bus topology; star-ring topology; star topology; tree topology.** *Syn:* **loop topology.**

3.698 RJ-11: A six-pin modular telephone plug. *Note:* Also called a permissive connection, an RJ-11 plug is generally used on two-wire circuits, but can be used on four-wire circuits. *Note:* This definition reflects colloquial usage. Standards referencing this term should point to the precise standardized connector specification.

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3.699 RJ-45: A eight-pin modular telephone plug. *Note:* Also called a programmable connection, an RJ-45 plug is generally used on four-wire circuits, but can be used on eight-wire circuits. *Note:* This definition reflects colloquial usage. Standards referencing this term should point to the precise standardized connector specification.

3.700 rotary hunt: An arrangement allowing calls placed to seek an idle circuit in a prearranged multichannel group.

3.701 round trip time (RTT): The total time taken for a single packet or datagram to leave one device, reach the other, and return. [IEEE Std 610.10-1994a]

3.702 router: In networking, a device that interconnects two networks using the network layer (layer 3) address. *Note:* Routers are protocol dependent because they must be able to identify the address field within a specific network layer protocol. *See also:* **bridge; gateway; hub.**

3.703 routing: **(1)** In data communications, a path by which a message reaches its destination. **(2)** A path that network traffic takes from its source to its destination. *See also:* **adaptive routing; fixed routing; static routing; stochastic routing.**

3.704 routing indicator: A coded indicator preceding a message showing the transmission routing of the message.

3.705 RS-232: *See:* **EIA/TIA-232-E.**

3.706 RS-232-C: An EIA/TIA standard, officially known and published as EIA/TIA-232-E. *See:* **EIA/TIA-232-E.**

3.707 RS-422-A: An EIA standard, officially known and published as EIA-422-A. *See:* **EIA 422-A.**

3.708 RS-423-A: An EIA standard, officially known and published as EIA-423A. *See:* **EIA 423-A.**

3.709 RS-449: An EIA standard that has been rescinded. This standard has been replaced by EIA/TIA-530-A. *See:* **EIA/TIA-530-A.**

3.710 RTT: Acronym for **round trip time.**

3.711 S/N ratio: Acronym for **signal-to-noise ratio.**

3.712 SACK: Acronym for **selective acknowledgment.**

3.713 SAP: Acronym for **service access point.**

3.714 SDN: Acronym for **software defined network.**

3.715 secondary station: A station that has been temporarily selected to receive a transmission from the primary station. *See also:* **primary station.**

3.716 section: A length of coaxial cable which forms the transmission medium for a network. *See also:* **segment.**

3.717 sectional center: Class 2 office in the North American hierarchical routing plan; a control center connecting primary centers of the telephone system together. *See also:* **end office; primary center; regional center; toll center.**

3.718 secure modem: *See:* **port protection system.**

3.719 secure path: *See:* **trusted path.**

3.720 security management: In networking, a management function defined for controlling, authenticating, and authorizing access to network resources.

3.721 segment: One or more sections of coaxial cable that form the transmission medium for a network.

3.722 selective acknowledgment (SACK): An acknowledgment mechanism used with a sliding window protocol that allows the receiver to acknowledge packets that are received out of order. *Syn:* **extended acknowledgment.**

3.723 selective calling: The ability of a transmitting station to specify which of several stations on the same line is in condition to receive a message.

3.724 selective retransmission: A transmission scheme where the transmitter may send multiple PDUs without waiting for an acknowledgment. If the receiver indicates that an error occurred in a given PDU, the sender will retransmit only the errored PDU. *Note:* In this scheme, the receiver will accept PDUs that are out-of-sequence. *Contrast with:* **Go-Back-N.**

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3.725 serial transmission: In data communications, the conveying of a character of information one bit at a time on a single path. *Contrast with:* **parallel transmission.**

3.726 server: In a network, a device or computer system that is dedicated to providing specific facilities to other devices attached to the network. *Contrast with:* **client.** *See also:* **database server; disk server; file server; mail server; network server; print server; terminal server.**

3.727 service access point (SAP): **(1)** An address that identifies a user of the services of a protocol entity. **(2)** The point at which services are provided by one layer (or sublayer) to the layer (or sublayer) immediately above it. [ISO/IEC 8802-6 : 1994]

3.728 service delay: In data communications, the time that elapses from the release of a message by an originator to its receipt by the addressee.

3.729 service specification: The formal description of the services provided by an entity of the OSI model to the next higher layer. *See also:* **application layer; client layer; data link layer; entity layer; logical link control layer; medium access control sublayer; network layer; physical layer; presentation layer; session layer; sublayer; transport layer.**

3.730 session layer: The fifth layer of the seven-layer OSI model, responsible for coordination of the communications in an orderly manner. *See also:* **application layer; client layer; data link layer; entity layer; logical link control layer; medium access control sublayer; network layer; physical layer; presentation layer; sublayer; transport layer.**

3.731 shield: A barrier, usually metallic, within a coaxial cable that is designed to contain the high-powered broadcast signal within the coaxial cable to reduce electromagnetic interference and signal loss.

3.732 shielded twisted pair (STP): A twisted pair medium surrounded by a metallic shield to minimize electrical interference and noise. *Note:* Specifications are provided in IEEE Std 802.5. *Contrast with:* **unshielded twisted pair.**

3.733 short packet: A packet with a length of less than 64 B. *Syn:* **under-sized packet.** *Contrast with:* **long packet.** [IEEE Std 610.10-1994]

3.734 short stack: A stack of protocols with less than seven layers. *See also:* **thin stack.**

3.735 sign-off: *See:* **logoff.**

3.736 sign-on: *See:* **login.**

3.737 signal: In networking, an electrical pulse that conveys information through a transmission medium. *See also:* **analog signal; baseband signaling; broadband signaling; digital signal; in-band signal; out-of-band signaling.**

3.738 signal interphasing: A method of simultaneously overlapping multiple transmission signals to achieve higher transmission rates.

3.739 signal quality error (SQE) heartbeat: A signal from the transceiver to a node peripheral indicating that the transceiver is functioning properly. *Note:* This term is contextually specific to IEEE Std 802.3.

3.740 signal-to-noise ratio (S/N ratio): The ratio of relative power of the usable signal to the noise present, expressed in decibels. [IEEE Std 610.10-1994]

3.741 simplex circuit: In networking, a circuit permitting the transmission of signals in one specific direction only. *See also:* **channel; dial-up circuit; foreign exchange circuit; four-wire circuit; leased circuit; two-wire circuit.**

3.742 simplex operation: *See:* **one-way-only operation.**

3.743 simplex transmission: Transmission in which data is sent in one specific direction only. *Contrast with:* **duplex transmission; half-duplex transmission.**

3.744 single-level network subject: A network subject that causes information to flow through the network at a single security level. *Contrast with:* **multilevel network subject.**

3.745 single-mode optical fiber: An optical fiber in which a single concentrated light beam travels straight down the center of the fiber, maximizing its information-carrying capacity. *See also:* **multimode optical fiber.**

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3.746 sliding window: A protocol used to allow a sender to transmit multiple packets before waiting for an acknowledgment. *Note:* The protocol places a small window in the sequence and transmits all packets that lie inside the window. The window size is adjusted based on the successful rate of packet transmission. *See also:* **Go-Back-N; selective retransmission.**

3.747 slot time: A multipurpose parameter used in CSMA/CD technique that describes the contention behavior of the MAC sublayer of a LAN. *Notes:* 1) This value represents the amount of time during which a collision will occur if two stations transmit simultaneously. It is calculated as a function of the propagation delay of the network. 2) This term is contextually specific to IEEE Std 802.3. *Syn:* **contention interval.**

3.748 SME: Acronym for **systems management entity.**

3.749 SMFA: Acronym for **specific management functional areas.**

3.750 software defined network (SDN): A network based on a public circuit-switched network that gives the user the appearance of a private network.

3.751 source quench: In networking, a method for controlling congestion in which a device detects the congestion and requests that the source stop transmitting. *See also:* **fair queuing.**

3.752 source routing: A bridging technique where frames contain the list of bridges and networks that must be traversed for the frame to reach the destination. In this scheme, the transmitter must know the route to the destination before sending the frame. *Contrast with:* **spanning tree.**

3.753 space-division switching: A circuit-switching method in which each connection through the switch takes a physically separate and dedicated path. *See also:* **circuit switching; message switching; time-multiplexed switching.**

3.754 spanning tree: A bridging technique where a network of randomly interconnected bridges can automatically build a logical tree structure so as to guarantee a unique path between any pair of stations on the network. In this scheme, the transmitter does not have to know how to route the frame to the destination; that is the job of the bridges. *Contrast with:* **source routing.**

3.755 specialized common carrier: A common carrier providing a limited set of services. For example, only private line services.

3.756 specific management functional areas (SMFA): A category of systems management user requirements.

3.757 spread spectrum: A modulation technique for multiple access, or for increasing immunity to noise and interference.

3.758 SQE: Acronym for signal quality error. *Note:* This term is contextually specific to IEEE Std 802.3.

3.759 standard: **(1)** A set of detailed technical guidelines, used as a means of establishing uniformity in an area of computing development. [IEEE Std 610.10-1994] **(2)** Pertaining to the set of guidelines, as in (1). For example, a standard interface or a standard definition. [IEEE Std 610.10-1994] **(3)** An agreement among any number of organizations that defines certain characteristics, specifications, or parameters related to a particular aspect of computer technology. For example, ANSI, ISO, and IEEE are standards-making bodies. *Note:* Such organizations may include industrial, academic, or governmental entities. [IEEE Std 610.10-1994] **(4)** In software engineering, mandatory requirements employed and enforced to prescribe a disciplined uniform approach to software development, that is, mandatory conventions and practices are in fact standards. [IEEE Std 610.12-1990] *See also:* **convention; de facto standard.**

3.760 star-bus topology: A topology where the stations are physically star-wired to a hub but which logically act like a bus. *Note:* This is a common wiring scheme when using traditional point-to-point media such as twisted pair and optical fiber in a bus network. *See also:* **bus-ring topology; bus topology; loop topology; ring topology; star-ring topology; star topology; tree topology.**

3.761 star-ring topology: A topology having a logical arrangement of a ring with a physical implementation of a star. This results in a system with relatively short cables, as in a ring network, and allows maintenance to be performed from a single point, as in a star network. *Note:* This is accomplished by connecting each node over a cable to a

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wiring closet and connecting all cables in a ring topology within the wiring closet. This is the common way in which IEEE 802.5 token rings are built. *See also:* **bus-ring topology; bus topology; loop topology; ring topology; star-bus topology; star topology; tree topology.**

3.762 star topology: A topology in which stations are connected to a single central switching facility. *See also:* **bus-ring topology; bus topology; loop topology; ring topology; star-bus topology; star-ring topology; tree topology.**

3.763 start bit: In asynchronous transmission, a signal that lasts a single bit time, indicating the beginning of a character. *Contrast with:* **stop bit.**

3.764 start element: *See:* **start signal.** *Contrast with:* **stop element.**

3.765 start signal: In asynchronous transmission, a signal preceding a character that prepares the receiving device for the reception of code elements. *Syn:* **start element.** *Contrast with:* **stop signal.**

3.766 start-stop signal: A signal composed of a sequence or group of signal elements, each group representing a character or block, having a duration equal to the duration of an integral number of unit intervals and which are separated by time intervals for which the duration is not fixed.

3.767 start-stop transmission: *See:* **asynchronous transmission.**

3.768 static routing: A routing strategy that determines the path to be followed by network traffic using the information and algorithms fixed at the time of network generation.

3.769 station: One of the input or output devices on a communications network. *See also:* **device; primary station; secondary station; server.** *Syn:* **data station.**

3.770 station lobe: The wiring that connects a LAN station or other device to a hub, excluding equipment and station attachment cables.

3.771 stat mux: Abbreviation for **statistical multiplexer.**

3.772 statistical multiplexer (stat mux): A multiplexer that uses time division multiplexing technique by dynamically allocating telecommunication line time to each of the various attached terminals, according to whether a terminal is active or inactive at a particular moment.

3.773 STD: Acronym for **subscriber trunk dialing.** *See:* **direct distance dialing.**

3.774 step-by-step switch: A switch that moves in synchronism with a pulse device such as a rotary telephone dial. *See also:* **crossbar switch.** *Syn:* **line switch.**

3.775 step-by-step system: A type of line-switching system which uses step-by-step switches. *See also:* **crossbar system; electronic switching system.** *Syn:* **line switching system.**

3.776 stochastic routing: A routing strategy in which the results of individual decisions vary according to the conditions in the network at decision time.

3.777 stop bit: In asynchronous transmission, a bit that signals the end of a character. *Contrast with:* **start bit.**

3.778 stop element: *See:* **stop signal.** *Contrast with:* **start element.**

3.779 stop signal: In asynchronous transmission, a signal following a character that prepares the receiving device for the reception of a subsequent character or block. *Syn:* **stop element**. *Contrast with:* **start signal.**

3.780 store-and-forward: Pertaining to communications where a message is received completely before beginning transmission onto the next node.

3.781 store-and-forward switched network: A switched network in which the store-and-forward principle is used to handle transmissions between the sender and the recipient.

3.782 STP: Acronym for **shielded twisted pair.**

3.783 sublayer: A subdivision of a layer in the OSI model. *See also:* **application layer; client layer; data link layer; entity layer; logical link control layer; medium access control sublayer; network layer; physical layer; presentation layer; session layer; transport layer.**

3.784 subscriber's loop: *See:* **local loop.**

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3.785 subscriber trunk dialing (STD): *See:* **direct distance dialing.**

3.786 subscriber's drop: A wire that runs from a cable terminal or distribution point to the subscriber's premises.

3.787 subvoice-band channel: A channel with a bandwidth narrower than that of a voice-band channel. *Note:* It is generally used in telegraphy.

3.788 supervisory sequence: In data communications, a sequence of communication control characters, and possibly other characters, that define control function.

3.789 suppressed carrier transmission: A method of transmission in which the carrier frequency is suppressed partially or fully.

3.790 SVC: Acronym for **switched virtual circuit.**

3.791 switched network: A network, using a switching technique, to direct messages from the sender to the ultimate recipient. *See also:* **circuit-switched network; store-and-forward switched network.**

3.792 switched virtual circuit (SVC): A virtual circuit that is established on an as-needed basis to interconnect any two end users attached to a network. *Note:* SVC service requires the definition of some call control procedures for the establishment, maintenance, and termination of the virtual circuit. An SVC may not be available when the user wants if too many SVCs are open at once. *See also:* **permanent virtual circuit.**

3.793 switching: In networking, pertaining to a connection that is established by closing switches. *See also:* **circuit switching, digital switching, message switching; packet switching.**

3.794 switching computer: A communications computer designed to handle switching messages or packets in a network. [IEEE Std 610.10-1994]

3.795 switching node: The intelligent interface point where the customer's equipment is connected to a public packet switching network.

3.796 synchronous communication: *See:* **synchronous transmission.**

3.797 synchronous time division multiplexing: A method of time division multiplexing in which time slots on a shared communication channel are assigned to devices on a fixed, predetermined basis.

3.798 synchronous transmission: A transmission in which information and control characters are sent at regular clocked intervals so that sending and receiving stations are operating continuously in step with each other. *Syn:* **synchronous communication.** *Contrast with:* **asynchronous transmission.**

3.799 systems management: In networking, functions in the application layer related to the management of various OSI resources and their status across all layers of the OSI architecture.

3.800 systems management entity (SME): An entity that carries out communications to perform systems management functions such as monitoring, controlling and coordination in the OSI environment.

3.801 T-carrier system: A hierarchy of high-speed digital transmission facility designed to carry speech and other signals in digital form according to their transmission capacity. *See also:* **T1, T1C, T2, T3,** and **T4.**

3.802 T1: A carrier facility that transmits digital signal level one. The data rate is 1.544 Mb/s, the equivalent of 24 voice-band channels. *Note:* T1 is used to provide long-distance telephone service and also to provide voice and data communications to individual subscribers.

3.803 T1C: A carrier facility that transmits digital signal level 1C. The data rate is 3.152 Mb/s, the equivalent of 48 voice-band channels.

3.804 T2: A carrier facility that transmits digital signal level two. The data rate is 6.312 Mb/s, the equivalent of 96 voice-band channels.

3.805 T3: A carrier facility that transmits digital signal level three. The data rate is 44.736 Mb/s, the equivalent of 672 voice-band channels.

3.806 T4: A carrier facility that transmits digital signal level four. The data rate is 274.176 Mb/s, the equivalent of 4032 voice-band channels.

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3.807 tap: (1) In a baseband system, a component or connector that attaches a transceiver to a cable. (2) In a broadband system, a passive device used to remove a portion of the signal power from the distribution line and deliver it onto the drop line. *See also:* **fan-out box.** (3) In the security environment, the term is used for a breach of security on a telecommunication line or channel.

3.808 TASI: Acronym for **time assigned speech interpolation.**

3.809 TCM: Acronym for **time compression multiplexing.**

3.810 TCU: Acronym for **trunk coupling unit.**

3.811 TDM: Acronym for **time division multiplexing.**

3.812 TDMA: Acronym for **time division multiple access.**

3.813 TDR: Acronym for **time domain reflectometer.**

3.814 telecommunication: The transmission of signals by electrical, electromagnetic, optical acoustic, or mechanical means.

3.815 telecommunication access program: A software program located in a front-end communications processor that handles tasks associated with the routing, scheduling, and movement of messages between remote terminals and the host computer.

3.816 telecommunication circuit: A circuit that is designed to handle remote transmission of information. *See also:* **wideband circuit.** [IEEE Std 610.10-1994]

3.817 telecommunication line: A medium, such as wire or circuit, that connects equipment which enables data to be sent and received.

3.818 telecommunication monitor: *See:* **teleprocessing monitor.**

3.819 Telecommunications Industries Association (TIA): A sister organization of EIA that establishes and maintains standards for the telecommunications industries in the United States.

3.820 telegraphy: The communication of textual messages through a telecommunication medium at speeds of 150 baud or less.

3.821 telephone exchange: *See:* **central office.**

3.822 teleprocessing: The overall function performed in an information processing system that combines telecommunication, data processing, and non-machine interfaces.

3.823 teleprocessing monitor: The software program, usually located in the host computer, that handles various tasks required for incoming and outgoing messages. *Syn:* **telecommunication monitor.**

3.824 terminal: Any point in a system or communications network at which data can either enter or leave. *See also:* **virtual terminal.**

3.825 terminal interface processor (TIP): A computer that connects terminals directly to a network, eliminating the need for a host computer.

3.826 terminal server: On a network, a server that provides access to a central computer from one or more terminals. *See also:* **database server; disk server; file server; mail server; network server; print server.**

3.827 thin stack: A less than fully featured protocol stack. *See also:* **short stack.**

3.828 TIA: Acronym for **Telecommunications Industries Association.**

3.829 time assigned speech interpolation (TASI): The sending of two or more voice calls on the same telephone circuit simultaneously by interleaving the active signals of one conversation with the periods of silence of other conversations.

3.830 time compression multiplexing (TCM): A multiplexing technique that provides full-duplex digital data transmission over a single twisted pair. *Syn:* **ping-pong transmission technique.**

3.831 time delay: The time interval between the manifestation of a signal at one point and the manifestation or detection of the same signal at another point. *See also:* **propagation delay.** [IEEE Std 610.10-1994]

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3.832 time derived channel: A channel that is obtained from multiplexing a channel by time division.

3.833 time division multiple access (TDMA): A multiplexing technique in which a channel is divided among different users allocating to each of them a time slot in a repeating cycle.

3.834 time division multiplexing (TDM): A method by which two or more channels of information are transmitted over the same link by allocating a different time interval for the transmission of each channel. *See also:* **synchronous time division multiplexing; wave division multiplexing.**

3.835 time division multiplexing (TDM) bus switching: A method of time division switching in which time slots are used to transfer data over a shared bus between transmitter and receiver.

3.836 time division switching: The switching of inputs to outputs using time-division multiplexing techniques. *See also:* **time division multiplexing bus switching.**

3.837 time domain reflectometer (TDR): Test equipment that verifies proper functioning of the physical components of the network with a sequence of time-delayed electrical pulses.

3.838 time multiplexed switching (TMS): A form of space-division switching in which each input line is a time division multiplexing stream. At the receiving end, the different signals are divided out and merged back into single streams. *See also:* **circuit switching; message switching; space-division switching.**

3.839 time slot: In time division multiplexing, when time is divided into slots to route data from input to output.

3.840 TIP: Acronym for **terminal interface processor.**

3.841 TMS: Acronym for **time multiplexed switching.**

3.842 token: In a local area network, a control mechanism that is passed among stations to indicate which station is currently in control. *See also:* **token access; token bus; token passing; token ring.**

3.843 token access: A means of transmitting data over a local area network that employs a token, a special bit pattern, to which a station attaches its data.

3.844 token bus: A network with a physical bus and logical ring topology where token passing is used to determine which node is allowed to transmit next. *Note:* ISO/IEC 8802-4 : 1990 describes the token bus topology. *See also:* **bus-ring topology.**

3.845 token passing: A local area network access method in which a terminal can transmit only after it has acquired the network's token.

3.846 token ring: A network in a logical ring configuration around which a token is periodically passed. The node which has the token at any time is the only node allowed to transmit on the network. *Note:* ISO/IEC 8802-5 : 1992 describes the token ring topology.

3.847 toll center: Class 4 office in the North American hierarchical routing plan; a control center connecting end offices of the telephone system together. *See also:* **end office; primary center; regional center; sectional center.**

3.848 toll circuit: *See:* **trunk circuit.**

3.849 topology: **(1)** The interconnection pattern of nodes on a network. **(2)** The logical and/or physical arrangement of stations on a network. *See also:* **bus-ring topology; bus topology; loop topology; ring topology; star-bus topology; star-ring topology; star topology; tree topology.**

3.850 traffic: **(1)** Messages that are transmitted and received over a communication channel. [IEEE Std 610.10-1994] **(2)** A quantitative measure of network load. *Note:* Generally refers to the packet transmission rate, frames/second or frames/hour. [IEEE Std 610.10-1994]

3.851 traffic flow security: **(1)** The concealment of valid messages on a communication circuit, usually by causing the circuit to appear busy at all times or by encrypting the source and destination addresses of valid messages. **(2)** The state of protection that results from (1).

3.852 trailer: The contiguous control bits following a transmission that contain information used for such purposes as bit error detection and end-of-transmission indication. *Contrast with:* **header.**

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3.853 transceiver: (1) A device that both transmits and receives data. (2) A device that connects a host interface to a network. (3) A device that applies electronic signals to the cable and may sense collisions. *Note:* Definition (3) is contextually specific to IEEE Std 802.3.

3.854 transceiver cable: A four-pair, shielded cable which interconnects a workstation to a transceiver or fan-out box. *Note:* This term is contextually specific to IEEE Std 802.3. *See also:* **AUI cable; coaxial cable; drop cable; trunk cable.**

3.855 transceiver chatter: *See:* **chatter.**

3.856 transfer rate: The average number of bits, characters, or blocks per unit time passing between corresponding devices in a data transmission system. It is expressed in terms of bits, characters, or blocks per second, minute, or hour. *Syn:* **data rate.**

3.857 transmission: The propagation of a signal, message, or other form of intelligence by any means, such as optical fiber, wire, or visual means. [IEEE Std 610.10-1994]

3.858 transmission block character: *See:* **end of transmission block character.**

3.859 transmission control character: A control character used to control or facilitate transmission of data between DTEs. [ISO/IEC 2382]

3.860 transmission error control: The process that ensures no errors are introduced while transmitting data between sender and receiver.

3.861 transmission medium: The physical facility utilized for the interconnection and transmission of messages between a user station and network device. For example: coaxial cable; optical fiber. [IEEE Std 610.10-1994a]

3.862 transmitter on/transmitter off (X-on/X-off): An asynchronous protocol that synchronizes the receiving terminal with the sending terminal.

3.863 transport layer: The fourth layer of the seven-layer OSI model, responsible for error-free end-to-end communication. *See also:* **application layer; client layer; data link layer; entity layer; logical link control layer; medium access control sublayer; network layer; physical layer; presentation layer; session layer; sublayer.**

3.864 tree topology: A topology in which stations are attached in a tree layout fashion on a shared transmission medium. The tree layout begins at the head/end and each of these may have branches. The branches in turn may have additional branches to allow quite complex layouts. *See also:* **bus-ring topology; bus topology; loop topology; ring topology; star-bus topology; star-ring topology; star topology.**

3.865 trunk: (1) A transmission path between exchanges or central offices. (2) A telephone exchange line that ends in a PBX.

3.866 trunk cable: (1) A cable circuit between two switching centers or two individual distribution points. (2) The main (large-diameter) cable of a broadband coaxial cable system. *See also:* **drop cable.** [ISO/IEC 8802-3 : 1993]

3.867 trunk circuit: A pair of complementary circuits with associated equipment terminating in two switching centers. *Syn:* **toll circuit.**

3.868 trunk coupling unit (TCU): (1) A physical device that enables a data terminal equipment (DTE) to connect to a trunk cable. *Note:* The trunk coupling unit may be a passive connector, or may contain active elements. A drop cable may be used between the trunk coupling unit and the DTE to facilitate communication. (2) A device that couples a station to the main ring path. It provides the mechanism for insertion of a station into the ring and removal of it from the ring. [ISO/IEC 8802-5 : 1992]

3.869 trusted communications path: A path by which a network user, program, process, or device can communicate directly with the trusted network base.

3.870 trusted identification forwarding: In networks, an identification method in which a sending host transmits user authentication information to the receiving host and the receiving host can verify that the user is authorized for access to its systems.

3.871 trusted network base: The totality of security mechanisms within a network that are responsible for enforcing a security policy on the network.

3.872 trusted network component base: The totality of the security mechanisms within a network component that are responsible for enforcing the component security policy.

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3.873 trusted path: A path by which a user at a terminal can communicate directly with the trusted network base in a computer system. *See also:* **trusted communications path.** *Syn:* **secure path.**

3.874 turnaround time: In data communications, the amount of time required to reverse the direction of transmission from send to receive or vice-versa in a half duplex transmission.

3.875 twinaxial cable: A cable consisting of two conductors, insulated from each other, within and insulated from another conductor of larger diameter. *Contrast with:* **coaxial cable.**

3.876 twisted pair: A medium consisting of two insulated wires arranged in a regular spiral pattern.

3.877 twisted-pair cable: A group of twisted pairs within a single protective sheath.

3.878 two-way alternate operation: A mode of operation of a data link in which data may be transmitted in both directions, one direction at a time. *See also:* **one-way-only operation; two-way simultaneous operation.** *Syn:* **either-way operation.**

3.879 two-way simultaneous operation: A mode of operation of a data link in which data may be transmitted over a link simultaneously in both directions. *See also:* **one-way-only operation; two-way alternate operation.**

3.880 two-wire circuit: A leased circuit in which two conductors are used, each for a one-way transmission path. *See also:* **dial-up circuit; foreign exchange circuit; four-wire circuit; simplex circuit.**

3.881 type error: An error that occurs when a node is encountered with improper protocol information.

3.882 UART: Acronym for **universal asynchronous receiver/transmitter.**

3.883 unbalanced (to ground): The state of impedance on a two-wire circuit when the impedance-to-ground of one wire is different from the impedance-to-ground of the other wire. *Contrast with:* **balanced (to ground).**

3.884 under-sized packet: *See:* **short packet.**

3.885 universal asynchronous receiver/transmitter (UART): A universal receiver/transmitter device used in asynchronous transmission applications. *Syn:* **asynchronous receiver/ transmitter.**

3.886 universal receiver/transmitter: A circuit used in data communication applications to provide the necessary logic to recover data in a serial-in/ parallel-out fashion and to transmit data in a parallel-in/serial-out fashion.

3.887 universal synchronous receiver/transmitter (USRT): A universal receiver/transmitter that is used in synchronous communication applications.

3.888 unshielded twisted pair (UTP): A twisted pair medium consisting of only a pair of conductors exposed to outside electrical interferences and noise. *Contrast with:* **shielded twisted pair.**

3.889 U.S. Federal Communications Commission (FCC): A U.S. regulatory body operating under the Communications Act of 1934 to regulate all interstate telecommunications systems in the United States. [IEEE Std 610.10-1994]

3.890 user-user protocol: A protocol that is adopted between two or more users to ensure communication between them.

3.891 USRT: Acronym for **universal synchronous receiver/transmitter.**

3.892 UTP: Acronym for **unshielded twisted pair.**

3.893 V-series: A CCITT (ITU-TSS) family of recommendations describing the connection of digital equipment to the analog public telephone network.

3.894 value-added network (VAN): A communications network that provides enhanced services, such as character set conversion, protocol conversion, and message storing and forwarding.

3.895 VAN: Acronym for **value-added network.**

3.896 vertex: *See:* **node.**

3.897 vertical redundancy check (VRC): A parity check performed on each character of a transmitted block of data as the block is received. *Note:* This method can use even or odd parity, and it may be used on non-ASCII characters. *See also:* **longitudinal redundancy check.**

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3.898 virtual circuit: In networking, a circuit connecting a source and a sink that may be physically accomplished by using different circuit configurations during transmission of a message. *Note:* A virtual circuit looks like a permanent connection to the user. A switched virtual circuit requires call control and can be established and terminated by the user at will. *See also:* **data circuit; permanent virtual circuit; switched virtual circuit; virtual data connection.**

3.899 virtual circuit service: *See:* **connection-oriented service.**

3.900 virtual data connection: A data connection in which one or more of the data circuits are interconnected by a virtual circuit.

3.901 virtual terminal: A terminal that is defined as a standard on a network that can handle diverse terminals.

3.902 voice band: A range of audio-frequencies that is employed for the transmission of speech.

3.903 voice-band channel: A channel that is suitable for transmission of speech, or analog data and has a maximum usable frequency range of 300–3400 cycles per second. *See also:* **subvoice-band channel; wideband channel.** *Syn:* **voice-grade channel.**

3.904 voice-grade channel: *See:* **voice-band channel.**

3.905 VRC: Acronym for **vertical redundancy check.**

3.906 WAN: Acronym for **wide area network.**

3.907 WATS: Acronym for **wide area telecommunications service.**

3.908 wave division multiplexing (WDM): A multiplexing technique used in optical fiber transmission systems that defines multiple paths on the fiber by using different wavelengths (colors) of light for each channel. *See also:* **time division multiplexing.**

3.909 waveguide: A metal tube used to transmit microwaves.

3.910 WDM: Acronym for **wave division multiplexing.**

3.911 white noise: A type of noise that has a uniform power spectral density across a specified frequency spectrum.

3.912 wide area network (WAN): A network that connects hosts across large geographic regions such as cities, states, and countries. *See also:* **local area network; long haul network; metropolitan area network.**

3.913 wide area telecommunications service (WATS): Telephone service that permits customers to make or receive long distance voice or telephone calls and have them billed on a bulk rather than individual call basis.

3.914 wideband channel: A channel that is wider in bandwidth than a voice-band channel.

3.915 wideband circuit: A telecommunication circuit capable of transferring data at speeds from 19 200–2 000 000 b/s.

3.916 wire center: *See:* **end office.**

3.917 wiring closet: A central point at which all the circuits in a wiring system begin or end, allowing cross-connection. *Syn:* **main distribution frame; main distribution function.**

3.918 word: **(1)** A sequence of bits or characters that is stored, addressed, transmitted, and operated on as a unit within a given computer. *See also:* **byte.** [IEEE Std 1084-1986, IEEE Std 610.5-1990, IEEE Std 610.12-1990] **(2)** An element of computer storage that can hold a sequence of bits or characters as in (1). [IEEE Std 610.5-1990, IEEE Std 610.12-1990]

3.919 X-on/X-off: Acronym for **transmitter on/transmitter off.**

3.920 X-series: A CCITT (ITU-TSS) family of recommendations describing public digital data networks.

3.921 X.200: A CCITT (ITU-TSS) family of recommendations describing OSI protocols and service definitions.

3.922 X.25: A CCITT (ITU-TSS) family of recommendations describing packet-switching protocols.

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3.923 X.400: A CCITT (ITU-TSS) family of recommendations describing message handling systems.

3.924 X.75: A CCITT (ITU-TSS) family of recommendations specifying interconnections between public data networks, including signaling, satellite usage, and multiple physical circuits of different nations.

3.925 Xmodem: A protocol used for file transfer employing an eight-bit error checking protocol with a block size of 128 B. *Note:* Xmodem was developed by Ward Christensen.

3.926 Ymodem: A protocol for file transfer employing a CRC Xmodem with a packet size of 1024 B. *Note:* Ymodem was developed by Chuck Forsburg.

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