

# Glossary

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**AD converter** An analog-to-digital converter (ADC) is used to sample an analog signal and convert the sampled value to a digital value. It is typically used to help represent an analogue signal to a computer.

**avionics** It is the on-board electronics used to help pilot an aircraft. Important components of an avionic system include communications subsystem, navigation subsystem, autopilot subsystem and electronic flight management subsystem.

**base station** A base station consists of a Base Station Controller (BSC) and a Base Transceiver Station (BTS). The BSC controls the radio signals of a cell site, and performs functions such as frequency assignment and hand-off. A BTS consists of an antenna and other radio equipment used for providing wireless service in an area.

**cable modem** This is a type of modem that allows people to access Internet services via their cable television network from their home computers (or network of home computers).

**CAT** Computerized axial tomography (CAT) is a method of examining body organs by scanning them with X-rays and using a computer to construct a series of cross-sectional scans along an axis—popularly known as a CAT scan.

**cellular system** It is a hand-held mobile radio telephone system. It can be used over a geographic area of several square kilometres. The area is divided into small sections called cells and each cell has its own base station.

**CNC equipment** A Computerized Numerical Control (CNC) equipment uses a stored program to automatically fabricate a design. For example, a CNC lathe can be fed a fabrication model in the form of a program. It can then carry this out on many work products to generate a required shape. Similarly, a CNC drilling machine can carry out automatic drilling on several work products based on a stored program.

**distributed system** A distributed system consists of multiple independent computers spread over a geographic area, and connected to each other over a communication network. The individual computers in a distributed system do not have any shared memory. Therefore, these are also called *loosely-coupled systems*.

**DSP** Digital signal processing (DSP) refers to using computers to process signals such as sound, video, and other analogue signals which have been converted to digital form. Some uses of DSP are to decode modulated signals from modems, to process sound, video and images in various ways, and to understand data from sonar, radar and seismological readings. A digital signal processor is a specialized CPU used for digital signal processing.

**ethernet** It is a widely used local area protocol. It implements the IEEE 802.3 standard and is based on the CSMA/CD protocol.

**FDDI** Fibre Distributed Data Interface (FDDI) is a standard for data transmission in a local area network that can extend in range up to 200 km (124 miles). The FDDI protocol is based on the token ring protocol. An FDDI local area network can support thousands of users. The underlying medium is usually optical fibre. However, it can be copper cable as well, in which case it is called Copper Distributed Data Interface (CDDI). An FDDI network contains two token rings, in which tokens rotate in opposite directions. One of the rings is normally used for possible backup in case the primary ring fails. The topology of FDDI is, therefore, a dual-attached, counter-rotating token ring. The primary ring offers up to 100 Mbit/s capacity. If the secondary ring is not needed for backup, it can also carry data, extending capacity of the network to 200 Mbit/s. FDDI is a product of American National Standards Institute (ANSI) and conforms to the open system interconnect (OSI) model of functional layering. FDDI has been largely made redundant by the availability of fast Ethernet and more recently gigabit Ethernet, on cost and speed considerations.

**flash memory** Flash memory is a type of Electrically Erasable and Programmable Read-Only Memory (EEPROM). Flash memory differs from EEPROM in that EEPROM erases its contents one byte at a time. This makes it slow to update. Flash memory, on the other hand, erases its data in entire blocks, making it a preferable technology for applications that require frequent updating of large amounts of data as in the case of a memory stick. Memory sticks are popularly used in digital cameras and several other embedded applications. However, there is a bound of the order of a million updates that a flash memory can sustain.

Of late, flash memory is being used as pen drives. Pen drives are available in capacities exceeding 1GB and can even be used as a hard drive. Flash memory can be used as a hard drive when the number of memory updates required is not very large as in Apple Computer's iPod. In this case, it has many advantages over a traditional hard drive. It is non-volatile, does not have any moving parts; it is silent, much smaller than a hard drive, weighs much less and consumes much less power than a hard drive, and has a much faster access time. However, the advantages of a traditional hard drive include more competitive price and much higher capacity. However, the prices of flash memory are falling very rapidly (about 50% every year) and the capacities are rising.

**flight simulation** Flight simulation is based on a simulator that tries to simulate (that is, replicate) the experience of flying an airplane as closely and as realistically as possible. The different types of flight simulators that are now available range from video games, to full-sized cockpit replicas mounted on hydraulic platforms, controlled by state of the art computer technology to give a realistic feel of flying.

**GPS** A global positioning system (GPS) consists of a constellation of satellites which orbits the earth, transmitting precise time and position information. A GPS receiver on earth can compute the difference in time that signals from different satellites take to reach the receiver, and from this it can determine the precise latitude and longitude of its current position.

**hub** A hub (sometimes referred to as a concentrator) is a common connection point for nodes in a network. Hubs are commonly used to connect the different segments of a LAN. A hub contains multiple ports. When a packet arrives at one port, it is copied to the other ports, so that all segments of the LAN can see all packets being transmitted.

In its simplest form, a hub works by duplicating the data packets received via one port and making it available on all ports, therefore, allowing data sharing among all devices connected to the hub. On the other hand, a *manageable* (or intelligent) hub allows the data transfer to be monitored and the ports to be configured individually. Another type of hub, called a switching hub, reads the destination address of each packet and then forwards the packet to the correct port.

**internet routers** It is a special-purpose computer (or software package) that handles the connection between two or more packet-switched networks. Routers spend all their time looking at the source and destination addresses of the packets passing through them and deciding which route to send them on.

**internet telephony** Internet telephony is used to transport telephone calls over the Internet.

**IP address** This is a dot-decimal notation that is used to identify computers on a network.

**LDAP** Lightweight Directory Access Protocol (LDAP) is a software protocol for enabling anyone to locate organizations, individuals and other resources such as files and devices in a network, whether on the public Internet or on a corporate intranet. LDAP is a 'lightweight' (small amount of code) version of Directory Access Protocol (DAP), which is a part of X.500, a standard for directory services in a network. LDAP is lighter because in its initial version it did not include security features. Because it is a simpler version of X.500, LDAP is sometimes called X.500-lite. Because LDAP is an open protocol, applications need not worry about the type of server hosting the directory.

On TCP/IP networks (including the Internet), the domain name system (DNS) is the directory system used to relate the domain name to a specific network address (a unique location on the network). However, you may not know the domain name. LDAP allows you to search for an individual without knowing where they are located. LDAP can assist in this search.

An LDAP directory is organized in a simple 'tree' hierarchy consisting of the following levels:

- The root directory (the starting place or the source of the tree), which branches out to;
- Countries, each of which branches out to;
- Organizations, which branch out to;
- Organizational units (divisions, departments and so forth), which branches out to (includes an entry for);
- Individuals (which includes people, files and shared resources such as printers).

LDAP originated at the University of Michigan and has been endorsed by at least 40 companies. Netscape includes it in its latest Communicator suite of products. Microsoft includes it as a part of what it calls Active Directory in a number of products including Outlook Express. Novell's NetWare Directory Services interoperates with LDAP. Cisco also supports it in its networking products.

**MPEG** MPEG is a standard set by the Moving Picture Experts Group (MPEG) for the compression and encoding of sound and video images. The Moving Picture Experts Group is a working group of ISO/IEC charged with the development of video and audio encoding standards. MPEG uses lossy data compression. In a lossy transform, samples of picture or sound are taken, chopped into small segments, transformed into a frequency space, and quantized. The resulting quantized values are then entropy coded. MPEG also adds extra steps to predict the picture content from past reconstructed images, and only the extra information needed to perform the prediction, are coded. This results in better compression.

**MRI scanner** An Magnetic Resonance Imaging (MRI) scan is a radiology technique which uses magnetism, radio waves and a computer to produce images of body structures. The magnetism in an MRI scanner is produced by a giant circular magnet surrounding a tube that acts as the platform.

**multimedia multicast** Multimedia applications include a synchronized set of flows of different media, such as data, voice and video. In multicast transmissions, any host can transmit to several receivers called a *multicast group*. Any host can join a multicast group and receive data. Multimedia multicast can efficiently use available network bandwidth for continuous media communications.

**multiprocessor** In a multiprocessor system, multiple processors share a centralized memory. Therefore, a multiprocessor is also called a *shared memory system*. A multiprocessor system is also known as a tightly coupled system.

**packet switching** It is a method of sending messages over a network, after fragmenting messages into packets. Each packet has a size less than a maximum limit defined by the network. Packet switching does not require any end-to-end connection to be established between the sender and the receiver.

**piezoelectricity** Piezoelectricity denotes the electricity produced by mechanical pressure (from Greek word piezein) on certain crystals, notably quartz or Rochelle salt. In a piezoelectric material, application of pressure or stress results in development of charge on the surface of the material. Conversely, application of charge to the same material can result in a change in mechanical dimensions leading to development of strain.

**photo-voltaic cell** A photo-voltaic cell (also known as a solar cell) is a semiconductor device consisting of a large-area p-n junction diode, which, in the presence of sunlight is capable of generating electrical energy. This conversion is called the *photo-voltaic effect*.

**PSTN** A public switched telephone network (PSTN) is a collection of interconnected telephone systems operated by various telephone companies (Telcos) and administrations around the world.

**satellite tracking system** It is a system for tracking positions on the Earth's surface by comparing radio signals received from several orbiting satellites. An example of a satellite tracking system is a global positioning system (GPS).

**set-top box** The term set-top box refers to an electronic device that sits on top of a television set and is the interface between the home television and some communication channels such as telephone, ISDN, optical fibre or cable.

**streaming audio/video** A technique for transferring data such that it can be processed as a steady and continuous stream. Streaming technologies are becoming increasingly important with the growth of the Internet

because most users do not have fast enough access to download large multimedia files quickly. With streaming, the client browser or plug-in can start displaying the data before the entire file has been transmitted.

For streaming to work, the client side receiving the data must be able to collect the data and send it as a steady stream to the application that is processing the data and converting it to sound or pictures. This means that if the streaming client receives the data more quickly than required, it needs to save the excess data in a buffer. If the data does not come quickly enough, however, the presentation of the data will not be smooth. For audio data on the Internet, Progressive Network's RealAudio is being widely used.

**switches** A switch is a computer networking device that connects several local area network (LAN) segments. Looked from a different perspective, a switch effectively splits a large network into small segments, decreasing the number of nodes that share the network resources, resulting in higher transmission capacity.

**symbolic debugger** A conventional debugger works by examining the binary image of the program. In contrast, a symbolic debugger enables a programmer to display the lines of the original source code file, and the values of variables by referencing the variable name. It is called a symbolic debugger because variables and functions are accessed by using the symbolic names given to them in the source code file, rather than by interpreting Hex code.

**system call** All operating systems provide services to the user to perform low-level operations. For example, as a user you can write down a command such as `mkdir` at the command prompt to create a directory. However, as a programmer if you want to avail an operating system service from within a program code, you have to invoke the corresponding system call (posix system call for creating a directory has the following synopsis: `int mkdir (const char *path, mode_t mode);`).

**system generation** It is a utility that enables an operating system to properly configure and setup hardware and software configurations. It often requires relinking the object modules of the operating system.

**TCP/IP** TCP/IP stands for Transmission Control Protocol/Internet Protocol. It is a protocol suite for communication between computers. It is used as a standard for transmitting data over networks and is the basis for the immensely popular Internet. Internet Protocol is a connectionless protocol responsible for packet routing. The Transmission Control Protocol (TCP) is layered above the Internet Protocol (IP). These protocols were developed by DARPA to enable communication between different types of computers and computer networks. TCP is connection-oriented and provides reliable communication and multiplexing.

**thermocouple** A thermocouple is often used to measure temperature. A thermocouple consists of two wires of different metals joined at both ends. One junction is maintained at the temperature to be measured and the other is held at a fixed lower temperature. The current generated in the circuit is proportional to the temperature difference between the two joints.

**transformer-coupled circuit** When two electrical circuits are transformer-coupled, no direct current flows between them and they are said to be electrically isolated.

**URL** A uniform resource locator (URL) is an address of a web page (or web site) on the world wide web (WWW). To visit a certain web page, one needs to type in the respective URL to a browser.

**VPN** A virtual private network (VPN) is a network that uses a public telecommunication infrastructure, such as the Internet, to provide remote offices or individual users with secure access to their organization's network. A virtual private network can be contrasted with an expensive system of owned or leased lines that can only be used by one organization. The goal of a VPN is to provide the organization with the same capabilities, but at a much lower cost. A VPN works by using the shared public infrastructure while maintaining privacy through security procedures and tunneling protocols such as the Layer Two Tunneling Protocol (L2TP). In effect, the protocols, by encrypting data at the sending end and decrypting it at the receiving end, send the data through a 'tunnel' that cannot be 'entered' by data that is not properly encrypted. An additional level of security involves encrypting not only the data, but also the originating and receiving network addresses.

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