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20th Updated and Expanded Edition

by Harry Newton

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tem. After the Internet became very popular, the manager of my local phone company complained to me that his average phone call had now risen to one hour (from three minutes) and this was "killing him." He had been forced to put in more capacity, even though he wasn't getting paid any more money.

Internet Open Trading Protocol IOTP. An interoperable framework for Internet commerce, IOTP was developed by the Open Trading Protocol Consortium, and has been accepted by the Internet Engineering Task Force (IETF) for standards development. IOTP is intended to be independent of any underlying electronic payment systems, such as SET (Secure Electronic Transaction), Mondex, CyberCash, and DigiCash. According to the IETF, a "fundamental ideal of the IOTP effort is to produce a definition of these trading events in such a way that no matter where produced, two unfamiliar parties using electronic commerce capabilities to buy and sell that conform to the IOTP specifications will be able to complete the business safely and successfully."

Internet Packet Exchange IPX. Novell NetWare's native LAN communications protocol, used to move data between server and/or workstation programs running on different network nodes.

Internet Peering See Peering.

Internet Plumbers Internet plumbers are the companies who make the equipment that makes up the Internet's infrastructure, such as the routers and the servers. They include Cisco, IBM, Lucent and Sun.

Internet Print Server An Internet print server allows anyone to print a document on any printer on the Internet with the same ease as printing on a printer attached to the PC. Internet Printing is just like e-mail, Internet faxing, Internet Telephone and Video. It is a new method of data streaming through the Internet, that will further open up the Internet for new applications. Black Ice Software, was the first company to announce an Internet print server, www.blackice.com.

Internet Protocol IP. Part of the TCP/IP family of protocols describing software that tracks the Internet address of nodes, routes outgoing messages, and recognizes incoming messages. Used in gateways to connect networks at OSI network Level 3 and above. See Internet, Internet Protocol Address and TCP/IP.

Internet Protocol Data Record See IPDR.

Internet Protocol Address Also called IP Address. It's a unique, 32-bit number for a specific TCP/IP host on the Internet. IP addresses are normally printed in dotted decimal form, such as 128.127.50.224. Once your domain is assigned a group of numbers by the Internet's central registry, it can house one or several domains and/or hosts, i.e. computertelephony.com and teleconnect.com. People looking for those domains will be pointed to that server where they will find all information in the domain — perhaps a home page, or a place to leave e-mail, etc. There are three classes of IP address A, B, and C — the most common of which is a class "C" address block. A class "C" address block can address about 256 hosts (e.g., 128.10.10.*). a class "B" address block can contain about 256*256 (e.g., 128.10.*.*) hosts. Some ip addresses are reserved for broadcasts in respective domains. See Domain and Internet.

Internet Protocol Datagram The fundamental unit of information passed across the Internet. Contains source and destination addresses along with data and a number of fields which define such things as the length of the datagram, the header checksum, and flags to say whether the datagram can be (or has been) fragmented, This is a self-contained packet, independent of other packets.

Internet Protocol Suite The TCP/IP suite of network protocols which were mandated for use in the Internet in 1983. The suite includes the following protocols (and the Layer at which each functions in the context of the OSI Reference Model): IP, or Internet Protocol (Layer 3); TCP, or Transmission Control Protocol (Layer 4); UDP, or User Datagram Protocol (Layer 7); FTP, or File Transfer Protocol (Layer 7); TELNET, or TELecommunications NETwork (Layer 7); SMTP, or Simple Mail Transfer Protocol (Layer 7); and SNMP, or Simple Network Management Protocol (Layer 7). See the definitions of these terms for much more detail.

Internet Radio As I write this, I am wearing headphones plugged into my laptop listening to Klassik Radio from Hamburg, Germany. Find it and others at http://windows-media.com/radiotuner/default.asp. The music is wonderful. The clarity is perfect. How does this work? The "radio station" simply sets up a web server attached to the Internet. Instead of putting up text and pictures like other web sites do, it puts up its "radio station." That radio station may be programming its broadcasting over the air in Hamburg, or it may be programming by just specially putting the material up on he web site. That station might also give you its program. How do I listen to Internet radio broadcasts? Most internet radio broadcasts are easily accessible using your web browser and either RealPlayer (from www.Real.com) or Windows Media Player, which comes with Microsoft's browser Internet Explorer. Both of these softwares come with preloaded addresses for interesting Internet radio stations. But you can find thousands more by searching on Web for "Internet Radio." There are four neat things about Internet radio: The quality is perfectly fine on a dial connection; there's a huge variety of available radio stations (at least several thousand), enough to satisfy anyone's taste; it's all free and fourth, when you log onto many of the stations, a screen may pop up giving you the Radio's program guide. Internet Radio is one of the Internet's enormous benefits.

Internet Registry Activities involved in the administration of generic Top Level Domains (gTLDs) in the CORE (Council or REgistrars) Domain System. Such activities comprise all the services needed for assignment and maintenance of Internet domain names. As many as 90 registrars will be authorized by CORE as registrars to administer and maintain the new gTLDs: .arts, .firm, .info, . nom, .rec, .shop and .web. InterNIC historically has been primarily responsible for the assignment, administration and maintenance of a subset of the traditional gTLDs, specifically, .com, .edu and .org. Future responsibility for those traditional gTLDs is uncertain. See also CORE, DNS, gTLD and InterNIC.

Internet Relay Chat IRC. Sort of like CB radio, but run on the Internet, and far more confusing than CB radio. See IRC for a real definition.

Internet Research Task Force IRTF. An Internet organization that creates long- and short-term research groups concentrating on protocols, architecture, and technology issues. For more information on IRTF, see www.irtf.org.

Internet Router see Router.

Internet Security Information traveling on the Internet usually takes a circuitous route through several intermediary computers to reach any destination computer. The actual route your information takes to reach its destination is not under your control. As your information travels on Internet computers, any intermediary computer has the potential to eavesdrop and make copies. An intermediary computer could even deceive you and exchange information with you by misrepresenting itself as your intended destination. These possibilities make the transfer of confidential information such as passwords or credit card numbers susceptible to abuse. This is where Internet security comes in and why it has become a rapidly growing concern for all who use the Internet. See the Internet and Secure Channel.

Internet Server 1. An Internet server is a device which users on the Internet access to get services. Such services might be electronic mail, news, a Web page, etc. A company will have one or more Internet servers attached to the Internet when it wants to deliver services to people on the Internet. Such Internet servers could be called e-mail servers, FTP servers, News servers and World Wide Web servers. Internet servers most commonly run on Unix. But Microsoft Windows NT is increasingly gaining popularity.

2. A Sun Microsystems term, Part of Solaris' Server Suite. Provides secure, scalable workgroup-based Internet computing.

Internet Server API See ISAPI.

Internet Service Provider ISP. A vendor who provides access for customers (companies and private individuals) to the Internet and the World Wide Web. The ISP also typically provides a core group of internet utilities and services like E-mail, News Group Readers and sometimes weather reports and local restaurant reviews. The user typically reaches his ISP by either dialing-up with their own computer, modem and phone line, or over a dedicated line installed by a telephone company. An ISP is also called a TSP, for Telecommunications Service Provider, and a ITSP, for Internet Telephony Service Provider.

Internet Small Computer Systems Interface See iSCSI.

Internet Society See ISOC.

Internet Telephony In the very beginning, Internet telephony simply meant the technology and the techniques to let you make voice phone calls — local, long distance and international — over the Internet using your PC. To make these calls, both people on the phone need appropriate hardware and software. The hardware is typically a sound card or voice modem in a PC. There are almost as many ways of making phone calls on the Internet as there are software packages. The key is to figure a way that your PC can dial and reach someone else's distant PC — which must be turned on, plugged in and connected to some place that my PC can find you at. In short, making voice phone calls was the first definition of Internet telephony. But then people started thinking of other things Internet telephony could become. For example, Internet telephony could let you talk to someone while the two of you worked on making perfect a document that was on both your screens. If the Internet could send email, people started thinking of sending fax, voice,

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Memory Reserve Power The operating voltage, generally provided by a battery, which supplies power to the memory modules when your commercial power fails. You should check your memory reserve power before it's too late. You should test it even when you don't need it.

Memory Technology Driver A PCMCIA card definition. A memory technology driver is a memory device specific software that interfaces to Card Services to mask the details of accessing different memory technologies.

MEMS See MicroElectroMechanical System.

MEN See Metro Ethernet Network.

Menu Options displayed on a computer terminal screen or spoken by a voice processing system. The user can choose what he wants done by simply choosing a menu option — either typing it on the computer keyboard, hitting a touchtone on his phone or speaking a word or two. There are basically two ways of organizing computer or voice processing software — menu-driven and non-menu driven. Menu-driven programs are easier to use but they can only present as many options as can be reasonably crammed on a screen or spoken in a few seconds. Non-menu driven screens allow more alternatives but are much more complex and frightening. It's the difference between receiving a bland "A" or "C" prompt on the screen — as in MS-DOS and receiving a menu of "Press A if you want Word Processing," "Press B if you want Spread Sheet," etc. It's very easy to write menus in MS-DOS using BATch files. See also Audio Menus and Prompts.

Menu Bar call center term. The part of the menu system visible as a single row across the top of the display.

MEO Middle (or Medium) Earth Orbiting satellite. MEOs operate much like LEOs (Low Earth Orbiting satellites systems), although in slightly higher orbits. MEOs generally operate at an altitude of around 10,000 kilometers. Continuous global communications service can be achieved with six to 12 satellites. MEOs are capable of supporting both voice and data services. Contrast with GEO, Geosynchronous and LEO. See also Medium Earth Orbit.

MEP Multiplex Equipment Provisioning.

Merced Merced is a 64-bit multichip module jointly developed by Intel with Hewlett-Packard Co. It extends the Intel architecture in both raw speed (one version will reach 600-MHz) and overall performance. Merced will be followed by the two-chip processor called Flagstaff in the year 2000. Flagstaff chips will be the first built using a process that creates much smaller 0.18-micron-wide circuits, which will enable Intel to build smaller and faster chips in greater volume. There will be two versions of Flagstaff, with a choice of 4 Mbytes or 8 Mbytes of secondary cache, according to writer, Tom Davey.

Merchant Silicon Merchant Silicon is a special microprocessor chip, which is a non-ASIC, commercially available semiconductor chip.

Mercury-Wetted Relay A relay or switch in which the movable contact of the device makes contact with a pool of mercury. Before solid-state devices, this was common technology for switching dry circuits. See also Dry Contact.

Merging Traffic The telecommunications, cable, consumer electronic and media conglomerates all vying for access to the same markets. See Siliwood.

Meridian A Northern Telecom (now called Nortel) name for a family of PBXs.

Meridian Link Meridian Link from Northern Telecom enables Meridian 1 Communication Systems (i.e. PBXs and ACDs) to exchange information with host computers and the application software that resides on those computers. This means that the application software can use information such as Automatic Number Identification (ANI) and Dialed Number Identification System (DNIS) to automatically perform a series of routines, such as record look-up.

Meridians Lines circling the earth from pole to pole which are used to measure distance (longitude) around the globe.

Meridional Ray In fiber optics, a ray that passes through the optical axis of an optical fiber. This contrasts with a skew ray, which does not.

MERIT The successor to NSFNET, MERIT originally was a statewide IP network operated by the University of Michigan. It also was a substantial regional subnetwork (subnet) of the NSFNET and the Internet. MERIT provides access into the Internet through MAEs (Merit Access Exchanges) located in San Jose (MAE West) and Vienna, Virginia (MAE East); those points of access actually are provided in partnership with MFS Datanet. See MAE.

MERS Most Economical Route Selection. A term used by GTE and some other PBX manufacturers to mean Least Cost Routing. See Least Cost Routing.

Mesh Network architecture in which each node has a dedicated connection to all other nodes.

Mesh Connectivity A Wide Area Network (WAN) term for connectivity over a mesh network, wherein each site is directly connected with every other site. See Mesh Network for a much fuller explanation.

Mesh Network A leased line network that provides a direct connection between each site and every other site. Through the use of intelligent internetworking devices, such as Nodal Multiplexers in a T-Carrier network, each transmission might be routed over an alternative path should the primary (direct) path between the two sites be either congested or in a state of failure. The advantages of mesh networking include high availability of efficient transmission links of high quality. Through the use of intelligent internetworking devices, network redundancy offers the advantage of network resiliency. The disadvantages of a full mesh include high cost, difficulty of configuration and reconfiguration, and long lead times associated with carrier provisioning. Mesh networks are relatively easy and inexpensive to configure where four or fewer sites must be interconnected; the cost and complexity increase significantly where more than four sites are involved. As a result, large organizations increasingly tend to favor alternative solutions for voice and data. Such alternatives as Virtual Private Networks (VPNs), Frame Relay, SMDS and ATM offer performance comparable to leased mesh networks, but at lower cost, with greater flexibility of configuration, and without the long lead times.

Meso The Greek prefix meaning the middle.

Mesochronous The relationship between two signals such that their corresponding significant instants occur at the same average rate.

Message 1. A sequence of characters used to convey information or data. In data communications, messages are usually in an agreed format with a heading which establishes the address to which the message will be sent and the text which is the actual message and maybe some information to signify the end of the message. A Northern Telecom Norstar definition: A message, which appears on the telephone display that informs the recipient to call the person who sent the message. Messages can only be sent within the Norstar system.

2. The Layer 3 information in the OSI model that is passed between the CPE and SPCS for signaling.

3. A SCSA definition. The transport container for SCSA requests, replies and events. Assumes a set of conventions for directing the delivery of the message to the proper entity, either a client or service provider. See also SCSA Message Protocol.

4. A completed call, i.e., a communication in which conversation or exchange of information took place between the calling and called parties.

Message Alert A cellular phone term, also called "call-in-absence" indicator. A light or other indicator announcing that a phone call came in, an especially important feature if the cellular subscriber has VOICE MAIL.

Message Alignment Indicator In a signal message, data transmitted between the user part and the message transfer part to identify the boundaries of the signal message.

Message Backbone A single format message transport system designed for the electronic mail and messaging needs of an entire corporation or enterprise.

Message Center A centralized place within the corporation where messages are taken and (occasionally) delivered. Message centers are good if they are staffed with competent, motivated people and the various phones in the place have message waiting lights (like they do in hotels). If staffed by talented people, message centers work a lot better than the amateur message takers called secretaries and their part-time short-term replacements.

Message Circuit A long distance telephone phone line used in furnishing regular long distance or toll service to the general public. The term is used to differentiate message circuits from circuits used for private line service.

Message Customer Record Information System MCRIS. A system used by Verizon to receive and interpret central office switch usage records.

Message Detail Recording See Call Detail Recording and Call Accounting Systems.

Message Format The rules for placing information necessary for an electronic message. The format includes where the heading is and how long it will be as well as other control information.

Message Frame A SCSA term. A data link layer frame the encapsulates control and signaling data transmitted on the SCbus or SCxbus Message Bus. The form of a Message Bus frame is fully compliant with ISO HDLC UI (Unnumbered Information) Frame specifications. See SCSA.

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Message Handling Service 1. MHS. Software whose primary function is the movement of messages between application programs. MHS was developed by Action Technologies. Novell acquired full marketing and development rights to MHS for NetWare based LANs (local area networks). Under MHS, each application sends messages to the server's \mhs\mail\snd directory. MHS delivers messages to an application by placing them in the application's assigned directory. MHS is most commonly used for e-mail (electronic mail). Various e-mail programs use the MHS format for exchanging e-mail messages. MHS was superseded by GroupWise.

2. MHS also means the standard defined by ITU-T as X.400 and by ISO as Message-Oriented Text Interchange Standard (MOTIS). MHS is the X.400 family of services and protocols that provides the functions for global electronic-mail transfer among local mail systems.

Message Header The header before a string of data containing information regarding the destination of the data, usually in a packet in X.25 format.

Message Identifier MID. When the ATM Adaptation Layer segments higher layer information for transport in a sequence of ATM cells, the MID is a 10-bit field and is used to associate all the cells that carry segments from the same higher layer packet.

Message Integrity The notion that a message has not been altered and is, therefore, true to its original intent (a.k.a. data integrity).

Message Management A new term for managing all your voice mail, fax mail and electronic mail. The major concept is to join the control of the devices that produce voice, fax and e-mail through your desktop PC connected over your LAN. For example, you come into work in the morning, turn your PC on, and immediately see a screenful of messages — one line per message. By clicking on that line with your mouse, your PC would pull up the application that will then let you read or hear your message. The benefit is that you can handle your messages faster and be more discriminating about which ones you pay most and least attention to.

Message Packet A unit of information used in network communication. Messages sent between network devices (workstations, file servers, etc.) are formed into packets at the source device. The packets are reassembled, if necessary, into complete messages when they reach their destination. A message packet might contain a request for service, information on how to handle the request, and the data that will be serviced. An individual packet consists of headers and a data portion. Additional headers are appended to the data portion as the packet travels through the layers of the communication protocol. Any message that exceeds the maximum size is partitioned and carried as several packets. When the packet arrives at its destination, the headers are stripped off, the message delivered and the request serviced.

Message Rate A method of billing local phone calls that varies from one place to another. Phone calls are billed as "message units." Message units are a combination of length of call and distance of the call. In a city like New York you might buy "basic" phone service and be entitled to 50 "message units." That may mean you can call the local pizza house for under 5 minutes 50 times. Or it may mean that you can call from Manhattan to the Bronx 25 times — assuming each call is two message units.

Message Register Leads Terminal equipment leads at the interface used solely for receiving dc message register pulses from a central office at a PBX so that message unit information normally recorded at the central office only is also recorded at the PBX.

Message Registration A phone system feature that records the number of message units incurred by each phone. Useful in hotels which bill local calls by message units.

Message Retrieval The ability of a fax machine to store material already transmitted so it can be retransmitted.

Message Signal Unit Signal unit of CCS that carries a message corresponding to the information part or packet of the HDLC frame plus a message transfer part corresponding to the HDLC frame header.

Message Store An X.400 electronic mail term: A staging point, similar to a post office, in which messages are temporarily held for later transmission to one or more recipients.

Message Switch A message switch is another term for an electronic mail gateway, which is a LAN application that fetches messages from one electronic mail system, translates them to the format of another electronic mail system, and then sends them to the "post office" of that other system. The post office is the public entry point — the place you put mail you want the other system to receive.

Message Switching A technique for receiving a message, storing it for a while and then sending it on. Message switching is normally used when the desired recipient is not there. The message switch will keep attempting delivery, freeing the calling party to handle other work. Unlike voice phone calls no direct connection is made in message switching between the incoming and outgoing messages. Each message, like a Western Union telegram, contains a destination address and is recipient through intermediate nodes. Each node along the way receives the message, stores it briefly, and then passes it on to the next node. Message switching is a forerunner of what is now called packet switching. Only difference is that message switching had no fixed message length.

Message Switching Network A public data communications network over which subscribers send primarily text messages to one another.

Message Telecommunications Service MTS. The regulatory term for long distance or message toll voice service. Misnamed. Actually there's nothing "message-y" about this service. This is a 100% switched telephone service (which can, obviously, be used for voice, data, video or fax).

Message Telephone Service MTS. Official designation for tariffed long-distance, or toll, telephone service. See Message Telecommunications Service.

Message Toll Voice Service See Message Telecommunications Service.

Message Transfer MT. The carriage of information between parties using computers as intermediaries. It is one aspect of message handling.

Message Transfer Agent An X.400 electronic mail term: Software usually residing in a LAN server or host computer that moves messages between senders and recipients.

Message Transfer Part MTP. The part of SS7 signaling node that is used to place formatted signaling messages into packets, strip formatted signaling messages from packets, and send or receive packets.

Message Unit 1. The charge for one unit of local telephone service. How many message units you will find on your bill is a function of how many calls you made, how far the calls traveled, what time of the day or night you called and for how long you talked.

2. In IBM Corp's Systems Network Architecture, the portion of the data within a message that is passed to, and processed by, a specific software layer.

Message Unit Detail MUD. A service offered by local telephone companies in which they give you a report listing the phone number of all local calls made from each of your billing numbers. The billing number may be the main number for a PBX or the individual extensions if Centrex service is used. MUD reports are usually available to a telephone company customer at additional cost. MUD reports generally have to be requested in advance. Some telephone company central offices cannot generate MUD reports. When available, MUD reports may not be in machine processable form.

Message Waiting A light on the phone or some letters or characters on the phone's display indicating there's a message waiting somewhere for the owner of the phone. That message might be with a special message center (as in a hotel or a larger company), with the operator or with a computer attached to the phone system or with someone else in the company. Message waiting lights are incredibly useful at hotels. It's amazing more companies don't use them also.

Message-To-Slave Directory Propagation In electronic mail on a local area network, message-to-slave directory propagation is a way of updating user addresses where changes in the master post office are sent to the slaves, but changes in the slave post offices are not sent to the master.

Messages Roses French term for pay telephone pornographic messages. What the English call phone sex lines.

Messaging One-to-one communication. Messaging comes in several flavors (not all implemented as yet), including text messaging, audio messaging and video messaging. See also Instant Messaging.

Messaging Application Programming Interface MAPI. A set of calls used to add mail-enabled features to other Windows-based applications. See MAPI.

Messaging Enabled Applications MEA. This term defined by the Electronic Messaging Association, Arlington, VA. Applications that directly access the messaging service as a way of addressing and transporting information to and from objects on a network. Messaging Enabled Applications differ from Mail Enabled Application because they do not require electronic mail to successfully navigate the network. They may or may not have their own directory and also have the ability to directly access Directory Services. For example: A student requests a class via electronic mail to the education system. The education system automatically schedules the student (this an electronic mail enabled application).

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if you were renting software for small amounts of time.

Microtrenching How to get broadband fiber or coax to the last mile? You can't dig the big trenches we use for long-haul. Those trenches are too expensive and easily cost $100 a foot. A new digging technique known as micro trenching to the rescue. Micro trenching involves the creation of a shallow trench in the sidewalk or street asphalt, which is typically one-quarter of an inch wide and two to six inches deep. The layer of road base is not even touched. Using this method, a crew can lay as much as a thousand feet of fiber per day. Moreover the cost is typically one-fifth to a half of what normal trenching costs. Micro trenching also eliminates red tape and saves time. Surveying and permitting may take 30 days for a micro trenching job, as opposed to 60 or more days for a traditional trenching project. The difference is even more glaring when comparing the trenching work itself. A build may take as little as two days for micro trenching, but 30 or more days for conventional trenching work. From planning to completion, the build time frame for micro trenching may be 50 to 55 days, whereas the traditional approach can take 160 days, or more. Time is money. Much of this definition comes from Bill Morrow is vice chairman and CEO of Grande Communications, a Texas telecom company.

Microwave Electromagnetic waves in the radio frequency spectrum above 890 Megahertz (million cycles per second) and below 20 Gigahertz (billion cycles per second). (Some people say microwave refers to frequencies between 1 GHz and 30 GHz.) Microwave is a common form of transmitting telephone, facsimile, video and data conversations used by common carriers as well as by private networks. Microwave signals only travel in straight lines. In terrestrial microwave systems, they're typically good for 30 miles, at which point you need another repeater tower. Microwave is the frequency for communicating to and from satellites.

Microwave Absorber A tuned device used for blocking and preventing or reducing the re-emission or reflection of microwave frequency energy.

Microwave Band Loosely defined as those frequencies from about 1 gigahertz upward, Services that use microwave frequencies for point-to-point and point-to-multipoint communications include common carrier, cable TV operators broadcasters, and private operational fixed users.

Microwave Diffraction The tendency of microwave radiation to "bend" around objects.

Microwave Ducting Under certain conditions the earth and the upper atmosphere can sometimes behave as a wave guide with respect to microwave signals carrying them long distances.

Microwave Multi-Point Distribution System MMDS. Microwave Multi-point Distribution System. A means of distributing cable television signals, through microwave, from a single transmission point to multiple receiving points. Often used as an alternative to cable-based cable TV. According to an April, 1995 press release from Pacific Telesis, which was starting an MMDS service, "in digital form, it will provide more than 100 channels to a radius of approximately 40 miles from the transmitter. The MMDS transmitter delivers video to homes that are in its 'line of sight.' MMDS transmissions are limited by the terrain and foliage of a given market. The microwave signal is received by an antenna on the subscriber's home, then sent down coaxial cable to a box atop the customer's TV set. The box decodes and decompresses the digital signal."

Microwave Oven The following "urban legend" seems to be quite prevalent on the internet: "The microwave oven was invented after a researcher walked by a radar tube and a chocolate bar melted in his pocket." Actually, there is a kernel of truth in this, but it is, alas, inaccurate. The device was actually invented after researchers working on radar at Bell Labs noticed that a chocolate bar that had been left near a magnetron melted after a few hours of exposure. If a researcher had a chocolate bar melt in his pocket as he walked by radar equipment, he would most probably would have melted with it.

Microwave Pill In space weaponry, one idea is to place a microwave gun on board a microsatellite. Have the microsatellite siddle alongside your enemy's satellite, then emit a pulse of microwaves and fry your enemy's electronics permanently. This application, in U.S. military parlance, is called a "high-power microwave pill."

Microwave Pulse Generator MPG. A device that generates pulses at microwave frequencies.

Microwave Reflection The tendency of microwave radiation to bounce off objects and behave according to the physical principles of light.

Microwave Tags RFID radio frequency tags that operate at 5.8 GHz. They have very high transfer rates and can be read from as far as 30 feet away, but they use a lot of power and are expensive.

MID An ATM term. Message Identifier. The message identifier is used to associate ATM cells that carry segments from the same higher layer packet.

Mid Span See 802.3af.

Mid-air Passenger Exchange Grim air traffic controller speak for a head-on collision. Midair passenger exchanges are quickly followed by "aluminum rain." Definition from Wired Magazine.

Mid-span A phone service that runs from a pole to a hook attached to a cable strand before it reaches the building.

Mid-span Device See 802.3af.

Mid-span Meet Sonet's ability to mix the terminal, multiplexing and cross-connect equipment from different vendors. A major accomplishment for standardization. Wish more telecom systems could meet mid-span. Sadly, most can't.

Mid-split A broadband cable system in which the cable bandwidth is divided between transmit and receive functions. A cable television system in which the guard band (or split) between the upstream and downstream signals is at 114-150 MHz. Defined in IEEE 802.7. Compare to the definitions of Sub-Split and High-Split.

Midband Microsoft's word for telecom speeds that are faster than phone lines but slower than broadband networks. ISDN BRI is midband.

Middle Mile The connection between an ISP and the Internet Backbone. The middle mile consists of one or more carrier networks that move traffic from the access ISP to the "final" ISP. This is where path diversity takes place; indeed traffic typically takes two different paths through this middle mile - traffic flowing from the client to the content provider takes one route, while traffic from the content provider back to the client takes a different path. This is due to the carrier's policies (e.g. hot-potato routing) or to the decisions the Border Gateway Protocol (BGP) makes from each perspective. The middle mile is the section of the link where path diversity is possible.

Middleware Middleware is software which sits between layers of software to make the layers below and on the side work with each other. Essentially, middleware serves as a translation mechanism, gluing together application software across a network, and on a transparent basis. On that broad definition, middleware could be almost any software in a layered software stack. Let's consider several examples: In computer telephony, middleware tends to be software that sits right above that part of the operating system dealing with telephony — TSAPI in NetWare or TAPI in Windows — but below the computer telephony application above it which the user sees on their desktop. Database middleware supports one-way access from clients to a server-based database. Messaging middleware is similar to an e-mail system, allowing systems to exchange data.

Middlewave Communications software that acts as a universal translator between diverse radio frequencies and protocols. The software physically resides on a remote client and on a communications server located between the client and the applications server.

MIDI Musical Instrument Digital Interface, a standard for connecting musical instruments, synthesizers and computers. The MIDI standard provides a way to translate music into computer data, and vice versa. A file with a MIDI extension means that it's a file containing music. In contrast, a file with the extension WAV typically means it's a sound file, which means it may contain a voice recording.

MIDP Mobile Information Device Profile. Set of Java APIs that is generally implemented on the Connected Limited Device Configuration (CLDC). It provides a basic J2ME application runtime environment targeted at mobile information devices, such as mobile phones and two-way pagers. The MIDP specification addresses issues such as user interface, persistent storage, networking, and application model.

Midrange System Medium-scale computer that functions as a workstation or as a multiuser system handling several hundred terminals.

Midspan Repeater A device that amplifies the signal coming or going to the central office. This device is necessary for ISDN service if you are outside the 18,000 feet distance requirement from the central office.

Midsplit A broadband cable system in which the cable bandwidth is divided between transmit and receive frequencies. The bandwidth used to send toward the head-end (reverse direction) is about 5 MHz to 116 Mhz, and the bandwidth used to send away from the head-end (forward direction) is about 168 MHz to 400 Mhz. The guard band between the forward and reverse directions (100 MHz to 160 MHz) provides isolation from interference. Requires a frequency translator.

MIF 1. Management Information File. MIF is a file format for DMI that describes components within a PC. See WFM.

2. Minimum Internetworking Functionality. A general principle within the ISO that calls

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CRC, Frame Relay, Packet Assembler/Disassembler (PAD), X.25.

Packet Assembler/Disassembler PAD. A hardware/software combination that forms the interface between a X.25 network such as PDN and an asynchronous device such as a PC. The PAD generates call request, call clear, and other information packets in addition to the ones that contain user data. The PAD is responsible for packetizing the data from the transmitting device before it is forwarded through the packet network. On the receiving end of the transmission, the PAD strips away the control information contained in the header and trailer in order to get at the original text or payload, in effect disassembling the packets and reconstituting the original set of data in its native or original form. The PAD may be in the form of a standalone DCE device on the customer premise and supporting one or more terminals, or in the form of a printed circuit board which fits into an expansion slot of the terminal. Smaller users generally rely on the carrier to provide the PAD, which is embedded in the packet switch.

Packet Buffer Memory set aside for storing a packet awaiting transmission or for storing a received packet. The memory may be located in the network interface controller or in the computer to which the controller is connected. See Buffer.

Packet Burst Protocol A protocol built on top of IPX that speeds the transfer of NCP data between a workstation and a NetWare server by eliminating the need to sequence and acknowledge each packet. With packet burst, the server sends a whole set (or burst) of packets before it requires an acknowledgement.

Packet Controller The hub of the AT&T ISDN system. It acts as a fast packet switch providing virtual circuit services to the devices hooked to the system.

Packet Driver The specification developed by John Romkey at FTP Software to allow TCP/IP and other transport protocols to share a common network interface card. Packet Drivers have been written for a variety of network interface cards, and in many cases provide NetWare compatibility.

Packet Filtering Packet filtering is the recognition and selective transmission or blocking of individual packets based on destination addresses or other packet contents. Packet filtering can be an elementary form of firewall in that it can accept or reject packets based on predefined rules. This ability helps to control network traffic. See Packet Filtering Firewall.

Packet Filtering Firewall A packet filtering firewall is a router or a computer running software that has been configured to block certain types of incoming and outgoing packets. A packet-filtering firewall screens packets based on information contained in the packets' TCP and IP headers, including some or all of the following: Source address; Destination address; Application or protocol; Source port number; and Destination port number. See Packet Filtering.

Packet Forwarding Copying the packet to another node without looking at the destination address.

Packet Handler Function The packet switching function within an ISDN switch, for the packet mode bearer service.

Packet Inspection Essentially what it sounds like. Your device — typically a switch — looks at every packet it is moving around. Inspecting every packet that a switch switches gives the switch the ability to do neat things to the packets — like rate limiting, quality of service (e.g. voice and video gets moved faster) and various levels of security (porn gets dropped, selective encryption, etc.)

Packet Interleaving Refers to the process of multiplexing multiple incoming packets from multiple channels on to a single outgoing channel by sampling one or more packets from the first channel, then the next, and so on.

Packet Level In packet data networking technology, level 3 of X.25. Defines how user messages are broken into packets, how calls are established and cleared over the packet data network (PDN) and how data flows across the entire PDN. The packet level also handles missing and duplicate packets.

Packet Level Procedure PLP. A full-duplex protocol that defines the means of packet transfer between a X.25 DTE and a X.25 DCE. It supports packet sequencing, flow control (including maintenance of transmission speed), and error detection and recovery.

Packet Mode Bearer Service An ISDN term for X.25 packet data transmission over the D channel in a BRI application. Always a part of the ITU-T (nee CCITT) standards, the 16-Kbps D channel can accomplish its primary responsibilities for signaling and control while still leaving 9.6 Kbps free for end user transmission of low-speed data. Retailers use of this service for credit card authorization. See also AO/DI, BRI and ISDN.

Packet over SONET A metropolitan area network (MAN) or wide area network (WAN) transport technology that carries IP packets directly over SONET transmission without any data link facility such as ATM in between. Packet over SONET is intended to transmit data at the highest rates possible, because SONET has a smaller packet header overhead than ATM (28 bytes out of an 810-byte frame compared with 5 out of a 53-byte ATM cell).

Packet Overhead A measure of the ratio of the total packet bits occupied by control information to the number of bits of data, usually expressed as a percent.

Packet Radio Packet Radio is the transmission of data over radio using a version of the international standard X.25 data communications protocol adapted to radio (AX.25). It takes your information, and breaks it up into "packets" which are each sent and acknowledged separately. This assures error-free delivery from sender to receiver. A packet is a stream of characters consisting of a header, the information the user is sending, and a check sequence. The header gives the destination call sign, the call sign of the sender, and any digipeaters (digital repeater) call signs that will be used for relaying the packet. The check sequence makes certain that the data received is what was sent. AlohaNET, a packet radio network developed for a number of years ago for use at the University of Hawaii, was an early packet radio network for LAN networking among the islands and laying a foundation for subsequent packet networks, both wired and wireless. Packet radio data networks recently have been deployed by a number of carriers serving mobile and fleet applications, with such carriers including ARDIS, RAM Mobile Data and Nextel.

Packet Size The length of a packet, expressed in bytes (B). Packet size is of specified and fixed length in X.25 and other true packet networks. The size of the "packet" in other networks may be variable within limits, as is the case with an Ethernet frame or a Frame Relay frame.

Packet Sniffer Most data is now transmitted in packets. A packet sniffer is a piece of software that simply examines every packet on whichever circuit/s it's assigned to monitor. A packet sniffer could be used by a legitimate company to protect itself against unwanted intruders into its network. It could also be used by an intruder to monitor a data stream for a pattern such as a password or credit card numbers. See the Internet and IP.

Packet Switching Sending data in packets through a network to some remote location. The data to be sent is assembled by the PAD (Packet Assembler/Disassembler) into individual packets of data, involving a process of segmentation or subdivision of larger sets of data as specified by the native protocol of the transmitting device. Each packet has a unique identification and each packet carries its own destination address. Thereby, each packet is independent, with multiple packets in a stream of packets often traversing the network from originating to destination packet switch by different routes. Since the packets may follow different physical paths of varying lengths, they may experience varying levels of propagation delay, also known as latency. Additionally, they may encounter varying levels of delay as they are held in packet buffers awaiting the availability of a subsequent circuit. Finally, they may be acted upon by varying numbers of packet switches in their journeys through the network, with each switch accomplishing the process of error detection and correction. As a result, the packets may also arrive in a different order than they were presented to the network. The packet sequence number allows the destination node to reassemble the packet data in the proper sequence before presenting it to the target device.

Originally developed to support interactive communications between asynchronous computers for time-share applications, packet switched networks are shared networks, based on the assumption of varying levels of latency and, thereby, yielding a high level of efficiency for digital data networking. Isochronous data such as realtime voice and video, on the other hand, are stream-oriented and highly intolerant of latency. As a result, packet switched networks are considered to be inappropriate for such applications. Recent development of certain software and making use of complex compression algorithms, however, has introduced packetized voice and video to the corporate intranets and the Internet, which was the first public packet-switched data network and remains by far the most heavily used.

Here is another way of explaining packet switching: There are two basic ways of making a call. First, the one everyone's familiar with — the common phone call. You dial. Your local switch finds an unused path to the person you called and joins you. While you are speaking, the circuit is 100% all yours. It's dedicated to the conversation. This is called circuit switched. Packet switching is different. In packet switching, the "conversation" (which may be voice, video, images, data, etc.) is sliced into small packets of information. Each packet is given a unique identification and each packet carries its own destination address — i.e. where it's going. Each packet may go by a different route. The packets may also arrive in a different order than how they were shipped. The identification and sequencing information on each packet lets the data be reassembled in proper sequence.

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Packet switching is the way the Internet works. Circuit switching is the way the worldwide phone system works, also called the PSTN (Public Switched Telephone Network).

Packet and Circuit Switching each have their own significant advantages. Packet switching for example does a wonderful job getting oodles of data into circuits. Think about a voice conversation. When you are talking, he's listening. Therefore half the circuit is dead. There are pauses between your voice. Packet switching takes advantage of those pauses to send data. Packet switching has been used primarily for data. But with the growth of the Internet, it has been used also for voice. Because of the need to re-assemble packets and other reasons, there's up to a half second delay between talking and the person at the other end hearing anything. Packet voice on the Internet is not as clear as circuit switched voice. But that's changing as the packets come faster and the technology improves. See Internet, IP Telephony and TAPI 3.0

Packet Switching Exchange PSE. The part of a packet switching network that receives the data from a PAD Packet Assembly Disassembler) through a modem. The PSE makes and holds copies of each packet before sending them to the PSE they're addressed to. After the far-end PSE acknowledges receipt of the original, the copies are discarded.

Packet Switching Network A network designed to carry data in the form of packets. See Packet Switching.

Packet Telephony Another name for Internet Telephony. Also called Voice Over the Internet. See VoIP.

Packet Tracing The monitoring and reporting a particular packet addresses or types for diagnostic purposes.

Packet Type Identifier In packet data networking technology, the third octet in the packet header that identifies the packet's function and, if applicable, its sequence number.

Packet-centric A growing focus in the telecom industry away from voice-dominant (circuit-centric) networks and toward IP packet networks as the future delivery system for combined data and telephony. Definition courtesy Wireless Magazine.

PacketCable PacketCable is a project managed by CableLabs on behalf of its member companies, PacketCable is a fast-track initiative aimed at developing interoperable interface specifications for delivering advanced, real-time multimedia services over IP-based packet channels carved out of two-way CATV cable plants. PacketCable is built on the infrastructure set by CableLabs Certified, previously known as DOCSIS (Data Over Cable Service Interface Specification), which sets standards for CATV modems and related network elements supporting high-speed Internet access over CATV networks. The PacketCable architecture is built around the NCS (Network-based Call Signaling) specification, which is a CATV-specific enhancement to MGCP (Media Gateway Control Protocol). MGCP is the de facto standard for multimedia call control between the traditional PSTN (Public Switched Telephone Network) and IP-based packet networks. PacketCable includes specifications for call signaling, QoS (Quality of Service) control, PSTN interconnection, security, network management, codec support, billing event messages, and network announcements. See also CableLabs, CableLabs Certified, MGCP, and NCS.

Packetized Video First, read the definition of "Packet Switching." Then read the definition of "Packetized Voice" just below. The concept of packetized video is basically the same as that of packetized voice. A video camera feeds the signal into a codec, which converts the native analog signal into a digital format, and segments the data into data packets. The packets are sent across a packet network as a packet stream for reassembly by a codec on the receiving end of the transmission before presentation on a monitor. While packetized video performance is improving in quality through the application of increasingly sophisticated video compression techniques, it suffers from the same intrinsic packet-switching characteristics as does packetized voice. Namely, packet latency and loss. The result often is a video image which is less than pleasing. Note that voice and video are isochronous data, meaning that they are stream-oriented. In other words, the transmitting device must have regular and reliable access to the network. Further, the network must transport and deliver the data on a regular and reliable basis in order that a stream of information reach the presentation device. Such regular and reliable ingress, transport and egress of data results in a image of consistent quality. As packet-switched networks are not designed to support isochronous data communications, they generally are considered unsuitable for voice and video communications. Additionally, video is very bandwidth-intensive, thereby placing additional stress on packet-switched networks such as the Internet, which already is overloaded.

An example might help. Let's say that you are using an inexpensive ($200 or so) videoconferencing package consisting of a camera and software. Your friend has the same package. At a pre-arranged time, you place a call over the Internet to establish a videoconference. At two fps (frames per second) the videoconference goes along pretty smoothly, although both the video and voice quality are a bit rough. At some point, your friend turns his head quickly; at the same time, the Internet bogs down. The packet which contains the image of your friend's nose gets delayed or lost in the network. The video image of your friend now is missing a nose. Funny the first time, aggravating the second, maddening thereafter. The upside is that the videoconference is cheap, if not free, depending on your cost of Internet access. See also Packet Switching, Videoconferencing Internet and Isochronous.

Packetized Voice First read the definition of "Packet Switching" just above. The idea is to digitize voice and, compress it, and then slice it up into packets and send those packets from the sender by various routes and assemble them as they get to the receiver. Packet switching for data makes sense. Packet switching for voice has not made sense because the voice is too sensitive to latency, or delay, especially the variable delay which is part and parcel of packet-switched networking. Recently developed software and DSP hardware, which employs sophisticated compression techniques has improved the ability to conduct "reasonable" quality packet voice conversations over the Internet. See Packet Switching, IP Telephony, TAPI 3.0.

PacketNet Sprint's internal X.25 Packet Network.

PACS Personal Communications Access System. PACS is a cellular system providing limited, regional mobility in a given area. It provides mobility between that of a cordless phone and a full-fledged cellular system. Originally developed by Bell Labs in the early 1990s, PACS is a comprehensive framework for the deployment of PCS and applies to both licensed and unlicensed applications. Now it is approved by the TIA and Exchange Carriers Standards Associations. Today's currently implemented versions of PCS are "up-banded" versions of the 900 MHz AMPS and GSM cellular standards.

PACT Siemens' PBX And Computer Teaming. It defines protocols between Siemens PBXs and external computers.

Pad 1. A pad is a device inserted into a circuit to introduce loss, i.e., to reduce the level of a signal. "Level" is a measurement of amplitude (signal power) at a specified point in a circuit known as a Transmission Level Point (TLP). "Loss" is the measurement of the decrease in amplitude between two TLPs, and is measured in decibels (dB). A pad may consist of any combination of inductors, resistors and capacitors. Pad or padding, as a verb, means to attenuate or reduce a signal, as in "to pad down the level". For example, we might say "the signal is 'hot', give me 5db of padding."

2. Packet Assembler/Disassembler. A device that accepts characters from a terminal or host computer and puts the characters into packets that can be handled by a packet switching network. It also accepts packets from the network, and disassembles them into character streams that can be handled by the terminal or host. PADs generally are associated with X.25, an ITU-T Standards Recommendation for an access protocol used in older packet-switched networks. See also X.25.

3. A concrete slab used as the foundation for a microwave radio tower or satellite dish.

4. Portable Application Description, or PAD for short, is a data set that is used by shareware authors to disseminate information to anyone interested in their software products.

Pad Characters In (primarily) synchronous transmission, characters that are inserted to ensure that the first and last characters of a packet or block are received correctly. Inserted characters that aid in clock synchronization at the receiving end of a synchronous transmission link. Also called Fill Characters.

Pad Switching A technique of automatically cutting a transmission loss pad into and out of a transmission circuit for different operating conditions.

PAF File A British term. Post Office Address file, a publicly available data file that, when integrated with an application, links postcodes to full addresses. When using a PAF file, an agent can save time by entering only the postcode. The PAF file automatically inserts post town, street and country.

Page A chunk of information, like a document or file, on the Web. A hypermedia document as viewed through a World Wide Web browser. Pages are the way you make information available on the Web. They can contain text, black and white and color photographs, audio and video.

Page hits A measure of the number of Web pages accessed at a particular site, or of the number of times a single page is accessed.

Page Mirroring You're surfing the Internet. You come upon an Web site and find something you want to buy. It has a button that says, "To speak to an Agent, push here."



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in coordinating some enhanced call-related services. For example, network ring again requires the connection of two users when both stations become idle. In this case, TCAP is used to coordinate between the users' switches while waiting for each line to become idle. And it can do this without tying up network trunks.

One of the major advantages of TCAP is that it provides a set of protocol building blocks for use in a variety of service definitions. The TCAP building blocks are subdivided into the transaction sublayer and the component sublayer. For more on TCAP, see the 1988-3 issue of Northern Telecom's Telesis publication.

TCAS T-Carrier Administration System. Provides mechanized support for the facility maintenance and administration center to achieve centralized administration and control of the digital network.

TCC Telephone Country Code.

TCCKT Telephone Company Circuit ID.

TCF Training Check Frame. Last step in a series of signals in a fax transmission called a training sequence, designed to let the receiver adjust to telephone line conditions.

Tchotchke A Yiddish word meaning trinkets, best exemplified by the giveaway junk we often pick up at telecommunications trade shows. It's pronounced choch-kuh in Yiddish. The plural is pronounced choch-key. See Yiddish.

TCIC Trunk Circuit Identification Code. Only relevant to SS7. A number that uniquely identifies a trunk between an origination point code and a destination point code. An example would be between two telephone company switches.

TCIF TeleCommunications Industry Forum. A voluntary special interest group under ATIS (Alliance for Telecommunications Industry Solutions). TCIF addresses areas such as electronic commerce, including bar coding and EDI (Electronic Data Interchange). www.atis.org/atis/tcif/index.html See also ATIS.

TCL 1. Tool Command Language. Tcl is actually two things: a language and a library. First, Tcl is a simple textual language, intended primarily for issuing commands to interactive programs such as text editors, debuggers, illustrators, and shells. It has a simple syntax and is also programmable, so Tcl users can write command procedures to provide more powerful commands than those in the built-in set. Second, Tcl is a library package that can be embedded in application programs. The Tcl library consists of a parser for the Tcl language, routines to implement the Tcl built-in commands, and procedures that allow each application to extend Tcl with additional commands specific to that application. The application program generates Tcl commands and passes them to the Tcl parser for execution. Commands may be generated by reading characters from an input source, or by associating command strings with elements of the application's user interface, such as menu entries, buttons, or keystrokes. When the Tcl library receives commands it parses them into component fields and executes built-in commands directly. For commands implemented by the application, Tcl calls back to the application to execute the commands. In many cases commands will invoke recursive invocations of the Tcl interpreter by passing in additional strings to execute (procedures, looping commands, and conditional commands all work in this way). www.neosoft.com/tcl/default.html.

2. Tool Command Language.

TCM 1. Traveling Class Mark.

2. Trellis Coding Modulation.

3. Time Compression Multiplexing. A digital transmission technique that permits full duplex data transmission by sending compressed bursts of data in a "ping-pong" fashion.

4. Telecommunications Manager. The TCM is the manager of the department that plans, controls, and administers the telephony and telecommunications assets of the company. He ensures that the telephone and telecommunications systems are well-run and functioning smoothly. These assets may include the PBX and ISDN, T-1, local and long distance telephone lines, telephone sets, authorization codes, cable pairs, WANs, Fax machines, voice mail systems, automated attendants, interactive voice response systems, automatic call distribution, multiplexors, modem pools, etc. The internal data facilities such as LANs and routers may be under the administration of the TCM, or could be the responsibility of the Management Information Systems (MIS) department. But since the TCM has responsibility for both the inside wiring and the outside Carrier facilities, close coordination would be required if the internal data facilities are controlled by the MIS department.

The following are the functions of the TCM;

- Operating, administering, monitoring, and maintaining the existing telecommunications systems.
- Dealing with the various vendors and providers, including verifying and paying the bills.
- Preparing and managing the Telecommunications budget.
- Keeping abreast of changes in technology, services, industry structure, and rates.
- Assisting company management in developing a corporate telecommunications policy that meets business objectives.
- Developing and implementing company telephone and telecommunications procedures for efficient and cost effective use, and training company employees in these procedures.
- Upgrading, procurement, selecting, contracting, or purchasing a system, new system, equipment, or services.
- Planning and analyzing for growth, new requirements, or future functionality.

The goal of the TCM is to provide good telecommunications services for an organization and its employees at the lowest possible cost. This definition courtesy, Robert J. Perillo, Perillo@dockmaster.ncsc.mil.

TCN Collective Number Group Table.

TCNS Thomas Conrad Networking System is a 100 million bit per second proprietary networking system (LAN) based on ARCnet that can use most standard ARCnet drivers on any network operating systems.

TCO Total Cost of Ownership. A term coined by The Gartner Group to bring attention to the actual, total cost to the enterprise of owning a PC. In 1997 that figure was $29,353 for owning a standard, networked, Windows 95 PC for a period of three years. It's probably a lot higher now. The point is clear and fairly obvious — consider not only the acquisition/implementation cost of a workstation (networked or not), but also consider the total cost, including administration, maintenance, support, software upgrades and training. Of course, one problem with TCO is that it has now way to measure the actual benefits of owning that equipment. A product can also have a low cost of ownership, but not be the best product for the job. IN short, like all statistics, you can reach pretty well whatever conclusion you would like.

TCP 1. Transmission Control Protocol. ARPAnet-developed transport layer protocol corresponding to OSI Layer 4, the Transport Layer. TCP is a transport layer, connection-oriented, end-to-end protocol. It provides reliable, sequenced, and unduplicated delivery of bytes to a remote or local user. TCP provides reliable byte stream communication between pairs of processes in hosts attached to interconnected networks. It is the portion of the TCP/IP protocol suite that governs the exchange of sequential data. UDP (User Datagram Protocol) is a Layer 4 option that does not provide the same level of reliability, but does involve much less overhead. See Internet and TCP/IP for a much longer explanations.

2. An ATM term. Test Coordination Procedure: A set of rules to coordinate the test process between the lower tester and the upper tester. The purpose is to enable the lower tester to control the operation of the upper tester. These procedures may, or may not, be specified in an abstract test suite.

3. Total Call Processor.

TCP/IP According to Microsoft: Transmission Control Protocol/Internet Protocol (TCP/IP) is a networking protocol that provides communication across interconnected networks, between computers with diverse hardware architectures and various operating systems. TCP (Transmission Control Protocol) and IP (Internet Protocol) are only two protocols in the family of Internet protocols. Over time, however, "TCP/IP" has been used in industry to denote the family of common Internet protocols. The Internet protocols are a result of a Defense Advanced Research Projects Agency (DARPA) research project on network interconnection in the late 1970s. It was mandated on all United States defense long-haul networks in 1983 but was not widely accepted until the integration with 4.2 BSD (Berkeley Software Distribution) UNIX. The popularity of TCP/IP (Harry's note: it's the Internet's networking protocol) is based on:

- Robust client-server framework. TCP/IP is an excellent client-server application platform, especially in wide-area network (WAN) environments.
- Information sharing. Thousands of academic, defense, scientific, and commercial organizations share data, electronic mail and services on the connected Internet using TCP/IP.
- General availability. Implementations of TCP/IP are available on nearly every popular computer operating system. Source code is widely available for many implementations. Additionally, bridge, router and network analyzer vendors all offer support for the TCP/IP protocol family within their products.

TCP/IP is the most complete and accepted networking protocol available. Virtually all modern operating systems offer TCP/IP support, and most large networks rely on TCP/IP for all their network traffic. Microsoft TCP/IP provides cross-platform connectivity and a

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client-server development framework that many software vendors and corporate developers are using to develop distributed and client-server applications in heterogeneous enterprise networks over TCP/IP.

How TCP Works: TCP is a reliable, connection-oriented protocol. Connection-oriented implies that TCP first establishes a connection between the two systems that intend to exchange data. Since most networks are built on shared media (for example, several systems sharing the same cabling), it is necessary to break chunks of data into manageable pieces so that no two communicating computers monopolize the network. These pieces are called packets. When an application sends a message to TCP for transmission, TCP breaks the message into packets, sized appropriately for the network, and sends them over the network.

Because a single message is often broken into many packets, TCP marks these packets with sequence numbers before sending them. The sequence numbers allow the receiving system to properly reassemble the packets into the original message. Being able to reassemble the original message is not enough, the accuracy of the data must also be verified. TCP does this by computing a checksum. A checksum is a simple mathematical computation applied, by the sender, to the data contained in the TCP packet. The recipient then does the same calculation on the received data and compares the result with the checksum that the sender computed. If the results match, the recipient sends an acknowledgment (ACK). If the results do not match, the recipient asks the sender to resend the packet. Finally, TCP uses port IDs to specify which application running on the system is sending or receiving the data.

The port ID, checksum, and sequence number are inserted into the TCP packet in a special section called the header. The header is at the beginning of the packet containing this and other "control" information for TCP.

How IP Works: IP is the messenger protocol of TCP/IP. The IP protocol, much simpler than TCP, basically addresses and sends packets. IP relies on three pieces of information, which you provide, to receive and deliver packets successfully: IP address, subnet mask, and default gateway.

The IP address identifies your system on the TCP/IP network. IP addresses are 32-bit addresses that are globally unique on a network. They are generally represented in dotted decimal notation, which separates the four bytes of the address with periods. An IP address looks like this: 102.54.94.97

Although an IP address is a single value, it really contains two pieces of information: (a.) Your system's network ID, and (b.) Your system's host (or system) ID.

The subnet mask, also represented in dotted decimal notation, is used to extract these two values from your IP address. The value of the subnet mask is determined by setting the network ID bits of the IP address to ones and the host ID bits to zeros. The result allows TCP/IP to determine the host and network IDs of the local workstation. Here's how to understand an IP address. For example:

When the IP address is 102.54.94.97 (specified by the user)
And the subnet mask is 255.255.0.0 (specified by the user)
The network ID is 102.54 (IP address and subnet mask)
And the host ID is 94.97 (IP address and subnet mask)

OK. the above was Microsoft's definition. Here's my definition, which covers some areas Microsoft doesn't. TCP/IP is a set of protocols developed by the Department of Defense to link dissimilar computers across many kinds of networks, including unreliable ones and ones connected to dissimilar LANs. TCP/IP is the protocol used on the Internet. It is, in essence, the glue that binds the Internet. Developed in the 1970s by the U.S. Department of Defense's Advanced Research Projects Agency (DARPA) as a military standard protocol, its assurance of multi vendor connectivity has made it popular among commercial users as well, who have adopted TCP/IP. Consequently, TCP/IP now is supported by many manufacturers of minicomputers, personal computers, mainframes, technical workstations and data communications equipment. It is also the protocol commonly used over many Ethernet LANs (as well as X.25) networks. It has been implemented on everything from PC LANs to minis and mainframes.

TCP/IP currently divides networking functionality into only four layers:

A Network Interface Layer that corresponds to the OSI Physical and Data Link Layers. This layer manages the exchange of data between a device and the network to which it is attached and routes data between devices on the same network.

An Internet Layer which corresponds to the OSI network layer. The Internet Protocol (IP) subset of the TCP/IP suite runs at this layer. IP provides the addressing needed to allow routers to forward packets across a multiple LAN inter network. In IEEE terms, it provides connectionless datagram service, which means it attempts to deliver every packet, but has no provision for retransmitting lost or damaged packets. IP leaves such error correction, if required, to higher level protocols, such as TCP.

IP addresses are 32 bits in length and have two parts: the Network Identifier (Net ID) and the Host Identifier (Host ID). Assigned by a central authority, the Net ID specifies the address, unique across the Internet, for each network or related group of networks. Assigned by the local network administrator, the Host ID specifies a particular host, station or node within a given network and need only be unique within that network.

A Transport Layer, which corresponds to the OSI Transport Layer. The Transmission Control Protocol (TCP) subset runs at this layer. TCP provides end-to-end connectivity between data source and destination with detection of, and recovery from, lost, duplicated, or corrupted packets — thus offering the error control lacking in lower level IP routing. In TCP, message blocks from applications are divided into smaller segments, each with a sequence number that indicates the order of the segment within the block. The destination device examines the message segments and, when a complete sequence of segments is received, sends an acknowledgement (ACK) to the source, containing the number of the next byte expected at the destination.

An Application Layer, which corresponds to the session, presentation and application layers of the OSI model. This layer manages the function required by the user programs and includes protocols for remote log-in (Telnet), file transfer (FTP), and electronic mail (SMTP).

See also OSI and Public Key Encryption.

TCR 1. Transaction Confirmation Report. A report from a fax machine listing the faxes received and transmitted. It provides details about each fax, including date, time, the remote fax's number, results, total pages.

2. An ATM term. Tagged Cell Rate: An ABR service parameter, TCR limits the rate at which a source may send out-of-rate forward RM-cells. TCR is a constant fixed at 10 cells/second.

TCS 1. Transmission Convergence Sublayer: This is part of the ATM physical layer that defines how cells will be transmitted by the actual physical layer.

2. TCS is a manufacturer of excellent call center manpower scheduling software packages. It is based in Nashville, TN.

TCS-AT A Bluetooth term. A set of AT-commands by which a mobile phone and modem can be controlled in the multiple usage models. In BT, AT-commands are based on ITU-T recommendation v.250 and ETS 300 916(GSM 07.07). In addition, the commands used for fax services are specified by the implementation. TCS-AT will also be used for dial-up networking and headset profiles.

TCS Binary A Bluetooth term. Bluetooth Telephony Control protocol Specification using bit-Oriented protocol. It is also referred to as the TCS-BIN system. TCS-BIN will be used for cordless telephony profiles.

TCU 1. Timing Control Unit.

2. Closed User Group Table.

TCV Address Conversion Table.

TD-SCDMA Time Division - Synchronous Code Division Multiple Access. A unique 3G wireless cell phone standard being developed by China for use inside China. The spectral efficiency of radio systems is 3 to 5 times higher than that of GSM. When TD-SCDMA base-stations are connected to an existing GSM system, the existing transmission links may be reused. Network operators can offer 3G voice, video and data services without installation of completely new networks. Instead, selective insertion of TD-SCDMA network elements into existing GSM radio access network structures allows a gradual growth of 3G coverage alongside the existing cell phone infrastructure. See 3G.

TDAS See Traffic Data Administration System.

TDC 1. Time Division Controller.

2. Dial Code Table.

TDD 1. Time Division Duplex. A method used in cellular and PCS networks employing TDMA (Time Division Multiple Access) to support full duplex communications. Each radio channel is divided into multiple time slots through TDMA, thereby supporting multiple conversations. TDD supports transmission in the forward direction (from the cell phone to the cell site) through one radio frequency channel and one time slot. Another radio channel and time slot supports transmission in the backward direction (from the cell site to the cell phone). TDD is flexible with regard to allocation of timeslots for forward and reverse, making it best suited for asymmetrical applications, such as web browsing. See also FDD.

2. IPWireless's term for UMTS TD-CDMA. They claim that their TDD implementation

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