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NEWTON's TELECOM DICTIONARY

23rd Edition

Harry Newton

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I promise you I won't give your name to anybody. Nobody. Promise.

Harry Newton

Dedication to a Great Visionary

LeRoy T. Carlson

LeRoy T. Carlson founded, and is today Chairman Emeritus of Telephone and Data Systems, Inc. (TDS), one of the largest independent telephone companies in America still controlled by its founding family. TDS serves seven million happy customers in 36 states with 11,800 enthusiastic employees and enjoys over $4 billion in annual revenues.

Carlson, the son of Swedish immigrants, grew up on Chicago's South Side. He helped support his family during the Great Depression with a door-to-door produce business he created. He funded his college and graduate school studies by selling magazine subscriptions, used furniture, and laundry services to his classmates. Carlson served in the U.S. Navy, S.C., Lt. Jr. Gr. and the General Motors Overseas Corp. during World War II.

He and his wife, Margaret, have four children and ten grandchildren. Carlson, now 90, comes to work every day. He is among the oldest-living and hardest-working of the original telephone industry pioneers. I salute his great sense of humor and his zest for life. I am proud to dedicate this 23rd edition of my dictionary to LeRoy T. Carlson, a great American.

March, 2007

66-type Connecting Block A type of connecting block used to terminate twisted-pair cables. All wires are manually cut down with a special tool to terminate or connect them. See 66 Block.

66-type Cross Connect A cross connect made up of the 66-type connecting blocks and jumper wires for administering circuits. All wires, including jumper wires, must be cut down (or punched down) and seated with a special tool. See 66 BLOCK.

6611 IBM's multi-protocol router, which supports APPN in addition to TCP/IP, DECnet, AppleTalk, IPX, NetBIOS, and other protocols.

6bone The Internet's experimental IPv6 network. 6bone is an informal collaborative project designed as a testbed backbone network for IPv6 (Internet Protocol version 6), commonly known as IPng (Internet Protocol next generation). The 6bone is a virtual network layered on top of portions of the IPv4-based Internet. In the core of the 6bone are production-level (versus beta test-level versions) routers running the IPv6 protocol suite, connected to workstation-class machines also running native IPv6. The islands of IPv6 are connected to the current IPv4-based Internet through edge routers running both the IPv4 and IPv6 protocol suites. The plan is that, over time, IPv6 will gradually work its way throughout the Internet, replacing IPv4 in the process. See also IPng, IPv4, and IPv6.

6to4 A tunneling mechanism in an IPv6 network that encapsulates IPv4 endpoint information inside IPv6 source and destination addresses. 6to4 is useful when two hosts need to exchange IPv6 traffic over network segments that support only IPv4.

7-bit ASCII The standard code for text in which a byte (eight bits) holds the seven ASCII digits that define the character plus one bit for parity.

700 Service A non-geographic area code reserved for the provisioning of special IXC services, 700 numbers were created in 1983, with the intent that interexchange carriers could use them to create and implement new services quickly. AT&T originally marketed 700 Service in the form of Easyreach, which allows your calls to follow you in the same fashion as would 500 Service. Some carriers (who will remain unnamed) once used 700 numbers for user access to the network for purposes of intraLATA long distance calling, such as those from Manhattan to Westchester County – the cost presumably was less than the cost of the same call through the serving LEC. This practice was illegal and no longer is necessary, as local competition now is in place in most states. 700 Service is still evolving, with each carrier having the right to create whatever services it wants with its 700 numbers. Currently, 700 Service commonly is used in both voice and data VPNs (Virtual Private Networks). See also 500 Service and VPN.

701 1. The 701 was one of the first manual switchboards, also called a cordboard. it was made by Western Electric. A manual switchboard required the operator to insert a cord into the slot on a board that represented the location of a department or person receiving a call.

2. IBM's first computer, introduced in 1953. It was also known as the Defense Calculator.

709.1 EIA/ANSI 709.1 is an open, device networking and control communications protocol. In most fields, it's known as the LonWorks Platform. It's designed to connect all manner of devices to the Internet – from electricity meters to subway doors. See also www.Echelon.

711 711 is the abbreviated dialing code for accessing Telecommunications Relay Services (TRS) from anywhere in the United States. Dialing 711 will connect you to the relay service in the state you are calling from. TRS allows a person who has a hearing or speech disability to communicate via the telephone with whomever they wish to call. See also 911 and 311.

73 One of Western Union's 92 codes, meaning "best regards." Its use continues today among amateur radio operators.

75 ohm cable 75 ohm cable is the most common cable used in the cable TV industry to transmit video to houses and businesses. It refers to coaxial cable. A 75ohm video cable typically consists of a solid inner copper and one or more braided wire shielding around the core, separated by a plastic sleeve. A 75 ohm cable will act as a conductor, picking up TV signals and causing ghosting on the TV screen (i.e. multiple images). The shielding/s are necessary to keep the ghosts out. The most shields, the more effective the cable at keeping out ghosts. In Manhattan, New York City, the local cable company typically uses 75 ohm cable with four braided wire shields. 75 ohm cable works well with several caveats: Corroded connections often cause your TV picture to freeze. The solution is to replace the connectors. Second, it's hard to replace 75 ohm connectors yourself. To do it properly you need heavy duty equipment – the sort of stuff your local cable TV guy carries, not the stuff sold at your local Radio Shack.

8 PSK Eight phase shift keying.

8.3 Under the MS-DOS naming structure, a file's name can be eight letters in front of the period and three after it, e.g. LAZARUS8.TXT.

8.3 minutes. The time it takes for light to travel from the Sun to the Earth.

8-bit Computer A computer that uses a central processing unit (CPU) with an 8-bit data bus and that processes one byte (8 bits) of information at a time. The first microprocessors used in personal computers, such as the MOS Technology 6502, Intel 8080, and Zilog Z-80, were installed in 8-bit computers such as the Apple II, the MSAI 8080, and the Commodore 64.

800 The first "area code" for what AT&T originally called In-WATS service. See 800 Service and 8NN.

800 MHz rebanding An FCC-ordered relocation of traditional public safety radio channels, currently located in the 800 MHz band, to a different part of the frequency spectrum. This will put more separation between public safety frequencies and those used by cell phones, thereby avoiding harmful interference.

800 Portability 800 Portability refers to the fact that you can take your 800 number to any long distance carrier. A case example, once I had 1-800-LIBRARY. For many years, that number was provieded by AT&T. When portability came along, we were able to change it from AT&T to MCI and still keep 1-800-LIBRARY, which is 800-542-7279. 800 Portability is provided by a series of complex databases the local phone companies, under FCC mandate, have built. 800 Portability started on May 1, 1993. See 800 Service.

800 Service A toll free call paid for by the called party, rather than the calling party. A generic and common term for In-WATS (Wide Area Telecommunications Service) service provided by a phone company, whether a LEC (Local Exchange Carrier) or an IXC (InterexChange Carrier). In North America and in order of their introduction, all these In-WATS services have 800 (1967), 888 (1996), 877 (1998), 866 (2000), or 855 (2001) as their "area code." (Note: Future 800 numbers will follow the convention 8NN, where NN are specific numbers which are identical. Such 800 service is typically used by merchants offering to sell something such as hotel reservations, clothes, or rental cars. The idea of the free service is to entice customers to call the number, with the theory being that if the call was a toll call and therefore cost the customer something, he or she might be less inclined to call. Suppliers of 800 services use various ways to configure and bill their 800 services.

800 Service works like this: You're somewhere in North America. You dial 1-800, 1-888, 1-877, 1-866 or 1-855 and seven digits. The LEC (Local Exchange Carrier, i.e., the local phone company) central office sees the "1" and recognizes the call as long distance. It also recognizes the 8NN area code and queries a centralized database before processing the call further, with the query generally taking place over a SS7 (Signaling System 7) link. The centralized database resides on a Service Management System (SMS), which is a centralized computing platform. The database identifies the LEC or IXC (InterExchange Carrier) providing the 8NN number. Based on that information, and assuming that the toll-free number is associated with an IXC, the LEC switch routes the call to the proper IXC. Once the IXC has been handed the call, it processes the 800 number, perhaps translating it into a "real" telephone number in order to route it correctly. Alternatively, the IXC translates the 800 number into an internal, nonstandard 10-digit number for further routing to the terminating Central Office (CO) and trunk or trunk group.

As a real-life example, the publisher of this book has an 800 number, 800-LIBRARY (or 800-542-7279). When you call that number, MCI routes that number to the first available channel on the dedicated T-1 circuit which leased from MCI's, and connecting the MCI New York City POP (Point Of Presence) to the CMP New York City office.

Because 800 long distance service is essentially a database lookup and translation service for incoming phone calls, there are endless "800 services" you can create. You can put permanent instructions into the company to change the routing patterns based on time of day, day of week, number called, number calling. Some long distance companies allow you to change your routing instructions from one minute to another. For example, you might have two call centers into which 800 phone calls are pouring. When one gets busy, you may tell your long distance company to route all the 800 inbound phone calls to the call center, which isn't busy. See Eight Hundred Service and One Number Calling for more, especially all the features you can now get on 800 service.

In May of 1993 the FCC mandated that all 800 (and by extension all 8NN) numbers became "portable." That means that customers can take their 800 telephone number from one long distance company to another, and still keep the same 800. See also 800 Portability.

800 Services are known internationally as "Freefone Services." In other countries the dialing scheme may vary, with examples being 0-800 and 0-500. Such services also go under the name "Greenfone." In June 1996, the ITU-T approved the E.169 standard Universal International Freefone Number (UIFN) numbers, also known as "Global 800." UIFN will work across national boundaries, based on a standard numbering scheme of 800, 888 or 877 plus an 8-digit telephone number. See also UIFN and Vanity Numbers.

802 See 802 Standards.

802 Standards The 802 Standards are a set of standards for LAN (Local Area Network) and MAN (Metropolitan Area Network) data communications developed through the IEEE's Project 802. IEEE stands for Institute of Electrical and Electronic Engineers. The two most important standards are 802.11b and 802.11a. The standards also include an overview of recommended networking architectures, approved in 1990. The 802 standards follow a unique numbering convention. A number followed by a capital letter denotes a standalone standard; a number followed by a lower case letter denotes either a supplement to a standard, or a part of a multiple-number standard (e.g., 802.1 & 802.3). The 802 standards segment the data link layer into two sublayers:

A Media Access Control (MAC) layer that includes specific methods for gaining access to the LAN. These methods – such as Ethernet's random access method and Token Ring's token passing procedure – are in the 802.3, 802.5 and 802.6 standards.

A Logical Link Control (LLC) Layer, described in the 802.2 standard, that provides for connection establishment, data transfer, and connection termination services. LLC specifies three types of communications links:

An Unacknowledged Connectionless Link, where the sending and receiving devices do not set up a connection before transmitting. Instead, messages are on a "best effort" basis, with no provision for error detection, error recovery, or message sequencing. This type of link is best suited for applications where the higher layer protocols can provide the error correction and functions, or where the loss of broadcast messages is not critical.

A Connection-Mode Link, where a connection between message source and destination is established prior to transmission. This type of link works best in applications, such as file transfer, where large amounts of data are being transmitted at one time.

An Acknowledged Connectionless Link that, as its name indicates, provides for acknowledgement of messages without burdening the receiving devices with maintaining a connection. For this reason, it is most often used for applications where a central processor communicates with a large number of devices with limited processing capabilities.

802.1 IEEE standard for overall architecture of LANs and internetworking. See all the following definitions.

802.11 Wireless specifications developed by the IEEE. It details a wireless interface between devices to manage packet traffic (to avoid collisions, etc.) Some common specifications include the following:

802.11a 802.11a is an updated, bigger, better, faster version of 802.11b (also called Wi-Fi), which is now commonly installed in offices, airports, coffee shops, etc. Many laptops now come with 802.11b built-in. The newer 802.11a, also an IEEE standard for wireless LANs, supports speeds up to 54 Mbps. 802.11a runs in a 300-MHz allocation in the 5 GHz range, which was allocated by the FCC in support of UNII (the Unlicensed National Information Infrastructure). Specifically, 200 MHz is allocated at 5.15-5.35 MHz for in-building applications, and 100 MHz at 5.725-5.825 MHz for outdoor use. This allocated spectrum is divided into three working domains. At 5.15-5.25 MHz, maximum power output is restricted to 50mW (milliWatts), 5.25-5.35 to 250mW, and 5.725-5.825 to 1 Watt. 802.11a has been dubbed Wi-Fi5 (Wireless Fidelity 5 MHz) by the Wireless Ethernet Compatibility Alliance (WECA).

802.11a uses Coded Orthogonal Frequency Division Multiplexing (COFDM) as the signal modulation technique. COFDM sends a stream of data symbols in a massively parallel fashion, with multiple subcarriers (i.e., small slices of RF, or Radio Spectrum, within the designated carrier frequency band. Each carrier channel is 20 MHz wide, and is subdivided into 52 subcarrier channels, each of which is approximately 300 KHz wide; 48 of the subcarrier channels are used for data transmission, and the remaining four for error control. Through the application of a coding technique, each symbol comprises multiple data bits. The specified coding techniques and data rates specified, all of which must be supported by 802.11-compliant products, include BPSK (Binary Phase Shift Keying) at 125 Kbps per channel for a total of 6 Mbps across all 48 data channels, QPSK (Quadrature Phase Shift Keying) at 250 Kbps per channel for a total of 12 Mbps, and 16QAM (16-level Quadrature Amplitude Modulation) at 500 Kbps per channel for a total of 24 Mbps. The standard also allows more complex modulation schemes, that offer increased data rates. Currently, the most complex and fastest is 64QAM (64-level QAM), at 1.125 Mbps per channel for a total of 54 Mbps.

The symbol rate is slowed down enough that each symbol transmission is longer than the delay spread. The delay spread is the variation in timing between receipt of the signals associated with a given symbol, with the delay spread caused by multipath fading. Multipath fading is the phenomenon whereby the RF signals carrying a given data symbol arrive at the receiver at slightly different times. This is because the signal spreads out from the transmitter, with certain portions of the signal reaching the receiver more or less directly, while other portions of the signal bounce around off of walls, furniture, your co-worker's pointy head, and such. Now, each of the symbols contains multiple bits, which are imposed on it through the coding processes identified above. As the multiple symbols reach the receiver, they are sorted out and decoded, with the decoding process providing some additional time for the receiver to adjust for the delay spread and to get ready to receive the next symbol. Both 802.11a and 802.11b are designed to be compatible with Ethernet LANs, using the MAC (Media Access Control) technique of CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance).

If this sounds great, that's because it is great. If this sounds too good to be true, that's because it gets a little more complicated. While the 5 GHz spectrum is pretty clear in the US, it's not so readily available elsewhere. Military and government installations use portions of this band overseas. In Japan, only the 5.15-5.25 MHz spectrum is available. In Europe, the 5.725-5.825 MHz spectrum is already allocated for other uses. In Europe, ETSI (European Telecommunications Standards Institute) requires that two additional protocols be used in conjunction with 802.11a in order to protect incumbent applications and systems running over previously allocated shared spectrum. DFS (Dynamic Frequency Selection) allows the 802.11a system to dynamically shift frequency channels and TPC (Transmission Power Control) reduces the power level. In combination, these protocols serve to eliminate interference issues with incumbent signals. See also 802.11b, 802.11g, BPSK, CSMA/CA, MAC, OFDM, QAM, QPSK, WECA, Wi-Fi and (for a comparison of wireless standards) Wireless.

802.11b 802.11b is now the most common wireless local area network. 802.11b is now installed in offices, airports, coffee shops, hotels, boardrooms and homes. Many laptops now come with 802.11b wireless transmit and receive electronics built-in. 802.11b is also called Wi-Fi or WiFI (Wireless Fidelity). 802.11b is a low power wireless system so the closer you are to a transmitter, the faster it will be. This is roughly what you'll get: Wireless operating range (indoors): 100 feet at 11 Mbps, 165 feet at 5.5 Mbps, 230 feet at 2 Mbps, 300 feet at 1 Mbps. Wireless operating range (outdoors): 500 feet at 11 Mbps, 885 feet at 5.5 Mbps, 1,300 feet at 2 Mbps, 1,500 feet at 1 Mbps. 802.11b operates at the same frequency as some cordless phones, garage door openers, walkie-talkies, etc. So there's a real chance for interference in big cities, like New York. An 802.11b basestation is often attached to a local area network, which is then attached to the Internet and/or the corporate network. This means that you use 802.11b to surf the Internet or get to corporate databases, etc.

802.11b defines both the Physical (PHY) and Medium Access Control (MAC) protocols. Specifically, the PHY spec includes three transmission options – one Ir (Infrared), and two RF (Radio Frequency). 802.11b uses DSSS (Direct Sequence Spread Spectrum) modulation for digital communication. DSSS involves the transmission of a stream of one's and zero's, which is modulated with the Barker code chipping sequence. Barker code is an 11-bit sequence (e.g., 10110111000) that has advantages in wireless transmission. Each bit is encoded into an 11-bit Barker code, with each resulting data object forming a "chip." The chip is put on a carrier frequency in the 2.4 GHz range (2.4-2.483 GHz), and the waveform is modulated using one of several techniques. 802.11 systems running at 1 Mbps make use of BPSK (Binary Phase Shift Keying). Systems running at 2 Mbps make use of QPSK (Quaternary Phase Shift Keying). Systems running at 11 Mbps make use of CCK (Complementary Code Keying), which involves 64 unique code sequences, which technique supports six bits per code word. The CCK code word is then modulated onto the RF carrier using QPSK, which allows another two bits to be encoded for each 6-bit symbol. Therefore, each 6-bit symbol contains eight bits. Power output is limited by the FCC to 1 watt EIRP (Equivalent Isotropically Radiated Power). At this low power level, the physical distance between the transmitting devices becomes an issue, with error performance suffering as the distance increases. Therefore, the devices adapt to longer distances by using a less complex encoding technique, and a resulting lower signaling speed, which translates into a lower data rate. For example, a system running at 11 Mbps using CCK and QPSK, might throttle back to 5.5 Mbps by halving the signaling rate as the distances increase and error performance drops. As the situation gets worse, it might throttle back to 2 Mbps using only QPSK, and 1 Mbps using BPSK. Also to be considered in this equation is the fact that the 2.4 GHz range is in the unlicensed ISM (Industrial, Scientific and Medical) band, which is shared by garage door openers, microwave ovens, bar code scanners, cordless phones, Bluetooth LANs, and a wide variety of other devices. As a result, this slice of spectrum can be heavily congested at times, and performance can drop considerably. 802.11 divides the

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available spectrum into 14 channels. In the US, the FCC allows the use of 11 channels. Four channels are available in France, 13 in the rest of Europe, and only one in Japan. There also is overlap between adjacent channels (e.g., channels one and two), which fact further affects performance; therefore, any given system must maintain maximum channel separation from other systems in proximity.

Both 802.11a and 802.11b are designed to be compatible with Ethernet LANs. 802.11b uses a variation of the MAC (Media Access Control) technique of CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance), which is used in some wired Ethernets, as well. A device seeking to transmit over the shared medium (in this case, a shared RF channel) listens to the network. If it senses no activity over the carrier frequency for a minimum period of time known as the DIFS (DCF (Distributed Coordinated Function) Inter-Frame Spacing), it requests access by first transmitting a RTS (Request To Send) packet. The RTS packet includes both the source (i.e., transmitter) and destination (i.e., intended receiver) addresses, the duration of the intended session (i.e., transmission), and the ACK (ACKnowledgement) associated with it. If the network is available, the destination device responds with CTS (Clear To Send), repeating both the duration and the ACK. All other devices back off the network until the session is concluded. If the network, on the other hand, is busy, the device waits a period of time equal to the DIFS, plus a random number of slot times, as calculated with several back-off timers. The "listening" process takes several forms. CAM (Constant Access Method), the default method, involves constant monitoring of the network. Since CAM creates a power consumption issue for battery-powered devices, PAM (Polled Access Mode) can be substituted. PAM calls for all client devices to go into sleep mode, all awaking at regular intervals, at the exact same time, to listen for network activity. On January 3, 2000 the 802.11 technology got another boost when Microsoft and Starbucks announced that they were to join forces to offer wireless access, using 802.11b among other standards, in most of Starbucks' coffee outlets over the next two years. The deal, some analysts say, is a further sign that 802.11b could become a serious competitor to better known wireless technologies such as Bluetooth, HomeRF, or even next-generation cellular networks. Apple was the first to launch an 802.11b product line (called AirPort). All Apple computers now include a built-in antenna which, in conjunction with a networking card, can exchange data with a small base station plugged into a broadband Internet connection up to 45 metros (150 feet) away. Although some PC laptops now come pre-equipped with wireless hardware, most users buy a PCMCIA card, or PC card, that serves as a wireless modem and antenna. See also 802.11a, 802.11g, Bluetooth, BPSK, Chip, CSMA/CA, DSSS, EIRP, Ethernet, HomeRF, MAC, QPSK, Spread Spectrum, WECA, Wi-Fi and (for a comparison of wireless standards) Wireless.

802.11e IEEE's Quality of Service (QoS) standard. It is designed to guarantee the quality of voice and video traffic. It will be particularly important for companies interested in using Wi-Fi phones.

802.11g Similar to 802.11b, but this standard supports signaling rates of up to 54 megabits per second. It also operates in the heavily used 2.4-GHz ISM band but uses a different radio technology to boost overall throughput. Compatible with older 802.11b. Two optional modulations are allowed if systems manufacturers chose to add them: CCK-OFDM and CCK-PBCC. The new standard 802.11g is important because 802.11a and 802.11b are incompatible, but 802.11g devices will work with both 802.11a and 802.11b devices. For a comparison of wireless standards, see Wireless.

802.11i The IEEE standard for Robust Security Network for WLANs (Wireless Local Area Networks). 802.11i includes a strong message integrity check, allows for authentication using 802.1X and uses AES (Advanced Encryption Algorithm) for message encryption. WPA (Wi-Fi Protected Access) is an industry standard based on an early version of 802.11i. See also 802.1X, AES and WPA.

802.11j Standard for wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Its specifications are 4.9 GHz –5 GHz operation in Japan. In August 2002, the Japanese Government published new rules to use 4.9 and 5 GHz bands in hot spot (indoor), fixed (outdoor), and nomadic (mobile) modes using Wireless LAN technology. IEEE 802.11j amends IEEE 802.11 to deliver a standard method of supporting these capabilities with new technologies such as the ability to change channel widths and dynamically modify radio capabilities.

802.llk In December 2005, the IEEE 802.11 Working Group passed a major milestone in the development of IEEE 802.11k, "Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Radio Resource Management of Wireless LANs", by voting to accept a draft radio resource measurement document as a baseline for the final standard. Once completed, IEEE 802.11k will allow enhanced measurements and diagnostics for IEEE 802.11 wireless local area networks (WLANs) that operate in the unlicensed 2.4GHz (ISM), 4.9GHz (Japan), and 5GHz (UNII) bands. This amendment to the IEEE 802.11 base standard will enable more accurate and efficient operation of WLANs in governmental, residential, enterprise and metropolitan settings. "Next generation video streaming, wireless VOIP and dense WLAN deployments present new challenges that call for more precise WLAN measurements," says Stuart Kerry, IEEE 802.11 Working Group Chair. "IEEE 802.11k will help optimize these radio environments so more devices can coexist even as it reduces wireless network traffic congestion. Final approval of this amendment is targeted for January 2007."

802.11n This will be the next, faster standard in wireless local area networks. Eventually it will supersede Wi-Fi. For now (February 2007), the standard is not finalized. This means that products bearing the "802.11n" word might be called Pre-N or draft. By introducing 802.11n products, the manufacturers are guessing what the final standard will be. Does this mean you should steer clear of 802.11n products? The answer depends on the product. If it conforms to earlier wireless standards including 802.11a, 802.11b and 8021g, then you know the thing will work, albeit at speeds slower than the more than 500 million bits per second that 802.11n is scheduled to reach. If you stick with routers and cards from the same manufacturer, you can feel pretty comfortable that they will work together at the higher 802.11n speed – not at their maximum but higher. As to the standard, it is believed that 802.11n will run in both the 2.5 GHz and 5 GHz bands in order to be backward compatible with 802.11a, 802.11b and 802.11g. The 802.11n standard is based on MIMO (Multiple Input/Multiple Output), which will support theoretical transmission rates of up to 540 Mbps and will extend distances up to 200 meters – though you won't get 540 Mbps at 200 meters. 802.11n also adds Orthogonal Frequency Division Multiplexing (OFDM) for improved throughput. See also MIMO, Pre-N and OFDM.

802.11r Expected to be ratified in mid to late 2006, the 802.11r Fast Roaming standard will address maintaining connectivity as a user moves from one access point to another. This is especially important in applications that need low latency and high quality-of-service standards such as voice-over-WLAN (wireless LAN).

802.11s This standard will deal with mesh networking. It is predicted to be ratified in mid-2008.

802.12 Standard for 100VG-AnyLAN. Addresses 100 Mbps demand-priority access method physical-layer and repeater specifications. Approved in 1995.

802.15.1 The 802.15.1 is an IEEE standard for wireless personal area networks. Basically it is an enhanced Bluetooth v1.1 specification and it is fully compatible with the Bluetooth v1.1 specification. Bluetooth technology defines specifications for small-form-factor, low-cost wireless radio communications among notebook computers, personal digital assistants, cellular phones and other portable, handheld devices, and connectivity to the Internet. "The new standard gives the Bluetooth specification greater validity and support in the market and is an additional resource for those who implement Bluetooth devices," says Ian Gifford, IEEE 802.15 Working Group Vice Chair. "This collaboration is a good example of how a standards development organization and a special industry group (SIG) can work together to improve an industry specification and also create a standard. The IEEE standard also added a major clause on Service Access Points, which includes an LLC/MAC interface for the ISO/IEC 8802-2 LLC, a normative annex that provides a protocol implementation conformance statement (PICS) pro forma, and an informative, high-level behavioral ITU-T Z.100 specification and description language (SDL) model for an integrated Bluetooth MAC Sublayer. This SDL model offers an extensive overview (more than 500 pages long) of a significant portion of the Bluetooth protocols e.g., Baseband, LMP, L2CAP, and the Link Manager (using the host controller interface (HCI)). The IEEE-SA plans to further develop the 802.15.1 SDL model source to support the standard. The SDL code, which will be available on CD-ROM, will include a computer model for use with any SDL tool that supports the SDL-88, SDL-92 or SDL-2000 update of ITU-T Recommendation Z.100. The IEEE 802.15.1 Working Task Group used the SDL (Specification and Description Language) to translate the natural language of the Bluetooth Specification into a formal specification that defines how the Bluetooth protocols react to events in the environment that are communicated to a system by signals.

802.15.3 A standard developed to meet the requirements of portable consumer imaging and multimedia applications – what the IEEE refers to as the standard for High Rate Wireless Personal Area Networks (WPANs). (The IEEE defines High Rate as 20 Mbps or better.) It is based on a centralized and connection-oriented ad-hoc networking topology. The standard also supports peer-to-peer connectivity and isochronous and asynchronous data. 802.15.3 is optimized for low-cost, small-form factor, and low-power consumer devices, enabling multimedia applications that are not optimized by existing wireless standards. The current technology will operate in the unlicensed 2.4 GHz band and supports five selectable

data rates; 11, 22, 33, 44, and 55 Mbps, as well as three to four non-overlapping channels. The standard is secure, implementing privacy, data integrity, mutual-entity authentication and data-origin authentication for consumer applications. Task Group 3a (TG3a) has been charged to define an enhancement amendment for even higher speeds.

802.15.4 The IEEE 802.15 TG4 (Task Group 4) is chartered to investigate a low data rate solution with multi-month to multi-year battery life and very low complexity. Intended to operate in an unlicensed, international frequency band, the standard will support sensors, interactive toys, smart badges, remote controls and home automation. This is an important standard which will extend wireless communications to low-power, low-cost, low-speed devices – like sensors and switches for industrial and residential use to smart tags and badges, interactive toys, inventory tracking and much more. 802.15.4 provides for low-data-rate connectivity among relatively simple devices that consume minimal power and typically connect at distances of 10 meters (30 feet) or less and operating at data rates of 10 to 250 kbps. It allows devices to form short-range ad hoc networks within which they can interact directly. "This is an enabling standard," says Pat Kinney, Chair of IEEE 802.15 Task Group 4. "It builds a framework so existing low-end wired devices can participate in wireless networks and also creates a path for many new applications. The potential uses have several things in common. They all involve relatively simple, low-speed wireless links that need so little power that a set of AA batteries might last three to five years or even longer. "We believe a host of new applications will be based on the standard. These might include motion sensors that control lights or alarms, wall switches that can be moved at will, meter reader devices that work from outside a house, game controllers for interactive toys, tire pressure monitors in cars, passive infrared sensors for building automation systems, and asset and inventory tracking devices for use in retail stock rooms and warehouses." See ZigBee.

802.16 Officially known as the WirelessMAN Air Interface for Broadband Wireless Access (BWA), 802.16 is an umbrella standard specification for what generically is known as a Wireless Local Loop (WLL). Specifically, 802.16 was released in 2001 as a means of standardizing Local Multipoint Distribution Services (LMDS). 802.16 focuses on frequencies in the 10-66 GHz range and requires Line of Sight (LOS). Since the initial release, 802.16 has evolved considerably through the 802.16a, 802.16d and 802.16e extensions. The first BWA standard to be released by an accredited standards body, 802.16 features a protocol-independent core, supports high-bandwidth on-demand environments and hundreds of users per channel, and can handle either continuous or bursty traffic. In combination, the IEEE 802.16 standards and related standards from the European Telecommunications Standards Institute (ETSI) have served as the basis for a set of solutions known as Worldwide Interoperability for Microwave Access (WiMAX), which is promoted by the WiMAX Forum. See WiMAX for a fuller explanation. See also 802.16a, 802.1d, 802.16e and LMDS.

802.16a An extension (2003) of the 802.16 standard, 802.16a is based on Multichannel Multipoint Distribution Services (MMDS) and the European HiperMAN system. 802.16a operates in the 2-11 GHz range, which includes both licensed and license-exempt bands. It is designed for both point-to-point and point-to-multipoint topologies, and usually requires Line of Sight (LOS). See also 802.16.

802.16d Also known as 802.16-2004, this is a compilation and modification of previous versions and amendments 802.16a, b and c. It operates in the 2-11 GHz range and was designed for point-to-point, point-to-multipoint and meshed topologies. 802.16d operates best with Line of Sight (LOS), but does not require it. Included is support for indoor Customer Premises Equipment (CPE). See also 802.16.

802.16e Finalized in December 2005, 802.16e adds hand-off capability to 802.16 and its extension, thereby extending portability and mobility. This extension operates in the 2-11 GHz range and does not require Line of Sight (LOS). IEEE calls this new standard the Mobile WirelessMAN. According to the IEE, the mobile WirelessMAN standard will facilitate the global development of mobile broadband wireless access (BWA) systems. The standard amends and extends the IEEE 802.16 WirelessMAN standard, which addressed Wireless Metropolitan Area Networks for broadband wireless access but previously supported only fixed (stationary) terminals. The amended standard specifies a system for combined fixed and mobile BWA supporting subscriber stations moving at vehicular speeds in licensed bands under 6 GHz. See also WiMAX.

802.17 IEEE 802.17 optimizes packet transmission at multi-gigabit rates for local, metropolitan and wide area networks. In issuing the standard in July 2004, the IEEE said, "The protocol offered in this standard will enable the fiber optic rings widely deployed in local, municipal and wide area networks to carry more data, voice, and video content with greater reliability, efficiency, and economy. In addition to a new Media Access Control (MAC) method, the standard includes appropriate physical layer specifications and promotes multi-vendor interoperability. Its potential base of users includes telecommunication carriers, multi-service cable operators, carrier-neutral service providers, data centers, metropolitan facilities-based service providers, municipal and utilities owned networks, and large enterprise networks." 802.17 is really a technological specification being developed by the IEEE for Resilient Packet Ring (RPR), 802.17 is intended to optimize Ethernet-based metropolitan ring networks for packet transport with resiliency matching or exceeding that of SONET rings. RPR will carry voice and other TDM (Time Division Multiplexed) traffic with the QoS (Quality of Service) and resiliency of SONET and ATM combined, while supporting LAN traffic with the efficiency of Ethernet.

802.1b Standard for LAN/WAN management, approved in 1992; along with 802.1k, became the basis of ISO/IEC 15802-2.

802.1d IEEE standard for interconnecting LANs through MAC bridges (specifically between 802.3, 802.4, and 802.5 networks). The standard was approved in 1990, and was incorporated into ISO/IEC 10038. Works at the MAC level. The original version of 802.1d was invented by Digital Equipment Corporation, that used it to prevent bridging loops by creating a spanning tree. The algorithm is now documented in the IEEE 802.1d specification, although the Digital algorithm and the IEEE standard 802.2 handles errors, framing, flow control, and the Layer 3 service interface. See spanning tree.

802.1e IEEE standard for LAN and MAN load protocols. Approved in 1990, formed the basis for ISO/IEC 15802-4.

802.1f Standard for defining network management information specified in 802 umbrella standards. Approved in 1993.

802.1g An IEEE standard for remote bridging at the MAC layer.

802.1h IEEE practices recommended for bridging Ethernet LANs at the MAC layer. Approved in 1995.

802.1i IEEE standard for using FDDI (Fiber Distributed Data Interface) as a MAC-layer bridge. Approved in 1992, the standard was incorporated into ISO/IEC 10038.

802.1j IEEE standard for LAN connectivity using MAC-layer bridges. A supplement to 802.1d, it was approved in 1996.

802.1k IEEE standard for the discovery and dynamic control of network management information. Approved in 1993. In conjunction with 802.1B, was the basis for ISO/IEC 15802-2.

802.1m A conformance statement for 802.1e, it addresses definitions and protocols for system load management. Approved in 1993, it was incorporated into ISO/IEC 15802-4.

802.1n See 802.11n.

802.1p 802.1p is an IEEE standard for providing quality of service (QoS) in 802-based networks. 802.1p uses three bits (defined in 802.1q) to allow switches to reorder packets based on priority level. It also defines the Generic Attributes Registration Protocol (GARP) and the GARP VLAN Registration Protocol (GVRP). GARP lets client stations request membership in a multicast domain, and GVRP lets them register into a VLAN. 802.1p is an IEEE extension of 802.1D. It is the specification for the use of MAC-layer bridges in filtering and expediting multicast traffic. Prioritization of traffic is accomplished through the addition of a 3-bit, priority value in the frame header. Eight topology-independent priority values (0-7) are specified, with all eight values mapping directly into 802.4 and 802.6. Switches that support 802.1P and 802.1Q provide a framework for bandwidth prioritization. Essentially what all these words mean is that you can assign a priority to the type of traffic with IEEE 802.1p class-of-service (CoS) values and these allow network devices along the way to recognize and deliver high-priority traffic in a predictable manner. When congestion occurs, QoS drops low-priority traffic to allow delivery of high-priority traffic. See also 802.1q.

802.1q An IEEE standard for providing VLAN identification and quality of service (QoS) levels. Four bytes are added to an Ethernet frame, increasing the maximum frame size from 1518 to 1522 bytes. Three bits are used to allow eight priority levels (QoS) and 12 bits are used to identify up to 4096 VLANs. 802.1q is the IEEE specification for implementation of VLANs (Virtual Local Area Networks) in Layer 2 LAN switches, with emphasis on Ethernet. Similar to 802.1P, prioritization of traffic is accomplished through an additional four bytes of data in the frame header. Most data fields in this addition to the header are specific to VLAN operation. Also included is a field which provides the same 3-bit priority flag specified in 802.1P's priority-mapping scheme. In addition to conventional data traffic, 802.1Q supports voice and video transmission through Ethernet switches. In short, the 802.1Q specification provides a 32-bit header for VLAN frame tagging. Each 802.1Q tag sits in an Ethernet frame between the source address field and the media access control (MAC) client type/length field. An important feature of 802.1Q is the ability to share multiple subnets across a high-speed link. This capability not only reduced the number of lower speed links needed for physical separation, but it also allowed for asymmetrical traffic management so that different speed links could be managed more easily. With IEEE 802.1p and 802.1Q,

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RWhois.

whole nine yards The term "the whole 9 yards" came from World War fighter pilots in the Pacific. When arming their airplanes on the ground, the .50 caliber machine gun ammo belts measured exactly 27 feet, before being loaded into the fuselage. If the pilots fired all their ammo at a target, it got "the whole 9 yards."

whole person paradigm This is one of the more fascinating telecom concepts in a while. General Magic created it as some sort of psychological basis for the product/s it is producing. Here's General Magic's definition:

A psychological or behavior model of needs that all people experience. This paradigm is the design center for General Magic's personal intelligent communication products and services. It consists of three elements. 1. Remember - managing your internal agenda, such as things to do and people to see. 2. Communicate - maintaining relationships with your friends, family, and associates. 3. Know - getting information about the world.

wholesale access lines End-user access lines owned by the ILEC but served by another local carrier. Total service resale, UNE-P, and UNE-L are examples of wholesale access lines.

Wi-Fi Wireless Fidelity, A WLAN (Wireless Local Area Network) specified by the IEEE as 802.11b. Wi-Fi runs in the 2.4 GHz wireless range at speeds of up to 11 Mbps. See also 802.11a, 802.11b and Wi-Fi5.

Wi-Fi 5 A new version of Wi-Fi that's even faster, with a maximum speed of 54 megabits per second. Also called 802.11a. See also Wi-Fi.

Wi-Fi Camera A digital camera that can transmit its pictures over a Wi-Fi link.

Wi-Fi Protected Access. See WPA.

Wi-Pie In March, 2006, the Economist ran an article "Wi-Pie in the sky?" which it talked about the fact that cities across America plan to build municipal Wi-Fi networks to widen access to broadband. And the Ecoomist asked, "Will they work?" The answer was inconclusive. But the headline grabbed me and that's why it's in this dictionary. See also mesh networking.

WIA Wireless Institute of Australia. The peak body representing the amateur radiocommunications community in Australia. It is the organization to which the Australian Communications Authority (ACA) has delegated responsibility for conducting examinations for amateur radio operators.

WIC WAN Interface Card.

Wicking The longitudinal flow of a liquid in a wire or cable due to capillary action.

WID Wireless Integration/Interface Device. Also referred to as a "Proctor" box (name of the vendor), Cell Trace Box (US West's name for it), and protocol converter. One of its functions is helping convert older cellular phone systems which support only old-style 911 service (i.e. no location transmitting) to the newer E911 service which will transmit the cellphone user's location to the correct public safety people. www.proctorinc.com

Wide Area Augmentation System See WAAS.

Wide Area Network See WAN.

Wide Area Service Identifier WASI. Unique identifier for a business grouping of licensed facilities-based cellular service providers of Cellular Digital Packet Data (CDPD). It is used within CDPD for access control decisions.

Wide Area Telecommunications Service WATS. WATS permits customers to make (OUTWATS) or receive (INWATS) long-distance calls and to have them billed on a bulk rather than individual call basis. The service is provided within selected service areas, or bands, originally by means of dedicated WATS Access Lines (WAL) directly connected to the public telephone network at WATS-billing equipped central offices. The dedicated access line operation permits inward or outward service, but not both. Recent evolution permits WATS connection via regular user local PSTN dial lines.

wide area telephone service 1. A service provided by telephone companies in the United States that permits a customer to make calls to or from telephones in specific zones, with a discounted monthly charge based upon call volume.

2. See WATS and 800 Service.

wide band See Wideband.

Wide Band Frequency Hopping See WBFH.

wide center The local company's serving central office for a customer or an interexchange carrier.

wide characters 16-bit characters. See Unicode.

wide frequency tolerant power plant PBX power facilities are provided that will operate from AC energy sources which are not as closely regulated as commercial AC power. The wide tolerant plant will tolerate average frequency deviations of up to plus or minus 3 Hz or voltage variations of -15% to +10% as long as both of the conditions do not occur simultaneously. This feature permits operation with customer provided emergency power generating equipment.

wide SCSI A type of SCSI that uses a 16- or 32- bit bus. It can transmit twice as much information as narrow SCSI.

Wide avelength Division Multiplexing See WWDM.

wideband The original definition for a channel wider in bandwidth than a voice-grade channel. Then it became a channel wider than 12 voice channels. Now, it means a transmission facility providing capacity greater than narrowband (T-1 at 1.544 Mbps), e.g. T-3 at 45 Mbps. many rich folks in Silicon Valley now have T-1 circuits into their home. This makes surfing the Internet and accessing the Web more pleasurable. But George Lucas, the renowned filmmaker, has a T-3 in his house. He clearly is wideband. See also Bandwidth. Contrast with Narrowband and Broadband.

wideband modem A modem whose modulated output signal can have an essential frequency spectrum that is broader than that which can be wholly contained within a voice channel with a nominal 4-kHz bandwidth. A modem whose bandwidth capability is greater than that of a narrow band modem.

wideband packet transport Transmission of addressed, digitized message fragments (packets) interleaved among the addressed fragments of other messages at a rate high enough to support general purpose telecommunications services.

wideband switch Switch capable of handling channels wider in bandwidth than voice-grade lines. Radio and TV switches are examples of wideband switches.

Wi-Fi his is another name for IEEE 802.11. It is a term coined by the Wireless Ethernet Compatibility Alliance (WECA). Products certified as Wi-Fi by WECA are interoperable with each other even if they are from different manufacturers. A user with a Wi-Fi product can use any brand of Wi-Fi access point with any other brand of client hardware (e.g. a laptop PC wireless Ethernet card) that is built to the Wi-Fi standard.

Wi-Fi switching Wi-Fi switching is a new architecture for wireless local area networks that combines gigabit Ethernet switching, Wi-Fi and smart antenna design. Wi-Fi switches send and receive multiple transmissions simultaneously and extend the range of Wi-Fi from meters to kilometers.

Wi-Fi5 A Wi-Fi version specified by the IEEE as 802.11a, Wi-Fi5 runs in the 5 MHz range at speeds up to 54 Mbps. See also 802.11a and Wi-Fi.

Wi-Fi-x A generic name for 802.11a and 802.11b. When you see Wi-Fi-x chipset, you know it means a chipset that will handle both the slower and faster Wi-Fi connections. See also 802.11a and 802.11b.

Wi-Fi5 Wireless Fidelity 5, much like the term Hi-Fi (High Fidelity) is used to describe audio equipment. Wi-Fi5 is another name for a wireless locla area network (LAN) running under the 802.11a standard in the 5-GHz range. See also 802.11 and Wi-Fi.

WiFi See Wi-Fi, which is the preferred and most common spelling.

WiFly The charming name of a WiFi company in Taiwan.

Wig Queen ELizabeth I of England was completely bald. She lost her hair after suffering from smallpox at the age of 29. To disguise her loss she always wore a wig, thus creating a vogue for wigs in Europe that lasted several hundred years and giving new meaning to that incredibly bad pun about hair today, gone tomorrow.

wigwag A visual signaling system developed by Albert James Myer, a medical officer in the US Army, while he served on frontier duty in Texas in 1856. Wigwag used flags for daytime signaling and torches for nighttime signaling. The Army officially adopted Myer's wigwag system in 1860.

wiki A Wiki, in its simplest form, is a Web site that can be written on and edited by multiple users at once. That gives it pluses and minuses. On the positive side it benefits from the wisdow of many. On the negative side it suffers from the misdeeds of many – bad, unverified information, deliberately wrong information, pranks, etc. The most famous wiki is Wikipedia. To visit it, go here: http://en.wikipedia.org/wiki/Main_Page.. When visiting Wikipedia, the standard Internet caveat remains: check, check, check.

wikipedia See wiki.

wilco "Will comply." A term used in radio communications, indicating that the recipient will comply with sender's just-radioed instructions.

wild line Any incoming copper loop that is running outside of the PBX. Typically a wild line is an alarm, fax or modem line that you don't want running through the telephone switch. Many installers like to differentiate between these "wild lines" and the stuff that gets punched down and run to the phone switch.

wildcard mask A 32-bit quantity used in conjunction with an IP address to determine which bits in an IP address should be ignored when comparing that address with another IP address. A wildcard mask is specified when setting up access lists.

wildcards Special characters you use to represent one or more characters in an MS-DOS filename. An asterisk (*) represents several characters and a question mark (?) represents a single character. For example, the command

ERASE *.BAK

would erase all the files with the suffix "BAK."

The command

ERASE *.?A?

would erase all the files with "A" as the middle letter in a three-letter suffix.

wilderness protocol The recommendation that amateur radio operators (i.e., hams) in remote areas announce their presence on and monitor the national calling frequencies for five minutes beginning at the top of the hour, every three hours, from 7 AM to 7 PM. By doing so, a ham in a remote location may be able to pick up a distress call from someone in the back country and relay emergency information to another wilderness ham who has better access to a repeater. National calling frequencies (called simplex frequencies): 52.525, 146.52, 223.50, 446.00, 1294.50 MHz.

wildfeed A satellite transmission of a TV show or other broadcast that isn't meant for public viewing. Wildfeeds are raw transmissions of TV shows, sporting events or news reports sent via satellite. It's how American networks send shows to their affiliate stations and Canadian broadcasters, and how TV news reporters feed live reports home. Some of those feeds are listed on Web sites or in a satellite listings guide, but true wildfeeders prefer to go it alone: "It's got to be up there some place," says a typical wildfeeder, "If you've got a big enough dish you can find it."

wildfire The all-hearing, all-doing computer telephony slave from a company called Wildfire Communications, Lexington MA. The product uses very sophisticated voice recognition software so that its "master" (i.e. the user) can get Wildfire to take messages, find him, connect his calls, transfer his calls and act as a super intelligent on-line, computerized, 24-hour a day, never resting, all obedient secretary. Wildfire was a real breakthrough product, first introduced in the fall of 1994 and deserving of its own definition in this illustrious dictionary. Unfortunately Wildfire never caught on bigtime. It used too much processing power and consequently was too expensive. However, several computer telephony companies tried to copy it and the jury is still out. The demonstration on www.Wildfire.com is very impressive and worth listening to.

wilding Wireless hackers (aka whackers) search neighborhoods for leaky 802.11b networks to exploit. Most wireless LANs don't enable encryption, but probably should.

willful violation The act of knowingly committing a violation of the federal safety and health standards. A willful violation is the most serious finable offence.

WiLL A name Motorola uses for its Wireless Local Loop (WiLL) product, which was developed to serve the basic telephony needs of people in urban and difficult to reach rural areas. Cellular based, WiLL technology is intended to provide fixed telephony services in areas with little or no existing wireline telephone service or as a supplement to the existing wireline service. It uses very few cellular transmit/receivers – often just one at the end of the landline. The WiLL system provides three major benefits to the telecom operator looking to expand their service area: more rapid deployment of telephone service; lower cost alternative to copper wire installation, and increased flexibility in system implementation and design. A WiLL system can be operational in weeks, compared to the huge amounts of time it would take to lay and install copper wire from an end office to each of the subscriber points in a typical local loop. Although WiLL is cellular-based, the system does not require a cellular switch. This makes the WiLL system a lower cost alternative to using "typical" cellular systems for fixed telephony applications because the total system outlay costs as well as associated backhaul and maintenance costs are reduced. WiLL has three elements: the WiLL System Controller (WiSC), a Digital Loop Concentrator (DLC), and a Motorola cellular base station. It interfaces directly to the central office switch via 2-wire analog subscriber loops.

willful intercept The act of intercepting messages intended for a station experiencing a line or equipment malfunction.

Willy-Nilly The term Willy-Nilly was coined during the summer of 1914 to describe the litany of correspondence traversing Europe between Kaiser Wilhelm (Willy) of Germany and Czar Nicholas (Nilly) of Russia, as the two sought a means to avoid the collapse of Europe into a world war while maintaining their respective travel schedules on state business, and in the Kaiser's case – on vacation. Their efforts failed, along with the work of many others to find a political solution to the crisis, and the destruction that ensued eclipsed all wars prior and all wars since, including WWII.

WiMAX Worldwide Interoperability for Microwave Access (WiMAX) is a Broadband Wireless Access (BWA) solution that is based on standards recommendations from both the Institute for Electrical and Electronics Engineers (IEEE) 802.16 working group and the European Telecommunications Standards Institute (ETSI). WiMAX is promoted by the WiMAX Forum, a special interest group comprising members of the manufacturing, carrier and service provider communities. The IEEE established the 802.16 working group to standardize Local Multipoint Distribution Services (LMDS) and Multichannel Multipoint Distribution Services (MMDS). These services were highly touted in the 1990s as Wireless Local Loop (WLL) solutions that would allow competitive service providers to bypass the Incumbent Local Exchange Carrier (ILEC) copper local loops, thereby providing network access to customer premises more quickly and cost effectively. LMDS and MMDS were commercial failures due to their high cost, as well as performance issues and Line-of-Sight (LOS) requirements. The 802.16 standard from the IEEE is the primary basis for WiMAX. Officially known as the WirelessMAN Air Interface for Broadband Wireless Access (BWA), 802.16 was released in 2001 as an umbrella standard specification for WLL solutions. Specifically, 802.16 was released in 2001 as a means of standardizing LMDS and focuses on frequencies in the 10-66 GHz range and requiring LOS. Since the initial release, 802.16 has evolved considerably through the 802.16a, 802.16d and 802.16e extensions. The first BWA standard to be released by an accredited standards body, 802.16 features a protocol-independent core, supports high-bandwidth on-demand environments and hundreds of users per channel, and can handle either continuous or bursty traffic. 802.16a (2003) is based on MMDS and the European HiperMAN system. 802.16a operates in the 2-11 GHz range, which includes both licensed and license-exempt bands. It is designed for both point-to-point and point-to-multipoint topologies, and usually requires LOS (line of sight). 802.16d, also called 802.16-2004, is a compilation and modification of previous versions and amendments 802.16a, b and c, the latter two of which are considered obsolete. It operates in the 2-11 GHz range and was designed for point-to-point, point-to-multipoint and meshed topologies. 802.16d operates best with LOS, but does not require it. Included is support for indoor Customer Premises Equipment (CPE). 802.16e, at the time of this writing, is due to be finalized in October 2005. 802.16e adds hand-off capability, thereby extending the standard to include portability and mobility. This extension operates in the 2-11 GHz range and does not require LOS. The 802.16 specifications include several multiplexing options: Time Division Duplex (TDD) for half-duplex (HDX) communications and Frequency Division Duplex (FDD) for full duplex (FDX). 802.16 specification addresses both LOS and Non-Line-of-Sight (NLOS) topologies. In instances in which LOS (line of sight) can be achieved, WiMAX cell coverage can be up to 50 km (31 miles). Where LOS cannot be achieved, coverage generally is limited to approximately 8 km (5 miles). The fixed wireless standards provide for shared bandwidth up to 70 Mbps per base station, although the actual level of throughput depends on factors such as LOS, distance, air quality and interference. NLOS (non line of sght) technology addresses signal performance issues through a number of mechanisms, including Orthogonal Frequency Division Multiplexing (OFDM), sub-channelization, antenna design and error control. Specifications currently call for shared bandwidth up to 70 Mbps per base station, i.e., cell antenna. Cells typically are divided into as many as six sectors of 60 degrees, in which case each sector supports shared bandwidth of 8-11.3 Mbps, depending on output power and signal performance issues. Bandwidth is fully symmetric, i.e., the same amount of bandwidth is available to be shared upstream as well as downstream. At the customer premises, the receiver is in the form of a flat passive array antenna known affectionately as a "pizza box," by virtue of its size and shape. This antenna is installed on the side of the building or some other location that maximizes signal quality. The standards also provide for self-installed indoor CPE with no externally mounted antenna. Signal quality suffers in such a scenario and, as a result, distances are shortened.

WiMax provides for Quality of Service (QoS) through the definition of four polling schedules. Unsolicited Grant Service (UGS) is for services that periodically generate fixed units of data, such as uncompressed voice and video and services such as T1 and E-1. Real-Time Polling Service is for services that are dynamic in nature, but require periodic levels of bandwidth to meet real-time demands, with examples being compressed voice and video. Non-real-Time Polling Service supports connections that require random transmit capabilities, such as Internet access with a minimum guaranteed connection rate. Best Effort Service provides neither throughput nor delay guarantees. Security is provided through both authentication and encryption. WiMAX applications include private campus networks, T-1 and Fractional T-1 business service, rural or developing areas where cabled broadband service is not available, Wi-Fi hotspot backhaul and disaster recovery. See also HiperMAN, LMDS, LOS, OFDM, MMDS and QoS.

WiMAX Forum The WiMAX Forum is a nonprofit organization working to facilitate the deployment of broadband wireless networks based on the IEEE 802.16 standard through encouraging the compatibility and inter-operability of broadband wireless access equipment. The WiMAX Forum comprises member of the manufacturing, carrier, service provider and related communities. See WiMAX.

WiMedia Alliance The WiMedia Alliance is an industry association formed to promote personal-area range wireless connectivity and interoperability among multimedia

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