



# Wireless VoIP Glossary



voice. Data. wireless. *Become one.*

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## 2.5G

Bridging the gap between 2G and 3G cellular service, 2.5G extends CDMA and GSM technologies with faster Web access, Multimedia Messaging Service (MMS), and a change in radio architecture to handle more bandwidth. 2.5G phones can receive digital photos from other 2.5G phones that have built-in or add-on cameras. They can also get your notebook or PDA on the Net, albeit at modem-like speeds.

## 2G

Second-generation digital cellular service is the most widely used worldwide. It offers digital voice calling, limited Web-access capability, and Short Message Service (SMS). 2G cell phone standards include CDMA, TDMA and GSM.

## 3G

Third-generation mobile communications technology, as defined by the ITU, provides a global standard for cellular networks capable of handling live video calls and data access at broadband speeds. There are several flavors of 3G, including EDGE, CDMA 2000, and WCDMA/UMTS.

## 802.1q

An IEEE standard which defines a protocol to create multiple logical networks running over a single physical network. Commonly used to segment multiple communities of users that share the same network and restrict access to network resources without regard to physical topology of the network. Currently, many access points can support multiple VLANs on a single radio, allowing different security and authentication contexts for different types of users. As an example, guests might have open access to the network with a VLAN connection to the Internet only, while employees would use WPA and be allowed access to corporate network resources.

## 802.11a

One of three wireless networking specifications commonly called Wi-Fi. 802.11a uses the 5 GHz band and runs at 54 Mbps. 802.11a has not been adopted nearly as widely as 802.11b and 802.11g.

## 802.11b

The first of the three wireless networking specifications to be ratified, 802.11b uses the 2.4 GHz band and runs at 11 Mbps.

## 802.11e

A wireless standard that provides Quality of Service support for LANs. This is necessary for delay-sensitive applications such as wireless Voice over IP. The standard is under development and isn't expected to be ratified until 2006.

## 802.11g

802.11g is backward compatible with 802.11b, thanks in part to its use of the 2.4 GHz band, and it runs at the 54 Mbps speed of 802.11a.

## 802.11h

A supplementary standard to 802.11 to comply with European regulations. It adds transmission power control and dynamic frequency selection.

## 802.11i

A standard for improving wireless LAN security for 802.11a, 802.11b and 802.11g. It adds new encryption protocols,

including Temporal Key Integrity Protocol and Advanced Encryption Standard and support for mutual authentication between the client and the network, based on the IEEE 802.1x standard.

## 802.11k

A proposed standard for improving network performance. 802.11k is also called Radio Resource Measurement. As an example, currently, a client connects to an access point that has the strongest signal, even if that access point already is oversubscribed. 802.11k would instead have the client connect to an access point with a weaker signal, but with less clients. Overall throughput would be better and network performance would be more efficient.

## 802.11r

A proposed standard that would specify fast BSS transitions. Currently, when a client roams between access points and is using WPA or 802.11i, the transition time may take up to several seconds. For latency sensitive applications such as wireless VOIP, this causes the voice quality to degrade significantly or the call to be dropped. The standard is under development and not expected to be ratified until at least 2006.

## 802.11n

A standard in the works that would boost wireless LAN speeds to 108 Mbps and higher. 802.11n is not yet official and isn't expected to be complete until 2007 at the earliest.

## 802.1X

An authentication specification that allows a client to connect to a wireless access point or wired switch but prevents the client from gaining access to the Internet until it provides credentials, like a user name and password, that are verified by a separate server. In 802.1X, there are three roles: the supplicant (client), authenticator (switch or access point), and authentication server. 802.1X is called out as the authentication specification used by 802.11i.

## access point

The hub of a wireless network. Wireless clients connect to the access point, and traffic between two clients must travel through the access point.

## ad hoc network

A short-term wireless network created between two or more wireless network adapters without going through an access point. Ad hoc networks are handy for quickly trading files when you have no other way of connecting two or more computers.

## AES

An extremely strong encryption standard. It is the required standard for 802.11i. AES stands for Advanced Encryption System.

## Air Traffic Control

A Meru technology that provides deterministic channel access for clients, enabling upstream and downstream Quality of Service. In addition, provides coordination of client access among access points, ensuring neighboring clients do not interfere with latency sensitive clients, such as wireless voice over IP phones.

## **antenna**

A device connected to a wireless transceiver that concentrates transmitted and received radio waves to increase signal strength and thus the effective range of a wireless network. To accept an antenna, a device must have an appropriate antenna jack.

## **authentication**

The process of identifying a user, usually by a user name and password. Wi-Fi Protected Access, or WPA, and 802.11i, or WPA2 use authentication to verify whether users have access to a particular wireless network. The original security mechanism for 802.11, WEP, did not provide for authentication.

## **authentication server**

A back-end database server that confirms the identity of a supplicant to an authenticator in an 802.1X-authenticated network..

## **authenticator**

The gatekeeper role in an 802.1X-authenticated network. Access points and Ethernet switches can act as authenticators.

## **band**

Another term for spectrum used to indicate a particular set of frequencies. Wireless networking protocols work in either the 2.4 GHz or the 5 GHz bands.

## **bandwidth**

See throughput.

## **bridge**

A device that passes traffic between two networks that use different media or are physically separate, but which use similar network standards. An access point is a bridge that connects wired and wireless networks.

## **BSS**

Basic Service Set. See IBSS.

## **captive portal**

A Web page that appears automatically when you try to access any URL when first connected to some public wireless networks. On the captive portal page, you must enter login information or agree to acceptable use policies before you can use the wireless network to do anything else.

## **call admission control**

A concept for IP telephony systems which prevents the network from taking on excess calls, which could degrade call quality for all users.

## **CDMA**

The type of digital cellular phone network used throughout most of the United States, but rare elsewhere in the world. CDMA stands for Code Division Multiple Access, and CDMA2000 is the third-generation, or 3G, extension to which CDMA cellular operators are gradually upgrading their networks.

## **cell**

The geographic area covered by an access point. An overlapping group of cells allows a client to roam among them while maintaining network connectivity.

## **cellular coordination**

(see also inter-cell coordination)

Meru's patented ability to manage co-channel interference across multiple cells, ensuring that clients achieve the best performance. Similar to how cellular telephone networks manage interference client access.

## **certificate**

An instantiation of a digital identity. Certificates are typically signed by other people or certificate authorities to guarantee their authenticity.

## **certificate authority**

A trusted third party that can assure the identity of others when using security systems like SSL. A certificate authority registers the digital identity of a site or individual, and lets you confirm manually or automatically that someone you're interacting with - say, over a secure Web connection -- is who he appears to be.

## **channel**

A specific portion of the radio spectrum; for example, the channels allotted to one of the wireless networking protocols. 802.11b and 802.11g use 14 channels in the 2.4 GHz band, only 3 of which don't overlap (1, 6, and 11). In the 5 GHz band, 802.11a uses 8 channels for indoor use and 4 others for outdoor use, and none of them overlap.

## **circuit-switched network**

A network in which a virtual circuit is set up for each connection in order to simulate having a physical wire between two points. The telephone system is a circuit-switched network. Circuit-switched networks are generally considered less efficient than packet-switched networks like the Internet because the circuit remains reserved even when no data is being transferred (i.e. when no one is talking).

## **clear text**

Sensitive information like passwords sent across a network without encryption. Clear text is also commonly referred to as "in the clear."

## **client association**

The process by which a wireless client -- like a laptop computer - connects to an access point.

## **client card**

An add-on that gives a computer or PDA or similar device wireless capability.

## **closed network**

A wireless network that doesn't advertise its ESSID (network name).

## **co-channel interference**

Interference between at least two access points on the same channel. This causes retransmissions, which lowers overall throughput performance. This is a common side effect of microcell access point deployments that attempt to improve client throughput by spacing access points closer together and using higher data rates. However, 802.11 control information will continue to be sent at the lowest data rates, thus propagating over long ranges and causing significant co-channel interference.

## **collision**

The interference that results when two devices on a network start transmitting at the same time.

## **compression**

The process of using encoding information using fewer bits. Compression is important because it allows the reduction of expensive resources, such as connection bandwidth.

## **contention management**

In a wireless LAN, the ability to manage multiple clients simultaneously trying to access the wireless medium. The standard 802.11 mechanism for contention management is termed Carrier Sense Multiple Access/Collision Avoidance, or CSMA/CA. This produces exponential backoff when multiple clients contend, reducing throughput. Meru's method provides more deterministic channel access which enables 10 times the density of clients per AP while keeping throughput high.

## **DHCP**

A protocol by which a server automatically assigns IP addresses to clients so users don't have to configure them manually. DHCP stands for Dynamic Host Configuration Protocol.

## **DiffServ**

A method for trying to guarantee end-to-end Quality of Service over large networks, including the Internet. End-to-end QoS is the ability of the network to deliver service required by specific network traffic from one end of the network to another.

## **DNS**

An Internet protocol for mapping cryptic IP addresses (like 198.65.100.241) to human-readable domain names. DNS stands for Domain Name Service.

## **E911**

Enhanced 911, an emergency service that automatically sends phone number and location information to the operator. E911 is important when you need to get emergency help and are unable to speak or don't know your location.

## **EAP**

A standard form of generic messaging used in 802.1X. EAP stands for Extensible Authentication Protocol.

## **EAP-TLS**

Used to create a secured connection for 802.1X by pre-installing a digital certificate on the client computer. EAP-TLS stands for Extensible Authentication Protocol-Translation Layer Security.

## **encryption**

The process of scrambling data to make it difficult for unauthorized parties to understand.

## **ESS**

Extended Service Set. A set of two or more BSSes working together to form a single network.

## **ESSID**

Extended Service Set Identifier. See network name.

## **Ethernet**

The most common networking standard in the world, formally known as IEEE 802.3.

## **fast handoff**

A way that access points can let authenticated users roam among different access points without losing authentication. Fast handoff still results in non-zero delays as the client disassociates and re-associates with the new access point. Claimed by many to make high quality voice-over-IP possible, but not proven. 802.11r is a standard under development to enable secure fast handoff.

## **frame**

A packet encapsulated to travel on a physical medium, like Ethernet or Wi-Fi. A packet is like a shipping container; a frame is the boat on which the shipping container is loaded.

## **frame bursting**

An approach to increasing the speed of 802.11g-based wireless networks by unwrapping short 802.11g packets and rebundling them into a larger packet to reduce the impact of mandatory gaps between packets. Frame bursting is sometimes called "packet bursting."

## **G.711**

An audio compression codec used primarily for telephony that compresses at 64 kbit/s.

## **G.729**

An audio compression codec type used primarily for VOIP due to its low bandwidth, typically 8 kbit/s.

## **gigahertz**

A measure of electromagnetic wave frequency equal to one thousand million (1,000,000,000) hertz, often abbreviated as GHz and used to specify the radio frequency used by wireless devices. 802.11a networks operate at 5GHz. 802.11b and g networks use 2.4GHz, which is susceptible to interference from nearby cordless phones and microwave ovens that use the same frequency.

## **GPRS**

A cellular data technology for GSM networks. GPRS stands for General Packet Radio Service and provides between 10 and 50 Kbps of bandwidth.

## **GSM**

The primary type of digital cellular phone network used throughout most of the world outside the United States, and a growing standard in the U.S. GSM stands for Global System for Mobile Communications. GSM provides a very slow (9600 bps) cellular data service.

## **H.323**

H.323 is an umbrella recommendation from the ITU-T, that defines the protocols to provide audio-visual communication sessions on any packet network. H.323 was originally created to provide a mechanism for transporting multimedia applications over LANs but it has rapidly evolved to address the growing needs of VoIP networks. H.323 was the first VoIP standard to adopt the IETF standard RTP to transport audio and video over IP networks. It is being replaced by SIP as the primary protocol for VOIP communications.

## **handoff**

The act of switching coverage responsibility from one access point to another. It usually refers to what happens when a wireless client moves from one AP to another.

## **hot spot**

A place where you can connect to a public wireless network.

## **IEEE**

Institute of Electrical and Electronics Engineers. The acronym is pronounced I-triple-ee, and the organization develops standards for the computer and electronics industry, such as Wi-Fi.

## **IEEE 802.11**

802.11 is a family of wireless networking standards developed by the IEEE, including 802.11a, 802.11b, and 802.11g. 802.11a provides up to 54 Mbps on the 5GHz band. 802.11b hits 11 Mbps in the 2.4GHz band and is backward-compatible with 802.11, the original specification. 802.11g, the most recently approved, provides over 20 Mbps in the 2.4GHz band. It is compatible with 802.11b. Both 802.11b and 802.11g have effective ranges of about 300 feet; 802.11a's higher frequency limits its range to about 60 feet. Other standards in this family include 802.11e, 802.11h and 802.11n.

## **Infrastructure BSS**

An 802.11 network comprising an access point and stations. The access point forwards information to target stations or to a fixed network.

## **infrastructure mode**

The most common way of creating a wireless network in which clients associate with an access point.

## **Inter-cell Coordination**

(see also cellular coordination)

Meru's patented ability to manage co-channel interference across multiple cells, ensuring that clients achieve the best performance. Similar to how cellular telephone networks manage interference client access.

## **IP**

Internet Protocol, the method by which data is sent from one computer to another on the Internet.

## **IP address**

The numeric address (like 192.168.1.1) that identifies each device in a TCP/IP network.

## **IP PBX**

Telephone switching equipment that resides in a private business instead of the telephone company. An IP PBX delivers employees dial-tone, the ability to conference, transfer, and dial other employees by extension number as well as many other features. Voice transmissions are sent via data packets over a data network instead of the traditional phone network.

## **IPsec**

One of two protocols (with PPTP) used for VPNs. IPsec stands for IP security.

## **ITU-T**

The ITU Telecommunication Standardization Sector (ITU-T)

coordinates standards for telecommunications on behalf of the International telecommunication Union (ITU) and is based in Geneva, Switzerland.

## **Kbps**

Kilobits per second, or thousands of bits per second, a measure of bandwidth.

## **LAN**

Local Area Network, The computers at your site, connected via Ethernet or Wi-Fi. Local area network is often abbreviated to LAN. Compare local area networks with wide area networks.

## **latency**

The length of time between a packet being sent and the response to that packet being returned.

## **MAC address**

The unique address assigned to every wireless and wired Ethernet network adapter. MAC stands for Media Access Control. Despite the fact that MAC addresses are all unique, it's possible to assign one device's MAC address to another device.

## **Mbps**

Megabits per second, or millions of bits per second, a measure of bandwidth.

## **megahertz**

A measure of electromagnetic wave frequency equal to one million (1,000,000) hertz, often abbreviated as MHz and used to specify the radio frequency used by wireless devices.

## **mesh network**

A network topology in which every device can communicate with any other device that's within range. Mesh networking is particularly interesting for bringing wireless network access to an entire neighborhood.

## **microcell**

A cell having a very small coverage area, such as a lounge in an airport terminal.

## **mobile IP**

A communications protocol designed to allow mobile users to maintain their permanent IP address while moving from network to network.

## **MOS**

A numerical measure of the quality of human speech at the destination end of the call. The scheme uses subjective tests (opinionated scores) that are mathematically averaged to obtain a quantitative indicator of the system performance.

## **NAT**

A network service that makes it possible to share a single IP address with a network of many computers. NAT stands for Network Address Translation. Since a NAT gateway exposes only a single IP address to the outside Internet, it provides some measure of security.

## **network**

A collection of interconnected computers and associated devices. Networks can be characterized by the protocols they use (TCP/IP, for example) or by the geographic area they cover (LAN and WAN).

## **network adapter**

The card or built-in hardware used in a computer or handheld device to connect to a network, whether wired or wireless.

## **network interface card**

Commonly abbreviated to NIC. See network adapter.

## **POTS**

Also known as Plain Old Telephone Service. The services available from analog telephones prior to the introduction of electronic telephone exchanges into the public switched telephone network.

## **PPTP**

One of two protocols (with IPsec) used for VPNs. PPTP stands for Point-to-Point Tunneling Protocol.

## **pre-shared key**

A TKIP passphrase used to protect your network traffic in WPA. The Wi-Fi Alliance certifies this mode as WPA-Personal and it is primarily recommended for home or small office use. WPA-Enterprise uses individually generated keys from a RADIUS server and is considered more secure.

## **promiscuous mode**

A state of a wireless network adapter in which it listens to all the traffic on a wireless network rather than just the traffic addressed to your computer.

## **protocol**

See specification.

## **PSTN**

The Public Switched Telephone Network. The concatenation of the world's public circuit-switched telephone networks, in much the same way that the Internet is the concatenation of the world's public IP-based packet-switched networks. Originally a network of fixed-line analog telephone systems, the PSTN is now almost entirely digital, and now includes mobile as well as fixed telephones.

## **Quality of Service**

Quality of Service (QoS) refers to the capability of a network to provide better service to selected network traffic. The primary goal of QoS is to provide priority including dedicated bandwidth, controlled jitter and latency (required by some real-time and interactive traffic), and improved loss characteristics. Also important is making sure that providing priority for one or more flows does not make other flows fail.

## **R-Value**

An ITU-T specification (G.107) for determining call quality. R-value is an objective measurement, computed directly from measurements of packet loss, jitter and delay. While R-value is objective, it has a strong correlation to the subjective Mean Opinion Score method in ITU-T standard P.80

## **RADIUS**

Remote Authentication Dial In User Service. An authentication, authorization and accounting (AAA) protocol for applications such as network access or IP mobility.

## **receive sensitivity**

The capability of a radio transceiver to receive weak signals. The

lower the receive sensitivity, the more capable the transceiver is of understanding weak signals.

## **RFID**

Radio Frequency Identification, a technology used to uniquely identify objects. A transceiver (say, at a highway toll booth) sends out a signal that activates a transponder (a tag installed in a car, for example), which sends data back to the transceiver (let me through, I've already paid).

## **RJ-11**

A plug type used by telephones. It is often confused with the larger RJ-45 plug type used in Ethernet networks.

## **RJ-45**

A plug type used in Ethernet networks. It can be confused with the smaller RJ-11 plugs used for phone cables.

## **roaming**

The act of seamlessly moving your wireless connection from one access point to another as you walk around. To enable roaming between access points, they are typically connected to the same wired Ethernet network and given the same network name.

## **router**

An intelligent network device that goes one step beyond bridging by converting address-based protocols that describe how packets move from one place to another. In practice, this generally comes down to translating between IP addresses and MAC addresses for data flowing between your local network and the Internet..

## **signal strength**

The strength of the radio waves in a wireless network.

## **SIP**

Session Initiation Protocol (SIP) is a protocol developed by the IETF and proposed standard for initiating, modifying, and terminating an interactive user session that involves multimedia elements such as video, voice, instant messaging, gaming, and virtual reality. It is currently the leading signaling protocol for Voice over IP, gradually replacing H.323 in this role.

## **sniffer**

In wireless terms, a sniffer is software or a hardware device that searches for the presence of a wireless network. Another type of sniffer is software used to analyze or intercept wired network traffic.

## **software access point**

A wireless-enabled computer running special software that enables it to act exactly like a wireless access point.

## **specification**

In the networking world, a formal language used by different devices to communicate. Agreed-upon specifications become standards. Specification is generally interchangeable with the term "protocol."

## **spectrum**

A range of electromagnetic frequencies.

## **SSID**

Service Set Identifier, a set of characters that give a unique name to a WLAN.

## **SSL**

A security protocol that secures Internet transactions at the program level. SSL, which stands for Secure Sockets Layer, is widely used in Web browsers to protect credit card transactions, for instance. SSL is a component in EAP-TLS (Extensible Authentication Protocol-Transport Layer Security).

## **standard**

A specification that has been agreed-upon by enough parties or given a stamp of approval by an industry body.

## **stumbler**

A software program that looks for available wireless networks in range and reports information about them. The most common one is NetStumbler.

## **supplicant**

The client role in an 802.1X-authenticated network.

## **switch**

A specific type of hub that isolates the communications between any two computers from the rest of the network, thus increasing throughput. Switches are also called "switching hubs."

## **T-1, T-3**

Transmission systems commonly used in the Internet. T-1 provides a continuous, dedicated transmission rate of up to 1.5 Mbps, T-3 44.7 Mbps. T-1 and T-3 lines are expensive and generally for business or science use, not consumer use.

## **TDMA**

Time Division Multiple Access, a way to deliver digital wireless service. TDMA works by dividing a frequency into time slots and allocating them to multiple calls. TDMA is the standard on which GSM is based, but GSM phones will not work on TDMA networks and vice versa.

## **throughput**

The amount of data that can be transmitted in a given amount of time. Throughput is commonly measured in bits per second. (Although throughput is not really a measurement of speed, most people, including us, use the word "speed" when talking about a high-throughput network.)

## **TKIP**

An encryption key that's part of WPA. TKIP stands for Temporal Key Integrity Protocol. It's nominally weaker than the government-grade AES, but in the real world, TKIP is more than strong enough.

## **TLS**

Transport Layer Security. See SSL.

## **transmit power**

The amount of power used by a radio transceiver to send the signal out. Transmit power is generally measured in milliwatts, which you can convert to dBm.

## **virtual access point**

The ability of an access point radio to support multiple ESSIDs simultaneously. Often, the access point is also able to support different security contexts on each ESSID as well. This capability allows a single wireless LAN infrastructure to support multiple user types. As an example, commonly used in enterprises to support employees using WPA or WPA2 and guests with open

access simultaneously.

## **virtual cell**

Emulation of a single access point from many access points by having each access point use the same BSSID. This eliminates handoff as the client moves among the access points, which is critical for maintaining excellent voice quality. Virtual cell also eliminates channel planning when deploying a wireless LAN, greatly simplifying and reducing the cost of the process.

## **voice-over-IP**

A way of making telephone calls over a packet-switched network like the Internet. Voice-over-IP requires special telephones and software. Voice-over-IP is commonly abbreviated to VoIP.

## **VoIP**

Short for Voice over IP, which is simply voice data sent using Internet Protocol over the public Internet or an intranet. Its main advantage is that it avoids the usual phone service tolls.

## **VPN**

A method of creating an encrypted tunnel through which all traffic passes, preventing anyone from snooping through transmitted and received data. VPN stands for virtual private network.

## **WAN**

Wide Area Network, A collection of local area networks connected by a variety of physical means. The Internet is the largest and most well-known wide area network. Wide area network is generally abbreviated to WAN.

## **WEP**

An encryption system for preventing eavesdropping on wireless network traffic. WEP stands for Wired Equivalent Privacy. WEP is easily broken, and is in the process of being replaced by WPA and WPA2.

## **Wi-Fi**

A certification mark managed by a trade group called the Wi-Fi Alliance. Wi-Fi certification encompasses numerous different standards, including 802.11a, 802.11b, 802.11g, WPA, and more, and equipment must pass compatibility testing to receive the Wi-Fi mark.

## **wireless ISP**

A company that provides wireless Internet access. The term is often abbreviated to WISP.

## **wireless router**

A term that typically indicates a device that is an access point with the ability to share an Internet connection among multiple users via NAT and serve DHCP. Commonly used in homes and small offices. Wireless routers can only be used singly, and not in multiples as access points can.

## **wireless VOIP**

A term used to refer to Wi-Fi enabled handsets providing voice services over a wireless LAN network. Formerly based on completely proprietary solutions, wireless VOIP is a rapidly expanding application that is increasingly using SIP-based phones. New Wi-Fi/cellular phones are also emerging which promise the ability to use a single device

**WLAN**

Wireless Local Access Network, a LAN that can be connected to via a wireless connection.

**WPA**

A modern encryption system for preventing eavesdropping on wireless network traffic that solves the problems that plagued WEP. WPA stands for Wi-Fi Protected Access. It is not a standard from IEEE, but rather a certification from the Wi-Fi Alliance which was an interim step to provide increased security over the original WEP encryption. It is based on a draft standard of IEEE 802.11i.

**WPA2**

The certification provided by the Wi-Fi Alliance for IEEE 802.11i.