**WiMAX (Worldwide Interoperability for Microwave Access)**

It is a telecommunications protocol that provides fixed and fully mobile internet access. The current WiMAX revision provides up to 40 Mbit/s with the IEEE 802.16m update expected offer up to 1 Gbit/s fixed speeds. The name "WiMAX" was created by the WiMAX Forum, which was formed in June 2001 to promote conformity and interoperability of the standard. The forum describes WiMAX as "a standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL".

**What is WiMAX?**

WiMAX is an IP based, wireless broadband access technology that provides performance similar to 802.11/Wi-Fi networks with the coverage and QOS (quality of service) of cellular networks. WiMAX is also an acronym meaning "Worldwide Interoperability for Microwave Access (WiMAX).

WiMAX is a wireless digital communications system, also known as IEEE 802.16, that is intended for wireless "metropolitan area networks". WiMAX can provide broadband wireless access (BWA) up to 30 miles (50 km) for fixed stations, and 3 - 10 miles (5 - 15 km) for mobile stations. In contrast, the WiFi/802.11 wireless local area network standard is limited in most cases to only 100 - 300 feet (30 - 100m).

With WiMAX, WiFi-like data rates are easily supported, but the issue of interference is lessened. WiMAX operates on both licensed and non-licensed frequencies, providing a regulated environment and viable economic model for wireless carriers.

At its heart, however, WiMAX is a standards initiative. Its purpose is to ensure that the broadband wireless radios manufactured for customer use interoperate from vendor to vendor. The primary advantages of the WiMAX standard are to enable the adoption of advanced radio features in a uniform fashion and reduce costs for all of the radios made by companies, who are part of the WiMAX Forum™ - a standards body formed to ensure interoperability via testing. The more recent Long Term Evolution (LTE) standard is a similar term describing a parallel technology to WiMAX that is being developed by vendors and carriers as a counterpoint to WiMAX.
Uses

The bandwidth and range of WiMAX make it suitable for the following potential applications:

- Providing portable mobile broadband connectivity across cities and countries through a variety of devices.
- Providing a wireless alternative to cable and DSL for "last mile" broadband access.
- Providing data, telecommunications (VoIP) and IPTV services (triple play).
- Providing a source of Internet connectivity as part of a business continuity plan.

Triple-play

WiMAX supports the technologies that make triple-play service offerings possible (such as Quality of Service and Multicasting).

As a result, it is possible for a WiMAX operator to not only provide high-speed broadband internet access, but also VoIP and IPTV services to customers with relative ease. This enables a WiMAX service to be a replacement for DSL, Cable and Telephony services.

On May 7, 2008 in the United States, Sprint Nextel, Google, Intel, Comcast, Bright House, and Time Warner announced a pooling of an average of 120 MHz of spectrum and merged with Clearwire to form a company which will take the name Clear. The new company hopes to benefit from combined services offerings and network resources as a springboard past its competitors. The cable companies will provide media services to other partners while gaining access to the wireless network as a Mobile virtual network operator to provide triple-play services.

Some analysts have questioned how the deal will work out: Although fixed-mobile convergence has been a recognized factor in the industry, prior attempts to form partnerships among wireless and cable companies have generally failed to lead to significant benefits to the participants. Other analysts point out that as wireless progresses to higher bandwidth, it inevitably competes more directly with cable and DSL, inspiring competitors into collaboration. Also, as wireless broadband networks grow denser and usage habits shift, the need for increased backhaul and media service will accelerate, therefore the opportunity to leverage cable assets is expected to increase.

Rapid Deployment

WiMAX access was used to assist with communications[citation needed] in Aceh, Indonesia, after the tsunami in December 2004. All communication infrastructure in the area, other than amateur radio, was destroyed[citation needed], making the
survivors unable to communicate with people outside the disaster area and vice versa. WiMAX provided broadband access that helped regenerate communication to and from Aceh.[citation needed]

WiMAX hardware was donated by Intel Corporation to assist the Federal Communications Commission (FCC) and FEMA in their communications efforts in the areas affected by Hurricane Katrina. In practice, volunteers used mainly self-healing mesh, Voice over Internet Protocol (VoIP), and a satellite uplink combined with Wi-Fi on the local link.

**Connecting to WiMAX**

[A WiMAX Gateway which provides VoIP, Ethernet and WiFi connectivity]

[A WiMAX USB modem for mobile internet]

There are numerous devices on the market that provide connectivity to a WiMAX network. These are known as the "subscriber unit" (SU).

There is an increasing focus on portable units. This includes handsets (similar to cellular smartphones); PC peripherals (PC Cards or USB dongles); and embedded devices in laptops, which are now available for Wi-Fi services. In addition, there is much emphasis by operators on consumer electronics devices such as Gaming consoles, MP3 players and similar devices. It is notable that WiMAX is more similar to Wi-Fi than to 3G cellular technologies.
WiMAX Gateways

WiMAX gateway devices are available as both indoor and outdoor versions from several manufacturers. Many of the WiMAX gateways that are offered by manufactures such as ZyXEL, Motorola, and Greenpacket are stand-alone self-install indoor units. Such devices typically sit near the customer's window with the best WiMAX signal, and provide:

- An integrated Wi-Fi access point to provide the WiMAX Internet connectivity to multiple devices throughout the home or business.
- Ethernet ports should you wish to connect directly to your computer or DVR instead.
- One or two PSTN telephone jacks to connect your land-line phone and take advantage of VoIP.

**Indoor gateways** are convenient, but radio losses mean that the subscriber may need to be significantly closer to the WiMAX base station than with professionally-installed external units.

**Outdoor units** are roughly the size of a laptop PC, and their installation is comparable to the installation of a residential satellite dish. A higher-gain directional outdoor unit will generally result in greatly increased range and throughput but with the obvious loss of practical mobility of the unit.

Technical information

[ WiMAX MIMO Board]
WiMAX and the IEEE 802.16 Standard

The current WiMAX revision is based upon IEEE Std 802.16e-2005, approved in December 2005. It is a supplement to the IEEE Std 802.16-2004, and so the actual standard is 802.16-2004 as amended by 802.16e-2005. Thus, these specifications need to be considered together.

IEEE 802.16e-2005 improves upon IEEE 802.16-2004 by:

- Adding support for mobility (soft and hard handover between base stations). This is seen as one of the most important aspects of 802.16e-2005, and is the very basis of Mobile WiMAX.
- Scaling of the Fast Fourier transform (FFT) to the channel bandwidth in order to keep the carrier spacing constant across different channel bandwidths (typically 1.25 MHz, 5 MHz, 10 MHz or 20 MHz). Constant carrier spacing results in a higher spectrum efficiency in wide channels, and a cost reduction in narrow channels. Also known as Scalable OFDMA (SOFDMA). Other bands not multiples of 1.25 MHz are defined in the standard, but because the allowed FFT subcarrier numbers are only 128, 512, 1024 and 2048, other frequency bands will not have exactly the same carrier spacing, which might not be optimal for implementations.
- Advanced antenna diversity schemes, and hybrid automatic repeat-request (HARQ)
- Adaptive Antenna Systems (AAS) and MIMO technology
- Denser sub-channelization, thereby improving indoor penetration
- Introducing Turbo Coding and Low-Density Parity Check (LDPC)
- Introducing downlink sub-channelization, allowing administrators to trade coverage for capacity or vice versa
- Fast Fourier transform algorithm
- Adding an extra QoS class for VoIP applications.

SOFDMA (used in 802.16e-2005) and OFDM256 (802.16d) are not compatible thus equipment will have to be replaced if an operator is to move to the later standard (e.g., Fixed WiMAX to Mobile WiMAX)
Wireless USB

Wireless USB is a short-range, high-bandwidth wireless radio communication protocol created by the Wireless USB Promoter Group. Wireless USB is sometimes abbreviated as "WUSB", although the USB Implementers Forum discourages this practice and instead prefers to call the technology "Certified Wireless USB" to differentiate it from competitors. Wireless USB is based on the WiMedia Alliance’s Ultra-WideBand (UWB) common radio platform, which is capable of sending 480 Mbit/s at distances up to 3 meters and 110 Mbit/s at up to 10 meters. It was designed to operate in the 3.1 to 10.6 GHz frequency range, although local regulatory policies may restrict the legal operating range for any given country.

Uses

Wireless USB is used in game controllers, printers, scanners, digital cameras, MP3 players, hard disks and flash drives. Kensington released a Wireless USB universal docking station in August, 2008. It is also suitable for transferring parallel video streams, while utilizing the Wireless USB over UWB bandwidth.
ZigBee

ZigBee is a specification for a suite of high level communication protocols using small, low-power digital radios based on the IEEE 802.15.4-2003 standard for wireless home area networks (WHANs), such as wireless light switches with lamps, electrical meters with in-home-displays, consumer electronics equipment via short-range radio. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth. ZigBee is targeted at radio-frequency (RF) applications that require a low data rate, long battery life, and secure networking.

Overview

ZigBee is a low-cost, low-power, wireless mesh networking standard. First, the low cost allows the technology to be widely deployed in wireless control and monitoring applications. Second, the low power-usage allows longer life with smaller batteries. Third, the mesh networking provides high reliability and more extensive range.

The ZigBee Alliance is an association of companies working together to enable reliable, cost-effective, and low-power wirelessly networked monitoring and control products based on an open global standard. As per its main role, it standardizes the body that defines ZigBee, and also publishes application profiles that allow multiple OEM vendors to create interoperable products. The current list of application profiles either published or in the works are:

Released Specifications

- ZigBee Home Automation
- ZigBee Smart Energy 1.0
- ZigBee Telecommunication Services
- ZigBee Health Care
- ZigBee Remote Control

Specifications under development

- ZigBee Smart Energy 2.0
- ZigBee Building Automation
- ZigBee Retail Services

The relationship between IEEE 802.15.4 and ZigBee is similar to that between IEEE 802.11 and the Wi-Fi Alliance. The ZigBee 1.0 specification was ratified on 14 December 2004 and is available to members of the ZigBee Alliance. Most recently, the ZigBee 2007 specification was posted on 30 October 2007. The first ZigBee Application Profile, Home Automation, was
announced 2 November 2007. As amended by NIST, the Smart Energy Profile 2.0 specification will remove the dependency on IEEE 802.15.4. Device manufacturers will be able to implement any MACPHY, such as IEEE 802.15.4(x) and IEEE P1901, under an IP layer based on 6LowPAN.

ZigBee operates in the industrial, scientific and medical (ISM) radio bands; 868 MHz in Europe, 915 MHz in the USA and Australia, and 2.4 GHz in most jurisdictions worldwide.

The technology is intended to be simpler and less expensive than other WPANs such as Bluetooth. ZigBee chip vendors typically sell integrated radios and microcontrollers with between 60K and 256K flash memory, such as the Jennic JN5148, the Freescale MC13213, the Ember EM250, the Texas Instruments CC2530 and CC2520, the Samsung Electro-Mechanics ZBS240 and the Atmel ATmega128RFA1. Radios are also available as stand-alone components to be used with any processor or microcontroller. Generally, the chip vendors also offer the ZigBee software stack, although independent ones are also available.

Because ZigBee can activate (go from sleep to active mode) in 15 msec or less, the latency can be very low and devices can be very responsive—particularly compared to Bluetooth wake-up delays, which are typically around three seconds. Because ZigBees can sleep most of the time, average power consumption can be very low, resulting in long battery life.

The first stack release is now called ZigBee 2004. The second stack release is called ZigBee 2006, and mainly replaces the MSGKVP structure used in 2004 with a "cluster library". The 2004 stack is now more or less obsolete.

ZigBee 2007, now the current stack release, contains two stack profiles, stack profile 1 (simply called ZigBee), for home and light commercial use, and stack profile 2 (called ZigBee Pro). ZigBee Pro offers more features, such as multi-casting, many-to-one routing and high security with Symmetric-Key Key Exchange (SKKE), while ZigBee (stack profile 1) offers a smaller footprint in RAM and flash. Both offer full mesh networking and work with all ZigBee application profiles.

ZigBee 2007 is fully backward compatible with ZigBee 2006 devices: A ZigBee 2007 device may join and operate on a ZigBee 2006 network and vice versa. Due to differences in routing options, ZigBee Pro devices must become non-routing ZigBee End-Devices (ZEDs) on a ZigBee 2006 or ZigBee 2007 network, the same as ZigBee 2006 or ZigBee 2007 devices must become ZEDs on a ZigBee Pro network. The applications running on those devices work the same, regardless of the stack profile beneath them.

Licensing

For non-commercial purposes, the ZigBee specification is available free to the general public. An entry level membership in the ZigBee Alliance, called Adopter, provides access to the as-yet unpublished specifications and permission to create products for market using the specifications.
The click through license on the ZigBee specification requires a commercial developer to join the ZigBee Alliance. "No part of this specification may be used in development of a product for sale without becoming a member of ZigBee Alliance." This causes problems for open-source developers because the annual fee conflicts with the GNU General Public License. From the GPL v2, "b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License." Since the GPL makes no distinction between commercial and non-commercial use it is impossible to implement a GPL licensed ZigBee stack or combine a ZigBee implementation with GPL licensed code. The requirement for the developer to join the ZigBee Alliance similarly conflicts with most other Free software licenses.

**Uses**

ZigBee protocols are intended for use in embedded applications requiring low data rates and low power consumption. ZigBee current focus is to define a general-purpose, inexpensive, self-organizing mesh network that can be used for industrial control, embedded sensing, medical data collection, smoke and intruder warning, building automation, home automation, etc. The resulting network will use very small amounts of power — individual devices must have a battery life of at least two years to pass ZigBee certification.

**Typical application areas include**

- **Home Entertainment and Control** — Smart lighting, advanced temperature control, safety and security, movies and music
- **Home Awareness** — Water sensors, power sensors, energy monitoring, smoke and fire detectors, smart appliances and access sensors
- **Mobile Services** — m-payment, m-monitoring and control, m-security and access control, m-healthcare and tele-assist
- **Commercial Building** — Energy monitoring, HVAC, lighting, access control
- **Industrial Plant** — Process control, asset management, environmental management, energy management, industrial device control, machine-to-machine (M2M) communication
Android

Android is a mobile operating system developed by Google and is based upon the Linux kernel and GNU software. It was initially developed by Android Inc. (a firm purchased by Google) and later positioned in the Open Handset Alliance. According to NPD Group, unit sales for Android OS smartphones ranked first among all smartphone OS handsets sold in the U.S. in the second quarter of 2010, at 33%. BlackBerry OS is second at 28%, and iOS is ranked third with 22%.

Android has a large community of developers writing application programs ("apps") that extend the functionality of the devices. There are currently over 70,000 apps available for Android with some estimates saying 100,000 have been submitted, which makes it the second most popular mobile development environment. Developers write managed code in the Java language, controlling the device via Google-developed Java libraries.

The unveiling of the Android distribution on 5 November 2007 was announced with the founding of the Open Handset Alliance, a consortium of 78 hardware, software, and telecom companies devoted to advancing open standards for mobile devices. Google released most of the Android code under the Apache License, a free software and open source license.

The Android operating system software stack consists of Java applications running on a Java based object oriented application framework on top of Java core libraries running on a Dalvik virtual machine featuring JIT compilation. Libraries written in C include the surface manager, OpenCore media framework, SQLite relational database management system, OpenGL ES 2.0 3D graphics API, WebKit layout engine, SGL graphics engine, SSL, and Bionic libc. The Android operating system consists of 12 million lines of code including 3 million lines of XML, 2.8 million lines of C, 2.1 million lines of Java, and 1.75 million lines of C++.
BADA

BADA is a mobile operating system being developed by Samsung Electronics. It is designed to cover both high-end smartphones and lower-end feature phones. Samsung claims that bada will rapidly replace its proprietary feature phone platform, converting feature phones to smartphones. The name 'bada' is derived from the Korean word for ocean or sea.

History

Samsung announced the bada platform on 10 November 2009. After the launch, companies such as Twitter, EA, Capcom, Gameloft, and Blockbuster showed their support for the bada platform. After the announcement, Wave S8500 was first shown in Mobile World Congress 2010 in Spain in Feb 2010. At that time tens of applications running on the first bada phone were demonstrated such as Asphalt 5 by Gameloft.

In May 2010 Samsung released a beta of their Software development kit (SDK) for bada to attract developers. In addition, Samsung started the bada Developer Challenge with a total prize of $2,700,000 (USD). In August 2010 Samsung released version 1.0 of the SDK.

The first bada-based phone was the Samsung Wave S8500, released on June 1, 2010, and selling one million handsets in its first 4 weeks on the market.

Devices

[Wave S8500 Samsung Wave, GT-S8500, the first bada phone]
Samsung's first phone running the bada platform was shown at the Mobile World Congress 2010: the Wave S8500. The Wave is a slim touchscreen phone powered by Samsung's "Humminglebird" CPU (S5PC110), which includes a 1 GHz ARM Cortex-8 CPU and a built-in PowerVR SGX 3D graphics engine, "Super AMOLED" screen and 720p high-def video capabilities.

**Maemo**

Maemo is a software platform developed by Nokia for smartphones and Internet Tablets. It is based on the Debian Linux distribution. Its name is derived from the Finnish word "Maemo", meaning "mother earth."

The platform comprises the Maemo operating system and the Maemo SDK.

Maemo is mostly based on open source code, and has been developed by Maemo Devices within Nokia in collaboration with many open source projects such as the Linux kernel, Debian, and GNOME.

Maemo is based on Debian GNU/Linux and draws much of its GUI, frameworks, and libraries from the GNOME project. It uses the Matchbox window manager, and the GTK-based Hildon as its GUI and application framework.

The UI in Maemo 4 is similar to many handheld interfaces, and features a "Home" screen, which acts as a central point from which all applications and settings are accessed.

The Home Screen is divided into areas for launching applications, a menu bar, and a large customisable area that can display information such as an RSS reader, Internet radio player, and Google search box.

The Maemo 5 UI is slightly different: The menu bar and info area are consolidated to the top of the display, and the four desktops can be customized with shortcuts and widgets.

At the Mobile World Congress in February 2010, it was announced that the Maemo project would be merging with Moblin to create the MeeGo mobile software platform.
Windows Phone 7 Series.

Today Microsoft launches one of its most ambitious (if not most ambitious) projects: the rebranding of Windows Mobile.

The company is introducing the new mobile OS at Mobile World Congress 2010, in Barcelona, and if the press is anything to be believed, this is just the beginning.

The phone operating system does away with pretty much every scrap of previous mobile efforts from Microsoft, from the look and feel down to the underlying code -- everything is brand new.

7 Series has rebuilt Windows Mobile from the ground up, featuring a completely altered home screen and user interface experience, robust Xbox LIVE and Zune integration, and vastly new and improved social networking tools.

Gone is the familiar Start screen, now replaced with "tiles" which scroll vertically and can be customized as quick launches, links to contacts, or self contained widgets.

The look of the OS has also been radically upended, mirroring the Zune HD experience closely, replete with that large, iconic text for menus, and content transitions which elegantly (and dimensionally) slide a user into and out of different views.

The OS is also heavily focused on social networking, providing integrated contact pages which show status updates from multiple services and allow fast jumps to richer cloud content (such as photo galleries).

The Xbox integration will include LIVE games, avatars, and profiles, while the Zune end of things appears to be a carbon copy of the standalone device's features (including FM radio).

Besides just flipping the script on the brand, the company seems to be taking a much more vertical approach with hardware and user experience, dictating rigid specs for 7 Series devices (a specific CPU and speed, screen aspect ratio and resolution, memory, and even button configuration), and doing away with carrier or partner UI customizations such as Sense or TouchWiz.

That's right -- there will be a single Windows Phone identity regardless of carrier or device brand.
Those new phones will likely look similar at first, featuring a high res touchscreen, three front-facing buttons (back, start, and perhaps not shockingly, a Bing key), and little else.

Carrier partnerships are far and wide, including AT&T, Deutsche Telekom AG, Orange, SFR, Sprint, Telecom Italia, Telefónica, Telstra, T-Mobile USA, Verizon Wireless and Vodafone, while hardware partners include Dell, Garmin-Asus, HTC, HP, LG, Samsung, Sony Ericsson, Toshiba and Qualcomm.