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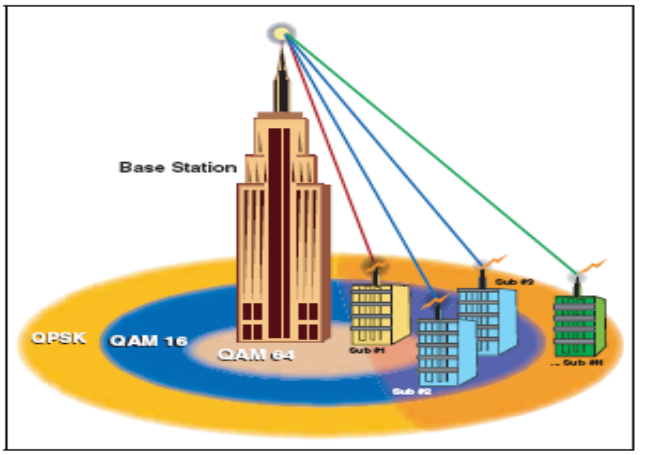
PAPER PRESENTATION

ON

WiMAX

(The Next Frontier BroadBand Wireless)



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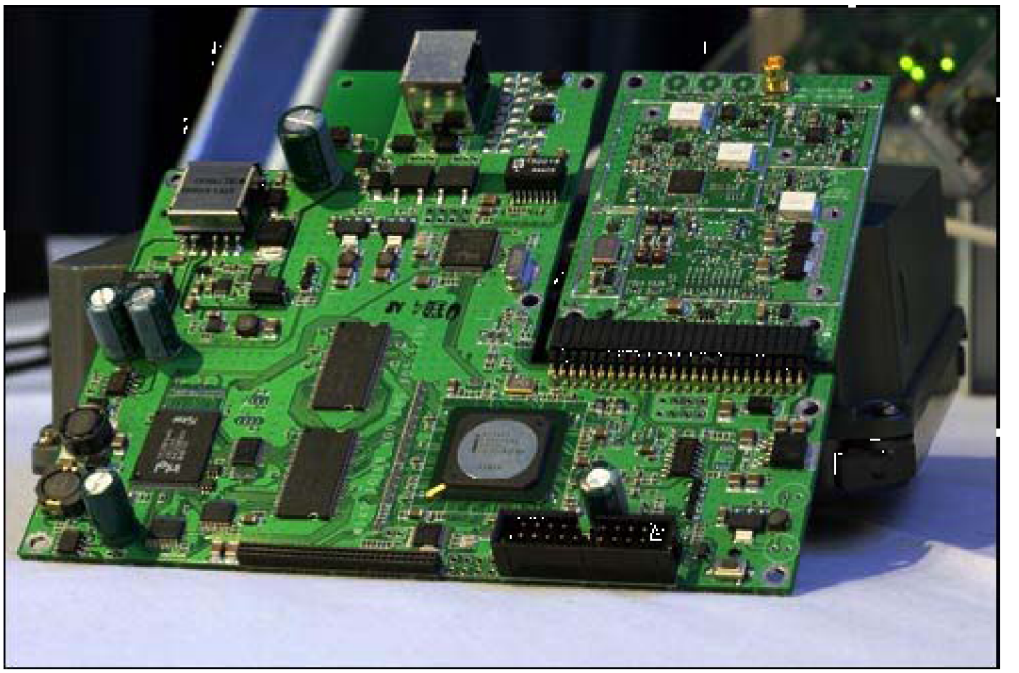
ABSTRACT :

A wireless revolution is seeping into our daily lives never before. Sooner or later we are all going to go wireless. Broadband Wireless Access has occupied a niche in the market for about a decade. The recently developed **Blue tooth** wireless technology is a low power, short-range technology for 'ad hoc' cable replacement and it enables people to wirelessly combine devices wherever they bring them. Due to the short-range limitations of Blue tooth, the recent emergence of Wifi has replaced it. Wifi popularly known as **802.11** is a moderate–range, moderate–speed technology based on Ethernet. It allows people to wirelessly access throughout a location. Although the technologies share a **2.4GHz** band, they have potentially overlapping applications. As more and more people use Wifi, more and more people are getting frustrated with its coverage limitations. The demand for more coverage has opened a door for WiMax. **WiMax** built on **IEEE 802.16** standards is a wireless technology that provides high throughput broadband connections over long distances .Due to its high security, robustness and mainly huge data rates is soon to replace/support existing wireless access technologies like Wifi, Bluetooth, etc and thus believed to be the next generation of wireless access technology. When commercially available, Wimax will offer fixed, nomadic and mobile wireless broadband connectivity without needing direct line-of-sight access to a base station.

INTRODUCTION :

WiMAX is a coined term or acronym meaning **Worldwide Interoperability For Microwave Access** (WiMAX). Its purpose is to ensure that the broadband wireless radios manufactured for customer use interoperate from vendor to vendor. WiMax is a new standard being developed by the IEEE that focuses on solving the problems of point to multipoint broadband outdoor wireless networks. It has several possible applications, including last mile connectivity for homes and businesses and **backhaul** for wireless hot spots. While WiMax has historically lacked the grass roots popularity of its popular cousin, WiFi, and is the standard for wireless metropolitan area networks (WMANs).

It has gained significant traction from the high profile support it has received from the likes of Intel, Dell, Motorola, Fujitsu and other big name corporations. It represents the next generation of wireless networking. Intel has called it as a technology that will enable up to 5 billion people to be connected over time.



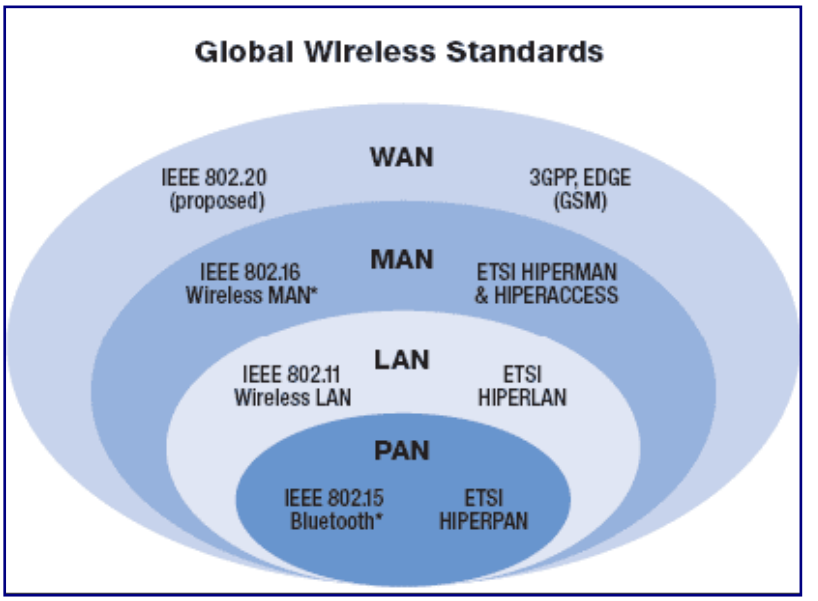
The first WiMax Chip

WiMAX is both faster and has a longer range than Wi-Fi. However, WiMAX does not necessarily conflict with Wi-Fi, but is designed to co-exist with it and may indeed complement it. This complementarity to Wi-Fi also extends to all flavors of wired ethernet (IEEE 802.3), token ring (IEEE 802.5) and non-IEEE Standards.

TECHNICAL DETAILS :

- Range - 30-mile (50-km) radius from base station**.**
- Speed - 70 megabits per second.
- Line-of-sight not needed between user and base station.
- Frequency bands - 2 to 11 GHz and 10 to 66 GHz (licensed and unlicensed bands).
- Defines both the MAC and PHY layers and allows multiple PHYlayer specifications.

WiMAX covers a couple of different frequency ranges. Basically, the IEEE 802.16 standard addresses frequencies from 10GHz to 66GHz. The 802.16a specification, which is an extension of IEEE802.16, covers bands in the 2GHz-to-11GHz range. WiMAX has a range of up to 30 miles with a typical cell radius of 4–6 miles.

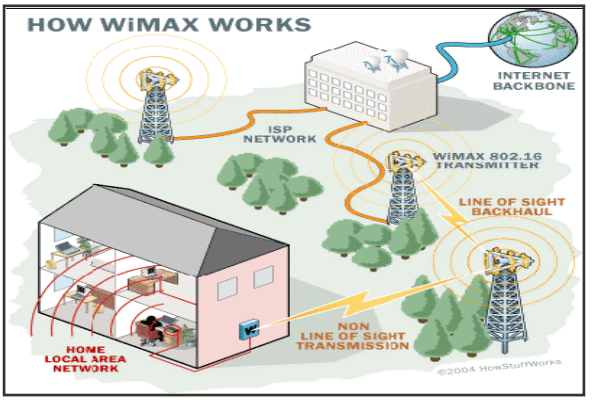


Behind WiMAX is the acceleration of radio technology in order to bridge greater distances. WiMAX's channel sizes range from 1.5 to 20MHz as well, and offer a WiMAX-based network the flexibility to support a variety of data transmitting rates such as T1 (1.5Mbps) and higher data transmitting rates of up to 70Mbps on a single channel that can support thousands of users. This flexibility allows WiMAX to adapt to the available spectrum and channel widths in different countries or licensed to different service providers. " **Wireless Into The Network: WiMAX ".**

WiMAX WORKING :

In practical terms, WiMAX would operate similar to WiFi but at higher speeds, over greater distances and for a greater number of users. WiMAX could potentially erase the suburban and rural blackout areas that currently have no broadband Internet access because phone and cable companies have not yet run the necessary wires to those remote locations.

WiMAX transmitting tower

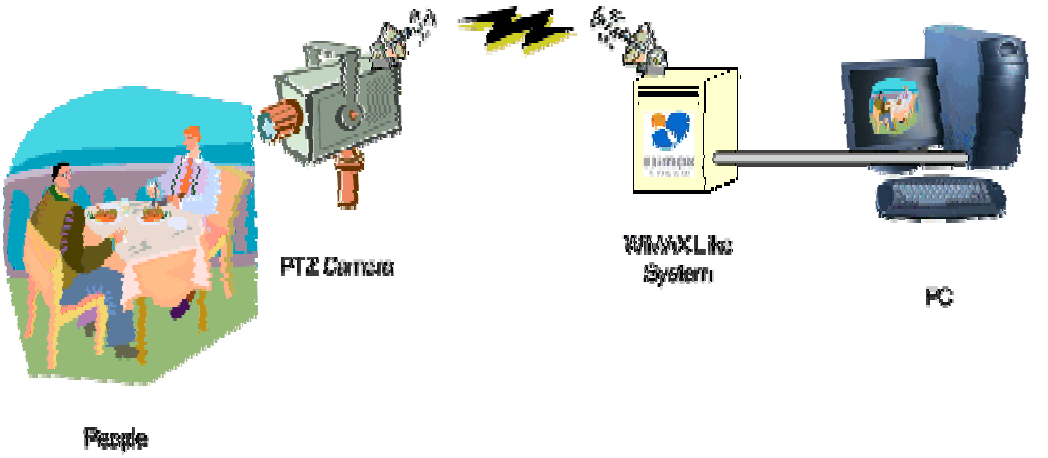


WiMAX working

A WiMAX system consists of two parts:

- A **WiMAX tower** - a single WiMAX tower can provide coverage to a very large area as big as 3,000 square miles (~8,000 square km).
- A **WiMAX receiver** - The receiver and antenna could be a small box or PCMCIA card or they could be built into a laptop the way WiFi access is today.

A WiMAX tower station can connect directly to the Internet using a high bandwidth wired connection. It can also connect to another WiMAX tower using a line-of-sight, microwave link. This connection to a **backhaul**, along with the ability of a single tower to cover up to 3,000 square miles, is what allows WiMAX to provide coverage to remote rural areas.



Broad band with WiMAX

WiMAX actually can provide two forms of wireless service:

- There is the **non-line-of-sight**, where a small antenna on your computer connects to the tower. In this mode, WiMAX uses a **lower frequency range** 2 GHz to 11GHz. Lower wavelength transmissions are not as easily disrupted by physical obstructions, they are better able to diffract, or bend, around obstacles.
- There is **line-of-sight** service, where a fixed dish antenna points straight at the WiMAX tower from a rooftop or pole. The line-of-sight connection is stronger and more stable, so it's able to send a lot of data with fewer errors. Line-of sight transmissions use **higher frequencies**, with ranges reaching a possible 66 GHz. At higher frequencies, there is less interference and lots more bandwidth.

WiFi-style access will be limited to a 4-to-6 mile radius. Through the stronger line-of - sight antennas, the WiMAX transmitting station would send data to WiMAX-enabled computers or routers set up within the transmitter's 30- mile radius. The fastest WiMAX handles up to **70 megabits per second**, which, according to WiMAX proponents, is enough bandwidth to simultaneously support more than 60 businesses with T1-type connectivity and well over a thousand homes at 1Mbit/s DSL-level connectivity.

COMPARISON BETWEEN WiFi & WiMAX :

parameters	WiFi	WiMAX
Speed	54Mbps	70Mbps
Mobility	Fixed, Nomadic, Portable	Fixed, Nomadic, Portable, Mobile
Range	Less than 100m	Greater than 3km
Frequency	2.4GHz	3.3-3.8GHz & 5.7-5.8GHz
Band	Unlicensed	Unlicensed

The biggest difference isn't speed, its distance. WiMAX outdistances WiFi by miles. WiFi's range is about 100 feet (30 m). WiMAX will blanket a radius of **30 miles** (50 km) with wireless access. The increased range is due to the frequencies used and the power of the transmitter. Of course, at that distance, terrain, weather and large buildings will act to reduce the maximum range in some circumstances, but the potential is there to cover huge tracts of land.

SIMILAR TECHNOLOGIES :

Unlike earlier **BroadBand wireless access** (BWA) iterations WiMAX is highly standardized which should reduce costs. However, since Chipsets are custombuilt for each broadband wireless access manufacturer, this adds time and cost to the process of bringing a product to market, and this won't be changed by WiMAX.

WiMAX's equivalent or competitor in Europe is **HIPERMAN**. WiMAX Forum, the consortium behind the standardization, is working on methods to make 802.16 and HIPERMAN interoperate seamlessly. Products developed by the WiMAX Forum members need to comply to pass the certification process. Korea's telecoms industry has developed its own standard, WiBro. In late 2004, Intel and LG Electronics have agreed on interoperability between WiBro and WiMAX.

APPLICATIONS :

1. Intel announced that it has begun sending WiMax chipsets to equipment manufacturers, which are planning to ship products to customers.

2. WiMax is the long-awaited industry standard. If WiMax lives up to its promise, it could solve the dilemma of delivering zippy, Internet connections in areas where the cost of running cables to homes and offices is prohibitively expensive.

WiMax access points are expected to start between $250 and $550 and fall gradually over time, with Intel estimating the cost approaching $50 by 2008. That would be cheap enough to include it in laptops, cell phones and other consumer gadgetry, which could support streaming video and voice over Internet Protocol, or VoIP.

3.The big name corporations have already comeup with a WiMax base station and WiMax access point(Fig a) for exterior use.

WiMax base station Redline Communication's WiMax access point(Fig a)

4. WiMax is being developed on WiFi's Virtual Guides, GPS PDAs and Audio Beam forming

5. WiMax has more on Embedded MP-3 virtual tours, Solar Powered WiFi, Mobile Hotspot, WiFi Pedicabs and the Internet Rickshaw.

6. Ensuring Bright Future:

Early products are likely to be aimed at network service providers and businesses, not consumers. It has the potential to enable millions more to access the Internet wirelessly, cheaply and easily. Proponents say that WiMAX wireless coverage will be measured in square kilometers while that of Wi-Fi is measured in square meters.

Base station

According to WiMAX promoters, a WiMAX base station would beam **high-speed** Internet connections to homes and businesses in a radius of up to **50 km**, these base stations will eventually cover an entire metropolitan area, making that area into a **WMAN** and allowing true wireless mobility within it, as opposed to hot-spot hopping required by Wi-Fi.

Broadband cable\DSL

Its proponents are hoping that the technology will eventually be used in notebook computers and PDAs. According to industry estimates ,this technology would initially be used by broadband cable/DSL providers. With futher improvement ,it would allow users to access the internet in a truly roaming environment.

WiMax will be driven by demand from the network providers themselves, and telecom providers also. A grid of a relatively small number of WiMax base stations can even connect an entire city. Since WiMax supports several communication protocols, this network can serve as the **backbone** for both an ISP, and a telecom provider, without the need for digging up roads. Lines between telecom and internet services are blurred already, with the companies offering both services. Once WiMax equipment becomes more readily available and affordable, ISPs will be able to offer WiMax services directly to consumers. If WiMax chipsets can be embedded in mobile devices(cell phones and PDAs) soon, **WiMax might land up replacing every other wireless technology.**

CONCLUSION :

WiMax with all it's challenges and opportunities is an unavoidable part of our future. WiMax has the potential to be a true business enabler. The possibilities with this technology are immense and numerous. It will lead to great advances of commercial Field. The researchers are filled with optimism, and based on this technology are beginning to make their mark. The extent to which WiMax will impact our lives only depends on the limits of human ingenuinity. It can rightly be said that WiMax is slowly but steadily ushering in the next revolution. Though the technology is still under standardisation process for use in chipsets, antenna and other devices, the WiMax forum expects it to be a killer.

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