

# Wimax

## Introduction

Today there are basically three different options to access the internet:

- Broadband access - In home either a DSL or ISDN. At the office, company may be using an E1 or an E3 line.
- WiFi access - In home using WiFi router that lets us surf the Web while we lounge with our laptops. On the road, we can find WiFi hot spots in restaurants, hotels, coffee shops and libraries.
- Dial-up access - If we are still using dial-up, chances are that either:
  - Broadband access is not available.
  - Broadband access is too expensive.

The main problems with broadband access are that it is expensive and it doesn't reach all areas. The main problem with WiFi access is that hot spots are very small, so coverage is sparse.

There is a new technology that solved all of these problems. This new technology would provide:

- The high speed of broadband service.
- Wireless rather than wired access, so it would be a lot less expensive than DSL and much easier to extend to suburban and rural areas.
- Broad coverage like the cell phone network instead of the hotspots of WiFi.

This system is actually coming into being right now, and it is called WiMAX. WiMAX is short for Worldwide Interoperability for Microwave Access, and it also goes by the IEEE name 802.16.

WiMAX has the potential to do to broadband Internet access what cell phones have done to phone access. In the same way that many people have given up their "land lines" in favor of cell phones for example here in Saudi Arabia the land lines subscribers reach 4.5 millions but for GSM they will reach 10 millions at the end of 2005, WiMAX could replace ISDN and

DSL services. WiMAX will also be as simplicity as WiFi, Just turning the computer on will automatically connect to the closest available WiMAX antenna.

### Wimax system

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.

A WiMAX system consists of two parts:

- WiMAX tower :

- Same to a cell-phone tower.
- Coverage very large area(8,000 square km).
- Connect directly to Internet using wired connection (high-bandwidth).



- WiMAX receiver:

The receiver antenna could be:

- A small box
- Or PCMCIA card
- Or built into a laptop.



A WiMAX tower station can connect directly to the Internet using a high-bandwidth, wired connection (for example, a T3 line). It can also connect to another WiMAX tower using a line-of-sight, microwave link. This connection to a second tower (often referred to as 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

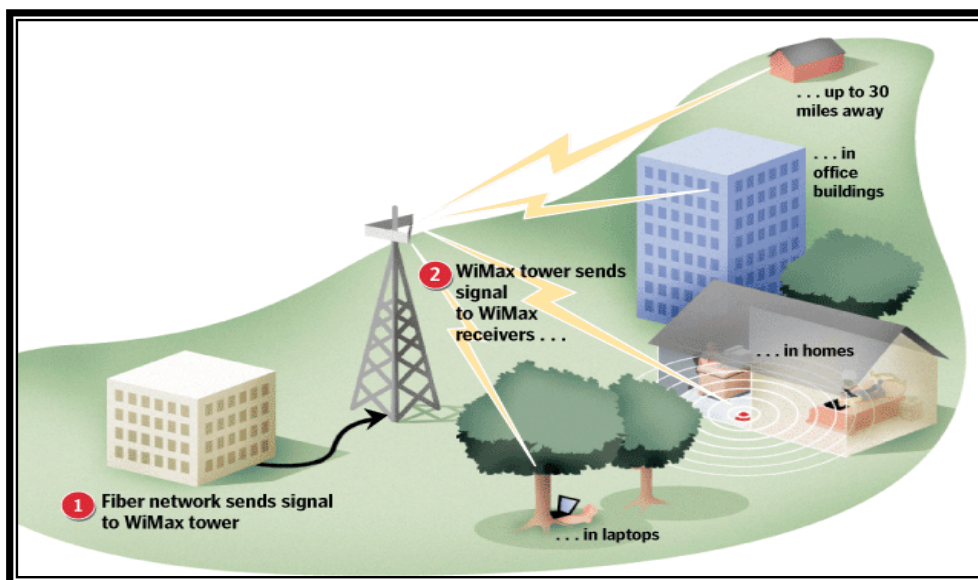
What this points out is that WiMAX actually can provide two forms of wireless service:

- There is the **non-line-of-sight**, WiFi sort of service, where a small antenna on your computer connects to the tower. In this mode, WiMAX uses a **lower frequency range** -- 2 GHz to 11 GHz (similar to WiFi). 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 (perhaps 25 square miles or 65 square km of coverage, which is similar in range to a cell-phone zone). 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 (2,800 square miles or 9,300 square km of coverage). This is what allows WiMAX to achieve its maximum range.



**Figure 1:** WiMAX system.

### What Can WiMAX Do?

WiMAX operates on the same general principles as WiFi; it sends data from one computer to another via radio signals. A computer (either a desktop or a laptop) equipped with WiMAX would receive data from the WiMAX transmitting station, probably using encrypted data keys to prevent unauthorized users from stealing access.

The fastest WiFi connection can transmit up to 54 megabits per second under optimal conditions. WiMAX should be able to handle up to 70 megabits per second. Even once that

70 megabits is split up between several dozen businesses or a few hundred home users, it will provide at least the equivalent of cable-modem transfer rates to each user.

The biggest difference isn't speed; it's 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.

### Wimax family

Technology	802.16	802.16a	802.16e
path	LOS Point to multipoint (PMP)	NLOS	NLOS
Freq band	10-66 GHz	2 –11 GHz	2 –6 GHz
BW	20 MHz	1.25 to 20 MHz	20 MHz
Range	50 Km	50 Km	1 – 3 miles
Mobility	Fixed	Fixed	Mobile
Modulation	QPSK 16 QAM 64 QAM	QPSK 16 QAM 64 QAM	QPSK 16 QAM 64 QAM
Data Rate	32 – 134 Mbps	< 75 Mbps	< 15 Mbps

### Conclusion

The biggest difference with WiFi isn't speed; it's distance. WiMAX range by kms(50Km). WiFi's range is about (30 m).

WiMAX would operate similar to WiFi but:

- 1) At higher speeds.
- 2) Greater distances.
- 3) For a greater number of users

## References

- [www.WIMAX.com](http://www.WIMAX.com)
- <http://computer.howstuffworks.com/wimax.htm>
- <http://adslgate.com/dsl/showthread.php?t=26243>