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WIMAX

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ABSTRACT

WIMAX stands for Worldwide Interoperability for Microwave Access. WiMAX refers to broadband wireless networks that are based on the IEEE 802.16 standard, which ensures compatibility and interoperability between broadband wireless access equipment .WiMAX, which will have a range of up to 31 miles, is primarily aimed at making broadband network access widely available without the expense of stringing wires (as in cable-access broadband) or the distance limitations of Digital Subscriber Line.

A WIMAX system consists of

A WiMAX tower, similar in concept to a cell-phone 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 Personal Computer Memory card, or they could be built into a laptop the way Wi-Fi access is today.

MODES OF OPERATION

Non-Line of sigh: Uses a lower frequency range.

Line of sight: Uses a higher frequency range.

WIMAX Scenario

Consider a scenario where a WiMax-enabled computer is 10 miles away from the WiMax base station.

A special encryption code is given to computer to gain access to base station

The base station would beam data from the Internet required for computer (at speeds potentially higher than today's cable modems)

BENEFITS OF WIMAX

Speed: Faster than broadband service

Wireless: Not having to lay cables reduces cost

Easier to extend to suburban and rural areas

Broad Coverage: Much wider coverage than Wi-Fi hotspots

FUTURES

WiMax will be deployed in three stages

In the first phase WiMaX technology (based on IEEE 802.16-2004) provides fixed wireless connections

In the second phase WiMaX will be available as a cheap and self-installing Subscriber Terminal (ST), linked to PC and to antenna

The third phase enables portability, thus WiMAX (based on IEEE 802.16e) will be integrated into commercial laptops

CONTENTS:

What is WIMAX?

- WIMAX stands for **Worldwide Interoperability for Microwave Access**

- WiMAX refers to broadband wireless networks that are based on the IEEE 802.16 standard, which ensures compatibility and interoperability between broadband wireless access equipment

- WiMAX, which will have a range of up to 31 miles, is primarily aimed at making broadband network access widely available without the expense of stringing wires (as in cable-access broadband) or the distance limitations of Digital Subscriber Line.

THINK OF INTERNET…

❖ There are three possible ways to access internet.

- Broadband access

Uses DSL or cable modem at home and T1 or T3 line at office

- WIFI

Uses WIFI routers at home and hotspots on the road

- Dial Up Connection

NEW TECHNOLOGY

✓ Broadband access is too expensive and Wi-Fi coverage is very sparse.

✓ The new technology promises

- High speed of broadband service
- Wireless rather than wired access
- Broad Coverage

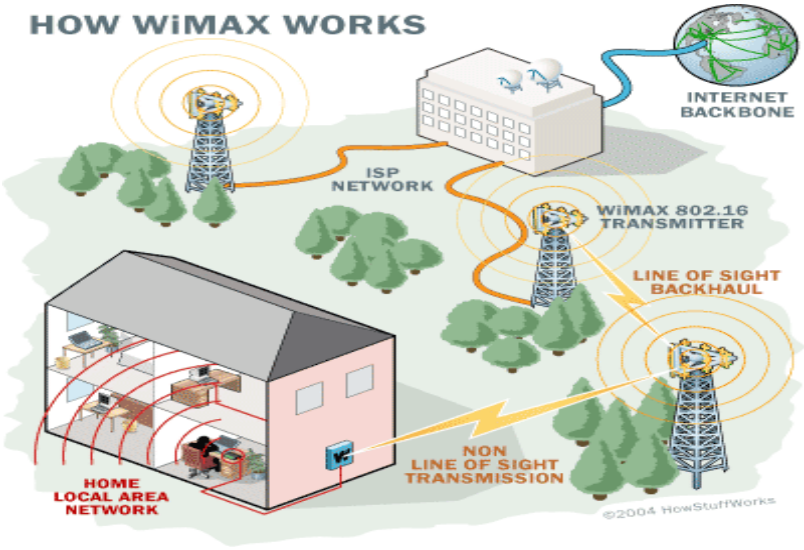
A WIMAX system consists of

1. A **WiMAX tower**, similar in concept to a cell-phone tower - A single WiMAX tower can provide coverage to a very large area as big as 3,000 square miles (~8,000 square km).

2. A **WiMAX receiver** - The receiver and antenna could be a small box or Personal Computer Memory card, or they could be built into a laptop the way Wi-Fi access is today.

WIMAXTOWER WIMAX RECEIVER

HOW WIMAX works?



MODES OF OPERATION

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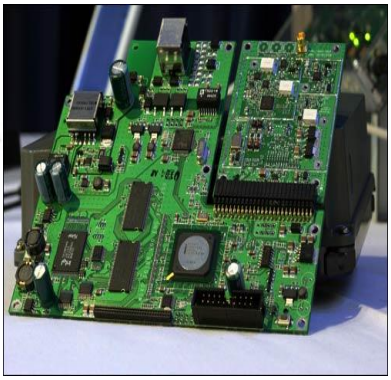
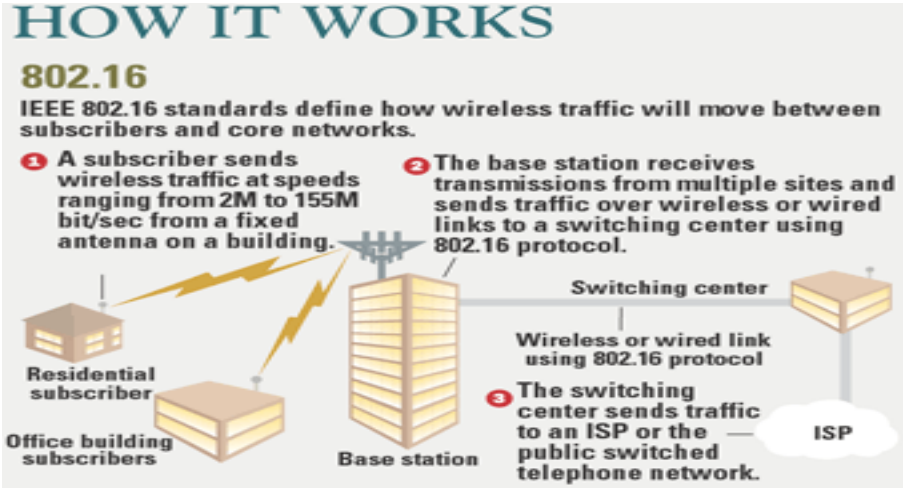
WIMAX Scenario

- Consider a scenario where a WiMax-enabled computer is 10 miles away from the WiMax base station.
- A special encryption code is given to computer to gain access to base station
- The base station would beam data from the Internet required for computer (at speeds potentially higher than today's cable modems)
- The user would pay the provider monthly fee for using the service. The cost for this service could be much lower than current high-speed Internet-subscription fees because the provider never had to run cables

WIMAX CHIPS





IEEE 802.16

- Range- 30 miles from base station
- Speed- 70 Megabits per second
- Frequency bands- 2 to 11 and 10 to 66(licensed and unlicensed bands respectively)
- Defines both MAC and PHY layer and allows multiple PHY layer specifications

IEEE 802.16 Specifications

- **802.16a**

Uses the licensed frequencies from 2 to 11 GHz

Supports Mesh network

- **802.16b**

Increase spectrum to 5 and 6 GHz

Provides QoS (for real time voice and video service)

- **802.16c**

Represents a 10 to 66GHz

- **802.16d**

Improvement and fixes for 802.16a

- **802.16e**

Addresses on Mobile

Enable high-speed signal handoffs necessary for communications with users moving at vehicular speeds

802.16 Architecture

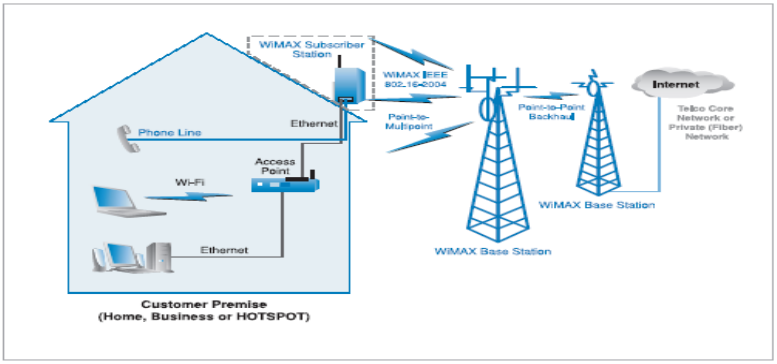
- P2MP Architecture

BS connected to Public Networks

BS serves Subscriber Stations (SS)

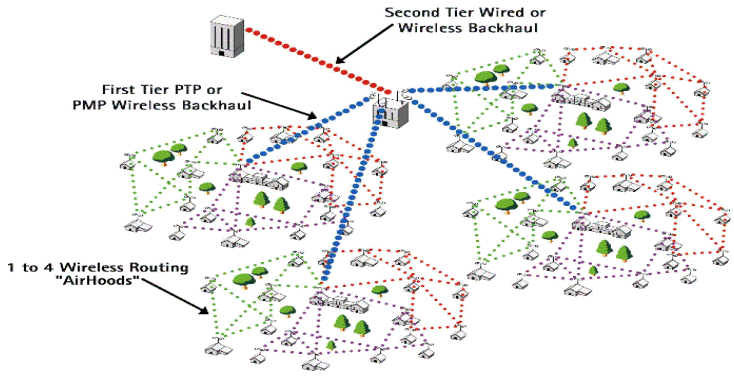
Provides SS with first mile access to Public Networks

- Mesh Architecture



OptionalarchitectureforWiMAX

Mesh Architecture



FEATURES OF WIMAX

- **Scalability**
- **Quality of Service**
- **Range**
- **Coverage**

Scalability

- The 802.16 standard supports flexible radio frequency (RF) channel bandwidths.
- The standard supports hundreds or even thousands of users within one RF channel
- As the number of subscribers grows the spectrum can be reallocated with process of sectoring.

Quality of Service

- Primary purpose of QoS feature is to define transmission ordering and scheduling on the air interface
- These features often need to work in conjunction with mechanisms beyond the air interface in order to provide end to end QoS or to police the behaviour or SS.

Requirements for QoS

- A configuration and registration function to pre configure SS based QoS service flows and traffic parameters
- A signalling function for dynamically establishing QoS enabled service flows and traffic parameters
- Utilization of MAC scheduling and QoS traffic parameters for uplink service flows
- Utilization of QoS traffic parameters for downlink service flows

Coverage

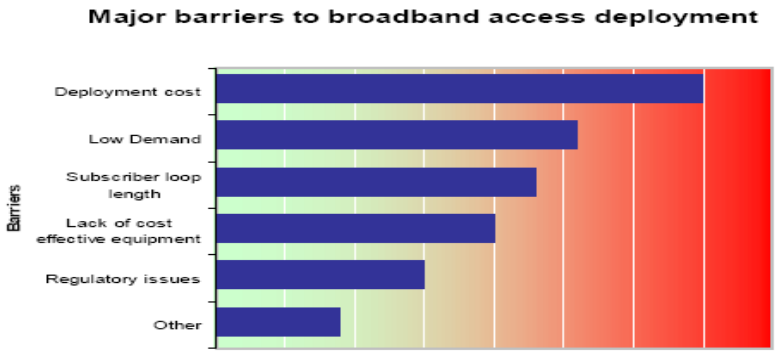
- Standard supports mesh network topology
- Optimized for outdoor NLOS performance

- Standard supports advanced antenna techniques

BENEFITS OF WIMAX

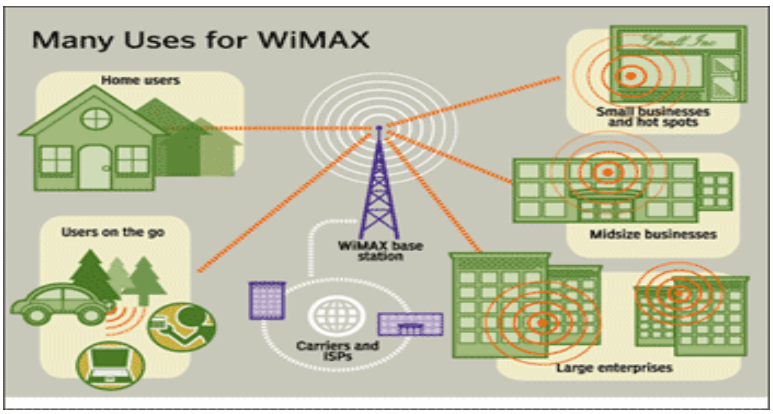
- **Speed**
  - Faster than broadband service
- **Wireless**
  - Not having to lay cables reduces cost
  - Easier to extend to suburban and rural areas
- **Broad Coverage**
  - Much wider coverage than Wi-Fi hotspots

Advantages of WiMax over 3G



- **WiMax spectrum is more economical than 3G.**
- The price paid per Hz is as much as 1000 times lower than for 3G spectrum
- The low cost is a clear driver for service providers to enter the field of wireless services with WiMax

USES OF WIMAX



FUTURE…

- WiMax will be deployed in three stages
  - In the first phase WiMaX technology (based on IEEE 802.16-2004) provides fixed wireless connections
  - In the second phase WiMaX will be available as a cheap and self-installing Subscriber Terminal (ST), linked to PC and to antenna
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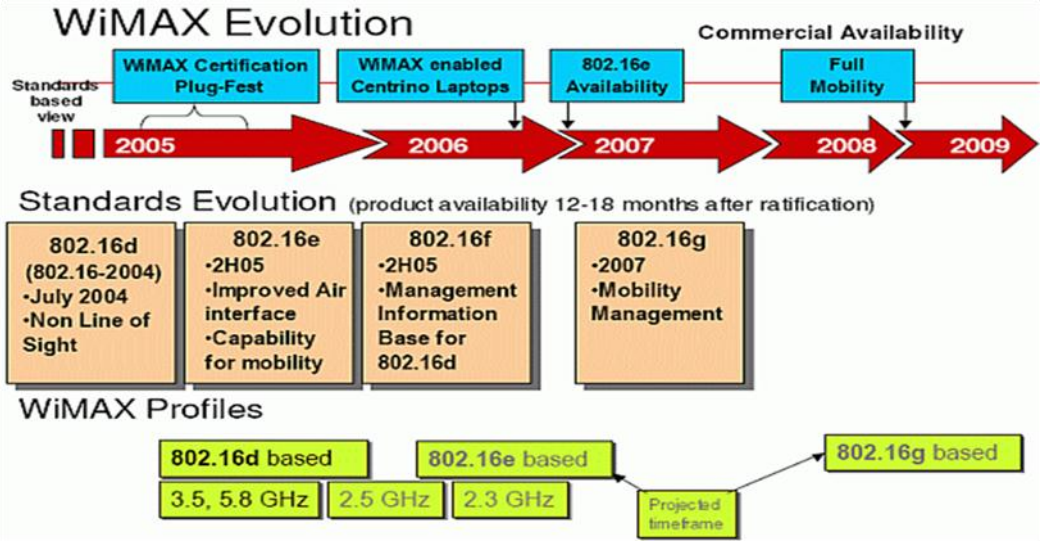

ISSUES in 3G vs. WIMAX

- Cost Issue
  - The main reason to opt for WIMAX is its low cost.
  - The price paid per Hz for WIMAX spectrum is as much as 1000 times lower than for 3G spectrum
  - The low cost of WIMAX spectrum compared to 3G is a clear driver for service providers to enter the field of wireless services with WIMAX

The WIMAX Forum

- Founded in April 2001
- No Profit organization comprised of wireless access system manufacturers, component suppliers, software developers and carriers
- A wireless industry consortium that supports and promotes WiMAX's commercial usage
- Comply with the WiMAX standard and focus on the interoperability
- Members include Intel, AT&T, Siemens Mobile, British Telecommunications, etc

Conclusion (The Final Issue)

- Will WIMAX replace 3G?
  - Along with the forthcoming standardization, WiMAX has the potential to substitute 3G and become a promising 4G
  - WiMAX has its distinct identity as either a stand-alone solution for incumbent and competitive fixed network operators or as complementary radio access solution for established 2G and 3G cellular network operators