What is WiMAX?

- WiMAX is an industry trade organization formed by leading communications component and equipment companies to promote and certify compatibility and interoperability of broadband wireless access equipment that conforms to the IEEE* 802.16 and ETSI* HIPERMAN standards.
- The 802.16a standard is a wireless metropolitan area network (MAN) technology that will provide a wireless alternative to cable, DSL and T1/E1 for last mile broadband access. It will also be used as complimentary technology to connect 802.11 hot spots to the Internet.
- WiMAX will accelerate and increase the success of future interoperability testing by providing tools for conformance testing. Tools can be used during the equipment maker's system development process to ensure conformance with the standards-based product roadmap as it evolves.
- Members include leading Operators, Equipment and Component makers (see list at end)
- WiMAX was formed in April 2001, in anticipation of the publication of the original 10-66 GHz IEEE 802.16 specifications. WiMAX is to 802.16 as the Wi-Fi Alliance is to 802.11.

WiMAX Goals

- A standard by itself is not enough to enable mass adoption. WiMAX has stepped forward to help solve barriers to adoption, such as interoperability and cost of deployment. WiMAX will help ignite the wireless MAN industry, by defining and conducting interoperability testing and labeling vendor systems with a "WiMAX Certified™" label once testing has been completed successfully.

WiMAX benefits

- Component Makers
  - Creates a *volume* opportunity for silicon suppliers
- Equipment Makers
  - Innovate more rapidly because there exists a standards-based, stable platform upon which to rapidly add new capabilities.
  - No longer need to develop every piece of the end-to-end solution
- Operators
  - A common platform which **drives down the cost** of equipment and **accelerates price/performance** improvements unachievable with proprietary approaches
  - Generate revenue by filling broadband access gaps
  - Quickly provision T1 / E1 level and "on demand" high margin broadband services
  - Reduce the dollar risk associated with deployment as equipment will be less expensive due to economies of scale
  - No longer be locked into a single vendor since base stations will interoperate with multiple vendors' CPEs.
- Consumers
  - More broadband access choices, especially in areas where there are gaps: worldwide urban centers where building access is difficult; in suburban areas where the subscriber is too far from the central office; and in rural and low population density areas where infrastructure is poor.
  - More choices for broadband access will create competition which will result in lower monthly subscription prices.

WiMAX Schedule

Jan 2003	April 2003	Q4 2003	Q3 2004	Q4 2004
IEEE802.16a Standard Released	Initial System Profile selected: 256 OFDM at 2.5, 3.5 and 5.8GHz	Select Certification LAB Complete Test Suites	Initial Vendor tests	WiMAX Certified Solutions in the Market

What Should Operators Deploy Now ?

Operators who want to deploy today should deploy with equipment from today's WiMAX member companies. Current members of WiMAX account for over 75% of all sub 11GHz BWA shipments worldwide, and in some regions this number is even higher. By deploying equipment from today's WiMAX members, an Operator can be assured there is a roadmap and upgrade path to WiMAX compliant equipment in the future.
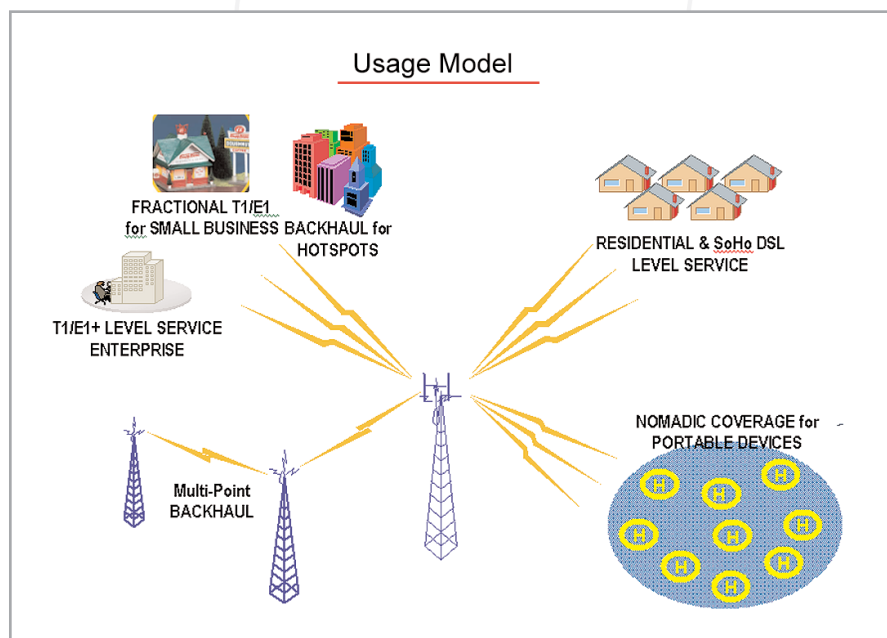
What is 802.16a?

- The 802.16a standard for 2-11 GHz is a wireless metropolitan area network (MAN) technology that will provide broadband wireless connectivity to Fixed, Portable and Nomadic devices. It can be used to connect 802.11 hot spots to the Internet, provide campus connectivity, and provide a wireless alternative to cable and DSL for last mile broadband access. It provides up to 50-kilometers of service area range, allows users to get broadband connectivity without needing direct line of sight with the base station, and provides total data rates of up to 280 Mbps per base station, which is enough bandwidth to simultaneously support hundreds of businesses with T1/E1-type connectivity and thousands of homes with DSL-type connectivity with a single base station.

What are the Benefits of 802.16 Technology?

- Cost & Investment Risk
  - Interoperable equipment lets operators purchase WiMAX Certified™ equipment from more than one vendor
  - A stable, standards-based platform improves OpEx by sparking innovation at every layer, Network Management, antennas, and more.
- Higher throughput at longer ranges (up to 50 km)
  - Better bits/second/Hz at longer ranges
- Scalable system capacity
  - Easy addition of new sectors supported with flexible channels maximizes cell capacity, allowing operators to scale the network as the customer base grows.
  - Flexible channel bandwidths accommodate spectrum allocations for both licensed and unlicensed spectrum
  - MAC protocol scales efficiently from one to hundreds of subscribers
- Coverage
  - Advanced techniques (mesh, beam-forming, MIMO) improve non-line-of-sight performance
  - Superior system gain allows greater penetration of obstacles at longer distances
- Quality of Service
  - Dynamic TDMA (Grant/Request) MAC supports new latency sensitive services such as voice and video
  - Differentiated service levels enabled with on-demand bandwidth allocation: for example T1/E1 for business; best effort for residential
- Help enable last-mile broadband deployment wirelessly while remaining complementary to Wi-Fi technology
  - Service providers could use an 802.16 equipment to deliver T1/E1-speed or higher network connectivity to their Wi-Fi access points. Today, it can take up to three months or more for service providers to provision a T1/E1 network line for a business customer. With wireless broadband technology, a service provider could provision the same network access in a matter of days and at a fraction of the cost. In addition, a service provider could offer "on demand" high speed bandwidth for events such as tradeshows, or for nomadic businesses such as construction sites with sporadic broadband connectivity needs.

Relationship Between 802.16a and WiMAX

- One of the purposes of the WiMAX Forum is to create a single interoperable standard from the IEEE 802.16a and ETSI HIPERMAN standards. This is achieved by the creation of System Profiles.
- Based upon what the WiMAX Forum sees in terms of vendor equipment plans, WiMAX has decided to focus on profiles for the 256 OFDM PHY mode of the 802.16a standard. This PHY will be combined with a non-optional MAC, ensuring a uniform base for all WiMAX implementations.
- Initially there will be three system profiles, covering the 5.8GHz license exempt band, and the 2.5 and 3.5 GHz licensed bands. More profiles are planned including the 2.3GHz band and more.

Relationship between 802.16a and HIPERMAN (European MAN standard)

- The IEEE 802.16a (256 OFDM PHY) and ETSI HIPERMAN standards share the same PHY and MAC. The WiMAX Forum is active in both standards making bodies to ensure that there is a global standard for Wireless MAN.

Relationship between 802.16a and 802.16e

- The IEEE 802.16e standard is planned to be an extension to the approved IEEE 802.16/16a standard. The purpose of 802.16e is to add limited mobility to the current standard which is designed for fixed operation. IEEE 802.16e is not intended to compete with 3G or other truly mobile efforts. Work on this extension is expected to be complete by the end of 2004.

WiMAX

❱❱ Relationship between IEEE 802.16 and IEEE 802.11

	802.11	802.16	Technical Difference
Range	Sub ~ 300 ft. (add access points for greater coverage)	Up to 30 miles Typical cell size of 4-6 miles	802.16 PHY tolerates greater multi-path, delay spread (reflections) via implementation of a 256 FFT vs. 64 FFT for 802.11.
Coverage	Optimized for indoor performance, short range	Outdoor NLOS performanceStandard support for advanced antenna techniques	802.16 systems have an overall higher system gain, delivering greater penetration through obstacles at longer distances.
Scalability	Intended for LAN applications, users scale from one to tens with one subscriber for each CPE device. Fixed channel sizes (20MHz).	Designed to efficiently support from one to hundreds of CPEs, with unlimited subscribers behind each CPE. Flexible channel sizes from 1.5MHz to 20MHz.	The MAC protocol used in 802.11 uses a CSMA/CA protocol, while 802.16 employs Dynamic TDMA. 802.11 can only be used in license exempt spectrum > limited number of channels. 802.16 can use all available frequencies, multiple channels support cellular deployment.
Bit rate	2.7 bps/Hz peakUp to 54 Mbps in 20 MHz channel	5 bps/Hz peakUp to 100 Mbps in a 20 MHz channel	Higher modulations coupled with flexible error correction results in more efficient use of spectrum.
QoS	No QoS support	QoS built into MAC -> voice/ video and differentiated service levels	802.11: contention-based MAC (CSMA/CA) basically wireless Ethernet 802.16: Dynamic TDMA-based MAC with on-demand bandwidth allocation

❱❱ Current WiMAX Member Companies

Airspan	Fujitsu Microelectronics America	RF Magic
Advantech	Intel	SiWave
Alvarion	L3 PrimeWave	SiWorks Inc.
Analog Devices	LCC	SR Telecom
Andrew Corporation	MTI	Stratex Networks
Aperto Networks	M-Web	Towerstream
Atheros Communications, Inc.	NEWS IQ	The Telnecity Group
China Motion Telecom	Nokia	TurboConcept
Compliance Certification	OFDM Forum	Vcom
Services	Powerwave Technologies	Wavesat Wireless Inc.
Comtech AHA	Proxim Wireless Networks	WiLan
Engim	Raytheon RF Components	Winova Wireless
Ensemble Communications	Redline Communications Inc.	Yahoo!
Filtronics	RF Integration Inc.	

For information on new members or for more information please visit **www.wimaxforum.org**