



WiMAX Standards and Regulations

**ITU/BDT Regional Seminar on Broadband Wireless Access
(BWA) for CIS, CEE and Baltic Countries**
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1



Agenda

- **Broadband & Internet Penetration in Region**
- **Intel's Spectrum Policy**
- **Standards**
- **Intel Products and Roadmap**
- **Applications**
- **WiMAX Forum**
- **Regulations**

2



Broadband Penetration in Region

CIS COUNTRIES

0.01 to 2.03

CEE & BALTIC COUNTRIES (Except EU Countries)

0.01 to 2.03

CEE & BALTIC COUNTRIES (Including EU Countries)

0.01 to 27.14

Internet Penetration in Region

CIS COUNTRIES

0.01 to 4.2

CEE & BALTIC COUNTRIES (Except EU Countries)

0.48 to 9.58

CEE & BALTIC COUNTRIES (Including EU Countries)

0.48 to 28.18

Source: International Telecommunications Union



3

Intel's Spectrum Policy

- **Sufficient Spectrum for operators**
- **Technology Neutrality**
- **Open, competitive licensing process**
- **Flexibility within licensed use**
- **Foster competition and innovation**



4

WiMAX Standards

WiMAX is defined as 'Worldwide Interoperability for Microwave Access' by the WiMAX Forum, officially known as WirelessMAN.

Standards

- IEEE 802.16.2004 / ETSI Hiperman (June 2004)
(Fixed, Nomadic Application)
- IEEE 802.16e (December 2005)
(Fixed, Nomadic, Mobile)

5



WiMAX recognition in the ITU

Excellent progress has been made already in ITU:

IEEE 802.16d

- Technology recognised in ITU-R Recommendation F.1763

IEEE 802.16e

- Recognised in ITU-R Recommendation M.1801

IMT-2000 Family

- IEEE submitted a proposal to ITU WP8F in January 2007 for the inclusion of Mobile WiMAX within the IMT-2000 Family.
- On 18th October 2007, ITU took a decision of global importance to include WiMAX technology in the IMT-2000 Family.

6



IMT-2000 Standards (six radio interfaces)

IMT-OFDMA TDD WMAN

- also known as **WiMAX**

IMT-DS Direct-Sequence

- also known as **W-CDMA** or **UTRA-FDD**, used in **UMTS**

IMT-MC Multi-Carrier

- also known as **CDMA2000**, the successor to 2G CDMA (IS-95)

IMT-TC Time-Code

- This comprises: UTRA TDD, TDD-SCDMA

IMT-SC Single Carrier

- also known as UWC, the best known implementation is **EDGE**

IMT-FM Frequency Time

- also known as **DECT**

7



IMT-2000 technologies (3G) are complementary

WiMAX and other 3G technologies will coexist

Each service provider's distinct network environment and business imperatives will determine which technology or mix of technologies best meets their needs.

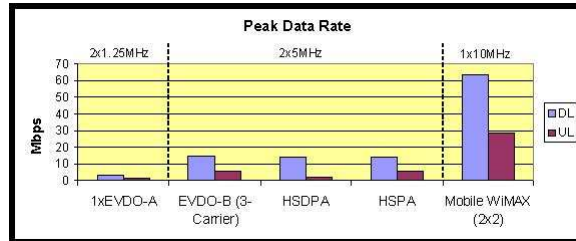
- **WiMAX** is optimized for **IP-based high-speed wireless broadband.**
- **Other 3G** technologies optimized for **cellular voice and moderate data-rate applications**

8



Data Rate Comparison of 3G technologies

Peak Data Rates up to 70 M bit/s (Source: ITU-R M.1801)



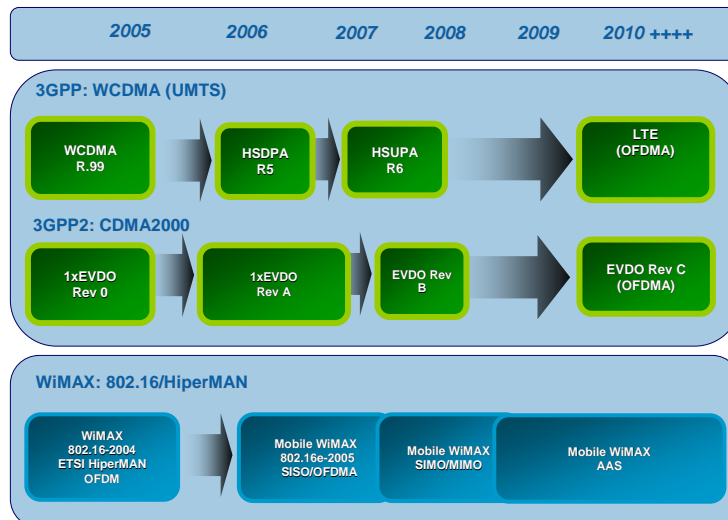
WiMAX peak data rates are 5X better than other 3G+ Technologies on systems tested

Fast upload and download speeds.

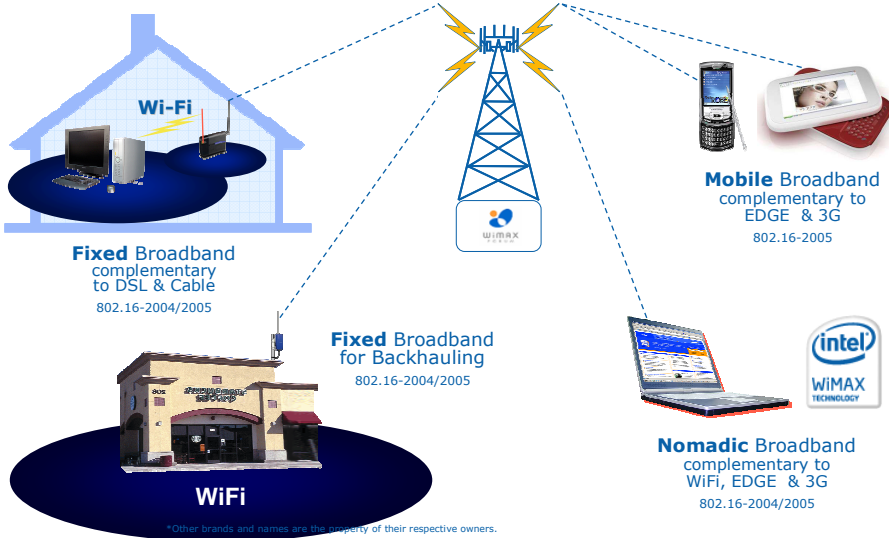
Source: WiMAX Forum (www.wimaxforum.org)



Wireless Broadband Roadmap



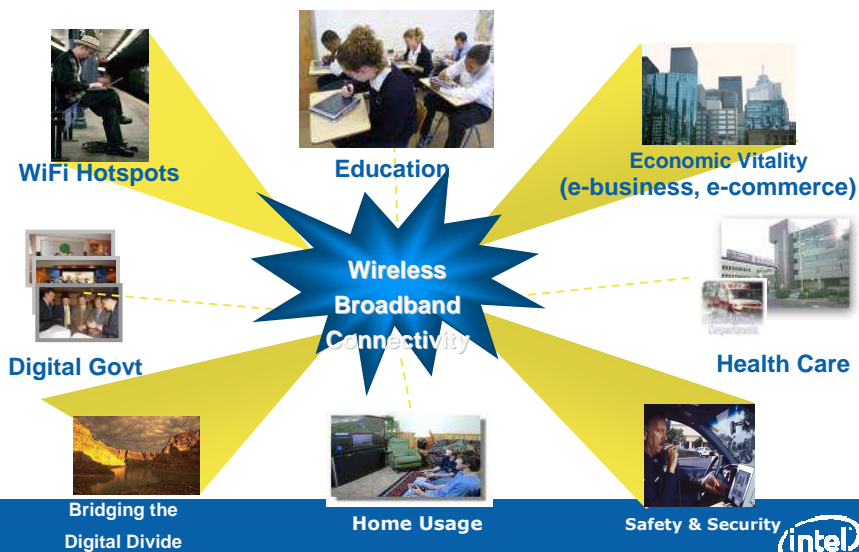
WiMAX Applications



Anytime, Anywhere – Always Broadband

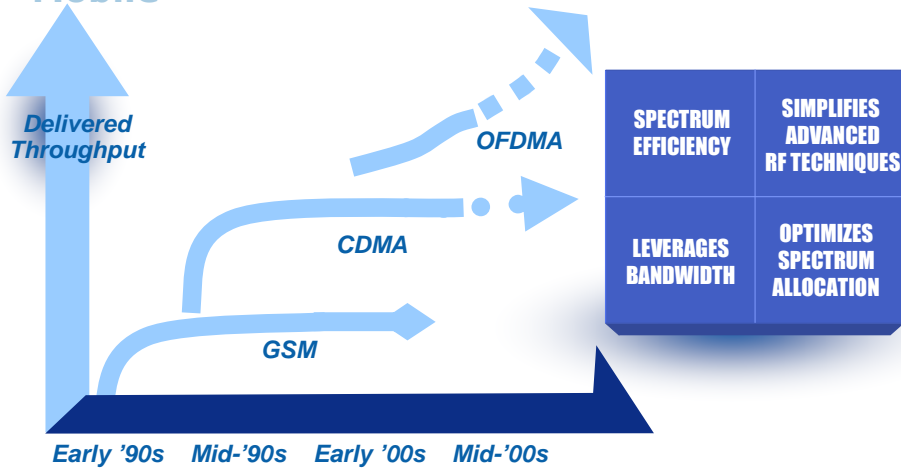


WiMAX Opportunities



Why WiMAX is such a Big Deal?

It Represents a Shift to OFDM for Fixed and Mobile



CDMA=Code Division Multiple Access, OFDM=Orthogonal Frequency Division Multiplex

13



Why WiMAX?

WiMAX Will Meet Emerging Customer Needs

Established Customer Demand

Broadband, but Fixed

Mobile, but Narrowband

Offering varying levels of Broadband Data, Voice, & Video for Multiple Devices and Usage Models

WiMAX offers a combination of both broadband and mobility



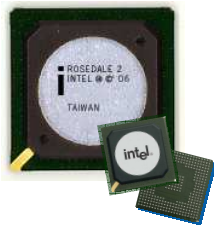
Mobile WiMAX Ambulance Demo (Triple Play Service)



15



Intel Developing WiMAX Chips



Rosedale-2: Optimized for cost-effective WiMAX modems



Baxter Peak: For Mobile Internet Devices (UMPC)



Ofer-R: World's First Single Chip Wi-Fi / WiMAX Radio for Mobile Devices

16



Intel silicon driving new devices



Fixed Modems



2006-2007

Intel® WiMAX Connection 2250

Mobile Notebooks & handhelds



2007-2008

Intel® Wi-Fi/WiMAX Module

CE



2008+

Integrated Wi-Fi/WiMAX
Multi-mode Chipsets

World's first combo Wi-Fi/WiMAX module
for Centrino Processor Technology notebooks in 2008

Intel may make changes to specifications, product descriptions, and plans at any time, without notice.
Other names and brands may be claimed as the property of others.

17



Ultra-Mobile PC + WiMAX = Mobile Internet



- Web surfing, e-mail
- MMS - Multimedia Messaging Service - high quality image
- Instant Messaging
- Push-type Service
 - Mail, image, ad & coupon
- VoIP, video-conference
- Gaming - low latency
- Music on demand, VOD
- Location Based Service (GPS)
- On-line shopping
- IP TV (DVB-H)
- Safety alarm
- Emergency service

18



WiMAX Forum (www.wimaxforum.org)



- The WiMAX Forum is an industry-led, non-profit corporation
- Formed to promote and certify compatibility and interoperability of broadband wireless products.
- Member companies support the industry-wide acceptance of the IEEE 802.16 and ETSI HiperMAN standards.

What this means?

For **network operators**; equipment interoperability across vendors

For **component vendors**; fewer product variations and higher volumes

For **end-users**; faster and cheaper access that is more widely available



WiMAX Forum Members

Equipment Manufacturers



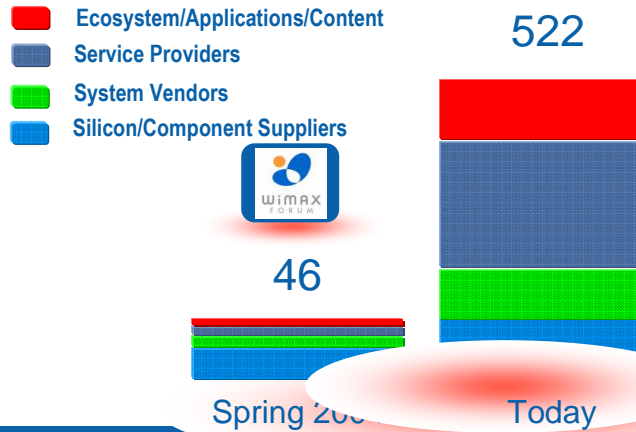
Service Providers



Plus others not specifically listed here



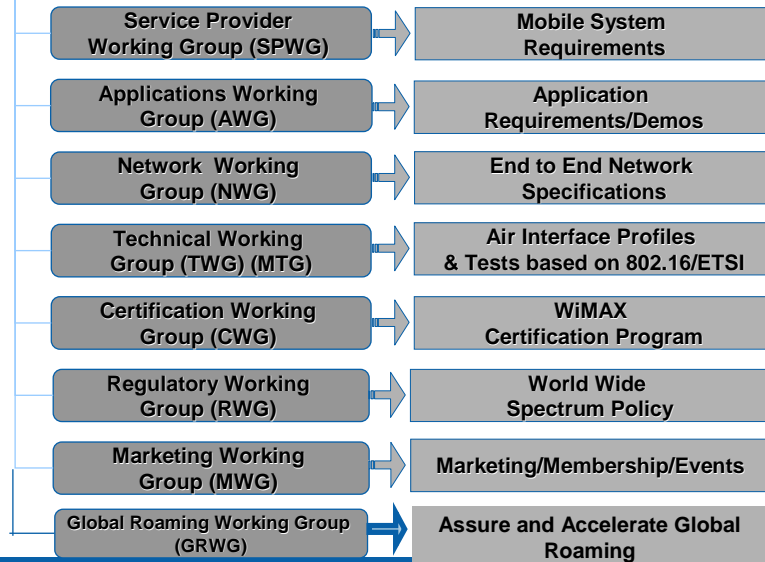
The WiMAX Forum Membership Growing!



21



WiMAX Forum Working Groups



22



WiMAX Spectrum

WiMAX (2.3/2.5 GHz, 3.5/3.7 GHz, 5.8 GHz)



Plans for profiles include below 1 GHz

Current WiMAX Forum Profiles

23



WiMAX Certification

- Certification program started mid-2005
- Certified products comply with the standards and they interoperate with certified products from other vendors.
- 31 Certified products (fixed/nomadic)
- Mobile WiMAX products are ready and certification will begin in first quarter of 2008.

24



Certification Labs

- AT4 Lab (Spain) – Lead Lab Opened August '05
- TTA(Korea) – Oct '07
- AT4 (US) – Oct '07
- CATR (China) 16d – April '07 , 16e – Nov '07/Dec'07
- ADT Taiwan Lab – Nov '07, 2nd Lab July '08
- Additional Labs in '08: India, Japan

25



WiMAX

300+ Trials / 100+ Commercial Deployments



26



Nationwide WiMAX Networks

- United States – 2008 – Sprint Nextel and Clearwire
- Pakistan – August 2007 - Buraq Telecom, Wateen Telecom and MyTel
- Kingdom of Bahrain – 4Q 07 - Mena Telecom
- Russia - The company plans to extend wireless Internet, or WiMax, coverage to 330 cities by 2010 - Summa Telecom
- Chile – March 2007 – Telmex
- Taiwan – June 2008 - Vastar Cable and Vmax Telecom
- Brazil – Currently Regional, plans to expand to national – Neovia
- Argentina – Migrating CDMA to WiMAX network in 2007 – Telmex
- Iraq – September 2007 - Kalimat Telecom

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27



Mobile WiMAX Status

- Commercial service in Korea
- Sprint launching early '08, USA
- Summa Telecom, Russia 2007
- Japan licenses end of '07
- UK licences next year
- Norway licenses next year
- Sweden licences next year
- Austria Public Consultancy
- and others...

28



Mobile WiMAX is real \$billions invested....at 2.5 GHz band

2 US carriers commit to WiMAX.



Sprint Nextel Corp. (NYSE: S) today [8th Aug '06] announced its plans to develop and deploy the first fourth generation (4G) nationwide broadband mobile network. The 4G wireless broadband network will use the mobile WiMAX (Worldwide Interoperability for Microwave Access) IEEE 802.16e-2005 technology standard.

“Mobile WiMAX...delivers four times the throughput of other wireless technologies at up to one-tenth the cost.”

Sprint

- Sprint PR details
 - Sprint to deploy mobile WiMAX in '07, launch services in '08
 - 100M+ POPs covered by the end of '08
 - Intel to supply technology for laptops and other computing devices

We believe this is a “inflection point” for mobile WiMAX deployments worldwide.



KT (Korea Telecom) Mobile WiMAX Application

Commercial Mobile WiMAX service since June 2006

Mobile TPS (Triple Play Service)

- Communication : Fixed mobile convergence communicator including SMS, MMS, chatting, VoIP, video conferencing
- Data : Mobile internet access
- Media : Real-time media service (VoD, MoD), Personal media blog



Fixed, Nomadic and Mobile ITU-R Recommendation F.1399-1

4.1.2 Fixed Wireless Access

Wireless access application in which the location of the end-user termination and the network access point to be connected to the end-user are fixed.

4.1.3 Mobile Wireless Access

Wireless access application in which the location of the end-user termination is mobile.

4.1.4 Nomadic Wireless Access

Wireless access application in which the location of the end-user termination may be in different places but it must be stationary while in use.

Strict implementation of this definitions constrain innovations / limit convergence



2.5 – 2.69 GHz (IMT-2000 Band)

- **WiMAX is IMT-2000 Standard**
- **TDD is optimized for data**
- **TDD disadvantaged over FDD**
- **2.5 GHz is excellent for Mobile WiMAX**
- **Open 2.5 GHz to WiMAX, this could be done as a first step within the TDD 50 MHz central gap.**

Regulatory framework for 2.5 GHz enabling WiMAX is necessary



Bandwidth & Business

- **Economic viability of a service provider's business case is highly sensitive to the size of the spectrum allocation license**
- **Spectrum available for deployment determines base station capacity**
- **Capacity constraints accelerate the need to split cells**
- **Excessive cell splitting causes significant operating and financial issues for operators**
 - Increases capital and operating expenses resulting in increased cost to deliver data
 - Additional cells increase interference issues for subscribers
 - Creates quality of service issues for subscribers
 - Limits operators from providing high bandwidth applications such as video and music downloads
 - Limits the number of subscribers that can be served by the operator

Increased bandwidth enhances overall efficiency of the network and reduces cost of network deployment

Innovative and technology neutral framework required!

- **WiMAX needs access to licenced spectrum: 2.5 GHz (mobile WiMAX)**
- **WiMAX needs access to Licensed spectrum: 3.4 – 3.8 GHz**
- **WiMAX needs some License-Exempt spectrum: 5.8 GHz**

WiMAX is not asking for special treatment; just equality!!

Conclusion

- **Broadband is vital for the development.**
- **Economical, easy, faster high performance solution (IPR-Intellectual Property Right advantage).**
- **WiMAX is the solution for personal true broadband mobile service.**
- **WiMAX is real, not hype. Deployed and changing lives.**
- **Approved by ITU as IMT-2000 standard (3G).**
- **WiMAX can be applied simultaneously, both in developing and developed countries.**
- **Competition at broadband market (driving end user prices down)**

To benefit, regulations and spectrums should be ready.

35



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