WiMAX Standards and Regulations

ITU Regional Development Forum
CIS, CEE and Baltic Countries

"Bridging the ICT Standardization Gap in developing countries"
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Agenda

• Broadband Situation in Region
• Standards and Roadmap
• Intel Products and Roadmap
• WiMAX Forum Update
• WiMAX Spectrum and Regulations
• Conclusion
Broadband Situation in Region

- Broadband Penetration: <1% (in 12 Countries)

- Internet Penetration: <5% (in 12 Countries)

- Mobile Signal Coverage: More than 80% of population covered (voice, narrow band)

How can we increase broadband and internet penetration?
IMT-2000 Standards (3G)

**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-FT Frequency Time**
- also known as **DECT**
WiMAX: All-IP 3G Wireless Network for Broadband Delivery

• Increased Revenue: rapid roll-out of advanced services
• Lower CAPEX and OPEX
• Higher Compatibility, Lower Complexity
• Simplified internetworking with other IP technologies
• WiMAX fits easily into wired and wireless ecosystem
Why WiMAX is such a Big Deal?
It Represents a Shift to OFDM for Fixed and Mobile

Delivered Throughput

Early '90s  Mid-'90s  Early '00s  Mid-'00s

CDMA  GSM  OFDMA

SPECTRUM EFFICIENCY  SIMPLIFIES ADVANCED RF TECHNIQUES
LEVERAGES BANDWIDTH  OPTIMIZES SPECTRUM ALLOCATION

CDMA=Code Division Multiple Access, OFDM=Orthogonal Frequency Division Multiplex
WiMAX Will Meet Emerging Customer Needs

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

Why WiMAX?

WiMAX offers a combination of both broadband and mobility.
Wireless Broadband Roadmap

<table>
<thead>
<tr>
<th>Year</th>
<th>3GPP: WCDMA (UMTS)</th>
<th>3GPP2: CDMA2000</th>
<th>WiMAX: 802.16/HiperMAN</th>
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<tr>
<td>2005</td>
<td>WCDMA R.99</td>
<td>1xEVDO Rev 0</td>
<td>WiMAX 802.16-2004</td>
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<td>2006</td>
<td>HSDPA R5</td>
<td>1xEVDO Rev A</td>
<td>ETSI HiperMAN OFDM</td>
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<td>2007</td>
<td>HSUPA R6</td>
<td>EVDO Rev B</td>
<td>Mobile WiMAX 802.16e-2005 SISO/OFDMA</td>
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<td>2008</td>
<td>LTE (OFDMA)</td>
<td>EVDO Rev C (OFDMA)</td>
<td>Mobile WiMAX SIMO/MIMO</td>
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<td>2009</td>
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| 2010 | +++

WiMAX: 802.16/HiperMAN
- WiMAX 802.16-2004
- ETSI HiperMAN OFDM
- Mobile WiMAX 802.16e-2005 SISO/OFDMA
- Mobile WiMAX SIMO/MIMO
- Mobile WiMAX AAS
Mobile WiMAX Roadmap

- Mobile WiMAX Rel 1.0 (802.16e)
  - 33 M bps Vehicular

- Mobile WiMAX Rel 1.5 (802.16e)
  - 100 M bps Vehicular

- Mobile WiMAX Rel 2.0 (802.16m)
  - 100 M bps High-speed Vehicular

2007 2008 2009 2010

* Peak theoretical achievable data rate
WiMAX Applications

**Fixed** Broadband complementary to DSL & Cable

**Fixed** Broadband for Backhauling

Mobile Broadband

Nomadic Broadband

WiFi

*Other brands and names are the property of their respective owners.

Anytime, Anywhere – Always Broadband
Intel Developing WiMAX Chips

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

**Rosedale-2:** Optimized for cost-effective WiMAX modems

**Baxter Peak:** For Mobile Internet Devices (UMPC)

Intel’s smallest processor built for low power Mobile Internet Devices and low cost PC’s

**Dana Point**
WiMAX Add-in Card Design

Approx indication of size
Intel silicon driving new devices

Fixed Modems

Mobile Notebooks & handhelds

naires

CE

2006-2007

2008

2009+

Intel® WiMAX Connection 2250

Intel® Wi-Fi/WiMAX Module

Integrated Wi-Fi/WiMAX Multi-mode Chipsets

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.
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
WiMAX Forum Members

Equipment Manufacturers

Service Providers

Plus others not specifically listed here
The WiMAX Forum Membership Growing!

- Ecosystem/Applications/Content: 522
- Service Providers: 46
- System Vendors
- Silicon/Component Suppliers

Spring 2004 vs. Today
WiMAX Certification

• Certification program started mid-2005.

• Certified products comply with the standards and they interoperate with certified products from other vendors.

• More than 40 Certified products available (for mobile, nomadic and fixed applications).

• WiMAX Forum forecasts that more than 1000 products will undergo Mobile WiMAX certification testing by 2011 and more than 100 certified products will be available by the end of 2008.

• More than 62 companies developing silicon and end user devices, as well as 37 companies developing products for infrastructure.
Mobile WiMAX Devices
WiMAX Intellectual Property Rights

Dispersed distribution of ownership of patents.
No single company has a dominant IPR position.

1550 patents are distributed among 330 companies
260 + Commercial Deployments (in more than 110 Countries)
Mobile WiMAX Regulation Status (2.5/2.3 GHz band)

-South Korea
-USA
-Japan
-Norway
-Sweden
-South Africa
-Saudi Arabia
-Germany Public Consultancy
-Summa Telecom, Russia
-UK Public Consultancy
-Austria Public Consultancy
and others...
Mobile WiMAX is real $billions invested….at 2.5 GHz band

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
WiMAX Spectrum Profiles

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

- 2.3/2.5 GHz: Mobile
  - Licensed

- 3.5 GHz: Fixed / Nomadic (mobile)
  - Licensed

- 5.8 GHz: Fixed / Nomadic
  - License Exempt

Current WiMAX Forum Profiles
ITU WRC2007 Agenda Item 1.4 : Results

Existing global identifications for IMT-2000 changed to “IMT”

- 802/862 – 915 MHz;
- 1 710 – 2025,
- 2 110 - 2 200 MHz;
- 2 500 – 2 690 MHz (WiMAX certification band)
- 2 300 – 2 400 MHz (WiMAX certification band)
- 3 400 – 3 600 MHz (WiMAX certification band) (no global allocation, but accepted by many countries)
- 450 – 470 MHz was newly identified globally for IMT.
How can we increase broadband penetration?

- We need to transform mobile networks to all IP based broadband mobile networks.
- We need to transform mobile users to broadband mobile users.
- We need to transform mobile handsets to broadband mobile internet devices.

**Solution:** Mobile WiMAX at 2.5 GHz and 2.3 GHz bands.
How can we increase broadband penetration?

- WiMAX is IMT-2000 Standard (3G) approved by ITU
- 2.5 GHz and 2.3 GHz are for global Mobile WiMAX deployment
- 2.5 GHz and 2.3 GHz bands recognized by ITU for IMT
- Technology neutrality for Mobile WiMAX
- Operators should be able to choose any 3G standard

Minimum 30 MHz band (TDD) for each operator
Conclusion

• Economical, easy, faster high performance mobile broadband solution (IPR Advantage).

• A clear roadmap exists for WiMAX and ready for application.

• Approved by ITU as IMT-2000 standard (3G), equality with other IMT-2000 technologies established.

• Mobile WiMAX can be applied simultaneously, both in developing and developed countries.

• You have the chance to transform narrowband mobile subscribers to broadband mobile subscribers and bridge the broadband gap.

• Need for all IP and OFDMA based broadband mobile technology.

To benefit, 2.5 GHz (or 2.3 GHz) spectrum should be allocated.