



WiMAX

Regulatory & Spectrum Issues

Algiers , 19 June 2006

Turhan MULUK
Wireless Standards & Regulations Manager
Government Affairs
Middle East, Turkey, Africa

1



Agenda

- General WiMAX Information
- Intel WiMAX Vision, Device Evolution
- WiMAX Spectrum
- WiMAX Regulations

2



WiMAX Forum



- The WiMAX Forum is an industry-led, non-profit corporation
- Formed to promote and certify compatibility and interoperability of broadband wireless products. Our
- 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

3



The WiMAX Forum Membership Continues to Grow!

368 WiMAX Forum Member Companies

- 85 Ecosystem/Applications/Content
- 136 Service Providers
- 71 System Vendors
- 76 Silicon/Component Suppliers

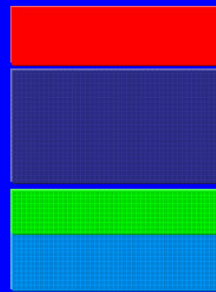
368



46



Spring 2004




Today

4



WiMAX Forum Members




EQUIPMENT MANUFACTURERS

- MOTOROLA
intelligence everywhere
- ZTE中兴
- NOKIA
Connecting People
- SAMSUNG
- NORTEL NETWORKS
- SIEMENS mobile
- alvarion
we're on your wavelength
- Huawei Technologies
- ALCATEL
- SR Telecom
- proxim
mobile networks
- Redline
comunicaciones
- Navini NETWORKS

SERVICE PROVIDERS

- BT
- AT&T
- KT
- Sprint
- SBC
- Reliance Infocomm
- PCCW 電訊盈科
- france telecom
- Qwest
- TELMEX
- Deutsche Telekom
- MVS
- Iberbanda
Banda Ancha para Empresas

* Other names and brands may be claimed as the property of others




WiMAX Standards

Standards

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

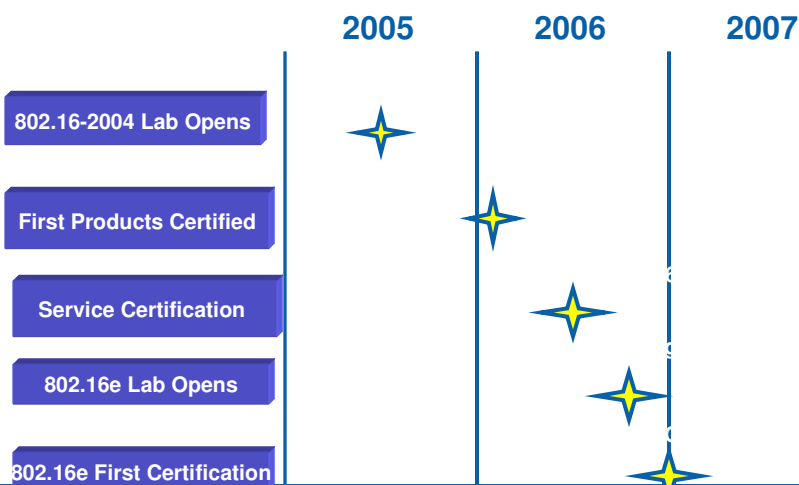
WiMAX Certification

- Certification program started mid-2005
- Spain (Malaga) Cetecom labs. 
- Certified products comply with the standards and they interoperate with certified products from other vendors.
- 20 Certified products (fixed/nomadic)
- >15 products waiting for certification
- Mobile WiMAX certification soon

7



Mobile WiMAX in 2006: certification and market trials begin.



8



Certification Profiles - Fixed WiMAX

| System profile | Certification profiles | | |
|---|------------------------|-----------|---------------|
| | Spectrum | Duplexing | Channel width |
| Fixed WiMAX (IEEE 802.16-2004, OFDM) | 3.5 GHz | TDD | 3.5 MHz |
| | 3.5 GHz | TDD | 7 MHz |
| | 3.5 GHz | FDD | 3.5 MHz |
| | 3.5 GHz | FDD | 7 MHz |
| | 5.8 GHz | TDD | 10 MHz |

Certified equipment available Future certification profiles

9



Mobile WiMAX Proposed Certification Profiles

| System profiles | Certification profiles | | |
|---|------------------------------------|-----------|-----------------|
| | Spectrum | Duplexing | Channel width |
| Mobile WiMAX (IEEE 802.16-2005, OFDMA) | 2.3-2.4 GHz | TDD | 8.75, 5, 10 MHz |
| | 3.4-3.8 GHz | TDD | 5, 7, 10 MHz |
| | 2.469-2.69 GHz | TDD | 5, 10 MHz |
| | 3.3-3.4 GHz | TDD | 5, 7 MHz |
| | 2.305-2.320 GHz 2.345-2.360 GHz | TDD | 3.5, 5, 10 MHz |

Certified equipment available Future certification profiles

10



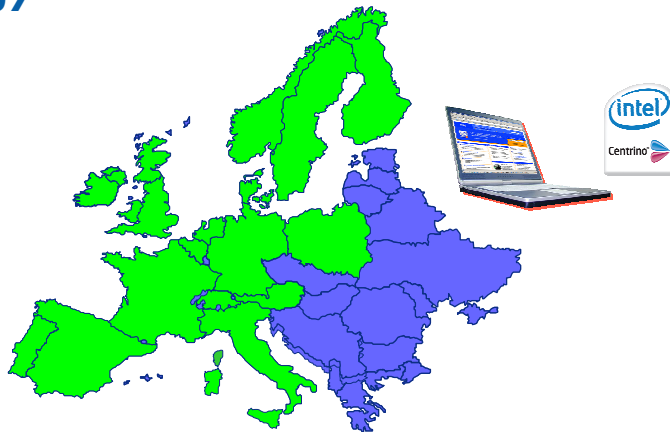
WiMAX Is Gaining Momentum



11



An Ambitious Nomadic WiMAX Coverage by '07

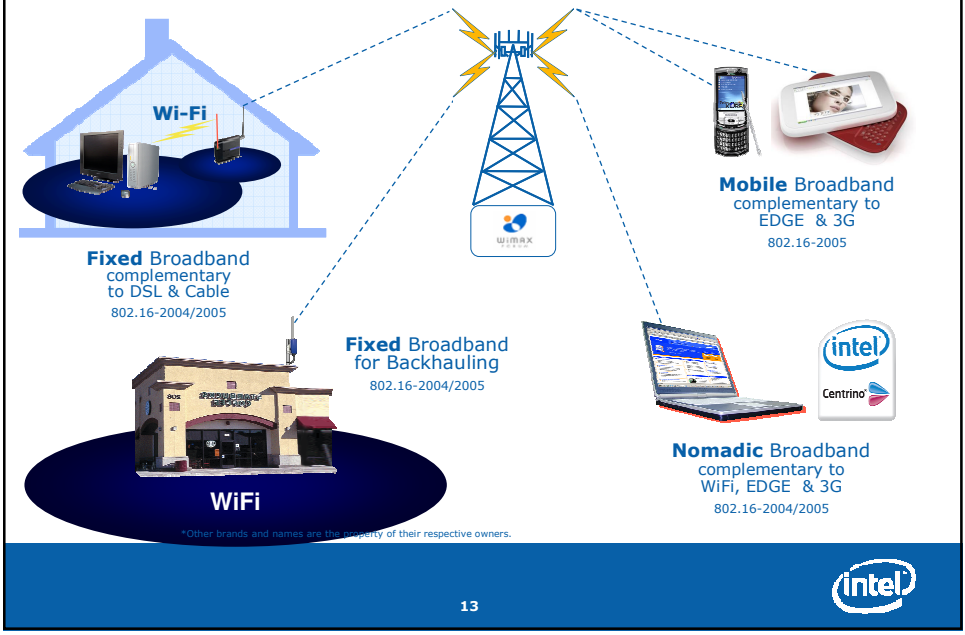


100+ Cities Covered in 10+ Countries
A Pan-European Roaming Service

12



Intel WiMAX Vision



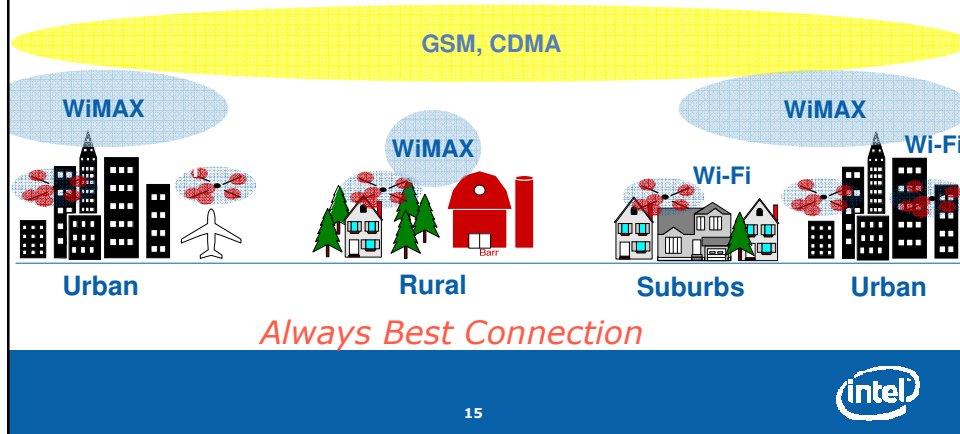
WiMAX Device Evolution



Wireless Networks Will Co-Exist

**"WiMAX is not competing with 3G.
It's a complementary technology"**

Mikko Salminen, director of fixed mobile convergence marketing at Nokia



WiMAX and 3G are complementary

- **WiMAX and 3G 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.**
 - **3G** is optimized for **cellular voice and moderate data-rate applications**
- Intel **supports both WiMAX and 3G** technologies with standards activities, R&D and product offerings.
- Intel **supports industry standards** for future wireless networks

WiMAX Spectrum

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



Future profiles include
below 1 GHz

Current WiMAX
Forum Profiles

17



3.4 – 3.8 GHz Band Licenced (Fixed / Nomadic)

- In most counties already allocated
- But allocations tend to be small
- Military sharing issues
- Administrations unsure about "Nomadic"
- Mobile use being pursued; possible delay
- TDD and FDD should be enabled
- Excellent for "Fixed" and "Nomadic"

WiMAX needs greater access to Licensed
spectrum: 3.4 – 3.8 GHz

18



5.8 GHz, Fixed, License-Exempt

- Limited access (few countries at present)
- Military concerns: frequency hopping Radar
- Possible risk of interference
- Power limitation: need 4W EIRP
- Good for rural coverage, backhaul, access

WiMAX needs some License-Exempt spectrum: 5.8 GHz



2.5 GHz, (Mobile WiMAX)

-Extract from the ITU Radio Regulations;

5.384A The bands, or portions of the bands, 1710-1885 MHz and 2500-2690 MHz, are identified for use by those administrations wishing to implement International Mobile Telecommunications-2000 (IMT-2000) in accordance with Resolution 223 (WRC-2000). This identification does not preclude the use of these bands by any other applications of the services to which they are allocated and does not establish priority in the Radio Regulations.

-Access to the 2.5 GHz band should be available as early as possible for new innovative 3G beyond true broadband wireless services.

-Intel WiMAX chips will be integrated in laptops, PDA's and mobile telephones near future as a standard feature like Wi-Fi.

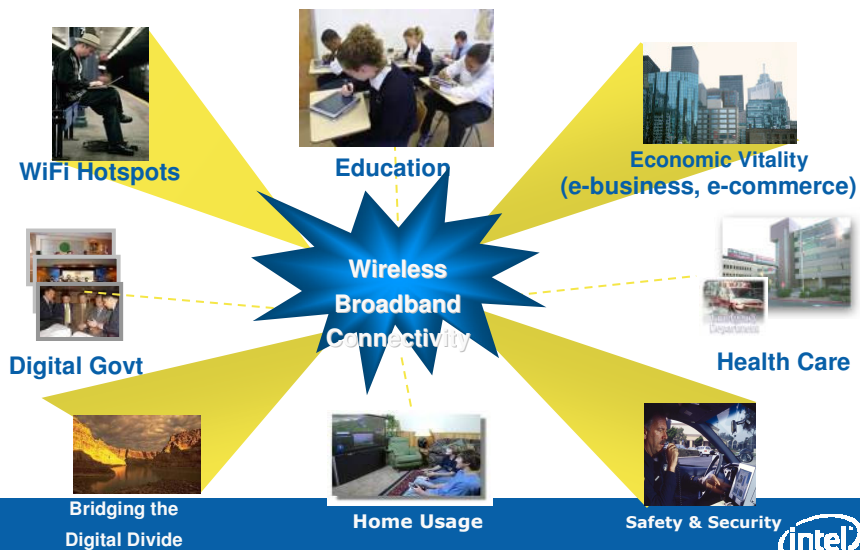


Why WiMAX Regulation?

- **Importance of Broadband for Economic development.**
(Proportional growth between telecom and GDP)
- **Growing demand for personal broadband mobile service**
- **Enables personal true broadband real-time applications.**
- **Competition at broadband market (driving end user prices down)**
- **Convergent Services (mobility to fixed broadband services)**
- **Lack of wireline structure to meet the growing demand for infrastructure.**
- **Economical, easy, faster high performance solution.**
- **Symmetric Data Rates**
- **Can be used for different applications (security, health etc.)**
- **All-IP based network with similar quality of service as wired broadband infrastructure with the addition of mobility.**



WiMAX Opportunities



Regulatory Obstacles

Spectrum, spectrum and spectrum!!!

- The biggest problem is access
- Current policy / regulations inflexible
- Allocations too small
- Fragmented spectrum policy
- Existing Users
- Inefficient use and “hoarding”

Innovative and “WiMAX friendly” technology neutral spectrum framework required!

23



“Technology Neutrality” Regulatory Framework

It is not a “free for all”

It is not chaos

It is standards based

It is not proprietary technologies

“Technology Neutrality”
enables competition

24



Implications If Technology Neutrality not Implemented

- “anti-competitive” behaviour
- Spectrum remains unused
- Innovation restricted
- No spectrum for new technologies

25



LICENCING CONDITIONS

NATIONAL OR REGIONAL LICENCES?

Intel supports National licenses where ever possible. For the success of operators national licences should be given. Operators with national licences can offer services every where in a country to their subscribers. Roaming, interconnection, coverage issues will be a problem with regional licences.

BANDWIDTH FOR EACH OPERATOR?

Bandwidth should be at least 30 MHz with no restrictions for TDD per operator.

IDEAL NUMBER OF OPERATORS

We do believe that enabling competition is important but not at the expense of success. We therefore believe that this needs to be assessed from a National level with the objective being that all deployments are successful deployments, i.e. one or many need to be successful”

26



LICENCING CONDITIONS

LICENCE FEE

- Intel believes that the greatest economic benefit from broadband wireless / personal broadband is from the continues and long-term usage of the spectrum and not from the assignment process alone. We encourage Administrations to “partner” potential Operators to ensure mutual benefit from a successful commercial deployment.

- Ideally Intel prefers licenses to be issued to those with the best business case and the best utilization of the spectrum for broadband wireless.

LICENCE DURATION

- Intel believes that a license between 10-20 years would be appropriate but with an appropriate review period to ensure that the spectrum is being utilized for the intended purpose. Intel is opposed to “spectrum hoarding”.

STANDARDS/CERTIFICATION

- Operators should use standard and certified products.

27



WiMAX Operator Rights

- Shouldn't be any restriction for nomadic, mobile application.
- Shouldn't be any restriction on TDD application
- Shouldn't be any restriction for VoIP, or any other telecommunication services.
- Should have the interconnection and roaming rights (national and international) with other operators
- Parallel to the development of new services should have the rights for the application of new services over WiMAX network (like GPRS and EDGE over GSM)

28



Operator Obligations

- Coverage
- Customer support
- Service quality
- Should use standard, certified, interoperable products, otherwise compatibility between different manufacturer products can not be satisfied, and user terminal at different operators area will not work.
- Compliance to relevant ETSI, ITU, IEEE related standards is necessary



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.

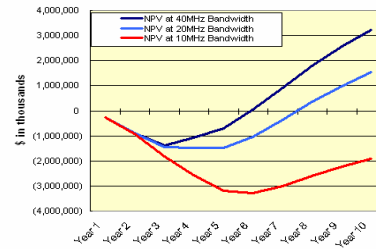
Strict implementation of this definitions constrain innovations / limit convergence



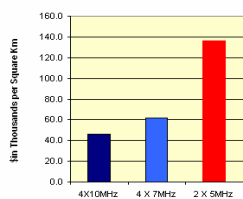
Bandwidth Impact to Business Model

- Economic viability of a service provider's business case is highly sensitive to the size of the spectrum allocation license
- Smaller allocations limit the capacity per km² requiring more infrastructure to meet demand
- This impairs an operators ability to create a compelling business case by:
 - Affecting range of services and QoS that can be offered
 - Increasing capital and operating expenses

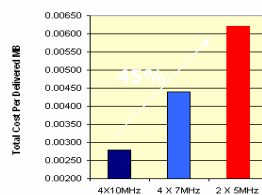
Sensitivity to Total Available Bandwidth



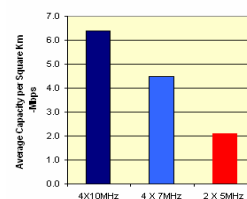
Cumulative CapEx/Km²



Year 10 Cost/Mb Delivered



Capacity/Km²



* Analysis based on Countrywide Network Deployment in Germany



Bandwidth & Business

- 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



Operator Needs

- Certified Products
- QoS
- Open standards based architecture
- Performance
- Economic, easy, fast, scalability
- Security
- Management
- Carrier class solution
- High Data Rates
- Support fixed, portable and mobile services

33



Realities

Broadband is vital for the development

WiMAX is real, not hype. Deployed and changing lives

- Intel is the "beyond 3G" broadband wireless thought leader
- **Standards and Certified products are ready**
- Intel has WiMAX products.
- Carriers have commercial fixed deployments today; mobile WiMAX is coming

WiMAX is the solution for personal true broadband mobile service

- All-IP based network with similar quality of service as wired broadband infrastructure with the addition of mobility.
- Optimized for data
- Delivers value, performance, strong ecosystem

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

To benefit, regulations and spectrums should be ready.

34



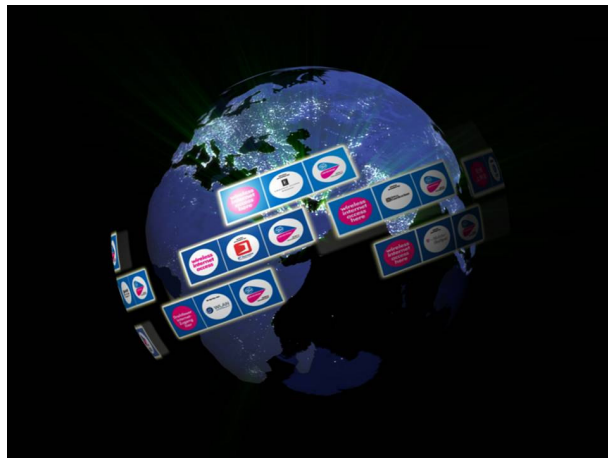
Recommendations

- **Innovative and “WiMAX friendly” technology neutral framework required!**
- **WiMAX needs greater access to Licensed spectrum: 3.4 – 3.8 GHz**
- **WiMAX needs some License-Exempt spectrum: 5.8 GHz**
- **WiMAX needs access to licenced spectrum: 2.5 GHz (mobile WiMAX)**

35



Together, we made real for Wi-Fi



Let's make it real for WiMAX

36





www.intel.com
turhan.muluk@intel.com