WiMAX & Regulatory Aspects

ITU-BDT Regional Seminar on Broadband Wireless Access (BWA)
for rural and remote areas for Africa
Yaoundé (Cameroon) , 18-21 September 2006

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Agenda

•General WiMAX Information

•Intel WiMAX Vision, Device Evolution

•WiMAX Spectrum

•WiMAX Regulations

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. Our
- Member companies support the industry-wide acceptance of the IEEE 802.16 and ETSI HiperMAN standards.
- More than 380 Members (only 46 Members - Spring 2004)

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

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WiMAX Forum Members

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* 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)

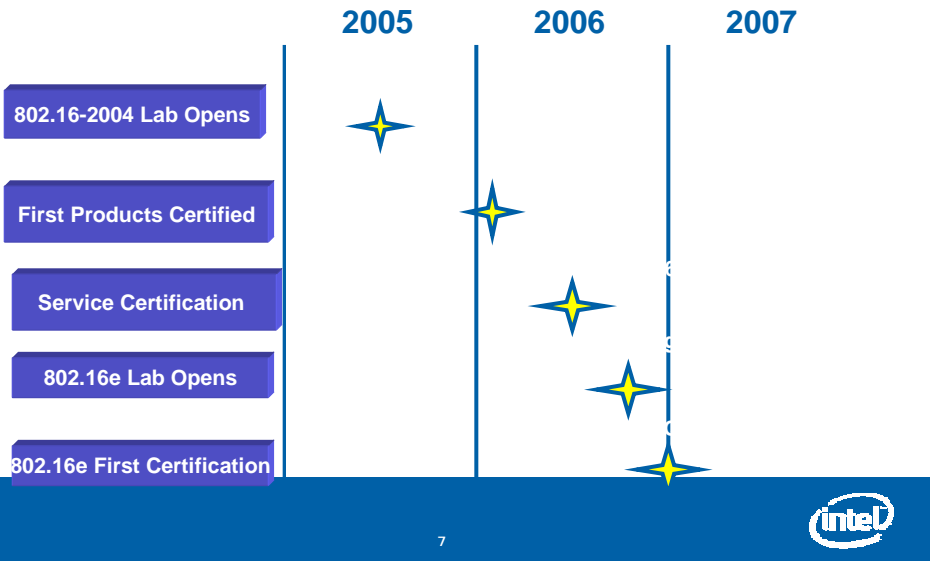
•IEEE 802.16e (December 2005)

(Fixed, Nomadic, Mobile)

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WiMAX Certification

•Certification program started mid-2005

•Spain (Malaga) Cetecom labs.

CETECOM™

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

•25 Certified products (fixed/nomadic,)
  (on 07-September-2006)

•Mobile WiMAX certification soon

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Mobile WiMAX in 2006: certification and market trials begin.

	2005	2006	2007
802.16-2004 Lab Opens	✦		
First Products Certified		✦	
Service Certification		✦	
802.16e Lab Opens			✦
802.16e First Certification			✦

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WiMAX Progress

>200 Trials Worldwide
>50 Commercial Worldwide
>40 Networks With Confirmed Intel Design

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INTEL WORLD AHEAD PROGRAM

Accessibility Connectivity Education

Connecting the Next Billion

Intel World Ahead Program

•Aims to enhance lives by accelerating access to uncompromised technology for everyone, anywhere in the world through **accessibility, connectivity, and education.**

•Intel also invests in local companies and works with industry partners to further expand the use of technology in order to support social and economic advancement.

•In the next five years, Intel plans to invest more than USD 1 billion to support this endeavour. Goals are wireless broadband PC access to the world's next billion users while training 10 million more teachers on the use of technology in education, with the possibility of reaching another 1 billion students.
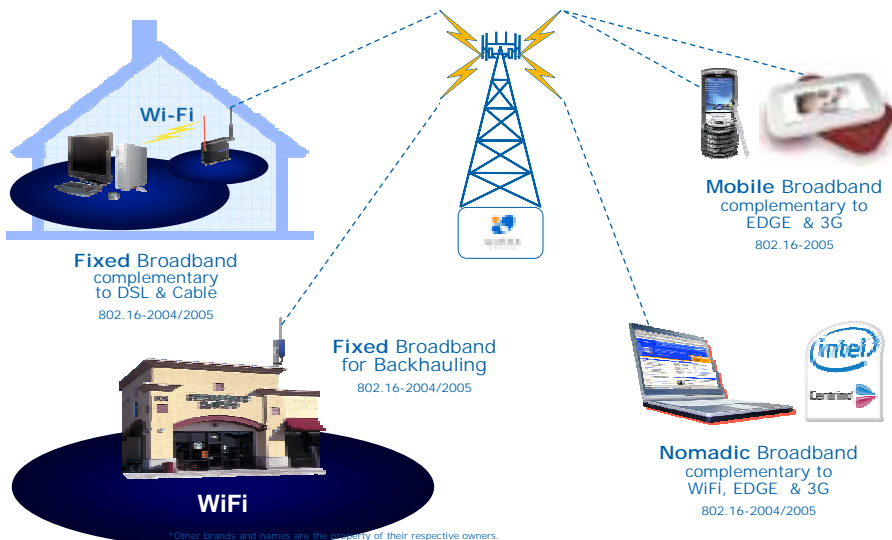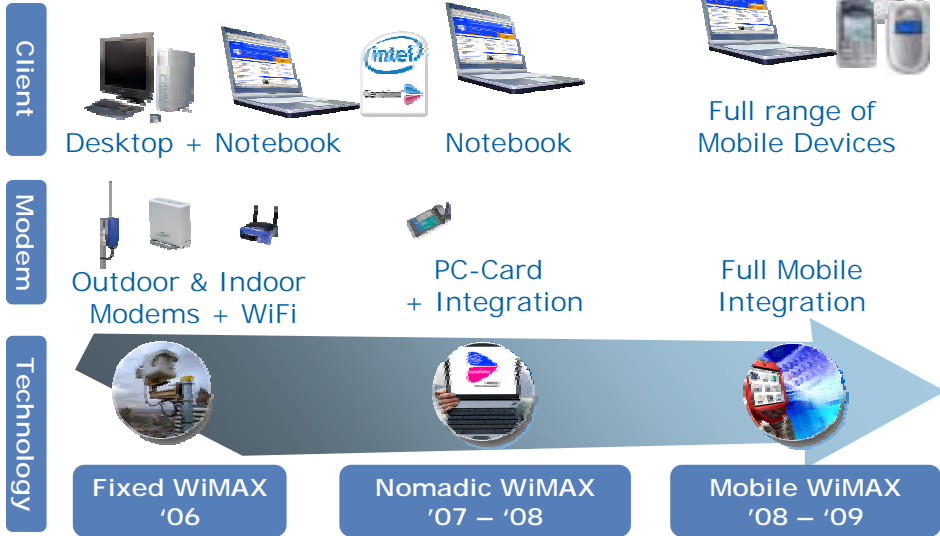
Intel World Ahead Program

Connectivity

•Expanding wireless broadband Internet access by leading ecosystem development and deployment

•Intel is committed to increasing the availability of high-speed wireless Internet connectivity in cities as well as suburban and rural communities. Intel is partnering with public and private organizations to drive WiMAX broadband deployments that reach locations where previously they were either impossible or too costly for carriers to pursue.

•WiMAX can wirelessly deliver Internet access over long distances, connecting remote areas without relying on legacy telecom technologies. Governments are beginning to view WiMAX as an efficient way to spread Internet access to regions that would not otherwise have sufficient infrastructure available for many years.
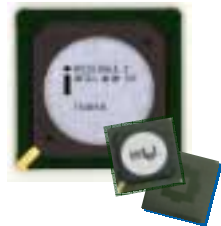
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Intel WiMAX Vision

Wi-Fi

Mobile Broadband
complementary to
EDGE & 3G
802.16-2005

Fixed Broadband
complementary
to DSL & Cable
802.16-2004/2005

Fixed Broadband
for Backhauling
802.16-2004/2005

WiFi

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Centrino

Nomadic Broadband
complementary to
WiFi, EDGE & 3G
802.16-2004/2005

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

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WiMAX Device Evolution

Client	Desktop + Notebook	Notebook	Full range of Mobile Devices
Modem	Outdoor & Indoor Modems + WiFi	PC-Card + Integration	Full Mobile Integration
Technology	Fixed WiMAX '06	Nomadic WiMAX '07 – '08	Mobile WiMAX '08 – '09

All Roadmaps, features, timelines, and code names are subject to change without notification.

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Intel Developing WiMAX Chips

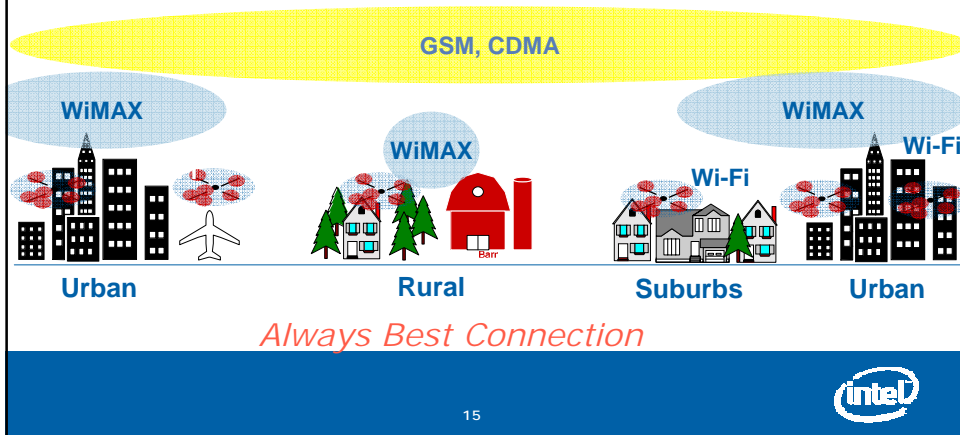**Rosedale-2: Optimized for cost-effective WiMAX modems**

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

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Wireless Networks Will Co-Exist

Always Best Connected

GSM, CDMA

WiMAX

WiMAX

WiMAX

Wi-Fi

Wi-Fi

Urban   **Rural**   **Suburbs**   **Urban**

Always Best Connection

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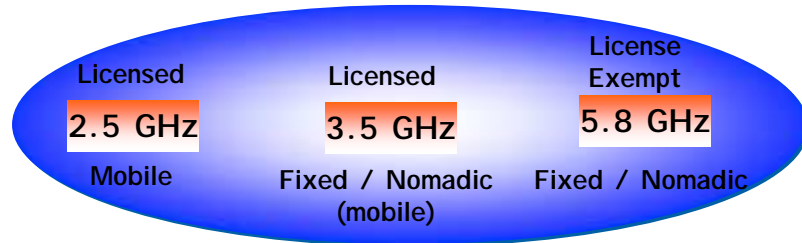

WiMAX and 3G are complementary

- **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

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WiMAX Spectrum

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

Licensed
2.5 GHz
Mobile

Licensed
3.5 GHz
Fixed / Nomadic
(mobile)

License Exempt
5.8 GHz
Fixed / Nomadic

Future profiles include below 1 GHz

Current WiMAX Forum Profiles

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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

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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

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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.
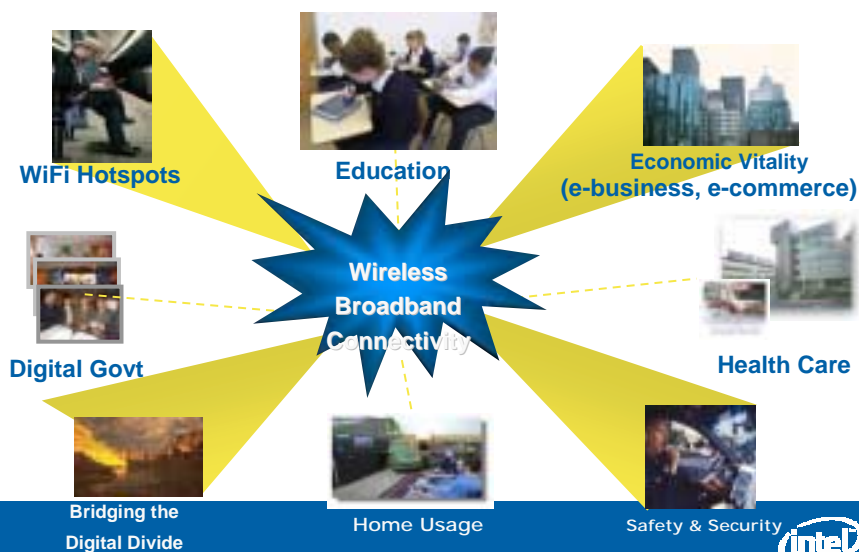
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Why WiMAX?

- 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)

- Lack of wireline structure to meet the growing demand for infrastructure.

- Economical, easy, faster high performance solution.

- Can be used for different applications (education, health, security etc.)

- All-IP based network with similar quality of service as wired broadband infrastructure with the addition of mobility.

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WiMAX Opportunities

WiFi Hotspots

Education

Economic Vitality
(e-business, e-commerce)

Wireless Broadband Connectivity

Digital Govt

Health Care

Bridging the
Digital Divide

Home Usage

Safety & Security

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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!

Implications If Technology Neutrality not Implemented

- "anti-competitive" behaviour

- Spectrum remains unused

- Innovation restricted

- No spectrum for new technologies

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"

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. In the instance where there is more than one Operator then the Administration may consider an auction process – but the auction should not be structured to extract the maximum value for revenue generating purposes.

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.

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


Operator Needs

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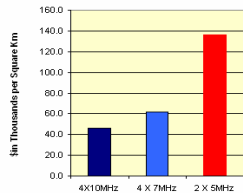- Support fixed, portable and mobile services

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
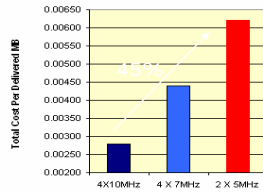 - Increasing capital and operating expenses
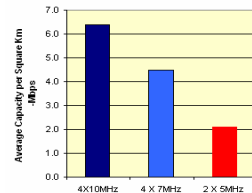

Sensitivity to Total Available Bandwidth
- NPV at 40MHz Bandwidth
- NPV at 20MHz Bandwidth
- NPV at 10MHz Bandwidth
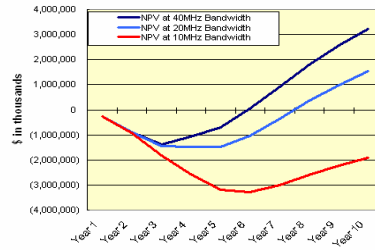
Cumulative CapEx/Km²	Year 10 Cost/Mb Delivered	Capacity/Km²

* Analysis based on Countrywide Network Deployment in Germany

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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

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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

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ITU RECOMMENDATIONS

WiMAX applications are defined in the following ITU Recommendations:

-Fixed/Nomadic WiMAX applications are point-to-multipoint enabling broadband access to homes and businesses. It is currently identified in ITU-R Recommendation F.1763 "Radio interface standards for broadband wireless access systems in the fixed service operating below 66 GHz

-Mobile WiMAX offers the full mobility of cellular networks at true broadband speeds. It is currently defined in Working Party 8A's ITU-R M. [8A/BWA] "PDNR Radio interface standards for broadband wireless access systems, including mobile and nomadic applications, in the mobile service operating below 6 GHz".

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Realities

Broadband is vital for the development

WiMAX is real, not hype. Deployed and changing lives

WiMAX is the solution for personal true broadband mobile service

Bringing broadband access to individuals and firms in rural areas.

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

WiMAX bridges the gap between technology "haves" and "have nots."

To benefit, regulations and spectrums should be ready.

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Recommendations

- Innovative and "WiMAX friendly" technology neutral framework required!

- WiMAX needs access to licenced spectrum: 2.5 GHz (mobile WiMAX)

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

- WiMAX needs some License-Exempt spectrum: 5.8 GHz

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Together, we made real for Wi-Fi

Let's make it real for WiMAX

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