New Technology and Regulatory Aspects

**ITU-D Regional Development Forum for the Africa Region
 NGN and Broadband, Opportunities and Challenges**
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Agenda

- **Presentation Key Messages**
- **Broadband Situation in Africa**
- **Why NGN?**
- **Next Generation Mobile Broadband Networks**
- **WiMAX Products**
- **WiMAX and ITU**
- **Regulatory Aspects**
- **Conclusion**

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Presentation Key Messages

- Accelerate the use of communications for greater socio-economic development, including E-education, E-health, and E-government, and enable countries to boost productivity and growth.

- Help kick start economies, increase broadband penetration and address the digital divide

- WiMAX here today, suitable for NGN, is IMT-2000 and will be IMT-Advanced

- Lower CAPEX, better IPR structure, better economies of scale

- License 2.3/2.5 GHz to maximize user benefits and increase GDP

- 30 MHz contiguous per operator needed in either 2.3 GHz or 2.6 GHz

- 2.3/2.5 GHz provides next generation mobile broadband transformation

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Broadband & Mobile Situation in Africa

Mobile (not Broadband) Penetration: 28.44% (Voice Based)

Broadband Penetration: 0.21%

Internet Penetration: 1.25%

Existing mobile networks do not meet the broadband and internet aspirations of African citizens.

Africa Needs

Next Generation Mobile Broadband Networks

(Mobile Broadband Transformation)

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What is an NGN?

ITU-T Definition
"A Next Generation Network is a packet-based network able to provide telecommunication services, able to make use of multiple broadband, QoS- enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It offers unrestricted access by users to different service providers. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users."

OECD Definition
All-IP or packet-based integrated networks. In a NGN environment, applications and services will be separated from the transported network *and all kind of applications and services such as voice, data and video can be organized into packets and delivered on an integrated IP network.*

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Why NGN?

-Need to converge and optimize the operating networks and the extraordinary expansion of digital traffic (i.e., increasing demand for new multimedia services, increasing demand for mobility, etc.).

-It consolidates both the fixed and wireless world under the same core network so that the same services can be delivered no matter what access technology is used (Cost and Capex reduction per user).

-**Accelerate the use of communications for greater socio-economic development, including E-education, E-health, and E-government, and enable countries to boost productivity and growth.**

-Network operation is cheaper and easier.

-Broadband capabilities with end-to-end QoS and transparency.

-Converged services between Fixed and Mobile networks.

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The economy runs on broadband

•Broadband is key for competitiveness and economic growth.

•Broadband means better access to business services, faster and cheaper ways of doing business, overcoming the disadvantage of distance, attracting inward investment and retaining jobs.

•Broadband stimulates growth in employment and in the number of businesses if available on a large scale.

•An increase in broadband coverage and in the take-up of triple-play services in Germany is estimated to lead to an increase of the German GDP by 46 billion euro by 2010 and to the creation of 265 thousand jobs.

Source: http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/06/200

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Next Generation Mobile Broadband Transformation

-Transformation of mobile networks to next generation mobile broadband networks.

-Transformation of mobile (narrowband) users to broadband mobile internet users.

- Requires the assignment of 2.5 or 2.3 GHz bands for true BB true for WiMax & LTE

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Next Generation Mobile Networks

-All IP and OFDMA Based

-Advanced Antenna Techniques

- Simplified internetworking with other IP based technologies

-Lower CAPEX/OPEX (Significant cost per bit advantage)

-High Data Rates

-Mobile+Nomadic+Fixed Services

-Combination of broadband and mobility

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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

•Competition at broadband market (driving end user prices down) WiMax here today

•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, commerce, 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 Intellectual Property Rights

Dispersed distribution of ownership of patents.

No single company has a dominant IPR position.
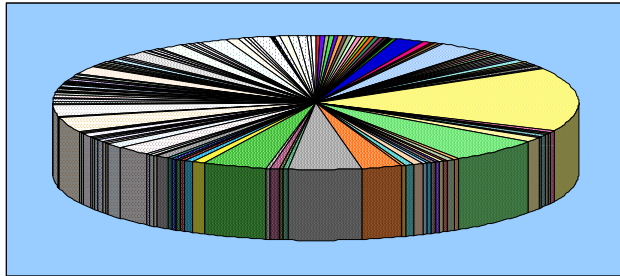
1550 patents are distributed among 330 companies

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2.5/2.3 GHz Commercial Mobile WiMAX Devices
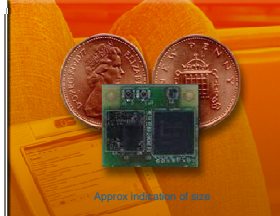
Mobile WiMAX Equipment Manufacturers at 2.5/2.3 GHz Bands

Samsung
http://www.samsung.com/global/business/telecommunication/productType.do?ctgry_group=11&ctgry_type=16

Motorola
http://www.motorola.com/business/v/index.jsp?vgnextoid=f005fcddf8a17110VgnVCM1000008406b00aRCRD&vgnextchannel=724be73820935110VgnVCM1000008406b00aRCRD

Nokia-Siemens
http://www.nokiasiemensnetworks.com/global/Portfolio/Products/Radio-access/WiMAX.htm?languagecode=en

Cisco
http://www.cisco.com/en/US/netsol/ns811/networking_solutions_solution_category.html

Huawei
http://www.huawei.com/radio_access_network/wimax.do

ZTE
http://wwwen.zte.com.cn/English/Events/jp2008/pro/wimax.htm

Alvarion
www.alvarion.com

Alcatel Lucent
http://www1.alcatel-lucent.com/serviceproviders/wimax

Nortel
http://www2.nortel.com/go/solution_content.jsp?parId=0&segId=0&catId=W&prod_id=56600

Oki
http://www.oki.com/en/WiMAX

Aperto
www.apertonet.com

Sequans
www.sequans.com

Pointred
www.pointredtech.com

Fujitsu
http://www.fujitsu.com/us/services/telecom/airspansolutions.html

Nec
http://www.nec.com/global/solutions/nsp/WiMAX

Redline
http://www.redlinecommunications.com

Airspan
http://www.airspan.com

Zyxel
http://us.zyxel.com/Products/Details.aspx?CategoryGroupNo=PDCA2006036

http://www.etiworld.com

http://axxcelera.com

http://www.srtelecom.com

http://www.telsima.com

www.proxim.com/products/landing_wimax.html

www.modacom.co.kr

http://www.flyvo.com/WiMAX/main.jsp

http://www.computex.biz/pCategory_CategoriesItem.aspx?showname=WiMAX

http://www.computex.biz/pCategory_CategoriesPcode.aspx?pcode=JX280

http://seowonintech.co.kr/en/product/list.asp?big_kind=B04

http://www.winetworks.com

http://www.somanetworks.com

www.selex-comms.com

Commercial 2.5/2.3 GHz WiMAX Products

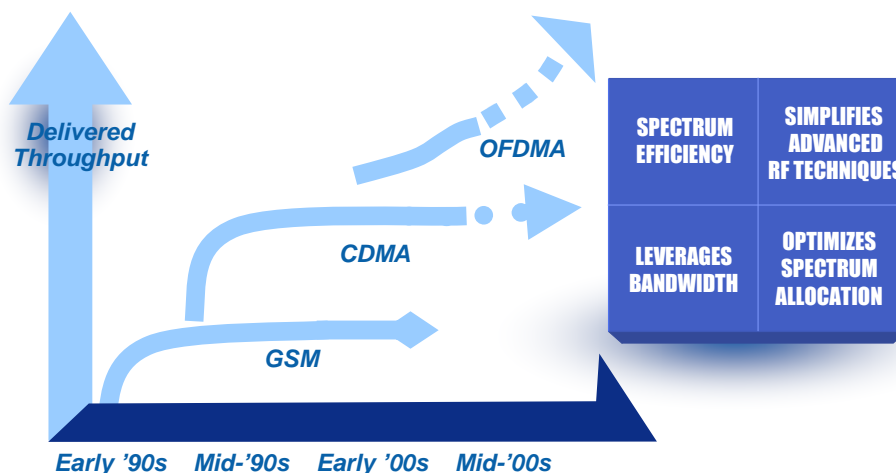It is useful to note in the list on previous slide -

- More WiMAX base station manufacturers at 2.5-2.3 GHz bands than GSM/UMTS base station manufacturers.

- GSM/UMTS base station manufacturers have WiMAX products at 2.5/2.3 GHz band.

- More than 60 companies are developing silicon and end user devices, in addition more than 40 companies developing products for infrastructure.

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Shift to OFDMA based Mobile Technologies

Both WiMAX and LTE are OFDMA based, WiMax available today LTE in 2010 +

Delivered Throughput

OFDMA

CDMA

GSM

SPECTRUM EFFICIENCY

SIMPLIFIES ADVANCED RF TECHNIQUES

LEVERAGES BANDWIDTH

OPTIMIZES SPECTRUM ALLOCATION

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

CDMA=Code Division Multiple Access, OFDMA=Orthogonal Frequency Division Multiplex Access
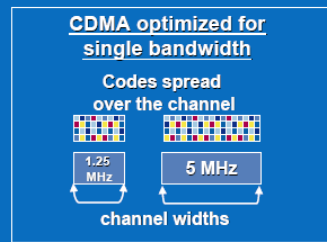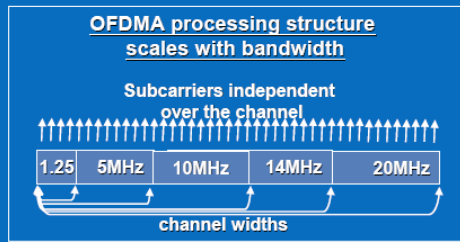
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OFDMA Scalability

CDMA does not scale well with multiple channel bandwidths
- CDMA 2000 = 1.25MHz channels
- WCDMA/HSDPA = 5 MHz channels

OFDMA allows for optimal operation in varying channel widths
- OFDMA = 1.25 MHz, 2.5, 5, 10, 14 and 20 MHz channels

OFDMA processing structure scales with bandwidth

Subcarriers independent over the channel

| 1.25 | 5MHz | 10MHz | 14MHz | 20MHz |

channel widths

CDMA optimized for single bandwidth

Codes spread over the channel

| 1.25 MHz | 5 MHz |

channel widths

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Narrow Band Wireless Networks

Optimized for Voice and Narrowband Data

Next Generation Wireless Broadband Networks

Enabling Wide Range of Applications
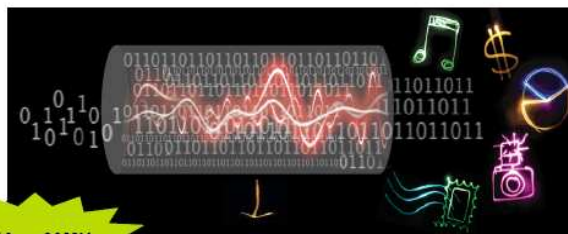
10 or 20MHz Channels

More Capacity at Less Cost

WiMAX is a Next Generation Mobile Broadband Technology

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IMT-2000 Standards (six radio interfaces)

IMT-OFDMA TDD WMAN (added during ITU Radiocommunications Assembly 2007)
- **WiMAX**

IMT-DS Direct-Sequence
- **W-CDMA** or **UTRA-FDD**, used in **UMTS**

IMT-MC Multi-Carrier
- **CDMA2000**, the successor to 2G CDMA (IS-95)

IMT-TC Time-Code
- **UTRA TDD, TDD-SCDMA**

IMT-SC Single Carrier
- **UWC**, the best known implementation is **EDGE**

IMT-FT Frequency Time
- **DECT**

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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)**

newly identified globally for IMT.

- 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.

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ITU-R WP 5D

- **IMT-OFDMA TDD WMAN (WiMAX)**

  - Work continues at ITU-R 5D for the inclusion of FDD Profile

  - Expected to be completed at June meeting of ITU-R 5D in Geneva

- **IMT-Advanced**

  - IEEE 802.16m will be Candidate Technology

Realising Broadband in Africa

- National, Regional and International Fiber Backbones

- National and Regional IXPs (outgoing traffic)

- Artificial Tariffs

- Competition

- Internet Access (computer for everyone)

- Education, Local Content

- Restriction for Broadband Services (such as VoIP)

- Electricity (base stations, user terminals)

Regulatory Obstacles

-Access to Spectrum (2.3/2.5 GHz bands)

-Slow Re-farming Process (existence of other systems at 2.3/2.5 GHz bands)

-Insufficient Spectrum Assignment for operators

-Technology and Service Neutrality

-Regional Licensing

-Restriction for mobile services

-Licence Duration (Return on Investment)

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

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Bandwidth Requirement for Operators

Intel recommends the assignment of at least 30 MHz (excluding guard bands) National Licence to an operator at 2.5/2.3 GHz band. Ideally, even more spectrum would provide a greater opportunity to successfully deploy at a National level.

The amount of spectrum per operator should be sufficient to enable them to deploy a true mobile broadband system that is then capable of competing and complimenting other wired broadband services. The amount of spectrum should be such that would allow an operator to choose wide channels, e.g. 10 MHz, and be able to choose a low risk frequency reuse plan, e.g. 3:1.

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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.

WiMAX supports mobile, nomadic and fixed services

Spectrum Policy General Recommendations

-Implement Service and Technology neutrality regulatory regimes
- No restrictions on services, e.g. VoIP allowed
- No preferential treatment for specific technologies
- No restrictions on mobility

- Market should decide any FDD/TDD split, e.g. 2.5 – 2.69 GHz band
- Minimum 30 MHz contiguous spectrum per Operator (excludes guard bands)
- Auctions; more market based than other options
- Nationwide licenses; avoid market fragmentation and maximise business case
- Timely access to 2.5 – 2.69 GHz/2.3-2.4 GHz spectrum bands needed

Enable a Sustainable and Competitive Broadband Market

Conclusion

- Africa should invest to Next Generation Mobile Technology

- WiMAX is ready for Next Generation Mobile Broadband Transformation

- Economical, faster, high performance solution

- Implement Service and Technology neutrality regulatory regimes – no services restrictions

To benefit, 2.5 or 2.3 GHz bands should be licensed

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www.intel.com/technology/wimax