Commission for
Communications Regulation

Information Notice

Notes from 2.3 GHz Briefing held on 1 March 2010

Document No:	**10/30**
Date:	**15 April 2010**

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Contents

1 Introduction

On 1 March 2010 ComReg hosted a briefing meeting on the future of the 2300- 2400 MHz (2.3 GHz) band[1]. The agenda of this meeting is contained in Annex 1. The purpose of this information note is to publish the presentations made on the day as well as making available a summary of the question and answer sessions. In some cases, and where necessary, ComReg has further elaborated on the questions following the meeting in order to provide clarity – where this has been done, it is clearly indicated.

ComReg has identified that the 2.3 GHz band can play an important role in facilitating the deployment of high speed broadband services to consumers and has taken a number of steps to release this band in Ireland.

In June 2009, ComReg published its first consultation (ComReg Document 09/49[2]) on this matter to which twenty respondents made submissions (ComReg Document 09/76s[3]).

In October 2009, ComReg published its response to consultation ComReg Document 09/76[4] which clarified ComReg's position on certain issues and other areas where further consideration is required. At this time, ComReg also published submissions to Consultation Document 09/49, in ComReg document 09/76s[3].

[1] ComReg Document 10/11 - ComReg briefing on the future of the 2.3 GHz band. Published 11 February 2010, http://www.comreg.ie/_fileupload/publications/ComReg1011.pdf

[2] ComReg Document 09/49 - Release of Spectrum in the 2300 – 2400 MHz Band Proposed Options & Licence Conditions. http://www.comreg.ie/_fileupload/publications/ComReg0949.pdf

[3] ComReg Document 09/76s - Release of Spectrum in the 2300 – 2400 MHz Band Submissions received from respondents

http://www.comreg.ie/_fileupload/publications/ComReg0976s.pdf

[4] ComReg Document 09/76 - Release of Spectrum in the 2300 – 2400 MHz Band Proposed Options & Licence Conditions. http://www.comreg.ie/_fileupload/publications/ComReg0976.pdf

2 Meeting Note

2.1 ComReg presentation

The meeting was opened by Dr. Samuel Ritchie (Manager Spectrum Operations) who with the assistance of Pat Kenny (Senior Economic Advisor to the Commissioners) gave a presentation (Annex 2) on the progress made to date in releasing the 2.3 GHz band.

A number of questions were put to ComReg, following the presentation. Those questions, and the responses given, were as follows:

Q1. Has ComReg decided on a 15-year term for national licences in the 2.3 GHz band?

A1. (ComReg) The response to consultation (ComReg 09/76) on the 2.3 GHz band states that there is a preference for a 15-year licence term. This preference was taken in light of the evidence available at the time - ComReg's final decision on this issue has yet to be taken.

Q2. Will there be any activity on the release of 2.6 GHz spectrum band in the near future?

A2. (ComReg) There is a current national licensee in the 2.6 GHz band operating a Multipoint Microwave Distribution System ('MMDS'). This licensee holds licences that expire in 2012 and 2014 respectively and the question of the release of the spectrum does not arise before the expiry of these licences. In addition the relative Statutory Instrument (S. I. 529 of 2003[5]) contains a provision that allows for the possible extension of these licences for up to 5 years. ComReg plans to commence a review of the MMDS licences in Q2 2010.

The timing of this review is dictated by Ireland's national MMDS licensing legislation (S.I. 529 of 2003) which allows ComReg to carry out a review of these licences after 18th of April 2010.

Q3. Is the 2.3 GHz band still available for the test and trial licensing scheme?

A3. (ComReg) Yes, test and trial licences will continue to be made available in all bands subject as always to spectrum availability.

2.2 ETSI Work Item Rapporteur presentation

Mr. Barry Lewis (Samsung and Rapporteur for ETSI work Item TR 102 837) gave a presentation (Annex 3) on the work being done within ETSI, focusing on ETSI 2300MHz System Reference Document ('SRDoc') Draft TR102 837[6].

[5] S.I. 529 of 2003 - WIRELESS TELEGRAPHY (Multipoint Microwave Distribution System) REGULATIONS 2003 http://www.comreg.ie/_fileupload/publications/SI529of2003.pdf

[6] ETSI members can access document BRAN(10)0022r5 by logging on to ETSI BRAN section of ETSI website - http://portal.etsi.org/portal/server.pt/community/BRAN/299

Questions asked of Barry Lewis

Q1. When will EU give final approval and does ComReg have to wait for EU approval before releasing the band?

A1. (Barry Lewis) There is a stable ETSI System Reference document at the moment (TR 102 837) which describes the technology options for the 2300-2400MHz band. ETSI has requested that the ECC develop a regulatory framework by mid 2011 and is developing a candidate harmonised standard for mobile broadband technology and a stable draft approved by the ETSI Technical Body will commence the normal ETSI procedures for public comment during Q3/4 2010. This implies that a fully approved published standard will be available towards the end of Q2 2011.

An ETSI Technical Body approved stable draft standard is a good building block for product compliance and is generally acceptable for Notified Body assessment and positive opinion enabling manufacturer declarations of conformity. The EU will then identify the published standard as a Harmonised Standard in the EU Official Journal around Q2/3 2011. There is no requirement for ComReg to wait for the Harmonised Standard before releasing the band.

A1. (ComReg) It is at ComReg's discretion to decide when it wishes to proceed with the 2300-2400 MHz competition. However at this stage ComReg does not envisage releasing this spectrum before a stable draft ETSI standard.

Additional information from ComReg since the meeting took place: The System Reference document was approved by ETSI BRAN and this will (following ERM adoption) pass to the ECC for their consideration and development of a regulatory framework.

Q2. What is the likelihood that this spectrum band is going to be harmonised across Europe?

A2. (Barry Lewis) A decision to harmonise the spectrum across Europe would need to be taken by the ECC and to date this has been a low priority for this band. However the band has been earmarked internationally for broadband technologies and there is growing interest at the moment from a number of countries while some others are adopting a 'wait and see' approach. Some others must contend with other uses, e.g. Military use.

Q3. Is equipment currently available for this band and if so how close are they to the current draft standard?

A3. (Barry Lewis) Yes there is wide availability of equipment in the band from a number of suppliers based on a common set of underlying technology standards. These suppliers are also active in ETSI and will drive for consistent alignment of the ETSI regulatory standard development.

2.3 UMTS Forum presentation

Mr. Lasse Wieweg (Ericsson and UMTS Forum) gave a presentation on "The band 2300 – 2400 MHz, Spectrum Design - Technical and Operational Considerations" which is contained in Annex 4.

Questions asked of Lasse Wieweg

Q1. With regard to TDD Vs FDD as a duplexing mode; which has the best performance characteristics, throughput and efficiencies relating to cost of network deployment?

A1. (Lasse Wieweg) Both have their advantages. For example FDD is good for facilitating multiple operators and achievable range, TDD has greater flexibility with regard to dynamic uplink/downlink split. Following that, having the combination of the two access schemes available in a mobile broadband network, but in different spectrum bands, would provide the optimal and complementary solution.

2.4 WiMAX Forum presentation

Mr. Peter Gibson (Intel & WiMAX Forum) gave a presentation on "WiMAX Spectrum & Regulatory Focus" which is contained in Annex 5.

Questions asked of Peter Gibson

Q1. New Zealand has similar demographics to Ireland and ComReg is interested in the current situation in New Zealand?

A1. (Peter Gibson) Licences in the 2.3 GHz band have been issued to a small number of interested parties.

Additional information provided by ComReg - Info is available at: http://www.rsm.govt.nz/cms/policy-and-planning/spectrum-auctions/2-3-2-5-ghz-auction

Q2. Is/Will China be using 2.3GHz?

A2. (Peter Gibson) In China the 2.3 GHz band is still mainly in Government use and is expected to be released across the Country for wireless broadband over the next few years.

2.5 Closing of meeting

The floor was opened for general questions, discussion or comments. None were put forward and Dr. Samuel Ritchie closed the briefing at 12:30, thanking the speakers and attendees for their participation.

Annex 1 – Agenda of Briefing

- 09.30 Registration & Refreshments
- 10.00 Opening of meeting and update on 2.3 GHz developments – Dr. Samuel Ritchie, Spectrum Operations Manager, ComReg
- 10.30 ETSI – 2.3 GHz activity within ETSI (Barry Lewis)
- 11.00 Refreshments
- 11.15 Presentation by UMTS Forum
- 11.45 Presentation by WiMAX Forum
- 12.15 Open Discussion

Annex 2 – ComReg presentation slides

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Introductory Comments

ComReg

www.comreg.ie

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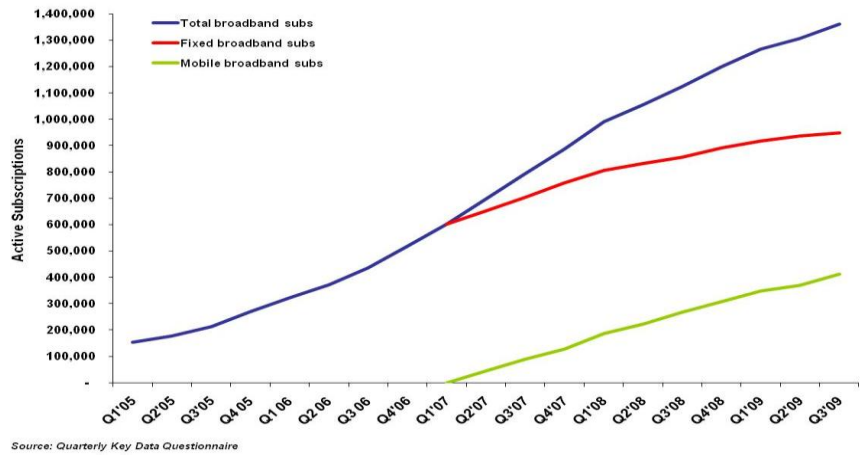
Wireless Broadband – Significant Growth



Source: Quarterly Key Data Questionnaire

www.comreg.ie


Commission for Communications Regulation
Why the 2.3 GHz Band?
2008 - 2010 Spectrum Management Strategy Consultation.
24 Respondents – significant interest shown
Drivers:
Available Spectrum
Emerging Technologies
Suitable Development Opportunity
www.comreg.ie
Commission for Communications Regulation
The Story So Far..
2.3 GHz Band Highlighted by Respondents to the 2008 – 2010 Spectrum Management Strategy Consultation
1st Consultation 09/49 (June 2009)
20 Respondents 09/76s
Response to Consultation 09/76 (Oct 2009)
www.comreg.ie

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Outcome of the 1st Consultation

- **Confirmed the interest in releasing the band**
- **70 MHz Nationally, 30 MHz Local/Closed User, Reflecting Current Usage.**
- **Auction Mechanism Favoured**
- **Spectrum Cap Favoured (20 – 30MHz)**
- **15 Year National Licence Term**
- **Licence Conditions to be established**
- **Publication of ETSI Harmonised Standard for Radio Equipment 2300 MHz – 2400 MHz** (ETSI TR102 837)
  - **Ireland Supported ECC & ETSI Work Proposals**
- **Economic Advice**

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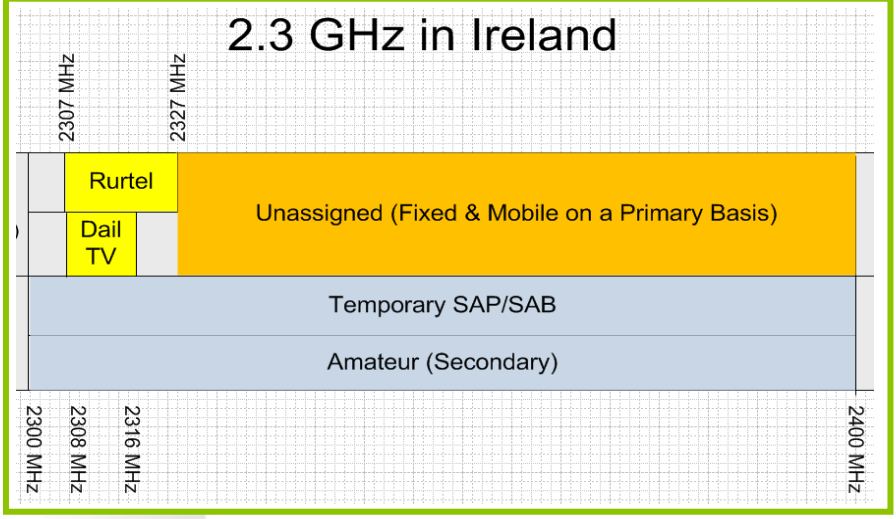
Current Assignments



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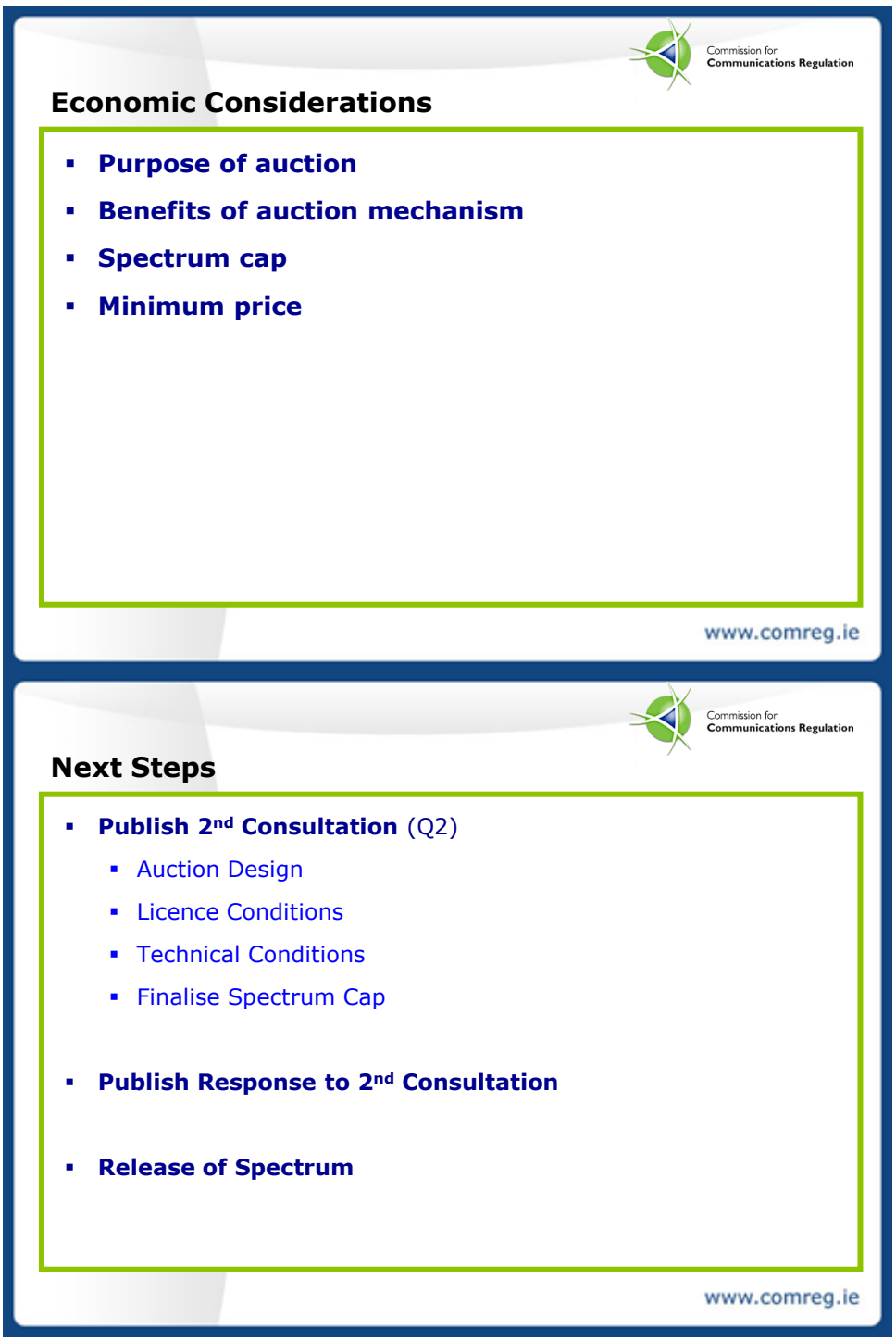
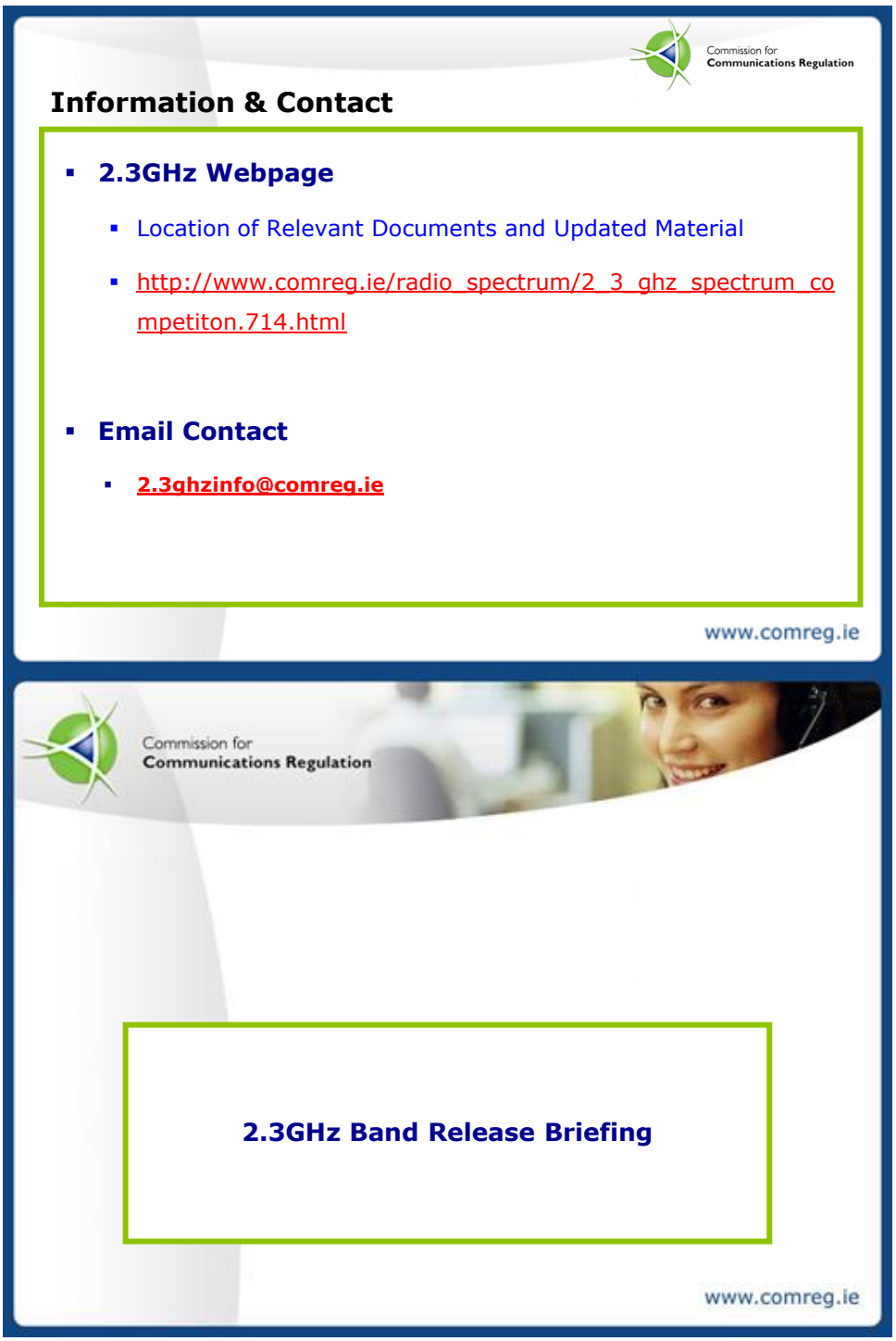
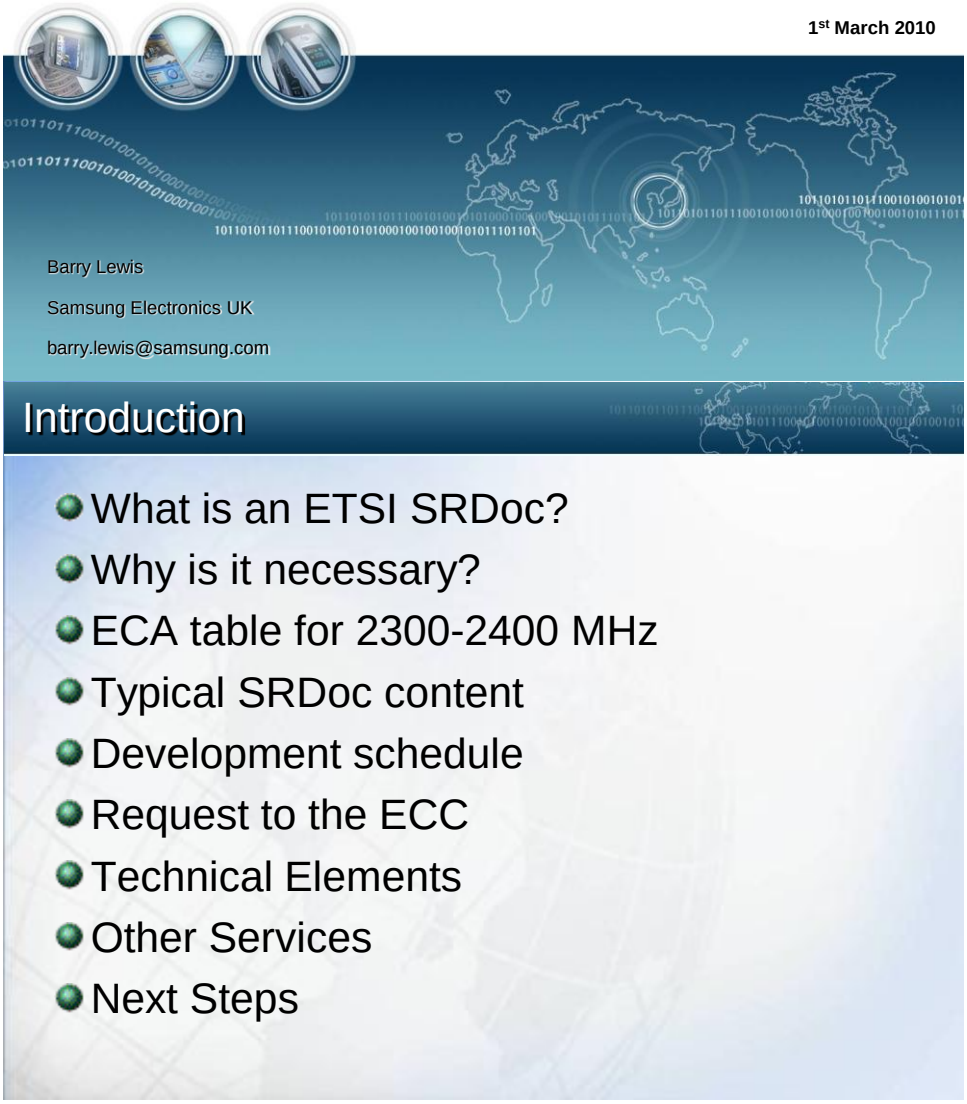

Commission for
Communications Regulation
Economic Considerations
Purpose of auction
Benefits of auction mechanism
Spectrum cap
Minimum price
www.comreg.ie
Commission for
Communications Regulation
Next Steps
Publish 2nd Consultation (Q2)
Auction Design
Licence Conditions
Technical Conditions
Finalise Spectrum Cap
Publish Response to 2nd Consultation
Release of Spectrum
www.comreg.ie


Commission for
Communications Regulation
Information & Contact
2.3GHz Webpage
Location of Relevant Documents and Updated Material
http://www.comreg.ie/radio_spectrum/2_3_ghz_spectrum_competiton.714.html
Email Contact
2.3ghzinfo@comreg.ie
www.comreg.ie
Commission for
Communications Regulation
2.3GHz Band Release Briefing
www.comreg.ie

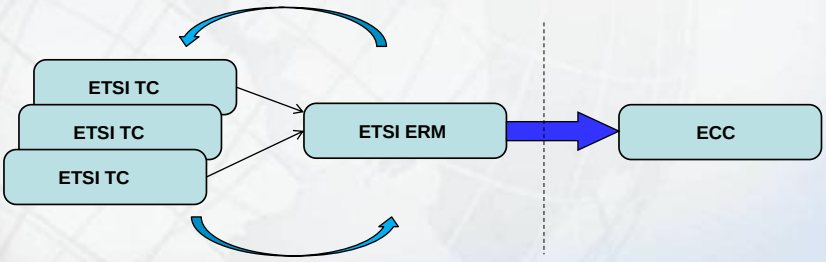
Annex 3 – ETSI Work Item Rapporteur presentation slides

ETSI 2300MHz SRDoc
Draft TR102 837



ETSI System Reference Document

- ETSI Technical Report.
- "Standard" template.
- Formal deliverable to the ECC.
- Work Item is carried out in ETSI BRAN.
- Work Item to be delivered via ETSI ERM.



Why is this report needed

- A System Reference Document is the formal means for Industry in ETSI to request new spectrum for new technology developments in the ECC.
- Industry supporters see synergies with products in nearby bands like 2500-2690MHz and markets growing in the APAC region where 2300MHz spectrum is being released.

Country	Frequency Range (MHz)	Block size
Korea	2300-2390	27
Malaysia	2300-2390	30
Singapore	2300-2350	30/20
Indonesia	2300-2360 (Mobile) / 2360-2390 (Fixed)	15
New Zealand	2300-2395	35/35/25
Vietnam	2300-2395	30
China	2300-2400	5

- Currently no regulatory framework exists for mobile broadband wireless in the 2300-2400MHz band in Europe.

European Common Allocation

•Extract from ERC Report 25 for the range 2300-2400MHz

ERC Report 25 identifies the European Common Allocation of the 2 300 MHz to 2 400 MHz range to Fixed, Mobile, Radiolocation and amateur services. The first two on a primary basis with the second two on a secondary basis. The major utilisations identified include the following:

Utilisation	ERC/ECC Documentation	European Standard
Aeronautical Telemetry	ERC/REC 62-02 [i 4]	-
Amateur	-	EN 301 783 [i 5]
Mobile Applications	-	-
SAP / SAB	ERC/REC 25-10 [i 6]	EN 302 064 [i 7]

Typical SRDoc Content

The SRDoc follows an ETSI agreed template which includes the following sections:

- Foreword, Introduction, Scope, References, Definitions,
  - "Standard" ETSI paragraphs.
- Comments on the SRDoc,
  - Statements by ETSI Members.
- Executive Summary
  - Background Information, Market Requirement, Radio spectrum requirement and justification, Regulations, Expected ETSI actions, Requested ECC actions,
- Annex A: Detailed Market Information
- Annex B: Detailed Technical Information
- Annex C: Sharing and Compatibility Issues
- Annex D: Bibliography

Development Schedule

- Proposed Schedule of work:
  - New Work Item started mid 2009.
  - First draft discussed during BRAN 60
  - Further elaboration during BRAN 61
  - BRAN 62 (next week) is scheduled to finalise the draft and submit to ERM.
  - ERM meeting set for 22-26th March.
  - Could be considered at the ECC meeting in mid June.

Requested ECC actions

- **ECC working group FM is requested to study the proposal contained in the SRDoc and develop an ECC deliverable as described below:**
  - Appropriate band arrangements and channelisation schemes.
  - Guidance on the expected spectrum utilisation by broadband mobile services including appropriate spectrum block sizes
  - Guidance on technical measures to protect other services using the spectrum.
  - Guidance on technical measures to protect other broadband mobile networks using the spectrum.
  - Spectrum engineering guidance to protect other services using the spectrum.
- **Furthermore, radio compatibility and sharing studies for the verification of coexistence with other services/applications operating in the proposed band may be needed.**

Basic Technical Elements

- Channel Raster Block Size and Channel Widths
  - 5MHz and 10MHz basic channelisation expected based on current mobile broadband technologies.
- Modulation Schemes
  - QPSK, 16-QAM and 64-QAM schemes anticipated.
- Duplex Mode
  - TDD
- Transmitter Parameters
  - E.g.Emission Masks, ACLR
- Receiver Parameters
  - E.g Sensitivity.

Other Services in the Band

- ERC Recommendation ERC/REC 25-10 identifies preferred tuning ranges for broadcast ancillary services including cordless cameras and video links.
  - Tuning range 2200 – 2500MHz recommended.
- ERC Recommendation ERC/REC 62-02 identifies spectrum for airborne telemetry systems.
  - that for future airborne telemetry applications the tuning range of equipment should primarily be in the frequency range 2300 - 2400 MHz.
- In many cases (depending on national circumstances the situation changes) these applications do not use the entire band.

Next Steps

- To finalise the SRDoc during BRAN 62 and submit to ERM.
- Develop an ETSI Harmonised Standard for mobile broadband equipment in the range 2300-2400MHz.
- To work with the ECC to develop a suitable regulatory framework.

- ETSI members (with an EOL account) can access the draft as BRAN61d021r3

Annex 4 – UMTS Forum presentation slides

The band 2300 – 2400 MHz

Spectrum design - technical and operational considerations

promoting mobile broadband evolution

Agenda

- General market situations
- Background - Setting the scene
- Spectrum arrangements - block allocations
- Guard bands – restricted channels
- Transmit power - emission masks
- Carrier aggregation
- The spectrum bouquet
- Conclusions

promoting mobile broadband evolution

General market situations

- The 3GPP technologies, supported by UMTS Forum, now provide advanced and rich mobile services to 4.5 billion subscribers
- mobile broadband with user experienced data rates of the order of 20 – 50 Mbps is provided in some countries
- around 900 types of HSPA handsets and handset variants
- hundreds of notebooks and USB modems that have HSPA
- HSPA is evolving and is typically providing 21, 28, and 42 Mbps services in commercial networks; 84 Mbps is on the way, and
- LTE is a central component of the evolution path for both 3GPP and 3GPP2 technologies.

Background

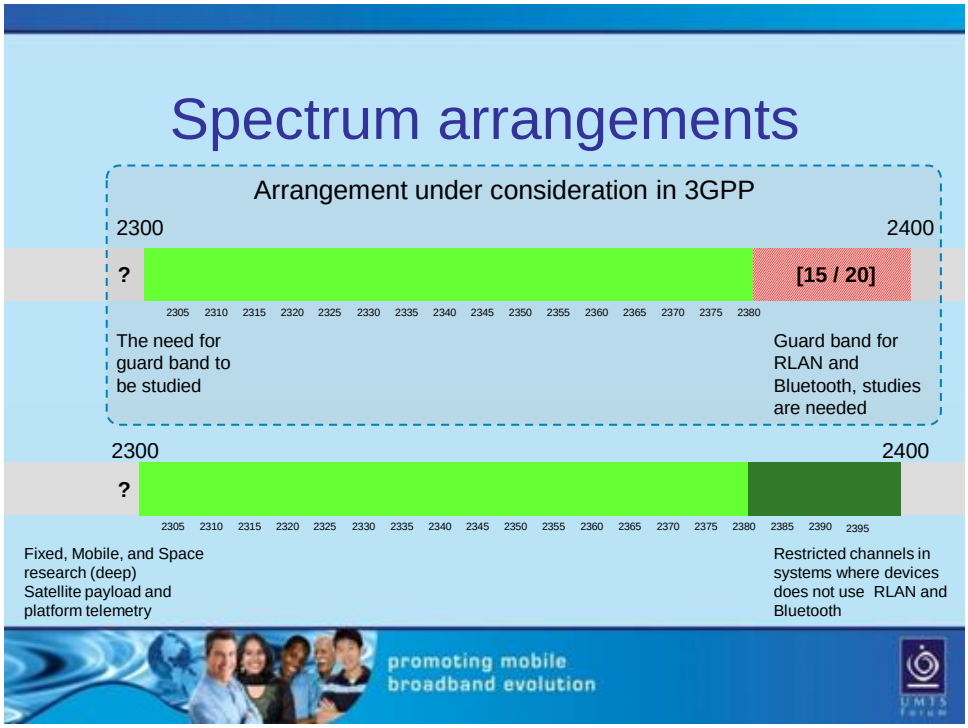
The band 2300 – 2400 MHz:

- is identified to IMT by ITU on a global basis
- specified for TD-LTE and TD-SCDMA in 3GPP
- TD-LTE terminal devices will be integrated with GSM, HSPA and LTE FDD, also including several other frequency bands
- spectrum harmonization work has already started in APT/AWF and ITU-R WP5D, and
- fully or partly available globally; some difficulties remain in some CEPT countries
- CEPT/ECC has blocked the internal work in ECC, but allows work that is related to studies in ITU.

Setting the scene

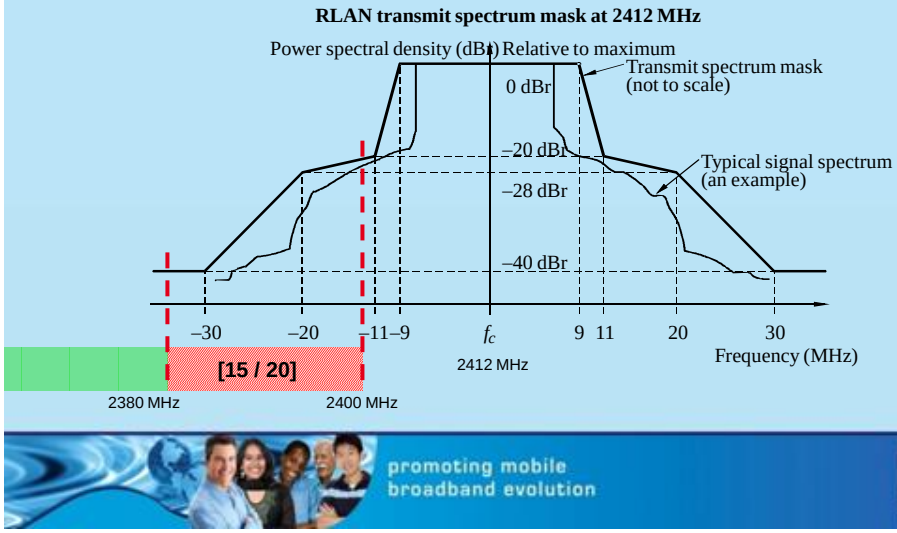
- Regulatory conditions for unpaired operations
  - no mixing of FDD and TDD
- the innovative global TD-LTE technology utilizes 5 MHz, 10 MHz, 15 MHz and 20 MHz channels bandwidths
  - a 5 MHz channel raster should therefore be implemented, and
  - from a spectrum efficiency point of view only a cell reuse one (1:1) factor should be considered.

Spectrum arrangements

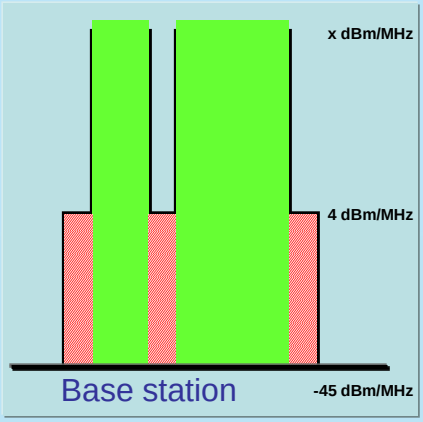


Block allocations - examples

Guard band at around 2400 MHz



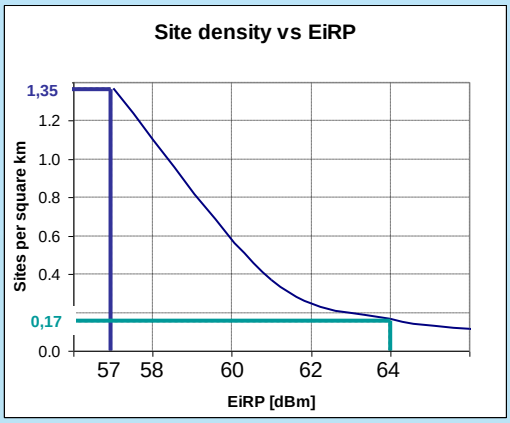
The considered emission masks



Additional base station filtering needed to meet these requirements

At the second adjacent channel the emissions should be down at - 45 dBm/MHz

Base station Tx power



An imposed Tx power reduction from e.g.

64 dBm e.i.r.p.

to

57 dBm e.i.r.p.

would lead to multiplication of base station sites

Carrier aggregation

Contributions in 3GPP suggest

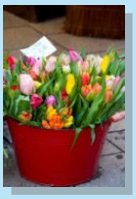
- TDD inter-band non-contiguous spectrum
- combining the bands 2.3 GHz and 2.5 GHz, for example:
  - 20 MHz in the band 2300 – 2380 MHz, and
  - 20 MHz in the band 2570 – 2620 MHz.

Carrier aggregation:
two, or more, basic carriers are combined into a wider resulting channel in-band or out-band

The spectrum bouquet a la Europe

For best practice service offerings; operators need to be able to use optimal spectrum packages, providing different:

- technologies;
- coverage options, and
- duplexing schemes.



Example a)

- GSM/HSPA 900 MHz FDD
- GSM/HSPA 1800 MHz FDD
- HSPA 2100 MHz FDD
- LTE 2300 MHz TDD

Example b)

- LTE 800 MHz FDD
- GSM/HSPA 1800 MHz FDD
- HSPA 2100 MHz FDD
- LTE 2300 MHz TDD

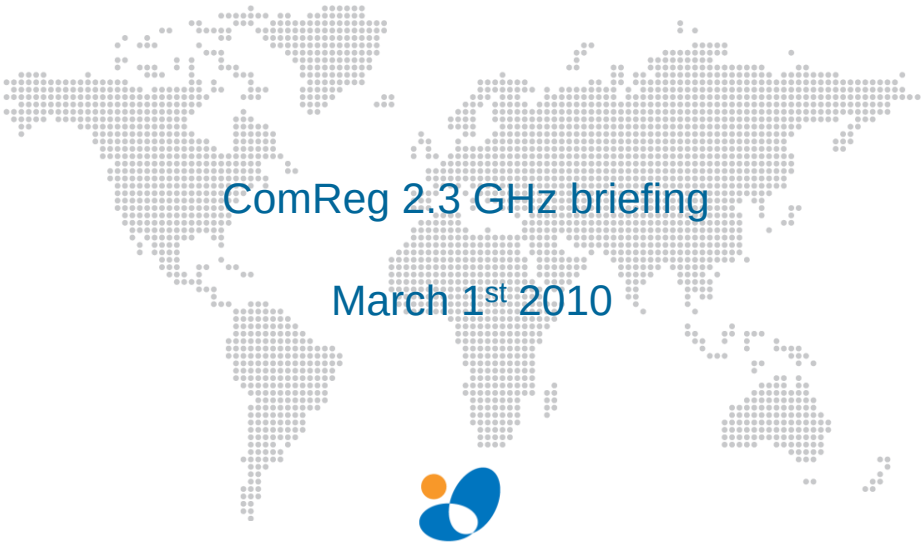
The combination of frequency bands is required for cost efficient operations, allowing for competition with rich service offerings; also for new entrants, while allowing all operators to evolve with the future technologies

Conclusions

- UMTS Forum is of the view that countries should allocate the band 2300 – 2400 MHz to TDD usage
- the most advanced technology option for operators is the innovative global TD-LTE technology
- to reap the full benefit for the consumers; preferably the band should be used in combination with other bands and technologies (GSM/HSPA)
- a global opportunity to harmonize this band
- LTE is a central component of the evolution path for both 3GPP and 3GPP2 technologies.

Thank you for listening !

Annex 5 – WiMAX Forum presentation slides



WiMAX Spectrum & Regulatory Focus

- **A global spectrum footprint** – Worldwide access to spectrum within a few specific frequency ranges:-

2.3 - 2.4GHz	2.5 – 2.69GHz	3.3 – 3.8GHz	700MHz/800MHz "Digital Dividend"

- **Service neutrality** – Operator choice of services and applications to create a sustainable business in chosen market segments
- **Flexible Frequency usage** – allowing operators to offer customers the choice of fixed, nomadic or fully mobile services
- **Technology neutrality** – Operator choice of wireless technology to suit the target market, offered services and business model
- **Sufficient Spectrum** – A minimum of 30MHz per operator (in contiguous blocks) to enable broadband services

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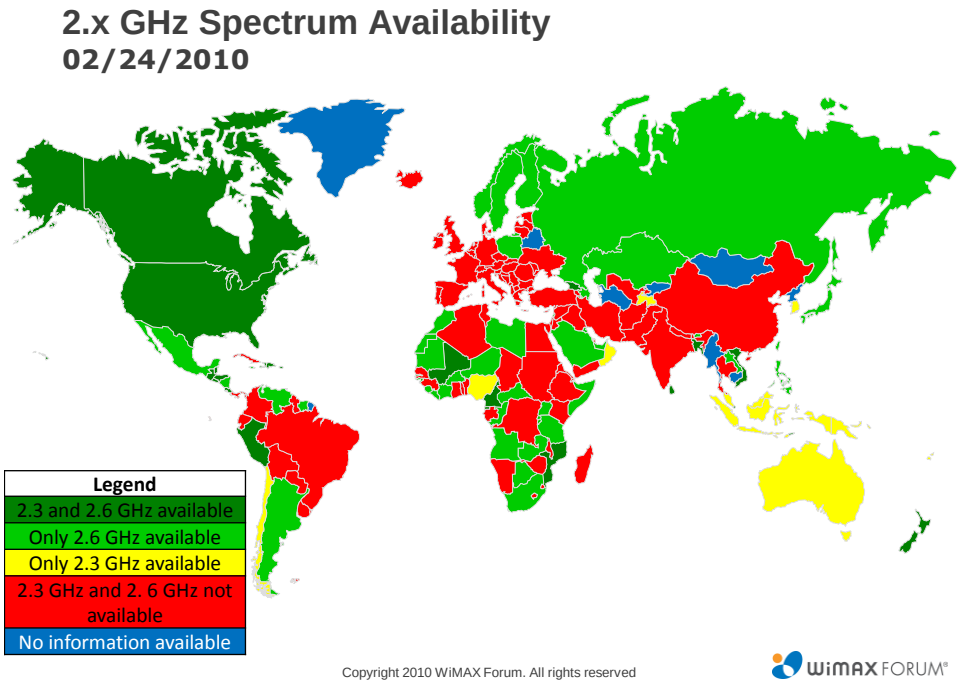
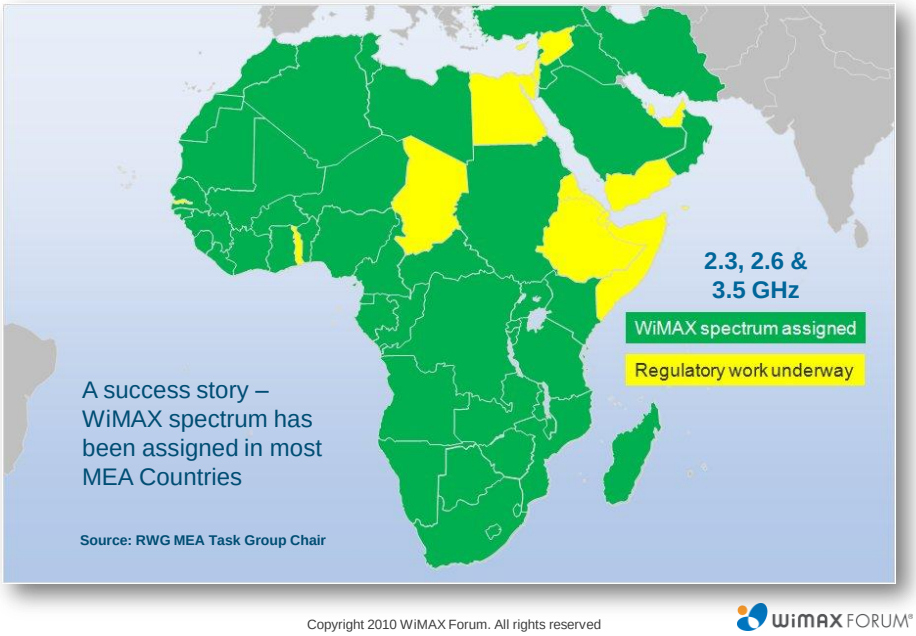
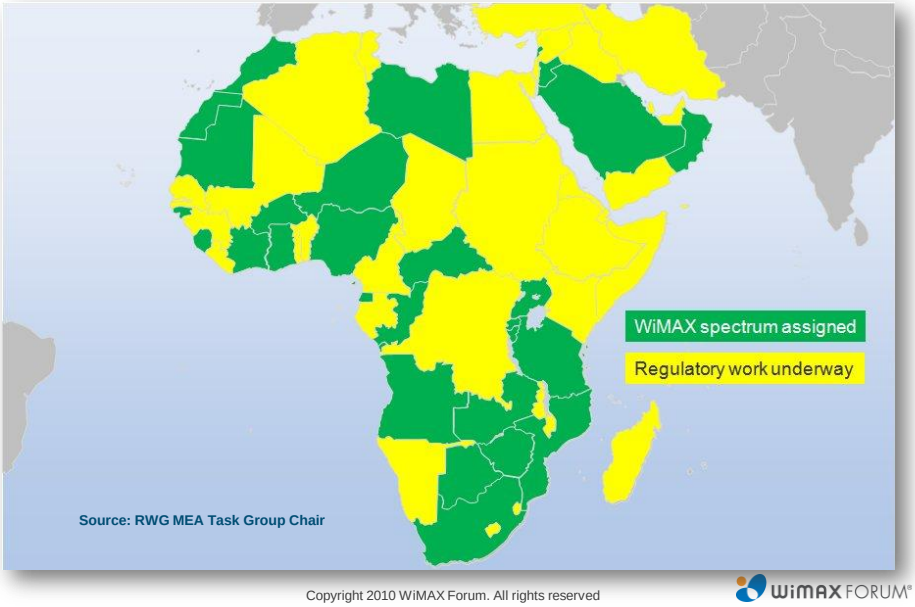


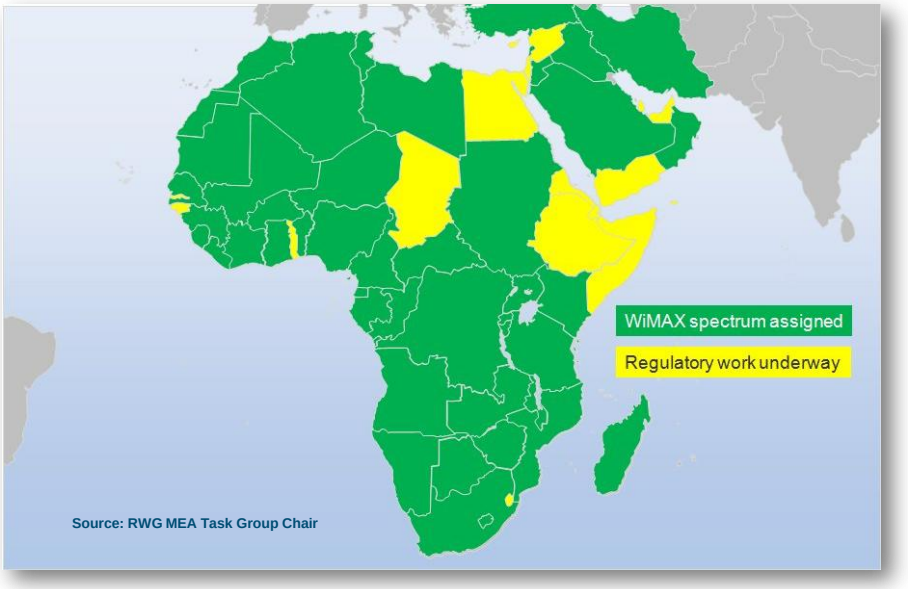
WiMAX in the Middle East and Africa

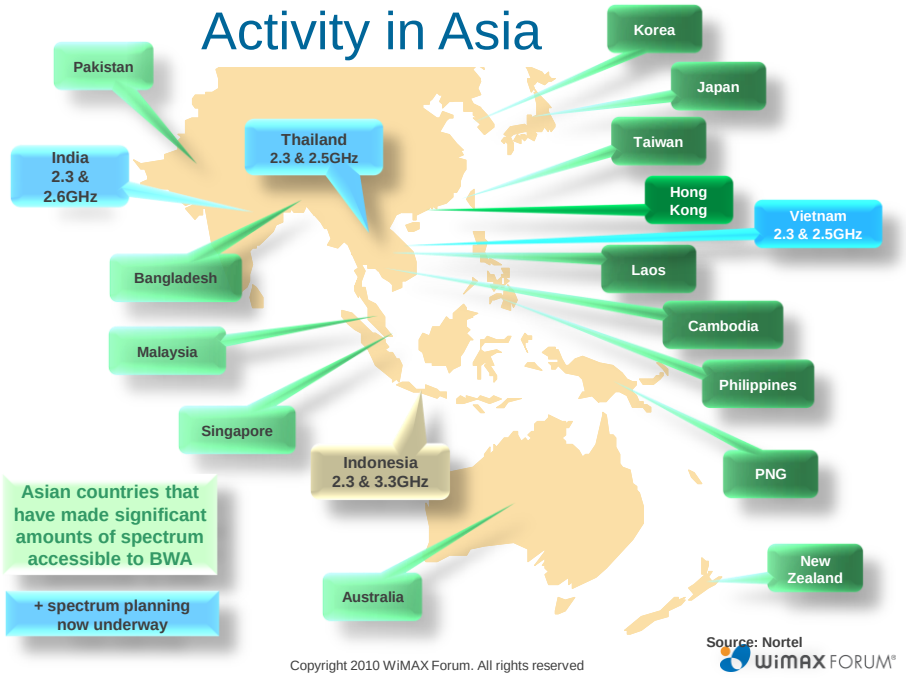


Middle East & Africa – 2.3GHz & 2.6GHz



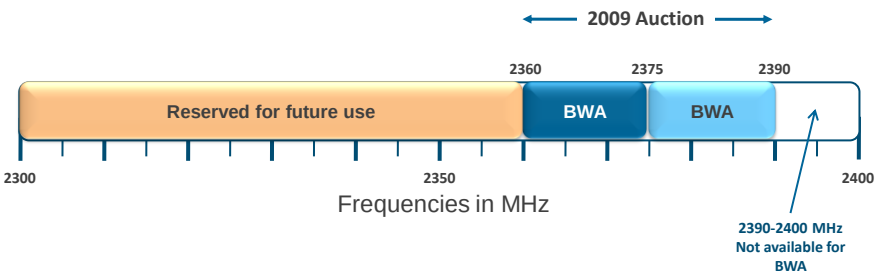
Middle East and Africa – 3.5GHz





WiMAX FORUM®

2.3GHz BWA Frequency arrangements in Indonesia



Source: Information Memorandum, April 2009

WiMAX FORUM®

Auction result

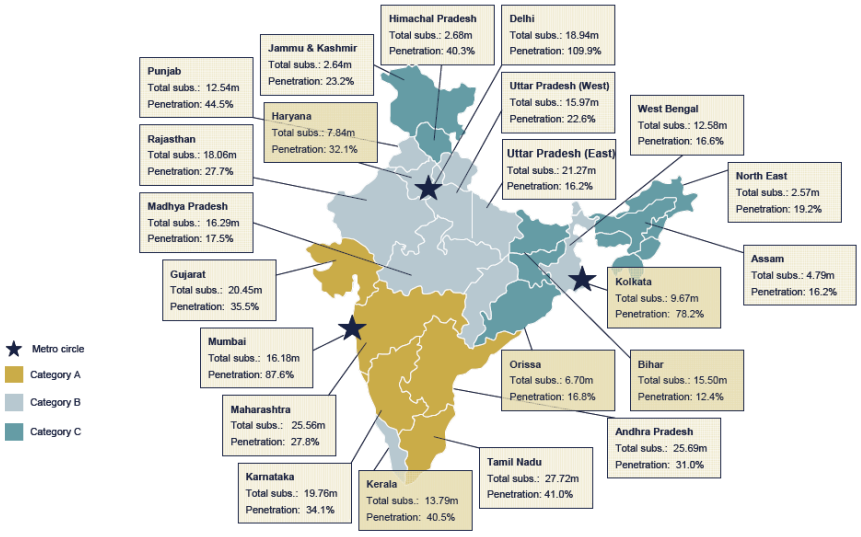
Spectrum Allocation Map at 2.3 GHz (Awarded)

FM	PT. First Media, Tbk
BH	PT. Berca Hardayaperkasa
INT	PT. Internux
COMADI	Konsorsium PT. Comtronics Systems & PT. Adiwarta Perdania
IM2	PT. Indosat Mega Media
TLKM	PT. Telekomunikasi Indonesia, Tbk
KWI	Konsorsium WiMAX Indonesia (Rahajasa Media Internet)
JT	PT. Jasnita Telekomindo

Title of Presentation August 22, 2009

WiMAX FORUM®

BWA Service Areas in India



Source: 3G/BWA Information Memorandum, 12th December 2008

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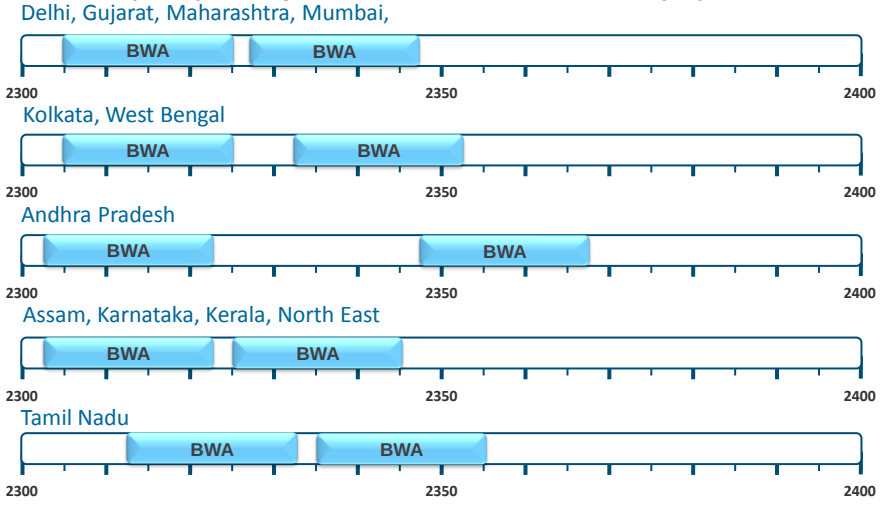
2.3GHz BWA Frequency arrangements

BWA Frequency arrangements in the 2.3GHz band vary by licence area:-



Source: 3G/BWA Information Memorandum 12th December 2008

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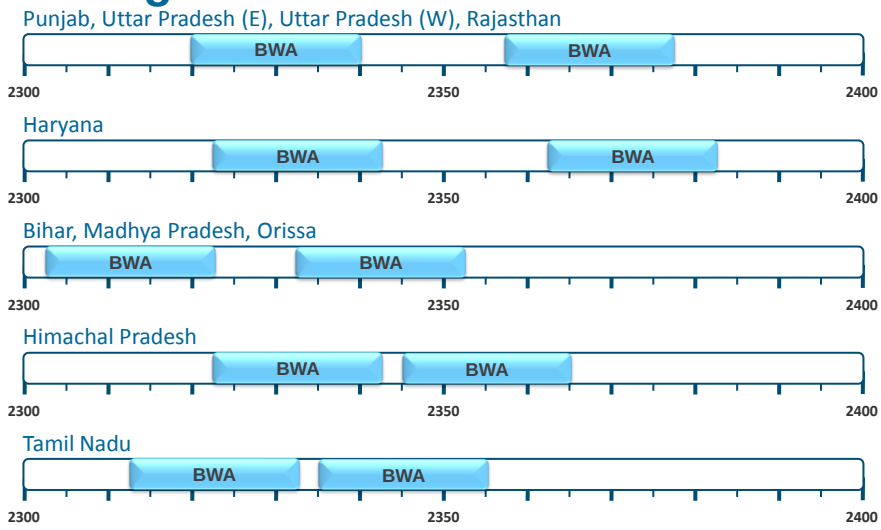
2.3GHz BWA Frequency arrangements



Source: 3G/BWA Information Memorandum 12th December 2008

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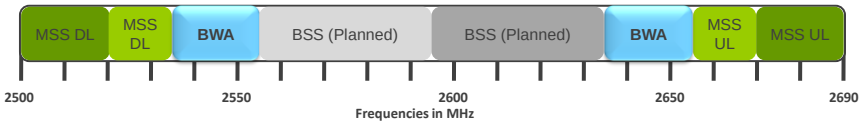
Forthcoming BWA auction in India

- India is now close to the important BWA Auction for a total of 4 spectrum blocks in the 2.3GHz and 2.6GHz bands
- 2 blocks of 20MHz in the 2.3GHz band and 1 blocks of 20MHz in the 2.6GHz band will be auctioned
  - BSNL already holds the license for the 2nd 2.6GHz block
- It is expected that the auction will take place during calendar year 2010
- Due to the complexity of the 2.6GHz frequency arrangements, the WiMAX Forum and the Dept of Space in India have been assisting the Dept. of Telecommunications to ensure appropriate compatibility between the various spectrum users

The frequency plan for 2.6GHz in India



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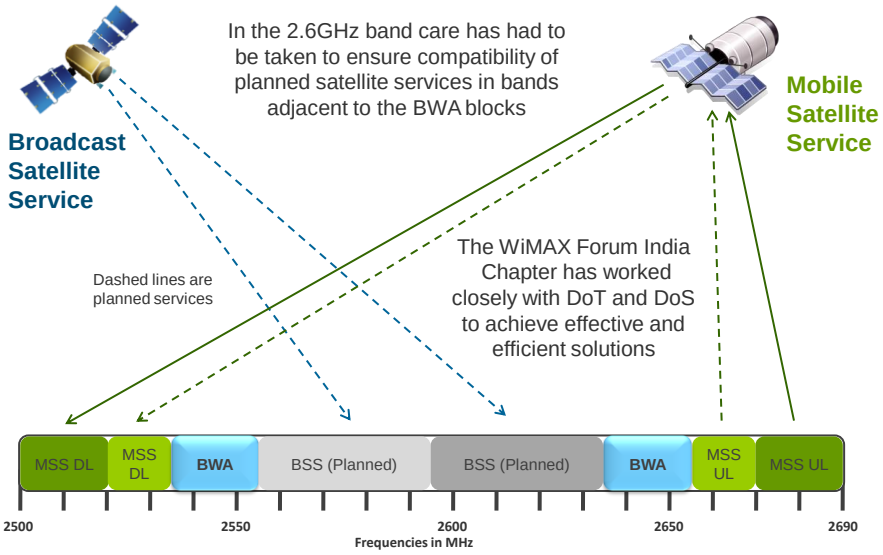
Working alongside satellite services



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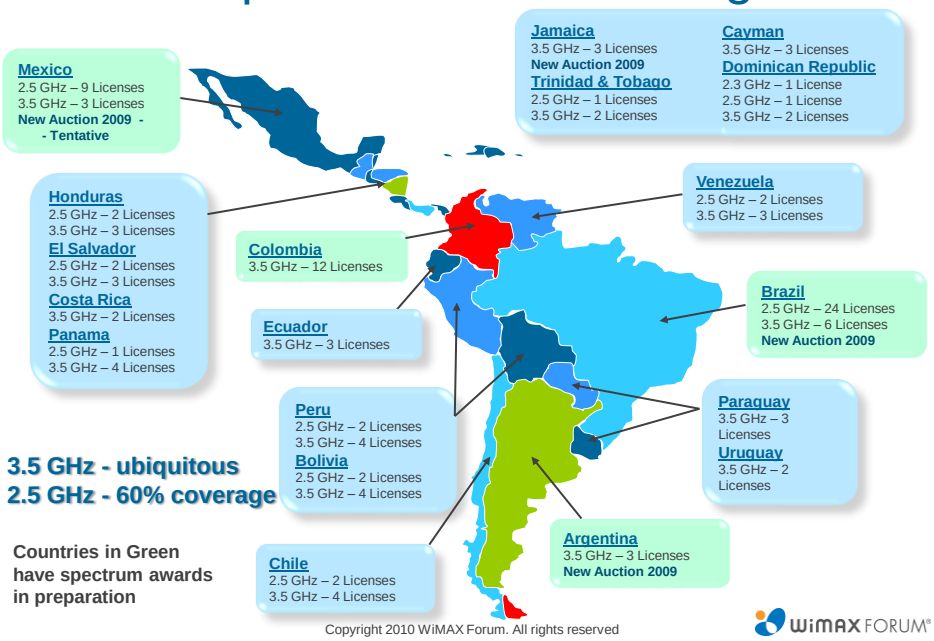
WiMAX Spectrum in CALA Region



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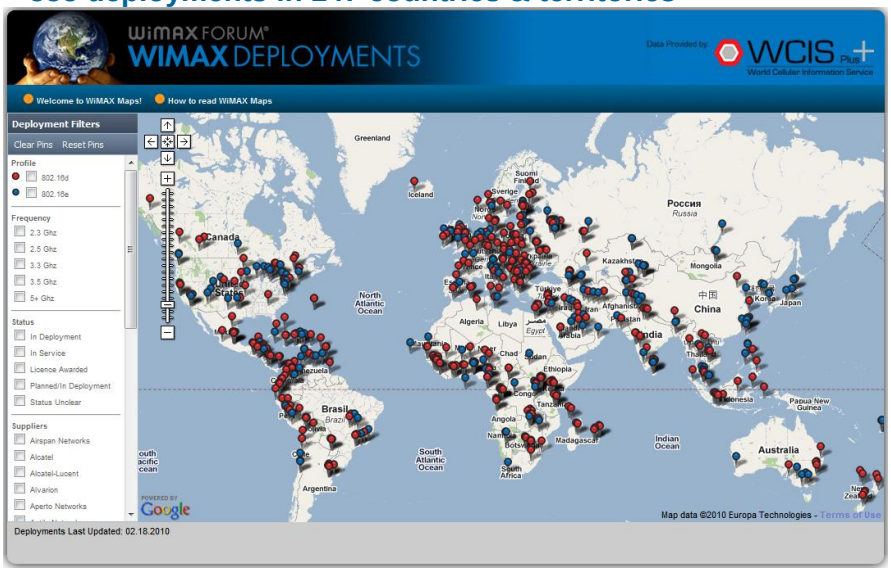
Current WiMAX worldwide footprint

22nd February 2010

- 555 deployments in 147 countries & territories



www.wimaxforum/maps

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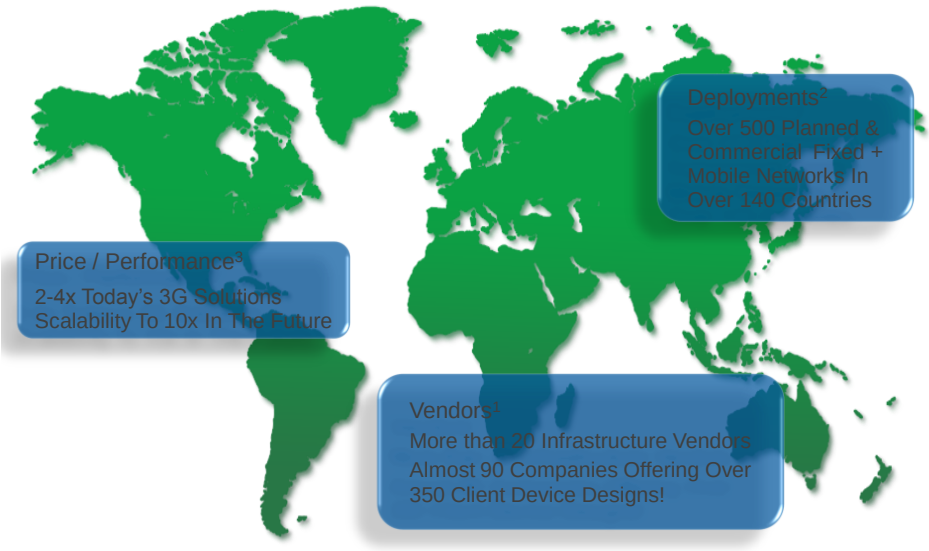
WiMAX Global Momentum Continues to



1. Infrastructure: ABI Research, 2009; Client devices: Orr Technologies, 2009.
2. Infonectics. 2009
3. 2-3x based upon actual network performance in Korea, US, Russia, Taiwan & Japan. Not per IEEE 802.16m Systems Requirements Document

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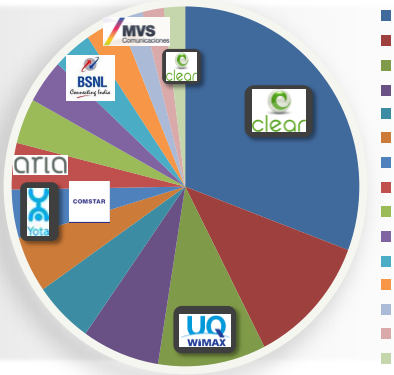
Mobile WiMAX Being Deployed in 14 of Top 15 PC Markets

- 1.2 billion PCs deployed worldwide
- Top 15 represent 71% of WW total
- All countries have 2.3/2.5 or 3.5GHz
- 11 IA OEMS supporting WiMAX today
- Clear / US: 35 models from 5 OEMs
- UQ / Japan: 18 models from 8 OEMs
- Yota / Russia: 34 models from 6 OEMs
- 100 notebook + netbook models certified by operators to date



ASUS FUJITSU lenovo Panasonic SONY
acer DELL msi ONKYO SAMSUNG TOSHIBA

Source: Computer Industry Almanac, Jan '09

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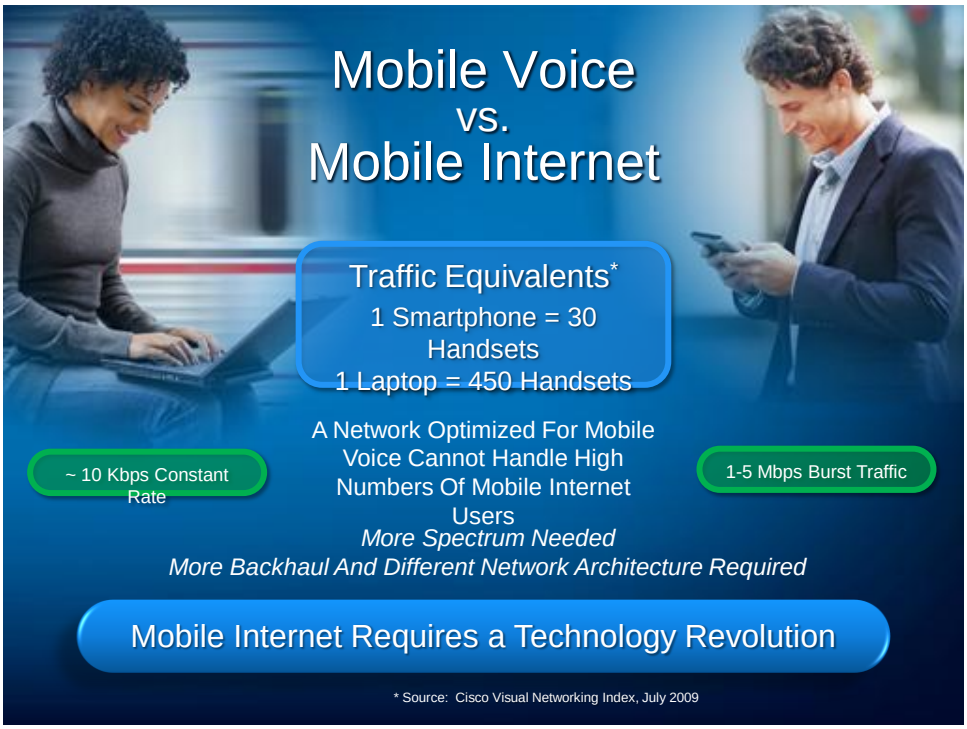
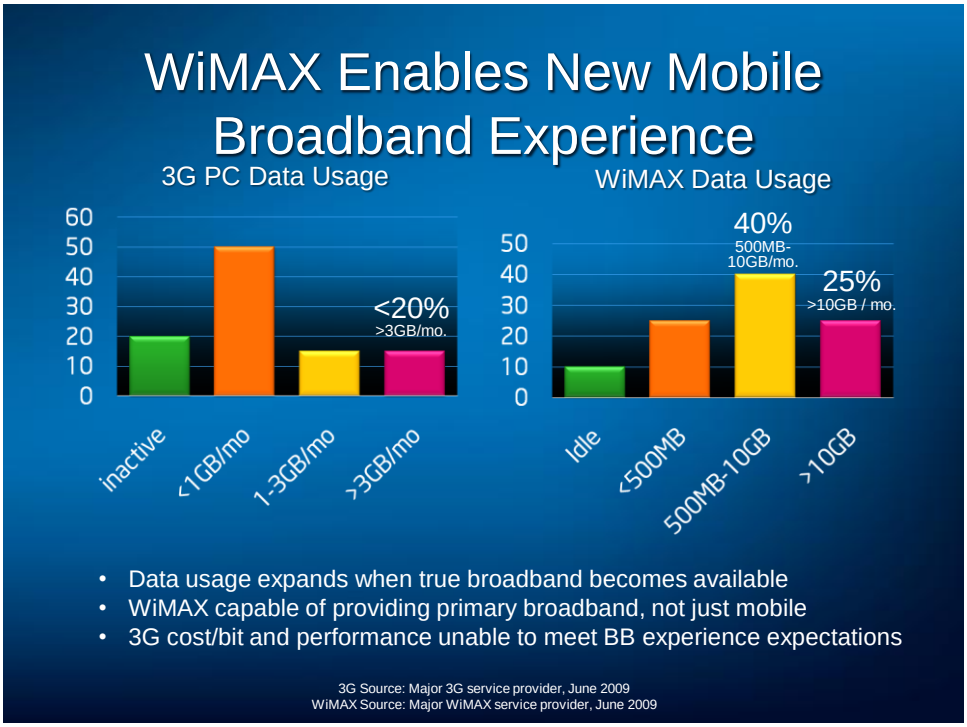
Source: Intel





Today, Leading examples around the world

Fastest Network
- Live notebook speed tests - 16 Mbps down,4 up
- MVNO services since July

2nd largest GDP in the world

New Emerging Market Deployment
- Large 2.5GHz deployment, 30 K+ subscribers
- 1000+ base stations deployed

Pop of 100M 5.6% use Internet*

Leading Emerging Market Deployment
- Large 2.3GHz deployment, 130k+ subscribers

Acquiring 30% of all new BB subs

Innovative Services
- Yota Music: 600K+ licensed tracks to download
- 250K+ subscribers, EBITDA Positive after 5 months

Average Use 10GB/month

Leading Mature Market Deployment
- 2.5GHz Deployments in Tier 1 and Tier 2 US Metros
- Comcast, TimeWarner Cable, and Sprint partners

120M Pops by EOY 2010

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Thank-You for your attention

Peter Gibson
WiMAX Forum - EuRWG