ITU-BDT Regional Seminar on Fixed Mobile Convergence and new network architecture for the Arab Region

Tunis, Tunisia, 21 - 24 November

WiMAX Solutions-Integral Elements of Fixed Mobile Convergence Networks

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FMC objectives and opportunity for new Access Solutions

- Next Generation Networks based on all IP infrastructure with added features such as IP Multimedia Subsystem (IMS) for developing and delivering a wide range of new subscriber services are key FMC objectives.
- New IP based core network architectures will create excellent opportunities for the adoption and deployment of new access solutions such as ones optimized for mobile IP.
- New mobile IP technologies based on the IEEE 802.16 family of International standards achieve fixed mobile convergence from the perspective of the access element of the network.
- Such "converged" technologies have the potential to open up new business opportunities for operators and can help to bridge the "broadband access" digital divide.

Operators and new access solutions = new business opportunities!

- Existing mobile operators, as well as new wireless operators with plans to compete with wire line operators have shown great interest in the WiMAX solution. While their respective business cases and plans may be different, both want to respond to the growing global demand for low cost access to broadband.
- Mobile wireless technologies have already demonstrated the critical role they can play as an access solution to significantly increase teledensity for voice when used as a low cost alternative to wire line solutions.
- This is a clear example of fixed mobile convergence at work - we now have an opportunity to do the same in the case of low cost broadband access because the technological solutions are available.
- Indeed Markku Hollstrom, head of Nokia WiMAX Business Program & General manager Broadband Wireless, expects WiMAX to "Do to the Internet what GSM has done to voice".

These predictions are not made lightly.

The regulatory hurdles facing non IMT family standards based BWA solutions.

- It is not disputed that IMT-2000 and enhanced IMT-2000 technologies can play an important role in delivering essentially ubiquitous access to high speed IP data.
- It is also widely acknowledged that **NOT** just technologies based on IMT-2000 standards, or even further development of those technologies, will enable operators to deliver competitive, low cost wire line speed and volume equivalent broadband access on a very wide scale.
- In this respect it is critical to examine regulatory hurdles that may impede deployment of solutions such as WiMAX, and in this respect the key issue concerns opening access to harmonized frequency bands to drive economies of scale.

Harmonized frequency band access for BWA.

- Currently bands in the 3.3 - 3.6 GHz range are licensed by many administrations for "fixed" or less frequently for "nomadic" BWA.
- This coincides with the 3.4 - 3.6 GHz frequency range the WiMAX Forum has designated for one of the key profiles for certification and interoperability testing. However it is notable that this band is also being seriously considered for IMT Advanced identification at WRC 07.
- The other key WiMAX profile bands are in the range 2300 MHz to 2690 MHz (specifically the 2300 to 2400 MHz and the 2500 to 2690 MHz sub bands). The 2500 - 2690 MHz band is identified for IMT-2000 and furthermore this band along with the 2300 - 2400 MHz and 2500 - 2690 MHz band is also under consideration for IMT Advanced identification at WRC 07.
- It is clear that additional globally harmonized bands just for BWA will be almost impossible to find.

WiMAX BWA and IMT relationships.

- WiMAX BWA solutions do not support circuit switched voice and therefore do not qualify for inclusion in the core IMT-2000 ITU-R Recommendation for IMT-2000 air interfaces. This situation often results in failure of BWA to gain access to bands already identified for IMT-2000.
- Core Global Standards Recommendations for IMT Advanced are not expected to be developed before around 2010, and so access by BWA to bands identified for IMT Advanced at WRC 07 may also be problematical for an extended period of time in many important markets.
- The obvious way to close the loop whereby WiMAX based solutions can gain access to globally harmonized bands is ensuring Mobile WiMAX is recognized in ITU-R Recommendations dealing with IMT Advanced.
- The question remains however - how to accomplish this and in what time frame?

Does Nomadic and Mobile WiMAX qualify for IMT Advanced?

- There is no point promoting WiMAX as a key IMT Advanced technology candidate if it falls outside the so called "Framework for systems beyond IMT-2000" definition as described in Recommendation M.1645 (Figure 2-1)
- The IMT Advanced requirements are articulated more specifically in new Recommendations being developed in Working party 8F such as "Methodology for calculation of spectrum requirements for the future development of IMT-2000 and systems beyond IMT-2000" (IMT Advanced).
- The purpose of the above DNR is to have a stable and justifiable basis for the calculation of additional spectrum requirements for the further development of IMT-2000 and systems beyond.
- The key parameters for IMT Advanced are those in so called Radio Access Technique Group #2. Technologies that can achieve the targets set out for RAT #2 can be presumed to be at least justifiable potential candidates for IMT Advanced.

TABLE 5-10B

Example required radio parameters for RATG 2

		RAT Group #2 Value			
Attribute	**Unit**	**Macro cell**	**Micro cell**	**Pico cell**	**Hot spot**
Application data rate	Mbps	50	100	1000	1000
Supported mobility classes		Stationary/ pedestrian, low high	Stationary/ pedestrian, low	Stationary/ pedestrian	Stationary/ pedestrian
Carrier bandwidth (CBW)	MHz	25-50	25-100	100	100
Guard band between operators	MHz	0	0	0	0
Minimum deployment per operator per radio environment	MHz	50-100	50-100	100	100
Number of overlapping network deployment	#	1 Š 4	1 - 4	1 - 4	1 Š 4
Possibility to flexible spectrum usage (FSU)	Boolean	Yes	yes	yes	Yes
FSU Margin	Multiplier	1	1	1	1
Area spectral efficiency	bits/s/Hz/ cell	2Š4	2Š5	3Š6	5Š10
Area spectral efficiency for multicasting	bits/s/Hz/ cell	1-1.5	1Š2.5	1.5 Š3	2.5 Š5
Typical operating frequency	MHz	< 6 000	< 6 000	< 6 000	< 6 000
Support for multicast	Boolean	Yes	yes	yes	yes

Key IMT Advanced target parameters - Mbps

Application data rate - 100 Mbps (for micro and pico cells).

This is the key target parameter for IMT Advanced and was previously articulated as peak data rate, but this raised the question of what this actually means? This parameter is very often either misinterpreted or not adequately defined so it is useful to dwell on this. In this respect the explanatory text in the draft "Radio Aspects Report for the terrestrial component of IMT-2000 and systems beyond IMT-2000" is very illuminating.

"This parameter is used by methodology for distributing the traffic. It represents a bitrate which is available for applications in a particular cell type. It may be smaller than the available peak bit rate and may not be available throughout the whole cell. …….. And …….

The available cell edge user data rate is in any event implicitly dependent on how the operator chooses to distribute the available peak sector data rate amongst users in the sector or cell and how this translates to the peak data rate achieved by individual users at any instant in time given the varying traffic conditions over time."

Key IMT Advanced target parameters - spectrum efficiency

- Area spectrum efficiency (bits/s/Hz/cell)

  2~5 for micro AND 3~6 for pico cells.
- This is also a key parameter because it determines the cell "application" data rates that can be achieved in a particular channel width or, from a different perspective, the cell capacity in a particular channel.
- It is also important from a regulatory perspective where it has particular significance.
- For instance it is incumbent on administrations and hence the industry, to utilize improved spectrum efficiency in order to make best use of the radio frequency spectrum resource.
- Further it is expected that administrations will support and promote technological innovation in order to maximise the number of services that can be made available to users via the spectrum resource.

Can IEEE 802.16 based WiMAX deliver IMT Advanced?

The short answer is YES! WiMAX can meet the key target parameters. To achieve the IMT Advanced targets it uses innovative techniques to achieve the required spectrum efficiency.

Furthermore there will be:

1. Nomadic IP application commercial deployments end 2006.
2. Mobile IP application commercial deployments end 2007.

This raises important questions such as:

i. How to deal with the "artificial" regulatory hurdles that may potentially impede non-IMT ITU-R standardized systems access to key globally harmonized bands?

ii. Why should we not endeavour to remove the artificial barriers to IMT Advanced entry for IEEE 802.16?

iii. If so how and when?

Options for early entry of WiMAX to IMT Advanced

1. Accelerate the time frame for development of Global Core Specifications for IMT Advanced in Working Party 8F.
2. Establish clear links between IEEE 802.16 and IMT Advanced in the ITU via other relevant Recommendations being developed in the ITU-R in the near term.

BUT WHY NOT A LESS TECHNOLOGY DETERMINISTIC APPROACH?

1. Do we really need to continue with the existing strict technology deterministic process in place for M.1457?
2. NO - developments in wireless technology such as soft ware defined radios plus the move to NGN and IP based services suggests that this may now be a "legacy regulatory approach" that stifles innovation and hampers deployment of important new services needed to bridge the digital divide.
3. Why not just use the ITU-R to "identify" suitable IMT-Advanced technologies provided they are supported by global standards?

If a more flexible regulatory approach makes sense regulators must take action

Administrations and operators from this region can play an important role in encouraging the ITU-R to move constructively on this important issue.

If administrations and operators are convinced of the immediate benefit that low cost nomadic and mobile IP solutions can deliver in terms of bridging the broadband digital divide and introducing competition, then please consider taking step to address the regulatory issues highlighted in this presentation.

…….. end ……