

# CONVERGENCE

PARTNERS

August 2007

## ~~WiMAX vs 4G~~ **WiMAX = 4G**

**Conclusion:** The long-term evolution of GSM (LTE), commonly referred to as 4G, is planned to start rolling out from 2011 and will finally enable the promised benefits of 3G (fast internet, mobile TV etc.) to be realised. However, today technology is available that is able to already deliver most, if not all, of these benefits several years before LTE promises to deliver it.

WiMAX is this technology (the so-called "elephant in the room"): standards have been passed, mobility will soon be enabled, and the cost of its rollout can be achieved at a fraction of the cost of the capital requirements of a 3G network. The equipment is robust and manufacturers are pressing on with chip developments for the new generation mobile devices.

So why then does LTE continue to exist?

In our view the answer to this question lies in the following:

- Resistance from some existing network operators;
- Limited availability of spectrum; and
- WiMAX mobility is only starting to look possible.

Nonetheless, in this report we demonstrate that WiMAX serves as a cheap and viable solution to Africa's wireless broadband needs, and is a serious contender that can be implemented by existing GSM operators and is in fact already being rolled out.

**Report 02/2007**

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*GSM succeeded beyond all expectations reaching 2.5 billion users globally in 2007*

*Increased regulatory and competitive pressures on operators in mature and maturing markets*

### **The success of GSM**

Following the success of the adoption of GSM globally, resulting in global GSM subscribers reaching 2.5 billion in 2007, the introduction of 3G, HSDPA and varied derivatives thereof, followed to meet the demand for increased data rates and carrying capacity of mobile networks by operators.

Even though voice continues to dominate the revenues of mobile operators, the pricing thereof is becoming more competitive. The number of operators globally, totalling more than 860 in early 2007, has increased competition and resulted in declines in the profit margins enjoyed by this sector in the past. Furthermore, increasing regulatory scrutiny and intervention in the sector has reduced the ability of operators to maintain high margins on interconnection and roaming. The most high profile of these investigations is currently being concluded by the European Commission on the issues of roaming and interconnection termination rates charged by operators. Regulators are closely watching the outcome of this investigation for possible implementation in their own jurisdictions. In Africa, communications regulatory and competition authorities are tightening regulations for operators with significant market power, thereby hoping to limit their ability to be price-setters at the expense of competitors and consumers.

Facing these pressures, operators are looking to the area of content creation and delivery as a growing source of revenue to supplement declining voice revenues and profit margins. The ability to provide high-speed mobile broadband capabilities is critical to the success of this content-driven strategy. Most operators are betting heavily on a solution to provide a mobile broadband capability based on the current 3G/HSDPA core network. The huge investments to date by mobile operators in acquiring spectrum and equipment for high-speed mobile broadband networks such as 3G and EDGE, are some of the reasons that Long Term Evolution (LTE) is being touted as the

*LTE is an evolution of the UMTS standard to improve efficiency, services and reduce costs for operators*

*Delay in LTE rollout could jeopardise business case*

next big wave in mobile broadband.

### **The anticipated LTE future**

LTE is the name given to a project within the Third Generation Partnership Project (3GPP) to improve the Universal Mobile Telecommunication Standard (UMTS) mobile phone standard to cope with future requirements. Goals of this project include improving efficiency, lowering costs, improving services, making use of new spectrum opportunities, and better integration with other open standards. LTE is not a standard, but is rather a process that will result in the release of a newly evolved UMTS standard, including extensions and modifications of the UMTS system. Its focus is the upgrading of UMTS to a so-called fourth generation mobile communications technology, essentially a wireless broadband internet system with voice and other services overlaid.

The question remains as to whether LTE will be the solution operators are searching for or simply another technology that promises much, but ultimately disappoints. In addition, there is a risk that the deadline for initial product availability by the intended delivery in 2011 will not be met. Based on the experience with 3G/UMTS, where the standards were approved and laid out in 1999, but only commercially rolled out on a reasonable scale (outside of Japan) from 2003 onwards, the pace of LTE commercial rollout could be delayed. Despite these serious concerns, operators, as late as the 3GSM World Congress in February 2007, refused to concede that LTE may be too little too late for GSM.

The hope is that LTE will be the platform for the development of new business streams for mobile operators, directly competing with fixed-line broadband offerings. This will provide mobile operators the ability to mirror the development and success of online user generated content sites such as YouTube and social networking sites such MySpace and Facebook for mobile devices, and similarly replicating the associated, lucrative online

*Media-rich content to drive improved revenue margins*

advertising trend.

This media-rich content, including user-generated content, music downloads, video clips and mobile TV requires a stable and cost effective platform for delivery of services to mobile devices. LTE promises to enable this with the potential to provide significantly higher data rates compared to HSDPA.

Vendors and operators, faced with the aforementioned increasing competitive pressures, are looking to this evolution of UMTS (LTE) to provide:

- target peak data rates of more than 100Mbps downlink and 50Mbps uplink; and
- improved service provisioning and reduced user and operator costs, through improved coverage and system capacity and by improving data rates and reducing latency.

Furthermore, LTE promises the delivery of enhanced multimedia broadcast multicast services, giving operators the ability to provide their subscribers with the media-rich content services they are demanding, especially mobile broadcast content (e.g. mobile TV, video-on-demand and video streaming generally).

The basis for this evolution is the general assumption that there will be a convergence toward the use of Internet Protocol (IP), and all future services (voice as well as data in its various forms) will be carried on an IP platform. One other key requirement of LTE is to allow for a smooth migration to these technologies. This can be enabled by providing:

- operators the ability to:
  - deploy the new system in existing (already paid for) spectrum;
  - reuse sites and maximise existing investments in transmission equipment;
  - maintain their base of end users by smooth service phase-ins and phase-outs, necessitating service

*Many potential benefits to overlaying LTE on existing mobile infrastructure*

*WiMAX offers all benefits of LTE and is available, while LTE is still some way off*

- continuity and mobility between systems;
- deploy the new technology in areas where it is profitable. Elsewhere, they can rely on existing systems for coverage and, to some extent, capacity;
- an emphasis on mobility between systems; and
- manufacturers the ability to apply existing R&D to new product development.

The result is anticipated to be affordable mass-market wireless broadband services that will boost operator profitability. Faster downloads, video sharing, true mobile TV with more channels and enhanced quality are some examples of applications that will benefit from LTE.

On the surface this all seems to be well and good, but the fact remains that the standards are still in development. While equipment vendors are pushing the technology's development, operators still seem somewhat undecided on this seemingly distant future – in the dynamic and short timeframes that this sector is characterised by, waiting four years may prove to be too long. Sprint Nextel is one of the operators hedging their bets by rolling out a WiMAX network alongside their current GSM network. Vodafone, previously a vocal opponent of WiMAX, has followed suit and recently deployed a test WiMAX network in Malta and has subsequently joined the WiMAX Forum.

One criticism sometimes levelled at WiMAX is its uncertain ability to carry voice traffic. However, in our view voice will increasingly become indistinguishable from other forms of data traffic as a result of the inevitable migration to Voice-over IP (VoIP). WiMAX has proven credentials as a reliable and effective carrier of data traffic. This will also ultimately drive voice pricing downwards for the consumer, an important consideration in the African market, particularly when mobile WiMAX is commercially available.

### **The next wave – WiMAX mobile**

What then is the solution to this apparent impasse between the

*Significant number of trials and commercial rollouts*

immediate need for true broadband and mobility by users? The reality is that there is a solution that provides all of the qualities assigned to and required of LTE, and which is available now. At this time, WiMAX technology and systems, based on the 802.16d standard, are mature and the standard has been adapted to include a component of mobility. The adoption of the 802.16e mobile standard should happen later this year. So in effect, we have a platform to deliver the much-promised capability of LTE, today.

The progress on the standards and certification of mobile WiMAX is also complemented by successful small and large-scale mobile WiMAX field trials being undertaken around the world by operators including Sprint Nextel (North America), Telecom Italia (Italy), Wateen Telecom (Pakistan), Omnivision (Venezuela), Telkom (South Africa), MWeb (South Africa) and TVA Sistema de Televisao (Brazil) to mention but a few.

As a result of this significant progress in both certification and commercial deployment, mobile WiMAX is set to take off, and is already attracting attention from operators as a critical component of their future network plans.

### **History of WiMAX, building on a successful past**

Since 1997, the highly successful 802.11 or Wi-Fi wireless local area networks (WLAN) technology has been used in broadband wireless access (BWA) applications along with a host of proprietary based solutions. When WLAN technology was examined in more detail, however, it was evident that the overall design and feature set available was not well suited for outdoor BWA applications. The need was identified for a stable and efficient BWA standard designed for optimal performance in all types of propagation environments, including line of sight (LOS), near LOS and non-line of sight (NLOS) environments, and which delivers reliable robust performance even in cases where extreme link configurations and conditions have been introduced. The robust multiplexing technology used in WiMAX supports high

spectral efficiency over ranges from 2 to 40 kilometres with up to 40 Mbps in a single radio frequency (RF) channel. While these transmission rates fall well short of the planned LTE 100Mbps, they are significantly better than currently available 3G performance and will continue to improve, especially as the next generation WiMAX standard (802.16m) is released. Advanced topologies (mesh networks) and antenna techniques (beam-forming, antenna diversity, etc.) can be employed to improve coverage even further. These advanced techniques can also be used to increase spectral efficiency, capacity, reuse and average and peak throughput per RF channel.

WiMAX requires a tower much like those used in cellular networks, or can be mounted on buildings, and a receiver, but a single tower can cover around 8 000 square kilometres. Importantly, WiMAX equipment can be retro-fitted into existing GSM base stations. WiMAX equipment can be powered using solar panels unlike current GSM base stations. A receiver can be small enough to be built into a laptop computer or mobile phone device in much the same way as existing Wi-Fi receivers. Although similar to Wi-Fi, WiMAX operates at higher speeds and greater distances, serves a larger number of users and provides stronger encryption. In addition, WiMAX is likely to exceed current ADSL offerings, with practical speeds exceeding 2Mbps in metropolitan areas with a transmission range of 20km, and with some vendors claiming speeds of up to 40Mbps and ranges of up to 50km.

WiMAX also has important cost advantages. First, it is a lower cost alternative to copper and optical fibre networks because deployment can be done much faster and can service lower density areas with ease. For example, the implementation of WiMAX in Maputo was accomplished in under a week. Further cost savings are possible due to the fact that WiMAX antennas can share existing cellular towers without affecting cellular transmissions. The cost of WiMAX services to end customers, however, will depend on how it is implemented and the business model used by service providers.

*WiMAX power consumption needs ideal for Africa*

*WiMAX can be added to existing mobile infrastructure and does not interfere with cellular communications*

*Standards-based technology allowing seamless interoperability between legacy and future standards-based network equipment*

WiMAX is also extremely flexible. A WiMAX connection can be routed to standard wired or wireless local area networks, it can provide backhaul capability, and unlike some other wireless technologies, it doesn't require a direct line of sight between sites. Due to WiMAX equipment being standards-based, operators are protected against the threat of vendor lock-in, and implementations are scalable and can be expanded as demand increases. What is more, quality of service can be guaranteed, vital for services such as VoIP and/or IPTV. While the bandwidth and throughput capability of WiMAX may not at this time be sufficient to handle true IPTV, future improvements to the standard are underway and this is expected to be a short-term drawback only.

### **Growing international and local adoption of WiMAX**

According to Forrester Research the combination of Wi-Fi and WiMAX will ultimately provide ubiquitous mobility for enterprises, particularly as the cost benefits of WiMAX are realised and coverage is rolled out. In addition, WiMAX will eventually emerge as the replacement for cellular data services based on 2.5G and 3G technologies because of its potential for lower-cost deployment, higher bandwidth and a lower end user price tag.

*Major vendors are supporting further development of technology, such as Motorola, Alvarion and Intel*

Increasingly, major vendors such as Motorola and Alvarion are backing the mobile WiMAX standard. The more than 100 operators covered in a recent (Q1, 2007) survey in Europe, the Americas and Asia Pacific, alone accounted for 950 000 subscribers, using a mix of WiMAX and proprietary technologies, with about 300 000 subscribers using WiMAX certified technology. In addition, these operators' WiMAX subscriber base grew 85% between Q1 2006 and Q1 2007.

WiMAX offers a better solution than current wireless infrastructure because it will provide greater throughput and reach than Wi-Fi and the current UMTS solutions offer. The hardware required for WiMAX is relatively cheap in comparison to other wireless technologies, and manufacturers like Intel are

*Commercial rollout of WiMAX networks increasing exponentially. Leading this wave is Sprint Nextel*

driving adoption with promises to include WiMAX chips on their motherboards.

In addition, the commercial rollout of WiMAX services is increasing in many developed and developing countries. For example, UK WiMAX provider, Urban WiMAX, announced a partnership with Nortel in July 2007, to build and trial a user-ready mobile WiMAX service ahead of the UK's spectrum auction in early 2008. The collaboration is intended to prove the technical deliverability of 4G mobile WiMAX in mature 3G markets. This partnership will be exploring the business case for a national wholesale and retail mobile WiMAX network. Similarly, US carrier Sprint Nextel and wireless broadband player Clearwire joined forces at the end of July 2007, to build a nationwide WiMAX network in the US. Their intention is to foster a quicker, broader and more efficient deployment of a mobile WiMAX broadband network than either company could accomplish on their own. Each firm expects to build its respective portion of the nationwide network and enable roaming between their respective networks. In order to optimise this rollout, the companies intend to exchange selected 2.5GHz spectrum between themselves. Under the network rollout plan, the partners have agreed to each focus on specific geographic regions: Sprint will focus its efforts primarily on larger, urban areas covering approximately 185 million people, including 75 per cent of the people located in the 50 largest US markets, while Clearwire will focus on more rural areas covering approximately 115 million people. Under the deal, Clearwire will also offer Sprint's 3G voice and data services as part of a bundle or on a stand-alone basis, with both providers offering dual mode services to customers. To illustrate the speed at which the market is moving, a soft launch of the Sprint WiMAX network is expected by the end of 2007 in the Chicago and Baltimore/Washington markets, with commercial services expected to be available in the first half of 2008. The company expects to generate between \$2bn and \$2.5bn in revenues in the 2010 financial year with more than 80 per cent anticipated to be

*Africa remains a wireless continent, demanding a wireless solution to its connectivity needs*

generated from new business lines such as WiMAX.

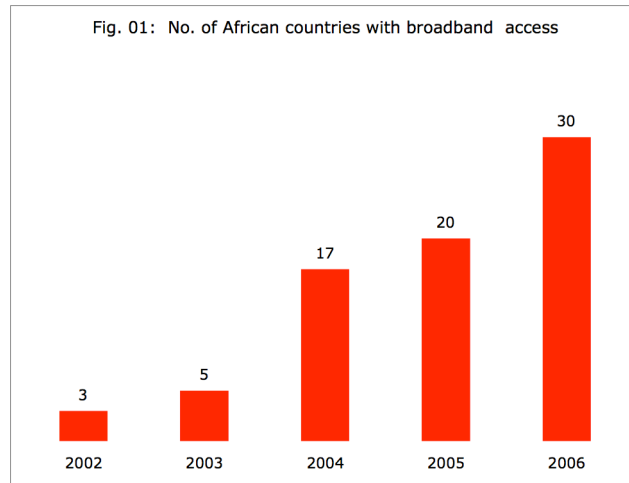
What is clear is that the WiMAX standard is capable of being a replacement and alternative to LTE, which is still some way off. The possibilities for, and benefits of, WiMAX on the African Continent in particular are evident, and the rush to incorporate broadband capacity in mobile devices is increasing. The WiMAX standard for wireless networking technology allows for greater reach and connectivity speeds that could go some way towards solving Africa's bandwidth problems, particularly in remote areas. With speeds beyond 54Mbps fairly difficult to achieve with current wireless networking technology, WiMAX is an attractive alternative and appears to be on the verge of major deployment throughout Africa.

### **Converging wireless broadband future for Africa**

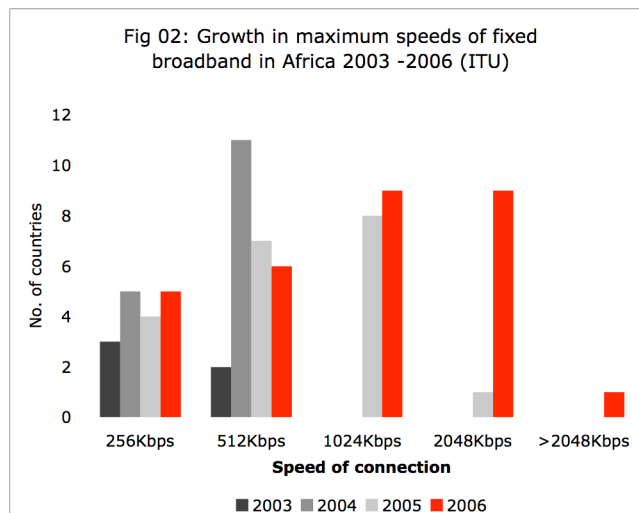
Notwithstanding the significant and necessary investments in fixed line infrastructure and fibre-optic infrastructure, the need for wireless broadband continues to drive Africa's mobile future. The widespread growth of broadband, from a very low base, in African countries (illustrated below in fig. 01), increases the urgency to find a long-term solution to the broadband requirements of a largely wireless continent. Notwithstanding the number of countries with broadband, the total subscribers still number less than 1.5 million broadband connections in 2007 (less than 0.4% of global broadband subscribers), with 350 000 of these connections being via cellular broadband connections. As such, even though more than half of African countries have some form of broadband access, it is largely via traditional fixed-line, V-Sat, GPRS, 3G/HSDPA or equivalent solutions and therefore suffers from either extremely sluggish rollout rates, high costs or is characterised by relatively low data rates and poor reliability.

In South Africa, one of the largest and most developed telecommunications networks in Africa, broadband penetration remains extremely low compared to comparative emerging economies. As a result of these low penetration rates, there is a

potentially large market for fixed and mobile broadband WiMAX, particularly in urban and suburban areas. This is even more evident in other parts of the Continent where there is an even lower installed base of fibre, satellite and fixed-line infrastructure. Governments or service providers that are eager to quickly catch up with developed countries without massive, expensive and slow network rollouts will use WiMAX to leapfrog ahead.

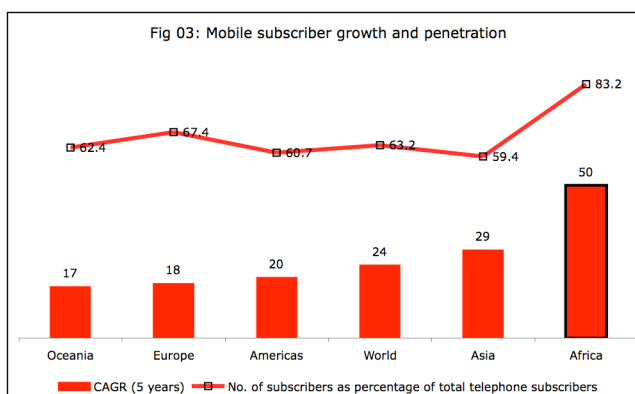


Furthermore, the illustration in fig. 02 below reinforces the fact that African broadband connectivity is way below international levels, with very low (by global standards) transmission rates being the norm:



*Growth of cellular in Africa continues to outstrip all other regions*

Further evidence that Africa is a wireless continent is demonstrated by the higher growth rates of mobile cellular subscribers and the relatively higher proportion of mobile users in the total telephone subscriber base:



The relative success of the Wi-Fi (802.11a-g) standard has laid the foundation for the deployment and adoption of wireless connectivity solutions in Africa. The increased deployment of WiMAX to meet the demand for high-speed mobile wireless connectivity is reflected in the number of test licences that have been issued in South Africa. In addition, the leaders in the commercial rollout of WiMAX services worldwide are not limited to developed markets, but include African countries such as Mozambique, South Africa, Namibia and Tanzania.

*WiMAX offers scalability and efficient subscriber management, therefore potential to be African broadband solution*

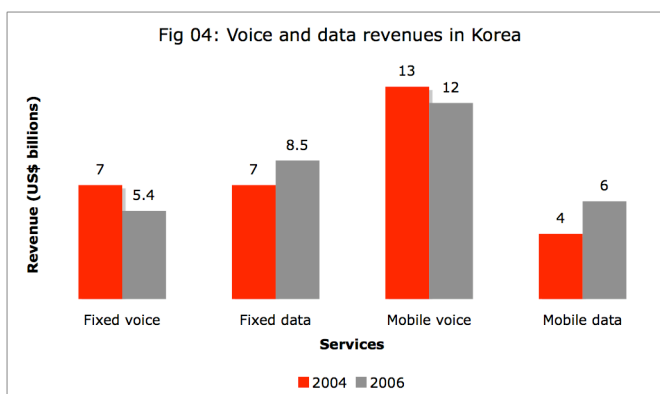
Unlike the difficulties experienced with Wi-Fi in scaling with increased users, WiMAX is able to scale through the efficient management of subscriber access to the network. Thereafter, WiMAX uses a scheduling algorithm that ensures connections are not lost and allows the base station to control quality of service by balancing resources according to demand. Therefore, WiMAX has the potential to do for African broadband internet access what cellular technology has done for phone access and will in all likelihood replace ADSL lines and work in tandem with Wi-Fi to provide universal wireless internet access in Africa. Taken on its own, WiMAX is an undeniably good fit for Africa and is a strong competitor to broadband cellular technology such as 3G and LTE.

*Global trend to mobile broadband to complement and in some cases replace fixed-broadband access*

*WiMAX offers significant cost benefits compared to other mobile broadband solutions*

**How do they match up?**

The global trend is towards mobile broadband and internet connectivity. Korea, a pioneer in fixed and mobile broadband, reflects the growing shift to a mobile internet environment. Fig. 04 below illustrates the diminishing CAGR returns from fixed voice and the substitution by mobile voice. Though fixed data has seen a 10% CAGR over the period, mobile data CAGR has increased by more than 20%:



Notwithstanding the push back by certain of the mobile operators towards mobile WiMAX for various reasons, the capex and operating costs of WiMAX networks is superior to current 3G networks. The WiMAX Forum suggests a basic four channel base station will be able to accommodate 1 000 subscribers offering a 384Kbps service with a contention ratio of 40:1. This implies that for a network of 12 000 subscribers, the operator would have to deploy 12 base stations. The WiMAX Forum has put forward several scenarios regarding the rollout of WiMAX networks in emerging markets, with various benchmarks for the implementation of a basic four channel base station estimated at about \$103 000 (in 2006, since when the equipment prices have decreased further), including site acquisition, the civil engineering and the backhaul (which can be provided by WiMAX itself). The latter is an important consideration in the African market where backhaul is a significant component of total cost due to the utilisation of satellite or fibre routes. This compares favourably to 3G deployments where the same configuration is estimated at

*CPEs are decreasing in price based on economies of scale*

\$180 000, to service similar subscriber numbers, but will need additional base stations to achieve the same level of geographic coverage.

As to the cost of customer premises equipment (CPE), the recent Sprint Nextel announcement should see the price of WiMAX CPEs start to drop as units become more widely available due to economies of scale through increased production, with major equipment vendors eyeing the potential of the trend evidenced by this announcement. The average selling price for WiMAX self-install residential CPE is estimated to be \$200, which is comparable to the PCMCIA 3G/ HSDPA cards available from the mobile network operators. However, consensus across the industry appears to favour the notion that the selling price of a residential self-install WiMAX unit is set to fall to within \$100 between 2008 and 2009, assuming prices drop at a rate of roughly 16% per annum. The price of a residential outdoor terminal should drop below \$100 by 2010, reducing at a rate of 10% per annum.

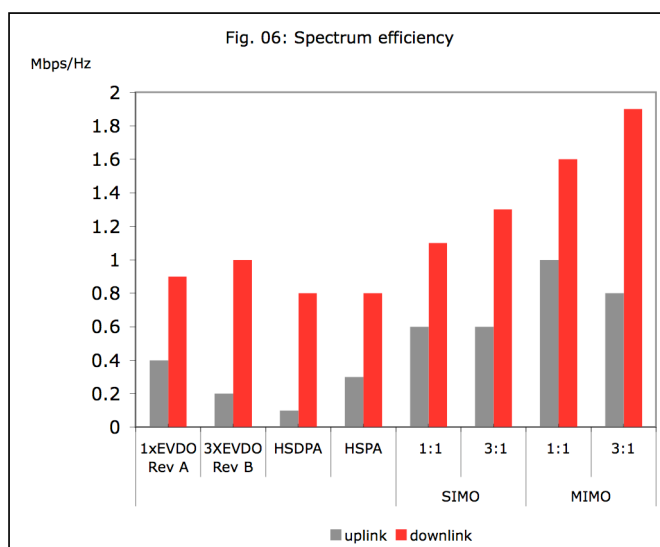
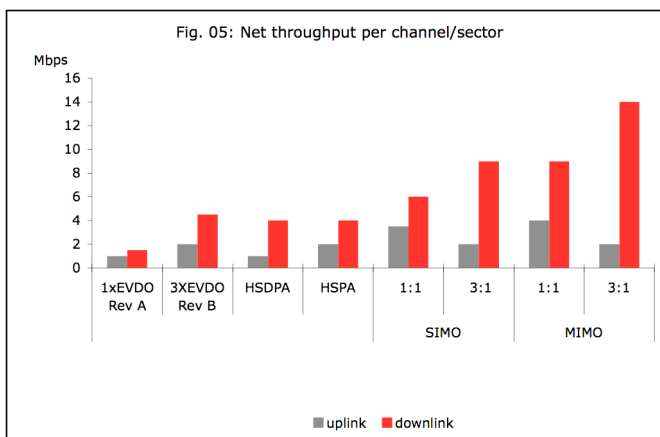
### **Spectrum utilisation**

*WiMAX is part of IMT-2000 group of technologies*

WiMAX is technically able to operate at any frequency band between 2GHz and 11GHz. However, Fixed WiMAX (802.16d) operates in frequencies of 3.4 – 3.6 MHz, and Mobile WiMAX (802.16e) operates under two frequencies, viz. 2.3 – 2.4 MHz and 2.5 – 2.690 MHz. The later is identified for mobile services in the three global regions of the ITU (International Telecommunications Union), and is aligned with IMT-2000. The inclusion of WiMAX in IMT-2000 is significant in that it now is able to gain access to spectrum resources. In addition, WiMAX also operates at the 5.8 GHz spectrum often used for backhaul of data traffic from the WiMAX access network.

Fig. 05 and Fig. 06 below provide a comparison between WiMAX and 3G in respect of performance and spectral efficiency:

*More efficient spectrum utilisation as opposed to current mobile broadband technologies*



The figures above provide a comparison between current broadband wireless solutions, namely EVDO (current 3G wireless broadband) and mobile WiMAX. The comparison is to the single-input multiple-output (SIMO) and multiple-input and multiple-output (MIMO) variations of WiMAX. Fig. 05 illustrates that mobile WiMAX provides significantly more throughput of data per channel compared to comparative other technologies. Fig. 06 demonstrates higher Mbps per Hertz of spectrum, thereby demonstrating that WiMAX is more spectrally and cost effective for operators who have paid a premium for access to the limited spectrum resources available globally.

The one spectrum challenge facing WiMAX at present concerns possible interference with C-Band satellite services in the 3.5GHz to 3.7GHz range. There are significant deployments of C-band

services in this range in Africa and the co-existence of WiMAX and C-Band at the same frequency is problematic. This issue is due to be resolved at the forthcoming World Radio Conference (WRC) in Geneva in October/November 2007 and may result in WiMAX services in this band being excluded.

However, in our view, there is (for now) sufficient frequency available in the other bands that are likely to be dedicated to WiMAX at the WRC (i.e. 2.4 – 2.5GHz and 5.8GHz).

### **Summary**

Based on the analysis contained in this report, it seems clear that operators (existing or new) will or should be shifting to mobile WiMAX to service the mobile broadband requirements of their customers. Africa, in particular, will be a high-growth wireless broadband environment and a standards-based solution will be most effective in this context as opposed to proprietary offerings. The recent moves by Vodafone to become a principal member of the WiMAX Forum could be the step that most strongly signals that the industry cannot wait for LTE and a demonstration of the very real threat that WiMAX poses to 4G.

### **Interesting snippets**

**4G technology shaping up ahead of time:** Although the International Telecommunication Union (ITU) will not release an official definition of wireless 4G technology until 2008/2009, there are already clear contenders for the designation, according to industry analyst In-Stat. The primary 4G technologies expected to be identified in the ITU's IMT-Advanced requirements are Long Term Evolution (LTE), Ultra Mobile Broadband (UMB), and IEEE 802.16m WiMAX, the research firm said. In-Stat analyst, Gemma Tedesco, said that two widely expected requirements for 4G technologies are that they be OFDMA-based, and that they support 100Mbps for wide area mobile applications. But it is expected that mobile operators will initially deploy 4G very slowly, relying on their EV-DO or HSPA networks to provide for more ubiquitous coverage. In-Stat forecasts that with the dominant worldwide technology currently being GSM/EDGE, and HSPA and EV-DO handsets not expected to be dominant until 2012, 4G deployments will most likely start in the 2010-2012 timeframe. "Companies are extremely uncomfortable talking about '4G' technologies, since the ITU has not defined 4G yet," said Tedesco. "However, each of the contending 4G technologies has a cheerleader, with Ericsson touting LTE, Qualcomm preferring UMB, and Intel touting 802.16m WiMAX." Drivers of LTE, UMB and 802.16m WiMAX adoption are

likely to herald the re-allocation of older spectrum for 4G technologies, the resolution of any WiMAX IPR issues, and the creation of FDD profiles for 802.16e WiMAX. But Tedesco warns that realistically, initial implementations of LTE, UMB and 802.16m WiMAX may fall short of throughput and other expectations, with later enhancements, or even some type of technology combination, actually bringing real 4G to the table. (Telecoms.com, 21 August 2007)

**Vodafone has signed up to principal membership of the WiMAX Forum**, the organisation dedicated to the promotion of WiMAX interoperability and adoption, though it's not giving up on 3G any time soon. WiMAX is a long-range wireless standard designed to operate in licensed frequencies - initially for fixed connections, but evolving towards mobility and eventually competing with 3G and other telephony standards. The standard is often compared to Wi-Fi, though the comparison is unfair as WiMAX isn't based on a 20-year-old wired standard but was designed for wireless use (at least, the bits not borrowed from DOCSIS were). WiMAX offers greater speed and range than Wi-Fi, but most importantly it offers quality of service guarantees that make VoIP and streaming applications easier to manage. "Our membership of the WiMAX Forum will complement our existing memberships of other key industry bodies such as the GSMA, 3GPP, and the Next Generation Mobile Network initiative," Vodafone global chief technology officer Steve Pusey said. (Telecoms.com, 09 August 2007)

**Nortel is teaming up with universities worldwide to help it develop 4G mobile broadband technologies**, which will be used to deliver applications like video, mobile TV and other multimedia services. The vendor has expanded its existing long-standing research partnerships with academic institutions like the University of Waterloo in Canada, The University of Texas at Austin in the US, and National Taiwan University (NTU) in Taiwan. Nortel has also formed new partnerships with Mera Networks in Russia and Technische Universitaet Ilmenau in Germany. The company's investigations with these universities are designed to improve spectral efficiency, and decrease time to market for Nortel's 4G mobile broadband platforms, which include Mobile WiMAX (IEEE 802.16e), and Long Term Evolution (LTE) and Ultra Mobile Broadband (UMB) standards. (Telecoms.com, 15 August 2007)

**Alvarion sees new industry milestone as Australian government chooses WiMAX to deploy rural and regional broadband network.** The Australian government announced a major broadband infrastructure project to bring advanced services to households and businesses across Australia. The Australian government gave its support WiMAX as part of its Federal Government Broadband Connect project, which is aimed at further extending high-speed affordable broadband services to all Australians. After a competitive tender process, it awarded the project to OPEL Networks Pty Ltd (OPEL), jointly owned by Elders, Australia's leading rural and regional service provider, and Optus, a leader in integrated communications in Australia. (www.alvarion.com, 28 June 2007)

**Intel's WiMAX vision:** WiMAX is a key component of Intel's broadband wireless strategy to deliver innovative mobile platforms for broadband Internet connectivity anytime, anywhere. There is a substantial unmet need for very high-speed wireless wide area Internet access to both fixed and mobile devices. WiMAX is an advanced technology solution, based on an open standard, designed to meet this need, and to do so in a low-cost, flexible way. WiMAX networks are optimized for high-speed data and should help spur innovation in services, content and new mobile devices. Intel currently plans to integrate WiMAX and Wi-Fi into its notebook platforms based on Intel® Centrino® Mobile Technologies. Pairing the two will help bring users the ultimate in high-speed mobile broadband. Intel believes that WiMAX, with its technical and economic advantages, should help enable mainstream adoption of personal broadband. WiMAX represents a global connectivity opportunity in highly developed mobile market segments and developing countries where this technology may help provide affordable broadband services. Intel envisions a world of pervasive connectivity for all – WiMAX can help deliver on that vision. (Intel's WiMAX vision, [www.intel.com](http://www.intel.com))

**Sources:**

The sources for this report are varied and include the following references:

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ITU World Telecommunication Indicators Database

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