



WiMAX will put Wireless Broadband in Your Pocket

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The 19th and 20th centuries are marked by two innovations that set the foundations for today's telecommunications industry:

- Alexander Bell putting voice conversations over wire in 1876.
- John Logie Baird putting television programmes over airwaves in the 1920s.

Ironically, the industry has spent the later part of the 20th century and lots of money reversing these developments by putting telephone conversations over airwaves (wireless) and television programmes over wire (cable).

Now, with the digital revolution and wireless broadband, things are about to change again. In the digital age, voice and video are just data applications and with wireless broadband solutions, even high definition video will be able to go wireless.

A good example of this is Wi-Fi. It has a magic combination of speed, ease of use, simplicity, cost effectiveness and embedded connectivity to laptops—all of which have driven the wide deployment of hotspots. The one drawback of Wi-Fi however, is its inability to provide cost efficient, pervasive coverage over large nation-wide geographies. A typical Wi-Fi hotspot will only cover a 200-300m radius and performance drops noticeably the further users are from the access point. Moreover, Wi-Fi technology has a limited radio spectrum meaning the capacity drops as more people log on at a hotspot.

The good news is that new technologies are available to address the demand for high-speed, wide area, wireless mobility. In particular, mesh Wi-Fi and WiMAX technologies have emerged to meet requirements needed to deliver a good wireless data experience. These requirements include high speed, low infrastructure and licensing costs, wide device support, and ease of use. Figure 1 shows the complementary nature of Wi-Fi, WiMAX and cellular based technologies.

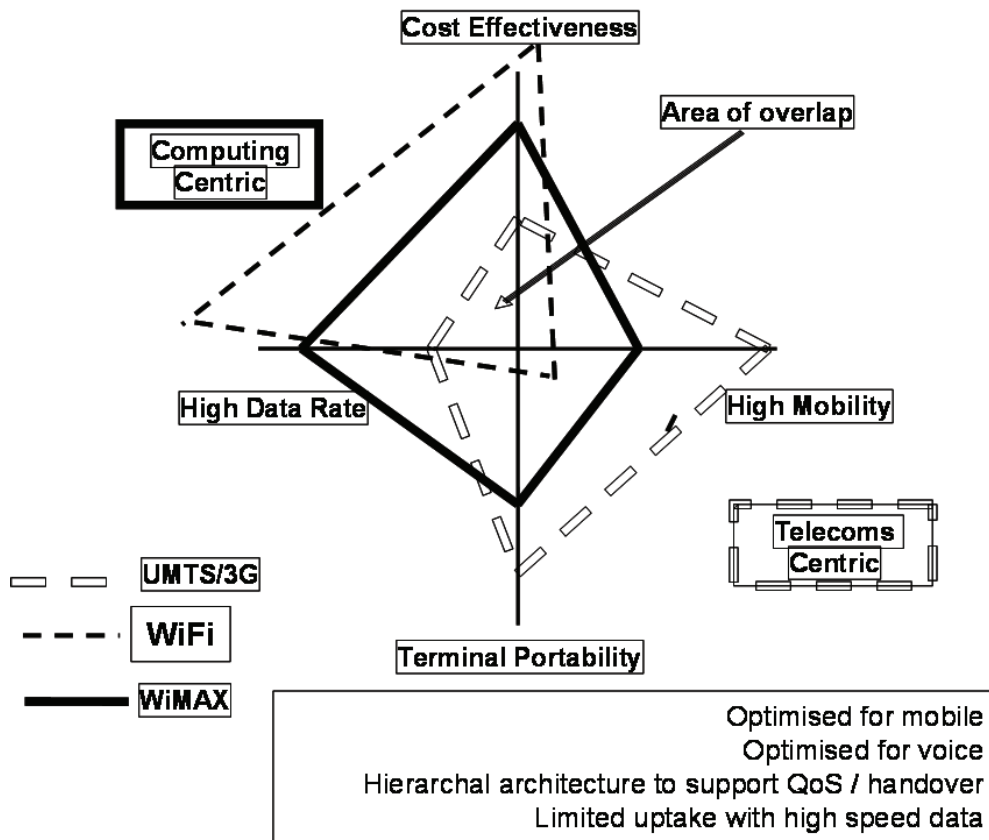


Figure 1 – The relationship between Wi-Fi, 3G and WiMAX

If you refer to Figure 1, you'll see that WiMAX, like Wi-Fi, was developed from an IT-based standard 802.16e, and comes from a heritage of high data rates in comparison to the traditional cellular technologies such as 3G. Despite this, terminal portability and mobility is limited for WiMAX versus cellular technologies. The bright side here is the cost effectiveness to operate the network. We at Motorola believe WiMAX is relatively more cost effective in replicating wireline DSL experiences against the cellular data equivalent such as HSPA.

Most regulators and governments around the world recognize the need for higher broadband speeds in wireline networks as evidenced by the numerous fibre-to-the-home (FTTH) initiatives. In comparison, there is less focus on the consumer demands for ubiquitous broadband wireless IP connectivity.

Personal Broadband

At Motorola, we call this the “mobile me”. It means being able to take your connectivity with you and make your broadband personal. Only 10 years ago a phone connection was associated with your house or office. Today, a phone connection is likely to be associated with your mobile phone and your mobile number is tied to you—not your home or office. We believe this shift in consumer thinking will apply to broadband data services in the future.

We can see the day where every user will have a mobile voice device as well as several other devices such as gaming consoles, MP3 players, laptops, and digital cameras—all of which will connect to the Internet wirelessly.

There is one crucial element to this era of ubiquitous connectivity – it is not about the one “Swiss army knife” type device like a PDA phone but rather, connectivity to a multitude of computer centric devices and services. Wi-Fi and WiMAX as connectivity platforms are clear winners in this area as both are increasingly being embedded into such devices.

Embedded connectivity is when data connection is not an add-on card or a user choice but is “part and parcel” of the device. A good example would be laptop computers where Wi-Fi is embedded as part of the hardware.

Personal broadband is akin to a DSL or cable connection in your pocket and this will enable users to be seamlessly mobile.

The DSL alternative

Vietnam is a market where broadband connectivity is an essential element for future growth. The connection between the uptake of broadband connections and the GDP per capita is a well known and understood correlation. Some studies have looked at WiMAX and its potential to shape a country’s economy by plotting the relative impact of broadband data in comparison to cellular and dial-up Internet access. A study from Latitude Broadband Research showed that broadband had a relative impact of 500% more than the impact dial-up Internet access had on emerging market GDP’s . As such, WiMAX clearly provides a vehicle to penetrate the market as a broadband DSL replacement today, while providing a future of personal mobile broadband services tomorrow.

The Unwired Cost

In order for personal broadband to achieve high adoption, the cost structure of wireless broadband must move away from the high capital cost of 2G and 3G today.

Currently, a cellular base station is the size of a fridge, consumes a lot of power and takes a crane to install. The result is higher costs to the consumer for accessing the network, and this is one of the reasons for the low uptake of cellular wireless data around the world.

The tipping point for mobile phone adoption was when the “car-boot” phone became a handheld phone. A similar tipping point is in place for wireless infrastructure with the development of a new range of base stations that can be hand carried, are easy to install, and connect with multi-Mbps speeds. Many of these small form-factor base stations have already been installed across the world to bring affordable access to broadband data. Motorola has currently entered into agreements for 12 WiMAX commercial deployments and numerous trials to install systems to provide cost-effective Internet access to consumers and businesses.

The effect of this change in Motorola’s approach to design and simplification of the network infrastructure is enabling more nimble and lower cost entrants into the broadband market. CommsLogic in Queensland, Australia, for example, has an extensive wireless broadband network covering nearly 2000 km2 with 2000 subscribers. Wateen in Pakistan has also used Motorola’s WiMAX solution to deploy low cost 802.16e fixed and nomadic solutions to consumers and small enterprises.

What is clear is that the rapid developments in wireless broadband which enable seamless personal mobility will cause some disruption to the existing telecommunications sector. Consumers will be the clear winners as innovative service providers start to roll out low cost wireless broadband at a fraction of the cost against new copper or fibre infrastructure.

Traditional voice services may begin to cost even less. Just as Voice over IP (VoIP) is impacting traditional wire-line revenues today, VoIP on newer, simpler and faster wireless connections will impact the mobile telecommunications market in the future. Once VoIP services like Skype begin to offer wireless IP-based voice calls consumers will enjoy the benefit of VoIP calls anytime, anywhere at a much lower costs than the traditional cellular carriers charge today.

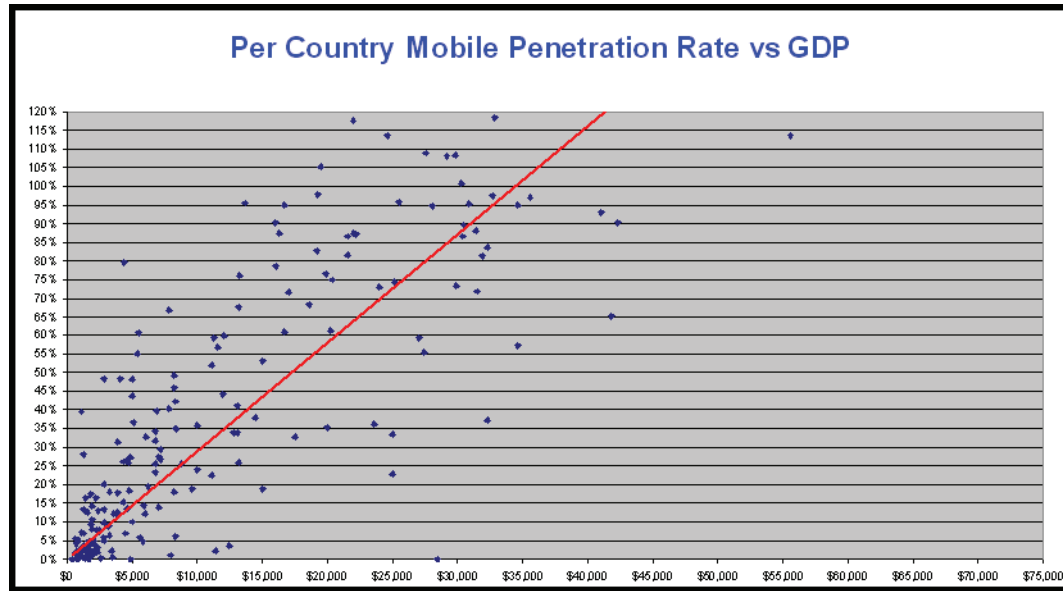
To exploit these opportunities, we shall see Internet Service Providers offering reliable, cost-effective deployments of broadband solutions across countries like Vietnam very soon. Now if we follow Latitude’s assumption of the relationship between broadband penetration and GDP, just imagine the multiplier effect if Vietnam established a wireless broadband network capable of reaching out to even more of the population.



Appendix - WiMAX will put Wireless Broadband in Your Pocket

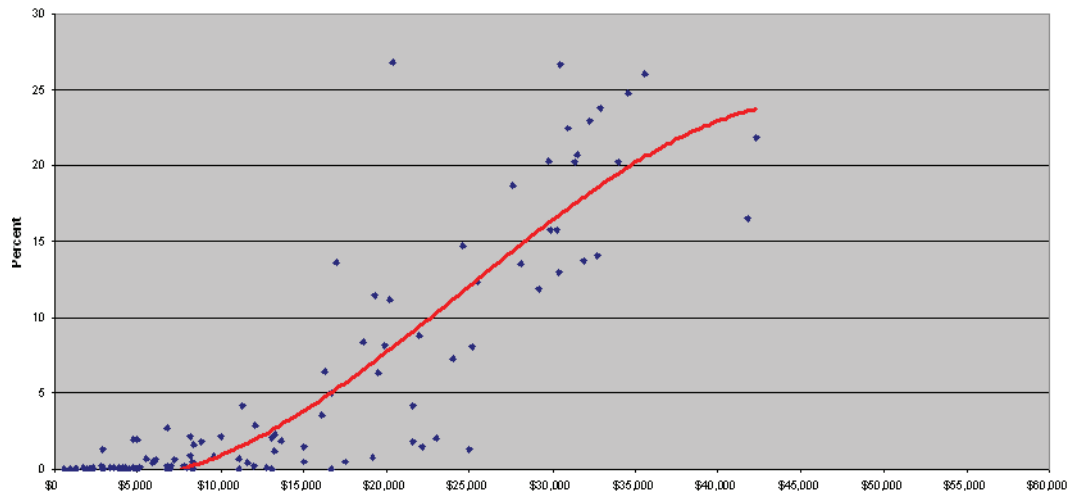
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High Broadband Penetration Rates correlate to higher productivity and access to information which can have a causal relationship to increased country GDP, as illustrated in the figures below.



Source Data: GDP Information from CIA Factbook 2006. Penetration Rates for 208 Countries Latitude Broadband Research June 2006

Per Country Broadband Penetration Rate vs GDP



Source Data: GDP Information from CIA Factbook 2006. Penetration Rates for 208 Countries Latitude Broadband Research June 2006

In the Emerging Markets

10% Mobile Penetration equates to US\$X of GDP *

10% Internet Penetration equates to US\$1.25X of GDP *

10% Broadband Penetration equates to US\$6.25X of GDP *

*Not a causal relationship



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