

Distant Thunder¹: The Advent of Personal Broadband

September 11, 2005



Nitin J. Shah and Scott E. Slater

Co-Founders, Personal Broadband Industry Association

Charles Reed

Chief Executive Officer, Capena International

Summary:

Investments in radio spectrum, wireless technology, network operators, Internet and software companies are beginning to signal a transformation in the telecommunications and digital media industries. We examine the market pull as well as the technology push in the broadband market, and its impact not only on traditional telecommunications companies but also on consumer electronics, digital media and content. Recent changes in the regulatory framework in the USA are pressuring the industry, and inspiring innovative and alternative solutions to conventional broadband access networks and services. We are starting to hear the distant thunder, and we examine these early signs and how they are pointing to the growth and development of an industry whose objective is to provide Personal Broadband services.

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¹ Early indication of a future event, but whose implications are difficult to perceive



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Personal Broadband

The current telecommunications landscape in the US and other parts of the world at varying degrees enjoys widespread availability and use of cellular phones and the Internet - in the home, at work and at schools. Broadband wireless takes the Internet into the digital media world making it personal and available to each and every person - Personal Broadband.

Personal Broadband is the market definition of the future of the Internet and digital media—broadband Internet access that is ubiquitous and affordably priced, supporting a wide variety of Internet, content, media, search and entertainment services.



The key features that make broadband Internet more attractive than conventional dial-up services are the always-on experience and speed. However, these benefits are only available today at a premium price—if they are available at all—and only within the confines of the home or the office.

Personal Broadband goes beyond today's broadband access features by delivering affordable, intelligent high-speed, always-on interactive Internet connectivity to you, where ever you are; it's not only fast and always on, and always there, but many services and experiences offered are better because they are personalized and based on new and more attractive business models that intersect beyond just connectivity.

A large component of personal broadband is a combination of technologies that support personal mobility in the network (e.g. Session Initiation Protocol, presence, location-determination, applicable to any set of heterogeneous access methods) as well as wireless access to reach people wherever they choose to be. The digital content, media, search, applications and advertising industries are just beginning to grasp the impact of these technologies on their future business.

While there is an acknowledged market opportunity for Personal Broadband services, the industry consensus required to drive the capital outlay and to deliver sustainable solutions for this market is only just emerging and converging from different sources - Intel Capital, Microsoft and Google investing into VoIP, traditional cellular carriers investing into super 3G and 4G and the FCC unregulating broadband and inspiring traditional and non traditional interested parties and investors.

The Market

Market and Industry Structure

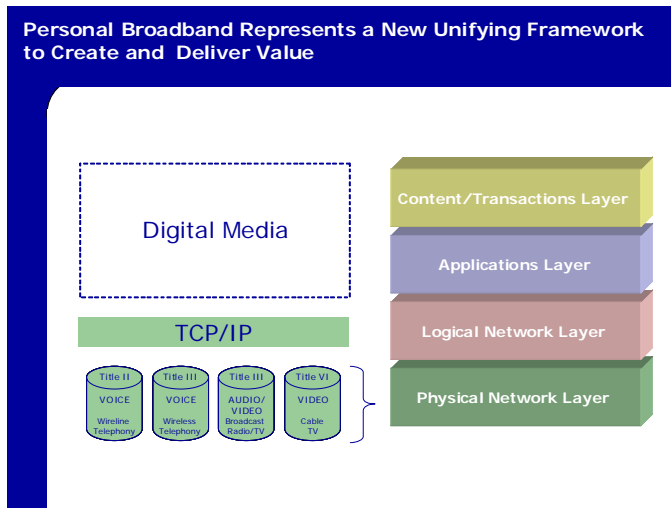
The traditional separation of voice, data and video services is being leveled by technology and innovation, and this is illustrated in the “layered” model of the industry² (illustrated below). Each layer represents a relatively new and

² Presentation to the FCC Wireless Broadband Forum on May 19, 2004 by Scott E. Slater:



sustainable industry segment which has to deliver the best performance and value for that function, and the end result is that consumers will enjoy a wide range of services and choices based on their personal preferences.

Every company involved in communications, digital content, and services has had to take notice of the different emerging signs in the industry, as the conventional fear is that the current landscape fosters consolidation and monopolistic behavior, not only of the access, but also the content and services. However, the very same landscape also indicates that those who grasp the implications of these signals will be tomorrow's winners.



The “Layered” model of the Personal Broadband industry.

US Regulatory Landscape and Spectrum

In the past months, the FCC has set rules protecting the local access providers of broadband services such as the DSL and Cable operators defining them as information services, so these networks are not obliged to share their wired connection to the consumer with other service providers.

Consumers groups have voiced concerns, since the current wireline broadband service providers are no longer under pressure to maintain competitive pricing.

http://www.fcc.gov/broadband/forum_0504/

For service providers whose future is dictated by access to consumers over broadband networks, the impact is even more fearsome.

Wireless technology is rapidly becoming the only viable way to compete in and around the broadband market.

Licensed radio spectrum has become the new currency for entering the broadband market, and with wireless, the possibilities are not only for fixed access but serving individual users - similar to cellular phone numbers are associated with an individual not the home they live in or where they work.

Over the past few years, there has been an increasing momentum of spectrum exchanges and acquisitions for broadband services. In the US, the most visible transactions were by Nextel (purchase of BRS spectrum from MCI, prior to their merger with Sprint: Sprint-Nextel's commitment to the FCC to provide broadband services to 30 Million subscribers within the next six years using this spectrum) and Clearwire (which is already in commercial deployment of broadband services, and is raising funds to expand the footprint of its broadband wireless networks in the US and globally).

In the background, many companies with radio spectrum which has been under-utilized for years are now eyeing an opportunity to build, acquire, re-purpose or sell their spectrum assets. In parallel, others are gearing up for FCC-managed spectrum auctions (in particular spectrum at 700 MHz which broadcasters may have to relinquish as they transition to digital TV services).

The introduction of new mobile broadband services, such as the video broadcasting trials over wireless by companies such as Nokia and Crown Castle, and Qualcomm's Media-FLO have added more uncertainty to the traditional landscape.

In the mean time, the proliferation of WiFi devices operating in unlicensed frequencies, and development of hotspot, hotzone and municipal WiFi networks for access in public spaces is providing proof for a disparate access medium free of many regulatory and market barriers that licensed spectrum users face. The FCC's inquiry of the 3.6 GHz frequency band is also gaining importance, where "pseudo-unlicensed" spectrum presents opportunities for

personal broadband deployments.

The trends in consumer electronics are a very important piece of the puzzle. Consumers are beginning to expect their appliances to be connected with broadband wherever they are. WiFi devices are not only integral to more than 80% of mobile computers, but have penetrated PDAs, digital cameras, gaming devices and as the costs continue to drop will be in most consumer electronics devices, including mobile phones.

For example, the Nokia 770 Tablet device, the Sony PSP and Nintendo DS gaming platforms, and newly announced Kodak and Nikon digital cameras are all integrated with WiFi technology. Today the target is in-home wireless connectivity, but with public access WiFi networks, the expectation is that these devices may soon be able to connect anywhere where people live, work, learn and play.

The challenge is when public access networks will be available to offer the type of personalized interactive services that people will expect with this diversity of connected devices in their hands.

Technology Push

The earliest indications of the changes in the personal broadband industry are evident from the companies which develop the building blocks of the wireless technologies (i.e. chip vendors such as Intel, Qualcomm, Samsung etc).

The competitive landscape for mobile technologies is dominated by the 3GPP and 3GPP2 based standards. The IEEE 802.16 standards have also evolved to target mobile broadband services, as well as the IEEE 802.20 "mobile broadband wireless access" standards (where some believe Qualcomm had deliberately impeded progress, but may now accelerate after the purchase of Flarion Technologies by Qualcomm). Also there is small but not insignificant adoption of "alternative" proprietary systems³, but currently commercial products which support personal broadband services.

³ See text box at the end of the article

It should be noted that the IEEE 802.11 standards (WiFi) have evolved over the past few years, where the primary application was for enterprise and residential connectivity (i.e. analogous to a “cordless phone”) to public access at hotspots, hotzones and municipal WiFi networks (i.e. analogous to a cellphone rather than a cordless phone).

Qualcomm and Flarion

The recent acquisition of Flarion, a venture-backed Broadband Wireless technology company, by the leading wireless company, Qualcomm, is a component of the battles emerging in the market for personal broadband.

The technology developed by Flarion enables Personal Broadband (wireless broadband services targeted to the individual, whether they are fixed or mobile) service. Since the technology is wireless, it not only allows for nomadic or mobile service, but the cost of deployment of the infrastructure is a fraction of that of the physical labor and construction associated with the Cable and DSL industries.

Qualcomm may have acted in response to the perception that the Flarion technology roadmap is more compelling than Qualcomm’s. This acquisition also gives Qualcomm the ability to control Flarion and to adapt Flarion’s OFDM technology for future standards. It also gives Qualcomm Intellectual Property on OFDM, both to add to their Media-FLO and future 3G products⁴. How Qualcomm uses the assets of Flarion (i.e. intellectual property in an emerging wireless technology called OFDM, which is targeted for “next generation” wireless systems such as 4G and WiMAX) is important to the vendor community and to network operators who may have to pay future royalties based on the Intellectual Property that Qualcomm has acquired.

However, we assert that this acquisition is more even profound: the investment is not only in technology but in declaring their stake in the personal broadband market.

⁴ “Qualcomm Snaps up Flarion”, Brian Modoff, Jonathan Goldberg, Vijay Doradla, Deutsche Bank, August 2005



WiMAX and Intel

Intel's commitment to WiMAX has created a major impetus around OFDM technology: the potential of chips embedded in devices which would provide a next generation wide-area mobile Internet service, and yet be as cost-effective as a WiFi connection today.

We believe the real challenge for the WiMAX community is not industry adoption (since Intel, in particular, has done a masterful job of gaining support for their vision for a multi-vendor open standard, with widespread support from carriers, infrastructure vendors and consumer electronics and applications providers)⁵.

The WiMAX community is now almost three years from its inception, and has moved its emphasis from fixed broadband access to portable/nomadic/mobile (personal broadband) services. The lack of a clear distinction between these two applications and markets had been the most significant source of confusion about the market application of WiMAX. The technical resolution of these different requirements has been a separation of the WiMAX standards into two components: the (non-compatible) split between the IEEE 802.16 d (fixed access) and IEEE 802.16 e (mobile) standards.

The timeframe for availability of products for both fixed and mobile products,

⁵ Trouble is, despite years of promises, WiMax has yet to move beyond trials and carefully scripted demonstrations, including those at the Intel Developer Forum.

Skeptics question whether all the promises can be fulfilled and suggest that other technologies can solve the same problems sooner.

"Any new technology that comes out takes a while before it either fails or becomes broadly established. In that period, people can say it's been overblown," said Sean Maloney, general manager of the mobility group at Intel Corp., one of WiMax's biggest cheerleaders. "I don't think that applies to WiMax."

CNN Online: August 29, 2005



which have been certified as compliant with the IEEE Standards and the WiMAX Forum Specifications is still open to debate, but the current estimate is that fixed WiMAX products will be available by the beginning of 2006 and mobile WiMAX products by 2008. In addition, many have speculated that Qualcomm's acquisition of Flarion may impact the "open" Intellectual Property for WiMAX-based technology.

WiBro and Korea

The Korean technology, WiBro, has been supported by Korean vendors and in the past year, has been adopted within the WiMAX family. The first public showcase for a personal broadband service based on WiBro is targeted for the APEC Conference in Korea in November 2005: much earlier than the comparable WiMAX/IEEE 802.16 standards based products.

Samsung recently demonstrated mobility and handover with their WiBro demonstration system, approximately two years ahead of the WiMAX schedule. Most of the news and speculations in the industry are regarding the potential competitive issues between WiMAX and WiBro and whether they are a superset or subset of one another.

WiBro has emerged in a nation (Korea) where broadband and mobile services are reaching saturation, and personal broadband has been defined as the core of the next generation of services

The real issue, therefore, is the market conditions and aspirations of the architects of these new technologies, and how they drive not only the technology but their alignment with the economic drivers of the market pull.

Market Pull

The industry still has not articulated the market and services of the broadband wireless technologies which are in development, and historical precedents are proving to be less relevant, as the applications are not yet clear. A historical perspective is useful here to show why previous technology battles in the wireless industry are not an indication of what may happen next.

In the early 1990's when the "killer application" unambiguously was voice, the industry indulged in a multi-technology battle between GSM, CDMA and TDMA. Qualcomm emerged from this battle on the basis of technology, not on questions about the application.

The emergence of Flarion, WiMAX, WiBro, Super 3G and 4G has been compared to the battles for technologies in the early days of digital cellular systems, but we assert that the picture is much more complex, since the initial application is based on access to the internet for PCs and the sustainable business models for these services are based on relatively new, small, local deployments, let alone the potential revenues and values of the types of applications and services to be delivered over these new technologies.

In markets like Korea, traditional media such as newspapers are beginning to face an acute challenge, as there has been significant shift to online and personal media delivery. The migration is a reflection of the impact of the availability, usefulness and affordability of broadband access.

Korea has adopted the market perspective of Personal Broadband, having reached saturation of conventional fixed broadband and mobility. Korean companies have taken an early and significant lead in creation of the core intellectual property and technologies to drive the adoption of personal broadband services.

In Taiwan, there was a recent announcement that WiMAX spectrum will be allocated to enable carriers to provide services for mobile broadband, but the regulator has banned VoIP services, as it may conflict with the traditional mobile services⁶. If this sets a global precedent, for example, then the future

⁶ Taipei, Aug. 29, 2005 (CENS)--Directorate General of Telecommunications (DGT) of the Ministry of Transportation and Communications (MOTC) has decided to open WiMAX wireless service, but it plans to remove voice service from the service in fear of likely protests from 3G operators.

range of services that can be delivered on broadband wireless networks will be shaped as much by regulations as by technology.

These examples illustrate the complexities and ambiguities which surround the emergence of personal broadband. The Personal Broadband Industry Association is dedicated to unifying and clarification of the market, sustainable business model and regulatory and legislative values which are focused on the economics and drivers of market pull and providing context for the technology push by the suppliers in the industry.

Conclusion

Personal Broadband is emerging as the target market for many companies, and we are alerting all that may either benefit, or have to adapt, to gain from this market.

The “distant thunder” is being heard, but we advise that this is not just about technologies, intellectual property and vendors performing wireless trials, nor about spectrum speculation in licensed frequency bands.

The upfront costs that limited participation for existing wireless and broadband deployments have been drastically reduced with new technologies. There are too many economic drivers in the market to slow these developments. The pace of technology and innovation on the web coupled with the evolution of wireless and requirements of enterprise promise innovation and growth that have already been tasted in other countries.

We are witnessing the prelude to an exciting few years, where the consumer electronics, telecoms, digital media and services industries will all combine to deliver Personal Broadband services to consumers: those who have not heard and understood the distant thunder will not be able to respond rapidly as the

DGT, Taiwan's telecommunications-industry regulator, will permit WiMAX-service operators to only run data and video services, in order to make the new service complementary to third-generation (3G) wireless service.

early indicators are not just about technology push, but the market pull of Personal Broadband.

The authors have participated in the personal broadband industry during its embryonic phase over the past decade. The shifts we are seeing in the industry implications are broader and more profound to all whose future success is predicated around touching people at every moment of their lives with digital media in digital communities. Mobile phones made it into peoples' pockets but only provide voice and messaging, which is a tiny piece of the industry: the storm that will arrive on our shores is about always-on IP services to individuals, wherever they live, learn, work and play: - Personal Broadband.

You can learn more about the Personal Broadband Industry Association by visiting <http://www.personalbroadband.org>

Technology Pioneers in Personal Broadband

It is important to note that there is a small cadre of innovative companies, who had developed proprietary wireless technologies, with performance and feature requirements which are comparable to (and in some cases more refined than) mobile WiMAX services.

Flarion Technologies, Navini Networks, IP Wireless and ArrayComm had each developed their own solutions, and each had chosen to either compete with or embrace WiMAX.

These venture-backed companies are relevant, in that they began development of their technologies earlier (albeit with much smaller resources than the WiMAX community), and their comparative performance has already been demonstrated in large field deployments or commercial service. For mobile WiMAX to reach that same level of maturity is yet another three years, i.e. mid-2008.

The point is that there will be many different technologies and technology companies vying for the radio access networks. Regardless of which of these many technologies may be the eventual "winner" (including the emerging "Super 3G" systems), the real focal point is the service capabilities they can support in all the applications and services layers to meet the needs of the user.

All these innovators are attempting to provide the best performance and economics to serve the emerging opportunities in the personal broadband market.