



**GOODBYE BOUNDARIES
HELLO DISRUPTION**

TOWARDS UBIQUITOUS WIRELESS BROADBAND

SEAMLESS MOBILITY, ONCE ONLY A CONCEPT, IS

Uninterrupted, anywhere/anytime access to information, entertainment, communication, monitoring and control, is the touchstone of future success. Already, mobile Internet access, email, instant messaging, online calendaring, on-demand music and video have joined cellular telephony as indispensable tools for everyday life. In the next generation of wireless, users will expect to enjoy more applications, more services and more content, seamlessly and over any device and any access network – wired, Wi-Fi, WiMAX, cable, evolving generations of cellular, advanced peer-to-peer networks and more.

Existing and emerging carriers are exploring multiple paths to provide the seamless, media-rich, interactive user experiences that will win subscribers and grow revenue. No matter what path a carrier ultimately chooses, competitiveness will depend on the ability to extend coverage with minimal new infrastructure costs, increase network capacity through more efficient use of available spectrum, and keep operations and maintenance expenses under control.

Beyond the individual carrier, the future will also require an ever greater level of integration from carrier to carrier, as well as from carriers to content providers and other supporting businesses. Standardized, IP-based wireless technologies will be required to support Mobile Virtual Network Enablers and Operators, multi-vendor provisioning of voice and data services, and out-of-domain third-party services. The goal is to support multiple business arrangements that provide users with all the services they want in a seamlessly unified user experience.

It's all about blurring and even eliminating boundaries – between networks, businesses, service types and locations. The disruption will be great, but for those who take advantage, the rewards will be even greater. Wireless connectivity between any device, any network and any service, anywhere, anytime – say hello to the future.

NOW THE INDUSTRY'S VISION FOR THE FUTURE.

MULTIPLE PATHS TO BROADBAND WIRELESS

To meet the market demand for new broadband services, mobile operators are building out their networks along various evolutionary paths. The 3GPP path holds promise for many cellular providers committed to the GSM family of wireless technology platforms, with a choice of upgrade roadmaps that allow carriers to add ever-faster data overlays to their existing voice infrastructure.

In addition, many carriers will find that WiMAX, mesh networks and other advanced technologies can help leverage traditional architectures to meet new goals. Operators must evaluate several critical variables to determine how and when to introduce these advanced solutions into their network mix, including the current state of the network, access to spectrum, and plans for future applications and services.

Existing carriers and new entrants will ultimately choose the path that is right for their business and their market; which could be one or a combination of evolving their existing cellular network, supplementing it with advanced networks, or completely building new networks from scratch.



E FUTURE.

Based on their current profile and future plans, each operator will have the opportunity to select a customized path to broadband wireless that optimizes investments, meets time-to-market requirements, and addresses the evolving demands of the customer base.

The good news is that all these solutions are entirely complimentary and interoperable, and Motorola is committed to supporting each evolutionary path – from 3GPP, to the full range of advanced networks, to hybrids that combine the strengths of multiple wireless technologies. Let's take a closer look at some of the possibilities.

3GPP TO LTE

Long Term Evolution (LTE) is the specification being defined by 3GPP for the next evolution of mobile communication systems architecture. Its objectives include a framework for the evolution of radio access technology toward a high-data-rate, low-latency packet-optimized radio access technology, and a complementary framework for core network evolution based on IP and incorporating IMS.

LTE will offer some unique advantages, including a wide range of supported bandwidths that will allow regulators and carriers great flexibility in location and spectrum assignment. It may even allow re-allocation of existing 2G and 3G spectrum to LTE. Another LTE advantage is that its high data rates and low latency promise an optimum medium for converged "Quadruple Play" service packages of data, voice telephony, high-speed interactive applications and feature-rich television via IPTV – all with full mobility.

While much has yet to be resolved, Motorola is working to ensure that its network infrastructure and devices can support a wide range of global frequency bands and that it can provide operators with unparalleled choice in network deployment. Today, the 3GPP roadmap includes multiple options, going from GSM via EDGE to LTE, from EDGE to UMTS to LTE or from GSM to HSxPA and deploying LTE as a complement. In the coming year, many operators will implement HSDPA and HSUPA upgrades, taking advantage of new compact equipment solutions to reduce base station costs, as well as new in-building extension solutions to enhance indoor service quality.

While the stage is set for accelerated HSxPA deployment this year, adjusting to an order-of-magnitude in network speed and traffic volume is not without its challenges. Another option that may be appropriate for greenfields as well as some existing operators is to skip HSxPA entirely, moving directly to LTE when it becomes available. And for existing HSxPA operators who have access to sufficient spectrum, LTE and HSxPA can coexist on the same network to maximize capacity in dense urban areas.



ADVANCED NETWORKS

Some operators are taking alternate paths, leveraging a new generation of broadband wireless solutions specifically designed for integrated services delivery over an end-to-end IP infrastructure. These include fixed broadband wireless solutions for unlicensed spectrum, broadband mesh networks and – perhaps most significantly for mobile operators – fixed and mobile WiMAX solutions.

WiMAX offers a broadband wireless access technology that is optimized for high-speed mobile data and high-quality VoIP. With true broadband performance, open standards design, interoperability, industry-wide ecosystem support and significant cost advantages, WiMAX offers mobile operators a wide range of opportunities to expand their service portfolios and reduce delivery costs, regardless of their existing investment profile. WiMAX is appropriate for any type of market environment, whether deployed as a complementary overlay to existing networks or as the primary access where alternatives are unavailable or unaffordable. Even carriers committed to the LTE evolutionary path will find that WiMAX can coexist in the same environment to add flexibility and accelerate time-to-market for broadband wireless services.

Motorola has developed a comprehensive portfolio of broadband wireless solutions and services that can help carriers deliver and extend coverage. Motorola's MOTOwi4™ portfolio of fixed broadband, broadband over powerline (BPL), mesh networks and WiMAX solutions offer flexibility to meet a wide range of needs. In fact, Sprint Nextel has already announced a \$3 billion-dollar initiative to build a nationwide wireless network using WiMAX technology. The company is partnering with Motorola to build the network and develop access devices. And Wateen Telecom has engaged Motorola to plan, design and deploy a nationwide WiMAX network that will serve 22 cities and 100 million users throughout Pakistan.

ALL ROADS LEAD TO IP

Without question, the next wave of mobile access and content services will be built on IP-based technologies which will initiate and accelerate a new cycle of rapid, competitive innovation based on an open development and delivery environment.

With IP as a shared foundation, mobile operators will gain an expanded ecosystem of content providers, advertisers and end users. Content, applications and services will move seamlessly across next-generation networks and devices with unprecedented efficiency. This will provide fertile ground for the creation of new services, new business models and partnerships, and new revenue opportunities.

By providing the right mix of value-added services over next-generation IP core and access networks, operators can differentiate themselves from the crowd of encroaching competitors and position themselves as the clear provider of choice for future applications and services.



Q & A



An interview with Dan Coombes, chief technology officer, Motorola Networks and Enterprise

Q. How well is the industry positioned to deliver Mobile WiMAX solutions to the market and how much traction have we seen for mass deployments?

Coombes: When we look back over the past year and reflect on all that we have accomplished as an industry, it is truly astounding the pace at which we are evolving our next-generation broadband solutions.

In late 2005, the IEEE ratified the standard behind Mobile WiMAX 802.16e-2005. The industry rallied behind the WiMAX Forum, which succeeded in delivering the first profiles for Mobile WiMAX certification. We have a host of significant market trials in every region of the world and with all types of operators. And with that, we have seen increasing numbers of operators extending their trials into full market deployments that, in many cases, include next-generation core solutions like IMS. These are arguably among the most advanced telecommunications networks ever realized on the planet.

The promise of WiMAX is heavily founded on its open-standard design and capacity for interoperation. At industry plugfests and interoperability demonstrations we are showcasing the truth that these solutions work – that equipment vendors, network operators and device manufacturers can now speak a common language.

ON THE WiMAX IMPACT

Q: Why is WiMAX so well suited to address the market demand for broadband wireless systems?

Coombes: With WiMAX we have all the pieces to drive the global evolution of broadband wireless. This is a technology that was developed from the start to handle data – not as a data overlay to a voice service.

Hundreds of companies have contributed to the development of the WiMAX technology. This broad industry participation and worldwide adoption will ensure that we realize full economies of scale, bringing down the cost points for network equipment and subscriber devices dramatically in exactly the same way that Wi-Fi equipment costs have fallen.

Q: So is WiMAX a universal solution for broadband wireless access?

Coombes: No, there is no one-size-fits-all solution. Each provider has a unique combination of existing investments, access to spectrum and end-user requirements. We have to provide a portfolio of solutions that can be architected to deliver an optimal solution in a wide range of circumstances.

With this in mind, Motorola has developed MOTOWi4™ – a comprehensive broadband wireless portfolio. One of Motorola's key differentiators in the broadband wireless market is our ability to address the full scope of the operator's deployment concerns. With next-generation core solutions, a full portfolio of end-user devices, operations and management tools and a comprehensive services portfolio, Motorola is prepared to lead service providers to the future of broadband wireless.

LOOKING AHEAD: BROADBAND WIRELESS

Just like the Internet and the cell phone, broadband wireless will quickly grow from a novelty to an essential part of everyday life. Looking five to ten years ahead, Motorola believes that new ad hoc usage models will emerge, and advanced networks will grow and interconnect to serve as the foundation for true seamless mobility – giving people continuous access to voice, data and media wherever they go.

All-IP networks will enable an unprecedented level of synergy between different networks and different devices. This interoperability will increasingly allow access-agnostic service provisioning, with support for both SIP and non-SIP services. Adding cognitive radio, multi-mode antennas, and self-configuring technologies will enable users to connect to the best available network for access to any services they require, regardless of shifting radio resources and traffic patterns. And they'll be able to roam between different domains and access points without worrying about configuring connections.

Peer-to-peer broadband connectivity will also become an increasingly important technology, providing new service models for carriers while empowering users like never before. New forms of communication and entertainment will emerge, centered around communities with common interests, sporting events, social networks and even user locations. For example, imagine a sporting event where spectators can compete with each other to predict the next play using the peer-to-peer capabilities built into their cell phones. Then, after the game, imagine that they can use a social networking service in conjunction with built-in GPS to find their buddies and discuss the game at a restaurant or friend's house.

LESS IN THE NEXT FIVE TO TEN YEARS

Broadband wireless technologies will also need to provide a high degree of user personalization, along with simple, strong security for users and content providers alike. Users will want absolute control over the kinds of content and services they receive, as well as the types of social networks and other groups they participate in. But to assert and maintain that control, they won't want to have to reauthenticate each time they cross a network boundary. By the same token, content providers will expect their intellectual property to be protected across different devices and networks. True seamless mobility will require industry cooperation and standards in the areas of authentication and identity management, trusted platforms, authorization, communication security, configuration and policy management, and digital rights management.

NEW FORMS OF COMMUNICATION AND ENTERTAINMENT WILL EMERGE, CENTERED AROUND COMMUNITIES WITH COMMON INTERESTS, SPORTING EVENTS, SOCIAL NETWORKS AND EVEN USER LOCATIONS.

Q & A



An interview with
Nicholas Demassieux,
Motorola fellow,
Broadband
Wireless Research

Q: Why do we need mobile broadband in the first place?
What are the driving forces and the potential impact to society?

Demassieux: Remember when calling someone from the street meant finding a phone booth? By the early to mid 20th century, science fiction writers like Erich Kästner and Robert Heinlein were already imagining wireless phones that people could carry and use anywhere. Decades later, when science fiction became reality, the benefits of anywhere/anytime communication were obvious. Soon, everyone had a cell phone.

Similarly, by mobilizing the Internet, we can fulfill the dreams of two age-old myths that are found in many different cultures around the world: the magic mirror, which allows people to see each other and talk remotely; and the magic wand, which allows them to control things remotely.

Most Internet users today are still tethered to their desktops, or else they have to visit an Internet café or booth. And even more fundamentally, most people in the world have never even made a phone call, let alone used the Internet. The magic mirror and wand of the mobile Internet will connect the unconnected and free users from the constraints of time and place – improving lives while fostering cultural enrichment and economic growth around the world.

ON THE FUTURE OF BROADBAND WIRELESS NETWORKS

Q: What will be the key to getting there?

Demassieux: Ongoing build-out of the wired Internet will be part of the solution, but it is too expensive and impractical to fill more than a fraction of the need. For example, think about the staggering costs of wiring up all the regions of the world that are underserved today – not to mention the competition for more than a billion existing users who want to free their Internet experience from the constraints of wires and hotspots. That's where the mobile Internet comes into play.

Connecting the next five billion users will require a paradigm shift in the way we build, deploy and use wireless technologies. Today's fragmented landscape will have to give way to a cooperative environment in which carriers, device manufacturers and standards bodies work together. We need smart, cost-effective global technology standards designed to drive down costs while simplifying interoperability.

Q: Can you give us an example? What kinds of standards and technologies will be required?

Demassieux: We need standardized technologies that transform the natural limitations of RF physics into strengths for wireless networking. For example, Motorola has demonstrated an experimental OFDM-based system that delivers very high bit rates in the 20 MHz bandwidth over a wide area, at vehicular speeds, even in difficult urban and suburban environments. This research has also led to field experiments using smart antenna techniques in WiMAX base transmitter arrays to provide substantial power gains on the downlink, without significantly impacting the cost of a standard WiMAX mobile terminal. These kinds of technologies enable a better mobile Internet experience at a lower cost, and have now been incorporated in the WiMAX standard.

We also need standards that make the broadband wireless experience seamless and secure for the end user. All-IP networks provide an essential foundation, allowing users to enjoy a consistent experience as they move between different networks and devices. Cognitive radio and multi-mode antenna technologies will allow devices to use the best available network in any environment. Self-configuring technologies will allow devices to access these multiple networks, roam between them, and even form peer-to-peer connections without placing a burden of complexity on the user. The industry will need to adopt standards in all these areas – as well as security standards that protect users, devices, networks and intellectual property in a future where worlds of information are literally in the air, everywhere you go.



Q: What is Motorola doing to help make all this happen?

Demassieux: Motorola has a strong core of wireless technology research, and we're already playing a key role in developing next-generation broadband wireless networks that approach the price/performance of wireline networks.

Motorola is also helping pioneer the needed standards. For example, we're working to leverage WiMAX and OFDM to accelerate technology convergence within standards families like 3GPP, 3GPP2, 802.11 and 802.16. We're engaged in the ITU-T NGN-GSI initiative to create standards for packet-based networks that support ubiquitous mobility. We work with the IETF on Internet standards such as SIP, which supports transport-independence for VoIP, multimedia distribution and more. We collaborate on a variety of initiatives to ensure end-user security as well as to protect the intellectual property of content providers.

And that's just the beginning of what Motorola is doing to help usher in the next generation of broadband wireless. But we can't do it all alone. Ultimately, the key to success will be industry-wide collaboration in the spirit of the open innovation model. Motorola's expertise, continuous innovation, and ongoing participation in wireless standards will help us drive that collaboration – optimizing the price, performance and reach of seamless mobility and enabling a truly mobile Internet.

ABOUT MOTOROLA

Motorola is known around the world for innovation and leadership in wireless and broadband communications. Inspired by our vision of seamless mobility, the people of Motorola are committed to helping you connect simply and seamlessly to the people, information, and entertainment that you want and need. We do this by designing and delivering “must have” products, “must do” experiences and powerful networks – along with a full complement of support services. For more information on our company, our people and our innovations, please visit <http://www.motorola.com>



MOTOROLA

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