



4G Revisited

The continued evolution of wireless mobility.



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4G Revisited

THE CONTINUED EVOLUTION OF WIRELESS MOBILITY.

Abstract

This white paper examines the two leading 4G technologies and the current status of deployed 4G networks. It continues with advice on managing long-term 4G costs. The paper concludes with a discussion of next steps and our position.

Introduction

A few short years after 3G service brought us anytime, anywhere broadband—and before Apple rolled out its 3G iPhone—4G networks began raising the bar in select markets. This latest evolution in wireless networking offers faster wireless data transmission speeds, vastly superior coverage and support for a new generation of mobile applications and services.

Do we really need something better than 3G?

Some still question the timing of deploying 4G. The weak global economy presents very real challenges. Moreover, few if any carriers have recouped the significant investment they poured into their 3G networks. So do we really need another wireless technology? Most industry analysts and economists say yes.

The GSM Association expects the mobile industry to experience continued growth in usage, despite the recession, and to provide stimulus for the global economy. Many governments believe the time is right for wireless investment as well, as evidenced by China's Wireless Cities Initiative and wireless infrastructure projects in the Asia Pacific region and across Europe. In fact, the European Union is currently investing € 1 billion to create new jobs, promote business growth and help rural areas get online.ⁱ

The U.S. Government's IT and broadband stimulus investment is one of the largest single investments supporting 4G. In their Spring 2009 research paperⁱⁱ, Alan Pearce and Michael S. Pagano estimate that "new wireless broadband investments of \$17.4 billion will, within twenty four months of making this additional investment, increase gross domestic product (GDP) by 0.9% to 1.3%, which translates in dollar terms to \$126.3 billion to \$184.1 billion, and will result in an increase of between 4.5 million and 6.3 million jobs."

According to research conducted by AT&T and Accenture, the top three benefits of wireless enablement include increased productivity, reduced costs and improved customer satisfaction. In addition, faster, more available wireless access made possible by 4G technologies will help users address changing mobility dynamics:

- Consumers and mobile workers have become increasingly dependent on mobile broadband for productivity and convenience.
- More people continue to work outside the traditional office setting. Industry analysts estimate that the mobile workforce could exceed 800 million in 2009, and these workers spend as much as 40 percent of their time away from their desks.



- Customers expect constant accessibility and responsiveness—whether mobile workers are in or out of the office.
- Emerging Internet applications such as VoIP, virtual collaboration, and rich video and audio content such as Webcasts, training and business presentations demand increasing amounts of bandwidth.

What is 4G?

4G is the next evolution in wireless broadband connectivity, designed primarily for data transport versus voice networks pulling double-duty as data movers. Two leading technologies comprise 4G: Worldwide Interoperability for Microwave Access, better known as WiMAX, and LTE, which stands for Long Term Evolution. Both of these 4G technologies are IP-based and use a digital modulation method known as orthogonal frequency-division multiplexing (OFDM).

- **WiMAX** is based on the open IEEE standard (802.16) and delivers up to 70 Mbps at up to 30 miles. It is backed by Intel, Motorola, Google, Sprint Nextel, Clearwire and major cable operators. The faster 802.16m standard is due to be ratified in 2010.
- **LTE** is a set of enhancements to the Universal Mobile Telecommunications System (UMTS). With speeds up to 250 Mbps tested, LTE is a proprietary protocol being designed by carriers and equipment vendors such as AT&T, Verizon, Vodafone, T-Mobile and NTT DoCoMo. Regarding speed, LTE will be faster than current WiMAX networks, however 802.16m will close the speed gap.

Will one standard win out over the other?

LTE and WiMAX are both likely to survive, but one will most probably dominate. Because GSM is the predominate 3G technology in use today, many industry luminaries predict that LTE may eventually become the dominant standard.

LTE also requires less carrier investment, allowing operators to take advantage of 3rd Generation Partnership Project (3GPP) technologies. Technologies like High Speed Packet Access enhanced (HSPA+) should only require moderate hardware and software upgrades to fill the performance gap between today's 3G and the 4G of tomorrow.

WiMAX technology, on the other hand, comes with a price, requiring a new infrastructure of hardware and software. According to WiMAX proponent Intel, WiMAX offers the lowest cost per bit for new broadband deployments and the best economics for new, easily upgradeable networks. Therefore, WiMAX shows the most promise in rural, underserved areas and developing countries, where there is less legacy 3G infrastructure installed, mitigating the investment issue.

Then again, WiMAX has a multiyear head start on LTE, as LTE is three years behind WiMAX in terms of standardization.

WiMAX in action

The WiMAX Forum estimates that as of July 2009, there were 487 WiMAX deployments in 141 countries. According to Juniper Research, there will be 50 million global WiMAX 802.16e broadband subscribers by 2014, generating upwards of \$15 billion in mobile WiMAX service revenues.



- **South Korean WiBro service** launched in and around Seoul in June 2006. Based on the IEEE 802.16e international standard, this commercial mobile WiMAX service offered users wireless Internet connections while on the move at speeds as high as 120 km (74 miles) per hour. By 2007, the service covered all areas of Seoul, including every subway line, as well as Incheon city and throughout the GyeongGi-Do province. Korean telecoms plan on rolling out voice-over-WiBro sometime in 2009.
- **Taiwanese M-Taiwan program** launched in 2005 to blanket the nation in wireless broadband access. Now in the fifth year of the state-sponsored program, WiMAX networks are deployed in 15 cities and counties, including Taipei, Taoyuan, Taichung, Kaohsiung, Pingtung and Hualien. In Q1 2009, the number of wireless users was reported to be 7.3 million.
- WiMAX deployments in the U.S. include:
 - **XOHM** debuted in Baltimore, its first major U.S. city, on Sep 29, 2008.

- **Clearwire**

The following markets are online or scheduled to go live by the end of 2009:

Atlanta, GA	Chicago, IL	Dallas, TX	Las Vegas, NV	Portland, OR
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- **Sprint**

The following markets are online or scheduled to go live by the end of 2009:

Abilene, TX	Amarillo, TX	Atlanta, GA	Austin, TX	Bellingham, WA
Boise, ID	Charlotte, NC	Chicago, IL	Corpus Christi, TX	Greensboro, NC
Honolulu, HI	Las Vegas, NV	Portland, OR	Killeen-Temple, TX	Lubbock, TX
Maui, HI	Midland-Odessa, TX	Philadelphia, PA	Raleigh, NC	Salem, OR
San Antonio, TX	Seattle, WA	Waco, TX	Wichita Falls, TX	

LTE in action

The LTE standard has been complete enough that several vendors have been shipping pre-standard chipsets, test equipment and base stations since early 2008. Likewise, vendors in North America, Asia and Europe are already moving forward with deployment plans this year:

- Verizon has committed to launching a pre-commercial LTE service in two U.S. cities in late 2009. Commercial service will officially go live the following year, expanding to as many as 30 markets.
- Fujitsu is partnering with Freescale Semiconductor to facilitate LTE deployments in Japan in late 2009.
- ABI Research believes that NTT will also deploy LTE in Japan in 2009.
- In Europe, TeliaSonera, Tele2 and Telenor will each begin rolling out their networks in 2009 and make commercial services available in 2010.

Ongoing trials by operators such as Vodafone indicate that large deployments for LTE will take place in late 2011, with wide-scale deployments beginning in 2012.

According to Tole Hart of Gartner, Inc. in the “Gartner says Mobile VoIP Poses a Huge Challenge for Traditional Mobile Voice Providers” press release dated May 5, 2009, “Mass-scale adoption of end-to-end mobile VoIP calling will not happen until fourth-generation (4G) networks are fully implemented in 2017.”ⁱⁱⁱ



Managing costs

As with 3G mobile broadband, 4G access will come at a price. Therefore, companies will want to put strategies in place for managing their 4G costs, including:

- Make sure those employees who will need 4G access have it. This will help dissuade them from buying more expensive individual 4G subscriptions and burying the costs in expense reports.
- Outfit each mobile worker with a combination of mobile broadband technologies, such as 4G, Wi-Fi and Ethernet. Better yet, give them an integrated client that simplifies connecting to each network type. Whenever Wi-Fi or Ethernet networks are available, users should then be able to seamlessly connect to them instead of pricier 4G—and drive down access costs. A single client will also reduce IT support costs.
- Buy 4G access in bulk to net attractive pricing and additional discounts. Corporate users can then share a pool of megabytes. Not only does this reduce access costs, it helps companies avoid overage charges that often occur with “fixed-rate” individual plans.
- Integrate 4G AAA with your existing user database. This will eliminate the need for redundant management while allowing employees to use their existing corporate credentials—and reduce ongoing IT and help desk costs.

What should you do?

4G will usher in an era of pervasive mobility that will change the way people interact with each other while they're on the move. In particular, mobile video technology will provide a richer experience.

What should you be doing today in anticipation of the 4G technology shift? While you may not deploy 4G on a broad basis until 2010 or later, now is the time to begin developing your company's mobility strategy. Determine where 4G fits in, and ensure you have the appropriate amount of lead time to develop and test applications that will be unique to your business. iPass is, of course, always available to help.

Conclusion

4G networks are the logical evolution of wireless data services. At iPass, we believe 4G will offer significant value to enterprise customers and should be part of your enterprise mobility roadmap. The transition to 4G will occur over time and should be viewed as a complementary technology rather than an either/or proposition.

iPass will support both LTE and WiMAX technologies. We will continue supporting dial, Wi-Fi, hotel Ethernet and 3G access. We view 4G as a logical extension of our global virtual network. Our software-based platform provides the unique ability to embrace any network or device type to unify mobility, minimize technology risks and manage costs in this increasingly diverse world. As the number of network deployments and various types of mobile broadband devices increase, iPass will provide seamless access, control, management and unified billing of 4G through the iPass Mobile Office service.



Learn more about 4G technology

Learn more about the evolution of 4G technologies:

- Visit the WiMAX Forum Web site www.WiMAXforum.org.
- Visit the 3rd Generation Partnership Project (3GPP) Web site www.3gpp.org/article/lte.
- If you missed the first iPass 4G white paper, *4G Ahead! A new world of enterprise mobile broadband*, download it at <http://info.ipass.com/content/AssetDownload?docid=4GAhead>.
- View the iPass 4G video presentation at www.ipass.com/misc/4G_ahead.html.

About iPass

iPass helps enterprises unify the management of remote and mobile connectivity and devices. With iPass software and services, customers can create easy-to-use broadband solutions for their mobile workers, home offices and branch and retail locations, complete with device management, security validation and unified billing. iPass offerings are powered by its leading global virtual network, on-demand management platform and award-winning client software. The iPass global virtual network unifies hundreds of wireless, broadband and dial-up providers in more than 160 countries. Hundreds of Global 2000 companies rely on iPass services, including Ford, Nokia and Procter & Gamble. Founded in 1996, iPass is headquartered in Redwood Shores, California, with offices throughout North America, Europe and Asia.

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ⁱ *Commission Earmarks €1bn for Investment in Broadband – Frequently Asked Questions*. Memo, Europa. January 28, 2009.

ⁱⁱ *Accelerated Wireless Broadband Infrastructure Deployment: The Impact on GDP and Employment*.

ⁱⁱⁱ *Gartner, Inc., Gartner says Mobile VoIP Poses a Huge Challenge for Traditional Mobile Voice Providers*, May 5, 2009.

