WiMax Reality Check

EXECUTIVE SUMMARY

The broadband wireless telecom sector has seen more than its fair share of build-and-destroy cycles. Surviving vendors are in the midst of resurrecting broadband wireless; this time, the foundation is WiMax, the marketing name for the emerging technology based on the Institute for Electrical and Electronics Engineers (IEEE) 802.16 standard.

WiMax Reality Check analyzes the current state of technology and market development for this latest incarnation of broadband wireless technology. The report is based on information from and direct interviews conducted in the third quarter of 2004 with more than 100 technology suppliers, service providers, and investors with a direct interest in the WiMax market. The report includes insight and analysis into the following critical areas:

- Potential WiMax applications, including mobile services, backhaul, DSL extension, and fixed/mobile convergence
- Potential users, including cellular operators, DSL providers, and enterprises
- Drivers of and barriers to adoption of WiMax technology
- The evolution of the 802.16 standard
- Spectrum options for WiMax networks
- Infrastructure and user equipment pricing
- Deployment outlook by region
- Vendor strategies and competitive positions

There are plenty of reasons to be hopeful that WiMax will succeed where previous broadband wireless efforts have failed. Among the main reasons for optimism:

- **Bandwidth.** 802.16 equipment certified by the WiMax Forum will be able to support shared throughput of up to 75 Mbit/s. That puts WiMax in a position to compete with existing technologies such as third-generation (3G) cellular, many copper-based access services, and 802.11 wireless LAN services (a.k.a. WiFi).
• **Performance.** Unlike other broadband wireless technologies, such as first-generation MMDS, WiMax doesn't require a clear line of sight between the base station and the user's equipment. As a result, WiMax can tap a wider pool of customers than just those with a clear view to the transmitter.

• **Coverage.** WiMax Forum-certified base stations will have a coverage radius of three to five miles, depending on factors such as terrain and population density. This coverage is closer to cellular than WiFi. The more geography a WiMax base station can cover, the lower the service provider's overhead costs.

• **Spectrum.** WiMax can be used in licensed and unlicensed frequencies, initially between 2 GHz and 11 GHz, with the possibility of future support for frequencies up to 66 GHz. The first WiMax-certified products will be available for the 2.5GHz, 3.5GHz, and 5.8GHz bands. Spectrum flexibility is important because it widens the deployment options and, as a result, the technology's market potential.

• **Industry support.** More than 100 equipment vendors and service providers are currently members of the WiMax Forum, the industry's primary trade association. Widespread support this early in WiMax development strongly suggests that the technology will be a mainstream rather than niche play.

• **Interoperability.** The WiMax Forum's main *raison d'être* is to coordinate the testing and certification of WiMax products to ensure interoperability between equipment made by different vendors. Unlike many other broadband wireless technologies, WiMax equipment isn't proprietary, so service providers and end users can buy different pieces of equipment from different vendors. This approach stimulates competition, which helps drive down deployment prices.

**Key Findings**

Key findings of *WiMax Reality Check* include the following:

*WiMax will debut as a way to deliver fixed services before expanding into portable and finally mobile services.* Initial uses of WiMax will be focused on backhaul connection of network access points to wireline infrastructure. The most obvious use of WiMax in this context is for connecting 802.11 "hotspots" to wired networks, but WiMax will also be deployed for backhaul connections of DSL-type services offered by competitive local exchange carriers looking to bypass incumbent-owned wireline networks.

*There is no industry consensus on exactly when WiMax will become a mainstream option for service providers.* The first WiMax Forum-certified products should be commercially available by mid 2005, based on the current schedule for interoperability testing. Intel is one company that takes an aggressive line, saying products capable of supporting portable services will hit the market by late 2005. Intel expects PC card-type WiMax modems to debut in 2006, followed by Centrino-style chipsets by late 2006. Intel's outlook is noteworthy because most companies (even rivals) agree that it's a dominant influence – if not the dominant influence – in this market. Nevertheless, Intel can't carry the WiMax sector alone, so it's important to note that other vendors don't envision mobile products until 2007 or 2008.

*Whenever it arrives, WiMax will be a critical network technology force for a long time.* There are several reasons to believe that WiMax will develop into a major market over the next several years. First, its backers have learned from the mistakes of MMDS and 802.11, and thus they've taken important steps toward avoiding the problems that plagued those technologies, such as interoperability and business-case-annihilating overhead. Second, WiMax promises a better-performing, less-expensive alternative to many – but not all – technologies that already serve its target applications. Finally, although competition will be fierce on the equipment side, it
will quickly drive down costs for users and service providers, in turn improving the chances that WiMax will be much more than a niche play.

For competing technologies, WiMax will be more friend than foe – at least initially. If only half of its backers' bullish claims about performance and equipment pricing hold up in the real world, WiMax will be a viable option for applications such as 802.11 "hotspot" backhaul and for extending broadband to areas that can't be served by wireline DSL infrastructure. But toward the end of this decade, as WiMax's footprint grows and its costs drop even further, it could begin to displace cellular and 802.11. In the short term, WiMax could affect DSL in certain areas. For example, CLECs may use WiMax as a way to bypass ILECs' leasing fees. And in areas where the copper infrastructure is still in the midst of being upgraded for DSL, WiMax could compete because both technologies will be in the early stages of their fixed-cost amortization curves.

Vendors and service providers view WiMax as a potential key enabler for fixed/mobile convergence. There are already many ways for a wired service provider to offer portable and/or mobile services. For example, besides the obvious option of buying a cellular operator, some wireline network providers now offer 802.11 service, either by building their own network of hotspots or by reselling a partner's service. WiMax will emerge as another option for creating new revenue streams, offering a bundle of services to attract and retain customers, and to grab market share from cellular rivals. As Alcatel puts it: "[Broadband providers] want a piece of mobility. They feel that if they do nothing, broadband will diminish. They see WiMax as an opportunity to first provide extended range on broadband access and, later on, to offer mobility."

The business case for WiMax as a vehicle for triple play – voice, video, and data – is unclear. WiMax can clearly handle voice and data, but video may be possible only at higher frequencies, where more traffic can be shoehorned into less spectrum. The catch is that signals don't travel as far at higher frequencies, so more radio infrastructure will be required, increasing the service provider's overhead.

WiMax is one of the most crowded emerging markets in telecom history, yet companies continue to pile on. The wheels won't fall off – but many vendors will. There simply isn't room for everyone, and the initial casualties are likely to take place as early as mid 2005, based on the size and timing of the initial WiMax market. Even if mobile WiMax equipment becomes available in late 2006 – a wildly optimistic date – the market will be relatively small, consisting primarily of fixed deployments such as backhaul and DSL extension. Considering that so many would-be WiMax vendors are currently unprofitable, it's difficult to see how they can hang on until the market takes off in earnest. Granted, they can always hope that investors will come through and tide them over, but many of those investors were burned by broadband wireless just a few years ago. WiMax is clearly a better bet than MMDS, but that doesn't mean VCs won't tar it with the same brush.

Equipment pricing is still in flux, but it's already clear that pricing pressure will be significant at the market's start and will only increase. Estimates for WiMax base stations vary significantly, from $10,000 for a bare-bones model to $150,000 for full-feature units, and some vendors say that the top-end estimates have already fallen by half. For customer premises equipment, the consensus is that the initial crop of devices will be in the $250 range and quickly fall to $50 in subsequent generations. Pricing pressure will winnow the field of WiMax vendors, particularly those already on shaky financial ground.

Report Scope and Structure

Heavy Reading contacted all of the companies publicly listed as members of the WiMax Forum as of August 1, 2004, as well as key wireless technology suppliers and service providers that were not forum members at that time but that are considered influential forces in WiMax's development. In all, information from 150 different companies was used to compile this report on the WiMax state of the art.
The report's structure is as follows:

- **Section II** offers complete background information on WiMax technology, including the evolution of the 802.16 standard and the Forum's certification process.

- **Section III** identifies and analyzes the key factors that will shape the WiMax market, including spectrum issues, equipment pricing, regulatory issues, and competition from existing and emerging technologies.

- **Section IV** explores prospects for potential WiMax applications, including mobile services, backhaul, and DSL extension, as well as the types of service providers and enterprises that may use the technology.

- **Section V** offers capsule summaries of strategies and competitive positions for 24 public and private companies now developing or considering WiMax product lines.

The report is essential reading for a wide range of industry participants, including the following:

- **Wireless service providers:** What is the most realistic timetable for WiMax technology development and the arrival of commercial products? How will the economics of early-generation WiMax fit into your plans to expand access and backhaul networks using broadband wireless? How much risk will there be in being an early adopter of WiMax? Is it realistic to consider using WiMax in unlicensed spectrum?

- **Wireline service providers:** Will WiMax offer an efficient and cost-effective way to extend broadband access services in underserved areas, such as rural markets? Is there a way to take advantage of WiMax to minimize competitive threats from wireless network operators? How important will WiMax be in efforts to converge fixed and mobile network services?

- **Equipment vendors:** What do your competitors see as the realistic time frame for delivering WiMax-based products? What are the most likely price points for market acceptance? How will standards efforts affect the timing and delivery of enabling technologies? Which types of service providers will be most receptive to considering WiMax?

- **Components manufacturers:** How do your WiMax development plans compare with those of your competitors? How will strategic decisions by big players such as Intel affect the overall development of the WiMax market? Which equipment makers will be most likely to develop WiMax-based products first?

- **Investors:** Which technology vendors are in the best position to capitalize on the emerging WiMax market? What is a realistic timeframe for market development? Is now the right time to jump into WiMax, or is it wiser to wait for the market to develop further before trying to separate the winners and the losers?

**WiMax Reality Check** is published in PDF format. The report is sold as an enterprise license, which means it can be distributed throughout the purchaser's organization.