

Speed Bumps on the Wireless Superhighway: Obstacles on the Road to WiMAX



By [Daniel P. Dern](#)

Date: Oct 21, 2005

[Return to the article](#)

WiMax holds a lot of social promise. But what are the technical challenges that could slow down its adoption? Daniel Dern gives you a short-and-sweet overview of the issues.

The value of broadband network speeds, whether for Internet access or internal applications, is inarguably compelling. Cable, DSL and fibre have made broadband available to an ever-growing number of homes and businesses.

The same applies to wireless network connectivity: the more you use it, the more useful it gets. Combine broadband with wireless, and you get Broadband Wireless Access (BWA), good for everything from Internet activity like graphic web browsing, streaming audio/video, VoIP, and serious gaming through private applications (which may be travelling in part over the Internet) such as telemedicine, security and safety.

Wireless service requires transceivers to send and receive signals. This typically involves some form of base station (like a WiFi Access Point), and client-side capabilities — add-on accessories, like PCMCIA or USB WiFi cards, or embedded into devices, the way most new notebook computers now include WiFi. (Devices may act as peers, and/or create meshes, but the principle is the same.) If users are buying service, somebody has to act as the "carrier," deploying base stations (in licensed or unlicensed frequencies), and presumably also connect these base stations to the Internet (and provide billing, accounting, security, etc.).

WiFi (802.11) has made broadband wireless access available on a building-area-ish basis, in coffeeshops, airports, libraries, city centers and other areas... but service is only available within a range of maybe a hundred yards (unless you're prepared to tote a Pringles can on your shoulder). Mesh deployments can extend coverage areas, but they still require a fairly dense deployment of WiFi access points.

Next-generation ("2.5G") wireless cellco services, such as Verizon's EV-DO, are

making near-the-low-end-of-broadband services available. Cellco data services offer the area reach that WiFi Access Points can't match... but don't get into serious broadband capacity. Cellco service also has other limits, like inability to do bandwidth reservation.

One emerging contender for Broadband Wireless Access is WiMAX (Worldwide Interoperability for Microwave Access), an industry consortium-based specification implementing the IEEE 802.16 Air Interface Standard.

According to [WikiPedia](#), "WiMAX is a certification mark for products that pass conformity and interoperability tests for the IEEE 802.16 standards. IEEE 802.16 is working group number 16 of IEEE 802, specializing in point-to-multipoint broadband wireless access."

The initial version of 802.16 — 802.16d — is intended for fixed-location applications such as private line bypass, and last-mile broadband access, in metro and even rural areas. A subsequent version, 802.16e, will include support for roaming (across service cells), making mobile use more meaningful.

According to [Wimax.com](#), "WiMAX can provide broadband wireless access (BWA) up to 30 miles (50 km) for fixed stations, and 3 – 10 miles (5 – 15 km) for mobile stations. In contrast, the WiFi/802.11 wireless local area network standard is limited in most cases to only 100 – 300 feet (30 – 100m). With WiMAX, WiFi-like data rates are easily supported, but the issue of interference is lessened. WiMAX operates on both licensed and non-licensed frequencies, providing a regulated environment and viable economic model for wireless carriers."

You can use it to "bridge" — connect equipment and locations where running fiber or copper cabling is too expensive, disruptive or impractical, e.g. over rivers and lakes, across rocky valleys or icy terrain. You can provide connections for emergencies, short-term needs for more capacity or ephemeral locations. You can support mobile voice, data and video applications, like telemedicine and emergency services. And you can bring broadband Internet access to the un- and under-served.

Most DSL and cable offerings are asymmetric; the "downstream" (provider to customer) bandwidth usually is much greater than "upstream" (customer to provider). However, WiMAX can be "symmetric," providing equal bandwidth in either direction, or even asymmetric giving more upstream bandwidth than down," notes S.K. Chang, Director of Product Management at Aperto Networks

Also, like WiFi, and unlike today's cellular services, WiMAX allows different customers to purchase, and to be allocated, different amounts of service. And unlike WiFi, which is based on Ethernet, WiMAX is based on the cablemodem DOCSIS protocol, says Michael Finneran, President, dBrn Associates, Inc., an independent wireless telecommunications consultant. "It's a much more sophisticated protocol... it's

'request/grant,' unlike Ethernet, so there are no collisions on the inbound channel, and unlike WiFi, WiMAX 'doesn't have to treat everyone equally,'" says Finneran.

WiMAX has begun to arrive. There are millions of pre-WiMAX links already in use around the world: proprietary, vendor-specific implementations. Vendors like TowerStream are offering wireless fixed broadband in a number of cities, using pre-WiMAX. Intel will be adding WiMAX capabilities to its Centrino chipsets during 2006.

Is WiMAX, like WiFi, broadband-to-the-home, and a nothing-but-Law&Order-reruns cable channel, inevitable and fast approaching?

Not necessary, according to a number of industry experts. WiMax faces a number of obstacles — speed bumps on the wireless superhighway.

Competing Technologies

Until relatively recently, cell phones have been primarily just for talking. While the current cell networks — second generation, all digital (the first generation cell network was analog) — can support data traffic, speeds haven't been much better than that of a POTS modem on a dial-up phone line on a good day.

The cellcos (cellular phone providers) have been working on their "next-generation" networks — data, and higher speeds. Third-generation ("3G") is getting closer; mostly, we're at more like what's humorously called "2.5G" — better than the 2G service, but nothing like serious broadband speeds.

"WiMax already has competitors today in EV-DO, one of the cellco broadband offerings]," says mobility guru Chris De Herrera, creator of [MobilityTalk](#) and other popular mobile/handheld sites. "While EV-DO is slower (500kbytes/s), it is already deployed, and has an 'all you can eat' pricing model of \$59.99 from Verizon nationwide. EV-DO does fall back to 1xRTT (128k) in rural areas. So will WiMax be cheaper or faster, or is this just another wannabe technology? Also, the currently defined 3G standard of WCDMA is a future competitor."

WiMAX has a number of things going for it, including mobility, support for time-sensitive traffic, and bandwidth reservation. Cellular networks won't have that until they get to their next generation; 4G, an all-IP broadband wireless network.

On the other hand, cellular is here now, and has a huge installed base, which also means an existing customer set that can be marketed to.

Completely different technologies could, of course emerge. On one hand, they would face the same base level challenges that 2.5/3G, WiFi and WiMAX have and do, namely reaching vendor standards, affordable gear, service deployment, and

critical-mass acceptance.

Cellco's aren't the only competing competition; within the wireless IP space, there's also "[TD-SCDMA](#), and another IEEE standard, 802.20, being worked on by folks like [Flarion](#). Plus WiFi, with the help of meshing and a lot of Access Points, can be used to blanket metropolitan areas; while WiFi may not provide the same tech specs, it has the advantage that dang near everybody already has WiFi-equipped devices, or could get the necessary add-ons through a simple shopping click or lunch-time stop.

WiMAX may also end up competing with itself. It's entirely possible that the mobile version of WiMAX will use different frequencies from the fixed version, which could mean different carriers and/or gear.

Deployment Considerations

De Herrera has a number of concerns regarding WiMAX. "One, it is shared bandwidth that is covering a large area. So as the number of subscribers increases, the performance will go down, unless they install additional access points.

"Two, WiMAX hardware deployment: Will consumers see the need for an additional wireless network card for their notebooks? How easy will it be to move between WiMAX and WiFi/802.11g networks? (Picture making a VoIP call and moving around.) How will this work in the enterprise, where WiMAX and WiFi networks overlap, and the enterprise does not want corporate data to go over the Internet?"

It's not clear whether WiMAX will be a consumer-oriented mobile service, at least early on — and with Intel working on including WiMAX in their mobile chipsets, for negligible additional cost, some of this may be moot. As for moving VoIP calls between WiMAX and WiFi, since both are IP, the handoff should be far easier than the already-being-worked-on cell-to/from-VoIP handoffs.

Cost, of course, counts — especially for consumers. To compete with fixed broadband, the CPE (Customer Premises Equipment, equivalent to your cablemodem) will need to be in the sub-\$100 range, or to be folded in transparently to the cost of service, rather than another \$300. Businesses, on the other hand, may be more price-tolerant, especially if they don't have any other meaningful broadband options.

De Herrera also wonders whether there is enough antenna space to support WiMAX. "This is the ongoing debate regarding the number of cell sites and the number of antennas there." Antenna space is affecting the rollout of HDTV for the same reason, De Herrera notes.

Another interesting question in terms of WiMAX deployment. Who has the extra \$5+

billion dollars to lay out to build this network? Says Herrera, "The cellular networks don't, and neither do the local telcos."

One answer: WiMAX won't, at least initially, be a wide roll-out, any more than the cellco's 3G services are. It will happen a city at a time, which is how BWA providers like TowerStream are doing it.

Hey Folks, It's Radio

WiMAX — like any wireless technology — has its limits and constraints. For example, "Radio channel behavior is highly variable," Craig Mathias, principal at wireless consultancy Farpoint Group, points out. People are contending for bandwidth in a rapidly-changing environment. "Mobility makes it worse," he adds. Changes in distance impact bandwidth; physical obstacles may further reduce service; and the system has to determine when to switch from one service cell to another.

Pocket-Sized Or Not?

As any cell phone or WiFi user knows all too well, sending radio signals chews up power. "Is WiMax going to be low power and small enough to be supported in small form-factor, low-power devices like cell phones and Pocket PCs?" asks Chris De Herrera. "This question is critical to understand how broad the audience that can be supported with WiMax."

If You Deploy It, Will They Come?

The big question for WiMAX, in North America, is whether there's a viable market, says Craig Mathias. "It's not clear whether there's a big market for fixed WiMAX in the United States, because there's already a lot of competition in wired and in non-WiMAX wireless. And we haven't had a chance to try the products and service yet... we'll know more by the end of 2005."

As for the mobile-oriented version of WiMAX, "Mobility is the key application for wireless service," Mathias acknowledges. "The question is, given other competitors, especially cellular, what will WiMAX do to obtain market advantage?"

"WiMAX looks great on paper," agrees dBRN's Finneran. "The markets will be the true test... price, capacity and ease-of-implementation will be major factors."

Farpoint's Mathias currently sees fixed WiMAX as dominating the broadband wireless access business for point-to-multipoint, possibly also for point-to-point. Mobile WiMAX, he feels, faces significant competitive hurdles. "But the WiMAX industry has a lot of smart, committed players... and marketing is just as important as technology."

© 2007 Pearson Education, Inc. Informit. All rights reserved.

800 East 96th Street Indianapolis, Indiana 46240