

SOLECTEK



WiMAX
FORUM
PRINCIPAL MEMBER

WHITE PAPER

Capturing customers **today** with WiMAX 802.16d: The business and technology case for fixed WiMAX

Dr. Eric Lee and Todd Easterling
January 25, 2007



“Although the WiMAX movement continues to focus on mobile opportunities, it is the traditional fixed wireless market that will remain the technology’s bread and butter through 2009.”

Market research firm:
Visant Strategies

For fixed broadband operators, WiMAX is here today

As a Principal Member of the WiMAX™ Forum with experience manufacturing wireless equipment since 1989, Solectek Corporation has researched the merits of the 802.16d standard for fixed broadband wireless and the forthcoming 802.16e standard for fixed and mobile applications. Solectek believes that 802.16d, which is proven in the field and available today, is the best option for operators to immediately enhance revenues by capturing readily available customers, and that 802.16d will remain the dominate fixed WiMAX solution to the end of the decade or longer.

Unlike mobile WiMAX broadband systems being discussed for future deployment, 802.16d is optimized for fixed broadband delivery to homes, businesses and other fixed locations. According to WiMAX research firm Visant Strategies, it is “the traditional fixed wireless markets that will remain the technology’s bread and butter through 2009” (source: Visant report/press release: Amidst Mobile Aspirations, Many forget other WiMAX Opportunity).

Why operators should deploy WiMAX 802.16d:

- **Securing customers and revenue streams today is job one for any carrier.** For the foreseeable future, the only way operators can grow their subscriber base and profits is with WiMAX 802.16d products.
- **802.16d is the only way to increase the value of your company today.** Operators/Carriers valued — as a company — by the number of paying subscribers. The only way to increase the valuation of a carrier today (or the value of a distributor selling to carriers) is to use 802.16d. First versions of 802.16e equipment are expected in late 2007 to early 2008 and most mobile carriers typically test new technology for 12 to 18 months before wide deployment. There are even reports that the 802.16e market is 3 to 5 years away.
- **802.16d creates barriers to entry and enhances competitive position.** If a carrier does not choose to deploy 802.16d in the 3.5GHz or other frequency bands, their competitors will. 802.16d can help keep competitors at bay, both now and as new technologies and services become feasible and economical.
- **Broadband to homes, businesses and government buildings is a utility and such customers don’t care how it is delivered.** Customers that need broadband service don’t care what standard is used, anymore than they care what type of transformers or wires their electric company uses to deliver their electricity. What they do care about is obtaining quality service now (not in two to five years), reliability and competitive pricing. 802.16d delivers this today.
- **Fixed and mobile applications are fundamentally different business models.** Just as DSL or cable modems serve homes, or fiber optic and T1 lines serve broadband to businesses, 802.16d is tailored for this same ‘permanently installed’ customer base, especially in geographic areas with little or no wired infrastructure. Conversely, 802.16e is similar to the mobile cellular business model, delivering data to people on the move and generally with





less than ideal speed and reliability. The 802.16d service model is about providing DSL/Cable modem-like services to homes and businesses — without the high infrastructure costs, installation delays, and right-of-use challenges involved in trenching cables. In addition to standard internet service, 802.16d is the best solution for homes with demand for high bandwidth always-on interactive services, such as real-time online video games.

- **Widely available 3.5GHz licenses are for fixed, not for mobile.** The opportunity to deploy fixed broadband services is here now for savvy operators that secure a foothold in the 3.5GHz frequency band available in most parts of the world. 3.5 GHz licenses are only granted for fixed wireless applications. This precious resource, the equivalent of “wireless real estate,” will be used for fixed broadband delivery — not for mobile applications which will be in the 2.3GHz and 2.5 GHz bands. The bottom line: if you don’t deliver broadband to customers in the 3.5GHz band, your competitors will, regardless of future mobile broadband deployments.
- **Capturing customers with fixed services in 3.5GHz can later lead to offering mobile services in other frequency bands.** Operators can leverage their existing 3.5GHz fixed wireless license and customer base to later offer mobile services to their customer base in other frequency bands. If a carrier can create a positive customer relationship, quality service and accurate billing with fixed broadband users today, they can later approach these same customers with “bundled” services that add mobile broadband.
- **802.16d is also the solution for carriers without a license.** Operators that cannot afford or choose not to invest in frequency licenses can go ahead and deploy 802.16d WiMAX in unlicensed bands (starting in the second half of 2007). Unlicensed band opportunities will not exist in 802.16e, which is primarily targeted for a dense urban environment. The use of unlicensed bands for urban deployments will not be feasible, since large carriers that make multi-million dollar investments in 802.16e mobile networks will not risk deployment in unlicensed bands. The net effect is that unlicensed bands will present golden, “little-upfront-cost” opportunities for 802.16d operators — and there is a definite window of opportunity to secure this foothold.
- **Does your company really want to compete against cellular 4G services and multi-billion dollar mobile operators?** Probably not. The truth of the matter is that 802.16e is going to be on a collision course with cellular 4G services. Competition against well-established cell carriers or the sheer scale that a mobile service requires in terms of organization, capital, and staying power may not be suitable for many smaller, emerging carriers. For example, Sprint will invest approximately US\$2.5 billion dollars in their 2.5GHz mobile WiMAX network in the U.S., and then millions to market the service. The market for 802.16e mobile WiMAX services will be dominated by very large carriers capable of affording and deploying city-wide or even nation-wide mobile infrastructure. For new or small carriers, there’s really only one choice from an investment and ROI perspective — capture customers using 802.16d.
- **Total system costs are far less for 802.16d.** The architecture for 802.16e will require much more advanced functions such as hand-off and advanced mobility related features. All of these factors will render the 802.16e base station very expensive for the operator, compared



with an 802.16d base station which can be obtained for less than US\$10,000. Thus, the initial upfront cost for 802.16e operators will be expensive, and the payback period longer. Furthermore, those in the industry that profess that the economies of scale of mass-produced mobile 802.16e chipsets will provide a cost advantage over fixed 802.16d chipsets do not take into account competitive pressures. Providers of 802.16d technologies have already made their 802.16d R&D investment. And in order to maximize their ROI on that investment, they will have no choice other than to be competitive with alternative components and technologies.

- **Compared to 802.16d, the 802.16e mobile end-user terminal/radio will not be powerful.** The “thin client” model forces the end-user device to be inexpensive and thus devoid of intelligence or power. In addition, battery life considerations force the client terminal radio to be very weak, as compared to 802.16d radios. Also, the mobility requirement for the client device forces the base station to be powerful and full of advanced hardware and software features. 802.16d base stations, however, are much simpler and inexpensive to deploy.
- **Service overlay...start now, and grow later.** Operators can think of WiMAX as a two-step evolution. 802.16d service planning and deployment is undoubtedly easier than what 802.16e service planning and deployment will be. With 802.16d, savvy operators can gain solid experience in WiMAX with a short payback cycle and then overlay an 802.16e network if they see market opportunities at a later time.
- **Fixed 802.16d equipment is proven and reliable, and thus less risky to deploy.** When it comes to your subscriber base, being an “early adopter” of new technology, especially technology as complex as 802.16e is expected to be, may not be in the best interest of your customers. If you are a small or new carrier, can you afford to go through extensive trials, side-by-side with the “Sprints” of the world?
- **In addition to Point to Multipoint subscriber applications, 802.16d is especially well suited for “Backhaul transport.”** WiMAX is already used to ensure robust backhaul communications where reliability and throughput are paramount. There is strong demand for such products and these customers require solutions today for cellular base site interconnection, Internet traffic backhaul and public safety networks.
- **Mesh systems can utilize the benefits of 802.16d.** Wireless mesh networks for internet access and public safety applications are being deployed around the world, and fixed WiMAX can be used as an overlay to further extend the WiFi-powered mesh network simply by connecting to the existing nodes to expand the coverage area.

The truth about upgrading WiMAX 802.16d to 802.16e

Solectek has researched the claims that some manufacturers have made relative to an “easy” upgrade path from 802.16d to 802.16e. These equipment providers and certain WiMAX chipset vendors have tried to create the impression that this transition can be “seamless” or “transparent” for the operator and subscriber, and as easy as downloading new software. This is misleading at best. Solectek’s objective, however, is to be honest and forthcoming with customers about WiMAX technologies and the opportunity to grow into fixed or mobile solutions.



The transition from an 802.16d network to an 802.16e network actually involves many more issues than just the chipsets or radio cards a particular manufacturer uses. The 802.16d systems on the market today are optimized for fixed networks; they are an end-to-end solution focused entirely on the fixed market. This not only includes the radio design, but also software, supporting hardware, power considerations and a myriad of decisions that go into the overall system design.

Moreover, the simpler 802.16d architecture allows the base station systems to be designed at a fraction of the cost of deploying 802.16e base stations. For operators desiring to eventually add 802.16e capability to their existing 802.16d networks, at a minimum their base stations will have to be substantially retrofitted to include the additional 802.16e features. Practically and economically speaking it will simply make more business sense to replace their equipment or overlay an 802.16e network once such products are available, proven and affordable. The objective for carriers should be to capture customers now with proven and cost effective 802.16d equipment, and in a few years when 802.16e is proven and the economies of scale lower costs, only then upgrade to or overlay mobile services.

So why is there so much confusion about 802.16d and 802.16e?

There are two reasons. The first reason is money. The largest telecoms and chip vendors in the world are mainly interested in mass-market mobile services, where everyone carries a phone or portable device and pays a monthly fee. And these are the companies that spend millions of dollars to create marketing buzz around that business, which is indeed well suited for 802.16e. For the most part, they have no interest in serving the fixed market for homes, businesses and other users. And thus, they have no interest in creating marketing buzz for 802.16d. In fact, they would just as well “play down” the benefits and availability of fixed wireless.

The second reason there is confusion in the market is that some equipment vendors and WiMAX chipset providers have — to ride the 802.16e mobile wave/hype — tried to portray their companies as having technology that provides a “smooth transition” from 802.16d to 802.16e. To aid them in this pitch, some have misrepresented or leveraged the work of The Evolutionary Task Group (ETG) of the WiMAX Forum. The ETG has worked to specify a “nomadic version” of 802.16d with an associated upgrade path. This “extended d” standard provides for sub-carrier channels to support a better link budget and nomadic services, as well as support for non-line of-sight consumer premise equipment (CPE).

Some vendors of WiMAX 802.16d equipment and components have irresponsibly used “extended d,” which may indeed be able to be software upgraded, to make customers think that this upgrade will move them to 802.16e capability with very little effort or cost. The fact is that extended d, and its “nomadic” capabilities, is not the same as 802.16e and its anticipated mobile capabilities. The WiMAX Forum has stated that single-mode OFDM consumer premise equipment and equipment based on SOFDMA are not compatible, as they are based on two entirely different modulation techniques which require chipset encoding.



In short, an 802.16**d** network cannot be instantly upgraded to an 802.16**e** network via only a software or simple component upgrade. The infrastructures for 802.16**d** and 802.16**e** are different. The “system design” is dramatically different. For example, today’s 802.16**d** radios are designed to maximize distance and performance. They are often built with relatively large directional antennas and without regard to power consumption. Conversely, the 802.16**e** terminals planned will easily tradeoff antenna performance and radio output in exchange for a small form factor and long battery life.

At the outset any network’s deployment, different broadband applications and market opportunities lead to divergent system-level designs to fit the needs of the specific network’s requirements. This makes an easy and “seamless upgrade” path virtually impossible.

Furthermore, even if a seamless **d-to-e** network upgrade were to become technically possible at the system and component levels, there is nothing simple or affordable about having a “truck roll” to a home or business to modify existing equipment, or to place a customer’s service at risk by downloading more complicated software.

Conclusion

Operators with immediate wireless broadband customer opportunities should capture such accounts with WiMAX 802.16**d**. The delivery of wireless broadband services to permanent installations such as residences, businesses, schools, government and other organizations will always be best suited for fixed broadband wireless systems, and 802.16**d** will meet this need for the foreseeable future.

If and when 802.16**e** becomes cost competitive and proven for fixed installations, operators can consider augmenting or overlaying their fixed 802.16**d** systems with mobile solutions when such technologies are proven and the operator can justify and finance the large investment required to deploy mobile services.

Securing customers and revenue streams today — and increasing their company’s valuation today — is paramount for any carrier and their investors. When 802.16**e** is available, cost competitive and mature, Solectek will, in addition to 802.16**d**, offer products for that unique market. For the foreseeable future, however, the only way operators can grow their subscriber base and profits is with WiMAX 802.16**d** products.

The information presented herein is deemed to be accurate and reliable; however, Solectek is not responsible for errors or omissions. This information presents an opinion only. Customers investing in WiMAX technology should conduct their own analysis of all issues and deployment alternatives.

About Solectek

Founded in 1989, Solectek has long been a leader in the broadband wireless networking industry. Headquartered in San Diego, Solectek has more than 60,000 installations in over 80 countries since 1999. Solectek manufactures a full line of broadband wireless connectivity solutions operating up to 100 Mbps for enterprise, government, and carrier customers. For details, refer to www.solectek.com.



SOLECTEK

Solectek Corporation

6370 Nancy Ridge Dr. STE 109

San Diego, CA 92121

main: 858.450.1220

fax: 858.457.2681

info@solectek.com

www.solectek.com