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# the **WiMAX** guide

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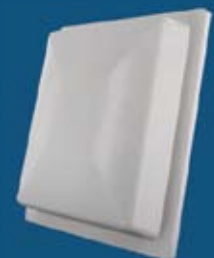
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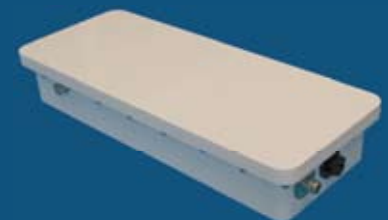
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“During our trials, we found the VistaMAX Solution to be both cost effective as well as providing us the functionality that our company required.”

Glenn James, GM  
McPherson Media  
Shepparton, Australia

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- Integrated multi-strike lightning protection



*OBR5800  
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*VistaMAX is available in 1.9, 3.5, 3.65 and 5.8 GHz*



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## WiMAX is no Betamax



The press always loves a good story. The comments by a Nokia executive in early April comparing WiMAX and LTE to Sony's 1970's Betamax technology and standards battle with JVC's VHS format provided for good reading. However while many considered the

higher-quality Betamax to be a superior video recording technology, it was ultimately the consumer's preference to record longer programming times which ultimately allowed JVC to prevail with their VHS technology. In the end, customers don't really care about the technology itself, only what they can do with the technology.

This is an important point – customers are the ones that ultimately determine the fate of any technology, not the providers. The detractors of WiMAX, mostly large, incumbent cellular operators, have relegated WiMAX as “a niche technology for emerging markets.” Ironically, these were also some of the same groups a few years back that said a new, unlicensed, wireless LAN technology known as “Wi-Fi” would never succeed. More on that latter.

But to really understand WiMAX, you must first examine the different ways the technology is being used. While broad generalizations are often made about WiMAX, there are actually several different flavors with regards to spectrum profiles, business models and devices. In its initial development, WiMAX was designed as a *fixed wireless broadband* technology and in that capacity has become the undisputed leader. Most global deployments today are using WiMAX to provide wireless DSL type services without the prohibitive cost of digging up streets and putting in copper and fiber. WiMAX is also increasing becoming the technology of choice for backhauling traffic from Wi-Fi hotspots and for applications such as remote video surveillance and traffic monitoring.

While fixed WiMAX provides enormous opportunities, the real excitement of WiMAX is with mobility and being able to take your broadband experience with you. Today, remote users must either seek out a public Wi-Fi hotspots or subscribe to costly 3G data plans. While 3G performance is typically acceptable for basic email and web browsing, problems occur when trying to download larger files or videos. Subscribers on Clearwire's mobile 4G WiMAX network have reported download speeds up to 4Mbps (compared to 1Mbps or less on existing 3G networks).

Is this increase in performance really necessary? With over a billion downloads, the iPhone App Store has been a phenomenal success and has introduced millions of users to new ways to use mobile devices. To

provide for the increased demand, new all IP based 4G networks are needed. As Ben Wolff, Co-Chairman for US WiMAX provider Clearwire has stated, “while traditional carriers focus on network coverage, WiMAX is about network capacity - the ability to deliver a large amount of bandwidth to a large amount of people.”

**“the real promise of WiMAX lies with mobility and being able to take your broadband experience wherever you go.”**

With certified equipment now available, 2009 is the year for commercial WiMAX deployments. The WiMAX Forum™ recently reported that there are nearly 460 WiMAX deployments in 135 countries. Additionally, there are nearly 40 devices that have undergone WiMAX Forum™ certification and over 200 that have been announced or are commercially available. Furthermore, new dual-mode 3G/WiMAX and integrated Wi-Fi/WiMAX devices are providing innovative ways to access these networks. Once seen as a potential competitor to WiMAX, Wi-Fi's similarities to WiMAX and the ease of combing the technologies is now seen as an advantage. Enterprises, verticals and university campuses that have traditionally deployed Wi-Fi are now using WiMAX to supplement their networks.

WiMAX is of course not without its' challenges. The global financial crisis has put significant strains on new operators as they deploy networks. Many WiMAX providers are smaller, green-field operators and access to capital is crucial. Fortunately in the US and many countries, governments have recognized the importance of broadband on GDP growth and have established stimulus programs to invest in broadband initiatives.

Access to licensed spectrum and fair regulatory environments is another significant challenge. WiMAX and 3G auctions in India have stalled and are progressing slowly in other parts of the world. More work is needed to educate community leaders on the importance of broadband and how these needs can be met effectively with wireless broadband solutions.

Best Regards,

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# BWA/WiMAX Overview by Region



## Asia-Pacific

At the end of Q3 2008, nearly 2.68 million BWA/WiMAX global subscribers were counted among the operators tracked by 4GCounts ([www.4GCounts.com](http://www.4GCounts.com)). Out of this total, there were 761,659 BWA/WiMAX subscribers in the Asia-Pacific region. The top operator in Q3 2008 in terms of the number of WiMAX subscribers in

APAC was Korea Telecom, with 168,562 WiBro subscribers. After three consecutive quarters of adding over 39,000 subscribers (per quarter), in Q3 2008 KT reported a decrease of 33,341 subscribers. This represents a decrease of 16.5% with respect to Q2 2008.

Q3 2008 saw most of the WiMAX license holders in Malaysia launching their services. These include Packet One Networks, Asiaspace and REDtone. Also during this quarter Mobilink (Pakistan) launched its WiMAX service in Karachi. The service has been branded as Mobilink Infinity, providing wireless broadband and telephony for residential and enterprise consumers based on the mobile WiMAX standard.

Worldwide BWA/WiMAX revenue for Q3 2008 totaled US\$492 million, and APAC was the region with the highest WiMAX revenue – US\$150.14 million. During Q3 2008 average revenue per user (ARPU) figures decreased for most operators, notably on the business segment side. Interestingly residential ARPU remained steady as compared to the business ARPU. We believe this trend is mainly because during financial crises, businesses and large corporations are the first to reduce spending. During the third quarter of 2008 APAC region experienced the highest decrease in residential ARPU as compared to the second quarter; ARPU in this region was reduced by 8%, compared to the other regions, whose residential ARPUs remained steady. The average residential ARPU in APAC in Q3 2008 was US\$38 while as the business ARPU was US\$126.

2009 will be a tough year for WiMAX in general, but with some bright spots in APAC, such as India. WiMAX CAPEX investments will slow down among the many greenfield operators who have limited access to credit. Those are the majority of operators in the 3.5GHz band. They will focus on the most profitable portion of the market, mainly business customers looking for a reliable, last mile connectivity. Expansion into new markets and segments will only be considered in risk free areas and market segments. For the few WiMAX operators with deeper pockets such as BSNL (India) the scenario will be mixed. If these service providers can benefit from a broader government program to reduce the digital divide, they will benefit from additional credit to boost the fixed broadband access penetration in the country. ■



## Europe

Europe had 544,504 BWA/WiMAX subscribers in Q3 2008, representing 20% of the worldwide BWA/WiMAX subscribers for that quarter. Some of the top operators in terms of number of subscribers in Europe include Iberbanda (Spain), Irish Broadband (Ireland) and Banda Ancha (ALO

(Spain). Iberbanda had 59,800 BWA/WiMAX subscribers as of Q3 2008.

WiMAX deployments in France have hit serious delays. According to the terms of the WiMAX licenses issued in that country, 3,564 WiMAX locations should have gone live on June 30th, 2008. Yet only 526 sites have been built out. The announcement that two large mobile operators (Telenor and NetCom) in Norway seem to be focusing on LTE rather than WiMAX, is a further sign of the growing mobile operator momentum behind LTE, and the increasing marginalization of mobile WiMAX. Today, nearly 400 operators are deploying or trialing WiMAX, and there are over 100 operators committed to LTE, including many CDMA operators.

Europe reported BWA/WiMAX revenues of US\$130.20 million in Q3 2008. The average residential ARPU in Europe in Q3 2008 was US\$55 while as the business ARPU was US\$131.5. Europe's high ARPU figure is mainly led by Russian operators. Synterra, for example, has a BWA/WiMAX network in Moscow operating in the 2.5-2.7 GHz band. The network was built using pre-WiMAX equipment with NextNet (acquired by Motorola), and covers the whole city of Moscow. Current clients are corporations and small business with an average ARPU of US\$170 for download speeds of 1Mbps. Synterra offers fixed wireless access mainly, with plans to migrate to mobile WiMAX through a software upgrade. Other Russian operators with high ARPU contributions are Art Communications, Effortel Holding and Metromax, with business ARPUs of over US\$190 monthly. Enforta has some of the lowest rates for business customers in Russia, starting as low as US\$49 per month. Most European operators' business ARPUs are in the US\$100-140 range.

2008 was a year of significant change: the wireless industry grew data subscribers and services, and WiMAX struggled to maintain momentum as the spearhead of a new generation of wireless networks more closely integrated with IT and networking. By midyear, the clamor of hype for the still formative development of LTE extinguished whatever pre-market hype WiMAX had at the start of the year. In what we see as a natural course of events, WiMAX and LTE alliances were resolved more by commercial over technical priorities. ■





## Middle East & Africa

As of Q3 2008, the region covering the Middle East and Africa (MEA) had 126,530 BWA/WiMAX subscribers. Pesco Telecom (Lebanon), MTN (Cameroon) and ZAIN (Bahrain) were the leading operators in terms of the number of subscribers; Pesco Telecom had 13,245 subscribers while ZAIN had more than 10,000 in Bahrain as of Q3 2008.

ZAIN holds a WiMAX license in Bahrain for fixed and nomadic wireless operations. The license does not specify whether to use TDD or FDD, but ZAIN has chosen WiMAX with TDD. Pesco Telecom introduced BWA/WiMAX services in Lebanon in late 2004 with a proprietary system (based on Motorola Expedience), and has proven that BWA/WiMAX can be a success story even in countries where telecom regulation is unclear and international backhaul is a scarce and expensive resource. DSL service really boomed in Lebanon in Q1 and Q2 2008, and this was the major challenge Pesco faced, especially since Lebanese DSL service enjoys a relatively recent and good quality copper infrastructure. However, despite this fierce competition the company maintained its clientele, and even attracted new customers (although at a slower pace), which indicates that WiMAX can be a winning technology in the Middle East.

MEA BWA/WiMAX revenues totaled US\$29 million in Q3 2008. The average residential ARPU in the region at this time was US\$53, while the business ARPU was US\$134. For business users, VPNs are proving extremely popular for data transfer, as are voice bundles. Applications also affect the ARPU generated by individual operators. Mena Telecom (Bahrain), for example, launched a high-speed (up to 8 Mbps) wireless portable Internet service that is suitable for both business and residential users. Among the many benefits offered are unlimited free calls between Mena Telecom customers, 30% lower rates for international calls, and the ability to transport the device anywhere in the Kingdom. Service starts at a monthly fee of BHD 8 (US\$21) + an equipment monthly fee of BHD 3 (US\$8) for downlink speeds of 512kbps; the bundled plan of Internet + telephony is US\$29 for the same speed. The residential packages of 8Mbps downlink cost BHD 110 (US\$292) and BHD 114 (US\$300) for the Internet only and the Internet + telephony packages respectively. Mena is charging approximately US\$8 for VoIP as part of every plan.

During 2009 WiMAX will face a strong economic headwind, but its image as a more efficient, lower cost network, along with the availability of more mobile devices, will help build momentum in terms of deployments. Emerging and underserved markets like Africa will be a central theme for growth of WiMAX despite financial constraints, since WiMAX is viewed as a contributor to economic growth, and funding for several projects is underway. ■



## Central & Latin America

In Q3 2008 the Central and Latin American region (CALA) accounted for a total of 395,000 BWA/WiMAX subscribers, representing 20% of the worldwide BWA/WiMAX subscriber base. The top 5 deployments in terms of number of subscribers were from Telcel (Paraguay)

with 65,000; MVS (Mexico) with over 50,000; Axtel (Mexico) with 50,000; Orbitel (Colombia) with 49,500; and Neovia (Brazil) with 23,000. Approximately 64% of all the subscribers reported in CALA were residential, and 36% were from the business segment.

Average monthly ARPUs in the CALA region were US\$37.89 for residential and \$79.90 for business. The region had the lowest ARPU for business worldwide; operators such as Andinatel (Ecuador), Axtel (Mexico) and Metrovia (Guatemala) have business plans available starting at US\$45 per month. It is possible that this low figure is because they are mainly focused on serving small office/home office and small-to-medium enterprise segments (SoHo and SMEs), rather than large corporations as served by operators in North America and Europe.

Operators in this region are offering average downstream speeds of 512kbps to their residential subscribers, and anywhere from 1Mbps to 2Mbps to their business subscribers. WiMAX provides a more competitive advantage in Latin America where the price per Mbps is very similar to DSL, at US\$27 (residential) and US\$31 (business). Most operators in this region offer WiMAX service plans to complement their DSL and cable offerings. Applications are often driven by double-play services (High Speed Internet + VoIP). The total revenue generated for this region in Q3 2008 totaled US\$60 million, representing 12% of the global revenue generated this quarter.

The most widely allocated spectrum in the region is 3.5GHz – approximately 80% of operators have deployed in this frequency band. Some operators are deploying 802.16e-2005 equipment either in the 2.5GHz or 3.5GHz band, however their offer is limited to fixed and nomadic services only. Such is the case of Axtel (Mexico) operating in the 3.5GHz and deploying Motorola equipment, Embratel/Telmex (Peru) deploying in the 3.5GHz and deploying Motorola, Telmex Chile operating in the 3.5GHz band and deploying Alcatel-Lucent, and Movilmax (Venezuela) operating in the 2.5GHz and deploying Samsung.

Many Latin American countries still face challenges to complete their WiMAX deployments plans due to lack of sufficient spectrum and delayed auctions. While low broadband penetration makes the region look promising for WiMAX, a lack of spectrum in both the 2.5GHz and 3.5GHz bands has affected the deployment plans of some operators. This is particularly true in Mexico, Brazil and Argentina, three of the strongest countries of the region, where 3.5GHz spectrum auctions have been repeatedly delayed. Other major challenges CALA operators are facing are the high cost of CPEs to address the mass market, lack of network capacity, interoperability issues, & competition from incumbents. ■





## North America

In the United States, much of the focus has been on Clearwire as they prepare to launch their nationwide WiMAX network. In addition to pre-WiMAX service in its smaller markets, at the beginning of 2009 Clearwire was providing mobile WiMAX service in Portland, Oregon and in Baltimore (under the Xohm brand) with plans to launch an additional 8 markets in 2009 and cover 120M people by the end of 2010.

The subscriber breakdown by segment in North America was 78% residential and 22% business. North America had the largest number of BWA/WiMAX subscribers as of Q3 2008, with a 32% share of the worldwide subscriber base. The total number of subscribers in North America was 859,000. Clearwire USA continued to be the top operator, with 469,000 subscribers in the United States at the end of Q3 2008 – an increase of 1.54% compared with the 461,850 subscribers reported in Q2 2008. The firm's growth flattened during the period as the company moved from pre-WiMAX to mobile WiMAX equipment. Other operators that contributed to this amount include Inukshuk with an estimated 200,000 subscribers, Kite Broadband with over 58,000, KeyOn with 41,689, and Barrett Xplore with 34,273.

ARPU in North America were US\$39 for residential and US\$158 for business as of Q3 2008. Operators such as TowerStream, whose customer base is 100% business, reported the highest ARPU in the region, at US\$82. Other US operators such as Covad and Amatechtel mainly focus on serving large business enterprises, which contributed to North America being the region with the highest ARPU for the business segment. Nevertheless, other operators such as Barrett Xplore, Clearwire, Kite Broadband, Digital Bridge, Inukshuk and KeyOn, reported more modest business ARPU in the US\$50-100 monthly range. These operators are mostly focused on SoHo and SME sized business, offering pricing plans with downstream speeds that go from the 750kbps to 5Mbps in most cases. The total BWA/WiMAX revenue generated by North America totaled US\$122.21 million, positioning the region in second place after APAC.

North America also reported the highest number of proprietary base station sector deployments, with over 26,000 sectors in place as of September 2008. Less than 5,000 base station sectors were deployed either in the 802.16e-2005 or 802.16-2004 standards. North America was the region with the lowest number of 802.16-2004 base stations deployed (only about 1,000). ■

*Maravedis is a world-leader and pioneer in WiMAX and 3GPP/LTE market research and analysis. Maravedis has established itself over the years as the most credible and reliable market intelligence in the broadband wireless industry. At Maravedis we have at heart to work closely with equipment vendors, service providers, the component feed chain, and the investment community to produce reliable analysis of equipment shipments, emerging trends and realistic market forecasts worldwide.*

*Maravedis/BWA Research UK's 4GCounts is an exclusive online interactive Operator Tracking Service database and analysis profiling WiMAX & LTE operators worldwide on a quarterly basis. Developed from the ground up and comprised of key information on applications, service offerings, ARPU, pricing, target markets, subscribers and deployments worldwide, 4GCounts is a unique source of comprehensive information for the entire WiMAX & LTE ecosystem. More than a database, it is an online resource for industry collaboration & development.*

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# Mobile WiMAX: A Device for Every Occasion



**Jeff Orr**  
**ORR Technology**

The key to widespread adoption of WiMAX services is the device. The device is the point of interaction with the network operator's service. Selecting the right WiMAX device has many variables, including: country, network operator and the type of service offered. WiMAX fundamentally provides a shared or dedicated connection to the Internet. Email, web browsing and access to services delivered through an internet connection are all possible. WiMAX devices differ in form factor and functionality, spanning several categories including: customer premise equipment (CPE), computing peripheral adapters, phones, computers with embedded radios and emerging consumer electronics segments. Let's examine several interesting mobile WiMAX devices from around the world.

One of the most anticipated devices in 2008 was Nokia's N810 Internet Tablet WiMAX Edition. The N810, announced in April 2008, became available in October. The MID-class handheld combined the versatility of a computing platform with the size and weight of a 3G phone. In January 2009, Nokia surprised many by announcing it would exit the WiMAX device market.

Samsung Mobile announced its Mondri handheld (Latin for 'world') for the US-based Clear service from Clearwire in March. Mondri signifies Samsung's first entry of a WiMAX-powered handset outside the South Korean market where it offers the broadest WiMAX device portfolio available. Mondri has the potential to fill the void left by the Nokia N810. The Windows Mobile 6.1 touch-screen device uses Opera's mobile browser and includes direct access to several online services including Fring, Gypsii and Microsoft's Live Messenger. In addition to WiMAX, the Mondri model includes Wi-Fi and Bluetooth 2.0 radios. Voice communication is accomplished using VoIP service.



**Figure 1 - Samsung Mobile's Mondri handset for Clear by Clearwire**

Russia is challenging South Korea for the title of coolest mobile WiMAX devices. Scartel is offering an HTC-designed handset, dubbed MAX 4G, incorporating both a GSM radio for cellular voice alongside a Sequans-powered mobile WiMAX radio for high-speed data services on its Yota 4G service. Microsoft Windows Mobile 6.1 is the operating system and HTC layered its TouchFLO 3D user interface on top. Based on HTC's Touch HD platform, the MAX 4G is officially available in Russia only.



**Figure 2- HTC MAX 4G for Scartel Yota in Russia**

Dedicated handsets are a newer device class

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for WiMAX. The first generation of devices leveraged the power of a host computer to enable mobile broadband service. USB dongles and expansion PC Cards are very common for direct connection to WiMAX networks. Malaysia's P1 Networks recently introduced its Wiggy USB adapter to complement an indoor CPE offering. Simply plugging the dongle into a Windows laptop computer or MID creates immediate access within the operator's network coverage.



**Figure 3 - Wiggy WiMAX USB Adapter for P1 Networks (Source: Kong Technology)**

Another popular use for WiMAX is to share a single mobile broadband connection with

## WiMAX Silicon Innovation - Interview with Dr. Georges Karam, SEQUANS CEO

Silicon chip providers deliver the engines for device manufacturers to design creative form-factors and functionality. Capacity, coverage and power are common words of the WiMAX silicon vernacular. All three elements must be balanced, such that capacity and coverage are possible without consuming significant power. Consumers expect days of battery operation wherever they go before a charge is required and managing these three competing forces create a dilemma for chip developers. One company that has witnessed success in staying ahead of the curve for WiMAX chip development is Sequans Communications. The privately-held company, founded in 2003 and headquartered in Paris, claims design wins in more than half of all mobile WiMAX Forum Certified products.



While coverage and performance improvements using MIMO have proven effective in initial mobile WiMAX products, the uplink connection (the direction from the device to the WiMAX base station) suffers from an imbalance in capability. "Early on in WiMAX development, we realized the uplink connection would break before the downlink and it was not going to be as simple as increasing the CPE's output power," says Sequans president and chief executive officer Dr. Georges Karam. "We devised a way to enable the second transmitter in our mobile station chips to allow MIMO in both the uplink and downlink, improving the link budget and removing the imbalance."

The two-transmitter capability for devices has been dormant in Sequans chips since its first generation. In 2008, network operators began requesting improvements in the uplink performance of mobile devices and Sequans stood at the ready. "We're the only vendor to offer this capability today," says Karam. Service providers went so far as to write the uplink MIMO capability into the next iteration of certification testing requirements by WiMAX Forum. The company anticipates a significant time-to-market advantage over its chip competitors.

The full benefits of uplink MIMO are not realized unless both ends of the connection – the device and the base station – support it. Again, Sequans had the answer. A software update to its existing chips allows a signal to be sent twice in a delayed manner on each antenna. This creates diversity in the uplink signal that an existing base station can utilize without breaking compatibility to existing infrastructure or devices, adds Karam.

Who benefits from these advancements? Device manufacturers obtain these benefits for little to no additional cost. They are also able to improve the output power of the product, organically increasing the effective range of the signal using lower cost amplifiers. Broadband operators see increased network coverage and confidence to pursue more customers. End-users are remaining connected to WiMAX services in more places with fewer stops to charge the battery. Vive l'innovation!

multiple Wi-Fi-enabled devices. This is accomplished using a router, either a stand-alone model like the one pictured below or integrated into a CPE modem. Computers that don't have their own WiMAX connection attach to the Wi-Fi access point in the router and share the performance. This method is valuable for road warriors and colleagues that frequently need high-speed access, but cannot guarantee the methods offered by hotels, airports and remote offices.



Figure 4 - Clear Spot WiMAX/Wi-Fi router (Source: Clearwire)

Not all mobile WiMAX devices are entirely mobile. Homes and small business offices can benefit from a desktop CPE modem that provides an alternative to DSL or cable modem services. CPE models range from basic modem functions to the addition of VoIP gate-

ways and Wi-Fi routers. An advantage of CPE compared to other fixed broadband services is that it is self-installed by the user and can be relocated with minimal effort or professional assistance.



Figure 5 - Gigaset SE681 Modem (Source: Gigaset Comm, Siemens AG)

To ensure compatibility and interoperability, the WiMAX industry has established guidelines and testing procedures that vendors pursue to become WiMAX Forum Certified. The certification ensures a network operator that base stations and subscriber devices designed for a common certification profile work together properly. Certification testing for mobile WiMAX devices began in 2008 and today there are nearly 40 devices covering three different frequency bands. The complete list is provided below.

Vendor	Model	Frequency
Airspan Networks	MiMAX USB	2.5 GHz
Alcatel-Lucent	CARC 500 Series	2.5 GHz
Beceem Communications	USB200 Reference Design	2.5 GHz
Fujitsu	MB86K21-UD1 USB Reference Design	2.5 GHz
GCT Semiconductor	GCT SoC GDM7205K	2.5 GHz
Gigaset Communications GmbH	Gigaset SE680 WiMAX (Outdoor)	2.5 GHz
Gigaset Communications GmbH	Gigaset SE681 WiMAX (Indoor)	2.5 GHz
Gigaset Communications GmbH	Gigaset SX682	2.5 GHz
Huawei Technologies	EchoLife BM325 USB Modem	2.5 GHz
Huawei Technologies	EchoLife BM625 CPE	2.5 GHz
Intel Corporation	Echo Peak Volume (WiMAX/WiFi link 5150 MC)	2.5 GHz
Intel Corporation	Echo Peak Volume (WiMAX/WiFi link 5150 MC(512ANXMMWG))	2.5 GHz
Intel Corporation	USB Reference Design	3.5 GHz
Intel Corporation	Wi-Fi/WiMAX Link 5350	2.5 GHz
MODACOM Co. Ltd.	Express Card Modem MW-C25xxE	2.5 GHz
MODACOM Co. Ltd.	MW-U25xx USB Modems	2.5 GHz
Motorola Inc.	CPEi25150	2.5 GHz
Motorola Inc.	CPEi25750	2.5 GHz
Motorola Inc.	WTM1000 Reference Design	2.5 GHz
NEC	AccessTechnica PA-WM3200C PCMCIA	2.5 GHz
NEC	AccessTechnica TRP-2GW-2A PC Card	2.5 GHz
NEC	Access Technica UD02NA PCMCIA	2.5 GHz
NEC	Aterm UD01 NA USB	2.5 GHz
NEC	Aterm WM3200U USB	2.5 GHz
Oki Electric Industry Co., Ltd.	BR3001 USB Subscriber Station	2.5 GHz
POSDATA	FYLV0 U100 USB Dongle	2.3 GHz
Redline Communications	RedMAX 4C RPM CPE	2.5 GHz
Runcom Technologies Ltd.	Tornado RNU200 CPE	2.3 GHz
Samsung Electronics	SWC-E100 Mobile WiMAX ExpressCard/34	2.5 GHz
Samsung Electronics	SWC-U200 (3.5 GHz) USB Dongle	3.5 GHz
Samsung Electronics	SWC-U200 (3.5 GHz) USB Dongle	3.5 GHz
Samsung Electronics	SWC-U200 USB Dongle	2.5 GHz
Samsung Electronics	SWT-P230 Mobile WiMAX PC Card	2.3 GHz
SEOWON INTECH Co., Ltd.	SWU-3220 USB Modem	3.5 GHz
SEQUANS Communications	SQN1110-RD Reference Design	2.3 GHz
SEQUANS Communications	SQN1110-RD Reference Design	2.5 GHz
Telsima	StarMax 3160	2.5 GHz
ZTE	TU25 USB Modem	2.5 GHz
ZyXEL Communications	MAX-206M2 Modem	2.5 GHz

Figure 6 - WiMAX Forum Certified Mobile Devices, April 2009 (Source: WiMAX Forum)

In addition, vendors have provided mobile operators with devices that have not yet completed certification. More than 200 devices designed using IEEE 802.16e-2005 chipsets have been announced or are commercially available today.

A promise of open mobile broadband networks, such as mobile WiMAX, is the flexible choice for consumers to shop and acquire devices without the network operator's involvement. The availability of the Nokia N810 Internet Tablet from Amazon.com in 2008 is a great example of this change from 3G phones and data card products. Devices are generally distributed in three ways: full price from a retailer or e-commerce store; leased as part of monthly service from a network operator; subsidized purchase as part of a contract with a network operator.

Depending on where you live and which operators provide WiMAX service in your country, the device options vary. If the product you want is not offered today, make your interest known. Contact the network operator and let them know how mobile WiMAX devices inspire your need for high-speed communications anytime and anywhere. ■

.....

Jeff Orr is founder of ORR Technology (<http://orrtechnology.com/>) and author of the Mobile WiMAX Device Guide. He is also the editor for Mobile Broadband News and a columnist for TMCnet. A 20-year veteran of high-tech marketing and product management, Jeff had the distinction of being the first WiMAX Forum employee and a board member for the industry group.



# New Devices Provide Access to 3G & WiMAX Networks



## Paul Kaputka Sidecut Reports

The expected parade of innovative end-user devices for Clearwire's U.S.-based WiMAX services has already begun, with new options that bring WiMAX connectivity to more devices and to more places.

Perhaps the most innovative offering to date is Clearwire's "Clear Spot," a mobile Wi-Fi/WiMAX router that is about the size of a deck of playing cards. After connecting to a Clear network by plugging a standard WiMAX dongle into the Clear Spot's USB port, the router then becomes a mobile "hot spot," able to provide Wi-Fi connectivity to up to eight different devices in its vicinity.



**Clear Spot WiMAX/Wi-Fi router**

According to Clearwire chief strategy officer Scott Richardson, the idea behind the Clear Spot was to bring WiMAX connectivity to "all the other devices out there" that have the now nearly ubiquitous support for local-area Wi-Fi. While WiMAX-enabled notebooks are starting to appear on laptop vendors' websites and store shelves, there are still a lot of PCs, laptops and netbooks in use that do not have native WiMAX support, but almost certainly have a Wi-Fi chip inside.

The **\$139.99 Clear Spot**, already available from Clearwire in cities where it has commercially launched services, can operate for several hours on battery charge, or can be plugged in for longer uses. According to Clearwire the router (manufactured jointly by Clearwire and Cradlepoint, an experienced vendor of mobile routers) has enough performance juice to support high-demand applications like VoIP and virtual private network (VPN) connections, mak-

ing it an attractive option for small business users who want a mobile workgroup solution.

On the personal side, a Clear Spot could be used as a hub for an impromptu study or gaming session, or to provide Internet access to Wi-Fi-enabled devices like smartphones. One target market for Clearwire is iPhone users, many of whom seek out Wi-Fi hotspots after being frustrated by the device's often slower-than-expected 3G connections.

"Just connecting the devices that already exist is a big business for us," said Clearwire's Richardson. "I see every iPhone user as a future customer."

### Sprint's Hybrid Solution

For greater personal connectivity, a new type of device has already been introduced by Clearwire partner Sprint Nextel, in the form of a "hybrid" USB dongle that supports both WiMAX and 3G connectivity. Called the **Sprint 3G/4G USB Modem U300**, the device is being rolled out in each of the Clearwire service markets, usually a few months after the official launch of Clear services in each locale.



**Sprint 3G/WiMAX USB dongle**

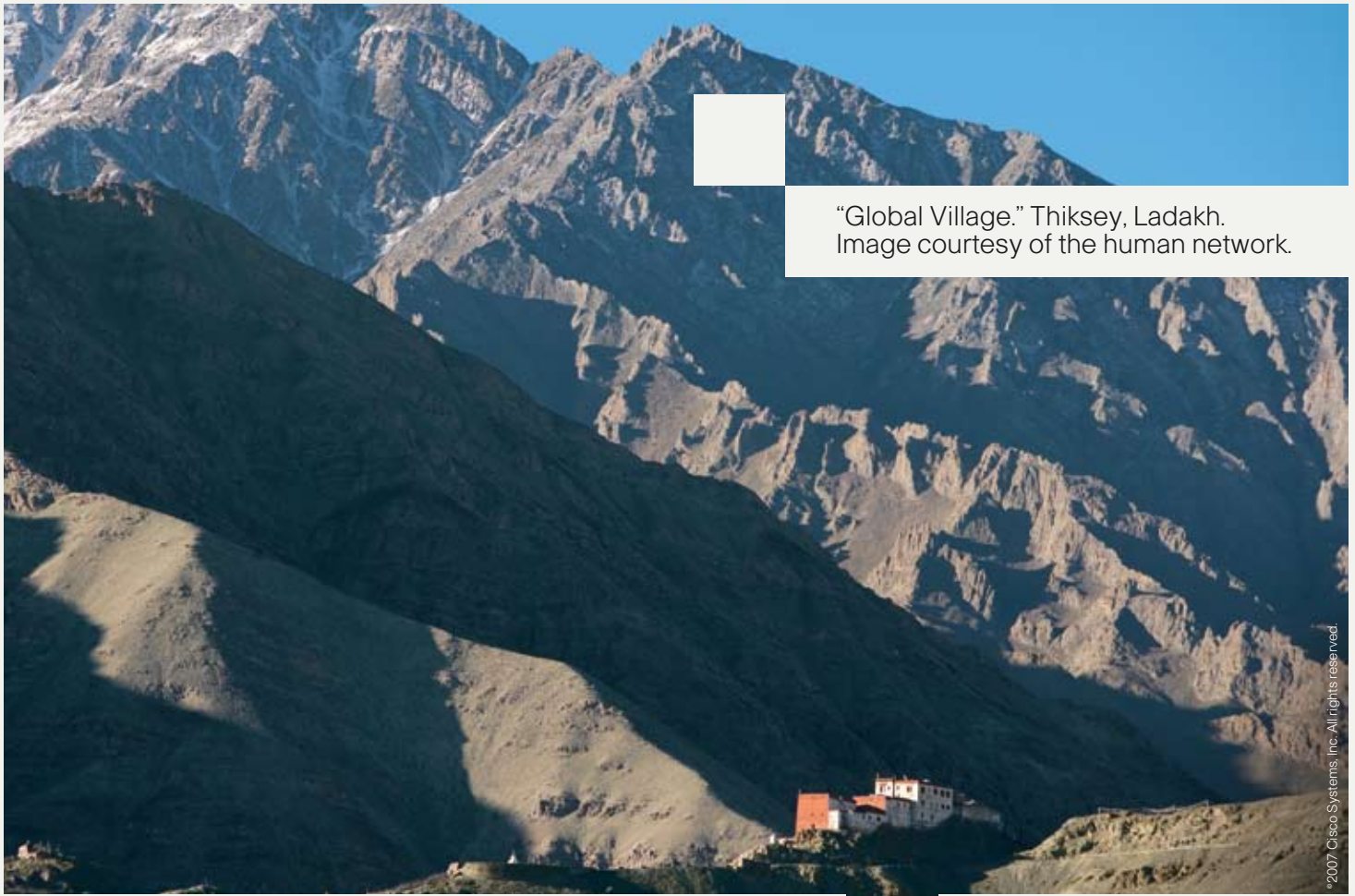
Currently priced at \$79.99 (after rebates and with the acceptance of a standard two-year service contract of \$80 a month), the so-called "hybrid" device gives individual users access to both high-speed WiMAX connections when those are available, and

then to Sprint's highly rated 3G cellular data network in areas not yet served by WiMAX. Such a device is targeted squarely at the mobile business professional who spends a good deal of time in a Clearwire-covered market, but who also needs coverage while traveling across the U.S.

The hybrid card, Sprint said, will be offered in all the new markets targeted for 2009 launches by Clearwire, typically a few months after the market goes "live." ■

*As editor, publisher and CEO of Sidecut Reports, Paul Kaputka continues a career trying to make literal sense out of complex computer and networking-related subject matter, a quest that began in earnest 17 years ago when he joined Unix Today! as a networking beat reporter.*

*The long-term goal of SIDECUT REPORTS is to provide an online home for long-form analysis of topics at the intersection of Telecommunications, the Internet and Public Policy. Stay tuned to the Sidecut Blog for ongoing analysis and more information as we build the site out.*



“Global Village.” Thiksey, Ladakh.  
Image courtesy of the human network.

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On the human network, a remote village is included. In a place where books don't usually exist, the Library of Congress can. Technologies such as Mobile WiMAX are bringing rural schools and villages to the rest of the world. Leveling playing fields. Flattening geographies. And reinventing everything. Visit [cisco.com/go/wimax](http://cisco.com/go/wimax) for more information.

welcome to  
the human network.





# WiMAX in Taiwan Developments & Trends



M-Taiwan Office, IDB/MOEA, Taiwan

In the period 2008-2012 accumulated worldwide investment in WiMAX network deployment is expected to exceed US\$22.5 billion. Currently there are already more than 330 telecoms engaged in WiMAX technology testing or commercial operations. This means that more than half of the world's telecom operators are involved in WiMAX in some form.

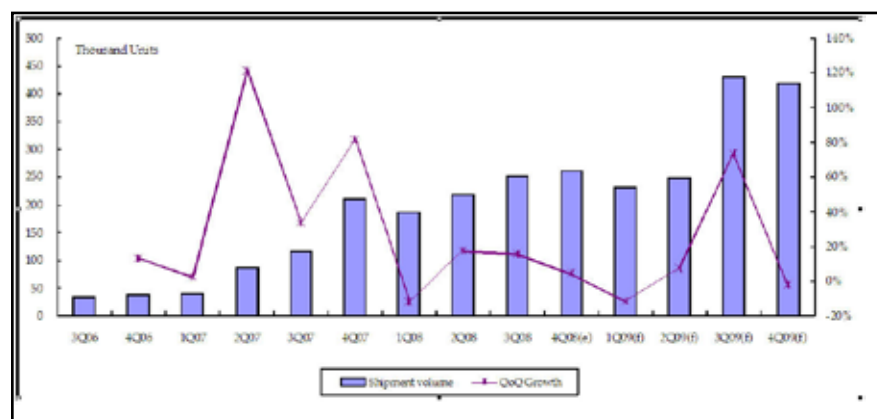
Taiwanese companies have built upon their past contributions to the ICT industry and are playing an important strategic role in the WiMAX industry. Taiwanese makers have coordinated their efforts in terminal access device R&D with international telecom equipment vendors, and have completed interoperability testing between these devices and base stations - providing global telecom operators with competitive CPE products. Furthermore, they are aggressively engaged in the R&D of small-sized base stations, helping to complement efforts of international telecom equipment vendors. The establishment of two WFDCLs (WiMAX Forum Designated Certification Labs) in Taiwan and the launch of the six Taiwanese WiMAX operators' networks in 2009 will further accelerate product certification and commercialization for Taiwanese companies, and spur product adoption by telecom operators worldwide.

## Taiwanese WiMAX Equipment Makers' Shipment Statistics

Stimulated by the Executive Yuan's M-Taiwan program, which is carried out by the IDB (Industrial Development Bureau), and the WiMAX Acceleration Project, carried out by the DoIT (Department of Industrial Technology), Taiwanese companies have made aggressive investments in WiMAX technol-

ogy and product R&D. As a result, Taiwanese companies have already gained development advantages in the WiMAX industry supply chain. In 2008, Taiwanese WiMAX CPE shipment volume reached 914,000 units, accounting for approximately 30% of total global shipments. Shipment value amounted to US\$146.5 million. In 2009, Taiwanese WiMAX CPE shipment volume is forecasted to top 1.4 million units, growing over 40% in comparison with 2008.

Figure 1: Taiwanese WiMAX CPE Shipment Volume, 1Q 2006 - 4Q2009



Source: M-Taiwan Project, compiled by MIC, March 2009

## Current Product Development of Taiwanese Equipment Makers

Looking at the WiMAX CPE shipments by technology, the demand for 802.16d products remained relatively stable throughout 2008, with the full-year shipment volume accounting for approximately 39% in the overall shipments. Meanwhile, the full-year shipment volume of mobile WiMAX 802.16e products represented a share of about 61%.

In application products, product differentiation will continue to increase. Besides only data, Residential CPEs in the future will also actively support VoIP (Voice over Internet Protocol). For wireless modules, beyond providing mini card/half mini card, many different interfaces will be supported - providing opportunities for handheld and consumer electronics products. It can therefore be expected that the scope of products supporting WiMAX will become broader in the future, with product mobility increasing significantly.

“...more than half of the world’s telecom operators are involved in WiMAX.”

Table 1: Taiwanese Makers’ WiMAX Equipment Development

Company	Product	Standard	Development
Gemtek	CPE/BS	16d	Indoor & Outdoor CPE already in mass production
		16e	Wave 1 products in mass production Wave 2 products in mass production Notebook PC built-in modules undergoing tests Pico BS in development
Cybertan	CPE	16e	Card and G/W samples can be provided for testing
Zyxel	CPE/BS	16e	Wave 1 card and indoor CPE in mass production Wave 1 outdoor CPE in mass production Wave 2 products in mass production Pico BS can be provided for testing
Microelectronics Technology	CPE/BS module	16d	Indoor & Outdoor CPE and BS radio unit in mass production
Delta Networks	CPE	16d	Indoor CPE, outdoor CPE ready for mass production
Quanta Microsystems	CPE	16e	Cards ready for mass production Indoor CPE ready for mass production Notebook PC built-in modules undergoing tests
Accton	CPE/BS	16e	Wave 1 products in mass production Wave 2 products in mass production
Alpha Networks	CPE/BS	16d	Indoor and outdoor CPE ready for mass production
		16e	Indoor and outdoor CPE and cards ready for mass production
Wistron NeWeb	CPE	16e	Cards and Wi-Fi G/W sample can be provided for testing; ready for mass production
Asus	CPE/BS	16e	Indoor CPE ready for mass production Notebook PC built-in modules undergoing tests
Foxconn	CPE/BS	16e	Card samples ready for mass production Wave 2 indoor and outdoor CPE in mass production
USI	CPE/BS	16d	Indoor and Outdoor CPE and micro BS in mass production
		16e	Indoor and outdoor CPE and card sample in mass production
Cameo	CPE	16e	Wi-Fi/WiMAX router samples can be provided for testing
Tecom	CPE/BS	16e	PCMCIA card sample ready for mass production Indoor modem ready for mass production IAD / MIMO sample ready for mass production Macro BS sample can be provided for testing

Source: M-Taiwan Project, compiled by MIC, March 2009



Support of customer devices is another factor to consider. As many WiMAX CPE shipments are to remote regions with sparse populations, carriers will have to spend on average at least US\$100 per case - from initial call to closure - dealing with customer problems. In order to reduce operating costs, WiMAX carriers will require that CPE vendors provide products with remote data management and update capabilities. Furthermore, these remote control technologies are required to comply with the OMA (Open Mobile Alliance) DM (Device Management) standards. Taiwanese equipment makers have been aggressively seeking collaboration with OMA partners to satisfy these requirements.

As for WiMAX notebook PCs, starting in 2008 Taiwanese vendors Asus, Acer, and MSI made considerable investments in related R&D and announced the development of WiMAX enabled products. Asus demonstrated a WiMAX-enabled Eee PC model at year-end 2008. Meanwhile, companies including HTC, Asus, Benq, Inventec, Tecom, and Wistron NeWeb have engaged in the development of WiMAX mobile phones. HTC has begun shipments of a dual-mode GSM/WiMAX phone - HTC MAX 4G - to Russian WiMAX carrier Scartel (Yota). In the future, Taiwanese WiMAX products are expected to become more diverse and migrate from nomadic to full mobility, providing total solutions to fulfill the carriers' demand.

In the WiMAX CPE chipset segment, currently the main suppliers are still international companies such as Intel, Sequans, and Beceem. Taiwanese chipset suppliers have made aggressive moves in this segment, too. Companies including MediaTek and MDV have been engaged in the R&D of WiMAX chipsets. By year-end 2008 Taiwanese chipset suppliers had begun sampling their chipsets to Taiwanese equipment makers.

## Taiwanese Equipment Makers' Shipment Outlook

The countries having seen aggressive WiMAX network deployment in 2008 included Russia, India, Japan, and Malaysia. Further progress of network deployment in 2009 in these countries is projected to play a crucial role in Taiwanese WiMAX CPE makers' shipment performance. By the end of 2008, there had already been a limited amount of shipments from Taiwanese device makers to major Russian WiMAX carrier Scartel. Meanwhile in In-

dia, the prospect of WiMAX market in 2009 remains muddled due to a number of reasons. To begin with, the WiMAX equipment tenders are carried out separately in different telecom circles with complicated procedures, making it a burdensome task for interested parties. Moreover, the values of WiMAX tenders in India are relatively low in general, leaving limited room for profits. Equipment companies seeking to tap the Indian market will therefore suffer from considerable cost pressures. In addition, the schedule spectrum auction has been postponed indefinitely. Despite these negative factors, WiMAX network deployments is seeing continuous progress in India and the market still poses a lucrative business opportunity for the Taiwanese equipment makers in 2009.

In Malaysia, local WiMAX carrier Packet One Networks, to which some Taiwanese makers had begun shipments in 2008, has begun expanding its services in March 2009. Meanwhile in Japan, UQ Communications began offering trial services in February 2009, attracting 20,000 candidates to sign up for the recruitment of 5,000 trial users. UQ Communications has also been in discussions with Taiwanese makers over WiMAX CPE procurement.

In comparison with 2008, Taiwanese equipment shipments will see further growth in full-year 2009. Taiwanese WiMAX CPE shipments should benefit from the demand surge starting in the second half of the year, when network deployments are expected to take off. ■

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*M-Taiwan is the blueprint for an islandwide WiMAX environment in Taiwan. M-Taiwan is advancing the international competitiveness of Taiwan's cities through the adoption of city-wide wireless networks that provide integrated mobile services.*

*M-Taiwan has successfully integrated WiMAX, WLAN and cellular networks, achieving a comprehensive WiMAX ecosystem. With partners such as Alcatel-Lucent, Intel, and Sprint-Nextel, Taiwan has integrated quality WiMAX testing and certification labs. It is expected that over 90% of WiMAX CPEs are to be manufactured here, commencing the second quarter of 2009.*

**“In the future, Taiwanese WiMAX products are expected to become more diverse and migrate from the nomadic scenario to full mobility, providing total solutions to fulfill the carriers' demand.”**



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# WiMAX Backhaul

## Wireless Ethernet is Making it Happen



Aviv Ronai  
CMO, Ceragon Networks

Although a good deal of attention has been dedicated to the access elements of WiMAX networks, little focus has been placed on the wireless backhaul evolution. Wireless backhaul and the aspects of the technology are critical building blocks in the implementation of any WiMAX network topology.

### What's Backhaul Got to Do with it?

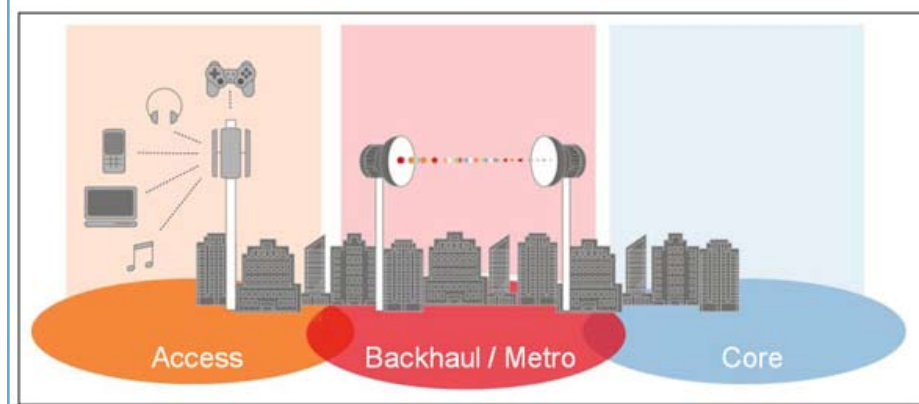
WiMAX Backhaul is the transport link between a Base Station (BS) and the WiMAX Access Service Network Gateway (ASN-GW). Backhaul is generally defined as the network components which connect client/subscriber access sections of networks with their core switching and management topologies. It transports considerable traffic from a POP to the rest of the network, and essentially acts as the “glue” that pieces all of the network elements together. This enables the

network to deliver seamless and transparent broadband communications to its customers effortlessly, and with high reliability and availability.

For service providers who select WiMAX as their underlying technology, high-capacity backhaul is essential for ensuring continuous

delivery of rich media service across high-speed data networks. If the backhaul and its components are not cost-effective, resilient, scalable and able to supply sufficient capacity, then a providers' entire network can be seriously compromised – resulting in significant customer churn.

Figure 1: WiMAX Backhaul - enables value added bandwidth-hungry services



## Components of WiMAX Backhaul Architecture

The backhaul of the network is recognized as a major enabler of network performance. In order to deliver the expected bandwidth requirements of WiMAX and other newer technologies, the backhaul is critical.

Following is a list of the most critical requirements that must be addressed by any effective WiMAX backhaul architecture:

- 1) High-capacity - Rich media services enabler
- 2) Native Ethernet - WiMAX-inherent data architecture/structure
- 3) Accelerated and Rapid Scalability - Fast-time-to-market new service/solution design
- 4) 99.999% Availability - Real-time, critical services
- 5) QoS – Multi-service environment
- 6) Ultra low latency/jitter - Uncompromised, clean delivery of voice/video communications
- 7) OPEX and CAPEX Efficient - 4G business model success realization

## Backhaul Options

A good game plan for the development of WiMAX solutions is to examine the mobile carriers' business model and learn from their network considerations. Usage of technologies for backhaul is dependent on regional factors such as regulation, fiber reach and competitive environment. This being the case, one might also expect to encounter similar trends when considering the deployment of WiMAX. Overall cost of bit-per-distance, target network capacity and traffic type (all IP, TDM, or both) are the main factors which impact the selection of a backhaul solution.

While both wireless and wireline technologies can be used to build these backhaul systems, most WiMAX operators opt for wireless point-to-point (PtP) microwave solutions. This is due for a number of unique advantages offered by PtP microwave including: quick installation, support for high-capacity data traffic, scalability and lower cost-per-bit compared to T1's and fiber.

With PtP solutions, WiMAX operators can also build out their own networks, therefore avoiding the need to rely on networks owned by their (incumbent) competitors. We will explore these benefits in the following paragraphs.

It is obvious that today's cost factors almost prohibit the use of wired technologies to construct a WiMAX backhaul infrastructure. For instance, the cost of deploying one mile of fiber in an urban environment can run up to \$1 million. Bridging the same distance using wireless microwave link would cost less than \$50k to set up – all elements and labor included. The dramatic differences in pricing are mostly due to the continued high costs of deploying fiber as well as the availability of fiber, which keeps the costs significantly higher, and requires service providers to search for alternatives.

Though copper T1 lines might cost less to deploy and lease, they have limited capacity of only 1.544 Mb. Even if a carrier uses four T1s, the maximum bandwidth that they are able to support is 6 Mbps. This falls far shorter than the bandwidth required by WiMAX backhaul networks that assume 20-70Mbps capacity per cell-site.

Currently T1 is a very cost-effective solution with relatively low costs per single T1. However, if a T1-based network needs to support higher bandwidth – in the tens and even hundreds of Mbps – the added copper lines multiplied by the cost per-line renders the technology uneconomical. In contrast, wireless backhaul solutions can offer data rates reaching up to 500Mbps over a single radio channel (aggregated capacities can reach up to several Gbps). Plus, wireless links can be deployed quickly and – where limited or no infrastructure is in place – they eliminate the costs associated with digging up the ground to lay fiber or copper.

With these examples in mind, and due to its rapid implementation cycle and scalability, it is clear that wireless backhaul is the most reasonable, cost-effective solution for WiMAX backhaul networks.

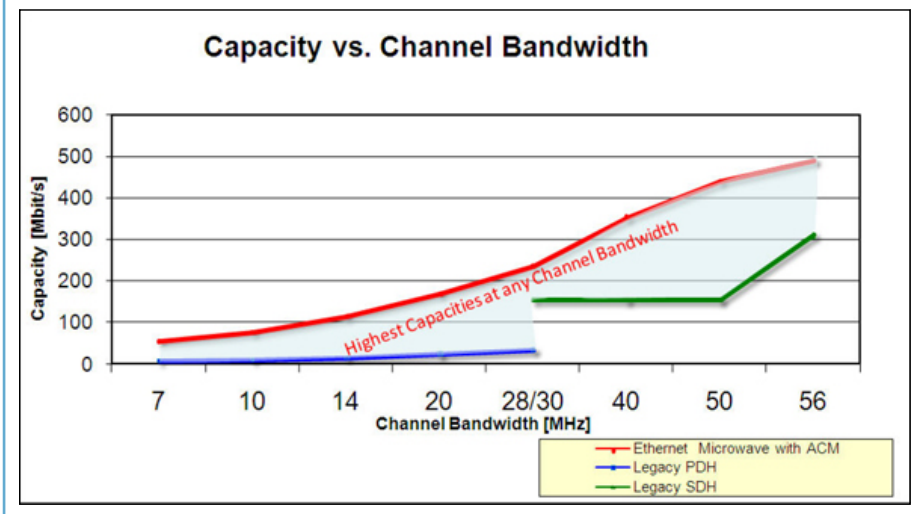
## The Case for Ethernet

Combining wireless Ethernet over microwave is ideal for WiMAX backhaul. Apart from its inherent scalability features (unlike the rigid structure of T1 or STM connec

**“WIRELESS BACKHAUL SOLUTIONS CAN OFFER DATA RATES REACHING UP TO 500 MBPS OVER A SINGLE RADIO CHANNEL.”**



Figure 2: Wireless Ethernet - Higher Capacity at any channel bandwidth



**“WIRELESS MICROWAVE BACKHAUL PROVIDES BANDWIDTH FLEXIBILITY THAT THE WIMAX INDUSTRY HAS BEEN MISSING.”**

tions) Ethernet makes for “flatter”, more cost efficient network topologies.

Ethernet backhaul can be used either by mapping Ethernet over a PDH/SDH connection, or by employing native-Ethernet solutions. The advantage of native Ethernet is that packets are not mapped into fixed length frames, such as SDH virtual containers or PDH frames. Instead, packet traffic is enabled using the smallest possible overhead and with an optimal frame size for each throughput and modulation scheme. At the same time, TDM interfaces are maintained to coexist within the same frame.

Ethernet can also support ultra-high data rates, exceeding TDM-based solutions’ capacity in all wireless channel bandwidths. The diagram above shows the performance of Ceragon’s FibeAir® IP-10 under different deployment scenarios compared with PDH and SDH systems.

## What does the future of WiMAX backhaul hold?

WiMAX is a versatile technology, enabling different service providers to offer rich media and data-oriented services over wireless broadband networks. It fits the strategy of incumbent Telcos, cable companies, satellite operators and broadband ISPs without a wireless play to extend their services in cities and rural areas.

Meanwhile looking at the global landscape of telecom infrastructure, it is clear that

wireless backhaul will support the deployment of WiMAX worldwide by improving the business case of both competitive service providers and incumbent’s rural operations.

Wireless microwave backhaul provides bandwidth flexibility that the WiMAX industry has been missing. Microwave backhaul continues to thrive in places where fiber is either too expensive, or is unavailable. The recent economic downturn is making PtP microwave backhaul even more attractive as it offers a quick and cost-efficient path for new deployments or network upgrades with almost no compromise on performance and capacity compared to fiber. ■

*Aviv Ronai is a 17 years veteran of the Telecom industry. Ronai is a frequent speaker in all major industry events.*

*Ceragon Networks Ltd. (NASDAQ/TASE: CRNT) provides high-capacity LTE-ready wireless backhaul solutions for mobile and fixed operators, WiMAX and enterprises networks.*

# A Business Case for VoIP: Add Value & Drive Revenue



Scott Bell  
CTO, Alianza Inc.

VoIP technology is rapidly changing and has radically improved over the last few years. Gone are many of the quality issues, now replaced with higher quality of service and reliability. As a result, individuals and business looking to save money without sacrificing quality are open to discovering the benefits of VoIP. Therefore, many WiMAX service providers are considering adding feature-rich voice to their broadband service while evaluating long-term solutions to deliver additional services to their customers.

In an economy where every dollar spent is being scrutinized, cost savings are a big hit with businesses and consumers. Immediate cost savings from VoIP can be easily measured. Other, less tangible benefits are those that can improve residential or business employee productivity through VoIP specific features. These may be more difficult to show in pure cost savings, but are real benefits. Features such as extension-to-extension dialing regardless of employee location are of value if a business has several office locations or has

employees who work from home.

VoIP is accessible in practically every setting. Therefore, it provides consumers and small businesses the same services offered to large enterprise customers. This allows everyone to experience increased mobility and productivity with enterprise-class features. If you are already providing data service, adding voice to your offering is a natural progression for residential, small businesses or enterprise customers who are used to bundled service packages and frequently prefer receiving services from one provider.

Selling VoIP begins with determining the customer's functional needs. What do your residential users need - dial tone only, voicemail to e-mail, several telephone numbers, Web access? What are the business users needs - IVR, 800 numbers, Wi-Fi or IP phones? By answering these questions, you can determine the functional requirements of the system. Reviewing functionality and feature lists available, either in-house or from your hosted

VoIP provider, will assist you in the process of determining customers' needs.

## Residential Benefits

Residential customers' purchasing decisions routinely come down to price and convenience. Adding VoIP to their broadband service and disconnecting from traditional landlines can save them significant money. Features such as unlimited local & long distance, 3 way conferences, caller ID, advanced call handling, and localized dialing experience are typically included in basic VoIP packages without extra charges, saving customers' money. If properly marketed to current customers who are already using your service and a traditional phone service, you make their decision quite easy.

Residential customers want to feel comfortable that the technology will work, so educating them on installation and features goes a long way. This process can begin in the early marketing stages to let them know about the



many features available through VoIP that are not available through their current service. Be sure to point out features such as free on-net calls, music on hold, and voicemail to e-mail.

You may want to prepare a marketing piece than answers frequently asked questions about the technology. This can include topics such as- how does VoIP work, what is the installation process, can I use my computer while on the phone, and how long does the process take? By answering these questions early, you can alleviate concerns and increase your residential uptake, both with current and new customers.

### Small Business Benefits

For many small and medium businesses (SMB) the upfront cost of a traditional communications solution can be quite high. The ongoing cost for services, administration, and long distance charges is overwhelming, making the final purchasing decision on a business telephone system daunting. There are so many details to consider that leave them wondering, "Where do I start?" With a VoIP solution there are a myriad of alternatives, so informing your customers about their options is a great place to begin.

SMBs want package pricing, low up-front costs, manageable ongoing costs, ease-of-use and administration, and increased productivity and mobility. There are a growing number of success stories with VoIP, opening the door for opportunity. Business-grade VoIP is catching on, and many SMBs are open to being educated on the advantages, such as lower costs, manageable costs, and improved efficiencies.

Be sure to point out features that save time and money. For example, a soft phone can be installed on laptops, so calls can be made from any Internet connection, such as at an airport hot spot or hotel lobby, as if the person were in the office. VoIP can provide call forwarding when a businessperson wants all incoming calls to go directly to a cell phone or routed to another worker's desk phone while on vacation.

Extension to extension dialing is another great example. No matter where employees are located, they can be connected with 3 or 4 digit dialing. Other features, such as blind or attended transfer, call pick-up, transfer to voicemail, shared voicemail box and hold mu-

sic or hold messages about the company, will make small businesses seem larger and can be an added benefit in your marketing efforts.

These days, VoIP calls are high-quality and reliable. Everything is plug-and-play. Even the most basic network equipment or routers have the ability to give priority to voice. Soon you'll hear your SMB customers wondering, "What have I been waiting for?"

### Enterprise Customer Benefits

Enterprise customers are a purchasing group with specific needs. VoIP is extending its reach into enterprise networks with better integration, cost savings and features that enhance employee productivity. The convergence of these benefits encourages enterprise customers to look at alternatives to standard telephony solutions. Many are open to the fact that VoIP standards and advanced applications are making installation easier, with the added benefit of cost savings.

The main reasons enterprise companies will move to VoIP are flexibility, increased features, ease of use and savings on operational costs. By focusing on these advantages, you can work closely with current or potential enterprise customers to help them move to a VoIP solution.

Additionally, because many PBX systems have not been fully depreciated, voice vendors are finding ways to integrate systems that allow enterprises to migrate to VoIP over time. This approach leverages their current circuit-switched system while making way for the transition to a fully invested IP based solution. Technology such as Session Initiation Protocol (SIP) is one of the ways voice providers are assisting customers transitioning to IP based solutions. SIP is a widely accepted protocol based on the HTTP protocol and shares many of the same elements. SIP maintains a registration state of each end-point (phone) with a central server. This allows incoming calls to be directed to a VoIP phone or adapter registered to the same server, no matter how either device is physically connected to the network.

Many of the VoIP specific features are designed to enhance employee productivity. The same features that benefit the SMB, including soft phones, extension to extension dialing, voicemail to e-mail, and conference calling, also enhance productivity at the en-

terprise level. These benefits are even greater when spread across a large organization. Additionally, things like adding or moving users can be simplified because they can plug their phone into any LAN port and still access 3 or 4 digit dialing.

Many enterprise companies are also enjoying the efficiencies of having voice on their network, which allows for tighter integration and optimization. This gives the service providers who add voice an opportunity to further execute and leverage their strengths. Customers using additional services on their network, such as VoIP, need more bandwidth and close integration of the network provides an opportunity to optimize quality of service from the initial setup.

VoIP provides distinct communication advantages and is accessible for practically every business setting. Customers of any size gain access to big business capabilities while eliminating high costs and stressful ongoing maintenance. When budget is a consideration, businesses can enjoy a complete communications system with productivity and mobility features like never before. And with the increasing convergence of media and software applications, VoIP is rapidly becoming the essential foundation for a future-focused business. ■

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*Scott Bell, CTO of Alianza, oversees strategic product direction. In 2008 he was named CTO of the Year by UTC.*

*Alianza's award-winning hosted voice platform enables WiMAX service providers to add a feature rich voice offering to their broadband service.*



# WiMAX for Security: How WiMAX is Enabling the Surge in Video Surveillance



Robb Henshaw  
Proxim Networks

There is an increasing need for video surveillance to help secure the world's ports, airports, cities and transportation infrastructure as well as schools, hospitals, government and other critical environments. Now more than ever, organizational demands have hastened our search for better, more cost-effective security applications, and in many instances, rapid deployment of security systems has become essential. But as critical as improved security has become, budgets to accomplish this goal are by no means unlimited.

Organizations of all kinds are being challenged to install video surveillance in areas that are too remote, too costly or physically impossible to reach with additional cabling. As a result, wireless solutions have been a boon to the video surveillance market as they enable the ability to cost-effectively leap over these barriers, allowing a virtually unlimited

number of video surveillance cameras to be deployed quickly, easily and affordably.

In particular, WiMAX has emerged as the premiere solution to provide the wireless backhaul and transmission of real-time video surveillance. As a wireless WAN technology, WiMAX was designed specifically with the efficient backhaul of broadband data, voice and video at its core. Unlike wireless mesh technologies, which provide unpredictable service for backhauling streaming video, WiMAX is deterministic with built in scheduled access and Quality of Service (QoS) mechanisms to ensure the reliable delivery of video.

In a WiMAX-enabled video surveillance system, high resolution, real-time video from each security camera in the network is transmitted from multiple subscriber units to a base station which is then backhauled via a wireless Point to Point radio to the regional

security center which controls all of the cameras. As a result, the use of WiMAX provides the following advantages:

- Eliminates the massive costs and delays of trenching for fiber
- Quickly deployed and configured - operational within hours
- Deploys virtually anywhere - across rugged terrain, bodies of water and remote areas
- Carrier-class reliability ensures non-stop security
- High capacity, configurable and secure broadband wireless for guaranteed QoS
- Enables real-time transmission from and control of surveillance cameras
- When integrated with Wi-Fi networks, allows remote and mobile monitoring (via PDAs, PCs, laptops, etc.) and increases ROI



## **CASE STUDY: Turkey's Largest Video Surveillance Network Uses Proxim's WiMAX as Wireless Backhaul**

The port city of Bodrum is the second largest tourist city in Turkey, with a peak tourist population of over 1.5 million people during the summer months. To ensure the protection of both tourists and locals alike, as well as the port itself, the Bodrum Police Department commissioned the construction of a city-wide wireless video surveillance network, utilizing Proxim Wireless' Tsunami™ MP.16 3500 licensed band WiMAX radios as the wireless backhaul to connect over 70 video cameras.



This deployment is a direct result of an initiative by Turkey's Department of the Interior to roll out video surveillance across the entire country. Prior to deploying Proxim's WiMAX radios as backhaul, the city of Bodrum had attempted to utilize traditional wired telecom infrastructure for the video surveillance network. But as an old, historical city, it was impossible to trench the number of lines that would have been necessary to provide enough throughput for the large number of cameras.

"Not only would digging up the streets of Bodrum compromise the historical integrity of the city, but it would have been completely cost prohibitive," said Faruk Meltem, IT Director of the Bodrum Police Department. "Given the extremely high number of tourists that visit Bodrum and the amount of activity in the port, we needed a solution that could help our Police force more efficiently protect our people and our assets, without breaking the bank. And since today's wireless networks are highly secure, we could safely deploy wireless at a fraction of the cost, but with all the performance and security features we required."

As a result, the Bodrum Police Department

turned to STM, a wireless systems integrator, and Corvus, a Proxim distributor, for the overall design and implementation of the deployment. Corvus, which has worked with Proxim on numerous video surveillance networks throughout Turkey, knew from experience that Proxim's WiMAX radios are optimized to allow the high throughput uplink connections mandatory for video backhaul, and could provide more than enough throughput for the 70 video cameras. And by utilizing Proxim's proven wireless technology, the city of Bodrum saved an estimated \$60,000 per month on leased line costs, while also avoiding the high cost (and damage to the historical city) that would have been incurred by trenching for fiber. Proxim's WiMAX radios also enabled the network to be deployed in a matter of months, as opposed to the years it would have taken to deploy the necessary wired telecom infrastructure.

"This is the 9th wireless video deployment we have executed with Proxim's broadband wireless technology, and each and every time we have been able to save our customers millions on deployment costs over wired infrastructure," said Atilgan Yilmaz, General Manager of Corvus. "Proxim's WiMAX technology provides as much bandwidth as – and in some cases more than – wired telecom infrastructure, so when you combine the cost and performance benefits, Proxim is the easy choice for wireless video surveillance networks."



Overall, STM and Corvus deployed 67 of Proxim's Tsunami MP.16 3500 subscriber stations, connected to 37 Tsunami MP.16 3500 base stations. They deployed over 70 Pelco

digital surveillance cameras, each of which required at least 3.5 Mbps at any given time to provide 25 frames-per-second performance and 4CIF video quality. To allow co-location of Base Stations in adjacent licensed channels GPS was used to synchronize the Base Stations together for optimal performance.

"Now that wireless broadband networks have proven themselves time and time again to provide at least the same performance of wired telecom infrastructure at a fraction of the cost, we are seeing the demand for wireless to enable video surveillance networks skyrocket," said Humberto Malave, Vice President at Proxim Wireless. "As a result, critical video surveillance networks like this one in Bodrum are able to be deployed much quicker, and put in locations where you need them independent of any wired backhaul limitations. This enables police departments and public safety organizations to put the cameras where the crime is." ■

*Robb Henshaw is the Director of Corporate Communications for Proxim Wireless, where he oversees the company's international communications.*

*Proxim Wireless is a leading provider of end-to-end broadband wireless systems delivering voice, video, data and mobility to all organizations today.*

# Case Study:

## Airspan Addressing Rural & Underserved Markets



Airspan, a leading provider of broadband wireless access networks such as advanced WiMAX solutions, has been serving rural and underserved regions across the world, helping to bridge the digital divide.

Many of the emerging markets in the world have less-than-ideal connectivity and find that WiMAX solutions enable them to access broadband and IP telephony to help improve quality of life, educational opportunities and economic conditions, all at a low cost of entry and with a quick-to-market business model.

However, recent research has shown that even an economically advanced country such as the United States suffers serious delinquency in broadband connectivity and the government has taken action to try to correct this situation.

### The United States not ranked as #1

The United States trails Japan, Sweden, South Korea, France, Germany and Canada in broadband quality and subscription rates per capita, according to rankings by the Information Technology and Innovation Foundation (ITIF).

The recently passed American Recovery and Reinvestment Act (ARRA) allocated \$7.2 Billion for broadband propagation in the United States, especially in rural regions. The program, known as the Broadband Technology Opportunities Program (BTOP), will disperse money in the form of grants and loans to enable companies to deploy broadband networks and reach un-served and underserved Americans.

Airspan is in a unique position to assist rural telecommunication companies. With the largest market share in the segment already, Airspan not only has a wealth of experience and expertise in this area, but Airspan has also

been very involved with a consortium of organizations, such as OPASTCO and WCAI, political figures, system integrators and others to best understand and prepare for the program's application rules and regulations.

"There is a lot of confusion out in the field right now," commented Declan Byrne, Chief Marketing Officer of Airspan Networks. "There are hundreds of companies out there who understand the potential in growing their networks and helping their communities and economies, but are not sure how to go about planning for the release of funds or how to access the funds."

Companies who have previously received funding from the Rural Utilities Services (RUS), operating under the U.S. Department of Agriculture, will have a significant advantage. These companies have already undergone a stringent approval process by the government, already serve rural areas and will most likely receive quick approval for network expansion plans. Additionally, the infrastructure products deployed by current or former RUS grant and loan recipients will also have undergone a strict RUS certification process. Airspan has the broadest suite of RUS-certified fixed and mobile WiMAX products, in the broadest frequency range, among vendors.

J.J. Stutler, CEO of Stutler Technologies, partner of Airspan Networks, commented, "Many RUS recipients are already customers of ours and using Airspan equipment out in the field. We are looking forward to assisting these companies in expansions and system upgrades. We have developed very close relationships with these companies as well as hundreds of other rural carriers nationwide. Stutler, located in Emporia, Kansas, is in touch with the



characteristics and challenges of connecting rural communities to broadband."

### Operating In the Rural Market

LigTel Communications, a customer of Stutler/Airspan, has deployed a WiMAX network in Noble County, Indiana. With a dual band network operating on both the licensed 700 MHz and lightly-licensed 3.65 GHz, LigTel is providing Indiana residents and business with high-speed, broadband data access.

"We chose WiMAX for our deployment because it provided us the best means of getting high-bandwidth connections to our customers using our 700 MHz license. Airspan's products have allowed us to deploy WiMAX in both 3.65 GHz and 700 MHz, addressing both coverage and capacity needs," commented Mike Troup, Internet Manager at LigTel. LigTel found that Airspan's WiMAX solutions addressed the flexibility, scalability and diverse equipment range they needed to complete the project. In addition, Airspan is currently the only vendor to offer a comprehensive WiMAX 700 MHz solution.

Last year, a portion of the 700 MHz license was auctioned successfully. The license holders have waited for the band to be cleared by analog television broadcaster which began earlier this year. The low-frequency sub-1 GHz bands, such as 700 MHz, have excellent signal propagation characteristics where the



radio signal penetrates obstacles such as trees and buildings and travels considerably farther than higher frequency solutions. These qualities translate into cost savings for operators by requiring far less infrastructure per square mile. This solution is especially attractive for areas with low population density or for long-range coverage requirements. In addition to broad availability in the United States, this frequency is also available to operators in Asia and other key international WiMAX markets.

Hill Country Telephone Cooperative is another Airspan WiMAX rural customer located in Mason, Texas. The network is operating on the 3.65 GHz frequency band. With a low population density, Hill Country needed a low-cost-to-market solution that would enable them to reach city residents as well as surrounding city locations with a broadband solution. The WiMAX network complements their existing DSL business, with added coverage where the current DSL wires do not reach. The Company was attracted to the pay-as-you-grow business model which allows them to start with a minimal coverage plan and add equipment as the service demand grows.

Larry Pechacek, Business Development Manager for Hill Country, stated, "We are very satisfied with the equipment and services and are planning on deploying into additional markets. The solution allowed us to extend our service reach at a very affordable price."

The demand for affordable broadband solutions is growing quickly worldwide. There has been a significant in WiMAX demand in regions such as the Middle East, Africa and India. In the United States, the broadband stimulus program will continue to drive demand for the next 12-36 months. In addition to standard carrier Internet and telephony services, WiMAX is ideal for municipalities, educational institutions, public safety and defense entities and oil and energy companies.

### **Reducing the WiMAX carbon footprint**

Climate change is moving up the boardroom agenda. Energy costs are rising, adding pressure in an already competitive business environment. Rural and emerging market companies are increasingly concerned with the environment and the financial and ecological

impact of their networks. Margins are being squeezed at a time of increasing regulation, greater scrutiny on business strategy and certainly one of the most challenging economic times.

CEOs continue to be concerned about the potential impact of rising energy prices on their business growth prospects, with related costs of insurance, compliance and regulatory aspects posing a significant business challenge. Operators and other telecommunications service providers know that they must cut energy usage to improve their corporate image, as well as their balance sheets.

WiMAX vendors such as Airspan have considered these challenges and have incorporated these concerns into R&D development. By increasing coverage and capacity, fewer base stations are needed – fewer base stations mean a decrease in power consumption. In addition, smaller and more power-efficient base stations are being designed. Smaller base stations need fewer materials and have a smaller physical footprint. Often they require no cooling system, further reducing their environmental impact. And, smaller and fewer base stations have a positive aesthetic environmental impact as well. ■

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#### *About Airspan*

*Airspan has been a leading vendor of wireless products and solutions since 1992. Today we have more than 400 customers in 100 countries around the world. Airspan has been at the forefront of developing these new wireless standards. Furthermore, by creating in-house expertise in WiMAX, Wi-Fi and VoIP, Airspan is able to exploit synergies and come up with innovative products and solutions that closely integrate these technologies in the most beneficial ways for our customers.*

# Case Study: WiMAX Provider Launches Service in Panama



In 2002, Liberty Technologies, then exclusively an infrastructure provider to ISPs in Panama, was assigned a portion of the 3.5 GHz spectrum by the Panamanian government and launched a residential network service based on Time Division-Synchronous Code Division Multiple Access (TD-SCDMA) wireless networking technology. In the next four years, as WiMAX technology standards and associated products and applications evolved, Liberty worked closely with Cisco® to explore a business case and upgrade path that would encompass the newer wireless technology.

The migration to WiMAX was accomplished in July 2007 with a software upgrade to the 802.16e WiMAX standard. Liberty deployed 24 wireless base stations around Panama City and in two neighboring cities in the WiMAX Profile B architecture using the Cisco BWX 8305 Base Station and Antenna.

The base stations are designed to use two highly efficient wireless technologies—beamforming and multi-input/multi-output (MIMO) - that provide multi-megabit service delivery, increased coverage, and greater indoor penetration. Adaptive beamforming can double the system throughput for a Mobile WiMAX network while at the same time reducing the number of cell sites needed by nearly half. This is achieved by “beaming” a signal directly to each user instead of blanketing an entire coverage area.

“The initial move to WiMAX was more for our benefit and wasn’t evident to our customers,” says Liberty Chief Executive Officer, Moises Abadi. “Because there were no truck

rolls necessary to upgrade the base stations, the operational costs were low. And the centralized nature of the system makes it much easier to troubleshoot and fix. Redundancy is another benefit. But as we migrate to Profile C, with the ability to insert a USB wireless card in a wide variety of third party mobile devices, we think that customers will see the benefits and differentiation of our service.”



Boaters on the bay can stay connected with WiPET

Liberty sells the easy-to-install WiMAX modems at a discount at retail stores such as supermarkets, drug stores, and electronics stores. The modems can also be ordered through the Wipet Web site ([www.wipet.com](http://www.wipet.com)). Prepaid and postpaid service plans for days and months are available, some offering partial rebates off the cost of the modem. Consumers can also choose the broadband access speeds they prefer: from 128k at the low end to multi-megabits per second.

Thus far, Liberty has been promoting the portability rather than the mobility of WiMAX, since consumers can easily take their modems from place to place, including boats on the bay. In 2009 Liberty will deploy software that support 3rd party modems, which will allow users to access the Wipet service via a small Cisco BWX 350 USB modem on their laptop, desktop, or PDA. ■

The screenshot shows the WIPET website interface. At the top, there's a navigation menu with links like 'Inicio', 'Quiénes Somos', 'Cobertura', 'Cómo Abrir', 'Ayuda', and 'Contacto'. Below the menu, there's a table titled 'Planes y Tarifas' with columns for 'Wipet 12 meses' and 'Wipet sin Contrato'. The table lists various service plans with their respective speeds and prices. To the right of the table, there are several promotional banners: 'Ingresar a mi cuenta prepagada', 'WIPET SOPORTE', 'ahora con más COBERTURA WIPET', and '305-7777'.

## About Cisco Broadband Wireless

Cisco Broadband Wireless is the industry's first end-to-end IP next-generation network (IP NGN) solution that integrates licensed and unlicensed wireless access technologies into a converged IP service delivery architecture. Built on the same Carrier Ethernet infrastructure used by cable, wireline, and mobile operators, Cisco Broadband Wireless adds Mobile WiMAX, WiFi hot spots, and WiFi mesh, creating new opportunities for service providers, customers, and markets.

<http://www.cisco.com/go/wimax>

Liberty Technologies Wipet WiMAX Service

<http://www.wipet.com>

# Case Study: Alvarion Deploys WiMAX Solution for Kenya Networks



**Customer:** Kenya Data Networks Ltd.  
**Area:** East Africa  
**Solution:** BreezeMAX®  
**Application:** WiMAX for last mile broadband access

**Alvarion® deploys WiMAX network to provide broadband wireless connectivity solutions for Kenya's business and residential markets**

## The Challenge

To find a reliable cost-effective last mile access solution to support added value broadband services to Kenya's business and residential markets as a part of KDN's Butterfly® service.

"Adapting WiMAX technology is helping us create awareness and educate the market toward adopting the Internet as a way of life." Mr. Vincent Wang'ombe, Marketing Manager, KDN

KDN sought a wireless technology to replace Wi-Fi endpoints and extend the reach of its Butterfly service, as well as continue to meet infrastructure demands of Kenya's growing business sector. KDN also needed to augment the Butterfly service with an effective last mile access solution that supported their plans for mobile device connectivity.



## The Solution

KDN decided to extend the reach of their WiMAX network, particularly since the company considered WiMAX to be the best economic choice for the unique needs

of the growing East African market. The company selected Alvarion's award winning BreezeMAX platform to deliver high performance last mile access as part of their plan to augment their Butterfly solution, solving the issues of reaching the end user. In addition,

the extended WiMAX network is utilized for enterprise inter-branch services, connecting bank branches, ATMs, schools, cyber cafés and businesses.

BreezeMAX platform extended KDN's existing infrastructure to provide last mile access in Nairobi and 40 towns across Kenya and support seamless WiMAX connectivity with mobile devices and Internet services to residential customers

## The Result

- Increased revenues for broadband services
- Rapid ROI
- High Level of Customer satisfaction
- Better QoS offering
- Mass market enabler with access to a larger market share

Since the extension of KDN's existing WiMAX network and augmentation of their Butterfly service, customers are enjoying uninterrupted, consistent high quality service and satisfaction. Furthermore, the extended WiMAX network offers full support for the mobile device connectivity planned for the next phase of the rollout. WiMAX technology is enabling quicker service deployment and access to more markets, giving KDN a fast ROI, increased revenues and growth.



Using Alvarion's last mile infrastructure, KDN is reaching more customers with a stable and error-free link with almost zero failure rates, and able to offer competitive broadband rates to both current and new customers. KDN's pioneering rollout is setting a new standard of service for the growing enterprise and residential markets, permitting customers across the country to benefit from a wider range of service applications. Furthermore, KDN plans to utilize the capabilities of their WiMAX network to offer Personal Broadband services, realizing the vision of seamless mobile device connectivity.

"We chose Alvarion's WiMAX and VL networks to provide and support the ever growing demand in our markets." Mr. Vincent Wang'ombe, Marketing Manager, KDN. ■

**"ADAPTING WIMAX TECHNOLOGY IS HELPING US CREATE AWARENESS & EDUCATE THE MARKET TOWARD ADOPTING THE INTERNET AS A WAY OF LIFE."**

-Mr. Vincent Wang'ombe  
Marketing Manager, KDN

Kenya Data Networks (KDN) is a full service data communications carrier and Kenya's leading provider of commercial leased lines, Frame Relay and metro Ethernet-based services. Since 2003, KDN has worked with Alvarion to deliver wireless



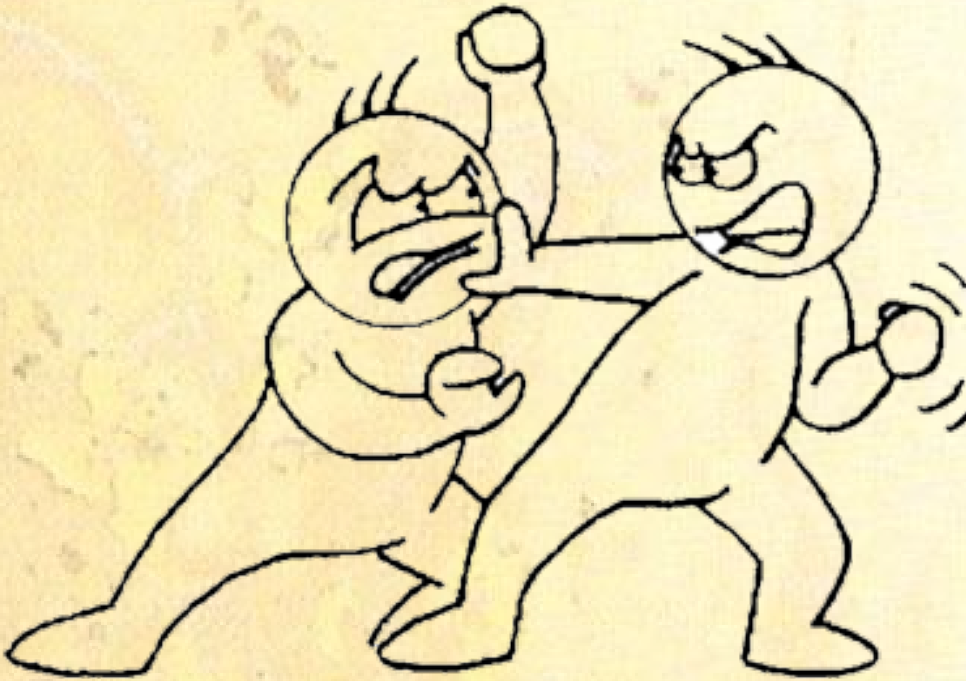
broadband networks. Looking to become the infrastructure provider of choice for operators and users alike, KDN recently developed a new wireless Internet solution called Butterfly® that offers the ability to communicate anytime, and from anywhere. Butterfly is a convenient, one-stop, communications solution for individuals and enterprises and offers subscribers triple play data, voice and video services.

Alvarion is the largest WiMAX pure player, ensuring customer long-term success with fixed and mobile solutions for the full range of frequency bands. Based on its OPEN™ WiMAX strategy, the company offers superior wireless broadband infrastructure and an all-IP best-of-breed ecosystem in cooperation with its strategic partners. Alvarion has delivered over 200 commercial WiMAX deployments worldwide.



# Opinion: Making Enemies of Friends

## *Why the WiMAX vs. LTE Battle Isn't a Battle*



A quick Google search on the term “WiMAX vs. LTE” returns well over 3 million results, a clear sign that there is no shortage of opinions on the so-called battle that exists between these two next-generation (4G) technologies. You don’t have to look hard to find a breakdown of the carriers and vendors that have pledged their support to one technology over the other, and analysis on how these organizations’ support will affect the future of these technologies. Everyone is pitting the two technologies against each other in what they would have you believe is an epic battle for the future of wireless networks – but there’s just one problem.

### **The WiMAX vs. LTE “battle” isn’t a battle at all.**

Neither of these technologies will emerge as victorious over the other, and neither will be forced to accept a role as the “also-ran” in the annals of tech history. In fact, both WiMAX and LTE play different, but equally important, roles in the future of wireless networks. And those roles are “access” and “backhaul”.

With the support of North America’s two largest carriers and GSM carriers around the world, LTE certainly seems to be win-

ning when it comes to providing the future of wireless access. And despite the fact that Clearwire recently committed to roll out mobile WiMAX for access in 8 new markets in 2009, WiMAX has lost a lot of momentum as the access technology of choice. One main factor here is device availability.

The industry often gets into a chicken-and-egg argument about whether WiMAX’s access networks weren’t rolled out sooner because the devices didn’t exist to take advantage of them, or whether the number of available WiMAX-enabled devices was low because the networks didn’t exist for them to connect to. It doesn’t matter. What matters is that WiMAX device proliferation today is extremely low. The cancellation of the Nokia N810 line of handsets – arguably the most well-known WiMAX enabled device on the market – is yet another indicator that device support for WiMAX is waning. As a result, WiMAX is being viewed less and less as the viable next-gen wireless access technology.

And this is exactly where most LTE enthusiasts spin the argument to declare that, since WiMAX is losing ground as the 4G access technology of choice, LTE “wins”. The fact of the matter is, even if WiMAX does not become the next wireless access technol-

ogy of choice, it still has a very important role to play as a backhaul technology for both 4G and Wi-Fi networks worldwide. WiMAX was originally designed as a wireless backhaul technology to begin with, and it is especially well suited for that task.

Just as neither WiMAX or LTE have displaced or will displace the use of Wi-Fi (due the widespread adoption and level of consumer comfort with Wi-Fi), the “WiMAX vs. LTE” comparison is not an either/or proposition. WiMAX is already being used around the world as the premiere wireless backhaul technology for bandwidth intensive applications such as wireless video surveillance, and it will continue to be used for that exact purpose, as well as the backhaul technology for wireless voice and data networks. So, as LTE networks begin to roll out, it is extremely likely that WiMAX technologies will be used as the wireless backhaul, while LTE provides the access. And as advances are made in high-performance outdoor Wi-Fi, again, WiMAX will play a key role as the backhaul.

As an industry, it’s important to do away with the sensational language that paints a picture of a one-technology 4G future. Instead, let us focus on how the existing (and future) wireless technologies will work together, and realize that there are significant market opportunities for both wireless backhaul and access. ■

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*Robb Henshaw is the Director of Corporate Communications for Proxim Wireless, where he oversees the company’s international communications.*

*Proxim Wireless is a leading provider of end-to-end broadband wireless systems delivering voice, video, data and mobility to all organizations today.*

# COMPANY DIRECTORY

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Alianza Corporation





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### Company Background

European Antennas Ltd is now trading as Cobham Antenna Systems, Microwave Antennas. Same products, same technology, same location, same people.

The company is based in a single UK location, and specialises in the design, development and manufacture of flat panel, sector, omni-directional and ultra wideband antennas. There is a large catalogue of antenna designs available, plus antenna development projects are undertaken. The company's production facility, development laboratory, spherical near field anechoic chamber (to test prototypes and verify radiation patterns) and administration offices are on one site in Cheveley, near Newmarket, UK, ensuring control of our stringent quality procedures.

The business objective of Cobham Antenna Systems, Microwave Antennas, is to provide products and services of exceptional value to our customers by ensuring that expectations are realized and every endeavor is made to exceed them. To meet this objective, changes and improvements are continually implemented to manufacturing resources, processes and procedures via investment planning and training.

### Cobham's WiMAX Products & Solutions

Cobham Antenna Systems, Microwave Antennas, design and manufacture antennas in the 250MHz to 40GHz frequency range for commercial, defense, satellite and security systems.

The **Vector antenna series** has been designed with WiMAX interoperability and compliance. The Vector series comprises directional panel antennas, 60, 90 and 120 degree sectors (base stations) and omni-directional antennas. Antennas are supplied for use WLAN, WiFi, RFID, TETRA, PMR, telemetry, surveillance, broadcast and cellular telecommunications systems, installed in arenas, airports, railways and stations, buoys, race cars, tunnels, helicopters, UGVs and UAVs.



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### Company Background

PCTEL is a leading global supplier of antenna solutions for multiple wireless applications including WiMAX, SCADA, land mobile radio, broadband wireless access, RFID, in-building wireless, aeronautical navigation, and GPS. We produce the industry leading antenna product lines MAXRAD® and Bluewave™.

PCTEL's engineering teams are world class and utilize some of the industry's best design tools, test equipment, and test ranges to produce antenna solutions offering the customer excellent performance and value. PCTEL utilizes high quality materials to build antennas that provide the superior performance and reliability expected by our customers.

PCTEL has sales and manufacturing locations world-wide allowing us to offer global support and manufacturing of our extensive range of base station, mobile and portable antenna models.

### PCTEL's WiMAX Products & Solutions

The **MSPDBDI244914NF** sector panel antenna provides coverage of 2.4 GHz to 2.5 GHz and 4.9 GHz to 5.9 GHz frequencies in a single antenna housing.

The **WISP4959018BMV** sector panel antennas cover frequencies of 4.9-6.0 GHz and are designed for use in sectorized WISP applications using a single sector or multiple sector antennas and multiple radios. It offers a choice of 45°, 60°, 90° or 120° single beamwidth sector. Multiple antennas can be utilized to cover several geographical sectors using additional radios. Great for use in place of an obstructed wall mounted omni.

The **SP2327-17XPAB** is designed to cover frequencies from 2300 to 2700 MHz with a VSWR of less than 1.5. Port-to-port isolation of typically > 25 dB. This panel provides field adjustable azimuth beamwidth of 60°, 90° and 120°.

The **MMO24580608** base antenna provides coverage of 2.4-2.48 and 5.15-5.85 GHz frequencies and is housed in a rugged U.V. stable, plastic radome with an aluminum base. This antenna is ideal for indoor or outdoor applications.





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## Phazar Antenna Corp

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### Company Background

Phazar Antenna Corp. is a division of Antenna Products Corp. that focuses on commercial wireless antenna systems for use by 700 MHz, Cellular, AWS and PCS wireless service providers, wireless Internet and broadband communication system suppliers and other wireless applications. Phazar Antenna Corp. offers a broad line of antennas covering 144 MHz to 6 GHz in omni-directional (single and dual band) and directional antennas in sector, panel, waveguide and horn configurations. Distributed Antenna System (DAS) antennas have been developed to address coverage problems in metropolitan and urban areas that wireless carriers require for future advanced services.

Phazar Antenna Corp. has developed several new product lines of high performance base station antennas that enhance the performance of the latest WiMAX and WiFi broadband infrastructure and backhaul systems for both Fixed wireless and Mobile wireless applications. The new product lines offer high gain performance with superior null-fill beam-forming features that improve the coverage under the antenna horizon for base station sites.

### Phazar's WiMAX Products & Solutions

The antennas cover the entire 2.3 to 2.7 GHz frequency range, which allows the antenna to be used for either WCS/WiBro (2.3 to 2.4 GHz), WiFi (2.4 to 2.5 GHz) or BRS/MMDS (2.5 to 2.7 GHz) systems. Antennas can be supplied in 65, 90 or 120 degree horizontal beam-widths with 5.5 or 7.5 degree vertical beam-widths, offering various gains and system coverage. Cross-Polarization is > 24 dB and null-fill is > 20 dB.

We have also developed new product ranges covering 2.0 to 2.3 GHz, 3.3 to 3.8 GHz and 5.125 to 5.850 GHz with the same high gain, null-fill performance in 65, 90 and 120 degree beam-widths. Omni-Directional, Dual Polarized and Quasi-Omni-Directional antennas can also be offered for MIMO requirements or DAS (Distributed Antenna Systems) applications.

Our parent company, Antenna Products Corp. also offers self-healing, low latency Mesh Networking radios for 700 MHz, 2.3 GHz, 2.4 GHz, 3.5 GHz, 4.9 GHz and 5.8 GHz systems.



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## ZDA Communications LLC

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### Company Background

ZDA Communications, located in Columbia, SC, specializes in the engineering and manufacturing of wireless communication antennas, cable assemblies, passive components, and other fine products. Our extensive range of antennas, within the 144 MHz to 6 GHz spectrum, includes: Flat Panel, Sector, Omni-directional (single or dual band), Yagi (include multi-band), Mobile, Rubber Duck Antennas. The Broadband and Ultra Wide Band Antennas are ideal for the Wireless, Security, and Civil markets. Our standard antennas can be used for applications including: WiMAX, WLAN; Wi-Fi, Cellular, PCS, RFID, WISP, In-building-wireless coverage, Surveillance and Telemetry applications.

Continuing roll out of new products with advanced technologies, and a dedication to expanding our existing range of antennas and of designing custom made solutions ensure ZDA Communications US LLC continue to provide high quality, cost effective antennas of outstanding performance.

### ZDA Communication's WiMAX Products

Specifically, for WiMax applications, we have developed new product ranges covering, 700 MHz both upper and lower band, 2.0 to 2.3 GHz, 3.3 to 3.8 GHz and 5.125 to 5.850 Yagi, omni and sector antennas, other antennas include sector and panel antennas can also be chosen. The added value is that we are extremely competitively priced as well as a 2 year warranty.

Please visit our website at <http://www.zdacomm.com/> to know more about us and our other products.



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## Ceragon Networks Ltd.

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### Company Background

Ceragon Networks Ltd. (NASDAQ and TASE: CRNT) is a leading provider of high-capacity LTE-ready wireless backhaul solutions.

We provide a broad portfolio of innovative, field-proven, high capacity wireless backhaul solutions for wireless service providers as well as private businesses. These solutions are designed to deliver voice and premium data services, eliminate the backhaul capacity bottleneck, significantly reduce backhaul costs and transition to next generation IP-based networks.

Ceragon's focus on backhaul is a significant advantage as it serves all types of access technologies, and any type of network. The main driver of Ceragon's business is its modular **FibeAir**® product family, a cutting-edge, high-capacity solution for wireless backhaul transport of broadband services over IP and SONET/SDH networks.

### Ceragon's WiMAX Products & Solutions

*Flexible solutions that meet evolving needs.*

Based on innovative technology and designed with network evolution in mind, the FibeAir solutions offer modular designs and a rich set of features. Whether serving GSM, CDMA, HSPA, WiMAX, LTE or private networks, Ceragon's FibeAir solutions provide highly flexible and scalable answers for cost effective, future-proof high-capacity backhaul connectivity.

Ongoing Leadership - As a long-time leader, Ceragon has achieved numerous industry "firsts", including the first solution for wireless transmission of 155 Mbps at 38 GHz, the first native IP wireless transmission offering, the first to achieve Metro Ethernet Forum (MEF) certification for microwave Ethernet, and other breakthroughs. The Ceragon's innovative approach has been proven to provide a rapid, cost effective and scalable wireless answer for all types of access networks.

Worldwide sales - With a customer base of over 150 service providers and hundreds of private networks Ceragon's solutions are deployed in nearly 100 countries. Ceragon maintains over 20 sales offices located throughout North and South America, EMEA and Asia, handling direct sales. Partnerships with leading distributors, VARs and system integrators around the world provide an active indirect channel.



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## DragonWave, Inc.

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### Company Background

DragonWave Inc. (TSX : DWI) is an emerging leader in the market of high-capacity wireless Ethernet network solutions. With over 6000 deployments in more than 40 countries, DragonWave offers wireless carrier-Ethernet links as a cost-effective alternative that enables cellular carriers and network operators to expand their market coverage and meet increased bandwidth requirements rapidly and affordably. Our field-tested point-to-point digital microwave radio systems are ideally suited for backhaul networks, mobile and fixed networks, enterprise and private networks, as well as rapidly emerging next-generation networks, including WiMAX and LTE. Our wireless backhaul solutions are designed to support any type of network deployment: from capacity upgrades to network expansions to new network deployments.

### DragonWave's WiMAX Products & Solutions

DragonWave's **Horizon Compact** and **Horizon DUO**, are point-to-point Ethernet radios operating in both licensed and unlicensed spectrum from 6 to 38 GHz and support ring/mesh architectures, providing scalable, ultra-low latency, native Ethernet connectivity of up to 1.6 Gbps full duplex for carrier-grade delivery of next-generation triple-play IP services. DragonWave's Horizon systems feature high efficiency, low latency and full support for critical Ethernet data transport features, such as VLAN queuing and prioritization, flow control, and jumbo packet support. DragonWave's digital microwave radios are known in the industry for their small form factor and weather-proof design, delivering exceptional reliability even in the most stringent outdoor requirements.

DragonWave also offers a portfolio of Service Delivery Units (SDU) products based on Pseudowire technology. SDU offers a solution for providing high-capacity TDM transport and high-capacity carrier Ethernet traffic over a single converged packet-based network. Providing a convenient, compact termination point for mixed TDM and Ethernet services, SDU enables DragonWave's Horizon products to support the network traffic generated by converged IP-based services, such as data access, VoIP, and video streaming, as well as legacy TDM services.



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## Aradial Technologies, Inc.

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### Company Background

Aradial Technologies provides top performance AAA Servers and OSS/BSS solutions for Wimax, Internet Service Providers, VOIP and Mobile operators.

Aradial's AAA/RADIUS and billing Solutions are servicing ISPs since 1997. Hi-Capacity Providers with millions of subscribers and Small providers can easily integrate Aradial Solutions into their IT and Network infrastructures. Aradial Solutions enable service providers to effectively compete in deploying next Generation solutions and services while supporting existing infrastructure and legacy systems. Using policy algorithms, Aradial can implement rule-based authentication giving a complete manageability of network resources. Aradial Technologies customers and partners include some of the world's largest corporations, institutions, telecommunications carriers, billing companies and internet service providers (ISPs).

Aradial solutions are deployed by carriers globally for converged services including ISP, WISP, Hotspot, Municipal Hotzones, Mobile, IPTV, VOIP retail and wholesale.

### Aradial's WiMAX Products & Solutions

**Our products for WiMAX AAA and billing (CSN) are in the forefront of WiMAX technology. Some features include:**

- WiMAX Forum standards NGW compliant – supports both 802.16d and 802.16e.
- Convergent Billing for all IP based services, prepaid and postpaid.
- Real-time and Scalable AAA functionalities.
- EAP-TTLS and EAP-TLS for authentication.
- Integrated with leading ASN-gateways partners.
- Integrated with WiFi and traditional Access controllers (for example: Mikrotik, Wavion, Nomadix, Colubris, etc)
- Cost effective solution and fast ROI.
- Billing and Ordering, all services, such as Broadband Data, VOIP, Voice, IPTV, VOD for WiMAX.
- Allows controlling users balance, time and traffic in real-time and with zero leakage.
- Advanced user management for subscribers & prepaid cards management.
- Self ordering and provisioning (Activation and Hotlining)
- Packet Of Disconnect (PoD) and Change of Authorization (CoA)
- Redirection to activation portal at zero balance and purchasing plans through Spotngo portal.
- Multiple resources - allows the user to have multiple user ids on the same account (e.g. Multiple phone numbers, data services usernames, connected to the same account).
- Integration with external billing systems - Advanced APIs for external billing integration both for real-time events and provisioning.



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## EyeBill Interactive Solutions

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### Company Background

EyeBill Interactive Solutions Plc is a global software vendor of Billing and Customer Care solutions for the telecommunications industry. EyeBill is different for its taste for innovation, industry know-how and ability to turn your business ideas into real success.

Since its establishment EyeBill has been supporting both traditional and non-traditional telephony (VoIP & generic) business models, but to stay ahead of our customers' demands, the company constantly initiates billing software developments in line with the hottest trends in the telecom business - Voice and Video over IP/Broadband, Triple Play, WiMAX, IP Centrex and other NextGen services. EyeBill is recognized as a premium telecom billing solutions provider by its customers worldwide and as a respected partner of leading global telecom equipment vendors.

### EyeBill's WiMAX Products & Solutions

**EyeBill Piranha** billing is designed for all types of mobile, traditional and VoIP service providers - giving them the ability to enjoy rapid business development and to move beyond their legacy billing systems with a conceptually new solution that incorporates the abilities of OSS/BSS vendors, but offers revolutionary flexibility.

EyeBill Piranha supports all of the classic business models as per the current telecommunications market trends, but in addition, EyeBill help you offer something unique to your local market that will give your business a competitive advantage, making your marketing campaigns unique and memorable, thus increasing your brand awareness: Using Piranha Skeletons any number of complex pricing and discount policies can be supported based on service subscriptions, usage, accumulated bonuses and/or upfront fees. Piranha Skeletons are pluggable business models and/or automation procedures that succeed to bring to life even the most creative and ambitious service plans.

EyeBill have paid special attention to making the Piranha billing easily amenable to integration with third-party systems and telecom equipments for maximum automatic provisioning of any type of data and/or even triggering in addition to the standard real-time AAA control of services (different protocols on different equipment are supported at the same time).





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## FTS Billing Software Solutions

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### Company Background

FTS (LSE: FTS) is a leading provider of Billing, CRM and Business Control solutions for communications and content service providers. By analyzing events from a business standpoint rather than just billing them, FTS allows providers to better understand their customer base and leverage business value from every event and interaction.

FTS deploys its full range of end-to-end, stand-alone and add-on solutions to customers in over 40 countries and has implemented solutions in wireless, wireline, cable, content and broadband markets including multiple cross-network installations.

### FTS' WiMAX Products & Solutions

FTS offers its **FTS express™** for WiMAX – an extremely flexible billing appliance that can be adapted to the needs of every WiMAX operator, at a fraction of the cost of fully-fledged solutions. The appliance is designed for WiMAX infrastructure providers, resellers and systems integrators to quickly and easily solve WiMAX service providers' back-office requirements.

FTS express provides an all-in-one solution for online charging, AAA, billing and invoicing, customer management, voucher management, calling cards, policy management and more. Setup is simple, with an easy UI setup for localization (taxes, currency), rating plans and business rules. The solution requires minimal set-up for full operational mode, yet is fully expandable and scalable so it can grow with the service provider's future needs and growth.

FTS serves customers in developed and emerging markets with installations in the Americas, Asia-Pacific, Europe, Middle East and Africa.

*For more information, please contact Gadi Maoz, VP Sales & Marketing on [gmaoz@fts-soft.com](mailto:gmaoz@fts-soft.com) or +972-9-960-0284.*

# WITH MECA YOU'RE THE LEADER OF THE PACK!

**MECA has the essential RF components needed to mesh new WiMAX networks with existing infrastructure equipment**



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Fixed Attenuators • Isolators/Circulators • Adapters & Cables**

**Most models available from **STOCK** – 2 weeks ARO**

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**Since 1961**



## Anatech Microwave Company

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### Company Background

Anatech Microwave, develops, manufactures, and supplies a large variety of RF, and Microwave products, used in Wireless, and communication systems. Our quality products are used in WiMAX, WiFi, Homeland security, and public safety systems, Wireless LAN, PCS, GSM, Point to point communications, and other wireless, and communications systems. For the design engineer, Anatech offers the flexibility of providing products designed to match exact specifications, and requirements. As a manufacturer and supplier, Anatech works with a variety of distributors, and helps maintain their supply chain, by providing accurate deliveries, and works with long range demand requirements, by maintaining close contact with the program manager, and contractors. Anatech provides solutions to the professional that develops, designs, or integrates wireless systems

### Anatech's WiMAX Products & Solutions

Our key products include a large variety of RF & Microwave filters and Duplexers offered in different technologies like Cavity, Ceramic, LC, Saw, and Crystal. We also offer Power dividers, Directional couplers, Amplifiers, Antennas, and RF Cables.

In recent years, Anatech has been successful in meeting the demands of the ever growing WiMAX market, by building products in the 3.5 GHz and 2.5 – 2.6 GHz range specifically designed for WiMAX systems. Our primary WiMAX products include Cavity Bandpass filters and Duplexers, Ceramic Bandpass filters and Duplexers, Power Dividers, Amplifiers, Antennas, Directional Couplers and many other related products.

As an example our AB3500B510 is a Cavity Bandpass filter covering the WiMAX band from 3400 – 3600 MHz, with an Insertion loss of 2dB while attenuating 3283 MHz by 35dBc. AB2530B519 on the other hand is a 2530 MHz narrow band Cavity filter with a 1.5dB Bandwidth of 20 MHz, Insertion loss of 3dB and attenuation of 45dBc at 2515 MHz and 2545 MHz. AM3425B1003 is an example of a WiMAX Ceramic Bandpass filter at 3425 MHz with a Bandwidth of 50 MHz, Insertion loss of 2dB and rejection of 25dB at 3225 MHz and 3625 MHz, built in a very small package size of 10.6 x 3.9 x 6 mm max.



## ET Industries, Inc.

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### Company Background

Electromagnetic Technologies Industries, Inc. (ETI) is a manufacturer of state-of-the-art wireless systems, sub-systems and components and a provider of highly refined wireless solutions. ETI is organized into two divisions, Systems Division and Components Division.

The Systems Division focuses on the manufacture of smart, multi-beam antenna systems and the implementation of turnkey wireless networks for communications, data, media, surveillance, SCADA and aerial applications. ETI networks are characterized by high subscriber and data capacities with high coverage distances from with fewer cell sites.

The Components Division designs and manufactures high-spec., wideband RF subsystems and components including directional couplers, QPSK modulators, hybrids, power dividers and beamformers. Components range from 10 MHz to 65 GHz and are built to the highest quality insuring reliability and performance.

ETI was established in 1996 with a focus on advanced engineering. The company employs industry leaders with hundreds of years combined experience, with over a hundred technical publications and numerous patents between them. The company has grown quickly with a global customer base which includes the US Military, NASA, Lockheed Martin and the Indian Space Agency.

### ET Industries' WiMAX Products & Solutions

#### RF Microwave Passive Components

- > QPSK Modulators
- > Single Sideband Modulators
- > Vector Modulators
- > Bi-Phase Modulators
- > I & Q Demodulator
- > Phase Comparators
- > Double Balance Mixers
- > Triple Balance Mixers





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## MECA Electronics, Inc

### Company Background

Since 1961, MECA (Microwave Electronics Components of America) has designed and manufactured an extensive line of RF/Microwave components with industry leading performance including:

- Adapters
- Bias Tees
- Cable Assemblies
- DC Blocks
- Directional & Hybrid Couplers
- Fixed Attenuators
- Isolators/Circulators
- Power Divider/Combiners
- RF Loads, DC Blocks

Since the early days of Series I AUTOPLEX thru recent national deployments of UMTS and E-911, MECA has long been the "backbone" of high performance wired and air-interfaced networks for commercial wireless. We continue to offer a wide variety of models specifically design to mesh your next generation WiMAX networks with existing infrastructure. MECA is one of few component manufactures to be an approved source of supply to ALL of the major US / Canadian service providers and principle OEM's as well.

MECA's uncompromised reputation for delivering rugged and reliable components to the field on-time, every time is due to the unique ability to manufacture cost-effective products without reliance on foreign materials and labor. The quality and consistency of our products differentiates us from the countless start-up companies and brokers who buy/resell off shore materials.

Engineers, Product Managers and Equipment Installer alike trust MECA for critical projects and rely on our superior product performance and extraordinary delivery (from STOCK – 2 weeks ARO) to stay on schedule. We proudly offer a 36 month warranty on ALL of our American-made RF/Microwave components.

### MECA's WiMAX Products & Solutions



#### Attenuators

MECA offers a wide selection of attenuators designed to exceed commercial specifications. Standard attenuation values of 3, 6, 10, 20 and 30 dB are available from STOCK! Need a special value? Many attenuators are available in all values from 0 - 40 dB in 1 dB increments.



#### DC Blocks

DC Blocks covering wireless band applications from 0.400 – 3.000 GHz. Available in 7/16 DIN, N, BNC & TNC configurations with RF power ratings to 500 watts (2.5 kW peak)



#### 705S-3.000

MECA introduces WiMAX Hybrid Couplers for high performance WiMAX applications between 2.0 GHz - 4.0 GHz. Available with SMA-Female connectors and rugged aluminum housing for long lasting, reliable performance



#### Bias Tees

RoHS compliant, high power, Bias Tees that cover wireless band applications from 0.500 – 2.500 GHz. Unique modular design offers maximum connector flexibility at any port! Available in 7/16 DIN, SMA, N, BNC & TNC configurations



#### Couplers (CN/CS Series)

50w couplers designed for excellent performance across all wireless bands from 0.8 – 2.2 GHz making them ideal for base station, in-building wireless and repeater systems.



#### Low Power Loads

MECA V-Line RF loads are optimized for excellent performance across all wireless bands and their rugged construction makes them ideal for both base station and in-building wireless systems. N, SMA and 7/16-DIN are always available from STOCK - even in large quantities - for your next generation equipment deployments!



#### Power Divider/Combiners

Increased power rating and extended frequency range! 2-way thru 16-way 40w, Power Divider/Combiners are optimized for excellent performance across all wireless bands from 0.7 – 2.7 GHz and their rugged construction makes them ideal for both base station and in-building wireless systems.

## ARC CHART

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### ARCchart

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#### Company Background

ARCchart is an independent research and consulting firm focusing on all aspects of the wireless communications sector. Based in London, ARCchart's depth and breadth of analysis provides a global perspective on wireless technology and industry developments.

Combining original thinking with exceptional knowledge and experience, ARCchart assists clients in making sound commercial decisions about technologies, market strategies and competitive positions. With strong roots in the tracking of M&A activity across the communications space, ARCchart's strategic advice covers all aspects of the wireless value chain - ranging from semiconductors and WLANs to network operators, handsets and mobile applications. ARCchart is an affiliate of London-based investment bank ARC Associates.

#### ARCChart's WiMAX Products & Solutions

The WiMAX market is on the cusp of an explosion. The global standard for fixed and mobile wireless communication is expected to bring the benefits of scale economics, driving down equipment pricing and fuelling widespread deployment.

Whilst WiMAX subscriber numbers are still dwarfed by those observed in the cellular and fixed broadband industries, major WiMAX operators are now emerging like Clearwire in the US, WiMAX Telecom in Europe and Prestige-Internet in Russia. However, it is the developing world which is experiencing significant growth with emerging WiMAX operators like Kenya Data Networks, Packet One in Malaysia, Entel in Chile and Dialog Broadband in Sri Lanka.

ARCchart's Global WiMAX Landscape wallchart provides coverage of the leading WiMAX operators around the world who have either launched services or are expected to do so imminently.

For analysts, researchers and marketing professionals, the data is available electronically (MS Excel), ready to port into models, pitches and presentations.

*Stay tuned for updated Wimax Wallchart May 2009.*

<http://www.arcchart.com/wallcharts/wimax.asp>



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### In-Stat

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#### Company Background

In-Stat's market intelligence combines technical, market and end-user research and database models to analyze the Mobile Internet and Digital Entertainment ecosystems. Our insights are derived from a deep understanding of technology impacts, nearly 30 years of history in research and consulting, and direct relationships with leading players in each of our core markets. In-Stat provides its research through reports, annual subscriptions, consulting and advisory services to inform critical decisions. Technology and semiconductor vendors, infrastructure and device manufacturers, service providers and media companies worldwide rely on partnerships with In-Stat's tenured, experienced staff and on our in-depth market intelligence to support critical business, product and technology decisions.

#### In-Stat's WiMAX Products & Solutions

##### Covering the Full Spectrum

In-Stat's breadth of coverage is supported by a robust research methodology that examines each segment of the value chain - from semiconductors to equipment and infrastructure, to services and content purchased by consumers and enterprises.

##### No Barriers

In-Stat's analysts are some of the best in the industry and direct analyst inquiry time makes it easy for subscription service clients to communicate with them.

##### Syndicated Research Services

In-Stat's research service subscribers enjoy a regular flow of easily consumable data and analysis designed to help support their business decision-making process.

##### In-Stat In-Sights

In-Stat In-Sights provide actionable analysis of market changes that will have an impact on our customers and the markets they serve.

##### In-Stat In-Dustry Updates

In-Dustry Updates refresh the detailed data and analysis by providing much-needed forecast updates, signpost confirmations, market share movements, and technology/regulatory impacts.

##### Consulting Services

The In-Stat Consulting team works closely with customers to help marry our ongoing research with their specific requirements.



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## Maravedis Inc.

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### Company Background

Maravedis Inc. is a world-leader and pioneer in Broadband Wireless and WiMAX market research and analysis. Maravedis has established itself over the years as the most credible and reliable market intelligence in the broadband wireless industry. At Maravedis, we have at heart to work closely with equipment vendors, service providers, the component feed chain, and the investment community to produce reliable analysis of equipment shipments, emerging trends and realistic market forecasts worldwide.

### Maravedis' WiMAX Products & Solutions

From WiMAX to cellular mobile and emerging technologies, we offer more than just numbers. Maravedis develops and publishes quality reports and provides consulting services that are delivered into informed and rational opinions thanks to its renowned in-depth expertise of wireless technologies, regulations and market trends.

Maravedis helps you make strategic decisions that have direct effect on your revenue. Therefore, our extended service offering includes a custom consulting practice to meet your very specific research needs. Past successful mandates range from the analysis of CPE characteristics sought by carriers to the potential market of new power amplifier solutions for WiMAX base stations.

4GCounts is a web-based service providing easy access to the latest WiMAX & LTE network deployment trends and information. It is dedicated to tracking and analyzing 4G deployments worldwide. Developed from ground-up and comprised of key information on applications, service offerings, ARPU, pricing, target markets, subscribers and deployments worldwide, 4GCounts is a unique source of comprehensive information for the entire 4G ecosystem. It also includes Quarterly reports providing an executive summary of key information found and analyzed by the Maravedis "4GCounts Team".

The 4GCounts Quarterly Reports provide an executive summary of key information found and analyzed by the Maravedis "4GCounts Team". Each of them contain meaningful and accurate information on applications, service offerings, ARPU, pricing and target markets. They also present statistic and graphics of recent service provider deployments, industry trends and investments among other items. February 2009 is now available.



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## ORR Technology, LLC

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### Company Background

ORR Technology provides marketing strategy and implementation services to small business, enterprise, and Fortune 100 companies around the world. The company specializes in emerging technology markets, where it supports companies looking to optimize or grow product and service offerings.

Founded in 2007 by WiMAX and mobile broadband expert Jeff Orr, ORR Technology has assisted companies including industry research firms, semiconductor and equipment manufacturers, publishers, and Fortune 100 media companies. Most recently Jeff provided expert market knowledge to The Walt Disney Company on emerging broadband wireless technology trends as both an external consultant and employee. He also produced a number of industry research reports, and organized trade events for Yankee Group and CMP Media. Previously, Jeff was actively involved in the formation of WiMAX Forum, holding volunteer director and board member roles in addition to becoming the trade group's first employee and serving as the Director of Marketing.

### ORR Technology's WiMAX Products & Solutions

The Mobile WiMAX Device Guide is the definitive source for announced and commercially available mobile WiMAX (IEEE 802.16e-2005) devices. Over 185 mobile WiMAX devices have been announced or are commercially available from more than 55 manufacturers. The 260-page guide details each product's features and specifications across six consumer electronics categories. The guide is the first to provide network operators and ecosystem vendors with a comprehensive view of product announcements and device specifications. Developed through extensive industry experience, the guide includes the breadth of information to accurately portray the evolution of mobile broadband equipment.

ORR Technology operates Mobile Broadband News (<http://mobilebroadbandnews.com/>), a leading news portal for mobile broadband technology announcements, deployment and market growth. The company also provides services to assist companies in the creation and communication of marketing positioning and messaging.





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## Rethink Technology Research

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### Company Background

Rethink Technology Research is a thought leader in quadruple play and emerging wireless technologies. It publishes weekly research notes, market forecasts, in-depth research papers and provide consulting under two service brands, Wireless Watch and Faultline.

The former focuses on every aspect of the wireless and mobile industry, in particular emerging standards and technologies, and how they support operator business models and vendor strategies. The latter analyzes the transition from analog to digital media, and the revolution in content deliver this has created. In particular, it provides research and consulting in triple and quad play models, broadband digital media and mobile TV.

Rethink Technology also collaborates with ArcChart to produce the daily online newsletter and web site, Rethink Wireless, which provides daily insights into the latest developments in the mobile and wireless markets.

Since its formation in 2002 Rethink has conducted consulting assignments for many of the largest technology companies in the world, as well as some of the newest and freshest start-ups. Clients include service providers, vendors and financial institutions all round the world.

### Rethink's WiMAX Products & Solutions

Rethink has become a well known name in providing news, research, forecasts, seminars and consulting to WiMAX operators, suppliers and investors. It has a unique database of over 400 service providers that are using or trialling WiMAX, which provides unparalleled intelligence about the business models that the technology supports.

In its published reports and customized consulting and research, Rethink focuses on WiMAX business cases, technology trends, pricing and puts the technology in the context of mobile broadband and quad play as a whole. It assesses WiMAX on a daily basis, as a market in its own right and in relation to other technologies like LTE, HSPA, Wi-Fi, CDMA2000 and wireline broadband.

Rethink produces the WiMAX Directions weekly research note on a key issue for the market, and its weekly analyst paper Wireless Watch also contains a special WiMAX section in every issue. Rethink's research director and lead WiMAX/4G analyst, Caroline Gabriel, is also a contributor to publications like WiMAX Trends and a frequent speaker at 4G and broadband wireless conferences.



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## Sidecut Reports

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### Company Background

Sidecut Reports, an independent editorial research firm, provides business professionals with deep background, up-to-the minute information, and decision-making analysis on pertinent topics that goes far beyond blogs at a price far less than that charged by traditional analyst operations. Led by longtime industry journalist Paul Kapustka, Sidecut Reports provides in-depth looks into topics at the intersection of telecommunications, the Internet and public policy.

"Sidecut Reports is designed to provide the in-depth coverage blogs don't have the time for, at a price far less than traditional 'industry analyst' reports, which can cost thousands of dollars each," said Kapustka, who was managing editor at the GigaOM blog network before starting Sidecut Reports in 2007.

Kapustka, who has covered networking and Internet industry topics since 1991, has held top editorial positions at a wide range of industry publications, including CMP Media's Advanced IP Pipeline and Networking Pipeline websites, InformationWeek, InternetWeek, CommunicationsWeek, Light Reading, the (old) Red Herring, and Open Systems Today! and Unix Today!.

### Sidecut Report's WiMAX Products & Solutions

Now available for purchase from the Sidecut Reports website (<http://www.sidecutreports.com>) is the Sidecut Reports 2009 U.S. WiMax Market Report, which includes a comprehensive study of the "new" Clearwire WiMax deal and its \$3.2 billion of investment from a group that includes Google, Comcast, Intel and Time Warner Cable.

Motivations behind the investments and the combination of WiMax assets from Sprint Nextel and Clearwire Corp. to form the "new" Clearwire are explored and explained. The report also contains the first in-depth examination of the Clearwire market launches in both Portland, Ore., and Baltimore.

Available for free download from the Sidecut site are the following reports: The Sidecut Reports Consumer Guide to WiMax; the Sidecut Reports Business Guide to WiMax Deployment; and the Sidecut Reports Net Neutrality Report. For reprint rights or special corporate access to our reports, please contact Paul Kapustka at [kaps@sidecutreports.com](mailto:kaps@sidecutreports.com).



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## Hutton Communications

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### Company Background

Hutton Communications, Inc. headquartered in Dallas Texas, is a distributor of commercial wireless communications and related equipment all throughout the United States and Canada. Hutton serves cellular and radio communications dealers, wireless communications carriers and self-maintained end users of communications systems. In addition, Hutton provides its customers with power systems solutions for emergency backup, alternative energy sources, or out-of-grid power requirements.

### Hutton's WiMAX Products & Solutions

Hutton Communications works with many of the leading equipment vendors to support backhaul of WiMAX. WiMAX is creating a need for higher capacity, higher reliability backhaul solutions. Our lines of licensed and unlicensed Point-to-Point products meet this need perfectly. Product lines such as BridgeWave, Ceragon, DragonWave, Exalt, Motorola, Nera, RADWIN and more; provide the IP centric bandwidth that WiMAX installations need.

### *Slightly Different than the Usual Heard*

With multiple sales and warehouse facilities, Hutton provides local sales support and fast delivery to your location. Hutton stocks the products you need for immediate shipment and fast, economical delivery. In addition to wireless bridges and antennas, you can order cables, towers, backhaul for WiMAX solutions, and thousands of other wireless communications products. Let Hutton be your wireless system supplier.



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## TESSCO Technologies, Inc.

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### Company Background

Rely on TESSCO as Your Total Source® partner for the products you require to design, build, run, maintain, and use all critical wireless communication systems.

Customers such as carriers and their program managers and contractors, large industrial and commercial companies, government institutions, maintenance and repair organizations, and value-added resellers, depend on TESSCO for the latest services and most reliable solutions in the marketplace.

TESSCO delivers the breadth and depth of products and services you require for your homeland security and public safety communication needs, including our newest innovations and future technologies, such as: Remote Surveillance, Disaster Preparedness & Recovery, Wireless Broadband, Battery Backup, and the latest in WiMAX and more!

And as the wireless world is rapidly evolving, making the right decisions directly impacts your bottom line and success. But when you do business with TESSCO, you can rely on us to deliver what you need to succeed – the largest selection of products and services in the industry, exceeding 25,000 from 300 leading brands; the most innovative technologies to meet your most pressing needs, today, and in the future; comprehensive and hands-on training; backed by on-time and error-free delivery, as well as 24/7/365 world-class customer service and technical support.

Visit [www.tessco.com](http://www.tessco.com) today and discover what TESSCO can do for you.



Accton Wireless Broadband Corp.

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## Accton Wireless Broadband Corp.

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### Company Background

Established in 2006, Accton Wireless Broadband Corp. (AWB), part of the Accton Group, develops WiMAX devices for fixed and mobile solutions with the premise located in Hsinchu Science-based Industrial Park. The company contributes the utmost to innovative design and R&D for WiMAX technology with our mission to shorten the digital gaps.

AWB offers full ranges of WiMAX wave 2 fixed and nomadic CPEs and mobile subscriber products including indoor CPE, outdoor CPE, PC card, USB adapter and PCI express card. They are all supporting 2.3, 2.5 and 3.5GHz frequency bands, MIMO and has passed the IOT compatible tests with major base station vendors.

Partnering with leading telecommunication vendors and operators, AWB has developed a best-of-breed WiMAX CPE that enables next generation broadband-centric anytime, anywhere access. The products have been widely distributed to local and international markets and received honorable acclaim. For more information, please refer to [www.AWBnetworks.com](http://www.AWBnetworks.com).

### AWB Networks' WiMAX Products & Solutions

#### WiMAX 802.16e Wave 2 Indoor CPE

The AWB RG230 integrates Wi-Fi (IEEE 802.11b/g), VoIP and Ethernet technology and provides internet connectivity through WiMAX.

#### WiMAX 802.16e Wave 2 Outdoor CPE

The AWB OD200 is a WiMAX outdoor CPE with indoor and outdoor unit. Indoor unit provides internet connectivity through outdoor unit.

#### WiMAX 802.16e Wave 2 PC Card

The AWB PC200 is a WiMAX CardBus Card for laptop users to connect to WiMAX BWA services. It supports Windows XP and Vista system.

#### WiMAX 802.16e Wave 2 USB Adapter

The AWB US210 is a WiMAX USB adapter for laptop users to connect to WiMAX BWA services.

#### WiMAX 802.16e Wave 2 PCI Express Card

The AWB EC200 is a WiMAX Express Card for laptop users to connect to WiMAX broadband wireless access (BWA) services. It supports Windows XP and Vista system.



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## Airspan Networks Inc.

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### Company Background

Airspan is a worldwide leader in broadband wireless with over 400 customers in more than 100 countries. As a founding member of the WiMAX forum, Airspan has led the way in WiMAX, being among the first wave of companies to achieve certification for its Base Station and End User Devices.

Airspan is also leading in the race to Mobile WiMAX. All of Airspan's base station products support Mobile WiMAX. MiMAX, Airspan's USB based Mobile WiMAX end user device, will be the first Wave 2 compatible unit for laptops.

### Airspan's WiMAX Products & Solutions

Airspan offers one of the most comprehensive portfolios of products and solutions in the wireless industry today.

Airspan's WiMAX product range comprises **HiperMAX, MacroMAX and MicroMAX Base Stations**, mobile WiMAX user devices, indoor and outdoor CPEs that also integrate Wi-Fi and VoIP technologies. In addition, we have developed VoiceMAX, a unique and powerful solution essential for carrier-class VoIP delivery.

Our products have been developed with the future in mind. Thanks to the advanced technologies built into our products, we will not only be able to software upgrade our HiperMAX base stations to Mobile WiMAX but we will also be able to run Mobile and Fixed WiMAX on the same platform.

MacroMAXe is a class-leading 2nd generation Mobile WiMAX base station which has been designed and optimized for the 2.3GHz and 2.5GHz Mobile WiMAX bands. It employs the software defined radio (SDR) technology first developed for HiperMAX, together with dual radio transceivers, antennas and GPS receiver all in a highly integrated, physically small and light, all outdoor package.

Airspan's award winning MiMAX Q-Series USB device is a quad-band MIMO USB dongle for laptops and personal computers. Now certified by the WiMAX Forum for the 2.5GHz band, MiMAX also operates in nearly every applicable WiMAX frequency from 2GHz and up to 5GHz frequencies. Certification includes thorough assessment of the features required in the WiMAX Forum 2.5 GHz profile as well as rigorous testing of multi-vendor interoperability.





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## Alvarion, Ltd.

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### Company Background

Alvarion (NASDAQ: ALVR) is the largest WiMAX pure-player with the most extensive WiMAX customer base and over 250 commercial deployments around the globe. Committed to growing the WiMAX market, the company offers solutions for a wide range of frequency bands supporting a variety of business cases.

Alvarion is leading the market to Open WiMAX solutions with the most extensive deployments and proven product portfolio in the industry covering the full range of frequency bands, with fixed, nomadic and mobile solutions. Alvarion's products are designed to enable the delivery of personal mobile broadband, business and residential primary broadband access, corporate VPNs, toll quality telephony, mobile base station feeding, hotspot coverage extension, community interconnection and public safety communications.

Through its OPEN™ WiMAX strategy, superior IP and OFDMA know-how, and proven ability to deploy end-to-end turnkey WiMAX projects, Alvarion is shaping the new wireless broadband experience.

### Alvarion's WiMAX Products & Solutions

Alvarion® offers a complete portfolio of carrier class, field-proven and award-winning products for fixed, nomadic and mobile wireless access for licensed and license-exempt frequencies:

- BreezeMAX® 802.16e Mobile WiMAX wave II certified products for licensed frequencies (2.x GHz and 3.x GHz)
- BreezeACCESS® VL and BreezeNET® B for license-exempt frequencies (900 MHz, 4.9 and 5.x GHz)
- BreezeACCESS VL SU-Video for wireless video surveillance solutions optimized for the high performance needs of the video surveillance market
- BreezeMAX/BreezeACCESS Wi² for Wi-Fi 802.11 as a Wi-Fi mesh solution extension to the WiMAX network
- Star management suite for efficient management and monitoring



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## Aperto Networks

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### Company Background

Building on proven technologies, the WiMAX Forum Certified™ **Aperto PacketMAX**© system gives service providers the carrier-grade, multi-services infrastructure they need to affordably take full advantage of the business opportunities offered by broadband wireless and the recently approved Stimulus Package.

PacketMAX delivers the critical elements required to extend services to a wide range of users—from large enterprises and public-sector organizations, to multi-tenant buildings and residences—using a single, standards-based platform. Our product line is RUS-accepted and supports the widest range of frequencies for licensed and license-exempt WiMAX deployments, including 5.8 GHz, 5.4 GHz, 5.1 GHz, 4.9 GHz, 3.65 GHz, 3.5 GHz, 3.3 GHz, 2.5 GHz, and 2.3 GHz.

### Aperto's WiMAX Products & Solutions

Our Product line includes:

- **PM 5000 Base Station:** The industry's highest density, highest capacity, and highest performing WiMAX MACRO base station, capable of supporting thousands of users with outstanding QoS and reliability.
- **PM 3000 Base Station:** Stackable, rack-mountable, single-sector MICRO base station providing outstanding value and functionality.
- **PM 4000 Base Station:** PacketMAX 4000 is a rack-mountable MICXRO 801.16e WiMAX base station that supports redundancy of all major subsystems including power, backhaul, wireless controllers, and radios
- **PM 100/ 300/400 Series Subscriber Units:** Unique combination of performance and functionality for the SOHO, medium-large enterprise, and MTU/MDU markets.
- **PM 500 Series Subscriber Units:** Self-install unit for all-indoor WiMAX consumer services.
- **PM 600/700 Series Subscriber Units:** USB and PC-Card devices for 802.16e WiMAX services
- **WaveCenter Element Management System:** GUI-based element management system (EMS) for managing networks powered by PacketMAX.



## AXIS Network Technology, Inc.

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### Company Background

AxisNT is a leading vendor of software reconfigurable digital radios, subsystems and IP to OEMs for deployment in WiMAX networks worldwide. Our Remote Radio Heads, and the innovative software that drives them, are already enabling WiMAX services to be delivered in the USA, Asia and Europe, with state-of-the-art power efficiency performance that helps network operators to minimise CAPEX and OPEX.

### AXIS' WiMAX Products & Solutions

**The AxisNT family of Remote Radio Heads (RRH)** is available immediately for OEM deployment in WiMAX networks worldwide.

Due to the use of our patented transceiver technology, Axis RRH exhibit excellent uplink and downlink performance to give customers the coverage and capacity edge.

**The AxisNT family of single and dual RF Modules** for 2GHz to 4GHz employ a multi-band architecture for TDD and FDD OEM applications using OFDMA, CDMA and TDMA technologies. The RF Module performs all the Tx/Rx analogue RF functions between the digital transceiver and the antenna ports. The RF power amplifiers are designed for integration with Digital Pre-Distortion (DPD), Quadrature Modulation Correction (QMC) and Crest Factor Reduction (CFR). Axis has deployed its RF Modules in OEM Remote Radio Heads for WiMAX and UMTS Base Station Systems.

**The AxisNT family of Configurable Digital Radio Systems (CDRS)** performs all the digital transceiver functions between the baseband IQ interface and the analogue RF front end, and is capable of operating over 400MHz to 4GHz. The CDRS is a multi-protocol, multi-band, digital radio for OEM applications delivering optimal cost, lowest power consumption and small size, and employs a flexible architecture for TDD or FDD applications using OFDMA, CDMA and TDMA technologies.



## Cisco

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### Company Background

Cisco enables people to make powerful connections—whether in business, education, philanthropy, or creativity. Cisco hardware, software, and service offerings are used to create the Internet solutions that make networks possible—providing easy access to information anywhere, at any time.

### Cisco's WiMAX Products & Solutions

Through our expansive Cisco IP Next-Generation Network portfolio, mobile operators around the world are seeing the benefits of increased network efficiency, reduced time to market and the ability to offer new and personalized services.

Cisco Broadband Wireless Access products for Mobile WiMAX feature advanced antenna systems and support adaptive beamforming and multiple-input multiple-output (MIMO). They allow for multi-megabit service delivery, increased coverage, and greater indoor penetration for the following benefits:

- Subscribers experience high-quality wireless services
- Service providers get fewer service calls, faster time-to-market with new services, and improved cost efficiencies

This open-standards solution is compliant with the Mobile WiMAX specification and the Profile C Network Reference Model. It includes a full suite of base stations, antenna systems, access service network gateways, management systems, and customer premises equipment. Specific Products:

- **Cisco Broadband Wireless Gateway**
- **Cisco BWX 8300 Series Broadband Wireless Access System**
- **Cisco BWX 2300 Series Broadband Wireless Access System**
- **Cisco BWX 200 Series Modems**
- **Cisco BWX 300 Series Modems**
- **Cisco BWX Element Management System**



always best connected

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## Green Packet Berhad

### Company Background

Green Packet Solutions, part of the Green Packet Berhad group of companies, is a leading developer of Next Generation Mobile Broadband and Networking Solutions. Our mission is to provide seamless and unified platforms for the delivery of user-centric multimedia communications services regardless of the nature and availability of backbone infrastructures. Founded in San Francisco's Silicon Valley in 2000, Green Packet Solutions has expanded its global footprint to Kuala Lumpur (Headquarters), Singapore, Shanghai, Taiwan, Australia, Bahrain and Bangkok.

Green Packet Solutions empowers Operators to improve ARPU via leading edge carrier-grade connectivity solutions and interoperability-tested WiMAX Modems. Green Packet Solutions' products offer best-in-class performance and are of the highest quality, ensuring our customers are "ALWAYS BEST CONNECTED"

With R&D centres located in USA, Shanghai, and Taiwan, we are on the edge of new developments in 4G (particularly WiMAX and LTE), as well as software advancement. Green Packet Solutions' presence around the world shouts our global capabilities and localization abilities. Furthermore, fellow symbiotic players can leverage on Green Packet Solutions' strategic alliances in the telecommunications industry to strengthen one's stake in the ecosystem.

### Green Packet's WiMAX Products & Solutions



#### WiMAX Indoor Modems (D Series)

The D Series enables WiMAX Operators to deliver high-speed wireless broadband to residential and enterprise users, providing a quick and easy way to get started with WiMAX. Selected models integrate VoIP services to provide quality IP-based voice transmission and 802.11b/g high speed wireless LAN access point that enables multiple WiFi-enabled devices to enjoy wireless WiMAX connectivity anytime within the indoor perimeters.



#### WiMAX Outdoor Modem (O Series)

Green Packet Solutions' O Series are designed to be used in conditions where indoor penetration is difficult, for example, thick/insulated walls or due to the presence of obstructing objects such as trees or mountains.

Additionally, this modem may be deployed for users residing at WiMAX network fringes to ensure optimum coverage.



#### WiMAX USB Modem (U Series)

For users who are constantly on the move, the U Series is a perfect companion, providing instant WiMAX connectivity anytime, anywhere. It comes built-in with an intelligent connection manager that converges connection management, communication services and entertainment within a single client. As such subscribers enjoy a simple, unified access to various networks and applications from one user-friendly and trendy interface.





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## Harris Stratex Networks, Inc.

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### Company Background

Harris Stratex Networks, Inc. is a leading specialist in providing complete end-to-end wireless solutions for 4G WiMAX mobility and broadband networks. Customers in more than 135 countries depend on Harris Stratex to build, expand and upgrade their voice, data and video solutions. The company is recognized around the world for innovative, best-in-class wireless networking solutions and services.

### Harris Stratex's WiMAX Products & Solutions

#### WiMAX Access

The Harris Stratex **StarMAX** broadband wireless access platform is an industry-leading mobility solution that enables fixed, nomadic and mobile services based on IEEE 802.16-2004 and 802.16e-2005 standards. High-performance base stations, together with rich variety of subscriber devices, deliver market-leading transmission performance and highly-expandable coverage options, including four sectors with STC/MRC functionality in a single base station. Several frequency versions for 802.16e-2005 standard compliant base stations cover the 2.5, 3.3 and 3.5 GHz, and are available as split box with an outdoor RF unit.

The StarMAX 16d product portfolio is NWG ASN interoperable, with QoS and 802.1Q VLAN packet priority, supporting VoIP, video and other multimedia applications.

#### IP Microwave Backhaul

The Harris Stratex **Eclipse Packet Node** platform supports scalable high-capacity native Carrier Ethernet/IP wireless transmission, and is ideal for building out WiMAX backhaul network infrastructure. Eclipse Packet Node provides speeds up to 1.2 Gbps, with carrier-class Layer 2 QoS and network resilience.

#### Network Services

Harris Stratex Network Services includes a full turnkey offering for the full spectrum of design, deployment and management of broadband networks in any location around the world. Harris Stratex has extensive experience in Ethernet/IP and a comprehensive suite of IP consultancy, network planning and design services, and can help you build the most efficient, high-performance network possible.

**For more information go to:**

<http://connect.harrisstratex.com> and enter the keywords: 'hstx wimax'



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## Proxim Wireless

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### Company Background

Proxim Wireless Corporation (NASDAQ: PRXM) is a leading provider of end-to-end broadband wireless systems that deliver the quadruple play of data, voice, video and mobility to all organizations today. We are 100 percent focused on wireless technology, and that focus enables us to provide a complete portfolio of WLAN, Wi-Fi mesh, WiMAX (point-to-multipoint), and point-to-point technologies.

Regardless of the application, our end-to-end product portfolio enables partners to custom-build the wireless solution that fits customers' specific needs. Our broadband wireless equipment is used by enterprises, service providers, carriers, government entities, educational institutions, healthcare organizations, municipalities and other organizations that need high-performance, secure and scalable broadband wireless solutions.

### Proxim's WiMAX Products & Solutions

#### Focus Applications:

Using a combination of WLAN, Wi-Fi Mesh, WiMAX and Point-to-Point backhaul technologies, Proxim enables a wide variety of fixed and mobile applications, including:

- Security and surveillance – Systems including video surveillance, gunshot location and perimeter security
- Last-mile connectivity – Wi-Fi and WiMAX access for both enterprises and consumers
- Enterprise WLAN – Wireless access and building-to-building campus connectivity
- Public Safety – In-field mobile data access for public safety officers, field service technicians and other mobile field workers
- Cellular Data, Voice & Video Backhaul – High-performance wireless point-to-point backhaul connections for carriers and wireless ISPs
- Intelligent Transportation Systems (ITS) – Complete broadband wireless networks that tie together critical transportation systems

#### WiMAX Solutions:

- Tsunami MP.16 3500 – Licensed WiMAX base station and subscriber units
- Tsunami MP.11 Series – Unlicensed, fixed and mobile WiMAX base station and subscriber units
- Tsunami MP.11 HS Series – Ultra-secure, government-grade WiMAX for all organizations
- MP.11 5012 Residential Subscriber Unit – Affordable indoor and outdoor WiMAX subscriber units
- MP.11 5012-CPE – CPEs that provide the industry's most aggressive price point and reduce the cost barriers for wireless broadband
- MeshMAX™ Product Series – The world's first tri-radio (Wi-Fi, Wi-Fi mesh, and WiMAX) access point



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## Powerwave Technologies, Inc.

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### Company Background

Powerwave Technologies, Inc. (NASDAQ: PWAV) is a global leader in end-to-end wireless coverage and capacity solutions for wireless communications networks. Offering cutting edge wireless infrastructure to address the demands of enterprise and commercial customers, Powerwave offers a comprehensive suite of solutions, including Antennas, Base Station Solutions and Coverage Solutions. Powerwave's product line supports all wireless network protocols and frequencies including Next Generation Networks in 4G technology such as WiMAX and LTE. Powerwave solutions, products and services also help wireless operators and OEMs reduce capital and operating expenses, speed rollout of services, improve coverage and capacity, and reduce environmental impact.

### Powerwave's WiMAX Products & Solutions

Powerwave offers one of the most extensive lines of base station Antennas, Tower Mounted Amplifiers (TMA) and Filters in the world. Our product portfolio covers all major frequency bands and air interfaces.

#### Base Station Solutions:

##### VersaFlex™ Enclosures

- \* VersaFlex™ Enclosure Solutions
- \* VersaFlex™ Documentation
- \* VersaFlex™ Installation Videos
- \* VersaFlex™ CEV

##### Power Amplifier Solutions

- \* MCPA Modules
- \* Single MCPA Outdoor Booster Systems
- \* Dual MCPA Outdoor Booster Systems
- \* Triple MCPA Outdoor Booster Systems

##### Filters

##### TMA Products

- \* Tower Mounted Amplifiers
- \* Power Distribution Unit
- \* Current Injectors

##### RF Conditioning Solutions

- \* Base Station Filter

##### Integrated Radio Products

- \* Integrated Power Transceiver
- \* Digital Radio Solutions

#### Antenna Solutions:

- \* Antennas
- \* Remote Electrical Tilt (RET) Products
- \* iRET Antennas
- \* Antenna Patterns
- \* Product Catalog
- \* Mounting Solutions
- \* Testing
- \* Obsolete Products



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## Samsung Electronics

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### Company Background

Samsung Electronics Co., Ltd. is a global leader in semiconductor, telecommunication, digital media and digital convergence technologies. Employing approximately 138,000 people in 124 offices in 56 countries, the company consists of five main business units: Digital Media Business, LCD Business, Semiconductor Business, Telecommunication Network Business and Digital Appliance Business.

### Samsung's WiMAX Products & Solutions

The Samsung Mondī™ is a Mobile Internet Device (MID) that carries many of the powerful features and uses of a laptop computer or netbook, but its compact slider form factor easily fits into the hand or pocket. GPS Navigation provided by Route 66 adds to the Mondī's versatility. Available in a solid black finish, this device extends horizontally to reveal a full QWERTY keyboard and optical mouse. The Mondī™ is packed with multimedia features that offer instant access to E-mail, Internet, video content and business applications.

Samsung is the global leader in delivering mobile WiMAX technologies and offers an end-to-end solution including chipsets, infrastructure, mobile devices and consumer electronics, including devices capable of accessing both mobile WiMAX and other wireless technologies. UQ Communications in Japan and Scartel LLC., in Russia are examples of other Mondī (tm)ing operators preparing for significant commercial deployment of national-wide service using Samsung's mobile WiMAX total solution.

Samsung Telecommunications America, LLC, a Dallas-based subsidiary of Samsung Electronics Corporation Ltd., researches, develops and markets wireless handsets and telecommunications products throughout North America. For more information, please visit:

[www.samsungwireless.com](http://www.samsungwireless.com).



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## Vecima Networks Inc.

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### Company Background

Established in 1988, Vecima Networks Inc. is a recognized world leader in value and performance for WiMAX technology. Vecima's VistaMAX® family follows a portfolio of successful wired and wireless products featuring QAM modulation, OFDM, wireless DOCSIS® and advanced software for network management. Vecima's equipment helps Telecommunications companies, Wireless Internet Service Providers, and MSOs provide premium last-mile broadband connectivity. Vecima's wireless products include base stations, subscriber stations, backhaul, and sophisticated network management tools in the 600 MHz – 5.8 GHz frequency ranges.

### Vecima's WiMAX Products & Solutions

The **VistaMAX®** product family enables exceptional last-mile broadband connectivity using integrated single box base stations and subscriber stations as the network elements. Using VistaMAX® based on the IEEE 802.16-2004 standard and WiMAX Forum™ system profiles allows Service Providers to achieve high performance, non-line of sight wireless connectivity. The NMS8000 (Vecima NMS platform) provides system operators with comprehensive tools to operate and manage VistaMAX® networks. VistaMAX® is available in 1.9, 3.5, 3.65 and 5.8 GHz.

The **WaveRider LMS8000** Broadband Wireless system features market-leading throughput performance and system capacity at 900 MHz. Featuring OFDM technology and incorporating the superior WaveRider Dynamic Polling MAC, the LMS8000 Series is specifically designed to enable network operators to fully exploit the non-line-of-sight advantages of the 900 MHz band. Also offered are high throughput point-to-point and point-to-multipoint wireless backhaul in 5.8GHz, 4.9GHz and 900MHz.

Vecima's **BWIN** (Broadband Wireless Internet Network) employs the feature-rich DOCSIS® platform along with powerful RF technology to create a cost effective system for fixed broadband access. BWIN is available in 700MHz, 850MHz, 2.5GHz, 3.5GHz and 5.8GHz.





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## EDX Wireless LLC

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### Company Background

EDX Wireless was founded in 1985 as one of the first engineering software providers that offered PC-based planning and design tools for RF networks. Since that time, EDX has come to be known for its unsurpassed dedication to innovation, customer service and engineering integrity.

With a global ecosystem of distribution, integrated partner solutions, service and support, more and more carriers are turning to EDX for smart wireless network planning tools that meet the challenges of today's broadband network designs. EDX offers wireless network planning tools for any system operating from 30 MHz to 100 GHz, including RAN and backhaul systems.

### EDX's WiMAX Products & Solutions

**EDX® SignalPro®** with the Network Design Module is a comprehensive, carrier-class RF planning tool for the design and deployment of wireless networks. With a focus on innovation in broadband wireless technologies:

#### -WiMAX, LTE and Wi-Fi network design features:

- MIMO/Adaptive Antennas
- Automatic Frequency Planning
- Automatic Traffic Planning
- Specialized studies and features for fixed and mobile systems

#### -Advanced propagation prediction models and methodologies

#### -Coverage/interference, point-to-multipoint, mesh, and link (backhaul) studies

#### -Outdoor, indoor, outdoor-to-indoor, urban, rural - any environment

#### -For service providers, equipment vendors, and technology consultants worldwide

*Unleash the power of smart planning with EDX.*



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## Forsk

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### Company Background

Forsk is the world-leading provider of RF planning and optimization solutions for the wireless industry. Our 150+ customers are wireless operators, equipment suppliers and consulting firms from 60 countries. Forsk has strategic partnerships with major players including AT&T Mobility, Vodafone, Motorola, Nortel Networks, Alcatel-Lucent and Huawei. Atoll is an open and flexible multi-technology RF platform supporting WiMAX, GSM/GPRS/EDGE, UMTS/HSDPA/HSUPA, CDMA2000 1xRTT/EV-DO, TD-SCDMA, and Microwave. Forsk is member of the WiMAX Forum.

### Forsk's WiMAX Products & Solutions

#### Atoll

Atoll WiMAX is a state-of-the-art WiMAX and Broadband Wireless Access (BWA) network planning and optimization tool developed in cooperation with the major WiMAX equipment manufacturers. Atoll WiMAX supports the IEEE 802.6 and the evolving IEEE 802.16 e evolving standard. It also supports advanced antenna diversity systems, such as Adaptive Antenna Systems (AAS) and Multiple-Input-Multiple-Output (MIMO).

Atoll is also an open technical information system that easily integrates with other IT applications and increases productivity.

It features advanced development tools and open interfaces that enable the integration of customised or commercially available complementary modules.

Atoll is designed to work in a wide range of implementation scenarios, from standalone to enterprise-wide server-based configurations using distributed and parallel computing.

#### Atoll Modular Configuration

Atoll Core is the central module that supports the user interface, the GIS features, the propagation modelling engine, all data management services, interfaces and software development tools. All technology modules run on top of Atoll Core.

Atoll 2.8 also features Automatic Frequency Planning tools and Automatic Cell Planning tools that deliver, on top of the technology modules, a comprehensive set of automatic network design and optimisation functionalities.



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## GCT Semiconductor, Inc.

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### Company Background

Delivering highly integrated semiconductor solutions for wireless communications.

GCT Semiconductor is a leading fabless semiconductor company that produces innovative integrated circuit solutions for the wireless communications industry. With its proven radio frequency (RF) CMOS and system-on-a-chip (SOC) expertise, GCT provides state-of-the-art CMOS RF transceivers, single-chip mobile digital TV receivers and Mobile WiMAX solutions serving 3G and 4G mobile system manufacturers by reducing BOM cost, lowering power consumption and minimizing total solution size.

#### GCT WiMAX™ IC Advantages

- Lower power consumption
- Smaller form factor
- Lower BOM cost
- Co-existence with WiFi
- Market-Proven WiMAX solution
- Field-Proven WiMAX solution



*Wireless Communications Innovation*

### GCT's WiMAX Products & Solutions

#### Single-Chip Solutions

##### **GDM7205 & GDM7213:**

The industry's first Mobile WiMAX™ IEEE 802.16e Wave 2 compliant 2.x and 3.x GHz monolithic single-chip solutions, which include RF, MAC and PHY, all into one monolithic integrated circuit.

##### **GDM7215:**

The industry's first single-chip solution supporting both Mobile WiMAX IEEE 802.16e WAVE 2 and WiFi 802.11 b/g.

##### **GDM7701:**

Highly integrated baseband system-on-chip (SOC) designed for Femto AP applications, offering a low BOM cost ideal for low-cost mobile WiMAX Femto AP applications.



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## Fujitsu Microelectronics America

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### Company Background

As a founder and board member of the WiMAX Forum™, Fujitsu Microelectronics leads the worldwide promotion and implementation of new generations of broadband wireless access technology. Since the inception of its mobile WiMAX SoC development program, Fujitsu has been actively working with early engagement customers and world-class base-station companies for IOT collaboration. Fujitsu has also been collaborating with ODMs, helping them to commercialize a variety of MS (mobile station) form factors to be ready for mass production. These form factors include PCMCIA cards, USB dongles and subscriber stations. The Fujitsu OFDMA PHY/MAC baseband SoC offers MIMO and beamforming features. Fujitsu is fully committed to participating in the 2008 Wave 2 certification program.

### Fujitsu's WiMAX Products & Solutions

The company's IEEE802.16e-2005 WiMAX SoC was launched in June 2007. Fujitsu's second-generation mobile WiMAX SoC solution is available and targets embedded handheld applications such as smart phones and PDAs. An advanced power management scheme greatly reduces its on-chip power consumption. Enhanced and optimized PHY and MAC circuitry allows the chip to be more efficient for embedded applications that use 65nm process technology. Compact modules combining baseband, RF and power management chips simplify design.

The new Mobile WiMAX (802.16e) base station SoC is flexible enough to support the low-cost requirements of a femto base-station architecture and yet scalable enough to support pico and even micro base-station architectures. This enables system manufacturers to leverage a single core solution across a multiple small base-station platforms. The highly integrated SoC incorporates all the PHY and MAC features necessary for a base station to meet the Mobile WiMAX Wave 2 certification requirements.



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## SEQUANS Communications

### Company Background:

Sequans Communications is the leading supplier of WiMAX semiconductor solutions based on IEEE 802.16-2004 and 802.16e-2005 standards. Sequans has products that are WiMAX Forum Certified™ for both Fixed and Mobile WiMAX, for both base station and subscriber station technology, and is the first and only WiMAX chipmaker to achieve this distinction.

Sequans offers equipment manufacturers the most complete and powerful semiconductor solutions available today, enabling them to build the widest range of high performing WiMAX network components: femto, pico, micro and multi-sector macro base stations, outdoor and indoor subscriber terminals, home gateways, and all types of mobile devices.

### SEQUANS' WiMAX Products & Solutions

**SQN1210 Mobile WiMAX mobile station SOC.** Baseband and triple band RF integrated in a single 65 nm die. Delivers high throughput (>40 Mbps) and low power consumption of less than 350 mW with fully loaded MIMO traffic. Covers all international WiMAX bands, 2.3-2.4, 2.5-2.7,

3.3-3.8 GHz. Implements dual transmit channels, enabling uplink MIMO as specified in Release 1.5 of the Mobile WiMAX system profile, for significantly increased cell coverage and lower power consumption and cost. The most powerful solution in the industry.

**SQN1130 Mobile WiMAX mobile station SOC.** Features 2X2 MIMO, maximum likelihood decoder, high throughput (>30 Mbps) and low power consumption (<280 mW). WiMAX Forum Certified™

**SQN2130 Mobile WiMAX base station ASIC.** Can support any size base station, including femto with no compromise on features; TDD and FDD. WiMAX Forum Certified™

**SQN1140 (for 2.5 GHz) and SQN1145 (for 3.5 GHz) Mobile WiMAX mobile station RFICs.** Provides direct conversion RF transceivers in both transmit and receive paths; low noise amplifiers.

**SQN1170 Mobile WiMAX mobile station chipset.** Combines baseband, RF, and memory in small 12X12 package with low power consumption (<600 mW in peak MIMO mode).

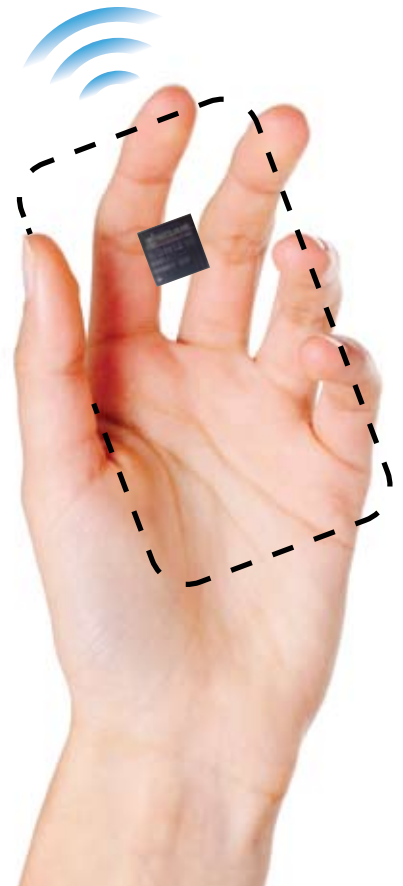
# What will you create with the breakthrough in performance?

## The New SQN1210: SOC for Mobile WiMAX Mobile Stations

The first 65nm single die baseband and RF chip.

- 10X10 package includes SDRAM
- Triple band RF support, 2.3, 2.5, 3.5 GHz
- Supports 2Tx and uplink MIMO
- Ultra low power consumption
- <350 mW (with fully loaded MIMO traffic)
- Ultra high throughput >40 Mbps

Learn more at [www.sequans.com](http://www.sequans.com) today,  
or visit us at booth #5750 WiMAX Pavilion.







## Intel Corporation

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### Company Background

Intel Corporation is the world's largest semiconductor company and the inventor of the x86 series of microprocessors, the processors found in most personal computers. Founded on July 18, 1968 as Integrated Electronics Corporation, Intel also makes motherboard chipsets, network cards and ICs, flash memory, graphic chips, embedded processors, and other devices related to communications and computing.

### Intel's WiMAX Products & Solutions

The Intel® WiMAX/WiFi Link 5350 and Intel® WiMAX/WiFi Link 5150 are the family of IEEE 802.16e and 802.11a/b/g/Draft-N1<sup>1</sup> wireless network adapter that operates in the 2.5GHz spectrum for WiMAX and 2.4GHz and 5.0GHz spectra for WiFi. This adapter delivers up to 13Mbps<sup>2</sup> downlink and 3Mbps<sup>2</sup> uplink over WiMAX and up to 450Mbps Tx/Rx<sup>3</sup> over WiFi. This integrated module embedded in new Intel® Centrino® 2 processor technology notebooks provides flexible and convenient connectivity to both WiFi and WiMAX networks to enhance today's mobile lifestyle.

#### Features and benefits

**IEEE 802.16e-2005 Wave 2 compliant. Mobile WiMAX release 1 Wave 2 system profile ready:** Broadband connectivity for rich Internet experience while on the go with open standards based WiMAX networks

**Over-the-air provisioning, management and upgrade support:** Activate and stay connected on broadband with minimal effort

**Secure broadband connectivity:** Peace of mind with secure access to critical information and applications when you need it

**USB power optimization:** Stay connected longer

**Quality of Service and Optimized Handover Support:** Enjoy better voice quality while on the move

**Intel® PROSet Wireless WiMAX Connection Utility v1.0:** Scan for and securely connect to WiMAX networks

Visit here for more information:

<http://www.intel.com/network/connectivity/products/wireless/wimax/wifi/index.htm>



## Wavesat

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### Company Background

Wavesat is a global leader in mobile broadband, providing advanced semiconductor solutions to the world's leading carriers and mobile device manufacturers to deploy future-proof broadband services and products. Wavesat delivers silicon, software and reference designs that enable customers to deploy multiple broadband technologies such as WiMAX Wave2, WiFi, and XG-PHS today and to migrate seamlessly to future 4G technologies such as LTE. Wavesat's technology leadership resides in an intelligent, multimode 4G architecture and cost effective platforms that combine software, reference designs with superior technical support to provide integrated, power efficient solutions. Wavesat is a principal member of the WiMAX Forum®.

### Wavesat's WiMAX Products & Solutions

The **Odyssey™ 8500** chipset is powered by a unique 4G multi-core architecture incorporating multiple ultra low power DSPs, offering flexibility, high performance and low power consumption. The System-On-a-Chip (SOC) manufactured using advanced Embedded DRAM technology requires no external memory, thus saving customers valuable real estate, cost and power consumption for very small form-factor portable and mobile applications such as wireless USB dongles, mobile handsets and other consumer electronic devices.

Reference Designs:

- Odyssey 8500 Software Platform
- 2.3/2.5/3.5 GHz WiMAX ExpressCard
- 2.3/2.5/3.5 GHz WiMAX USB Dongle
- 2.3/2.5/3.5 GHz WiMAX PCI MiniCard
- 2.3/2.5/3.5 GHz WiMAX Indoor CPE



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**Aptilo WiMAX CSN System Named Best WiMAX product or Service by Wireless Broadband Innovations**



Aptilo Networks has been named Winner of the Wireless Broadband Innovation (WBI) Awards 2009, which recognizes leadership, innovation and excellence in wireless broadband. Aptilo's WiMAX CSN System™ earned the top honor in the Best WiMAX Product or Service category, for outstanding leadership and vision in WiMAX.

The WBI Awards recognize leadership and the very best in innovation for wireless broadband. Entries from more than 170 companies from 34 countries were evaluated for the Award.

"Aptilo's WiMAX CSN System is a field-proven, truly groundbreaking solution that addresses the needs of today's rapidly evolving WiMAX landscape," said Michael Gebert, Organizer of WBI Awards. "Aptilo is a clear leader in WiMAX, and we are proud to name them as the winner of the WiMAX Best Product or Service."

## Aptilo Networks

### Company Background

Aptilo Networks is the leading vendor of integrated service management and access control solutions for service providers, enterprises and municipalities needing a rapidly deployable, scalable multiservice solution to easily manage data and voice services over WiMAX™, metro wireless, Wi-Fi and fixed networks. Aptilo's service management platforms control billing, user services and access in these networks, which are currently deployed worldwide in more than 40 countries.

### Aptilo's WiMAX Products & Solutions

By leveraging Aptilo's solid experience in the Wi-Fi and wireless mesh markets into the WiMAX arena, Aptilo offers a proven, multi-access (Wi-Fi / WiMAX) and cost-effective platform that can grow with the needs of our customers. The Aptilo's WiMAX CSN System consists of the Aptilo Service Management Platform integrated with add-on modules for the specific WiMAX features. It can thus by default be used for networks using both WiMAX and Wi-Fi access. The system delivers a highly flexible and versatile authentication, authorization, accounting (AAA), policy management and service control solution for Mobile WiMAX and Wi-Fi network services, with support for pre- and post-paid data and Voice over IP (VoIP) services. The integrated data and voice services solution provides authentication, authorization and accounting through multiple authentication types and enforces QoS and service flow profile parameters for users, devices and services. Intelligent AAA Proxy functionality in the Aptilo WiMAX CSN System allows service providers to manage interactions with multiple external AAA servers and roaming partners while a large multitude of service offerings and combinations of time-, volume- and price-based subscriber accounts cover required business models. The Aptilo WiMAX CSN System is fully interoperable with WiMAX-compliant clients and Access Service Network (ASN) nodes such as WiMAX 802.16-2005 based Base Stations and ASN Gateways through standards interfaces defined by The WiMAX Forum®.



The Aptilo WiMAX CSN System allows service providers to manage interactions with multiple external AAA servers and roaming partners while a large multitude of service offerings and combinations of time-, volume- and price-based subscriber accounts cover required business models. The Aptilo WiMAX CSN System is fully interoperable with WiMAX-compliant clients and Access Service Network (ASN) nodes such as WiMAX 802.16-2005 based Base Stations and ASN Gateways through standards interfaces defined by The WiMAX Forum®.

**Aptilo is proud to be one of the first vendors with full support for pre-integrated NWG pre-paid and hotlining.** Aptilo's growing list of interoperable vendors through customer implementations and partner testing includes ADC, Airspan, Alvarion, Aperto, Aricent, Cisco, Harris Stratex, Motorola, Nortel, Redline, Starent, WiChorus and WiNetworks. (as of April 2009).

### Save time and money with an integrated WiMAX CSN solution:

Aptilo offers a unique, yet simple approach to challenges faced by many WiMAX Operators. We have integrated most of the different subsystems functions needed into our own product, the Aptilo WiMAX CSN System.

Dedicated subsystems are frequently underutilized from a functionality perspective. Many operators just make use of a fraction of the total functionality. Aptilo is second to none when it comes to critical core functions such as AAA, policy management and end-to-end pre-paid billing and we have developed sufficient functionality for the other subsystems. The Aptilo system also features a built-in user database. Our optional AC-network node can be deployed for traffic management including intelligent IP-address allocation, DHCP, policy based routing, VLAN and bandwidth shaping.

Furthermore, Aptilo's WiMAX AAA core is not like any other generic Authentication, Authorization and Accounting (AAA) solution. It is a purpose-built solid system for control of access, user services and billing in WiMAX networks. That is why we call it Aptilo WiMAX AAA+.

Deploying several subsystems from different vendors and getting them ready for launch is a complex and costly process, especially if something does not work as intended. With an integrated, ready to deploy solution there is no custom integration required at all for products from different vendors, as the different subsystem functions - all included in the integrated solution - are designed to work seamlessly together. Maintenance may not be the first thing considered when launching a new WiMAX service. In the long run, however, this might be the most important issue when it comes to OPEX (operating expenditures) for the service. Having several subsystem-vendors releasing new software versions at different times puts a great deal of pressure on the operation of the service.

The stability of the service may even be compromised due to sudden problems between subsystems not detected during the testing. Aptilo's WiMAX CSN System provides a more stable operation as the different subsystems are designed to work together and are well tested before release. The Aptilo WiMAX CSN System is an open system, which means that the operator is free to integrate with a dedicated subsystem when desired. The integration via Aptilo's well defined APIs and native interfaces give the operator the flexibility to make the integration in an easy and modular way throughout the lifecycle of the service.



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**WiMAX system ensures rapid, cost-effective service delivery, starting at 2,500 subscribers**

Introducing the Bridgewater® [ServiceMAX 500](#), a service control and subscriber data management system that enables small and mid-sized WiMAX operators to rapidly and cost effectively launch mobile broadband and Voice over IP services.

### ServiceMAX 500



The ServiceMAX 500 bundles Bridgewater's industry leading solutions – including AAA, DHCP, subscriber data management, prepaid and more – to accelerate commercial WiMAX launch. All this is packaged in a server platform that allows impressive scaling up to 100,000 subscribers.

This pre-integrated system not only saves valuable time and effort during installation and integration, but also simplifies maintenance and support with a single vendor point of contact.

## Bridgewater Systems

### Company Background

Bridgewater Systems (TSX: BWC), the mobile personalization company, enables service providers to efficiently manage and profit from mobile data services, content and commerce. The company's market leading mobile personalization portfolio provides a real-time, unified view of subscribers including entitlements, devices, networks, billing profiles, preferences and context. Anchored by Bridgewater's [Subscriber Data Broker™](#), the portfolio of carrier-grade and standards-based products includes the Bridgewater® [Service Controller](#) (AAA), the Bridgewater® [Policy Controller](#) (PCRF) and the Bridgewater® [Home Subscriber Server](#) (HSS). More than 120 leading service providers use Bridgewater's solutions to rapidly deliver innovative mobile services to over 150 million subscribers.

### Bridgewater's WiMAX Products & Solutions

Over 25 of the world's leading WiMAX operators have chosen Bridgewater to be a key part of their WiMAX Connectivity Service Network (CSN). As a Principal Member of the WiMAX Forum, Bridgewater is lead contributor to current and upcoming AAA and policy standards and architectures for WiMAX networks. Vendor neutral and featuring extensive multi-vendor interoperability, Bridgewater offers a comprehensive solutions suite that helps WiMAX operators accelerate commercial launch and introduce new personalized services.

The industry's leading Service Controller (AAA) features extensive support for fixed and mobile WiMAX, including:

- Authentication - User and device level authentication with full EAP support.
- Authorization – Fully profile and policy based for flexible control.
- Accounting - Supports session and flow-based accounting for differentiated charging, as well as support for pre-paid and post-paid.
- RADIUS/Diameter - Dual protocol stack ensures multi-vendor, multi-network compatibility.
- Mobile IP – Roaming features such as RADIUS AAA proxy and Mobile IP key derivation.
- Hotlining – Redirect subscribers to prevent revenue leakage.

**Lawful intercept** – Unique support in WiMAX to enable compliance with law enforcement and telecoms regulations.

**Pre-paid support** – Supports multiple prepaid billing models including standards-based and pre-standards implementations. Helps accelerate subscriber acquisition.

**Accounting mediation** – Reduces the load on backend billing systems and the need for custom mediation. Correlates, aggregates, filters, formats, and streams accounting records to billing system.

**Subscriber data management** – Subscriber Data Broker enables creation of advanced new services and revenue models – such as location based services (LBS), mobile advertising, and personalized promotions – by leveraging rich set of static, dynamic and usage data on a per subscriber basis. Allows service providers to easily manage subscribers and services to accelerate commercial WiMAX launch.

**Service model innovation** – Policy Controller provides dynamic network and application policy control to enable advanced service models including casual (non-subscription) user services and over-the-air provisioning device and subscriber provisioning to accelerate service introduction.

**Bridgewater's solutions stand at the leading edge of subscriber management.** Please visit [www.bridgewatersystems.com](http://www.bridgewatersystems.com) to see how we can help you get more from your network and your subscribers.





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## CommuniGate Systems

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### Company Background

Founded in 1991 and based in Mill Valley, California, CommuniGate Systems develops carrier-class Unified Communications and media delivery software for broadband and mobile operators to deliver value-added services and SaaS solutions.

### CommuniGate's WiMAX Products & Solutions

**Mobile Office** from CommuniGate Systems is a fixed mobile convergence solution that provides a suite of Unified Communications applications available for delivery in a SaaS model. It allows Mobile Operators to offer Value Added Services (VAS) to their small and medium business subscribers. Mobile Office delivers push communications on the mobile and a Flash UI on the desktop, tying SME subscribers to the Mobile Operators' brand. It increases ARPU by driving WiMAX data services, encouraging the purchase of add-on features, and substantially reducing subscriber churn rates.

Mobile Office includes a full suite of virtual applications such as push e-mail, push calendar, push contacts, push e-mail, shared folders, shared calendars, a global address book and the Flash-based Web 2.0 client Pronto!. Mobile Office works any time at any place via push

technology when the handset is connected to an IP network. It supports the largest variety of handsets including the iPhone, Nokia and Win-Mobile devices. Subscribers can use any PC, Mac or Linux computer to access services via the Flash-based user interface Pronto!. Mobile Operators can upgrade SME subscribers by offering other products including website hosting, backup services, storage services, archival services, and compliance services.

Mobile Office is built upon the CommuniGate Pro Unified Communications platform. CommuniGate Pro is the most reliable and efficient SaaS delivery platform. It delivers virtualization of domains with a modular feature set, powerful class of service provisioning, and a live rolling updates change management capability not found in other solutions. The platform's exclusive Dynamic Clustering architecture provides 99.999% uptime in a multi-tenant architecture with no single point of failure and allows SaaS providers to add frontend or backend nodes as needed without any downtime or service interruption. CommuniGate Pro makes it easy for service providers and operators to offer business class services with costs that decline as virtualized client volume increases. CommuniGate Pro is the only truly integrated UC platform that was built to power all forms of IP communications in one integrated platform.



always best connected

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## Green Packet Berhad

### Company Background

Green Packet Solutions, part of the Green Packet Berhad group of companies, is a leading developer of Next Generation Mobile Broadband and Networking Solutions. Our mission is to provide seamless and unified platforms for the delivery of user-centric multimedia communications services regardless of the nature and availability of backbone infrastructures. Founded in San Francisco's Silicon Valley in 2000, Green Packet Solutions has expanded its global footprint to Kuala Lumpur (Headquarters), Singapore, Shanghai, Taiwan, Australia, Bahrain and Bangkok.

Green Packet Solutions empowers Operators to improve ARPU via leading edge carrier-grade connectivity solutions and interoperability-tested WiMAX Modems. Green Packet Solutions' products offer best-in-class performance and are of the highest quality, ensuring our customers are ALWAYS BEST CONNECTED!

With R&D centres located in USA, Shanghai, and Taiwan, we are on the edge of new developments in 4G (particularly WiMAX and LTE), as well as software advancement. Green Packet Solutions' presence around the world shouts our global capabilities and localization abilities. Furthermore, fellow symbiotic players can leverage on Green Packet Solutions' strategic alliances in the telecommunications industry to strengthen one's stake in the ecosystem.

### Green Packet's WiMAX Products & Solutions

#### Intouch Connection Management Platform

Intouch Connection Management Platform (ICMP) is an easy to use, single-client solution that intelligently manages access network connections you offer (for example WiFi, WiMAX or 3G).

#### Simple & Unified Network Access

ICMP is designed to converge connection management, communication services and entertainment within a single client. In other words, subscribers gain connectivity convenience with single sign-on to a host of lifestyle-based value-added services, as well as a rich spread of applications and services, all via one user-friendly and trendy interface. Operators can monetize the value-added services to gain additional revenue on top of access network fees.

#### Connectivity On The Go

It includes the Seamless Mobility feature that enables users to automatically switch from one network to another, without any interruption to their connectivity or application usage. In other words, a user need not worry which network to connect to; instead based on the current location, he will be automatically connected to best available network. This gives users the advantage of wireless broadband unification and whilst addressing Operators' need for network convergence.

#### Optimize Usage of Existing Infrastructure

Aside from this, the ICMP is perfect for Operators offering multiple access networks as it enables the maximized use of existing infrastructure. Traffic from a congested network, for example, WiFi can be easily offloaded to the next available network, say WiMAX - thus creating a balance in bandwidth utilization.





YOUR WIRELESS FUTURE BROUGHT TO YOU

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## WiTech Supporting Both WiMAX & LTE Technologies in its TEA™ Family of Business Case Analysis Tools

TEA|WiMAX™ and TEA|LTE™ are powerful and unique applications that enable thorough techno-economic analyses in support of accurate and reliable business cases for WiMAX and LTE initiatives in a fast and dependable manner. They allow analyzing the business case for a 4G network initiative with a holistic approach, in an integrated, iterative way. The tools feature comprehensive market and revenue forecast models, well calibrated technical modeling tailored to the WiMAX and LTE technologies, calculation of Total Cost of Ownership (TCO) and detailed Profit & Loss with close evaluation of key performance indicators.

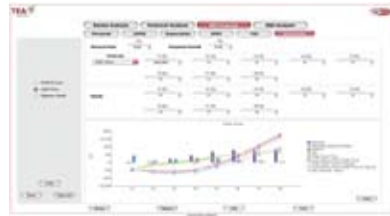
Confirming the appeal of the tools, Mentum®, a global leader in RF software planning solutions, announced that it is adding TEA|WiMAX™ and TEA|LTE™ to its product portfolio as a complement to its network planning solutions.

## WiTech S.p.A.

### Company Background

WiTech S.p.A. is a solutions, consulting and engineering company founded in 2003 as a spin-off of the University of Pisa, Italy. The company has gained quickly a foothold in the NGN/NGS scenario focusing on standard 3G and 4G wireless technologies such as HSxPA, WiMAX and LTE. WiTech is the developer of TEA|WiMAX and TEA|LTE, a family of powerful and unique business case analysis tools; as well as the provider of innovative, BPM-enabled OSS/BSS solutions, with a focus on the delivery of turnkey WiMAX CSNs, that leverage the company's modular and scalable WROP and TelcoGIS platforms. WiTech provides also the market with selected high-value services such as strategic consulting on technology and investment plans and engineering services for network planning and design. WiTech S.p.A. is a privately held company with its main offices in the Polo Tecnologico di Navacchio tech park, near Pisa, Italy.

### WiTech's WiMAX Products & Solutions



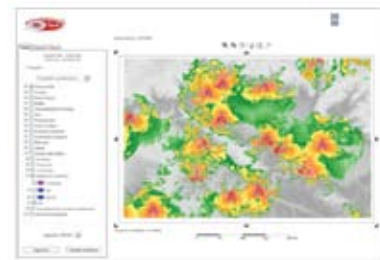
#### The TEA family of business case analysis tools

has been built by WiTech over five years of extensive industry experience supporting major operators and equipment suppliers in several strategic initiatives and projects. TEA|WiMAX, the WiMAX Forum compliant version of TEA, features a fast and simplified configuration of more than 500 different input variables and assumptions (with suggested/best-practice-recommended values) allows a fine-tuned setting of the TEA tools. An interactive, dashboard-styled and very easy-to-use Graphic User Interface (GUI)

provides users with optimum interactivity and the ability to perform fine-grained scenario & sensitivity analyses to align the business case with a company's strategies, analyzing the influence of parameter changes and the consequence of fundamentally changed boundary conditions in real time. At the end of the analyses, a very detailed report is automatically compiled and published in editable and PDF formats. The report contains a complete summary (with tables, diagrams and charts) of input parameters and assumptions, the results of the market analysis, the outcome of the technical modelling, and the economic and financial statements for up to ten years.

WiTech's **WROP Suite** and **TelcoGIS** are carrier-class integrated platforms tailored to support fast moving network operators and service providers addressing their key operational needs. WROP (WiTech Radius Operator Platform) is an Access & Service Management solution that allows to deploy and manage wireless and wireline broadband access networks with advanced features for subscriber authentication, accounting and service management. The platform support different business models thru the implementation of extended, multilevel value chains (like Wholesaler, Virtual Network Operator, Reseller, End Customer). **The WROP Suite** stands out for its rich feature set providing comprehensive support of different types of Broadband access networks (WiFi Hot Spot, xDSL, HiperLAN, Fixed WiMAX, Mobile WiMAX), Authentication schemas (UAM, PPPoE, PPPoA, 802.1x, Radius RFC2865/2138, Extended WISPr, etc.), Services (Fixed Access, Nomadic Access, Portable Access, VoIP, IP-Centrex, Mobile VoIP, etc.), Rating: Flat, Prepaid, Postpaid, Single Access Accounting, Advanced VoIP Rating, etc.).

The platform features also an integrated state-of-the-art NMS (Network Monitoring System) supporting the SNMPv1, SNMPv2c, SNMPv3 standards and capable of managing outage, event/notification, performance, etc.



**TelcoGIS** is a Geographic Information System-based solution that provides a foundation to implement applications and services in the areas of Network Optimization & Maintenance, Customer Provisioning & Assurance, Geomarketing Analysis & Commercial Planning.

Both solutions are built as modular and scalable framework, with a SOA (Service Oriented Architecture) approach, using state-of-the-art technologies (Java Enterprise Edition 5, Java Beans 3.0, Java persistency API, JavaServer faces, etc.) which advanced features are fully leveraged to provide the highest levels of reliability and efficiency of use, including clustering, load balancing, and transparent fail-over.

WROP and TelcoGIS are the keystones WiTech uses to deliver turn-key, reliable and affordable WiMAX CSN (Connectivity Services Network).

Thanks to their rich set of standard-based APIs (Application Programming Interfaces) both platforms can be easily integrated into new and existing environments. Through its own dedicated connectors developed by WiTech, they are also natively pluggable into the Intalio|BPP Business Process Management platform for a full automation of key operational processes.





## GEKA TELECOM

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### Company Background

Founded in 1982, GEKA TELECOM is an integrator of solutions and services for telecom operators and service providers in Africa. We integrate a turnkey offer of NGN infrastructures for operators, covering their needs in hardware, software & services, through a single interface in competitive lead-times.

Our customers are telecom professionals (PTTs, Alternative, Wireless ISPs, Mobile, MVNOs, etc), using our access, network, or application solutions, to provide reliable, QoS-enabled and cost-effective internet access, telephony and digital media services to enterprise and residential customers.

We help our clients define their needs & specifications, design the architecture and engineer the most adapted complete solution, take full project responsibility and management, deploy and commission the solution, transfer knowledge & skills, and perform maintenance and technical support. Our modular approach allows our solutions to fit both existing legacy environments and greenfield projects, in both urban or rural areas.

### Geka Telecom's WiMAX Products & Solutions

#### Core Network

Transport IP backbone (copper, fiber optics or microwave)  
• Traffic monitoring & optimization systems • Servers, storage and data center architectures • Internet access infrastructure / AAA • VoIP telephony platform: SoftSwitch & media gateways (CIRPACK THOMSON certified partner)  
• VAS applications: Online charging (prepaid), Voice Mail, IVR, Ring-Back Tone (STREAMWIDE certified partner) • OSS (supervision NMS) and BSS (Front-Office, Billing and Provisioning) application platforms • IPTV and VoD solutions

#### Access Network

WiMAX access network in 2.3, 2.5 or 3.5 GHz (ALVARION Gold distributor) • Microwave backhaul • xDSL and fiber access loops

#### End-customer site

WiMAX CPEs • IADs and set-top boxes • SIP phones • WiFi AP & controllers • IP PBX (AASTRA Gold partner)

#### Services

Project & business plan consulting • Network audit & survey • Radio engineering (EME & RNP) • Architecture optimization • Installation & commissioning • Training • Technical support & maintenance



## WireIE

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### Company Background

WireIE is a global leader in providing professional services and innovative solutions for the wireless network operator.

We offer a consistently high level of skill and experience in the design, deployment, and management of radio access, backhaul, and IP core network solutions. Where appropriate, WireIE will support a legacy network's transition to IP by designing customized hybrid solutions.

WireIE enjoys a solid footing in the design, deployment and optimization of GSM and CDMA networks. Our depth of knowledge in 4G technologies such as WiMAX and LTE is bridged by our success in designing and deploying 3G technologies such as UMTS and EV-DO.

WireIE can also provide a suite of solutions for Local Electricity Distributors who are adding enhanced intelligence and control to their grid. We can design, build and operate the broadband communication network that will enable Smart Grid applications and devices.

### WireIE's WiMAX Products & Solutions

#### Radio Frequency Design & Optimization

The WireIE RF Design and Network Optimization Centre combines our unique intellectual capital with the use of industry-leading RF planning and design tools - assuring every client will have a high performance network design targeted to address their fundamental business objectives.

#### IP Core Network Design

With a solid footing in both circuit switched telephony and IP based environments, WireIE is fully equipped to design and manage an operator's migration to an all IP core environment, regardless of whether the network is wired or wireless, simple or complex.

#### Turnkey Network Deployments

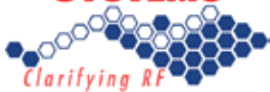
**Site Acquisition** - WireIE identifies, negotiates and closes easement rights so you can install your wireless transceiver equipment.

**Project Management** - our skilled team of project managers will deliver what we commit to, on time and on budget.

**Engineer & Furnish** - WireIE manages the design, installation and build out of your wireless broadband technologies.

**Break Fix Support** - We use a sophisticated network support management system to monitor your network health and activity so we can anticipate issues and resolve them

## BERKELEY VARITRONICS SYSTEMS



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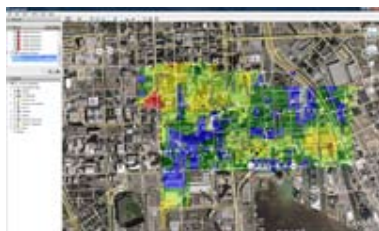
YellowFin™



Tortoise™



YellowFin™ receiver



DragNet™ Site Survey  
Software

## Berkeley Varitronics Systems

### Company Background

For over 37 years, Berkeley Varitronics Systems has provided design and consulting services for the wireless telecommunications industry. Over the past 15 years, BVS has anticipated the wireless industry's needs by developing more than 50 unique and portable field instruments for GSM, TDMA, CDMA and Wi-Fi site surveys. More recently, Berkeley has introduced a line of WiMAX and LTE testing tools and analysis software to meet the demand for network build out.



BVS is headquartered in Metuchen, NJ but has sales offices in the Northeastern, Southwestern and Southeastern regions in the United States as well as in Latin America and Switzerland. Internationally, BVS has wireless product distributors in over 40 countries spanning 6 continents for a true global presence.

### Berkeley Varitronics' WiMAX Products & Solutions

#### Handheld WiMAX Analyzers

The newly released **YellowFin™** is a tablet PC analyzer for Mobile WiMAX spectrum analysis as well as packet measurements. Full spectrum analysis features include power triggers, peak hold / search, multiple waveform traces and markers. Packet analysis identifies RSSI, Cell ID and Segment data, multipath and CINR (carrier-to-interference-plus-noise-ratios) all on a preamble basis.

#### WiMAX Stimulus Transmitters

**Tortoise™** is a dual-band, high power stimulus transmitter that contains an optional WiMAX modulator. Class A amplification, quad cooling fan system and lightweight (under 30 pounds) ensure that Tortoise will output the cleanest RF signal from a crane to a rooftop. The optional WiMAX OFDMA Modulator allows Tortoise to simulate WiMAX base stations and features adjustable step sizes, channel bandwidth and user settable Preamble number, Cell ID, Segment and frame lengths.

#### WiMAX Site Survey Software

**DragNet™** PC software runs on a YellowFin™ receiver using a tablet PC for on-the-spot WiMAX site survey analysis. The internal GPS receiver provides geo-coded data for automatically time-stamped LAT and LON WiMAX measurements anywhere in the world. Survey data is then overlaid onto satellite viewed earth maps to provide a complete overview for coverage studies and network traffic analysis.

#### WiMAX Pre-Deployment

BVS has developed a pre-deployment test system specifically for WiMAX engineers and installers. The system is comprised of Class A stimulus transmitters (**Gator™** or **Tortoise™**), high-speed, modular receivers (**Coyote™** or **Gazelle™**) and drive-study mapping coverage software (**Forecaster**).

#### BVS Engineering

All Berkeley products are designed, built and tested at BVS headquarters in Metuchen, NJ. Our in-house approach allows for quick turnaround, first class technical support and custom engineering solutions that lead to the best wireless testing tools in the industry. BVS designs all of our own custom silicon for calibrated receivers such as the one used in our YellowFin WiMAX Analyzer. This handheld, high-speed 802.16e WiMAX Mobile receiver scans up to 40 samples per second measuring all 114 preambles. And since our design team developed the digital receiver, power system, DSP and GUI, we can provide a complete WiMAX solution to our customers including RF spectrum analysis, multipath, RF interference detection, direction finding and WiMAX packet demodulation on a preamble basis.

Berkeley manufacturing methods utilize automated surface mount (SMT) and through-hole printed circuit board assembly techniques that provide quick (sometimes in just 48 hours) delivery of prototype or small production runs. Because of our internal manufacturing experience, we are sensitive to costs, manufacturability, parts availability, test-ware and other critical elements. Hardware design and prototyping are expedited through the use of in-house CAD tools, including schematic capture, PC board layout, Bridgeport, mechanical and LSI gate array design and simulation.



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## Gambit Communications

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### Company Background

Gambit Communications is a leader in network and SNMP simulation tools. Whether you are an enterprise planning to deploy, support or evaluate a WiMAX solution, or a vendor developing and testing a new wireless application, Gambit's portfolio offers simulation software to meet your unique goals.

Gambit's versatile products are used by leading enterprises and networking vendors for use in applications from development and testing to operator training and disaster simulations. Gambit's diverse set of over 500 customers includes: JP Morgan, VISA, Shell, US Army, US Air Force, Alcatel-Lucent, Cisco, Alvarion, Huawei, IBM, CA, HP, Intel, AT&T, MCI, and Nortel.

### Gambit's WiMAX Products & Solutions

#### MIMIC Wireless Simulator

MIMIC provides an inexpensive way for enterprises, device vendors, management and software developers to evaluate, test, demonstrate, develop, train and certify WiMAX/Wireless management applications without purchasing equipment and maintaining labs for those functions. It simulates up to 20,000 devices like Switches, Routers, Hubs, Base stations, Gateways, Ethernet Demarcation Devices from any manufacturer. It fully supports SNMP (v1, v2, v3), IPv6, IPMI, DHCP, TFTP, RMON (1, 2) as well as Telnet/Cisco IOS/Juniper JunOS.

MIMIC's recording tool can discover and record any WiMAX-based production network and simulate it in the lab. The virtual lab software easily constructs negative and pathological conditions like client load, traffic conditions, event storms, gateway down etc..., which are traditionally difficult to create in a physical lab.

#### For Enterprises:

By providing a duplicate (or replica) of your production network on your desktop, MIMIC makes it effortless to evaluate before a purchase, test, configure and train before the deployment, in support of the management application. It removes any worry about setting up, sharing and maintaining a physical lab.

#### For WiMAX hardware and software manufacturers:

MIMIC reduces the testing cost by 10-100 folds. It helps create a real world environment with thousands of diverse data sources in a lab and test all possible customer scenarios. The developers can implement their products quickly and test it reliably using MIMIC.

Reference [WiMax.com](http://WiMax.com) & receive a 10% discount. For more information: [www.gambitcomm.com/site/gambit30.shtml](http://www.gambitcomm.com/site/gambit30.shtml)



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## WirelessLogix

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### Company Background

Combining years of pioneering experiences and expertise, WirelessLogix provides a full range of comprehensive and intelligent measurement solutions that allow wireless device manufacturers, network vendors and carriers to design, measure, troubleshoot, optimize, and manage their products and networks more quickly and efficiently. WirelessLogix' engineering solutions support multiple wireless technologies including CDMA/EVDO, GSM/WCDMA/HSPA, WiMAX and LTE.

WirelessLogix' advanced line of products and services are currently being used by many of the world's largest manufacturers and carriers. Our test & measurement and optimization solutions enable these companies to be able to measure and enhance all aspects of their wireless network elements. In addition, these companies are able to maximize device and network efficiency by deploying solutions more quickly and easily than ever before, resulting in an accelerated return on investment.

Founded in 2003, WirelessLogix is headquartered in Plano, Texas, USA.

### WirelessLogix's WiMAX Products & Solutions

WirelessLogix provides a full-range of test & measurement and optimization solutions to support both field and lab testing of wireless networks, devices and chipsets. Our flagship product, **XCAL**, is the industry-leading drive test data collection tool.

- XCAL Diagnostic Monitoring Tool
- XCAP Post Processing Tool
- Support for CDMA/EVDO, GSM/WCDMA/HSPA, WiMAX and LTE
- RF Scanners supporting multiple bands and technologies
- Throughput testing via our UDP Server solution
- MOS Testing (PESQ, PEVQ)
- Multi-Device Testing via OPTis Benchmarking & OPTis •
- Multi-Call Generator products





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## Mobile Metrics

### Company Background

Mobile Metrics was founded in 2003 specifically to address the wireless data test market, and to the best of our knowledge was the first company to specialize exclusively in this field.

A technology leader in its field, Mobile Metrics Inc. focuses exclusively on providing test solutions for wireless networks. Mobile Metrics offers test and monitoring systems for WiMAX, LTE, WiFi, Mobile IP and GPRS/UMTS.

### Mobile Metric's WiMAX Products & Solutions

Within WiMAX, Mobile Metrics provides the **Torrent 7X00** series. The **Torrent 7200** is a groundbreaking product that tests base stations, mobile stations and end-to-end networks. One of the 7200's most notable features is that it can stress WiMAX networks with up to 4,000 emulated mobiles per channel. The heart of the system is the Mobile Metrics airlink unit, which can be used on either the mobile side or the base station side of an airlink interface. The 7200 can also be run with a virtual PHY interface (Ethernet) as an airlink substitute, which is useful in lab testing and in certain varieties of

WiMAX products.

The **Torrent 7100** was the world's first WiMAX core network test system when released in September 2006. Designed to test ASN Gateways and CSNs, the 7100 can stress core networks by emulating more than one million mobiles on a single Linux server. As a result, the 7100 is cost-effective with a small footprint.

Together, the 7100 and 7200 offer the ability to isolate and test any node in a WiMAX network, by emulating every node in a WiMAX network so the node-under-test can be surrounded and tested across all interfaces. Both products are essential for equipment vendors and service providers to perform functional, capacity, interoperability and WiMAX conformance testing.

Selected by the WiMAX Forum as the official protocol monitor for IOT infrastructure testing, the AirScan 750 is a standalone protocol monitoring solution that analyzes traffic on the R1, R3, R4, R6 and R8 interfaces. Among its many features are graphical message tracing, sniffer trace import/export, message filtering, graphical display of OFDMA frames, and graphical display of constellation maps.

# Handheld Mobile WiMAX Analysis

## 802.16e ANALYSIS:

RF Spectrum (40 samples/sec)

Packet (114 Preambles)

Multipath

Interference

Direction Finding

Site Surveys (optional DragNet™ software)



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**Acme Packet enables secure, premium quality video services for mobile broadband**

Acme Packet announced that it is enabling new entertainment services for mobile broadband networks with the launch of new streaming video control capabilities. Acme Packet advanced the functionality of its market leading Net-Net SBCs by adding a RTSP proxy for the control of streaming video, video-on-demand and IPTV. This control leverages the position of SBCs at the access border of the services and application network. The Net-Net SBCs proxy all RTSP commands such as play, pause, stop and rewind, between video clients and servers. The same security, service reach, SLA assurance and network availability benefits provided by the Net-Net SBCs are now extended to streaming video and IPTV services.

## Acme Packet, Inc.

### Company Background

Acme Packet, Inc. (NASDAQ: APKT), the leader in session border control solutions, enables the delivery of trusted, first class interactive communications—voice, video and multimedia sessions—and data services across IP network borders. Our Net-Net® family of session border controllers, multiservice security gateways and session routing proxies supports multiple applications in fixed and mobile service provider networks—from VoIP trunking to hosted enterprise and residential services to fixed-mobile convergence. They satisfy critical security, service assurance and regulatory requirements in wireline, cable and wireless networks; and support multiple protocols—SIP, H.323, MGCP/NCS, H.248 and RTSP—and multiple border points—interconnect, access and data center.

### Acme Packet's WiMAX Solution

Acme Packet's WiMAX access solution features its Session Border Controllers (SBC) and Multiservice Security Gateway (MSG) deployed at the access border of the SIP or IMS service network. For IP interconnect and peering with other service providers, Acme Packet's SBC mediates the differences between networks as well as provides security, quality and cost controls at the interconnect border.

Acme Packet's **Net-Net Session Director** (SD) provides critical control functions to deliver high quality interactive communications—voice, video and multimedia sessions—and streaming video across WiMAX IP access and interconnect network borders. The Net-Net SD provides 5 critical areas of control:



**Security** – protects the SBC and softswitches and other elements of the service delivery infrastructure ensuring network and service availability. Acme Packet's SBC provide denial of service protection from malicious attacks and non-malicious overloads.

**Service reach maximization** – extends the reach of services by enabling interoperability to maximize the different types of networks and devices supported. The Net-Net SD enables sessions to traverse data firewall/NAT devices, bridges networks using overlapping, conflicting or different IP addresses, mediates between different signaling, transport and encryption protocols, converts incompatible codecs, and translates signaling-layer telephone numbers, addresses and response codes.

**SLA assurance** – assures session capacity and quality by performing admission control to ensure that both the network and service infrastructure has the capacity to support a session with high quality. SBCs also monitor and report actual session quality to determine compliance with performance specifications set forth in service level agreements between service providers, contact centers and large enterprises, and their external or internal customers.

**Revenue and cost optimization** - helps service providers increase revenues or control costs by protecting against both bandwidth and quality of service theft, routing sessions optimally to minimize costs, and providing accounting and related mechanisms to maximize billable sessions.

**Regulatory compliance** – enables compliance with government-mandated regulations worldwide, including emergency services such as E-9-1-1 and lawful intercept.

For dual mode handsets and femtocells, Acme Packet's **Net-Net Security Gateway** (SG) securely wires subscribers to their mobile WiMAX voice and data services over the untrusted Internet and WiFi networks. The Net-Net SG authenticates endpoints, secures the voice and data traffic within IPsec tunnels to ensure privacy and protect against theft, and defends against DoS/DDoS attacks on the mobile service infrastructure to deliver non-stop service.



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## Alianza Corporation

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### Company Background

Alianza's award-winning hosted voice platform enables WiMAX service providers to quickly add a feature rich voice offering to their broadband service - with no capital expenditure. Alianza offers both residential and business-class features. Core platform components are unified into a single interface, providing a seamless back-office experience. Competitive products are cobbled together using disparate 3rd party components; Alianza's proprietary technology, built from the ground up, provides a cost effective and customizable platform for each service provider.

WiMAX service providers are looking for long-term solutions for delivering a broad range of IP telephone and voice applications to their customers. Adding VoIP can double your Average Revenue Per User (ARPU), decrease churn and create customer loyalty. But finding the capital, taking the time, and hiring the right folks to build it from the ground up is a formidable task. Alianza removes that barrier with their hosted voice platform.

### Alianza's WiMAX Products & Solutions

The platform is flexible, featuring API's that allow integration of back office administration and optimization of operational efficiencies. For example Alianza provides a single point of administrative interface. One click in the management portal propagates 17 different processes and remotely enables devices, eliminating process management issues that arise - saving time and money.

Another benefit is a fixed fee pricing model enabling service providers to deploy voice services without investing any up-front capital. Alianza's aggressive pricing also reflects the fact that there are no built-in licensing fees for third party components, as often is the case with competitors. An additional benefit of a hosted solution is the ability to launch in a fraction of the time it would take to build a complex in-house solution. We invite you to learn more about Alianza's technology by visiting [www.alianza.com](http://www.alianza.com).

Thank you for downloading the April 2009 edition of *The WiMAX Guide*. For questions, comments or information about *The WiMAX Guide*, please contact the WiMax.com staff at [editors@wimax.com](mailto:editors@wimax.com).

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# Top 10 Questions you should ask your WiMAX Vendor



**Tim Sanders**  
**The Finals Mile**

## Introduction

During the 1990's the broadband wireless industry became a business of thousands of wireless ISPs throughout the US and around the world.

Probably the tipping point came when US regulators and many International regulators apportioned spectrum for license-free use. This decision permitted carriers to launch service wherever and whenever they desired so long as their equipment met government specifications.

More recently, and especially on the International front, a large amount of licensed spectrum has been released for commercial broadband use. Arguably however, the radio products based on the 802.11 standard that evolved to support the early first launches of citywide broadband wireless networks may have been just as important. Until carriers began offering radio products with media access controllers (MACs) that supported longer-range and more interference resistant services, the industry had no real teeth.

Today of course the broadband wireless industry has evolved, particularly on the radio vendor front to one that offers numerous proprietary and standards based systems that work in both unlicensed and licensed spectrum from as low as 700 MHz to 60 GHz and higher frequencies. Carriers can utilize proprietary systems still based on 802.11 formats or the newer 802.16 standard (WiMAX) for both point-to-multipoint (PtMP) and point-to-point (PTP) applications.

In the last five to six years alone broadband radio vendors have developed solutions that offer true non-line-of-sight and self-install capability (primarily in licensed bands) as well as solutions that support affordable bandwidth applications as high as 1 Gbps. In fact, especially for new carriers in emerging markets, the plethora of choices can be dizzying. What radio product will best meet the carrier's needs? How does a carrier choose the best radio and vendor for its needs? The answers to these questions are important, because vendor choice commits carriers to a platform that may not be easily adjusted or replaced. So how should carriers go about selecting the right vendor for them?

## Choosing a Vendor

Opinions abound on the subject of how to best choose a vendor, but I believe that the choice of radio vendor begins first with the carrier's business plan. The carrier needs to

identify the types of customers it can best serve and determine their bandwidth and service needs as a first step. Once the service requirements are laid down, then the carrier can begin fitting radio products into a matrix that supports its business needs and its markets. Certainly other requirements impinge this decision--not the least of which is the geography the carrier needs to serve.

Today's broadband wireless and WiMAX focused carriers operate in both urban and rural markets. They may also serve both residential and business class customers with widely varying needs. These types of RF environments create problems that are very complex to solve. Carriers may need more than one type of radio technology to meet all of these needs. Can a single vendor supply everything you need? Or should carriers be open to multiple vendors? The answer for each wireless ISP is likely different and lies first in understanding its own needs clearly. However, how you approach vendors and the questions you ask them are crucial to your ability as a broadband wireless carrier to succeed. To that end I propose these Top Ten core questions to ask of all vendors before you make a final decision.

## The Top Ten

### 1 What frequencies and standards do you support? And what customer segments are your models designed to serve?

Most vendors by sheer necessity or by technological choice pick niches within the broadband wireless and WiMAX marketplace to serve. Only a few major vendors offer wide-ranging product lines that serve virtually all potential needs for a carrier. It can certainly be argued that specializing in a handful of frequencies or technical standards can convey an advantage in terms of product design and focus. Vendors do develop reputations within the marketplace for being especially adroit with various elements of the broadband wireless equation. One company that is strongly focused on PTP (point-to-point) backhaul solutions for example might offer a best of breed product in that category. And while it may also manufacture PtMP (point-to-multipoint) radios for end-user access, another firm may be superior in that regard for a carrier's particular needs. In the past, particularly with proprietary technologies broadband wireless ISPs typically had to choose a single vendor for PtMP at the very least and then mix and match back haul units.

Also too, carriers sometimes choose to deploy radios in multiple spectrum bands such as 900 MHz to reach customers with NLOS problems (900 MHz will penetrate some tree cover and walls at limited range) and also use higher frequency unlicensed bands for PtMP

service with other customers or customer segments. More recently, with the availability of 3.65 GHz PtMP WiMAX systems in the US, carriers have a new tool that offers NLOS capability and higher bandwidth. Similarly carriers using licensed spectrum such as 2.5 GHz might choose to use low-cost 5.8 GHz PTP back haul radios. Later as traffic climbs or in the event of interference carriers can shift to licensed PTP units in spectrum ranges such as 6 GHz, 11 GHz, 18 GHz and 23 GHz.

I tend to favor using best of breed applications if they meet your customer needs and target niches. The downside of multiple vendors however can be difficulty in pinpointing which vendor to contact in case of a problem as the source of the trouble may be unclear. Also, multiple platforms create a higher learning curve for technical people, because almost all gear, even WiMAX certified interoperable gear will likely have slight variations in performance that require different deployment and maintenance techniques.

Planning for necessary upgrades as your business changes and grows is another consideration. Carriers picking a vendor for an overall strategy or a series of vendors to fulfill various elements of a network deployment have to weigh this option as well.

### 2 Will your next technology upgrade be backwards compatible with my current radios? How do I protect my investment?

For carriers the issue of growth and upgrades is a really big decision point in determining primary and secondary vendors for their networks. If the current systems that vendors offer are pre-WiMAX or proprietary, and almost all still are (although this is beginning to change), will the carrier have to deploy hardware upgrades on either the base station or customer premise side to shift to a fully WiMAX-based solution? Or is it possible to simply upgrade via a firmware update to use your next generation gear?

This question holds true even if a carrier's needs are best met with a proprietary solution. Most carriers using unlicensed band frequencies fit in this category. There are few WiMAX product profiles for these spectrum ranges. However, the vendor may plan upgrades to its product line that are not incremental in performance, standards or technology but require replacement. If this is the case, existing physical infrastructure may have to be replaced to upgrade. It is true that a carrier can simply fixture it's next market with new technology and operate existing markets with legacy equipment. However, this once again creates burden for carriers. The carrier must carry multiple types of replacement inventory for failure replacement (in-

creasing inventory costs) and it must spend time training technicians in both systems.

### **3 What is your product roadmap for the next 3 years and next 5 years? How much point-to-multi-point bandwidth will you be able to provide? And what capacity will your backhaul units be able to provide?**

This is a vendor question very similar to the previous one but addresses some more technically granular issues. As carriers plan ongoing services for customers they must plan to support the next generation of services that their customers will be demanding, not just the ones customers need now. Understanding what directions your vendors may go regarding standards, especially in-built support for certain services such as IP-based products like VoIP or Quality of Service management tools, is important.

Carriers increasingly relate that both residential and business class customers are asking for more bandwidth. Carriers estimate that their customers will demand 100 Mbps connections in as little as five years. A vendor's ability to deliver higher bandwidth products is a decision point as well.

Does the vendor plan to add product lines such as backhaul specific products or support the new 3.65 GHz spectrum range? If the vendor is focused upon WiMAX products does it plan to offer products for all spectrum ranges that the WiMAX Forum have announced. And what about the new mobile standard long term evolution (LTE)? Does the vendor have a commitment to this standard and to rolling out products based upon it? If you are a carrier likely to focus upon LTE this is a key question. And perhaps a better one is to ask a vendor if it has sufficient intellectual capital to support all of its product ambitions.

Last but not least confirm that your vendors can support the level of backhaul bandwidth that customer demands will place on your networks.

### **4 How are your radio performance metrics proven? Is it by lab testing? Or is testing based upon real world customer deployments? Can you speak with your vendor's customers?**

Probably the one area that carriers complain about most often is vendor performance claims. Vendors have a product to sell so presenting that product in the best light is a necessity. That doesn't mean that vendors are dishonest in their claims. But what it does mean is that vendors will talk about the metrics that are most outstanding about their products first. And also, there is a distinct element of the real world that intrudes in any conversation about broadband wireless.

No two geographies and markets are exactly alike. The RF environment can vary even when two towns are very close together; as can the topology of hills, building shadow,

needed range, available tower sites and many more elements that affect the art form of a wireless deployment. Vendors cannot field test for every conceivable type of location. So what vendors often do is test with beta clients in the field. How extensive these tests are and in what geographies they were done are important to know. Vendors also perform extensive benchmark testing in lab settings. Radio products must receive certification from the FCC and have to meet those testing requirements too. If radios are WiMAX interoperable certified they will have undergone additional testing for that functionality.

So it is crucial to ask about how testing is accomplished and to judge how closely that testing is to the types of geography your deployments will face. The big key here is to not try for an exact fit, but rather to understand the realistic limits of what gear can likely do in the real world relative to benchmark testing. The closer a carrier pushes its chosen radio platforms or other components to their designed limits the more likely problems will arise. Staying within the limits of what gear can do is a real secret to success in the industry regardless of chosen platform.

Happily a lot of knowledge about where and how to deploy a given platform can be learned from a vendor's existing customers. In the case of a new platform there won't be existing customers to describe their experience. But a vendor's prior customers could talk about the vendor's responsiveness to problems, how it handled returns, warranty service, customer service, billing, and more. Always insist upon talking to existing customers; preferably some that the vendor did not recommend.

### **5 How widely deployed are your units and for how long? How long have you been in business? How many customers do you have worldwide and where are they? Also, how many units have you shipped?**

Nothing beats a track record in terms of comfort level for a carrier with a potential vendor. Nevertheless, vendors can become stale and drop a bit behind younger more aggressive vendors in terms of product innovation. However, for most broadband wireless ISPs reliability is the top characteristic they are looking for in terms of gear. Nothing antagonizes your customer base more than outages. Clearly, carriers carry a big burden in terms of network management and pre-emptive maintenance tasks that keep a network vibrant and well-tuned---carriers must do their part.

But asking a vendor how long a particular platform has been deployed, especially one making watershed claims of performance and capability, is essential. Knowing how many customers have been served in the real world and for how long are key determiners of reliability. It is a rule of thumb axiom amongst many carriers that almost any brand new platform will experience bugs when it hits the field and this is my personal experience.

Many years ago my former wireless ISP had used a tried and true and very reliable vendor product. When that vendor introduced a new,

improved version of a radio that had been completely re-engineered we happily bought it and became among the very first carriers to widely deploy it in our network. Approximately 5 firmware versions later the pain of the problems we were experiencing almost magically went away after that last upgrade. The lesson here isn't to reject new platforms--we had every reason to expect it to work well. It is rather to perform some field testing yourself before committing to a widespread deployment on a new platform.

### **6 How long will it take me to get shipments and do you guarantee shipping times? And what quantities can I get per shipment?**

The broadband wireless industry is arguably in its golden age worldwide. The interest in and adoption of broadband wireless technologies is at an all time high. Strangely enough, vendors can become a victim of this interest and success if the demand begins outstripping their ability to manufacture and ship products in a timely fashion. Many vendors in the broadband wireless space outsource the bulk of their manufacturing to other specialized firms. And they may not actually have complete control of their ability to produce product for customers. It bodes well for any carrier to ask to see data on actual shipping times and to have a clear understanding of how quickly a vendor can turn product around.

If your carrier is facing tight deadlines for deployment for cash flow reasons or any others, this is a question that needs to go to the top of the list. In general, choosing the right platform I believe is more important than a platform you can get within a certain period of time. But for some carriers this can be an issue. And it is certainly an issue with ongoing operations. Ask also how often they have experienced product delays in the past and how long they were. Also, what were the causes of the delays? A vendor that has never had a product delay is probably rare. How the vendor chooses to answer this question whether reluctantly or very openly should be telling in your estimation of how good the vendor relationship will be.

### **7 Do you have experience providing solutions for our type of carrier? Who are your biggest customers that are similar to us?**

For carriers this is probably a major element at all times. After all, carriers want vendors who understand their business. A vendor who focused solely upon licensed spectrum products in the past but is now offering unlicensed band gear may not understand the product needs of this carrier segment as well. The converse is certainly true also. Carriers vary in their needs and the frequencies of spectrum carriers choose or have available to them often imply significant differences in the types of networks and customer bases that these carriers need to serve.

It is crucial to speak with other carriers that the vendor supports to gain an understanding of how well that vendor meets the needs of a carrier like yours.



## 8 Who are your strongest competitors and why? What do you do better and what do they do better?

This is a bit of a test of character question for vendors, because they always know who their strongest competitors are. If they are reluctant to disclose relative strengths and weaknesses this can be a red flag. A vendor who is open about the differences while maintaining it has a stronger offering and can give good reasons why will garner trust from carriers. After all, a vendor may have a strong competitor who has an entrenched market presence and brand name that the market knows well. But if your potential vendor feels its newer products are technically superior but less well known, it may be right. How vendors talk about their competition or where they indicate defensiveness about their weaknesses is very telling in how they approach relationships with their customers. It also offers clues in where and how a potential vendor may plan upgrades.

## 9 Can you provide professional services or Integration or do you have partner firms that can do so?

Carriers have a lot on their plate. And increasingly it seems that some vendors are striving to assist carriers with more and more services that create stronger relationships. Some radio vendors for example will assist backhaul radio customers with the frequency coordination aspect of buying a licensed frequency PTP radio solution. A few even maintain contacts

with spectrum brokers to assist customers in purchasing licensed PtMP spectrum. Other vendors offer integration or network design professional services. Some have been known to assist carriers with mapping technology and GIS information for their potential markets. Some vendors don't attempt these tasks in-house but outsource them. A good ecosystem of additional service relationships can leverage carriers nicely into a stronger offering to its customers.

All of these can be extremely helpful to a carrier, particularly a carrier new to the broadband wireless space. For carriers understanding their own internal weaknesses as a company comes first. Then evaluating vendors for the additional value they can bring to the table with other services can significantly advance your business goals.

## 10 How is your warranty service handled and how quickly can you turn warranty units around? Also, do you have field technical staff to help solve difficult problems and will you provide this kind of support? What has been your biggest failure with your radio products?

For vendors probably the biggest test of character is how they address problems with customers. It is hard to evaluate how helpful a vendor will be when problems crop up in advance of a real world experience. Part of what

broadband wireless ISPs can learn from talking to other vendor customers is how they are treated. But there are many clues in regards to a company's warranty or repair policy. Are these policies lengthy and offer endless disclaimers for example? Or are warranties simple and all-inclusive? Likely for most vendors, the reality will fall somewhere in the middle. Even vendors who have significant boilerplate in their contracts may be very easy to deal with. They may offer performance above and beyond their contractual obligations. Asking other carriers with experience with a particular vendor on warranty service is helpful. Particularly if a carrier is considering deploying a platform that is new and has little field burn-in history, understanding how much the vendor is willing to support its customers in the field with technical assistance can be a life or death decision point for a carrier. Similarly, asking a vendor to tell you what its past problems are gives a carrier useful clues to how that vendor will react when problems arise because how the vendor chooses to answer this question is almost more important than the answer itself. ■

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