The Emerging WiMAX Ecosystem

by Monica Paolini

A strong and varied ecosystem of vendors is indispensable to the success of a technology. The worldwide success of GSM and its 3G evolution path is a testament to this point.

For a new technology such as WiMAX, which is built from the ground up independent of legacy technologies, the creation of an ecosystem is a crucial opportunity to develop innovative services and take full advantage of the new functionality. However, it is also a major challenge that can hinder the long-term success of the technology.

The WiMAX ecosystem is emerging as, on the one hand, operators begin to plan and deploy end-to-end networks and roll out services for their subscribers, and, on the other, as a growing number of vendors realize that WiMAX represents an opportunity they cannot afford to miss.

Operators are starting to think beyond the WiMAX radio interface and subscriber devices to the entire end-to-end WiMAX network, supporting connections to the subscribers on one end and to other networks at the other. Key areas of interest are the access service network (ASN), which coordinates traffic among the base transceiver stations (BTS), and the connectivity service network (CSN), which manages core network operations.

WiMAX's Advantage

Because WiMAX is an all-IP technology, WiMAX operators can use off-the-shelf components that are widely used in wireline networks. Therefore, operators can build cheaper and less complex networks while reducing time to market. At the same time, they can choose from a wider range of solutions that gives them additional flexibility when developing new services and applications, and easy integration with IP networks, VoIP, IP multimedia subsystem (IMS) and mobile applications.

However, WiMAX operators have requirements that differ from wireline operators. These vary greatly and depend on factors such as services offered, market segments served or size of deployments. For example, a small operator that offers mostly fixed-data services to residential customers will require a less-sophisticated VoIP gateway than a nationwide operator that plans to support mobile VoIP. The network management will also be less complex because it does not need to support handoffs. Mobile operators may need to integrate WiMAX with legacy cellular or fixed-wireless networks, while greenfield operators can afford to adopt

Alvarion Opens Door to New WiMAX Opportunities

WiMAX Ecosystem Interview

Interview with Rudy Leser, VP of Marketing, Alvarion, by Jonathan Singer

You coined OPEN WiMAX in your marketing this year. What does this mean and why it is important? Alvarion's OPEN WiMAX ecosystem is revolutionizing the telecom world with its operator-centric approach to building broadband networks. As the basic broadband services of today evolve into the personal broadband services of tomorrow, the new opportunities offered by this ecosystem to service providers and vendors are enormous.

OPEN WiMAX is an all-IP open architecture for mobile WiMAX access networks endorsed by the WiMAX Forum. Alvarion's OPEN WiMAX platform is designed to be open, standardized and interoperable. The ecosystem opens the door to complete, best-of-breed networks that optimize all elements of a mobile WiMAX network.

Does OPEN WiMAX imply that you support alternative wireless and mobile broadband technologies? Allowing vendors of all sizes to contribute in their respective fields of expertise, OPEN WiMAX reduces barriers to entry into the mobile WiMAX market and promotes multi-vendor solutions. As a result, OPEN WiMAX encourages competition and network innovation, reduces prices, and enhances industry product offerings with the ultimate benefit going to operators and their subscribers.

As a key driver of OPEN WiMAX and the number one WiMAX equipment supplier with more than 350 deployments in 100 countries, Alvarion is introducing new services at lower costs, focusing on helping operators capitalize on their investment in mobile WiMAX. OPEN WiMAX scales well, and encourages rapid and operator integration of third-party applications and services.

Simply put, the OPEN WiMAX architecture gives service providers the ability to choose any combination of vendors and partners to best fit their specific requirements.

What technologies comprise OPEN WiMAX? OPEN WiMAX is behind Alvarion's 4Motion solution, which combines the company's BreezeMAX system and solutions from best-of-breed partners. Together with Cisco and other vendors, Alvarion promotes the definition and acceptance of open interfaces and modular solution designs based on the WiMAX Forum's definition of the wireless standard. Alvarion's basic OPEN WiMAX architecture includes multiple Cisco products, the combination of which offers customers a smooth migration to mobile WiMAX Wave 1 & 2 certified networks.

What part of the WiMAX ecosystem do Alvarion's solutions address? Alvarion is working to empower service providers with the choice of the best combination of vendors and partners. As part of this end-to-end ecosystem solution, Alvarion provides BreezeMAX along with its BWG-IS ASN-GW IP-network access gateway to create a carrier-grade Radio Access Network (RAN). On the subscriber side, Alvarion is offering mobile WiMAX Network Adapter (PC card) and a mobile WiMAX USB modem.

Are there examples of several customers now delivering WiMAX-compliant networks? Recently DigitalBridge Communications launched a portable high-speed internet service in Rexburg, Idaho, USA using Alvarion's 802.16e WiMAX platform. Enforta deployed a WiMAX to the CIS countries using Alvarion's WiMAX solution, and Asia Pacific Telecom Group (APTG) selected Alvarion's mobile WiMAX 16e platform for deployment in Taiwan—part of the M-Taiwan program.

more innovative solutions that lack backward compatibility.

Ecosystem Emerging

Ecosystem vendors must adapt their current solutions to meet the wide range of requirements of WiMAX operators. Increasingly, vendors are seeing WiMAX as a growing opportunity; they're becoming more actively involved in understanding the market and in developing solutions optimized for WiMAX operators. Cisco, Disney, Microsoft, MobiTV and Sony Ericsson are all active members of the WiMAX Forum. The role of these ecosystem companies, in an organization initially dominated by radio access network vendors, is expanding.

The vibrant, rapidly expanding WiMAX ecosystem includes a wide range of players: content providers and application developers, device manufacturers, solution providers and equipment vendors (Figure 1). Many have started to work together to ensure that their solutions are fully interoperable, allowing operators to fully exploit WiMAX capabilities and deliver compelling, cost-effective services to their subscribers.

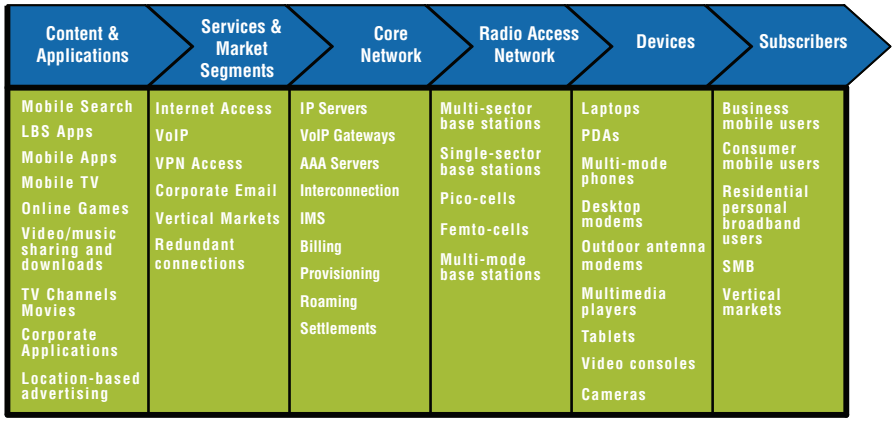


Figure 1

Vendors involved in these partnerships conduct extensive tests to ensure a level of interoperability above that required by standards and certification programs such as those managed by the WiMAX Forum. This activity is crucial to establishing a robust ecosystem because certification only covers interoperability between subscriber devices and base stations. This level of interoperability is an absolute requirement for mobile WiMAX operators because they will have no control over which devices will try to connect to their networks (especially if roaming is available) but need to be assured that they can indeed get a connection and perform as expected.

Within an operator's network interoperability among solutions is less problematic as the operator decides which elements to adopt. The case for a wide certification program for core network elements is not compelling, as each operator will need to customize them and integrate them in a different environment. Certification testing is not likely to cover all the scenarios

Comsys: Conquering the Challenge of Convergence

WiMAX Ecosystem Interview

Interview with Elkana Ben-Sinai,CEO, Comsys by Jonathan Singer.

Can you explain the major challenge of convergence? With mobile WiMAX being widely recognized as the important first step in 4G communications, there is little doubt that cellular and WiMAX will be expected to coexist and work together within the same handsets. The convergence plans announced by major service providers for mobile WiMAX and cellular affirm this; this trend will drive demand for flexible and future-proof architectures that can support both standards. These architectures are expected to focus on enabling mobile internet convergence through advanced baseband processors. Leading cellular operators Sprint Nextel, KT and NTT DoCoMo either have committed to deploy or are conducting trials with WiMAX.

Several handset vendors are already working on converged mobile WiMAX/cellular handsets. Sprint Nextel and KDDI have announced plans for a converged mobile WiMAX/cellular service, where KDDI already demonstrated its Ultra 3G concept in the field during 2006. Current solutions and demonstrations are "Velcro solutions," where a mobile WiMAX modem is added to an existing cellular handset. However, this results in an increase in valuable E-BOM, board space and power consumption—all critical factors in handset design—adversely affecting the user experience from such devices.

How does Comsys specifically address 4G convergence? Against this background, the advanced 4G convergence capabilities of ComMAX—a flexible multimode OFDM/A baseband processor from Comsys Communication and Signal Processing—are leading the field. ComMAX enables service continuity between cellular and mobile WiMAX (IEEE 802.16e), and provides manufacturers of multimode mobile WiMAX terminals with a comprehensive broadband solution with MIMO capability, which can operate over multiple bands, and which offers substantial cost and power savings.

The ComMAX SoC has been specifically designed with a flexible architecture to support current and future mobile WiMAX profiles including second wave certification. With software/hardware partitioning that has been optimized to meet the specific power and die-size requirements of mobile terminals, ComMAX incorporates a software-configurable modem core that addresses mobile WiMAX, 3GPP LTE as well as future 4G standards requirements.

Integrating advanced MAC engine with optimized neighbor-cell management, ComMAX supports full mobility at high vehicular speeds.

ComMAX is suitable for use by handset OEMs/ODMs, PDA designers, SD Card manufacturers and other wireless CE device manufacturers that are planning to add mobile WiMAX functionality to their products. The processor and accompanying reference designs will be available in the market toward the end of 2007.

Comsys has a background in cellular processor technology, which is proving a real strength in tapping the potential of cellular/WiMAX convergence. Although WiMAX has it roots in backhaul and fixed wireless broadband access and has been standardized in the IEEE 802 body, the mobile version is fundamentally a cellular technology and has more similarities service-wise with 3GSM than with WLAN. Target mobile WiMAX devices will rely on battery power. Therefore, the power consumption constraints are similar to those of existing cellular devices. Comsys' multimode solution offers up to 50% power savings compared with competing alternatives, and provides a cost-effective path toward seamless 4G services.

that operators will have to deal with. Independent interoperability testing among vendors, however, is a more informal but extremely valuable way to prepare the ground for an operator's integration of different solutions.

Assessing Available Solutions

Network operators can use a mix-and-match approach in planning their networks. Solutions from different vendors can work together in the same network and offer the right balance between technical innovation and continuity, and complexity and advanced functionality. Interoperability makes it easy for the operators to add new elements to their networks and upgrade those currently there.

As the ecosystem evolves and increases in complexity, it will initially be challenging for network operators to identify the best network elements. The landscape is still fragmented and in many instances vendors must wade into new territory because operators are building their businesses around innovative services at the same time that ecosystem players are developing solutions to meet their needs. In most cases it is simply not possible to know what the best solution is just by looking at what others have done or accepting industry wisdom because there is no precedent.

Operators need to carefully examine their own requirements and expectations, and explore more widely the options available from different vendors. During the initial growth phase it is imperative for operators to gain an in-depth understanding of the level of interoperability among different network elements and how it will evolve over time.

This will enable operators to add base stations from a different vendor into their networks next year using the same ASN gateway and core network elements. In other cases, fixed operators may elect to choose a more complex billing system that can be easily extended to support the mobile services they want to add down the road. Network operators with legacy networks face a difficult choice between sticking to solutions that work within the existing infrastructure but may not scale well, and future-proof solutions that afford more advanced functionality.

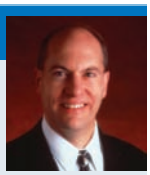
Network expansion and introduction of new service and devices becomes a less daunting and expensive prospect when operators know they can rely on an ecosystem of compatible and interoperable products.

WiMAX does not have the advantage of 20 years of amassed knowledge and experience that comes with the GSM family, but it is quickly assembling an impressive collection of players that are either working towards developing new solutions or adding support for WiMAX within their current solutions. WiMAX operators increasingly have the freedom to pick and choose from a dense ecosystem of best-of-breed players with solutions specifically designed to meet their needs.

Monica Paolini is a consultant and analyst focusing on wireless data technologies. She has worked with vendors, operators, regulators and industry associations to assess the opportunities that WiMAX brings to the market. She can be contacted at monica.paolini@senzafiliconsulting.com

WiMAX Ecosystem Interview

Test Solutions Help WiMAX Fulfill Potential



Interview with Donn Mulder, Vice President/ General Manager of Anritsu's Microwave Measurement Division, by Jonathan Singer

How is Anritsu developing test solutions for WiMAX? Anritsu's extensive experience in both wireless and IP technologies has us well positioned to develop instruments to address the unique challenges associated with testing WiMAX. We have taken this experience, and coupled it with customer research and feedback to design test instruments that meet market needs. The end result is test solutions designed to be highly accurate, simple to operate, and highly efficient, so that WiMAX products can reach the market faster and operate to their optimum level.

Please explain the testing challenges associated with WiMAX. WiMAX's open IP architecture provides tremendous flexibility, which is great for network operators. However, it poses a series of challenges for test manufacturers. Test instruments have to be developed with a high degree of flexibility and customization to address the unique testing requirements for each design and application.

What role is Anritsu playing in the WiMAX ecosystem? Content providers, application developers, devices manufacturers, solution providers, and equipment vendors, have to partner in order to achieve success. Anritsu has worked with companies in all of these categories to develop our test instruments. By getting input from companies in other elements of the WiMAX ecosystem, we have been able to design some truly innovative test instruments that best meet the market's needs, which ensure performance and bring products to market quickly.

Can you give examples of those products? Our Signature MS2781B integrates a full suite of physical-layer measurements of both fixed and mobile WiMAX signals. Its open Windows environment makes it easy to integrate popular simulation and analysis tools. For example, the Windows environment provides a seamless interface with MATLAB so that designers of WiMAX products can develop their own measurements and then view live results, post-processed by MATLAB, directly on Signature's display. The open platform architecture also allows Signature to easily evolve to satisfy any changes that may come from future WiMAX requirements.

Signature can also be integrated with the MG3700A vector signal generator for more in-depth WiMAX signal analysis. The MG3700A's 512-MS memory and modulation bandwidth of more than 120 MHz makes it a strong complement to Signature. Plus, the MG3700A is Arb-based, giving it the capability to transmit waveforms created in off-line applications, such as MATLAB. It can be equipped with Anritsu's IQproducer software to analyze WiMAX waveforms as well.

Anritsu also introduced the MT8222A BTS Master the first fixed WiMAX handheld test instrument. A single-instrument solution for engineers, technicians, and contractors responsible for the deployment of WiMAX networks, the BTS Master can measure the transmitted signal strength and signal shape of the selected BTS transmission. It can also analyze OFDM signals and display detailed measurements for evaluating transmitter modulation performance.