WiMAX 2010: Delivering 4G Around The World

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WiMAX is the only globally deployed 4G technology that today is enabling primary broadband in developing markets and providing 4G services in the most advanced telecommunication markets. With millions of subscribers today and triple-digit cumulative average growth predicted through 20141, WiMAX is starting to enjoy mass market adoption. Millions of people in Japan, United States, Korea, Europe, Malaysia, Russia, Taiwan and more than 100 other countries are currently enjoying the benefits of WiMAX. Expected to cover one-fourth of the globe's population in the next two to three years, WiMAX deployments now cover over 630 million people today.

A robust, flourishing competitive ecosystem, WiMAX is supported by a mature and diverse ecosystem of global leaders from both the telecommunications and PC industries. Over 530 companies, including more than 30 providing low cost consumer devices and modems, are committed to making WiMAX and mobile broadband a success.

Driven by the incessant global demand for affordable wireless broadband Internet, WiMAX addresses both the needs of telecom operators with the cost dynamics of the PC industry. A case in point, the initial cost to PC manufacturers of embedded Wi-Fi/WiMAX modules in laptops entered the market in 2008 at one-third to half the cost of the most advanced 3G solutions of the time. Today, WiMAX USB dongle pricing is roughly a fourth of the price of comparable 3G solutions.

By 2011, ABI Research projects the incremental material costs of adding embedded WiMAX to a device is predicted to be in the single digits. The impact of these types of device cost trends has a game-changing effect on the entire mobile broadband industry.

Connected Devices, Key to the Data Revolution

WiMAX operators offer a variety of WiMAX devices beyond what has been enabled on voice-centric networks. The demand for data is exploding — and 4G is all about data. WiMAX chips can be cost-effectively embedded into not only laptops and netbooks, but also consumer electronics (game players, digital cameras, navigation devices, home entertainment systems, etc.), utility meters, appliances and mobile Internet devices (MIDs), so users can connect, entertain, stay informed, and be productive wherever they go. These devices need the kind of speed and price/performance WiMAX offers.

WiMAX devices currently in market include 3G/4G handsets, personal hotspots (enabling multiple WiFi connections via a single WiMAX portable device), standalone broadband and VoIP modems (CPE), USB dongles, Wi-Fi/WiMAX gateways, MIDs

(Mobile Internet Devices) and finally laptops and netbooks with built-in WiMAX modules.

As of April 2010, more than 200 laptop and netbook models embedded with the Intel® WiMAX/WiFi Link 5000 and Intel® Centrino® Advanced-N + WiMAX 6000 series modules have been certified for operator networks. The world's leading PC manufacturers are offering Intel-based, embedded WiMAX solutions including Acer, ASUS, Dell, Fujitsu, Lenovo, MSI, Onkyo, Panasonic, Samsung, Sony, and Toshiba.

More than 30 companies in Taiwan deliver WiMAX device designs including AboCom, AWB, Acer, Alpha Networks, ASUSTek, Cameo, CyberTAN, D-Link, DNI, Gemtek, GIL, IAC, Inventec, JStream, Liteon, Loop, MiTAC, MTI, Ruby Tech, Qisda, Quanta/QMI, Spectec Computer, TECOM, USI, WNC, and ZyXEL.

WiMAX Service Provider Outlook

Unlike any previous wide area wireless network standard, WiMAX crosses multiple service provider segments. WiMAX is being deployed today by more than 90 operators with existing cellular networks and another 400+ wireless ISPs, wireline incumbents (including telecoms providers, DSL, and Cable companies), utilities providers, and private network operators. In February 2010, the WiMAX Forum counted 621 million people covered by WiMAX services providers. The WiMAX Forum also forecasts over 800+ million people will be covered by the end of 2010 and over 1 billion by the end of year 2011.

Intel® Centrino® Advanced-N + WiMAX 6250 Module

Figure 1. Intel Centrino Advanced-N + WiMAX 6250 Module

The Intel® Centrino® Advanced-N + WiMAX 6250 half size mini PCI express module (see Figure 1) is Intel's latest WiMAX solution for laptops and netbooks. The Intel® Centrino® Advanced-N + WiMAX 6250 solution includes enhancements and optimizations over the previous generation Intel® WiMAX/WiFi 5100 series modules. Performance enhancements include increased WiMAX throughput with downlink speeds up to 20 Mb/s and uplink speeds of up to 4 Mb/s. Enhanced QoS support improves streaming media, VoIP and video conferencing applications under a broad range of RF conditions. Support for 2.3, 2.5, and 3.5 GHz frequency bands enable a single design to support global deployment and roaming capability.

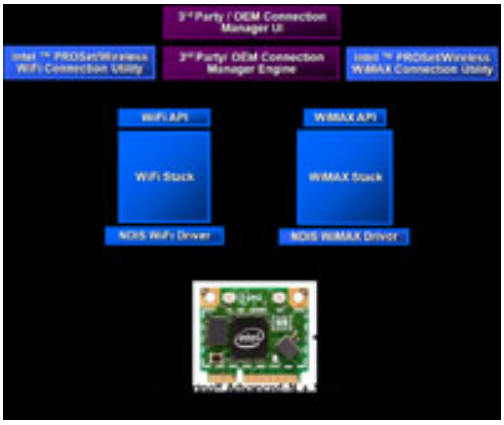
The Intel® Centrino® Advanced-N + WiMAX 6250 also enables enterprise class

WiFi capability through 802.11abgn protocols and bands, AMT 6.0 advanced management, WiDi wireless display, and Intel® My WiFi technologies support.

Platform Software Enabling

Intel provides to OEMs a complete software enabling solution for deployment of the either WiFi only or WiFi+WiMAX solutions. Intel's WiFi+WiMAX solution shares the same enterprise-class WiFi capabilities and software drivers as the Intel® Centrino® Advanced-N 6200 WiFi only solution. This simplifies OEM software integration and maintenance efforts. Figure 2 shows a high level diagram of the complete software architecture stack supporting the WiFi + WiMAX solution. While Intel provides connection utilities for both WiFi and WiMAX, API's are also exposed to enable support for OEM, service provider or end-user installed 3rd party connection managers.

Enabling the PC Industry through Scalable Platform Certification



The goal of Intel's laptop and netbook certification is to help successfully deliver Intel-based OEM laptops incorporating embedded WiMAX solutions, ensuring they meet or exceed baseline requirements for operation on WiMAX service provider networks.

Intel provides a complete set of technical documentation and full assistance to laptop and netbook OEMs in order for fast, repeatable, embedded WiMAX integration. Design-in support includes review and analysis of OEM platform Radiated Performance Test (RPT) results as agreed upon by WiMAX service providers. Laptop OEMs validate and document, along with Intel and the service providers, the ability of the platforms to meet the basic quality requirements needed to successfully launch the notebook on the network. The WiMAX service providers assist OEMs with network access, root cause determination and fix of any network connectivity issues. The WiMAX service providers also review the laptop

platform testing results to ensure adherence to all certification and launch requirements.

The Intel Precertification program paved the way for fast, efficient platform launches. Beginning in 2007, Intel embarked on an aggressive and comprehensive program to enable wide-scale adoption of embedded WiMAX in PC OEM laptop and netbook platforms. This program was designed to ensure fast, efficient and consistent “launch ready” platforms. Certification steps to ensure high performing, launch ready platforms include:

• New and advanced antenna designs for PC OEM platforms tuned for WiMAX performance

• Radiated Performance design-in collateral and training to teach OEMs how to integrate embedded WiMAX silicon and produce high-performing platform designs

• Radiated Performance test labs and services to help PC OEMs measure & improve their platforms

• Enabling activities to drive standards into the WiMAX Forum Certified Labs (WFDCL) for RF performance

• Definition of minimum baseline radiated performance requirements (KPIs) or “bar to meet” for launch on WiMAX service provider networks

• Extensive stationary and mobile in-network testing of multiple worldwide WiMAX networks for a wide variety of netbooks, notebooks and competitive devices

• Certification process alignment with multiple operators to drive a common methodology

• End User Experience and Performance Testing in multiple RANs worldwide on a variety of OEM notebook platforms to ensure they provide a consistent and clear user experience message.

The benefits of this process are:

• Intel and the PC OEM ensure an exceptional end user experience that is consistent with all other client devices

• OEM notebook Certification need only cover significant variations between notebook SKUs

• Every platform incorporates:

a) A certified WiMAX module and software

b) A certified CPU, chipset and OS components of similar evolution

c) Embedded antennas which meet stringent specifications and ensure verified RF performance by meeting all Key Performance Indicators (KPIs) as tested during RPT

•Parent/Child Certification if “Child” platforms:

a) Have the same LCD planar design and +/- 1 inch in size

b) Have identical antenna design, but can utilize 2nd-source manufacturers

c) Have identical antenna cable type, length and routing in the platform

d) Have identical antenna positioning in the platform

e) Are contained in a similar/same exterior casing.

Key Learnings:

• Intel’s embedded WiMAX certification program has led to a greater than 90% successful operator certification rate in two years. Laptop and netbook WiMAX performance has also advanced significantly as a result of the program.

• Leading PC OEM vendors are launching products worldwide with great success and report very few end-user or service provider issues.

• Extensive field testing has verified that a combination of Radiated Performance Testing (RPT) and module IOT is sufficient to certify the notebooks for launch without risk to the service provider, Intel or OEM vendor.

•99% of all issues found on OEM notebooks during field test were:

a) Already discovered during module IOT testing on the platforms or, b) Specific to a custom OEM connection manager.

• Fundamentally all platforms perform within the same envelope of performance by discovering non-compliant Radiated Performance KPIs before connecting to the operator networks.

• PC OEM platforms do not cause ‘loss of service’ or network disruption. No issues related to this have been reported on any launched networks worldwide to date.

This certification program has been utilized by and developed with leading WiMAX service providers and PC OEMs worldwide. Service providers that have utilized this program include UQ (Japan), Yota (Russia), Comstar (Russia), VMAX (Taiwan) and Clear (US). PC OEMs and ODMs that have participated include Acer, Asus, Dell, eMachines, Fujitsu, Lenovo, MSI, Onkyo, Panasonic, Samsung, Sony, Toshiba, and Quanta. Over 200 notebook and netbook SKUs have been certified worldwide to date.

Summary

Intel is continually working to further enhance laptop and netbook platforms through innovative product, technology and certification enablement efforts. The Intel® Centrino® Advanced-N + WiMAX 6250 combination WiFi and WiMAX half size mini-PCI Express module, along with extensive certification support eases OEM integration effort, reduces overall complexity of adding wireless wide area networking, and ensures an excellent end user experience.

The addition of WiMAX to laptop and netbook platforms provides another avenue by which service providers can attract new subscribers and enables new usage models by providing the speed of home broadband on-the-go.

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