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"WiMAX and Broadband Wireless (Sub-11Ghz) Worldwide Market Analysis and Trends 2005-2010"

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About the Team:

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Robert Syputa, BSEE, MBA, has over 26 years experience in the broad field of electronics and six years experience as a telecommunications industry analyst and consultant, particularly in the merging fields of WBB and related technologies and businesses. Background experience includes technical sales at Fairchild Semiconductor and sales management at Philips. Robert ran TEAM Associates, an independent manufacturer's representative firm who's clients included Honeywell and GE-Druck. Several years ago he developed an interest in emerging wireless communications fields including cellular and 802.11/802.16 standards for WLAN and WMAN systems.
Mr. Syputa obtained a Bachelors of Electrical Engineering from Southern Polytechnic State University and a Masters of Business Administration from Seattle University.

Claudine Maynard, Market Analyst holds a Bachelor of Commerce with specialization in international business from HEC Montreal. Part of her international telecom experience includes an assignment with an IT education company in Bombay, India, where she was an active consultant involved in both market research and business development."

About Maravedis

Maravedis is an objective, third party research and analysis firm focusing on Broadband Wireless Access technologies including WiMAX, 802.20, TD-CDMA and Wireless Local Loop Systems. Maravedis Mission is be the most trusted bridge between the world of emerging technologies and the world of real deployments and sound business models.

Maravedis has established itself over the years as the most credible and reliable resource for market intelligence in the broadband wireless industry. Maravedis works with equipment vendors, service providers, and the investment community to produce a sound analysis of equipment shipments, emerging trends and realistic market forecasts worldwide.

TABLE OF CONTENTS

LIST OF EXHIBITS

APPENDICES

Fixed Market Trends

The fixed/portable broadband wireless equipment market (sub-11GHz) has grown from a $430 million market to $562 million a 30% increase. Maravedis predicts the fixed Broadband wireless market to pass the $ 2 billion mark by 2010.

For the first time in its history, vendors including Airspan and Alvarion have made yet modest but positive cash flows. Further broadband wireless has evolved from an obscure acronym to the next big thing thanks to Intel's marketing machine and the formidable progress made by the WiMAX forum, growing membership to the extent that WiMAX is now synonymous with broadband wireless.

Maravedis has been following the industry long enough not to fall into the trap of using WiMAX as representing the whole story. WiMAX is an important, highly visible part of the evolving fixed/portable field but not all of it! Other technologies including DOCSIS-base, TD-CDMA and 802.20 merit to be analyzed as well.

The fundamentals for continued growth remain sound. Broadband is becoming a necessity for many residential and business subscribers worldwide. There were close to 130 million broadband subscribers worldwide at the end of 2004, a 30% growth from 2003.

Although DSL and Cable are poised to remain the dominant technologies for access in urban and developed areas, pre-standard wireless access technologies are already becoming reliable and cost effective complements or alternatives to providing voice and data services.

Some Key Findings include:

- Some 785,000 broadband CPEs and over 40,000 base station sectors were shipped in 2004;
- Alvarion remains the market leader with 26% market share followed by Motorola Canopy and IP Wireless;
- EMEA which represented 32% of the overall 2004 equipment sales continues to represent the largest market opportunity but Asia will outpace it by 2007;
- The carriers market segment with 68% of all sales represented the largest segment followed by Wireless ISPs and Public entities;
- The access and backhaul applications represented respectively 81% and 19% of total sales in 2004. However backhaul will represent 27% of equipment sales by 2010;

- 3.5GHz, the most allocated frequency band for BWA, represents the largest opportunity for BWA with over 40% of total sales followed by the 5.2-5.8Ghz band. We believe those bands will continue to dominate equipment sales especially in light of the fact that they are two of the initial WiMAX profiles. The 2.3 and 2.5-2.7Ghz market share will grow as Korean (WiBro) and US operators start deploying WiMAX equipment some time in 2006-2007
- The shipments of proprietary Fixed Indoor/Portable equipment already accounted for 21% of 2004 sales
- Shipments of OFDM based product already represents 18% of all shipments and that proportion will grow with the adoption of 802.16-2004 to close to 60% by 2008

Service Provider Trends

Maravedis estimates that close to 1 million subscribers worldwide had some form of fixed broadband (+256Kbps bi-directional) wireless access. Maravedis estimates total service revenues in 2004 to be US$1.4 billion.

In developing countries, representing most of the worldwide population, the potential for BWA/WiMAX growth is most pronounced. In rural areas, governments at all levels are driving the growth of broadband wireless through continuing frequency allocation and subsidies to make the rural business case more attractive in order to reduce the digital divide. Our research indicates that a tipping point that will drive increased unit demand is likely to occur due to effects of standardization: commoditized IC/SoCs will help drive the price equation, stimulate increased awareness and market driven demand, and provide increased supply stability and compatibility across similar equipment profiles

This year, operators will explore the challenge of growing broadband ARPU. There will not be a single solution: faster speeds and VoIP will work for some; content and IPTV services for others. There will be a growth in commercial bundles driven by telcos' responses to cable operators' triple play services. We expect VoIP services to continue to show strong growth and continuing acceleration in subscriber base in both the consumer and enterprise segments.

Maravedis surveyed operators to understand their greatest expectations vis a vis upcoming WiMAX equipment. The results of the survey are presented in the report. In essence, the number one expectation for service providers is lower CPE equipment cost, ideally in the sub $300 range. This is not a surprise when considering the impact of CPE subsidies in the total business case. The second highest priority expressed is for base stations to deliver “more throughput”, a response that came ahead of benefits such as “Interoperability”, “ease of installation” or “coverage”. Responses changed noticeably depending on service class: business or residential customers.

We also looked at BWA operators’ strategy towards mobility. The majority of service providers are excited about the prospects of mobility but concerns about regulation and network complexity alter the excitement.

Whether it is 3 G or 802.16 e,/WiBro the success of mobile broadband will be driven by the development of user friendly applications and handsets. In this section, Maravedis provides an overview of what are the applications driving the mobile broadband market including mobile gaming, multimedia messaging, gambling and other applications such as ring tones. The mobile consumer market represents the lion's share of mobile data services revenue due to gaming.

Spectrum & Regulation Trends

Maravedis spent more than six months directly surveying regulators in each of the fifty countries reviewed in this section. This aspect of the research and the construction of a detailed database reference is by far the most thorough in the industry. Maravedis fulfills the challenging task to contact, collect and continuously update its database because many customers have come to depend upon this resource to determine product development and marketing efforts.

Our research indicates that 82% of regulators surveyed allow both TDD and FDD multiplexing. About 50% of the countries require 3.5MHz channels while the rest is divided between 7 and 14Mhz. Very few countries impose narrow 1.75MHz channels. In Asia, the situation is more diverse. For spectrum block sizes, the situation also varies form region to region and between countries within the same region.

3.5GHz remains a band allocated mostly for fixed only services in 77% of the countries surveyed. However the regulators are starting to revise their positions to allow portable services in a first step towards allowing full mobility at 3.5GHz. 13% of countries surveyed have loosened up their requirements for fixed only services at 3.5GHz. Regulators recognize that the line distinguishing BWA and 3G is blurring and may converge in the future.

While most of Europe the band 2.5-2.69 GHz is exclusively reserved for UMTS mobile services and is therefore not available to BWA/WIMAX service providers. In other parts of the world, initiatives such as the ITU WP8F, are pushing to allow interoperability bodies between UMTS and OFDM in these mobile services.

Beyond the regulation constraints, WiMAX needs lower bands to economically deploy networks that will provide full mobility. Higher than 3GHz bands are not suitable for mobile networks as proper coverage would require too many base stations compared to sub 1GHz bands. The WiMAX regulatory group is working towards influencing the regulatory bodies worldwide to open up bands for WiMAX mobility. Those bands could include the 700 MHz and 450 MHz. The regulatory working group is also working to create an environment to support eventual global roaming for nomadic & mobile WiMAX devices

Solution Vendor Trends

Maravedis has surveyed more than forty BWA/WiMAX system vendors and larger infrastructure suppliers. During our careful review of product specifications, we have attempted to get a sense of the true capabilities of current proprietary broadband wireless and future WiMAX solutions.

In this study, Maravedis provides its readers with a review of real life deployments, product specifications, as well as an in-depth analysis of the strengths and weaknesses of every vendor. Alvarion, the market leader with 26% market share, may not have the highest performance system in the market, but it continues to beat every competitor according to several important business metrics such as customer base, OEM relationships, installed base, revenues and financial position. We also came to the conclusion that proprietary systems will be phased out only gradually and coexist in "hybrid" networks with WiMAX certified solutions. Such solutions will not be implemented commercially until at least Q1 2006.

We also provide a dynamic review of continued industry consolidation and guidance as to who will be around in the next 2 years and why. We look at how 802.16 compliant vendors will differentiate themselves from one another once the standard is in place and becomes widely adopted. OEM relationships have become key for system vendors hoping to grab a share not only of the soon to be commoditized fixed WiMAX market, but more importantly to position themselves among large mobile operators who will continue to shop with their traditional large suppliers.

WiMAX Trends

The whole concept around standardization is to reduce equipment and component costs through integration and economies of scale that will, in turn, allow for mass production at lower cost. In particular, current chipsets are custom-built for each BWA vendor making equipment development and manufacturing both costly and time consuming.

With large volumes, chipsets could sell for as little as $25 and other WiMAX components could benefit from these mass volumes as well. We expect the cost reduction impact to be mostly on the CPE at an average selling price close to $100 by 2008. Base station costs are more complex due to the variety of types and scale. However base stations are less of a factor in the economic equation for operator deployments.

A notable initial benefit of WiMAX is to reduce customer confusion represented by the advent of a WiMAX compliance label. However the hype generated by the press and vendors has sent an overly optimistic picture of what WiMAX systems can actually deliver. In this report we provide an in-depth reality check about what to expect in the next five years. Both proprietary systems and WiMAX are aiming at improving the coverage and penetration limitations of existing systems. The fact is that no system can go beyond the laws of physics and every deployment will face different challenges.

WiBro

WiBro is being incorporated into the WiMAX standard effort but can be viewed, for the time being, as a separate market development centered in South Korea that is valuable because it will be an early large scale deployment. WiBro will demonstrate the early capabilities of WiMAX systems for both fixed and mobile broadband communications that compares favorably for nomadic to mobile applications of 3.5G-4G cellular.

WiBro is likely to change opinions about the technical credibility and market merits while dispelling myths perpetrated by some that "WiMAX is too late" or offers nothing new. A major problem with the credibility of the WiMAX camp is that any delay or perceived delay registers as 'vaporware' and validation to the proposition that WiMAX will not shape up as a viable competition to existing wireless cellular or as some new breed of popular wireless broadband phenomena. WiBro is a central factor in proving that mobile WiMAX is real and is gaining more sales momentum.

The three operators who have been licensed spectrum by the Korean government are required to spend at least $1 billion US each on deployment of WiBro systems. Operators Korea Telecom, SK Telecom and Hanaro Telecom are required to start offering service in 2006.

These developments and emerging trends make WiBro developments and harmonization within WiMAX a key area of focus through 2005-2007. Maravedis provides insights into the plans of major players in the WiBro initiative and how this is likely to effect markets globally.

Mobility Trends:

The largest markets for wireless broadband will be for mobile applications. Mobile broadband is being developed from two opposing directions: From the WiMAX side, systems will become increasingly mobile as unification takes place under the 802.16 standard. From the cellular mobile side, systems are being driven to deliver voice, rich media and broadband data over an IP network. Both streams of development eventually will deliver similar data rates. However cellular phone/data network sales currently greatly exceed BWA in terms of both unit numbers and revenues.

The trend for WiMAX systems starts with the first stage being for fixed-nomadic CPEs with systems expected to become WiMAX Certified starting in the mid-2005.

The second stage of WiMAX systems based on 802.16e will provide greater nomadic followed by PCMCIA enabled laptop mobility. Maravedis analyses the trends towards greater mobility within individual IC and equipment companies, within the standards groups and forums, spectrum and regulatory issues, and major regional deployments such as WiBro. The exciting stages of growth of WiMAX are fueled by fundamental shifts in

underlying wireless technology, global shifts in market demand, and political and corporate aspirations to take part in a less fettered, standards based 3.5G-4G wireless platform.

Maravedis does not expect WiMAX to become a "3G killer" in the near future. WiMAX provides a framework for 4G mobile, more squarely pitted in the mobile market arena against 3GPP rev.7 than against either current 1x EV-DO/EV-DV or soon to roll out HSDPA.

For future considerations as the road maps of the two camps unfurl, WiMAX and 3GPP will overlap and contend for common mobile broadband ground, each with distinct market and technology development orientations but less distance that separating them.

Qualcomm and other vested interests in cellular fields contend, WiMAX is either too late or unnecessary. Competitive approaches should be recognized realistically and welcomed by implementers and users, particularly those that fit global patterns of economic and political expression. These major trends and others lead to both a conflicted and exciting future for wireless developments.

Maravedis spent time to build fundamental data through extensive interviews, fact gathering and analysis of legacy proprietary, fixed Point to Point infrastructure and the emerging field of 802.16/WiMAX technologies and trends because these fields are new or less understood and will have influence on converging markets. We also present the fields of legacy and emerging 3GPP mobile systems and road maps because this also defines a major adversary and direction in which the emerging field of technology is headed.

Key Findings include:

- Both 3GPP and WiMAX technological road maps converge by 2010 on similar bandwidth and mobility form-factor capabilities.
- Large scale cellular deployments of both WiMAX and 3GPP systems will converge within a framework of IMS (IP Multimedia Subsystem) network architecture. Other standards such as for common base station structure and seamless roaming between wireless systems and wired networks also are driven toward the direction of IP/Ethernet protocols which will become common to both WiMAX and 3GPP.
- 802.16e/WiMAXm (WiMAX Mobile versions) is a highly scaleable, modular and cellular, all IP/Ethernet protocol wireless communications system. Although early WiMAX will only be fixed to nomadic, the road map calls for rapid progression to CPE, device assisted laptop, and within 30 months to 'true mobile' capability.
- The highest growth in both mobile cellular and pre-WiMAX systems deployments is now occurring in developing markets and similar under-served economies. These markets are more prone to adopt new technologies that are more open to localized participation or more expedient to fulfilling market needs efficiently.

Intel has a vital role to play in development of WiMAX as both an extension to wired Ethernet networks and as a driver into a broader role in mobile wireless. Intel has both the process and design technologies and manufacturing might that argues in favor of their increased participation in an expanded, converged wireless broadband market.

Chipset Vendor Trends:

The whole industry is benefiting from the entry into the market of Intel which is behind most of the publicity around WiMAX. Intel has signed partnerships with the most important traditional BWA players but those deals are not a guarantee of future purchase orders, as evidenced by the announcement of multiple chipset suppliers to the same system vendors such as Airspan. On the CPE side however, we believe that Intel will dominate the market. However other chipset makers such as Wavesat and Sequans or Picochip have made their footprint with base station and/or CPE solutions.

The market for 802.16 chipsets should pass the one million-unit mark per year in 2007-2008 while 802.16e chipsets will be introduced in late 2007 and will grow exponentially thereafter.

Traditional Point to Point Analysis

Point-to-point (PTP) microwave communications is an industry with deep roots and still constitutes a far larger industry than any other segment of broadband wireless with current sales approaching the $4 billion mark worldwide and projected to reach approximately $6 billion before the end of the decade. Backhaul itself accounts for roughly 70% of overall sales within the PTP category today. We expect that figure to increase to 80% within five years. In the future we see PTP microwave losing ground to both PMP/WiMAX and to fiber.

Market Size Forecasts

We believe the BWA market will finally pass the billion dollars “psychological mark” in 2007 using a CAGR of 45% for CPEs and 25% for base stations revenues. This is a realistic expectation in light of the historical industry overall CAGR in 1999-2004 of 50%. In This report provides market forecasts in units and $ for the 2005-2010 period for both CPEs and base stations, fixed and mobile systems as well as numerous breakdowns.

