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"WiMAX, NLOS and Broadband Wireless Access (Sub-11Ghz) Worldwide Market Analysis 2004-2008"

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About the Author:

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About Maravedis

Maravedis Inc. is a world-leader in market research and analysis, specializing in BWA PMP markets. Offering more than just numbers, we offer our clients flexibility and results tailored to meet their needs. Maravedis produces an extensive portfolio of industry reports and databases of vital industry information. The research covers a breadth of issues - from regulatory issues to market forecasts and competitive analysis. Maravedis is based in Montreal, Canada.

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Benefits of the Report:

• **Comprehensive:** Increases chances that the report talks about industry aspects you care about and saves you hundreds of hours of research.

• **Unbiased:** Our editorial approach insures an objective and independent analysis of market players and trends

• **Accurate:** We collect data mainly through primary research you can rely on. We strive to provide you with realistic demand forecast scenarios.

• **Timely:** Insures you are up to date on current product & market developments that affect your comprehension of the market and decision process.

• **Consistent**: We are very careful to compare apples with apples and use only the right metrics such as manufacturer shipments, in units well defined.

• **Transparent:** We clearly state all our sources and assumptions.

• **Withstands the Test of Time**: Saves you money from having to repurchase new reports within the first year of publication.

• **Value–added**: Our analysis is based on access to confidential information that only renowned third parties have access to.

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Who Should Use This Report:

- **Operators** that need to understand how WiMAX will improve their bottom line and which vendors to consider;
- **Vendors** who want to strengthen their knowledge of their competitors and the overall market trends;
- **Consultants** who want a strategic understanding of Broadband Fixed Wireless Access in general and WiMAX;
- **Financiers** who want to understand the revenue potential of WiMAX and the emerging vendors;

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Scope of the Study

The present study will provide guidance on the following main topics:

Sub-11Ghz BWA Equipment:

- Review of Broadband Point to Multi point Systems
- Fixed Wireless History and Market Sizes 1999-2003
- 802.16 vs Proprietary SWOT Analysis
- BWA Equipment Market Size Forecasts 2004-2008
- BWA Market Drivers
- Analysis of 23 Selected BWA Vendors
- 6 selected Operators Case Studies
- Drivers for NLOS and 802.16
- Status of NLOS developments
- Actual performance Results of NLOS systems
- Forecasts of NLOS developments by PHY layer

802.16 Chipsets:

- Comprehensive Profile of 802.16 chipset and RF makers
- Timing of 802.16 chipset market
- Market drivers for 802.016 chipsets
- 802.16 Chipset Market Size Forecasts for 2004-2008

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Market Trends

Fixed broadband wireless market (sub-11Ghz) will grow from $430 million in 2003 to more than $1.6 billion by the end of 2008. In 2003, BWA shipments increased 45% over 2002. Vendors have announced both multi-million dollar contracts and hefty growth earnings compared to 2002. Technology news editors are now talking about a BWA come back with the emergence of millions of WiFi access points connected by more flexible and less costly fixed wireless solutions.

Despite the 2001-2002 market slowdown, the steady demand for bandwidth, coupled with wider access to the Internet and data in general, provide sound fundamentals for expecting future growth in both telecom services and equipment sales in the first/last mile. In other words, both residential and business subscribers worldwide are demanding faster connections for their applications and operators are struggling to give them that access. According to the ITU, there were almost a 100 million broadband subscribers worldwide at the end of 2003. Although DSL and Cable are poised to remain the dominant broadband access technologies worldwide, wireless access technologies are becoming a reliable and cost effective complement or alternative to providing data, voice and video services. Governments worldwide are also driving the growth of Broadband through continuing frequency allocation and programs to subsidize broadband deployments in order to reduce the digital divide between regions of high and low density areas.

Some Key Findings include:

- There were over 10,000 PMP BWA (sub 11Ghz) base stations and 1.2 Million CPEs installed worldwide providing 256Kbps+ broadband services to over 1.5 million subscribers.
- Alvarion is the market leader with about 25% market share followed by SRTelecom with 12% and Proxim with 9%;
- ZTE is the market leader in the fast growing Chinese market with about 30% market share;
- EMEA which represented 32% of the overall market in 2003 continues to represent the largest market opportunity but Asia will outpace it by 2005;
- The carrier and private networks market segments represented respectively 85% and 15% of the total market in 2003;
- The access and backhaul applications represented respectively 84% and 16% of total sales in 2003. However backhaul will represent 30% of equipment sales by 2008;

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- 3.5Ghz, the most allocated frequency band for BWA, represents the largest opportunity for BWA representing 40% of total sales followed by the 5.2-5.8Ghz band. We believe the 2.3 and 2.5-2.7Ghz market share will grow to 25% of the market by 2008
- Already 12 vendors offer a 3.5Ghz product and 4 more players will offer a 3.5Ghz product in 2004 which will render that band market even more competitive
- Among Plug & Play, NLOS, portable systems, IPWireless is the leader in shipments and revenues, followed by a small group of companies which include Navini, NextNet Wireless, or SRTelecom (Angel). It is however difficult to sub-segment the whole market on system capabilities.
- Shipments of OFDM based product already represent 39% of all shipments and that proportion will grow with the adoption of 802.16d to close to 60% by 2008
- Shipments of 802.16e will grow exponentially after 2007 to 1 million units and will be dominated by Intel

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 and hence less expensive equipment. 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 BWA components could benefit from these mass volumes as well. We expect the cost reduction impact to be mostly on the CPE in the first 2 years of WiMAX deployments as base station costs are more complex to deal with despite the promise of base station cost of under $20,000. However base stations are less of a factor in the operator economic equation for deployments.

The other notable WiMAX benefit will be to reduce customers' confusion and the advent of a WiMAX compliance label. Service providers are becoming familiar with WiMAX and include it in their review of equipment suppliers. That trend will become more important when WiMAX compliant equipment is deployed in real networks and delivers on its promises. However, WiMAX will not necessarily bring higher performance systems in the short term as quite a few current proprietary systems are already delivering on WiMAX coverage, cost and performance promises.

Beyond lower cost and compliant equipment, service providers need better coverage to make money. They need the ability to deliver access without truck roll, to all their potential customers around the base station regardless of natural and other obstacles (trees, buildings, etc.). In fact, people in the Industry often state that their customers would like to have a triple 50: equipment providing 50Mbps up to 50-Km radius with $50 CPEs!

For service providers, that means the ability to provide triple play services in the long term with data, voice and video services to their customers, the same way innovative CLECs like Fastweb in Italy are providing real time, symmetric services to both residential and business users with fiber.

More realistically, 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.

Currently, single carrier PHY layer dominates deployments with about 50% of modems shipped worldwide. However, Maravedis forecasts that both single carrier and CDMA systems will lose market share, as OFDM/802.16d becomes the widely adopted standard for air interface of BWA systems. Various flavors of CDMA should however remain strong in niche markets for mobility.

Mobility Trends:

Approved in February 2002 by the IEEE, the 802.16.e standard is aiming at providing broadband access to the mobile user walking around with a PDA or laptop while 802.20, if ever materializes, will address high-speed mobility issues.
Today at least 8 major BWA vendors interviewed are committed to implementing 802.16e in their product roadmaps. We believe Intel will start implementing its 802.16e chipsets in laptops starting in 2006. We believe mobile operators who are already adopting WiFi for hot spots will embrace Wimax as they move to some form of IP-based systems. The big backers of 802.20, Motorola and Cisco (which backs Flarion) are aiming at influencing heavily the standard and are clashing in standard battles with Intel and Nokia in the race for delivering components to mobile broadband devices.

Solution Vendor Trends

This report looks at both WiMAX "want to be" as well as proprietary solution vendors. It also looks at pure LOS players. During our careful review of product specifications, we have attempted to get a sense of the true capabilities of BWA solutions in the market and distinguish the apples from the oranges. We concluded that within the apples, there were different flavors and colors that make a price/performance comparison very difficult. Indeed some systems only offer data services including VoIP, others also provide E1 and POTS. Some systems are Plug & Play, others are outdoor-only. Some offer 2Mps at the CPE while others, 512Kbps, etc…

In this study, we provide you with a review of real life deployments, product specifications, as well as an in-depth analysis of the strengths and weaknesses of every vendor. **We provide you with market share numbers by frequency for every vendor**, a more precise measure of the competition. Alvarion, the market leader with 25% market

share, may not have the highest performance system in the market, but it beats every competitor according to several important business metrics such as customer base, installed base, revenues and financial position. We also came to the conclusion that proprietary systems will continue to contribute greatly to BWA's success.

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. REMEC will be the first player to exit the industry in 2004 and Chinese vendors such as ZTE will take more space in the BWA market. We also see a clear, growing interest by major infrastructure suppliers in the 802.16 technology for use with their mobile and PTP radios platforms. We also look at how 802.16 compliant vendors will differentiate themselves from one another once the standard is in place and becomes widely adopted. Will Wimax be dominated by non start-ups such as Intel and Nokia (for the base station) like it happened with WiFi? Specialization and the ability to integrate the product into a turn key solution will be the key to success. Expect partnerships with infrastructure suppliers to flourish. Vendors of fixed CPEs will need to adapt to a market where the line between fixed and mobility applications is increasingly blurred.

Chipset Vendor Trends:

The whole industry is benefiting from the late entry into the market of Intel which is behind most of the publicity around WiMAX. Intel has signed partnerships with Aperto, Alvarion and Airspan (among others) which together already hold over a 40% BWA market share. But Intel did not enter the game simply to address the fixed BWA market. It is betting heavily on the migration of chipsets into the millions of mobile devices.

Intel is sometimes perceived as "arrogant" towards certain solution vendors, as the silicon maker seems to be pushing its own roadmap towards the integration of chipsets into laptops while the integration of 802.16 at the base station does not seem to be its priority. Other chipset makers such as Wavesat have more experience in developing OFDM chipsets but only the future will determine if know-how will triumph over reputation, size and clout.

Market Size Forecasts

We believe the BWA market will finally pass the billion dollars "psychological mark" in 2006-2007. Nothing is easier than to make a forecast curve line steeper to please the industry. What matters is that we see real multi-million dollar contracts for large-scale deployments, more and more success stories from operators and growing subscriber numbers.

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 2006 and will grow exponentially thereafter.

Methodology & Assumptions

The research was conducted through two main channels:

Secondary Sources:

Maravedis as a small and specialized firm always commits to provide our clients with a new and unique perspective of the industry based on our own research. In order to ensure that we were not "duplicating" the information already available to stakeholders in the industry, we have reviewed most of the market research available in the market on broadband wireless access.

- ITU Statistical Yearbook 2002
- The World Bank Development Indicators 2003
- Market reports on the industry
- Numerous articles too long to describe

Primary Sources:

- Interviews with Service Providers
- Interviews with equipment vendors
- Interviews with Regulators
- SEC documents and other public financial data from equipment vendors
- Web sites of regulatory bodies
- Comments made on quarterly earnings calls made by company executives

In order to provide our customers with accurate, thorough and timely market analyses that withstand the test of time we have collected primary data through interviews of most vendors in the industry. Although it is a lengthy process, we believe gathering primary data directly from those players that craft the industry is the most valuable process for market research.

The survey took place from November 2003 to February 2004 and involved discussion with product managers, marketing managers, regulators, technologists and sales people at all organizational levels.

Most vendors have been willing to provide us with their insight of market activity by regions and market segments, customer requirements, strategies, and vision openly. Most vendors have provided us with their shipment and average selling price figures under non-disclosure agreement. This quantitative data was used internally to produce both historical market size figures and were integrated into our forecast model. As a result, we are not in a position to reveal all individual market shares.

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In the course of the study we had decided not to cover the following companies for the reasons mentioned in each case:

- Broadstorm: out of business
- Iowave: out of business
- Flarion: interviewed by not profiled
- MeshNetworks: was interviewed and analysis included in the 2014 vision section
- Orthogon Systems: only PTP products
- Narrow band products that deliver less than 256Kbps to te CPE

For every solution vendor selected, the report provides a detailed discussion on the following business aspects that goes well beyond the public information available on the Internet:

- Overview of the company
- Detailed and realistic description of the product offering based on product features analysis which includes:

Product Name
RF Band
Channel Size
Sectorization
Net Capacity per sector
Maximum Number of CPEs per Sector
Typical Radius Cell & Coverage/Fade Margin
Modulation
List Price per sector
Access Method
Duplexing Method
PHY
MAC protocol
Net Spectrum Efficiency
CPE Interfaces
CPE List Price
BS Network Interface
Commercial Status
NMS
Special features

Features describer may vary from a vendor to another. List price are not disclosed when provided to us under NDA.

- 2004-2005 Product Roadmap
- Product & Standard Strategies
- Markets and Customers: Real Commercial Activity
- Breakdowns of sales activity by Region, Segments, Frequency and Application
- Sales Channels
- Partnerships/Alliances
- Financial data (for public companies)
- Maravedis Assessment: SWOT Analysis

Fore every 802.16 chipset Vendor, we reviewed the following:

- Overview
- Product specifications
- Product Roadmap
- Alliances
- Ownership/Investors/Financial Background

Forecasts Methodology

Market sizes in dollar figures are obtained by combining the two following essential metrics:

- Manufacturers' unit shipments of CPEs and Base Stations (or equivalent 4 sectors, non redundant)
- Average selling price

Most of equipment suppliers provided us with their exact numbers under NDA while others gave us rough estimations. For the rest, we estimated their shipments and ASP from investor conference calls, contracts announced, and customers interviewed.

The construction of the model consisted in the following steps:

Average selling prices:

In this very competitive industry, all vendors provide discounts whether they sell direct to end-users or to resellers, specifically distributors, integrators, VARs. Those discounts can range from 5% to an outstanding 30% depending on volumes and regions.

It was thus essential for the model to run using an average selling price as opposed to an average list price in order to provide an accurate view of both price erosion and total

market size. We thus obtained various list prices and related discounts that we applied to obtain "street" prices. Although we are conscious that discount rates can vary greatly based not only on volumes but also on regions, reflecting the competitive environment, we had to draw a line to come up with a weighted average selling price which reflects discount practices across regions, volumes and product lines.

To provide you with realistic price forecasts, we first looked at the historical price decline and made assumptions as to future price decline according to our view of future volume shipments and technology cost reduction.

Historical Average selling price 1999-2003
Historical Price decline 1999-2003
Future price decline 2004-2008

Shipment Volumes

All market shares and statistics are reported in Manufacturer Sales. That is the sales realized by the manufacturer that ships the product. This does not measure the additional revenue realized by added margins when sold through the sales channel. For the purposes of accuracy and tying numbers back to public financial documents, we believe reporting in manufacturing sales is the cleanest metric.

Historical shipment volumes in units 1999-2003
Future shipment volumes 2004-2008

Forecasting is completed through statistical analysis based on historical data, general economic forecasts by CIBC world-markets, standard developments, upcoming frequency allocations and impact and recent contracts announced.

Scenarios:

We have attempted to run various scenarios to account for the possibility of major events affecting our base case scenario. In particular, we have looked at the effects of the following important events to take place:

- Major US operators start deploying BWA after 2006
- More aggressive deployment of BWA in all cities with frequency allocation
- Greater success of Wimax adoption

The model itself is confidential and will not be provided with the report