Nomadic, Portable,
Mobile **WIMAX-WiBro as**

3G++

ALL IP Options

A Comparative Analysis Of WIMAX- WiBro,
3G Evolution, And Other Wireless Broadband Alternatives

TELE Analytics

MARCH 2006

MAY 2006 UPDATE: **Inukshuk**
Parameters & Performance Of The New
600 Sites-2,000 Sectors Canadian BWA Network

Inukshuk, Canada

TURIN, ITALY

SEOUL, KOREA

SUMMARY

The January 2004 TeleAnalytics WIMAX report was not tempted to follow unconstrained DSL-eliminator visions rampant at the time. Instead, the report saw the WIMAX FBWA role as relevant to the rural areas and suburbia of the developed world, as a gap-filler technology for major DSL deployments, and as a "persuader" to some developed world non-competitive DSL offerings. A major part of the F-WIMAX opportunity was positioned in Tier 2-3 markets, where the broadband is taking off, but where the spatial teledensity of the demand is weak and the fixed network is often in need of serious investment. The 2004 report further identified that major vendors had the option to OEM F-WIMAX gear, focusing instead on the time when mobile IP was to become a mainstream vision. Events proved that nothing much needed to change in the statements made in early 2004, and the timing of this follow-up report simply reflects the fact that today Mobile WIMAX is knocking at the door, and WiBro is walking towards the living room.

Today's German or US $15-20 a month DSL, the even cheaper Japanese rates, and the massive-IPTV related fixed broadband investments, only mildly shrink the developed world FBWA sanctuaries. On the other hand, these same developments make any competition against urban fixed broadband across the board an even less realistic idea than it was two years ago. Nomadic-Mobile WIMAX applications though are already a reality, and the technology shares the inherent simplicity and transparency of a ground-up All IP network with WiBro and FLASH-OFDM.

Evidently, the technology is hardly the only broadband wireless option, and the existing technological diversity is helped by the diverse opinions concerning what the performance-operational 3G++ envelope should be after all. Clearly, these opinions largely reflect different competitive environments, and since the environments are not about to converge to any kind of homogeneity, multiple wireless broadband options will coexist in the marketplace for the remainder of the decade.
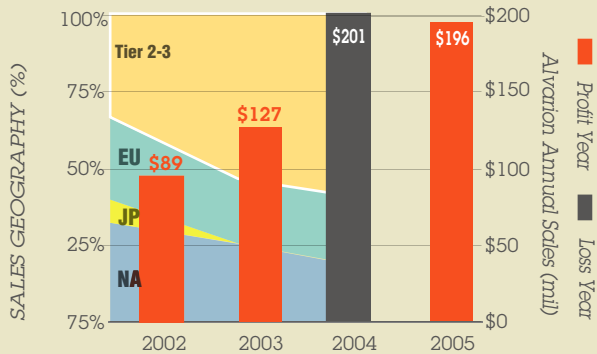
As analyzed in the report, HSPDA addresses the 3G downlink throughput issue, and in addition to the operators already deploying the technology, quite a number of others are publicly committed to do the same in 2006. Furthermore, HSUPA promises to address the 3G uplink bottleneck, eventually making the 3G Evolution capable of supporting both high-speed Internet access, and advanced use-to-user services. The Taiwanese, on the other hand, chose another route and their multi-year i3BG project (Integration Beyond 3G) already resulted in Taiwanese cities being blanketed by metro Wi-Fi. Flarion is now Qualcomm, and it is potentially putting another mobile IP option on the table, which can possibly flourish even without a revival of IEEE802.20. WiBro today is the only IEEE802.11e realization that entered the deployment phase, proving that all this technology development could not conceivably target only Korean consumption. Finally, IP Wireless is continuing on its rather lonely TD-CDMA path and the troubles of its New Zealand operator (Woosh) are due to a combination of reasons analyzed in the report.

All of the wireless broadband options are evolving, and many of the performance predictions are either the result of simulations, estimates, or of usage scenarios that may not always be relevant to the realities of the developed world operator. Furthermore, the business models put forward are sometimes echoes of the fixed and mobile broadband-saturated Korea. At other times, these scenarios seem to bypass the issue that the integrated operator most often has to live with increasingly ferocious VoIP attacks against the fixed voice revenue while having to sustain the anything but inconsequential IPTV CAPEX.

Although the report concentrates on the Nomadic/Portable/Mobile WIMAX and WiBro, it starts with the FBWA developments. Furthermore, the technology and the induced business options are examined not in a journalistic vacuum, but in correlation to the main competing technologies and within the current Telecoms framework as defined by the VoIP reality. The VoIP popularity is looked at in the context of both the Fixed and Mobile WIMAX variants, and the early mobile-voice focused WiBro deals in South America are discussed. The extensive forecasts for Fixed/Nomadic and Portable/Mobile WIMAX, along with those specific to WiBro, are detailed on page 10 of this brochure.

The detailed regional analysis included in the report is due to the fact that WIMAX's medium term fortunes will be largely defined not by the countless free-space spectral efficiency debates, but by how successful CEPT and other similar organizations prove in protecting the European consumer from the "mobile IP tropical disease". Of course, some explanation may soon have to be offered about how an Egyptian consumer with GDP just 1/22 of the WE one can possibly soon be the one to enjoy mobile IP, but of course winning time is sometimes the only realistic objective in sight.

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SALES GEOGRAPHY (%)

Tier 2-3

EU $89

JP

NA

$201 $196

$127

2002   2003   2004   2005

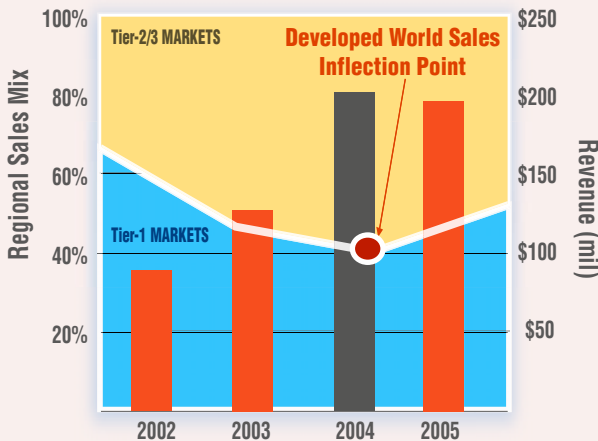Profit Year   Loss Year

Alvarion Annual Sales (mil)

Alvarion and Fixed BWA Trends

The 1994 established Alvarion is the oldest and biggest traditional FBWA player. While the FBWA discussion in the report is evidently more comprehensive, the summary picture of Alvarion's financials shown above is quite illustrative of the overall FBWA happenings.

The introduction though of N-P WIMAX and WiBro is just about to change this traditional FBWA picture, since the 2006 Korean WIBro spending may equal what FBWA grossed in 2005 and furthermore, contractual engagements by Telecom Italia and Bell Canada-Rogers can get the N-P-M WIMAX/WiBro engine start running for good.

The point was made in the report's original release in March, that the N-P-M WIMAX uptake in developed countries is bringing to a rapid end the days that BWA was associated with Tier 2-3 markets. The May 2006 released Alvarion 2005-sales data show that the point of inflection has been reached, even without the help by the more than $800 million Korean and Canadian WIMAX 2006 spending or the scheduled for 2007 introduction Alvarion 4Motion M-WIMAX product line.

Regional Sales Mix

Tier-2/3 MARKETS

Developed World Sales Inflection Point

Tier-1 MARKETS

Revenue (mil)

2002   2003   2004   2005

The Vulnerable Fixed BB Offerings

Oceania's FBWA history dates back to early 1997-98 Alvarion (then BreezeCOM) installations. In New Zealand, Walker Communications (now Woosh Wireless) is one of the oldest FBWA hands, and after years of deploying or trialing all major BWA technologies, it finally settled on IP Wireless gear.

In Australia, Unwired acquired the bulk of its 3.5 GHz spectrum in 2000, but it launched only in August 2004 after the necessary financing had been secured. The Australian fixed broadband market is dominated by Telstra, and its DSL infrastructure quality and pricing resulted in one of the less competitive DSL offerings of the developed world.

The August-2004 Unwired Sydney launch proved successful, and although the company's mid 2005 BB market share was just over 1%, the company is already past the mid point towards its originally planned breakeven point of 70,000 subscribers (see figure). An August 2005 Intel investment helped, and currently Unwired is expanding in Melbourne.

The blind association of Fixed WIMAX with only Tier 2-3 markets, represents an over simplification and instead the particularities of the competitive environment have to be looked upon. FBWA can be seen as capable of giving urban wireline a run for its money, wherever wireline did not try to be competitive enough. As analyzed in the report though, the circumstances for New Sydneys or New Aucklands selectively only exist in the rest of the developed world, and competitive ILEC responses are currently underway in both Australia and New Zealand, while the Irish IPEC response did not stop the big Irish FBWA success story.

Company Estimated Breakeven: 70K Subs

UNWIRED Subscribers (000s)

Aug-04   Dec-04   Jun-05   Dec-05
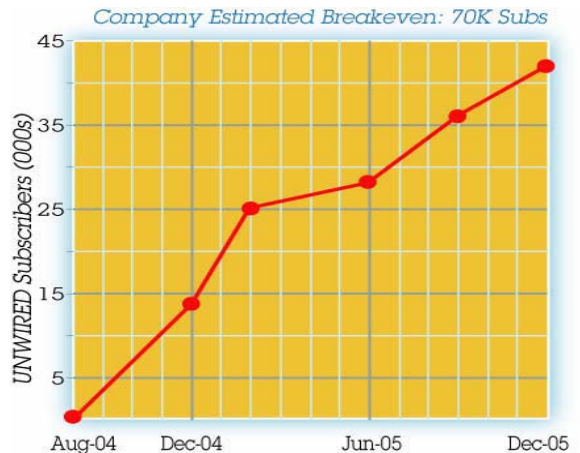
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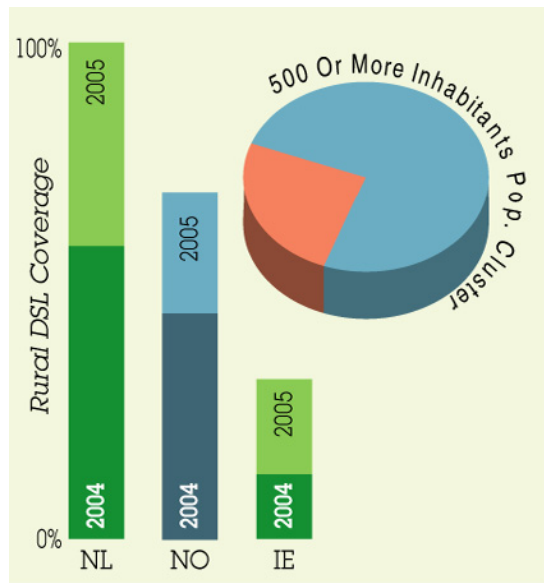
The Rural Areas Of The Developed World

By 2003, the rapid built out of urban wireline BB infrastructure allowed for increased attention to be paid to the developed-world rural areas, and the report discusses the major initiatives of both governments and operators.

The figure at the top of the page shows the situation for a few of the countries for which data are provided. The cooperative Netherlands geography allowed for almost universal DSL coverage to be achieved by 2005. Other European geographies are hardly as DSL-friendly, and in Norway 25% of the population lives in population clusters of less than 500 inhabitants each, while 23% live in even smaller population centers (less than 200 inhabitants).

Therefore the shrinkage of the areas that are not serviced by wireline progresses at radically different rates in the developed countries examined in the report, providing for different size-time windows for FBWA and Fixed WIMAX. This analysis, which of course factors in the underlying population counts, is among others at the basis of the detailed Fixed WIMAX forecasts provided.

It has to be pointed out that a significant part of these "white areas" can not be serviced by terrestrial means, and satellite provisioned broadband is often the only available or meaningful option. Finally, there is a significant borderline segment, where FBWA can do the job, but not at pricing levels anywhere close to the ones prevailing in the urban centers.

The Relevant Permanence Of The Developed-World FBWA Sanctuaries.

The 2005 fixed network landscape was characterized by multibillion (per operator) IPTV-related deployments, which in many markets already resulted in $35-45 per month 24 Mbits/sec DSL. This is approximately the range of pricing that most F-WIMAX business cases assumed, but of course for data rates of the 1Mbtis/sec variety. Perceptions of the minimum Triple Play bandwidth required vary, but even at the lowest end (5 Mbits/sec sustained) a Fixed WIMAX sector can support less than 8 concurrent households, and a four sector BS can support no more than forty.

Things are more realistic for F-WIMAX, when the TV stream is assumed to be delivered by satellite, leaving F-WIMAX in a "fixed line return role". Given that IPTV is currently a developed world undertaking, even in this role FWIMAX has to confront its usual nemesis, namely ADSL, which in general will provide for better cost per Kbits/sec delivered. On the other hand, IPTV related upgrades are mostly targeting 40-60% population coverage by 2008-2010, and therefore the natural FBWA sanctuaries (low density areas) are not about to be threatened any time soon.

Instead, the current IPTV deployments clear the atmosphere of 1990s-era FBWA revanchisms, and the report focuses on the obviously significant WIMAX-WiBro market that exists in the developed world, namely the nomadic-portable-mobile one.

Korean WiBro Subscriber Projections (mil.)

Consumer ■ Business

0.61 2.31 4.90 7.49 8.86 9.30
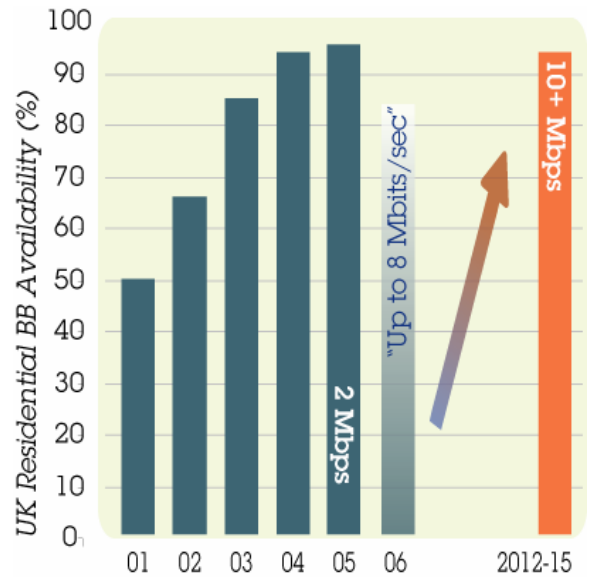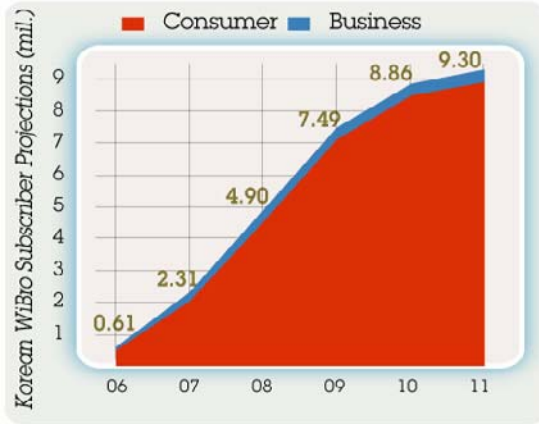
The Korean Dimension Of WiBro

The Korean-developed WiBro is currently the only existing member of the IEEE802.16e family that can lay claim to commercial availability, with about 18 months lead-time against the timeline established by the WIMAX Forum. Its marketing is being carried out time and again on the basis of forecasts and concepts totally specific to Korea, whose fixed and mobile broadband situation is anything but typical.

Therefore among others, the report interprets the more than nine million projected (by 2010) WiBro subs (figure at top) vis-à-vis the KT stagnated growth and the heavy regulatory burdens it faces on the FMC and IPTV fronts. Extrapolating these expectations outside Korea is possibly not a particularly rewarding path, given the wide range of competitive environments that WiBro and Mobile WIMAX are expected to serve.

The report looks at the issue in a realistic way and on the basis of the 3G precedents, where mass vendor and operator market research did not prevent the beyond reason inflation of the subscriber's expectations.

KT ■ SK

Annual Revenue (Tri. Won)

10.3 11.5 11.3 11.6 11.9 11.9 11.7

00 01 02 03 04 05 06(E)

The Throughput – Latency Debates

The HSPDA-HSUPA and Mobile WIMAX camps are not polarized, and vendors whose preferences would lie with either, would not be able to ignore the WiBro reality as well. Therefore, while realism is evident, the broadsides on the technological merits of the opposing solutions are already commonplace.

A large part of the debate revolves around throughput and latency claims-estimates, and the fact that WiBro doubles the 3G uplink throughput is possibly considered more esoteric. Furthermore, the fact that latency (figure at the bottom of page) and not raw throughput is most often the constraining factor in anything but Internet downloads, it is seldom illuminated to the degree reasonable for mobile networks rapidly coming under the IP/SIP/IMS umbrella.

Many of these estimates are the result of different assumptions or definitions; most have their origin in simulations or theoretical calculations, and very few have the benefit of any properly witnessed field measurements behind them. This situation, although definitely not the operator's dreamland, is realistically unavoidable, and the risks inherent in committing billions of dollars hardly unknown in the Industry, both wireline and wireless.

The report bypasses opportunities for both cheerleading and Cassandra roles, and simply positions everything for what it is: fact, estimate, claim or a best-case scenario.

ROUND TRIP TIME (msec)

■ Not Witnessed in Commercial Networks

LAN Wi-Fi FLARION WiBro HSDPA WCDMA EDGE GPRS
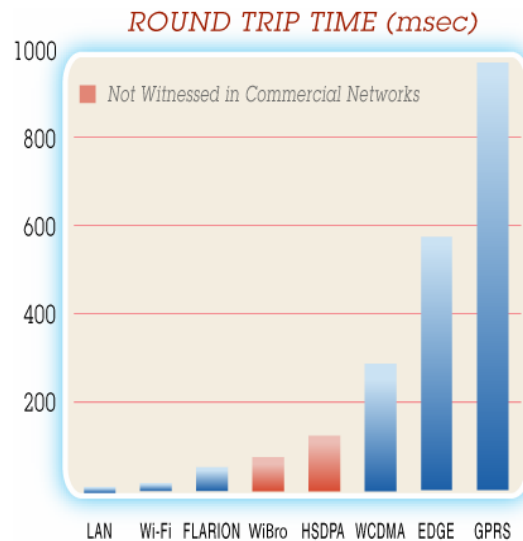
Metro Wi-Fi

TeleAnalytics released the first ever metro Wi-Fi publication (November 2004). The current surge of interest in this massively broadband wireless option is a well-understood and properly positioned reality.

The metro Wi-Fi challenge is positioned both against the 3G Evolution, and also against the WIMAX-WiBro options. The capabilities of the technology to put huge amounts of bandwidth at the street level, but also its poor height service ceiling, and very limited buildings penetration performance, are put into perspective on the basis of both analytical and field results.

Furthermore, the point is established that metro Wi-Fi has no independent (without Cellular assistance) mobile voice proposition to make. Exhaustive results are included with respect to what it costs to Wi-Fi whatever is worth Wi-Fing in NA (and around the world), what population and household counts can be addressed, and what is likely to happen and when. Finally, since Cloud in the UK and the US MSOs are already proving the prediction that the mayor is not the mobile operator's biggest worry , the report looks into the merits of metro Wi-Fi in the hands of new entrants. Special attention is paid to the US MSOs, since this type of operator can potentially address known weaknesses in the metro Wi-Fi business model. Furthermore, the MSO can also bring a dense and deterministic (wireline) backbone to the table, at pricing/performance points that can not be touched by a mobile-only operator and are challenging for an integrated one as well.
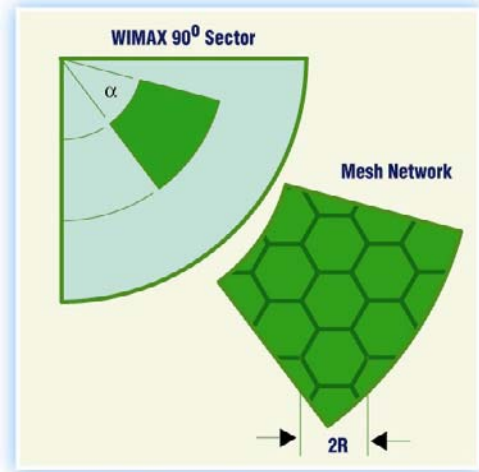
The Mobile WIMAX - WiBro Timeline

The WIMAX Forum timeline-watchers often created a feeling of collective guilt, for what is after all a Herculean effort which has not been delayed by more than one or two quarters (an Industry record), while at the same time dealing with the well known idiosyncrasies of the IEEE proceedings. A simplified view of the current plans and perceptions is shown in the figure below, and there is no doubt that the WIMAX Forum's plans are aggressive. Furthermore, the WIMAX case is not helped when individuals acting as reps of the Forum lay down a timeline, just to be informed by public statements of their CEO that no mobile full roaming and handover can be expected before 2010.

As the report analyzes, the perceptions of small and medium FBWA size players is not what will define things, and instead the color of developments to come is defined by the 18 plus month WiBro lead time, and by the plans and commitment of the majors. Alcatel for one already announced mid-2006 commercial Mobile WIMAX BS availability.
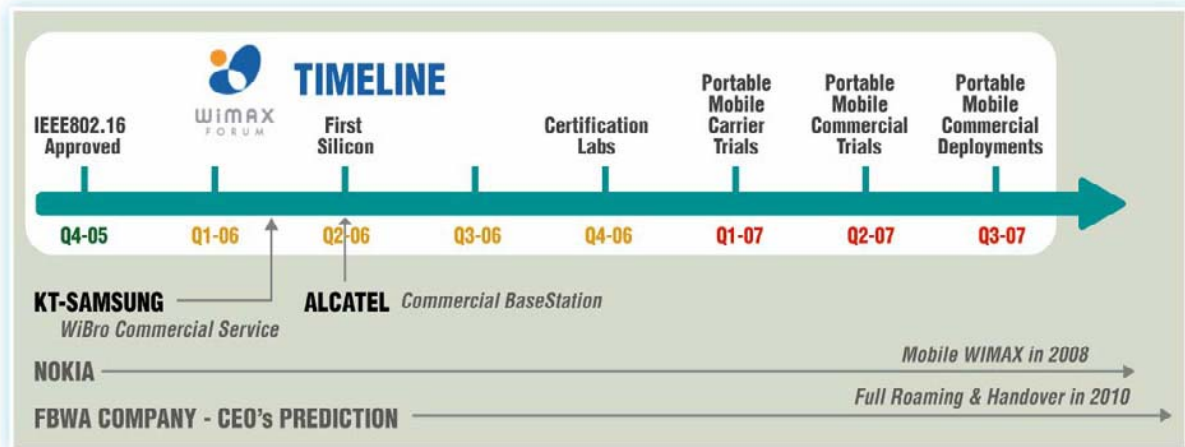
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WiBro –WIMAX

The WiBro-WIMAX relationship was not the easiest one around, and the early 2004 Korean comments were that WIMAX was then just a FBWA technology, and therefore not in par with the mobile WiBro. Rather polite potshots were exchanged for most of 2004, and some kind of deal was reached only in November of the same year, reportedly only after the US administration undertook a "persuasion" campaign.

While it never made sense to develop a whole new mobile technology for a country of less than 50 million people, a widely held belief existed that the Koreans planned to do just that. Such expectations were shattered, when in late summer 2005 Samsung's chairman made clear statements that he did not see 3G-4G under the "Intel inside" logo, and that Korea was ready to lead the world (with WiBro) to the domains beyond 3G.

WIMAX FORUM   TTA

IEEE802.16d   IEEE802.16e   Harmonized WiBro

The report analyzes the implications of the unusual situation developed. The IEEE802.11e bulk (WIMAX) is not planning commercial launches until the end of 2007, while the WiBro strand will become operational in a few months time in Korea, and it is also currently running high profile trials around the world. While both facts and arguments made in the report are too lengthy to mention here, it should be clear, that the Samsung actions are not the actions of a company scared by the 3G-Evolution competition, since instead of looking for allies it is ready to take on the road alone.

The Regional Outlook

The 3G evolution (HSPDA) is already deploying (Cingular), but WiBro besides Korea and a couple of rather firm deals in South America, also managed to engage major carriers to WiBro trials. Some of them (Telecom Italia) had previously announced firm HSPDA 2006 deployment intentions and therefore the map at the bottom should be redrawn at least quarterly. Furthermore, WiBro may get the firm commitment of a non-Korean major operator before the summer is over, and then the game changes altogether. For the time being though, WiBro publicly enjoys a fairly peaceful existence, with all the 3G Evolution potshots aiming against mobile WIMAX. The report analyzes in detail the evolving HSPDA-WiBro landscape, with a focus on the characteristics of the operators that are inclined to adopt either. The report's forecasts are also segmented along Mobile-WIMAX/ WiBro lines, just in case of the harmonization implied by the figure at the top of the page, takes somewhat longer than anticipated.

CA,US   UK,IT,DE,AT   KR,JP,PH

VE,BR   ZA

	HSPDA	W & W
Trial		
Commitment		
Deployment		

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Views Of The Mobile Networks Infrastructure Market

WIMAX & Flash OFDM

Applications

CDMA

UMTS

GSM

2004   2010
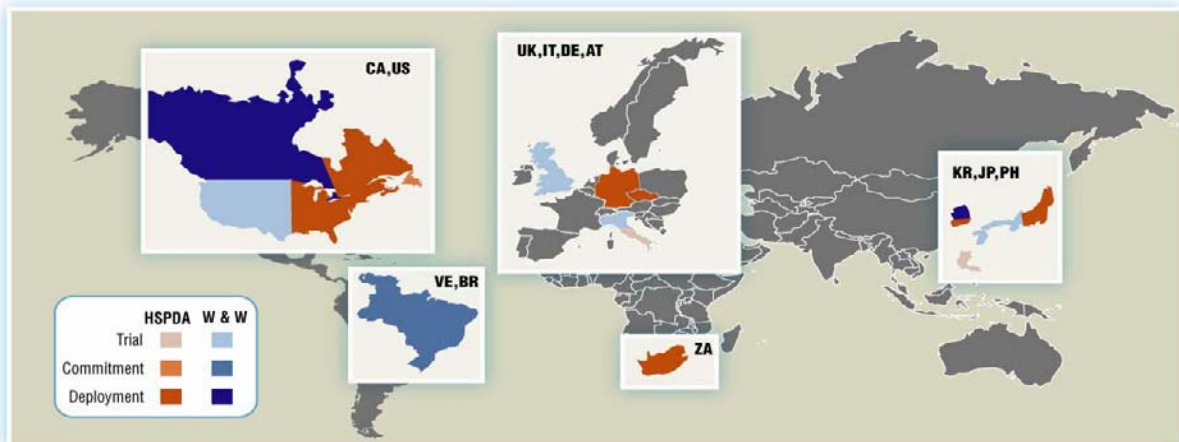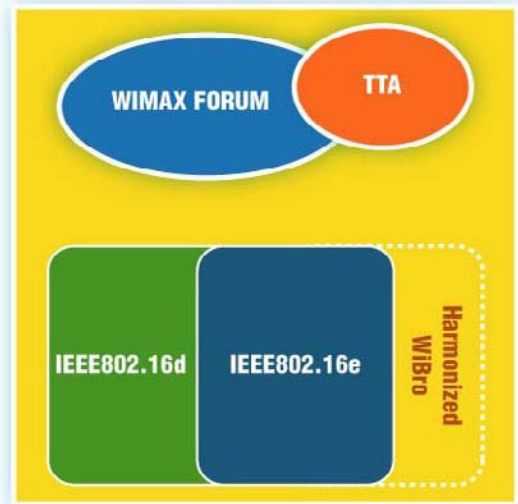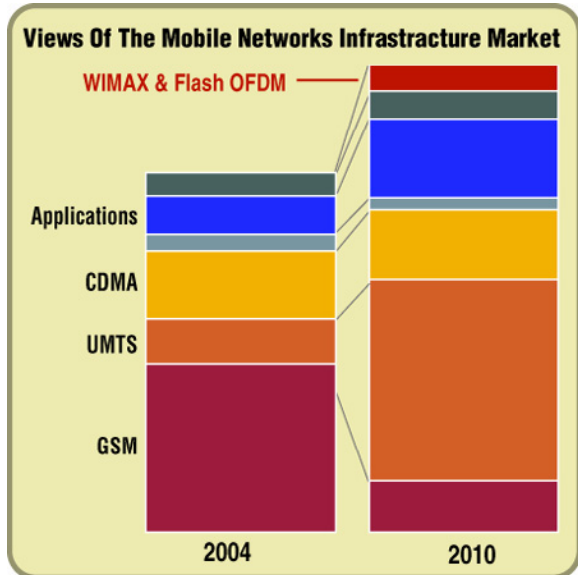
The Mobile Infrastructure Market

The figure above represents the mid-2005 estimates of a major mobile networks infrastructure vendor. Both Qualcomm's acquisition of Flarion and the WiBro step out from Korea, were probable at the time, but not done deals as they are today.

As the report analyzes, the competitive environment is rapidly changing and practically none of the majors are placing their bets on only one side. On the other hand, not all of the vendors feel equally comfortably on both sides of the mobile IP table, and the redistribution of the pie is unavoidable. Although the mobile infrastructure market macroeconomics are not directly within the scope of the report, the overall situation is briefly addressed. The point is made that depending on the 2006-07 decisions of few major operators, linear evolution scenarios may be seriously upset.

Spectrum - Logistics – Costs

The point was made in the 2004 TeleAnalytics WIMAX report that spectrum was one of the key challenges. Many of the UNS scenarios put forward for urban-areas F- WIMAX deployments are progressively more unrealistic, given the Wi-Fi caused pollution of the 2,4GHz band. Things are getting bad in the 5GHz band as well and two of the 5GHz pollution mechanisms are simple and are mentioned here: MIMOs are extending themselves in the 5GHz band (Airgo), and also the band is widely used for backhaul links of dual band mesh networks.

In the mobile WIMAX case, UNS is simply irrelevant and the report analyzes the bands that are currently available, and what can be expected in the future. The picture is at a minimum non optimal, and the European habit of tying bands to specific technologies is questionable both in terms of operators' and consumer interests.

Finally, the fact that one company (SPRINT-Nextel) practically monopolizes the US MMDS spectrum does not necessarily help and evidently WIMAX/WiBro needs a major US deployment as a basis of its worldwide ambitions. The discussed FCC MMDS-ITFS rulings consolidate the MMDS-ITFS-MDS band usage, but they hardly provide a recipe for an alternative nation wide MMDS spectrum owner to emerge in the short term.

This WIMAX spectral polyphony, which down the road is bound to create roaming problems (even GSM has its share), is also affecting propagation characteristics and building penetrability. In turn, this variability is reflected in the number of cells required, and cell counts mixed with throughput and latency arguments are not rarely used "to prove or disprove" whatever may be required in a particular case.

Again the report sees no reason to cheerlead any of the often "on demand" proofs, and instead realistically and carefully analyzes what is fact, what is a shaky argument, and finally what all this means.

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Pure IP Versus All IP

All IP is the term often used in association with the IMS-3GPP developments. On the other hand, Pure IP (as introduced by Flarion) is widely used to describe ground-up mobile IP technologies, WIMAX and WiBro included.

As the report analyzes, this Pure IP basis does not exhaust itself to the architectural simplicity implied by the stack in the figure on the right. Instead, it affects the balance of power in both a bread and butter way, but more significantly in the medium term. On the bread and butter side of things, the Wibro claimed latency of 50 msec, and a minimum uplink data rate of 128 Kbits/sec address well understood 3G limitations, and among others makes commercial (or ITU) grade full-duplex mobile VoIP a reality. On the medium term IP-propositions that M-WIMAX /WiBro bring to the table, the report analyzes the huge innovations capability of the IETF ecosystem, and the MIMO option as an architectural cornerstone rather than an afterthought. Finally, down the 2007-08 road lie the non-chartered territories of IEEE802.16 based mesh networks; these mesh options carry the promise of addressing metro Wi-Fi limitations of relevance both to the mayor and to the major mobile carrier, or the MSO.
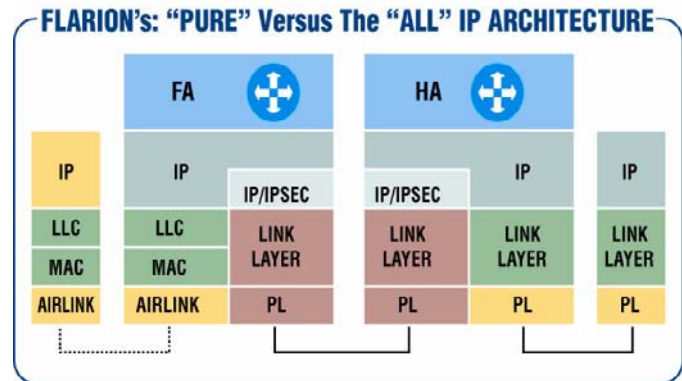
The High Stakes of 2.3 and 2.6 GHz

Many, including a number of regulators, consider the widely available 3.5 GHz band as non-optimal for M-WIMAX/WiBro. As the report analyzes, opinions of this nature beyond propagation considerations always reflect implicit or explicit definitions of mobility and specific usage-scenario assumptions. The fact though remains that for the major mobile operator, M-WIMAX/WiBro is mostly connected with frequencies below 3GHz and therefore a high stakes poker is underway around the world. The technology-neutrality poker is not about to stop M-WIMAX, whose time has come, but it will define the volume of things for the: remainder of the decade.

The report therefore analyzes in detail the 2.3/2.6 GHz developments and intentions, starting with the geographical mapping of the US ITFS-OFS-MMDS frequencies-ownership (figure below), and the new FCC bandplan. Furthermore, the multidimensional European happenings are looked at not only in terms of the CEPT proceedings, but on the basis of the regulatory practices and intentions, on a country-by-country basis. Similar in detail is the analysis of APAC markets, some of them so tight that any move in the "sweet" M-WIMAX bands is prone to lead to a serious redistribution of the pie.

The US ITFS-OFS-MMDS Geographical Spectrum Owenrship

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Inukshuk: "The Stone Man That Shows The Way"

In Inuktitut, the language spoken by the indigenous people of the Canadian North, "Inukshuk" means "The Stone Man That Shows The Way" and it refers to the road-marking stone structures built by the Inuit. **"Inukshuk"** is also the name of a Canadian FBWA operator which, after being established in 2001, shared the troubles of its parent companies until September 2005 when a very unusual partnership took control of its shares and its spectrum rights.

Bell Canada, the Eastern Canadian ILEC, along with Rogers, the Ontario MSO and major mobile operator, found themselves controlling the company and surprisingly enough, passed on fighting the case in court. Instead, they decided to pool their 2.3, 2.5 and 3.5 GHz spectrum holdings and to pour CAN $200 million into building a N-P-WIMAX network over three years. In early April 2006, just six months after the deal was struck, the joint venture was operational in the top twenty Canadian urban areas. The venture's apparent key objective is the invasion of Western Canada's Telecom markets, where both partners have a presence mainly through their mobile arms.

The case, non-withstanding its recent nature, is analyzed in the report, and is by far the biggest WIMAX initiative ever undertaken. Furthermore, it became operational at least six months before the likely commercial WiBro launch in Korea and the implications of course are much more significant than Canadians beating the Koreans to an N-P-M IP start line:

- The project is no $3-4 million FBWA job in a Tier 2-3 market, but a major undertaking in a country with a tradition of high wireline broadband uptake.

- The attack against the Western Canadian ILEC and its leading MSO is completely based on the utilization of the mobile assets of the two partners (cellular sites).

- No lengthy soul searching trials took place, and instead the network was up and running in the top twenty Canadian cities in just six months.

- Rogers had placed an order for a HSPDA deployment a few weeks before the Inukshuk launch,

- Neither Bell nor Rogers have ever been accused of business adventurism.

Space does not permit a further look at the implications, but what happened may provide some food for thought to European mobile operators, so eager to blacklist mobile IP, when many of them have to open fronts against wireline broadband and its Wi-Fi wireless extensions.
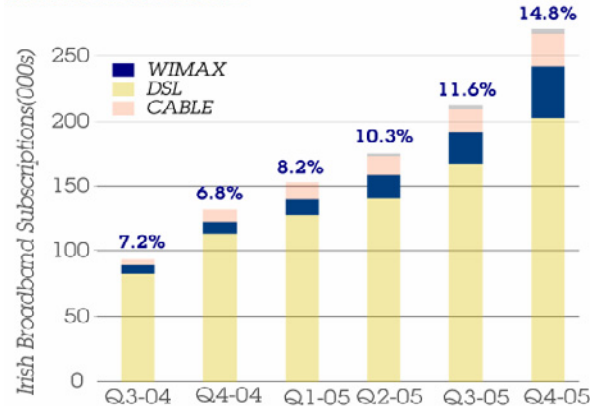
The WIMAX-claimed 150 trials-deployments are carefully analyzed in the report, since they represent a good assortment of Tier 2-3 firecrackers, companies which, in six months, have released more press releases than the number of their employees, a seriously aggressive Chilean Telmex, Bells-Rogers in Canada, and everything in between. Collectively though, the today's most successful FBWA story is found in Ireland, where as many as 11 (six active) operators managed to build an almost 15% broadband market share, in a country well known for its bad copper and years of little DSL investment.

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USERS

Users   Fixed-
              Nomadic- Portable
              Mobile
              WiBro

REVENUE

BS-Units   IEEE802.16-2004
                    IEEE802.16e

Terminals-Units Indoor-2004
                     Outdoor-2004
                     PCMCIA-2004

                     Indoor-e
                     Outdoor-e
                     PCMCIA-e
                     Handset-e

BS - TERMINALS

BS-Units   IEEE802.16-2004
                    IEEE802.16e

Terminals-Units Indoor-2004
                     Outdoor-2004
                     PCMCIA-2004

                     Indoor-e
                     Outdoor-e
                     PCMCIA-e
                     Handset-e

PRICE EVOLUTION

BS-Units   IEEE802.16-2004
                    IEEE802.16e

Terminals-Units Indoor-2004
                     Outdoor-2004
                     PCMCIA-2004

                     Indoor-e
                     Outdoor-e
                     PCMCIA-e
                     Handset-e

REGIONAL BREAKDOWN

North America
South America
CEPT
APAC
RoW

FORECASTS

Beyond the large number of statistics and forecasts provided in order to establish the mobile and fixed network WIMAX- WiBro contexts, the reports's main forecasts cover the period 2006-20010 and are geographically segmented in terms of:

North America, South America, Europe, APAC and China.

The main forecasted entities are grouped in terms of:

1. Users
2. Basestations-Terminals
3. Equipment Pricing Evolution
4. Equipment Revenue

The forecasted subsegments are shown diagrammatically in the respective blocks in this page.

Beyond a large number of roll-ups the forecasts are provided with granularity down to the level of the triplet:

TIME HORIZON

| 2006 | 2007 | 2008 | 2009 | 2010 |

USERS CEPT

100%

M

57%

N-P

F

0%

2006   2010

2004-e REVENUE APAC

100%

2004

e

98%

96%

94%

92%

90%

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