

# ALCATEL-LUCENT WIMAX BROADBAND SOLUTIONS

**Peter Lizúch**

*Alcatel Slovakia a.s.*

*033 20 Liptovský Hrádok*

*Slovak Republic*

e-mail: p.lizuch@alcatel-lucent.sk

## **Abstrakt**

New IP-based standards developed by the IEEE 802.16 working group are greatly accelerating adoption of disruptive broadband wireless access (BWA) technology. The latest standard for WiMAX, known as 802.16e-2005, stands to unify what has been a fragmented market. It promises so-called "universal WiMAX" - one access technology capable of supporting fixed, nomadic and mobile services. The convergence of demand for all three on a single standard holds unprecedented hope for mass adoption, economies of scale, and lower costs, both for infrastructure and terminal equipment. This presentation describes how and why universal WiMAX is a viable BWA technology for fixed, mobile, converged and private operators.

## **Introduction**

WiMAX IEEE 802.16e-2005 has become recognized as one of the key standards for broadband wireless access in wide-area networks (WANs). With the acceptance of this standard, Alcatel and other infrastructure suppliers are today engaged in a vigorous competition that will make this new technology more robust, as well as more adapted to today's service-provider and end-user needs.

802.16e-2005 can be called universal WiMAX because it combines the benefits of an IEEE global standard - interoperability with multiple manufacturers' equipment and strong support from the radio equipment, IT and semiconductor industries — with unique performance features. These include non-line-of-sight (NLOS) capability for deep indoor penetration to self-installed terminal equipment and state-of-the-art radio efficiency. The standard enables hand-off and the introduction of chipsets with low power consumption, allowing it to address the mobility market.

Universal WiMAX has appeal in three main market dimensions:

- It brings both high-speed Internet and basic telephony services (via VoIP) to areas of low population density where technical and economic factors have traditionally ruled out broadband deployments. In villages unreachable by fixed networks, WiMAX presents a unique opportunity to quickly roll out both basic fixed telephony and broadband services simultaneously — to every household.
- Naturally, it also enables competitive operators and new entrants who own no copper or cable networks to offer the above services anywhere — from dense urban markets to uncovered "white spots" — through their own infrastructure, bypassing the incumbent's copper network and unbundling. Mobile service providers who are seeking to compete head-to-head with fixed operators in residential broadband are another type of "challenger" enabled by universal WiMAX.
- It will add mobility and portability to high-speed Internet usage that today is largely tied to the home or office. Broadband access on the move can itself be the differentiator, or perhaps it is the ability to package fixed and nomadic/mobile services as a single user account; a new generation of services that are personal rather than residential can thus evolve.

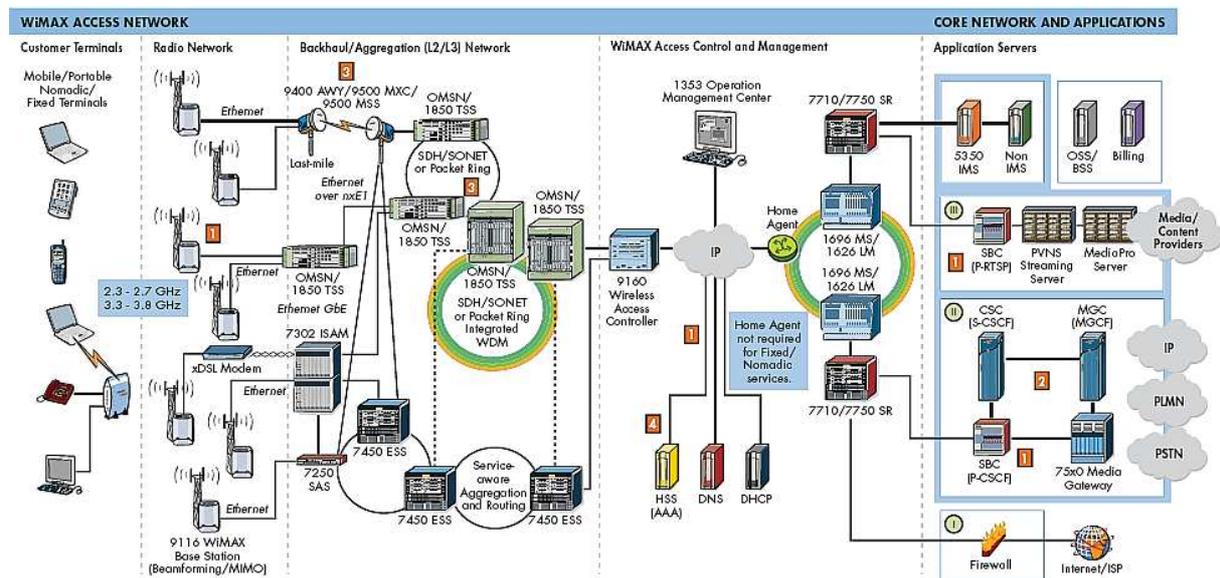
## Alcatel-Lucent WiMAX: A Full IP Architecture

A WiMAX-based access network permits operators to benefit from:

- broadband mobile wireless access to complement existing fixed or mobile infrastructures, and/or a
- seamless services offer across different infrastructures.

For its part, the Alcatel-Lucent WiMAX architecture is adaptable to the needs of diverse operator profiles, including incumbent, challenger or greenfield licensees.

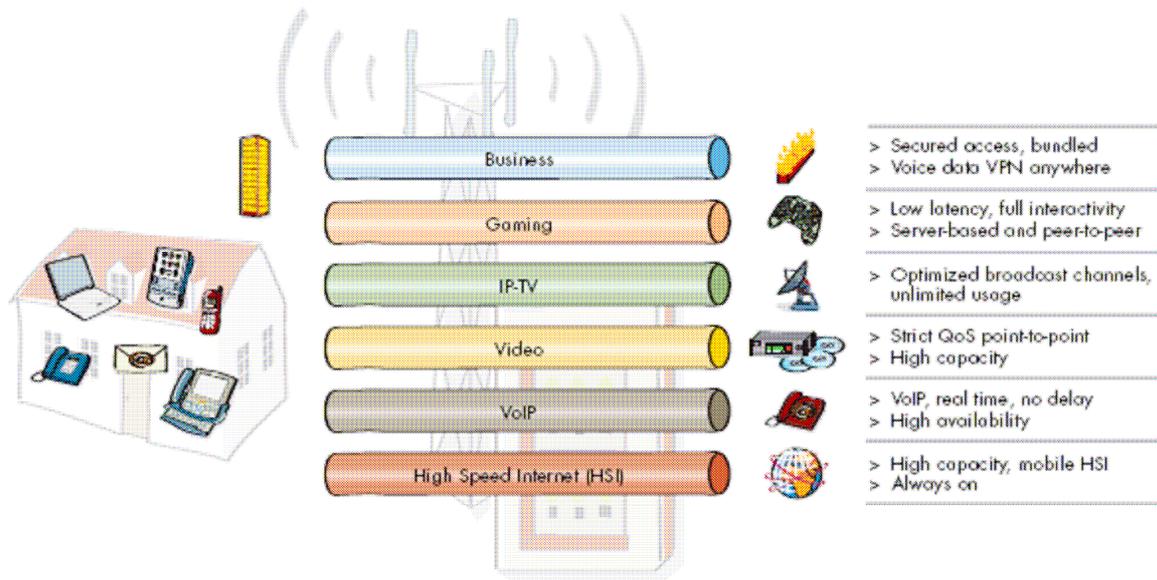
The WiMAX-based end-to-end architecture is divided into two main parts: the WiMAX radio access network, as well as the core network and application part (see Figure 1). Both parts are linked by clear and standardized interfaces in order to ensure compatibility with the existing infrastructure and investment protection, and the flexibility to evolve the network to meet future user needs.



Due to the many elementary building blocks that are part of the Alcatel-Lucent portfolio, a key feature of the Alcatel-Lucent WiMAX end-to-end solution is its capability of integrating seamlessly with an existing infrastructure and its adaptability to varying operator requirements. In this respect, the portfolio can provide either stand-alone radio access to broadband services or complement existing fixed or mobile network infrastructures.

The Alcatel-Lucent WiMAX solution allows for a complete integration of the WiMAX access network into a fixed (DSL or GPON) or mobile (UMTS or CDMA) architecture. In the case of integration with a mobile network, the proposed solution allows the end user to access services due to the common authentication and authorization mechanisms implemented in the fixed or mobile network part.

One of the key strengths of this architecture is the ability to provide end users with always-on mobile broadband IP services. This enables anywhere, anytime continuous Internet service, with sufficient QoS to support real-time applications such as VoIP, regardless of terrestrial displacement. Moreover, where regulatory rules impose, reduced mobility or fixed service can be provided using the same architecture, too. The WiMAX access network can also be stand-alone, or can be deployed to complement an existing access infrastructure — be it fixed, mobile, wired or radio based.



The WiMAX access network can also be stand-alone, or can be deployed to complement an existing access infrastructure — be it fixed, mobile, wired or radio based.

- In the stand-alone case, mobility under the WiMAX coverage provides continuous service access to end users thanks to WiMAX's mobile IP features.
- In the case of being associated with other access networks, WiMAX permits the operator to provide access to end users irrespective of access technologies due to the common authentication, authorization and accounting (AAA) Alcatel platform.

Another advantage of the Alcatel-Lucent WiMAX architecture is that it is flexible enough to provide for operators with less stringent requirements. These include:

- operators that wish, as a first step, to offer WiMAX as a fixed high-speed Internet solution with no foreseen need to bring operator-charged services, such as VoIP or other multimedia applications.
- wholesalers that intend to split the radio-access network among customer ISPs. In this case, the radio and network infrastructure are shared and managed by the wholesaler, but subscriber administration/management and service/application management remain the ISP's responsibility.

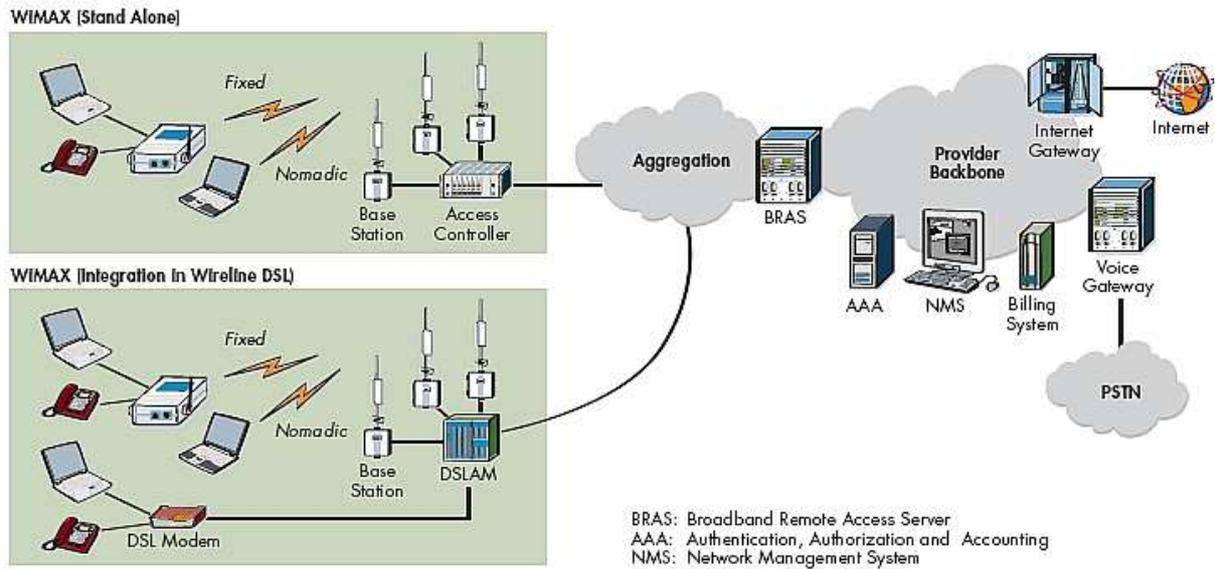
Thus, WiMAX can be used in different ways depending on the telecom operator, their business model and strategy, their competitive situation, the market in question and the regulatory conditions.

### Operators with Fixed Access Networks

In mature markets, broadband needs in urban and suburban areas are largely served via the high penetration of copper and cable networks. However, some suburban and rural zones are still not covered due to economic restraints or distance to the remote unit/central office. In these cases WiMAX is a highly cost-effective solution for extending coverage to these so-called "white zones," either as an incumbent or a challenger.

Universal WiMAX is an excellent option where the quality of the copper pair prevent mass-scale DSL deployment. Moreover, the possibility of offering broadband services in combination with voice services (i.e., VoIP) make wireless local loop (WLL) over WiMAX logical, potentially substituting for narrowband WLL in some cases.

Moreover, the WiMAX can add the nomadic option to existing home-bound broadband services.



## Operators with No Existing Access Networks

The WiMAX represents an opportunity for virtually any company to own a wireless substitute for a copper plant within months. In some cases this makes possible “fixed line” competition or it creates an attractive alternative to sometimes costly unbundling.

For “disruptive” service providers - an existing ISP, a switching-based CLEC, or a true new entrant (i.e., a Greenfield venture) - the critical element in the business strategy is differentiation. By exploiting the exceptional flexibility of universal WiMAX, they can use the technology to attack a weak spot in the service offerings of existing telecom players. Another example, a direct-to-home satellite broadcaster. In this case, the WiMAX offer would, of course, comprise high-speed Internet access and VoIP telephony, but the broadcaster could also differentiate exploiting its rights to distribute media content and use WiMAX to provide a better return path to make satellite-based services interactive.

## Operators with Mobile Networks

In countries where broadband penetration is still marginal, mobile service providers (MSPs) have a promising business opportunity to compete with the fixed incumbent in wireless broadband access by using WiMAX. WiMAX technology essentially puts the MSP in the position of the “disruptive” challengers mentioned earlier, except its interest is purely on high-speed Internet (“wireless DSL”) services, not VoIP; the goal is to preserve voice traffic on the 2G network. This strategy makes particular sense in that the 2G operator can reuse existing cell sites for WiMAX, nearly eliminating site acquisition costs, one of the most expensive aspects of deployment.

Preserving the 2G network as the main means of offering voice services, WiMAX can also be positioned as a complementary solution for mobile data services in dense urban areas in particular. Paired with existing 2G assets WiMAX can be used either to pose a differentiated challenge in data services to a market-leading 3G operator, or to differentiate an operator from a set of 2G competitors. By integrating WiMAX into their networks (leveraging existing cell sites) mobile operators can boost their service with high throughputs. For those operators offering GPRS or EDGE services, there is even the opportunity, if IMS is present, to offer the same applications (messaging, corporate, location-based services, etc.) on both networks with a single billing and subscriber profile.

## Operators with Both Mobile and Fixed Networks

Integrated operators (mobile and fixed) will combine the above themes and benefits. In particular, the combined fixed and mobile operator will be able to:

- Use existing cellular sites to install WiMAX base stations to extend fixed broadband coverage
- Provide a mobile broadband solution to complement the legacy fixed business with mobile voice and data in a converged business strategy
- Take advantage of the DSL network's high capillarity (points of presence) to provide cheap backhaul to the WiMAX network
- Leverage the strong existing core and backbone networks to support advanced data services

## Private Operators – Vertical and Enterprise Markets

WiMAX enables companies with several locations spread across one metropolitan area, for example, to run a private network, bypassing the public service provider and thus eliminating the need to pay recurring leased-line costs. By contrast, a limited WiMAX deployment can represent a small cost (no civil works). Even if there are only two sites, WiMAX can offer significantly lower costs, compared with leased-line rental fees. WiMAX also holds out opportunities for campus-oriented institutions where many information workers moving within a large work site (e.g., airports, harbour authorities, offshore oil platforms). Here, often with only one base station, the administration can increase the productivity/responsiveness of onsite workers (even vehicle-based personnel in an airport cargo-handling truck) by ensuring always-on connection and continual access to information.

## Conclusion

WiMAX is a highly flexible technology that holds compelling and varied value propositions for a range of different customer types. The starting point in assessing opportunities that may exist in any market is an understanding of:

- *The regulatory conditions:* Is there licensed frequency available to WiMAX?
- *The competitive environment:* Does WiMAX present an opportunity for the potential customer to differentiate itself from leading market players?
- *Market demand:* Are there any weak spots in the market's existing service offers, or pockets of untapped demand that WiMAX could address?
- *Existing network infrastructure:* What assets does the potential customer own, and can WiMAX extend or leverage its capabilities?
- *Terminal availability:* For the service offer envisioned, are WiMAX terminals available with the maturity, form factor and price level desired available?

## Literature :

- [1] Alcatel-Lucent internal leaflets
- [2] Alcatel telecommunication review