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**Delivering on the
WiMAX Promise in the
MENA Region**



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EXECUTIVE SUMMARY

As demand for broadband service continues to increase across the Middle East and North Africa (MENA) region, a wide range of broadband technology options are competing for a share of this market. WiMAX, which enables operators to target broadband markets quickly and cost effectively, is garnering significant attention, among new players and incumbents alike.

For new players, WiMAX offers a niche opportunity to buy a license at a fraction of the cost of a 3G license and capture market share from incumbents, particularly in areas that lack quality fixed-line infrastructure. For incumbents, it serves as a gap filler where fixed-line technologies are not economically attractive, or as a complementary means to supply broadband capacity and reach.

WiMAX offers several technological advantages, such as symmetrical broadband rates and advanced quality of service, but its drawbacks are slower downlink speeds and a less-developed vendor ecosystem than copper, fiber, or high-speed

packet access (HSPA). Therefore, over the long term, customers are likely to choose fiber or copper for fixed-line services, or HSPA for mobile broadband services.

In addition, two new emerging broadband technologies, which are both called 4G, have attracted operators' attention: Long Term Evolution (LTE) and WiMAX 4G. Although the battle for 4G supremacy will be closely fought, the current market gaps that WiMAX could address will likely persist even in the event that LTE emerges as the technology victor. Therefore, WiMAX players can count on benefiting from these specific market opportunities.

KEY HIGHLIGHTS

- WiMAX lets new players enter the broadband market quickly and target areas that lack quality fixed-line infrastructure.
- For incumbents, existing broadband technologies such as xDSL/FTTx and HSPA remain strategically superior to WiMAX, as they are more mature and compatible with their existing investments.
- However, incumbents can deploy WiMAX as a gap filler where fixed-line technologies are not economically attractive, such as in rural areas away from telecom exchanges.
- WiMAX can also be used for cellular backhaul to connect 2G and 3G base stations. However, as backhaul capacity requirements increase, it remains to be seen whether WiMAX can support high bandwidth cost-effectively.

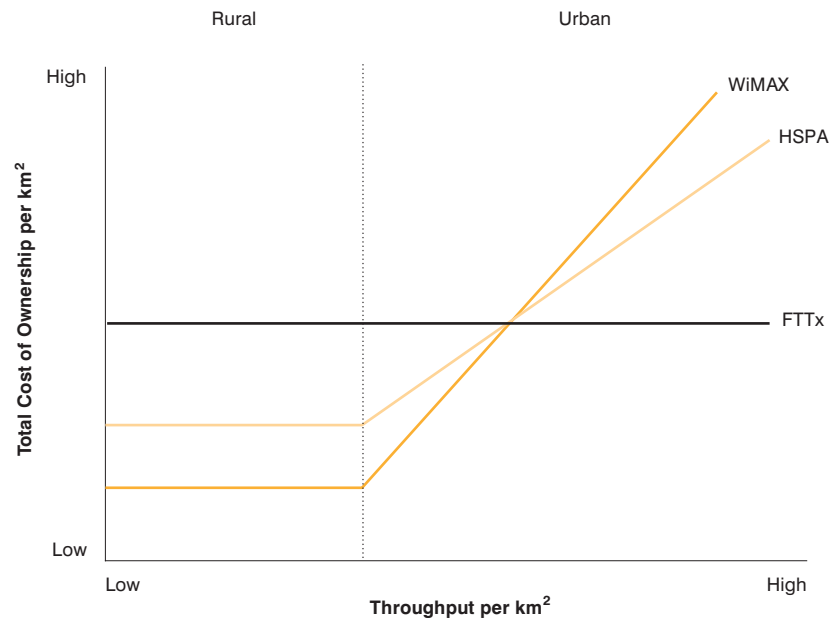
THE WiMAX PROMISE

WiMAX is a technology that enables operators to target broadband markets quickly and cost effectively, especially in rural areas (*see Exhibit 1*). It offers a niche opportunity for new players looking to enter the MENA

broadband market, particularly in areas that are lacking quality fixed-line infrastructure. Incumbents, on the other hand, can use the technology to fill gaps in places where fixed-line technologies are not economically viable or as a complementary means to supply broadband capacity and reach.

In addition, WiMAX licenses are available at a fraction of the cost of 3G licenses, which further simplifies the business model.

Exhibit 1
Broadband Technologies Cost Comparison



Source: Booz & Company

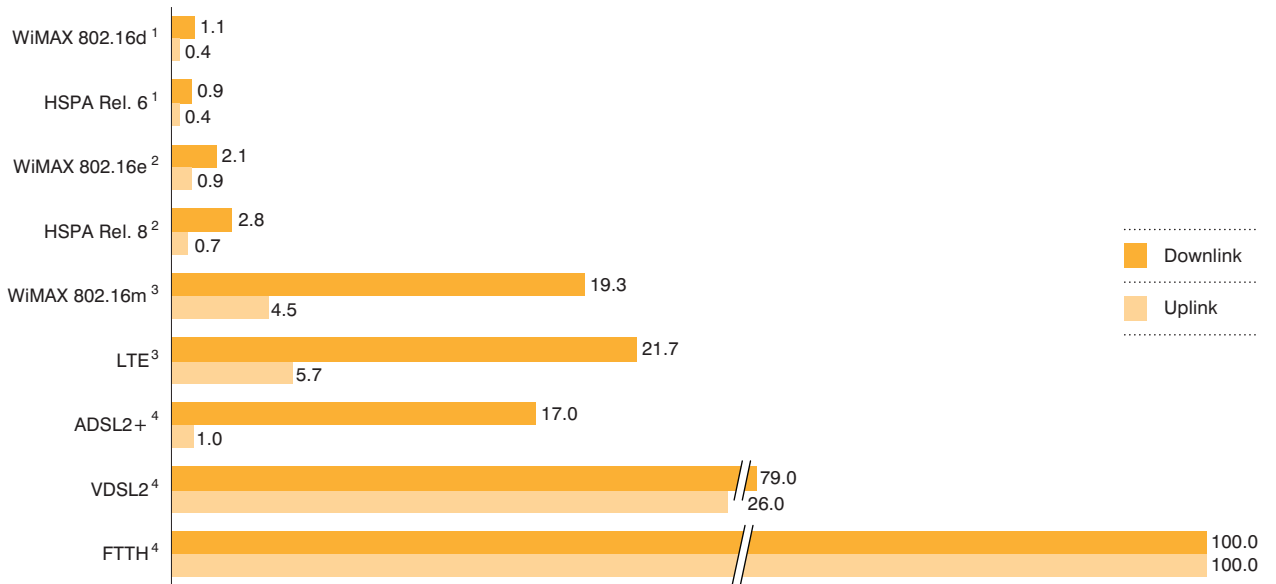
As a technology, WiMAX offers symmetrical broadband rates and low latency levels, and supports advanced quality of service (QoS) mechanisms for applications such as voice over Internet protocol (VoIP), video streaming, and video conferencing. The combination of these features makes WiMAX suitable for a number of applications and a wide range

of customer segments, including most enterprise customers. WiMAX could also provide cellular backhaul capacity to connect rural 2G and 3G base stations with limited bandwidth requirements, although it remains to be seen whether WiMAX can cost-effectively support high bandwidth as backhaul capacity requirements increase.

WiMAX also has a drawback in terms of slower downlink speeds (*see Exhibit 2*). Additionally, its vendor ecosystem is less developed than those of its competitors, such as copper, fiber, and HSPA. Therefore, over the long term, customers are likely to choose fiber or copper for fixed-line or HSPA for mobile broadband services.

Exhibit 2
Broadband Technologies Data Rate Comparison

(MBPS PER CUSTOMER)



¹ HSPA Rel. 6 assumes 5+5 MHz (FDD) while WiMAX 802.16d assumes 10 MHz (TDD).

² HSPA Rel. 8 assumes 10+10 MHz (FDD) while WiMAX 802.16e assumes 20MHz (TDD).

³ LTE assumes 20+20 MHz (FDD) while WiMAX 802.16m assumes 40MHz (TDD).

⁴ Maximum downlink and uplink ADSL2/VDSL2 speed reached for distance less than 300 meters. FTTH can reach speeds higher than 100 Mbps depending on splitting ratio per customer; total FTTH system downlink speed is 2.4 Gbps, sharable among customers.

Source: Qualcomm; Intel; 3GPP; WiMAX Forum; Ericsson; Alcatel-Lucent; Huawei Technologies; Nokia Siemens Networks; 3G Americas; Motorola; Booz & Company analysis

The Nuts and Bolts of WiMAX

WiMAX is available through fixed or mobile platforms. Fixed WiMAX release 6 was developed in 2006 and offers 14 Mbps sector downlink speed, which can be shared by stationary locations such as cafes and stores that are covered by the network.

Current mobile WiMAX operates over a 10 MHz spectrum and offers a range of 1 kilometer in urban areas and 3.8 kilometers in rural areas. The sector downlink speed reaches 32 Mbps in urban areas.

A future WiMAX network, which is planned for release in 2011, would operate over a 20 MHz spectrum and over a range of up to 2 kilometers for urban areas and up to 5 kilometers for rural areas. It would offer sector downlink data rates of up to 289 Mbps sharable by the users.

WIMAX IN THE MENA REGION

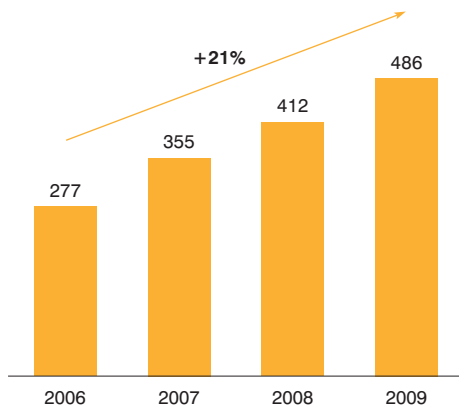
The rapid economic growth of MENA countries over the past few years has triggered a surge in demand

for broadband services. The number of broadband subscribers in the MENA region jumped by 62 percent in 2009 alone and averaged an 85 percent annual growth rate over the past four years (see Exhibit 3). Even with this impressive growth, there is still a large untapped opportunity as the overall penetration in MENA is lower than in the rest of the world.

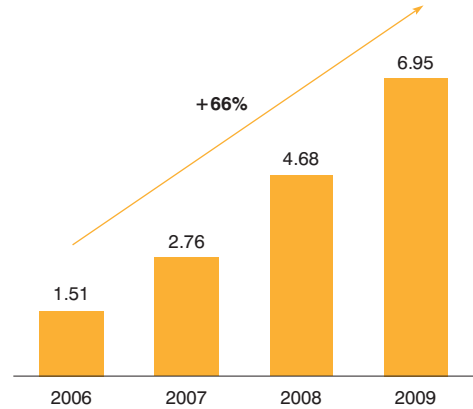
Although most broadband connections today are facilitated by fixed-line technologies, wireless is becoming an increasingly viable alternative to enter broadband markets. In fact, wireless broadband connections have already exceeded fixed-line technologies in several MENA countries. However, this demand is driven by 3G and HSPA technologies, not WiMAX.

Exhibit 3
MENA Broadband Demand Outpaces Worldwide Growth

WORLDWIDE BROADBAND SUBSCRIBERS (MILLIONS)



MENA BROADBAND SUBSCRIBERS (MILLIONS)



Source: World Broadband Information Service, 2010; Booz & Company analysis

PROFILING BROADBAND DEMAND FOR WiMAX

The demand for broadband services currently can be classified into four key market segments based on customer needs:

1. Mass market fixed broadband
2. Mobile/nomadic broadband
3. Fixed/mobile converged broadband
4. Niche market broadband

Mass Market Fixed Broadband: This is the largest segment by far and typifies the “broadband for everybody” approach. The demand in this market is characterized by throughput requirements that can be best served through established fixed technologies such as FTTx and xDSL. This segment is likely to have substantial

bandwidth requirements and would eventually support high definition multimedia and full home access to the Internet.

Operators seeking to serve this market use WiMAX in a complementary role, especially in areas with inadequate or nonexistent fixed-line infrastructure such as rural areas away from telecom exchanges.

Mobile/Nomadic Broadband: This segment typifies the “broadband on the go” for consumers and enterprise customers. Mobile/nomadic broadband is delivered wirelessly and designed for customers who require broadband access on the move,

whether at multiple fixed locations such as restaurants and airports or when traveling by car or train. The adoption of mobile broadband will accelerate in coming years with advances in device capability and lower price levels, which will boost the numbers of people needing access to broadband services on the go.

Currently, this segment is dominated by incumbent operators through their investments in the 3G/HSPA network. However, WiMAX remains a valid option for serving this segment.

Fixed/Mobile Converged Broadband: Converged broadband services offer customers a unified broadband

experience, whether the network is wire-line or wireless. This is the fastest-growing segment, with its expansion driven by the availability of dual-mode HSPA/Wi-Fi devices. Leading operators such as BT and Orange are offering such converged services through their fixed-line and HSPA infrastructure.

Dual-mode HSPA/Wi-Fi handsets are commercially available from leading device manufacturers. Conversely, dual-mode WiMAX/Wi-Fi devices are still new in the market. Therefore, they have a relatively high cost, limited portfolio availability, and an immature vendor ecosystem. Given the limited application of the technol-

ogy, the WiMAX vendor ecosystem is unlikely to develop to a level comparable with HSPA.

Niche Market Broadband: This market segment serves customers with specific needs, such as enterprises in areas that do not have access to fixed-line solutions and so need to be served by wireless technologies. These segments typically demand high data rates and may have distinctive requirements such as point-to-point connectivity and/or symmetrical data rates for downloading and uploading. For this segment, WiMAX is a preferred technology as it can offer cost-effective broadband over a large coverage area with symmetrical data rates.

WiMAX is a preferred technology for the niche market broadband segment, as it can offer cost-effective broadband over a large coverage area with symmetrical data rates.

WIMAX IN MENA: AN OPPORTUNITY FOR BOTH INCUMBENTS AND NEW PLAYERS

A number of existing operators, as well as new entrants, have launched WiMAX networks in the MENA region (see Exhibit 4). There are two main plays in this arena.

WiMAX Networks by Existing Operators: A number of regional fixed-line and mobile operators have either launched WiMAX networks or acquired WiMAX operators. These operators are attracted to WiMAX for its ability to serve niche market segments and to add a weapon to their broadband arsenal. To date, however, most of the existing operators have either pulled back from these investments or they have not been successful.

WiMAX Pure Players: These operators have commonly been new entrants in the telecom sector or smaller operators that acquired WiMAX licenses as an economically

attractive alternative to expand their regional footprint. The key short-term strategy for these operators was to introduce broadband services quickly and compete with existing fixed broadband solutions offered through legacy fixed networks. It's possible that WiMAX pure players' networks would be able to support voice and other advanced services in two to four years, enabling these operators to position themselves as full-fledged telecom service providers. But the WiMAX ecosystems (networks and handsets) run by these operators are unlikely to develop to a level comparable to HSPA and, so, will probably never be able to compete on an equal footing.

Examples of WiMAX pure players in the region include Menatelecom in Bahrain, Etihad Atheeb Telecom in Saudi Arabia, and Mada Communications in Kuwait.

Exhibit 4
Examples of WiMAX Operators in the MENA Region



REGION	COUNTRY	OPERATOR	TOTAL ANNOUNCED DEPLOYMENTS/ TRIALS FOR WIMAX		
Middle East	Lebanon	Comium Cedarcom	19		
	Jordan	Wi-Tribe Umniah Mada Communications			
	Iraq	Kalimat State Company for Internet Services (SCIS) 7NetLayers Iraqtel			
	Kuwait	Arab Telecom			
	Bahrain	Menatelecom Zain			
	Qatar	Qtel			
	Oman	Nawras			
	Saudi Arabia	ITC Bayanat Al Oula Zain Etihad Atheeb Telecom Mobily STC			
	North Africa	Algeria		Smart Link Communication AnwarNet Méditel Icosnet	12
		Tunisia		Divona Telecom	
Libya		Agathon Systems Libya Telecom & Technology			
Egypt		Orascom Telecom WIMAX Ltd. IEOC of Egypt TE Data EgyNet			
Sudan		JetNet			

Source: World Cellular Information Service, 2010; Booz & Company analysis

CHAMPIONING THE WiMAX TECHNOLOGY

Although WiMAX could be suitable for specific broadband segments, its growth and sustainability in the MENA region will depend on its positioning for various types of operators. Telecom operators that want to offer broadband services can be classified into five categories: fixed-line incumbents, fixed-line new entrants, mobile incumbents, mobile new entrants, and integrated operators. WiMAX is unlikely to be the main technology of choice for any of the operator categories except for fixed-line new entrants.

Fixed-line Incumbents: In most MENA countries, fixed-line incumbents provide broadband coverage to the majority of the population by targeting the mass-market fixed-broadband segment. To serve these subscribers, fixed-line incumbents typically focus on upgrading their copper infrastructures. They are likely to make only limited use of WiMAX technology in areas where it is not economical to build copper infrastructure, such as in remote rural markets.

Fixed-line New Entrants: Fixed-line new entrants are not constrained by investments in legacy technologies or by an obligation to serve every customer segment. Most new entrants follow a targeted market-entry strategy that focuses on lucrative areas that have either

high customer density or a lack of fixed-line infrastructure. Fixed-line new entrants' key priorities are a rapid time-to-market and a low total cost of ownership (TCO) to ensure that they break even as quickly as possible. WiMAX could be a valid choice for fixed-line new entrants that do not have access to local-loop unbundling (LLU) and do not want to carry the financial burden of building a fixed network infrastructure, at least in the short term. WiMAX offers a significant TCO advantage over xDSL/FTTx in underserved rural markets.

Mobile Incumbent Operators: Many incumbent mobile operators are tempted by the considerable opportunity presented by the mass-market fixed broadband segment because it would enable them to be an integrated operator offering fixed, mobile, and converged broadband services. Mobile incumbent operators' key priorities include service support, technology maturity, and TCO. Two other possible priorities are achieving a strategic fit with existing operations and spectrum uniformity. But HSPA is a better fit than WiMAX for mobile incumbents, as most 3G networks recently deployed in the MENA region support or have the built-in potential to support HSPA. However, incumbent mobile operators could use WiMAX to provide cellular backhaul capacity to connect rural 2G and 3G base stations with limited bandwidth requirements.

Mobile New Entrants: New mobile entrants can choose new technologies without concerns over compatibility with legacy systems. Most new

entrants target lucrative niche broadband segments that offer an impressive return on investment, such as urban areas or those that are poorly served by the incumbent players. The key priorities for mobile new entrants are time-to-market, TCO, and frequency availability. Other possible priorities are service support and data rate. WiMAX is a viable choice for these operators only in limited circumstances, such as when 3G/HSPA frequencies are unavailable. In most cases, HSPA offers a lower TCO compared to WiMAX. The exception is in rural areas, where WiMAX is more cost-effective. Additionally, new mobile entrants, too, can use WiMAX for cellular backhaul capacity.

Integrated Operators: Integrated operators offer a full suite of telecom services to the consumer and enterprise sectors. These operators are usually incumbents that gradually evolve their service offerings to meet the diverse requirements of existing customers or to attract new customers. They build a one-stop shop that offers a range of services such as fixed and mobile telephony, broadband connectivity, and entertainment services such as TV. Therefore, their technology requirements are similar to those of incumbent operators and include service support, technology maturity, and TCO. Integrated operators typically rely on mature technologies to target their customer base. But they can opportunistically deploy WiMAX to target specific segment requirements that can't be addressed through their existing technologies and, again, use it for cellular backhaul capacity.

4G: THE NEXT FRONTIER

As operators consider their broadband technology options for the immediate future, it will be important to keep an eye on two new emerging technologies, both dubbed 4G. Both will offer data rates as high as 100 Mbps, but operators should not expect interoperability between the two.

LTE is a 4G technology that succeeds the HSPA protocol. LTE promises peak data rates of 100 Mbps, allowing operators to support services such as mobile TV and HDTV content over mobile. LTE is expected to be commercially available in 2011, and will be backward compatible with HSPA.

The second upcoming 4G protocol, a WiMAX standard known as 802.16m, should be available in 2011 or 2012. It, too, promises a peak throughput of 100 Mbps, while also remaining compatible with existing WiMAX infrastructure. It is expected to provide improved broadcast, multicast, and VoIP performance, as well as greater capacity than the current WiMAX standard.

LTE has taken an early lead in terms of adoption: It has the backing of global mobile operators and vendors

that control more than 80 percent of the mobile customer base. However, Internet heavyweights Intel and Google are backing 4G WiMAX as they seek to promote an open network environment that is not controlled by the existing mobile operators.

Interoperability of LTE and 4G WiMAX is certainly possible, though such compatibility is not a foregone conclusion. Both Intel and Vodafone have signaled an interest in the convergence of LTE and the current WiMAX standard, 802.16e. Interoperability is technically possible due to their common features, such as the orthogonal frequency-division multiplexing (OFDM)-based radio interface, full IP core network, and multiple-input multiple-output (MIMO) antennae.

Although the contest for 4G supremacy will be a fight to the finish, the current market gaps that WiMAX could address will likely persist even in the event that LTE emerges as the technology victor. These opportunities should therefore continue to make WiMAX a viable option to serve the niche broadband segments for new entrants.

THE LAST WORD ON WiMAX

In short, WiMAX may not be the best choice for every market segment or operator type. The long-term sustainability of WiMAX in the MENA region is jeopardized by the technology itself, as well as by the business model of operators that elect to use the technology. Existing broadband technologies such as xDSL/FTTx and HSPA remain strategically superior to WiMAX for most incumbents as they are more mature and compatible with their existing investments. Fixed-line new entrants, which would most likely champion WiMAX, will be constrained by limited revenues from data services. (In comparison, fixed-line and mobile incumbents get the benefit of both voice and data revenues.) The business model for WiMAX new entrants limits their commercial capabilities to compete with incumbents, be it in marketing and promotions or retail and distribution.

For new market entrants, WiMAX offers a window of opportunity to enter MENA markets quickly and serve most broadband segments. WiMAX has potential as a wedge to compete with incumbent operators in countries with poor fixed-line infrastructures.

Operators intending to deploy WiMAX should carefully weigh their options and develop a strong business case that accommodates local market conditions and considers the strategic implications of the selected technology. The future of WiMAX in the MENA region will depend on its suitability for various broadband demand profiles, its strategic positioning for different types of operators, and the willingness of investors to support new operations.

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