



Intel Corporation Response to Consultation Paper on Draft Regulatory Framework for Broadband Wireless Access Networks

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To: National Telecommunication Regulatory Authority
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Introduction

Intel commends the National Telecommunication Regulatory Authority (NTRA) for their efforts to enable Broadband Wireless Access (BWA) in Egypt. The proposals in the Consultation Paper demonstrate that NTRA is committed to the deployment of broadband for Egyptian citizens. Intel welcomes the opportunity to respond to the Consultation Paper on Draft Regulatory Framework for Broadband Wireless Access Networks.

Intel believes that WiMAX technology can play a key role for the development of Egypt.

If our response is unclear in any area or if additional information is required we would be pleased to provide the necessary clarification or additional information in whatever appropriate format the NTRA desires.

Intel's detailed comments are contained in the subsequent pages.

Regards

Turhan Muluk

Wireless Standards and Regulations Manager



1- Stake Holder Information

a) Company Name:

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d) Company Profile

About Intel

Intel Corporation is the world's largest semiconductor manufacturer and a leader in technological innovation. Intel is also a leading manufacturer of communications and networking chips and equipment. Founded in 1968 to build semiconductor memory products, Intel introduced the world's first microprocessor in 1971. For the past 3 decades, the technology developed by Intel Corporation has enabled the computer and Internet revolution that is changing the world. Now, Intel is working on extending



broadband connectivity to even more people around the world through WiMAX-based products.

Corporate Snapshot

Year Founded:	1968
Employees:	99.900
Worldwide Offices and facilities:	199
Revenues 2005:	38.8 B US\$
Fortune 500 Ranking:	50
Stock Symbol:	INTC

About Intel Capital

With an overall strategy to enable innovation, Intel Capital seeks out and invests in promising technology companies worldwide. We focus on both established and new technologies that help to develop industry standard solutions, drive global Internet growth, facilitate new usage models, and advance the computing and communications platforms.

As part of Intel Corporation, Intel Capital calls on some of its best and brightest to evaluate prospective investments, offer business and technology guidance to our portfolio companies, and provide unrivaled access to the latest developments in the industry. We are among the largest venture capital entities in the world with offices in established and emerging markets around the world.

Since 1991, Intel Capital has invested more than U.S. \$4 billion in approximately 1,000 companies in more than 30 countries. In that time, about 160 portfolio companies have been acquired by other companies and another 150 have gone public on various exchanges around the world. Last year alone, Intel Capital invested more than U.S. \$130 million in about 110 deals with approximately 40 percent of its investments made outside the United States.

Intel Capital has an investment in Orascom Telecom WiMAX Limited (OTWL) a joint venture with Orascom Telecom of Egypt.



2. Replies to questions featured in Table 5.1

1	Do you agree to the award of a nationwide license?	Agree <input checked="" type="checkbox"/>	Disagree <input type="checkbox"/>
2	Do you agree to the award of three licenses?	Agree <input type="checkbox"/>	Disagree <input checked="" type="checkbox"/>
3	Do you agree that existing licensed telecommunication service providers should not be excluded from applying for the licenses?	Agree <input type="checkbox"/>	Disagree <input type="checkbox"/>
4	Do you agree to the license award process specified?	Agree <input type="checkbox"/>	Disagree <input type="checkbox"/>
5	Are the decided annual fees suitable?	Agree <input type="checkbox"/>	Disagree <input checked="" type="checkbox"/>
6	Are the facilitations proposed by the regulatory authority for the license award expected to help in providing the services rapidly at suitable prices?	Agree <input checked="" type="checkbox"/>	Disagree <input type="checkbox"/>
7	Does the license period allow for suitable financial returns?	Agree <input type="checkbox"/>	Disagree <input checked="" type="checkbox"/>
8	Is the allocated frequency spectrum suitable for the provision of services nationwide?	Agree <input type="checkbox"/>	Disagree <input checked="" type="checkbox"/>
9	Does the variety in permitted services allow for achieving financial returns?	Agree <input checked="" type="checkbox"/>	Disagree <input type="checkbox"/>



3. Table featuring comments on replies to questions in Table 5.1.

1) Do you agree to the award of a nationwide license?

Agree. Intel supports the award of nationwide licenses since this will allow operators to offer services in all areas of Egypt. This means that Egyptian citizens will be able to access wireless broadband even when they are not at home or at work.

2) Do you agree to the award of three licenses?

Disagree. 2X14 MHz spectrum for each operator will be insufficient to meet business case requirements.

We do believe that enabling competition is important but not at the expense of success. We therefore believe that this needs to be assessed from a National level with the objective being that all deployments are successful deployments, i.e. one or many need to be successful. As a result, Intel believes two BWA operator licences will be optimum for competition and a healthy market.

3) Do you agree that existing licensed telecommunication service providers should not be excluded from applying for the licenses?

General Comment: Intel does not have a specific view concerning licence for incumbent operators, but is keen to ensure that whatever spectrum is made available on a fair / equitable basis, it is put to use in an efficient and timely manner. Intel strongly opposes to spectrum hoarding (retention with no intention to use).

4) Do you agree to the license award process specified?

General Comment: Intel believes that the greatest economic benefit from wireless broadband access is from the continued and long-term usage of the spectrum and not from the assignment process alone. Ideally Intel prefers licenses to be issued to those with the best business case and the best utilization of the spectrum for broadband wireless. In the instance where there is more than one Operator then the Administration may consider an auction process – but the auction should not be structured to extract the maximum value for revenue generating purposes.

5) Are the decided annual fees suitable?

Disagree. It appears as though service providers will need to pay 3 separate fees: the bidding value, a share of revenues, plus a fee per MHz. Intel is concerned that this is excessive and may prevent service providers from deploying in a timely manner. It is very important that operators have the ability to implement sound business models.

6) Are the facilitations proposed by the regulatory authority for the license award expected to help in providing the services rapidly at suitable prices?



Agree

7) Does the license period allow for suitable financial returns?

Disagree. The licence period is likely too short in duration to provide suitable financial returns given that it typically takes 6-7 years to generate a positive cash flow. Therefore, a licensee should be able to expect to retain their license for a period of 15- 20 years.

8) Is the allocated frequency spectrum suitable for the provision of services nationwide?

Disagree. Although Intel is pleased by many of the provisions in this consultation, we are concerned that the spectrum allocations of 2X14 are insufficient to deploy true broadband services.

Economic viability of a service provider's business case is highly sensitive to the size of the spectrum allocation license. Smaller allocations limit the capacity per km² requiring more infrastructure to meet demand. This impairs an operator's ability to create a compelling business case by:

- Affecting the range of services and Quality of Service that can be offered
- Increasing capital and operating expenses since spectrum available for deployment determines base station capacity. Capacity constraints accelerate the need to split cells. Excessive cell splitting causes significant operating and financial issues for operators.

NTRA's objective "**to meet consumers' needs at the most suitable prices**" will only be met by allocating operators sufficient spectrum. Therefore, instead of reserving additional spectrum for future use, Intel suggests assignments of at least 2X21 MHz per operator with the possibility to grow assignments up to 2x28MHz as capacity and demand grows.

Furthermore, Intel recommends that NTRA should allow operators to determine and manage appropriate guard channels themselves to get maximum efficiency from spectrum. This will allow operators to maximise the spectrum use, whilst ensuring sufficient protection to the neighbouring licensees.

9) Does the variety in permitted services allow for achieving financial returns?

Agree with the following exceptions:

- Voice service will be one of the most important services for the financial return of BWA operators. Therefore, Intel believes, there shouldn't be any restriction voice services.
- WiMAX technology is developed for fixed, nomadic, mobile and backhaul applications. BWA operators should be able to offer backhaul services to all customers (including Wi-Fi operators) other than Licenced Telecommunication Operators.



- In addition to nomadic and fixed access, mobile access should be considered (subject to CEPT sharing studies).
- Broadband Wireless Access licensees should have the same licence rights as existing mobile and fixed operators (interconnection, national and international roaming etc.)

4. Economic studies and marketing material

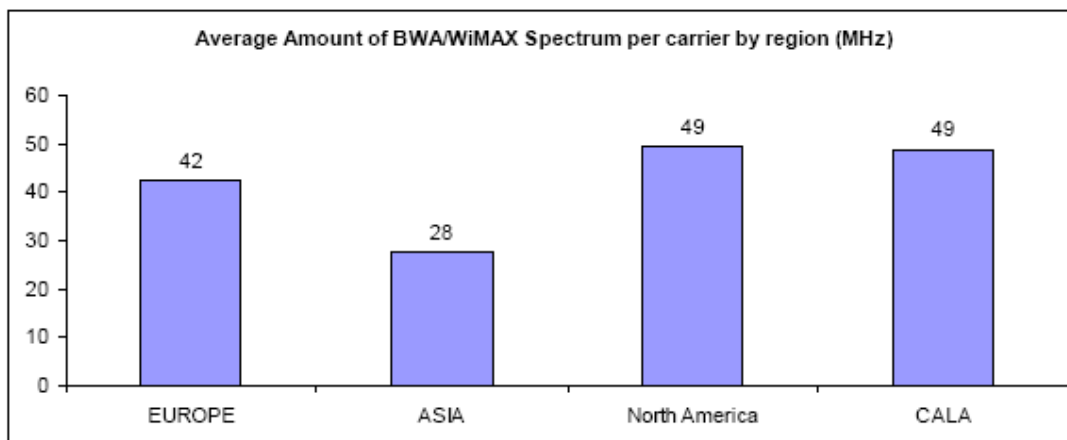
Spectrum is a critical and key factor for the success of broadband deployment. Spectrum management alone is insufficient to promote broadband. It should be accompanied by regulatory measures such as an effective interconnection regime. The need to ensure that allocation is done efficiently.

The success of broadband wireless access operation directly related the amount of spectrum regulators make available for BWA operators. If there won't be sufficient spectrum for BWA operators the best quality of services at the most affordable prices that meet the needs of consumers-existing and future can not be satisfied.

BWA operators should be able to compete with existing broadband service providers.

Amount of Spectrum

Table-1 shows the average amount of BWA/WiMAX spectrum per carrier by region (MHz).



Source: ClearSpectrum Database-Maravedis

TABLE-1

The Table-2 below shows how the amount of spectrum affect the available data rate per cell in WiMAX network. WiMAX network will support higher data rates if the sufficient amount of spectrum can be available for operators.



Modulation/ code rate	QPSK 1/2	QPSK 3/4	16 QAM 1/2	16 QAM 3/4	64 QAM 2/3	64 QAM 3/4
1.75 MHz	1.04	2.18	2.91	4.36	5.94	6.55
3.5 MHz	2.08	4.37	5.82	8.73	11.88	13.09
7 MHz	4.15	8.73	11.64	17.45	23.75	26.18
10 MHz	8.31	12.47	16.63	24.94	33.25	37.40
20 MHz	16.62	24.94	33.25	49.87	66.49	74.81

TABLE-2 WiMAX Data rate per cell for various coding techniques (in Mbps)

Germany and India Cases

Bandwidth Impact to Business Model for Germany and India cases can be seen in Attachment-1 and Attachment-2

Why WiMAX Forum Certified?

Before WiMAX Forum Certified systems were available, every solution was custom and not interoperable. Every piece of WiMAX Forum Certified equipment based on a common profile is interoperable with other WiMAX Forum Certified equipment. WiMAX Forum Certified means a service provider can buy equipment from more than one company and be confident everything works together. WiMAX Forum Certified means a more competitive industry, lower costs, and faster growth for broadband wireless everywhere around the globe.

Fostering Standards-Based Technologies

In order to maximize their spectrum allocation decisions, Intel recommends regulators must closely follow and support the norms and recommendations of multiple standards-setting organizations, including: (a) the Institute of Electrical and Electronics Engineers (IEEE); (b) the European Telecommunications Standards Institute (ETSI); (c) the Wi-Fi Alliance (for 802.11 products); and (d) the WiMAX Forum (for 802.16 products).

Wireless Broadband Everywhere (WiMAX)

Social and economic benefits of offering broadband services everywhere in a country are crucial to the development. There is a proportional growth between telecom and GDP. Countries are looking for economic, cost effective, easy and fast to deploy, high performance broadband solutions.



Today, there is a big opportunity for offering true personal broadband wireless services with WiMAX. WiMAX technology offers fixed, nomadic and mobile services. Intel is developing chips for WiMAX products. Users will be able to get wireless broadband services with these products via WiMAX networks. There are more than 380 WiMAX Forum Members (www.wimaxforum.org) today, WiMAX Standards and certified products are being deployed around the world today. WiMAX will enable competition in the broadband market and therefore reduce associated costs to the consumer. WiMAX can also be used for health, education, e-government, e-commerce, security etc. applications and will help to bridge the digital divide.

WiMAX Applications?

WiMAX (World Interoperability for Microwave Access, Inc.), based on the IEEE 802.16 standard, enables true broadband speeds over wireless networks at a cost point to enable mass market adoption. WiMAX is the only wireless standard today that has the ability to deliver true broadband speeds and help make the vision of pervasive connectivity a reality.

There are two main applications of WiMAX today: fixed WiMAX applications are point-to-multipoint enabling broadband access to homes and businesses, whereas mobile WiMAX offers the full mobility of cellular networks at true broadband speeds. Both fixed and mobile applications of WiMAX are engineered to help deliver ubiquitous, high-throughput broadband wireless services at a low cost.

Mobile WiMAX is based on OFDMA (Orthogonal Frequency Division Multiple Access) technology which has inherent advantages in throughput, latency, spectral efficiency, and advanced antennae support; ultimately enabling it to provide higher performance than today's wide area wireless technologies. Furthermore, many next generation 4G wireless technologies may evolve towards OFDMA and all IP-based networks as an ideal for delivering cost-effective wireless data services.

Intel is poised to deliver the key components needed for successful WiMAX networks. It delivered the fixed WiMAX solution, Intel® PRO/Wireless 5116 wireless modem, and is now sampling a fixed/mobile dual-mode solution code-named Rosedale 2. The highly cost-effective Rosedale 2 solution was designed to support both standards with an easy upgrade path from fixed to mobile and is expected to further accelerate the deployment of WiMAX networks.

Intel's WiMAX Vision

WiMAX is a key component of Intel's broadband wireless strategy to deliver innovative mobile platforms for broadband Internet connectivity anytime, anywhere.



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There is a substantial unmet need for very high-speed wireless wide area Internet access to both fixed and mobile devices. WiMAX is an advanced technology solution, based on an open standard, designed to meet this need, and to do so in a low-cost, flexible way. WiMAX networks are optimized for high-speed data and should help spur innovation in services, content and new mobile devices.

Intel currently plans to integrate WiMAX and WiFi into its notebook platforms based on Intel® Centrino® Mobile Technologies. Pairing the two will help bring users the ultimate in high-speed mobile broadband. Intel believes that WiMAX, with its technical and economic advantages, should help enable mainstream adoption of personal broadband.

WiMAX represents a global connectivity opportunity in highly developed mobile market segments and developing countries where this technology may help provide affordable broadband services.

Intel envisions a world of pervasive connectivity for all – WiMAX can help deliver on that vision.

Intel World Ahead Program

Overview

At Intel, our focus is not simply on what we make, but on what people around the world can accomplish when they have access to uncompromised technology and the means to use it. Intel's World Ahead Program is a comprehensive initiative that aims to enhance lives by accelerating access to uncompromised technology for everyone, anywhere in the world through **accessibility, connectivity, and education**. Intel also invests in local companies and works with industry partners to further expand the use of technology in order to support social and economic advancement.

In the next five years, Intel plans to invest more than USD 1 billion to support this endeavour. The main five-year goals of the World Ahead Program are to extend wireless broadband PC access to the world's next billion users while training 10 million more teachers on the use of technology in education, with the possibility of reaching another 1 billion students.

Intel has been working for many years with governments, industry, individuals, and organizations on a variety of efforts. Working in 112 countries and more than 1,300 cities worldwide, Intel is able to respond effectively to the unique needs of citizens around the globe.



Connectivity

Expanding wireless broadband Internet access by leading ecosystem development and deployment

Intel is committed to increasing the availability of high-speed wireless Internet connectivity in cities as well as suburban and rural communities. Intel is partnering with public and private organizations to drive WiMAX broadband deployments that reach locations where previously they were either impossible or too costly for carriers to pursue.

WiMAX can wirelessly deliver Internet access over long distances, connecting remote areas without relying on legacy telecom technologies. Governments are beginning to view WiMAX as an efficient way to spread Internet access to regions that would not otherwise have sufficient infrastructure available for many years.

Intel and WiMAX: Bringing Broadband to the Under-Served

Today, millions of businesses and consumers enjoy the significant benefits of broadband-access PC computing—and millions of others do not.

As a technology platform leader and a founding board member of the WiMAX Forum, Intel is evolving and accelerating the adoption of WiMAX industry standards and specific end-user solutions, bringing true broadband access to entire metropolitan areas, rural areas and other locations where it hasn't been logistically feasible or cost-efficient in the past.

Intel is working with a growing community of leading WiMAX product and service providers that are committed to the development of solutions based on Intel technologies. Additionally, Intel actively participates in efforts to standardize and drive interoperability in broadband wireless technology.

What Is the Challenge?

The challenge is bringing broadband access to individuals and firms in under-served areas. While many individual and business customers now have the luxury of high-speed broadband access at their fingertips, it's still a service that's concentrated in urban, high-density areas. Current infrastructures—typically offered by DSL or cable providers—result in limited coverage and a focus on cable television delivery.

To extend service to new, less-populated markets, providers must often engineer entirely new infrastructures from the ground up. This, in turn, drives up service pricing, slowing adoption in these areas. Even under ideal circumstances, telecommunications companies



require several months to install new T1/E1 lines and other enterprise-level data connections.

In addition to location limitations, DSL and cable technologies usually deliver limited upstream bandwidth, which can be a substantial limitation for commercial customers—especially those hosting Web-based resources or supporting substantial remote-user bases. WiMAX offers high throughput upstream bandwidth, which solves the DSL and cable limitation problems and makes this more attractive for commercial customers.

WiMAX technology—a standards-based wireless technology that provides high-throughput broadband connections over long distances—can help eliminate the need for physical “last-mile” connections from service providers to end customers. Mobile WiMAX technology can also provide a ubiquitous connection to extend high speed access beyond the home or office, making this an even more attractive option for servicing whole towns or villages.

Why WiMAX is Important?

WiMAX bridges the gap between technology “haves” and “have nots.” It offers the potential to do much more than just extend the power and reach of existing wireless networks. It supports a range of uses for communities around the globe that may have not had access to Internet service. WiMAX enables everything from basic high-speed access for homes to Internet telephony, business connectivity, and support for schools and government offices.

According to Sean Maloney, Intel executive vice president and ex-general manager of the Intel Mobility Group, “WiMAX-certified systems will provide the building blocks to connect the next five billion users to the Internet and truly usher in the broadband wireless revolution”

In collaboration with Intel—and using equipment based on the Intel® PRO/Wireless 5116 Broadband Interface—commercial networks have now been deployed such as the following carriers: Altitude Telecom (France), AXTEL (Mexico), BEC Telecom, S.A. (Dominican Republic), Dedicado (Uruguay), Globe/Innove (Philippines), Iberbanda (Spain), Irish Broadband (Ireland), SferaNET (Poland), Mikkelin Puhelin Oyj and Savonlinnan Puhelin Oy (Finland), Telgua (Guatemala), Ukrainian High Technologies (Ukraine), and WiMAX Telecom (Austria and Slovakia).

The global range of these carriers represents millions of customers—and shows the technology's broad appeal in emerging markets.



What Is the Solution?

The solution is a new, global standard for WiMAX compatibility and interoperability. Ultimately, Intel's goal is to help "connect the next billion people" via WiMAX.

Together with its technology, industry solutions partners, and leadership in the WiMAX Forum and Intel® WiMAX Alliance, Intel is supporting the industry-wide acceptance of the IEEE 802.16 and ETSI HiperMAN wireless Metropolitan Area Network (MAN) standard.

To this end, In January 2006, the WiMAX Forum announced the first fixed wireless broadband network products and today there are more than 20 certified products. Each hardware system passed stringent extensive test procedures consisting of protocol conformance, radio conformance and interoperability testing to attain the WiMAX Forum Certification seal.

Proven partnerships with leading telecommunications providers Intel is already collaborating with some of the world's leading telecoms to foster greater industry momentum for WiMAX.

Further information about WiMAX technology, including performance comparison data is available at www.wimaxforum.org.

5. General appraisal of regulatory framework and general comments

Intel appreciates NTRA for the timely initiative of BWA licence distribution procedures. This is very important for the economical, social development of Egypt and interest of foreign investors. Egypt will begin to offer WiMAX services simultaneously with the most developed countries.

Intel supports many of the ideas contained in this consultation and commends NTRA for their work. Specifically, the technology neutral approach adopted for the deployment of Broadband Wireless Access will allow service providers to choose the technology that best suits their business model. We encourage NTRA to continue with this approach in other allocations, including the 2.5 GHz band.

Our concerns are generally in the areas that may impact the viability of a service providers' business model. We encourage NTRA to provide sufficient spectrum for adequate durations to license holders. Furthermore, services such as VoIP and mobility (subject to sharing studies) should be considered.

Turhan Muluk
Intel Corporation
Monday, 26 August 2006

