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## Competitive Exams WiMAX: Wireless Area Metropolitan Networks

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WiMAX is a broadband wireless data communications technology based around the IEEE 802.16 standard providing high speed data over a wide area. The letters of WiMAX stand for Worldwide Interoperability for Microwave Access (AXess), and it is a technology for point to multipoint wireless networking. WiMAX technology is expected to meet the needs of a large variety of users from those in developed nations wanting to install a new high speed data network very cheaply without the cost and time required to install a wired network, to those in rural areas needing fast access where wired solutions may not be viable because of the distances and costs involved. Additionally it is being used for mobile applications, providing high speed data to users on the move.

The standard for WiMAX is a standard for Wireless Area Metropolitan Networks (WMANs) that has been developed by working group number 16 of IEEE 802, specializing in point-to-multipoint broadband wireless access. Initially 802.16a was developed and launched, but now it has been further refined. 802.16d or 802.16 – 2004 was released as a refined version of the 802.16a standard aimed at fixed applications. Another version of the standard, 802.16e or 802.16 – 2005 was also released and aimed at the roaming and mobile markets.

Although based around the IEEE standard 802.16, WiMAX technology also addresses the European Telecommunications Standards Institute (ETSI) HiperMAN (HIGH PERFORMANCE Radio Metropolitan Area Network) standard. This will make the standard a truly international standard and one which has the backing of the industry leaders in these fields

### WiMAX Forum

The WiMAX Forum is a wireless industry consortium with a growing number of members including many industry leaders. It has been set up to support and develop WiMAX technology worldwide, bring common standards across the globe to enable WiMAX to become an established worldwide technology.

One of the aims of the forum is to enable a standard to be adopted that will enable full interoperability between products. Learning from the problems of poor interoperability experienced with previous wireless standards, and the impact that this had on take up, the WiMAX Forum aims to prevent this from happening. Ultimately vendors will be

able to have products certified under the auspices of the Forum, and then be able to advertise their products as “Forum Certified”

Although WiMAX technology will support traffic based on transport technologies ranging from Ethernet, Internet Protocol (IP), and Asynchronous Transfer Mode (ATM), the Forum will only certify the IP-related elements of the 802.16 products. The focus is on IP operations because this is the now the main protocol that is used.

## WiMAX Flavours

Since its initial conception, new applications for WiMAX have been developed and as a result there are two “flavours” of WiMAX that are available:

- 802.16d (802.16 – 2004)
- 802.16e (802.16 – 2005)

The two flavours of WiMAX are used for different applications and although they are based on the same standard, the implementation of each has been optimised to suit its particular application.

- **802.16d-DSL replacement** The 802.16d version of WiMAX is often referred to as 802.16 – 2004 and it is closer to what may be termed the original version of WiMAX defined under 802.16a. It is aimed at fixed applications and providing a wireless equivalent of DSL broadband data. In fact the WiMAX Forum describes the technology as “a standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL.” 802.16d is able to provide data rates of up to 75 Mbps and as a result it is ideal for fixed, DSL replacement applications. It may also be used for backhaul where the final data may be distributed further to individual users. Cell radii are typically up to 75 km.
- **802.16e-Nomadic/Mobile** While 802.16/WiMAX was originally envisaged as being a fixed only technology, with the need for people on the move requiring high speed data at a cost less than that provided by cellular services and opportunity for a mobile version of WiMAX was seen and 802.16e was developed. This standard is also widely known as 802.16 – 2005. It currently provides the ability for users to connect to a WiMAX cell from a variety of locations, and there are future enhancements to provide cell handover. 802.16e is able to provide data rates up to 15 Mbps and the cell radius distances are typically between 2 and 4 km.

## Air Interface

WiMAX uses OFDM (Orthogonal Frequency Division Multiplex) as its modulation scheme. For 802.16d, 256 carriers are used, but for 802.16e the system is scaleable according to the conditions and requirements.

More advanced versions including 802.16e utilise MIMO (Multiple Input Multiple Output) and as a result support for multiple antenna. The use of these techniques

provides potential benefits in terms of coverage, self installation, power consumption, frequency re-use and bandwidth efficiency.

## **Competition for WiMAX**

The competition with WiMAX, 802.16 depends upon the type or flavour of WiMAX being used. Although initially it was thought that there could be significant competition with Wi-Fi, there are other areas to which WiMAX is posing a threat.

DSL cable lines WiMAX is able to provide high speed data links to users and in this way it can pose a threat to DSL cable operators.

Cell phone operators Cell phone operators see the new mobile version of WiMAX as a significant threat. It is offering data download speeds in excess of those that can be offered even using the latest cellular UMTS HSPA (High Speed Packet Access) systems that are being deployed. WiMAX is also able to offer greater cost efficiency. As a result, cellular operators are looking at ways of defending themselves against the possible use of WiMAX.

## **WiMAX Overview**

WiMAX is now being deployed in many areas and while it was initially seen as yet another wireless standard that might fall into the background, it is now emerging as a major front runner and posing threats to other areas of the industry. It is being seen by many as a real competitor to 3G, being able to offer data transfer speeds that are more in keeping with LTE (Long Term Evolution) the new 4G standard that is starting to be developed. In view of this, very much more will be seen of WiMAX 802.16 in both its 802.16d and 802.16e variants in the coming years.

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