

WiMAX Features, Characteristics and Application in Wireless Technology Computing

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ABSTRACT

WiMAX stands for Worldwide Interoperability for Microwave Access which is also called as IEEE 802.16, the WiMAX technology is basically a wireless broadband communications technology, and it is used to provide higher data rate with increased coverage area. It means that it is based on IEEE 802.16 standard, which provides high speed data over a wide area. This technology can operate Non-LOS (non-line of site). WiMAX is considered as a technology for point to multipoint wireless networking. In this paper it cover about WiMAX, WiMAX feature, it's Characteristics and Application and their architecture of WiMAX.

KEYWORDS: *WiMAX, IEEE 802.16, Non-LOS*

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1. INRODUCTION

The WiMAX is an IP based, wireless broadband access technology is used for Wireless Metropolitan Area Networks (WMANs) which is developed by IEEE 802.16 standard, to pursue from one point to multipoint broadband wireless access. It stands for "Worldwide Interoperability for Microwave Access", the main purpose is to designed this technology is that to deliver high broadband data speed. So basically WiMAX is a wireless standard communication technique which is used to provide the higher data services, the higher data rate the increased coverage also.

Initially 802.16a was launched, but nowadays it has further categorized by in two ways such as, 802.16d or 802.16-2004 which was released as a extended version of the 802.16a standard directed at fixed applications. Another version of the standard, 802.16e or 802.16-2005 was released and aimed at the roaming and mobile markets.

WiMAX is also considered as the wireless technique MAN (Metropolitan Area Network) that means it is used to provide data services or the data to higher coverage area as compared to existing technique like Wi-Fi.

The WiMAX technology is a latest development technology and it is also considered as a 4G (fourth generation) technology. The 4G technology is considered the 2G (Second generation) Broadband Wireless Access (BWA) standard. This broadband wireless access refers the wireless method of accessing the Internet. Supposed, to deliver the data

services or the data rate which this technology would providing the feature like increased the speed, and the distance. WiMAX is a three layer architecture named as: Physical layer, Mac layer, and Convergence layer.

WiMAX broadband technology uses key technologies which are used to provide high speed data rates:

- **OFDM (Orthogonal Frequency Division Multiplex):** OFDM has been organized into this technology to enable it to provide high speed data without the selective fading and other issues of other forms of signal format.
- **MIMO (Multiple Input Multiple Output):** By utilizing the multiple signal paths that exist, the use of MIMO either enables operation with lower signal strength levels, or it allows for higher data rates.

WiMAX is such an easy terminology, although strictly it applies only to systems that meet specific harmony criteria laid down by the WiMAX Forum, that people have a tendency to use it for the 802.16 standards and high tech themselves.

The 802.16a will provide broadband wireless connectivity to Fixed, Portable and Nomadic devices, as it is a standard for 2-11 GHz is a wireless metropolitan area network (MAN) technology and it can be used to provide campus connectivity, connect 802.11 hot spots to the Internet, and provide a wireless alternative to cable and DSL for last broadband access.

2. Literature Review:

WiMAX Architecture:

The standard of WiMAX technology is also considered as WLAN and it is used for convenient and it separated from different technologies. As seen in figure there are various component is given and these architecture based on IP network architecture

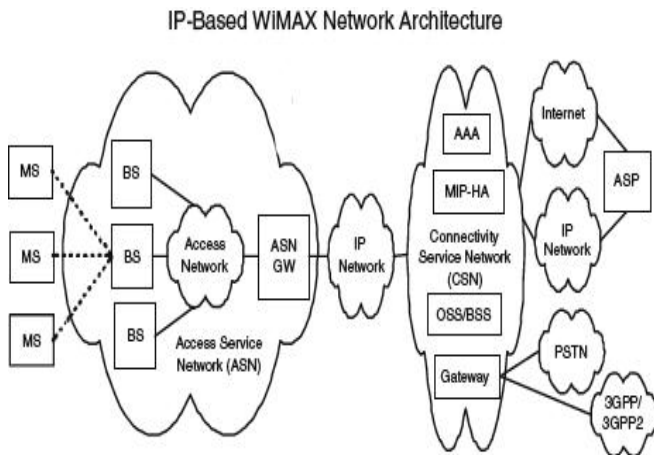


Figure: IP-Based WiMAX Network Architecture [1]
 Source: <http://www.mplsvpn.info/2010/05/wimax-architecture.html>

As shown in figure this architecture, the two layers namely ASN (Access Service Network) and CSN (Connectivity Services Network) are connected to each other with help of IP network which is intermediary of these two layers.

ASN: This layer is a first layer of IP Network. In this layer, various MS (Mobile Station) are connected to these layers which are BS (Base Station) via air interface. These air interfaces provided by BS and also provide micro mobility management which provide handoff, session management, key management and DHCP etc. The BS collect all the information which are sends from the MS and send to the Access Network which collect all the information which are send by the BS and send to the ASN gateway. The major functionality of ASN gateway is that paging of all the system or devices which are already existing in WiMAX technology, and caching of subscriber profile i.e. n number of subscriber profile who might be resistance in WiMAX system. Also it accepts the new request of existing subscribers and it will updated the cache.

IP Network: Basically it contain the all list of IP addresses and process to forward to the CSN layer which contain various component namely: AAA (Authentication, Authorization and Auditing)of the resources, MIP-HA (Mobile-IP Home Agent) which identify the original address of the current IP comes from the IP network, OSS/BSS (Operation Support System/Business Support System) which is mainly used for business activity and Gateway which just connect with PSTN as well as 3GPP/3GPP2.

The second layer which is also known as CSN (Connectivity Service Network) is connected to ASP (Application Service Provider) via internet and via the IP network. ASP performs function according to the request received such as to view all there application.

Working of architecture using the layer:
 Layers of 802.16:

This WiMAX architecture is three layer of architecture which is known by following:

1. Convergence layer
2. MAC layer
3. Physical layer

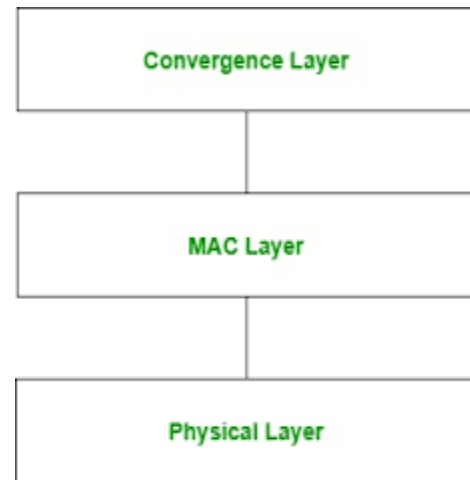


Figure: Layer of IEEE 802.16 Architecture
 Source: <https://www.geeksforgeeks.org/wimax-in-computer-network/> [2]

Physical Layer: The physical layer is responsible for checking the established connection, error detection, modulation and frequencies when the subscriber establish the connection between the subscribers. The basic function are encoding/decoding of signals, preamble generation/removal and bit transmission/reception [6].

MAC Layer: MAC layer basically provide the feature which is point-to-multipoint access, and it is based on CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance), and this layer also provide the interface between physical to convergence layer. It means that this layer will take the decision regarding the transmission of file from sender to receiver.

Convergence Layer: Basically the convergence layer is working on core layer and it provide the information of external network and it also provide some specific function regarding the service like ATM, Multimedia, and Telephony.

The basic application of this architecture:

1. Video streaming
2. VoIP
3. Video Conference
4. E-Learning [2].

3. Research Methodology:

Objective of WiMAX:

- To knowledge gain in-depth about the WiMAX technology and how it's works.
- To gain information about the WiMAX technology problems in maintaining and deployment.
- To suggest the solutions and the enhancements found during research.
- To validate that the new enhancements will provide more security and reliability in the other's people research and context.
- To investigate different techniques and methods that are adaptable for the WiMAX technology by using security feature.

Feature:

There are many features of WiMAX in terms of services compared with some other broadband services. Some features WiMAX features are:

- **Speed:** The speed of WiMAX has ability to handle up to 70 megabits per second for the transmission of data. The Downlink speed of WiMAX is 46 Mbps and Uplink speed of WiMAX is 4Mbps [6]
- **Bandwidth:** The bandwidth of WiMAX which gives 3.5 MHz to 10 MHz.
- **Range:** Range of a single WiMAX network connectivity is expected up to 40 miles with 70 Mbps speed or more, but it optimized to 1.5km to 5 km by reducing the cell size [6].
- **Data Transfer:** In WiMAX technology the data transfer from source to destination is that up to 120 kmph.
- **Cell Radius:** Cell radius which is seen in the coach that are D and R parameters, cell are up to 27 km/h.
- **Cell Capacity:** The cell capacity of WiMAX is 100- 200 users.
- **Duplexing Mode:** TDD, FDD
- **Legacy:** IEEE 802.16a, 802.16b, 802.16c, 802.16d.
- **Handover:** Optimized hard handover.

4. Conclusion:

This paper gives detail about WiMAX technology that emerged as a key solution for data as well as voice network. In the WiMAX technology how the data as well as voice network is transferred from Mobile Station to the Application Service Provider (ASP). The improvement of WiMAX technology is that, it is cost effective broadband services to the end user with increased performance for mobile communication and fixed indoor applications. It

provides the best security features by adopting best technologies available today. It supports device authentication as well as user authentication, flexible key management protocol, and strong traffic encryption for fast handovers.

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