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# A Review of Wi-Max Network

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**ABSTRACT-** *Wi-max stands for worldwide ability of microwave access. Together with the development of mobile communication and broadband technology, WiMax has become a hot spot for world medium operators and makers. WiMax guarantees to deliver the web throughout the world, and connect the long distance of broadband wireless property services. WiMAX can provide broadband wireless access at information rates of multiple Mbit/s to the end-user and at intervals a spread of many kilometers. a similar radio technology also will provide high-speed information services to all or any mobile terminals (laptops, PDAs, etc.) with AN optimized exchange between output and coverage. Ultimately, it'll modify the "Portable Internet" usage replicating on the move a similar user expertise as reception or at the workplace. Given its large advantages, WiMAX can develop as a robust radio access answer with several integration synergies in mobile or fixed specification. WiMAX also will modify end-users to profit from AN "Always Best Connected" expertise once accessing their applications via the simplest available network, at home, on the pause, or on the move. Projected technique improving SNR and min BER.*

***KEYWORDS- Digital Communication, WiMAX, Broadband Wireless Access, MAN, OFDM***

## I. INTRODUCTION

With the further development of the communication network, WiMax has major realistic significance and strategic value as a standard facing to "the last kilometre" access, especially when no globally uniform standard is established for broadband wireless access. There are two main types of such Standard: the IEEE 802.16d supporting air interface of fixed broadband wireless access system, and the IEEE 802.16e in the works is supporting the air interface of both fixed and mobile broadband wireless access systems[1].WiMax is a Broadband Wireless Access Metropolitan Area Network (BWA-MAN) technology based on the IEEE 802.16 standard, which is also called the IEEE Wireless MAN. It is a new air interface standard in connection with the frequency ranges of microwave and millimetre wave. Its main purpose is to provide a broadband wireless access approach which can be interoperated effectively in the environment of multiple manufacturers with "one-point to multi-point" in the metropolitan area network. With the increasing market demand for WiMAX, it is now regularly compared with Wi-Fi. While both technologies have some identical technical characteristics, however they are approaching the wireless space from completely different perspectives. The first WiMAX standard, IEEE 802.16-2001, was published in 2002. It defines a point-to multipoint (PMP) fixed wireless access system between a base station (BS) and its associated subscriber stations (SSs). It operates in the 10–66 GHz frequency range, which is the so-called line of-sight (LOS) communications.

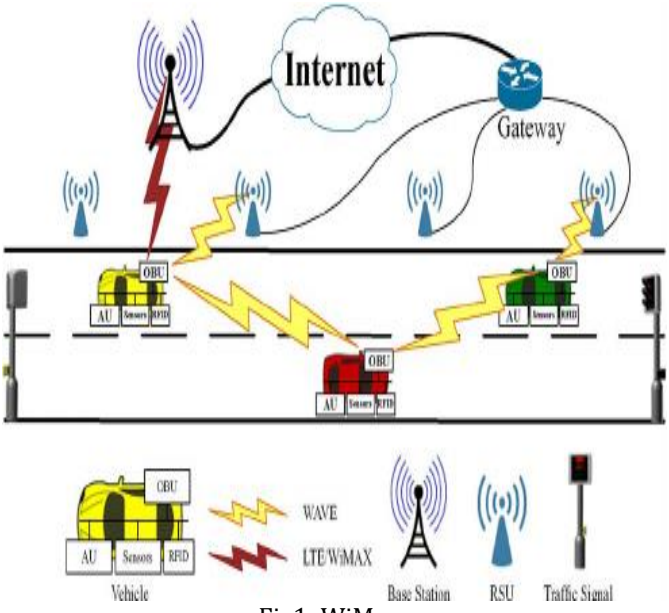


Fig1: WiMax

The IEEE 802.16-2004 standard was published in 2004 to extend the WiMAX specification into the 2–11GHz frequency range, the so-called on-line-of-sight (NLOS) operation. It also describes the WiMAX system profiles and conformance criteria to adapt to the dynamic wireless environment. By introducing the mesh mode, IEEE 802.16-2004 is capable of forwarding traffic from a node to its neighboring nodes. The latest WiMAX standard, IEEE 802.16e- 2005, was approved in December 2005. By employing scalable orthogonal frequency division multiplexing (SOFDM), IEEE 802.16e-2005 provides full mobility support for both licensed and unlicensed spectra [2]. Worldwide Interoperability for Microwave Access (WiMAX) is a telecommunications technology that uses radio spectrum to transmit bandwidth between digital devices. WiMAX has the ability to transmit large amount of data to large distance. The IEEE standard for WiMAX defines an adaptive modulation framework which allows a WiMAX system to communicate with various burst profiles according to the link quality. This adaptive modulation framework is also called as link adaptation. This link adaptation scheme uses different modulation

schemes for different communication link quality. This paper analysis different modulations schemes used in WiMAX link adaptation.

## II. LITERATURE SURVEY

**In N.A.M. Liyanage** by The mobile phone has become the major equipment which is being used by people for multiple purposes. Due to the advancements of technology, the capabilities of the mobile phone have been increased. One of the major uses of mobile phones is accessing the Internet. One of the biggest issues in mobile devices is consuming higher battery life especially when the phone is connected to internet. As more and more technology like Third Generation (3G)/Long Term Evaluation (LTE) have come with more improved data transmitting speed and none of the technologies focuses on the power consumption of the Mobile stations (MS). Unlike 3G /LTE the Worldwide Interoperability of Microwave Access technology (WiMAX) provides some additional features like sleep and idle modes which will allow the base stations (BS) to suspend the connection often when needed. WiMAX is a wireless data transmission technology same as Wi-Fi but affects to a closer range. Additionally, these standards (sleep and idle) define mechanism which will enable the control of MS stations transmitting power to BS. The research team first gives an overview of the key aspects of WiMAX, and its Media Access Control (MAC) layer and finally describes a mechanism to implement the sleep mode protocol which will highly decrease the power consumption of the MS. it is essential to support future enhancements of the protocol in a flexible manner. The WiMAX protocol defines two modes known as idle mode and sleep mode which suspends the transmitting and receiving operations. The proposed research paper based on only sleep mode. In sleep mode, unlike the idle mode, the MS transmits and receives data over connections between the BS and MS. The periods of no transmission and reception of each connection are not necessarily synchronized. The period when all connections are in this called "unavailable" and the MS can terminate the operation of the wireless interface. In the unavailable period, the BS can decrease its processing power consumption by suspending the wireless interface block.

In Sanjay Sharma by These days' ad hoc networks have found many applications. Multiple ad hoc routing protocols have been proposed, of which on demand routing protocols are very popular because they are easy to realize and have no power and priority concept for data communication in routing. In mobile ad hoc networks (MANETs), routing protocol plays the most important role. In the last decade, Ad hoc On-demand Distance Vector (AODV) routing protocol becomes the attention of focused research on MANETs worldwide. A lot of protocols had been proposed to improve and optimize AODV routing protocol to achieve the best in quest of reliable protocol. In this paper, we present some improvement suggestion to AODV routing protocol. Our proposed protocol, called AODV-PP, improved AODV in Priority models and in Power consumption. We also measure performance indicators for some metrics, such as energy, routing overhead, end-to-end delay, and packet delivery ratio, in WiMAX adhoc network. Proposed model which takes care of energy features based on priority of data for communication from source to destination. Here we studied the two on-demand routing protocols AODV & AODV-PP are analyzed and their performances have been evaluated.

In D. S. Shu'aibu by proposed a low complex algorithm for subcarrier allocation in multiuser OFDM of WiMAX system. he proposed algorithm uses particle swarm optimization (PSO) technique to search subcarrier with high channel gain and allocate it to users. The proposed method has a complexity of Mlog2N for M users and N number of subcarriers using big O O(.) notation. The proposed algorithm has been compared with previous works, and it has been shown that this algorithm has an average of 22.5% less central processing unit (CPU) time usage for allocating resources. maximum delay spread across the multipath of 5 μs and 30 Hz Doppler shift is used. The total power was set to 1W, a total of 64 subcarriers were used. The channel information was sampled every 0.5 ms to update the channel condition. For the PSO settings, 30 particles are used, with W=1, C1 and C2 are set to 2.0. We used gamma function to set the target data rate for each user. The approach Shen et al. (2003) used is called root finding; while that of Wong et al. (2004) is linear method and the proposed method presented in this paper is called PSO approach. Figure 2 shows the normalized data rate for 16-users and how the 3-approaches adhere or deviate from the target rate.

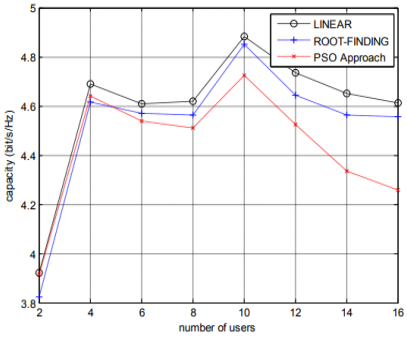


Fig2. Spectrum efficiency

In Mehdi Alasti by There are more components and functionalities in an end-to-end network providing QoS than the air interface QoS features discussed above, such as policy control and charging (PCC) functions in QoS provisioning. Here, we focus on a comparison of the QoS

framework between LTE and IEEE 802.16e/IEEE 802.16m at the air interface:

• QoS transport unit: The basic QoS transport unit in the IEEE 802.16e/IEEE 802.16m system is an SF, which is a unidirectional flow of packets either UL from the MS/AMS or DL packets from the BS/ABS [6]. The basic QoS transport in LTE is a bearer between UE and the PDNGW. All packets mapped to the same bearer receive the same treatment.

• QoS scheduling types: There are six scheduling service types in IEEE 802.16m including UGS, ertPS, rtPS, nrtPS, and BE from IEEE 802.16e and the newly defined a GP service. LTE supports GBR and non-GBR bearers. The GBR bearer will be provided by the network with a guaranteed service rate, and its mechanism is like rtPS; the non-GBR has no such requirement and performs like BE in IEEE 802.16e/IEEE 802.16m. • QoS parameters per transport unit: Depending on the SF type, IEEE 802.16e/ IEEE 802.16m can control maximum packet delay and jitter, maximum sustained traffic rate (MSTR), minimum reserved traffic rate (MRTR), and traffic priority. LTE MBR and GBR are similar to IEEE 802.16e/IEEE 802.16m MSTR and MRTR, respectively. However, MBR and GBR are only attributes of GBR bearers, while in IEEE 802.16e/IEEE 802.16m even a BE SF can be rate limited using its MSTR. Also, with 3GPP Release 8, GBR and MBR are set equal, while IEEE 802.16e/IEEE 802.16m allows the operator to select independent values for MSTR and MRTR. On the other hand, LTE AMBR allows the operator to rate cap the total non-GBR bearers of a subscriber.

• QoS handling in the control plane: The SF QoS parameters are signaled in IEEE 802.16e/IEEE 802.16m via DSx/AAI-DSx messages. In LTE the QCI and associated nine standardized characteristics are not signaled on any interface. Network initiated or client initiated QoS are both supported in IEEE 802.16e/IEEE 802.16m systems. Therefore, both operator managed service and unmanaged service can be supported. The flexible architecture gives the mobile client opportunities for differentiation. LTE only supports network initiated QoS control.

• QoS user plane treatment: The ARP parameter in LTE provides the following flexibilities to the operator: – Accept or reject establishment or modification of bearers during the call admission control decision based on not only the requested bandwidth, available bandwidth, or number of established bearers, but also the priority of the bearer –Selectively tear down bearers based on their priorities during an overload situation.

Fourth-generation wireless technologies such as IEEE 802.16e, IEEE 802.16m, and LTE are designed to support current and future QoS needs. Connection-oriented per-flow-based unidirectional QoS support in IEEE 802.16e allows several service flow types such as UGS, rtPS, nrtPS, ertPS, and BE to deliver real-time and non-real-time traffic. The UL bandwidth request and granting mechanism allows MSs to request and receive the required resources to transmit data in the UL direction. Advanced features such as a new scheduling service (i.e., aGP), quick access, and delayed bandwidth request in IEEE 802.16m further enhances the capabilities in providing the required QoS for next-generation mobile Internet applications. The LTE QoS mechanisms follow a network initiated QoS control based on GBR and non-GBR bearers, which is a class-based packet forwarding treatment for delivering real-time and non-real-time traffic.


Fig3. WiMax in City

In Rakesh Kumar Jha by Due to its large coverage area, low cost of deployment and high-speed data rates. WiMAX is a promising technology for providing wireless last-mile connectivity. Physical and MAC layer of this technology refer to the IEEE 802.16e standard, which defines 5 different data delivery service classes that can be used in order to satisfy Quality of Service (QoS) requirements of different applications, such as VoIP, videoconference, FTP, Web, etc. In this paper we have made six scenarios. Here two types of MAC layer QoS are used and they are UGS and rtPS having application of Voice over IP (VoIP) and MPEG respectively. Also the traffic priority for UGS is high as compared to rtPS. In each scenario the number of fixed nodes (Fixed Subscriber Stations) and Mobile nodes (Mobile Subscriber Stations) are different. To cover more nodes or if nodes are outside the coverage area more than one BS are required. The whole scenarios are based on the theoretical survey between Jalgaon and Bhusaval. We have observed that the two base stations are well sufficient to cover the desired area. If we increase the base station than somehow load will decrease but cost will increase, since we know that the area covered by one base station is 30 kms (practically) so in our scenario two base stations are efficient. Our research is dedicated to rural area and his development. In this project we have

considered no loss (there are no interference) hence this observation will totally fit with any rural area network.

In N.Nagarajan by addresses the problems concerning the delivery of video packets in video conferencing and other multimedia application services over WiMAX. Multiple competing traffic sources over a point-to multipoint WiMAX topology is modeled. The performance analysis on the capacity of the WiMAX equipment to handle VoIP and video traffic flows was conducted. Parameters that indicate quality of service, such as throughput, packet loss, average jitter and average delay, are analyzed for different types of service flows as defined in WiMAX.

In Jadhav, S. by focus on convergence of different Radio Access Technologies (RATs) providing good Quality of Service (QoS) for applications such as Voice over IP traffic (VoIP) and video streaming. The voice applications over IP networks are growing rapidly due to their increasing popularity and cost. To meet the demand of providing high-quality of VoIP at anytime and from anywhere, it is imperative to design suitable QoS model. They have conducted simulation study to evaluate the QoS performance of WiMAX and UMTS for supporting VoIP. They designed simulation modules in OPNET for WiMAX and UMTS, and carried out extensive simulations to evaluate and analyze several important performance metrics such as Mean Opinion Score (MOS), end-to-end delay, jitter and packet delay variation. According to results it was shown that WiMAX outscores the UMTS with a sufficient margin, and is the better technology to support VoIP applications compared with UMTS.

In Chin-Ling Chen and Cheng-Yi Pan presented an efficient way and the provision of Quality of Services (QoS) guarantee are the major issues in delivering delay sensitive traffic, like VoIP service in WiMAX (Worldwide Interoperability for Microwave Access). One well-designed scheduling algorithm is expected to coordinate QoS-related functional entities in WiMAX architecture. Existing downlink scheduling algorithms of WiMAX like DRR (Deficit Round-Robin) and WRR (Weighted Round-Robin) usually reserve minimum rate to each type of traffic and cannot consider the status of queue length of each connection, thus making it unsuitable for VoIP on-off traffic model. Author proposed an efficient downlink scheduling algorithm, which allocate the bandwidth based on queue-length estimation and compared the proposed scheme with DRR and WRR by estimating the system performance such as average delay, loss rate and throughput under several traffic scenario and system parameters value.

In Henriques, J. presented that the Mobile WiMAX (IEEE 802.16e) capabilities to support VoIP traffic under different scenarios and employing distinct Quality of Service (QoS), service classes were performed. Additionally, they characterized the heterogeneity access conditions within a city, by analyzing both Line of Sight (LOS) and Non-Line of Sight (NLOS) conditions. After examining the end-user perceived quality (Quality of Experience) and the network QoS related parameters, the attained results shown the impact of the correct WiMAX QoS service classes management on the number of well served VoIP users.

## III.CONCLUSION

Literature review, this paper analyzed numerous modulation schemes utilized in WiMAX link adaptation. QPSK, 16QAM and 64QAM modulation schemes are utilized in WiMAX network to implement link adaptation. Once the SNR of the channel is high QAM modulation scheme is used, once SNR of the channel is low QPSK modulation is employed. Additionally to those modulation schemes, the paper proposes a BPSK modulation scheme has got to be enclosed in an adaptation modulation framework to support terribly low SNR worth additionally. The addition of the BPSK modulation theme can improve the reliableness of link adaptation it's been over that Mobile WiMAX can't only be accustomed fulfill the demand for prime web speed however may be accustomed offer voiceover- IP services. The low-latency design of mobile WiMAX makes it possible to deliver VoIP services additional effectively and VoIP technologies might also be accustomed offer innovative services like voice chatting, push-total and multimedia system chatting. During this paper, intensive survey of paper revealed in field of wimax has been self-addressed.

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