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Performance Analysis of VOIP in WiMAX with different modulation

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Abstract: Recent development of wireless network is more focus on area coverage and service availability using different radio access technology. Also provides quality of services for various applications such as VoIP, video streaming and bandwidth intensive applications. Recently voice applications are rapidly growing because of their more popularity and demand. QoS is an important cause of providing high availability and accessibility of VoIP. In this paper, various QoS model been applied to analyze the VoIP traffic in WiMAX network. OPNET simulator is used to design the WiMax to make the analysis of the through put, load, traffic and MOS (Mean opinion score) with different modulation parameter. Simulation result shows that QPSK1/2 is better performance comparatively with other modulation namely adaptive.

Keywords: WIMAX, QoS, MOSIntroduction

I. INTRODUCTION

Now a day's wireless communication giving more preference using internet rather than using Public Switched Telephone Network (PSTN) based on several factors like service availability, cost of the service and etc,. This leads the enormous growth in Voice over IP network. VoIP is a de facto standard for voice applications in the internet to make use of voice/video at anywhere and anytime. With the telecom industry moving towards the next generation wireless networks which are going to provide high-quality service and down-link/up-link speed, VoIP continues to improve its QoS, especially for long distance calls. This improvement is going to impact businesses like call centres, multinational companies, as well as the normal users to a great extent than ever imagined.

Worldwide Interoperability for Microwave Access (WiMAX) is the finest technology for VoIP. For a long distance wireless access can use WiMAX for providing point-to-point communication to mobile cellular access. It gives wider coverage with lower cost of network deployment. Table: 1 shows the coverage area of a single WiMAX cell is around 30 to 50 km [1]. WiMAX supports Quality of Service (QoS) by providing different service classes for real-time and other traffic [4]

The main differences in the protocol and services are

	3G	Wi-Fi: 802.11	WiMAX: 802.16	Nobile-Fi: 802.20
Max speed	2Mbps	54Mbps	100Mbps	16Mbps
Coverage	Several miles	100 feet	50 miles	Severa miles
Airwave	Licensed	Unlicensed	Either	Licensed
Advantages	Range, mobility	Speed, price	Speed, range	Speed, mobility
Disadvantages	Slow, expersive	Short range	Interference issues?	High price

Table: 1 Network Deployment

WiMax systems are used to deliver the broadband access services to residential and enterprises customers in economical way. This operates similar to WiFi but at higher speed over greater distances and for greater number of users. The IEEE standard of WiMax is defined as 802.16. The physical layer of the WiMAX limits the operation in 10 GHz to 66 GHz at the initial stages. IEEE 802.16a and 802.16e standards provide a benefit from the network coverage, self-installation, power consumption , frequency reuse and bandwidth efficiency. The standard IEEE802.16d is used on WMAN fixed and IEEE 802.16e is used on WMAN Portable. The throughput for Fixed WiMAX is up to 75 Mbps with the 20MHz bandwidth while the portable WiMAX is up to 30Mbps with 10MHz bandwidth. Also, the network coverage of fixed WiMAX and the portable WiMAX is 4-6 miles and 1-3 miles respectively.

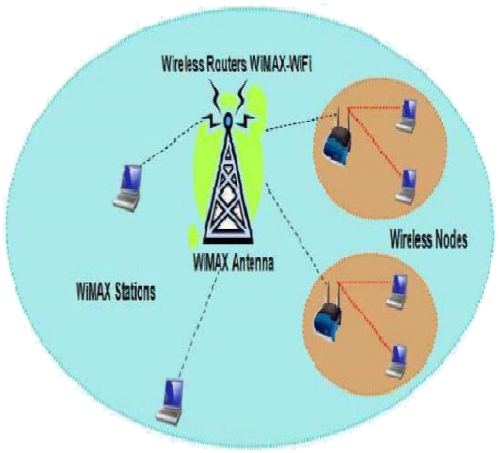

Figure: 1 WiMax and Wireless Network

Figure 1 gives an outline of how WiMAX and other wireless networks are integrated to work together to approach a better performance in either distance or transfer speed

In this paper, VoIP is an application scenario to study the performance using different modulation in WiMAX. OPNET model have designed and implemented WiMAX environment to analyze the throughput, latency and Mean Opinion Score (MOS) for different modulation in VoIP

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traffic. Our simulation results show that QPSK1/2 is giving a better performance comparatively adaptive modulation.

II. WIMAX NETWORK DESIGN

Fig: 2 Shows core service provider contains 7 cells and all are connected with backbone network. Network configure the appropriate WiMax parameter for the simulation In order to set the QoS, VoIP services can be enabled in mobile node along with mobility parameter. The network model is shown below:

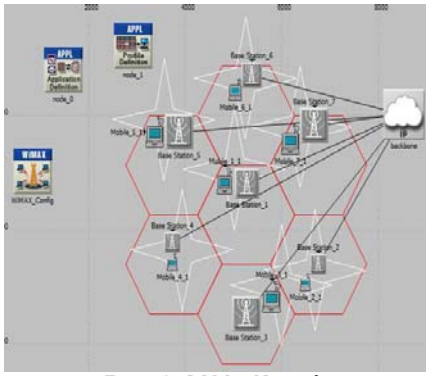

Figure 2: WiMax Network

Node trajectory model can be used to define node movement and it can be defined with different QoS parameters.

III. VoIP

Session Initiation Protocol (SIP)[5] is using in Voice over IP (VoIP) for signalling and controlling. VoIP using to make a phone calls over the internet. SIP is an RFC (Request For Comment) standard from the IETF (Internet Engineering Task Force), responsible for administering and developing protocols that define the Internet. SIP an application-layer control protocol for creating, modifying and terminating sessions with one or more participants. SIP ensures the call reaches to the called party by carrying out of mapping descriptive information to location information and call participant management can bring other users onto the call or cancel the connections to other users. Another popular protocol for a voice/video and multimedia conferencing on an IP network is H.323 [7]. This has a feature to handle failure of intermediate network including alternate gatekeepers or alternate endpoints to recovering from connections failures. VoIP is one of the most common and cheap technology to communicate voice/video and multimedia conference for a short and long distances. Many VoIP providers offer the service at free of charge regardless of the distance. The analog voice data is digitized and transferred as packets over the IP network. These packets are decoded and converted back to the analog voice signal.

IV. QOS AND SERVICE CLASS CONFIGURATION

Service class with various parameters was implemented and configured. Voice traffic reserved with minimum latency. VoIP enabled through Unsolicited Grant Service (UGS) [3]. The channel is configured to vary according to ITU Pedestrian a multipath fading model. All SS nodes have an uplink application load of 384 Kbps (Gold/BE service class) for a total of 1 Mbps.

Scenario 1:

All Subscriber Station nodes are configured to use Adaptive code modulation for the uplink application. Symbol duration configured with 100 ms along 384 Kbps. Cells with mobile nodes use Wireless OFDM with 7 subscriber and 5 milliseconds duration. The result show that the throughput of the Voice over IP application traffic changing with varying load in trajectory (Figure 4).

Scenario2:

All nodes are configured to use QPSK1/2 [6] modulation for the uplink application. Symbol duration configured with 100 ms along 384 Kbps. Cell with mobile nodes uses Wireless - OFDM with 7 subscriber and 5 milliseconds duration. The result show that the throughput of the Voice over IP application traffic changing with varying load in trajectory (Fig-5).

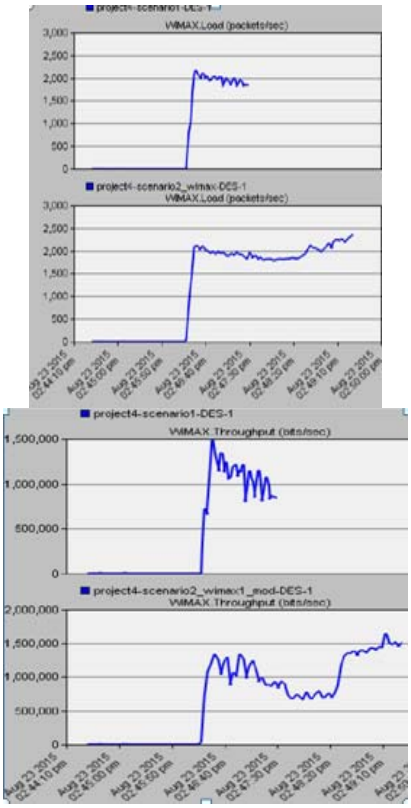

Figure 4: Load in Network Figure 5: Throughput

V. CONCLUSION

Next generation networks and multiple recent technologies offer different multimedia services. It also provides comfort to the users, companies and business organizations of utilizing the best available technology for the required service.

Extensive simulations have been conducted with different parameter to evaluate the performance of WiMAX for supporting the VoIP traffic. Analyse the simulation with

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some important critical parameters such as MOS, end-to-end delay, throughput and packet delay variation. Simulation results Fig: 6 show that WiMAX is the better technology to support VoIP applications with QPSK 1/2 compared with adaptive modulation techniques. This study is our first step towards exploring the possible implementations of the next generation wireless networks with VoIP and multimedia. Future work includes the suitable model for mapping of QoS between UMTS and WiMAX.

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