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# Literature Review of TCP and CBR Traffic in Wimax Environment Using Network Simulator

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**ABSTRACT:**The Standards Board of the Institute of Electrical and Electronics Engineers, based in the United States, formed a working group to address broadband wireless access under the IEEE MAC standard. The popular IEEE 802.11 "WI-FI" protocol is capable of providing ad hoc network facilities at low levels. However, in this case, nodes are limited to sending and receiving information. A new IEEE 802.16 standard, known as WiMAX (IEEE 802.16), has been introduced to diagnose this limited area problem, which provides high speed data to customers. It Promises to deliver worldwide Internet services connecting the last mile of WiMAX. WiMAX provides a solution to the ever-increasing demands for broadband wireless applications. The bandwidth and range of WiMAX makes it suitable. It is a standard based on IEEE 802.16 (WiMAX) wireless technology that provides high throughput fast broadband connections over long distances.

**KEYWORDS:** MANET, AODV, WIMAX, TCP, CBR, Performance Metrics, NS-2.

## I. INTRODUCTION

A mobile ad-hoc network is made up of wireless mobile nodes such as mobile phones, PDAs, laptops, pocket PCs, smart cars ... etc. It remains connected with each other through an autonomous configuration in the absence of any infrastructure. Wireless networks are becoming an increasingly popular solution for connecting devices together. The device can be moved here at any time, and new devices can be easily introduced into the network.

This paper mainly focuses on the implementation of IEEE 802.16 and with its help provides a comparison between TCP and CBR traffic. The transmission control protocol is one of the most commonly used transport protocols in the Internet. Many widely used applications use TCP to send data such as file transfer protocols, Telnet and HTTP connections, etc ... An important mechanism in TCP is congestion control mechanisms. It controls the TCP sending rate and provides end-to-end congestion avoidance and control. However, TCP congestion control was designed under the assumption that congestion is the main cause of packet drops and drops rarely occur due to link errors. It found traffic-based performance for various network scenarios.

The purpose of this paper is to implement and simulate IEEE 802.16 using a network simulator to have a better understanding of standards and system performance. The main objective of this work is to provide high data rate transmission as well as control the problem like delay and congestion. Proposing an end-to-end solution requires minimal changes to TCP and no changes to the network using delay-based error discrimination that minimizes errors and transmission errors that occur during TCP network congestion. And along with this WiMAX has many features, so we have decided to work on this technology, and have selected WiMAX in our research work, and compared the performance of different traffic variants CBR and TCP with WiMAX.

The objectives of this paper are to get accurate perception and finding the best behavior of the MANET reactive on demand routing protocols under mobility, scalability and heavy, medium and low traffic load.The rest of the paper begins the analysis of TCP and CBR traffic based performance under different network scenarios.

## II. LITERATURE REVIEW

Literature review is the major task of all research. It is through this that the basic problem occurring in the field of research work is found. This chapter reviews research by several performance evaluations of MANET routing protocols for various TCPs and CBRs. And the following papers related to it are discussed below:

SachinLalar et. al. [1] presented a “Simulation and comparative analysis of AODV, DSDV, DSR and AOMDV routing Protocol in MANET” describes in this paper routing protocol AODV, AOMDV, DSR and DSDV has been analysed and

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comparing the two performance matrices as packet delivery ratio, loss packet ratio with varying pause time and number of node under TCP & CBR connection via network simulator.

WarodomWerapun et. al. [2] presented a "Performance Comparison of TCP and CBR in MAODV Ad hoc Network" describes of this paper is to compare the performance of TCP and CBR using MAODV in wireless ad hoc network, where the efficiencies of TCP and CBR are evaluated in various parameters environment.

KhiatA et. al. [3] presented a "Wi-Fi and WIMAX Quality of service Performance Analysis on High-Level Traffic using OPNET Modeller" describes Heterogeneous networks, Heterogeneous network continue to be operate thanks to the various services they offer, especially in terms of mobility, wide coverage and rapid deployment. This study measures and evaluates the behaviour of Web-based applications in a vertical handover context between 802.16e and 802.11e technologies, taking into account all possible Quality of service mechanisms. The evaluation scenarios were performed using OPNET Modeller.

K. Saranyaet. al. [4] presented a "Performance Evaluation of Multipath Routing in WIMAX Network" describes cross-layer based efficient multi-path routing protocol, which considers the constraints delay and reliability. Right here the interference and loss rate can be assessed using the physical and link layer information and delay could be approximated using the routing layer info. The paths are chosen and the ranks are assigned to them based on the Quality of service parameters.
YesinSahraouiet. al. [5] presented a "Performance evaluation of TCP and UDP based video streaming in vehicular ad-hoc networks" describes the two most popular transport layer protocols are User Datagram Protocol and Transmission Control Protocol. In this paper, we propose an adaptation of UDP and TCP protocols for video streaming in VANET. In addition, an evaluation and comparison between these protocols are performed in order to choose the better transmission protocol at transport layer level for video streaming in VANET.

IoannisPapapanagiotouet. al. [6] presented a "A Survey on Next Generation Mobile WIMAX Networks: Objectives, Features and Technical Challenges" this survey provides a description of key projected features of the physical and medium access control layers of 802.16m, Moreover, a new unified method for simulation modelling, namely the Evaluation Methodology, introduced in 802.16m, is also presented.

HaiderRasheedAbdulshaheedet. al. [7] presented a "A survey on the use of WiMAX and Wi-Fi on Vehicular Ad-Hoc Networks" describes the two technologies known as WiMAX and Wi-Fi. The goal of this survey was to ascertain the best technology among the two technologies. This survey begins with the VANET architecture, and then discusses the characteristics and challenges of VANET, applications, before ending with a comparison of the two technologies that made of VANET, the experimental approach used, future perspectives, result and conclusion.

Ritika Sharma et. al. [8] presented a "Comparison based Performance Analysis of UDP/CBR and TCP/FTP Traffic under AODV Routing Protocol in MANET" describes the objective of this paper is to compare the performance of TCP/FTP and UDP/CBR traffic in AODV routing protocol generally implemented in a mobile ad hoc environment. An empirical study has been done using NS-2.

Ahmad Shafet. al. [9] presented a "Energy Based Performance analysis of AODV Routing Protocol under TCP and UDP Environments" describes one of the major issues in MANET is to minimize the energy consumption of wireless nodes. Higher energy consumption nodes minimize the network life while lower energy consumption nodes increase the network life. Various routing protocols have been proposed for energy saving. Ad hoc On-demand Distance Vector is an energy efficient routing protocol. In this paper, the energy based performance of AODV routing protocol is evaluated under Transmission Control Protocol and User Datagram Protocol by using different simulation scenarios.

G. N. Vivekananda et. al. [10] presented a "Performance Evaluation of TCP, UDP and SCTP in MANETs" describes effect on diverse quality requirements such as delay, bandwidth, jitter, and reliability. Transmission Control Protocol (TCP) allows two hosts to establish a connection and switch streams of data. User Datagram Protocol (UDP) is a connectionless protocol that is used mainly for low-latency applications. This paper gives the performance evaluation of TCP, UDP, and SCTP regarding various quality metrics using ns2. Simulation results prove that SCTP performs better than TCP and UDP regarding throughput, jitter, loss rate, packet delivery ratio, and end-to-end delay in ad hoc networks.

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SuhermanSuhermanet. al. [11] presented a "Delay reduction of transmission control protocol in WiMAX by prioritizing the acknowledgement packets" describes Transmission Control Protocol provides reliable connection by acknowledging every transmitted packet. The faster the acknowledgement packet is received, the quicker the next TCP window is sent. Previous study shows that by prioritizing the ACK packet route, the TCP delay for the whole data transmission is reduced. This article utilized the medium access within WiMAX network, which is the scheduler, to prioritize the ACK packet transmission.

MyaSandarOoet. al. [12] presented a "Performance Analysis of GPSR and ZRP over TCP and CBR Connection in MANET" describes a collection of nodes that is connected through a wireless medium forming rapidly changing topologies. Each node in the network can act as router as well as host to find paths to exchange information. For finding paths, location based routing protocols have been developed for MANET. In this research paper, the performance of two location based routing protocols GPSR and ZRP has been analysed by means of throughput, end to end delay, packet delivery fraction and routing overhead with varying speed limit and node density under TCP and CBR connection.

VikasSinglaet. al. [13] presented a "Traffic Pattern based performance comparison of Reactive and Proactive protocols of Mobile Ad-hoc Networks" describes primary objective of this research work is to study and investigate the performance measures of Reactive protocols and Proactive protocols routing protocols of MANET using TCP & CBR based traffic models. In this Paper investigate the effect of change in number of nodes on MANET routing protocols. Here, we will analyse and compare the performance of MANET routing protocols based on both CBR and TCP based traffic patterns. We have used the NS-2 simulator for performing various simulations and used awk scripts for analyzing the results.

Jesus A. Perez et. al. [14] presented a "Preliminary Analysis of the TCP Behavior in 802.16 Networks" describes broadband wireless access is gaining a great deal of interest from the networking research community. Particularly, the recently standardized WiMAX presents interesting perspectives, notably due to its capacity to offer consistent bandwidth and therefore consistent Quality of service. In this paper, we present preliminary results of the performance of TCP in a pre-WiMAX network. It is interested in the RTT and the relationship between the delay and packet loss rate, and find that TCP presents an acceptable cyclic behavior but with a high percentage of packet loss.

Ali H. Wheebet. al. [15] presented a "Performance Evaluation of Transport Protocols for Mobile Ad Hoc Networks" describes the Providing of Quality of service. This study provides an analysis and evaluation of the performance for TFRC, UDP and TCP transport protocols in MANET environment. In order to achieve high accuracy results. Moreover, Constant Bit Rate considered as a traffic source and On-demand Distance Vector as the routing protocol. For evaluation performance, QoS metrics such as end-to-end delay, packet delivery ratio, throughput and jitter are measured.

Wasan Ali Hussein et. al. [16] presented a "Performance Comparison of Transport Layer Protocols for Multimedia Application in Wired Networks" describes performance of transport layer protocols for multimedia application in the wired network. More precisely, TCP and UDP Performance are evaluated then compared. Two scenarios implemented to evaluate the performance of the two transport layer protocols, first scenario TCP and UDP are simulated independently. Whilst, TCP, and UDP Simulated Interoperation in the second scenario. Performance evaluated according to the QoS metrics like throughput, packet delivery ratio, fairness, and end to-end delay. This QoS criterion has been determined for each of two transport protocol. Network simulator used to simulate and implement both of TCP and UDP.

Outcome of Literature

Studies from the above papers have outcome that TCP and CBR performance are more accurately evaluated. The two scenarios TCP and CBR are simulated independently here. Performance is evaluated according to QoS metrics such as throughput, packet delivery ratios. This has been set for the QoS criterion. Network simulators better simulate and implement both TCP and CBR. WiMAX network Environment can be used for this.

## III. GENERAL PROBLEM

Wi-Fi technology is used for a limited area. Wi-Fi technology is still using local area networks to forecast the future. Wi-Fi can be used in various handheld devices, with the help of which the devices are connected to the internet or to each other. The reach of Wi-Fi networks is limited to a specific area and has the main problems of network range and

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speeds. This network is only within the specified area. And its installation is limited in some restricted space. Wi-Fi supports limited range and slow speed of broadband access. . These have emerged as the main issues in today's era. Therefore, we have presented a solution to this problem in our work.

## IV. WIMAX

IEEE 802.16 Stands for WiMaX. World Wide Interoperability for Microwave Access is a telecommunication technology designed to provide effective transmission of data using various modes of transmission such as lattice and PMP (point to multipoint). Developed standards and recommended practices to support the development and deployment of networks (wireless-man). IEEE (Institute of Electrical and Electronics Engineers) is an international professional organization about engineering on fields such as aerospace systems, computers, telecommunications, biomedical engineering, etc. WiMAX is a high-performance end to end network protocol. Its features are growth rate, high performance, unbiased QoS, highly secure communication of data with low packet delay. There are two main types of WiMAX services: mobile and fixed. Mobile WiMAX enables users to use the Internet during travel while fixed WiMAX stations provide wireless Internet access to customers within a certain radius. Hence the concept of WiMAX has been introduced to extend the range of the network.

It is also known as standards for microwave access and 802.16 for worldwide differences. It was designed for long distance wireless network connections to provide Internet access in a particular geographic area. It can be installed over a range of 39 miles and more. WiMAX technology is a standards-based wireless technology that is used to provide Internet access and multimedia services to high-end users.

**Reasons for Choosing WiMAX**

- WiMAX caters to a wide variety of requirements. Potential applications include expanding broadband capabilities and providing service providers with a more affordable option for support.
- WiMAX supports very high bandwidth solutions, where large spectrum deployments (ie> 10 MHz) are desired using existing infrastructure, providing the bandwidth needed to support the full range of high-value, multimedia services. While reducing costs.
- WiMAX helps service providers to face many challenges due to the increasing demands of customers without having to give up their existing infrastructure investment as it has the ability to intervene seamlessly across different network types.
- WiMAX, an IP-based wireless broadband technology, can be integrated into both wide-area third-generation (3G) mobile and wireless and wire line networks, making this broadband access solution, anytime, any Time can become part of the seamless.
- WiMAX has the following benefits: cheaper implementation costs, lower monthly running maintenance costs, less impact on faster and easier setup environment, greater scalability for future network expansion, and greater flexibility. WiMAX connection distances can be up to 30 miles (40 km) at data rates up to 64 Mbps using both unlicensed and specs.

**Features of WiMAX**

- **Difference:** The IEEE 802.15 standard is accepted internationally and the standard is maintained and certified by the WiMAX Forum for fixed, portable and mobile deployments and allowing the user to select their product from various certified vendors and differentiate it - Allows freedom to use in different portable or mobile.
- **Long Range:** It covers a distance of up to 30 miles but in practice it covers a distance of only 5 miles. Mobile WiMAX can support both LOS and NLOS connections. For that, it would have to meet the boundary condition for LOS, 40 km and for NLOS, 10 km.
- **Quality of service:** WiMAX Media Access Control QoS is designed to support a large number of users, with multiple connections per terminal, each with its own QoS requirement.
- **Security:** WiMAX has a strong privacy and key management protocol as it uses the Advanced Encryption Standard (AES) which provides a strong encryption policy. It also supports flexible authentication architecture which is based on Extensible Authentication Protocol (EAP) which gives different types of customer credentials including customer usernames and passwords, digital certificates and cards.

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**Applications of WiMAX**

WiMAX provides the ability for a network service provider to deploy new-age broadband service. WiMAX applications are more effective than today. It provides a wider customer base, adding a mobility feature to those services. WiMAX technology is a means of offering data, video, voice, mobile and Internet access to application service providers. WiMAX technology has various benefits such as it providing simple cost-based future cost savings and service efficiency but being able to create and allow VoIP calling, mobile devices, video High Speed Data Transfer.

## V. AODV ROUTING

In November 2001 the Mobile Ad-hoc Networks Working Group for routing of the IEFT community has published the first version of the AODV Routing Protocol (Ad hoc On Demand Distance Vector). AODV belongs to the class of Distance Vector Routing Protocols (DV). In a DV every node knows its neighbors and the costs to reach them. A node maintains its own routing table, storing all nodes in the network, the distance and the next hop to them. If a node is not reachable the distance to it is set to infinity. Every node sends its neighbors periodically its whole routing table. So they can check if there is a useful route to another node using this neighbor as next hop. When a link breaks a Count-To- Infinity could happen.

AODV is an 'on demand routing protocol' with small delay. That means that routes are only established when needed to reduce traffic overhead. AODV supports Unicast, Broadcast and Multicast without any further protocols. The Count-To-Infinity and loop problem is solved with sequence numbers and the registration of the costs. In AODV every hop has the constant cost of one. The routes age very quickly in order to accommodate the movement of the mobile nodes. Link breakages can locally be repaired very efficiently. To characterize the AODV with the five criteria used by AODV is distributed, hop-by-hop, deterministic, single path and state dependent.

Protocol allows mobile nodes to establish routes quickly for new destinations as well as to respond to changes in network topology and link failures as only affected set of nodes are notified. Nodes do not maintain routes to the destinations that are not in active communication. New routes are created on demand. It means control packets are broadcast when needed and hence eliminate the need for periodic broadcast of routing updates. AODV

## VI. DATA TRAFFIC

Data and traffic agents who take responsibility for transporting data across the network are of different types and offer different characteristics in the network [9–11]. It is necessary to understand the characteristics and hence the performance to find the suitability of each type in the network. The two types of data / traffic agent types used in the network are the following:

**TCP / FTP,** in such a traffic scenario, TCP represents the data type and FTP represents the application traffic agent of any application that uses TCP data Transports. Here TCP is a transport layer protocol and FTP is an application layer protocol. This scenario provides a connection-oriented transmission environment, where communication takes place in stages, namely, connection establishment, data transmission, connection termination. There are three basic features offered:

Reliable: TCP / FTP provides reliable communication, as it provides guaranteed data by employing acknowledgments that guarantee the delivery of data to a destination. If approval is not received by the time period, retransmission is performed to ensure delivery of data to the receiver. We can say that positive acceptance, timeout, and retransmission are required to guarantee the delivery of data in a network.

Bi-directional: Here in TCP / FTP, in one direction i.e. in forward direction, the sender transmits data and in the other direction i.e. in reverse direction, receiver accepts by sending acknowledgment to sender. So, this is how bi-directional communication occurs.

Conforming: The network confirms the nature when working with TCP / FTP. The network is analogous in terms of broadcasting as it provides both flow and congestion control. Flow control by preventing overflow of recipient buffer, and crowd control by keeping track of confessions, time outs, and retractions

**UDP/CBR,** This type of traffic generates the data CBR of the UDP type and application traffic agent. Here, the former is a transport layer protocol and the latter is the application layer protocol. It provides transmission of data at a constant bit rate and does not communicate in stages, and traffic moves in one direction from source to destination without any response from the destination. It presents the three basic features mentioned below:

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Unreliable: Network quiet is unreliable because it does not establish communication in stages and does not rely on acknowledgment to recover lost messages. The sender node does not take responsibility for successful delivery of data.
Unidirectional: Since no acknowledgment is transmitted from the receiver, only one way communication is done i.e. over the forward link. The destination does not send any data packets to the receiver, so it provides indirect traffic.
Predictable: UDP / CBR has the approximate nature of transmission, as it provides constant bit rate, fixed and known packet size, fixed and known packet interval, and fixed and known packet stream duration.

## VII. RELATED WORK

This paper evaluates the performance TCP traffic sources with WIMAX. It is technology to provide broadband wireless data access over long distances. It is based on IEEE 802.16 standards. The technology provides basic Internet protocol (connectivity and connection-oriented wireless communication to end users. Its features are high rate, high performance, unbiased QoS, highly secure communication of data with low packet delay. Two The main types of WiMAX services are: Mobile and Fixed. Mobile WiMAX enables users to access the Internet while traveling, while Fixed WiMAX stations provide wireless Internet access to customers within a certain radius. Hence the concept of WiMAX networks Is introduced to extend the range of. The basic WiMAX IEEE 802.16 architecture consists of a base station and a subscriber station. The BS acts as a central unit for transferring all data from an SSP to a PMP mode. Broadcast two through independent channels are: downlink channel (from BS to SS) and uplink channel (from SS to BS).
The transmission control protocol has been used for the data transmission process. The transmission control protocol is often preferred to be applied to the transport layer of mobile ad-hoc networks because of its many wide applications, which take advantage of reliable data transmission in the Internet. The transmission control protocol is a reliable one that maintains an end-to-end connection and is one of the core of the Internet protocol suite responsible for the transmission of Internet traffic and is very efficient for wired or wireless networks. Among the many features of both, the author has therefore evaluated the performance of TCP traffic located in the WiMAX network and with existing energy algorithms.

## VIII. CONCLUSION

Many wireless technologies have been deployed during the last few years. The findings presented in this paper compare those two traffic scenarios TCP / FTP and UDP / CBR. To find suitability from these two available traffics in a network in different environments, the results are compared and necessary conclusions are made. For AODV routing, many authors have presented the changing speed of nodes in a MANET on a traffic model like TCP and CBR i.e. the speed of nodes, this paper is performed based on the performance presented by the traffic pattern. Transmission protocols at the transport layer provide host-to-host communication services such as connection-oriented communication and reliability. User datagram protocol and transmission control protocol are the most popular transport layer protocols for data transmission in a network. However, UDP has no error recovery mechanism, unlike TCP which uses a recovery technique to recover missing data. We saw that TCP performed better than CBR traffic.

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