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PERFORMANCE ANALYSIS OF DIFFERENT TRAFFIC SOURCES TCP AND CBR IN AODV MANET

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Abstract:

Worldwide Interoperability for Microwave Access is one of the latest technologies in the Wire-Less World. WiMAX networks incorporate several qualities of service (QoS) mechanisms at the Media Access Control level for guaranteed services for data, voice and video. WiMAX promises to deliver the internet throughout the globe connecting the last mile of communication services. WiMAX provides solution to constantly increasing demands for broadband wireless applications. Using WiMAX increased bandwidth and range of Wireless area. This paper tries to explain the architectural performance issues of WiMax over different traffic sources like as TCP and CBR in AODV Mobile Ad hoc network. A comparison on the performance of for Mobile WiMAX environment is done. The performance matrix includes Packet Delivery fraction, End to End Delay, and number of packet dropped were identified. The study used NS2 simulator for the comparison on the performance analysis.

Key Words: TCP, CBR, AODV, MAC/802.16 & NS-2

1. Introduction:

Mobile ad hoc network is a collection of wireless mobile nodes dynamically forming a network topology without the use of any existing network infrastructure. Wireless access techniques are continuously expanding their transmission bandwidth, coverage, and Quality of Service (QoS) support in recent years. With the huge market success of Wireless Local Area Networks the new-generation wireless technique, WiMAX has now been standardized and deployed WiMAX stands for Worldwide Interoperability for Microwave Access [1]. The IEEE 802.16 standards provide wireless broadband internet for the "first-mile to Last-mile" or "First point to last point" connection. They are also known as Wi-MAX standards. Wi-MAX is based on wireless metropolitan area networking. It provides very high data throughput over long distance in a point to multipoint. Wi-MAX can provide wireless services up to 20 or 40 miles away from the base station. This technology aims to provide broadband wireless access to residential and small business applications, as well as to enable internet access in countries without any wired infrastructure [5].

IEEE 802.16 working group has developed a number of standards for WiMAX. The first standard IEEE 802.16 was published in 2001 and after this adds features and improved performances. WIMAX stands for Worldwide Interoperability for Microwave Access. It is the technology aimed to provide broadband wireless data access over long distances. Theoretically IEEE 802.16 can provide single channel data rates up to 75 Mbps on both the uplink and downlink. Downlink channel (from Base Station to Source station and Uplink channel from Source station to Base Station. Uplink channel is shared by all SSs while Downlink channel is used by Base Station. Providers could use multiple IEEE 802.16 channels for a single transmission to provide bandwidths of u to 350 Mbps [2]. IEEE 802.16-2004, has been developed to expand the scope to licensed and license-exempt bands from 2 to 11 GHz. IEEE 802.16-2004 specifies the air interface.

The rest of this paper is organized as follows; section II discusses the used routing methodology. In section III, IV, and V we present the details of WiMax, traffic and mobility. In last sections performance matrices, simulation parameter and

simulation model. We then evaluate our protocol and present the results in section VIII. Finally, section IX provides our conclusions and then last section X is References.

2. AODV Routing Protocol:

This protocol is based on on-demand routing. This protocol consists of two phases Route Discovery and Route Maintenance. Route discovery process starts on demand by the source. When a source node desires to send a message to some destination node and does not already have a valid route to that destination, it initiates a route discovery process to locate the other node. It broadcasts a route request (RREQ) packet to its neighbors, which then forward the request to their neighbors, and so on, until either the destination or an intermediate node with a fresh enough routes to the destination is located.

The second phase of the protocol is called route maintenance. AODV only supports the use of symmetric links. Routes are maintained. If a source node moves, it is able to reinitiate the route discovery protocol to find a new route to the destination. If a node along the route moves, its upstream neighbor notices the move and propagates a link failure notification message to each of its active upstream neighbors to inform them of the erasure of that part of the route. These nodes in turn propagate the link failure notification to their upstream neighbors, and so on until the source node is reached. The source node may then choose to reinitiate route discovery for that destination if a route is still desired.

3. Wimax:

Worldwide Interoperability for Microwave Access is a technology that bridges the gap between fixed and mobile access and offer the same subscriber experience for fixed and mobile user. WiMax is a high performance end to end network protocol. Its features are increased data rate, high performance, fair QoS, highly secured communication of data. WIMAX stands for Worldwide Interoperability for Microwave Access. It is the technology that provides effective broadband wireless data transmission over long distances. It is based on IEEE 802.16 standards and the standard defines only the physical layer and MAC layer functionalities. Broadband Wireless Access (BWA) provides unpromising solution for “last mile” access technology to provide high speed connections. IEEE 802.16 standard for BWA and its associated industry consortium, Worldwide Interoperability for Microwave Access forum promise to offer high data rate over large areas to a large number of users where broadband is unavailable. This is the first industry wide standard that can be used for fixed wireless access with substantially higher bandwidth than most cellular networks. The technology provides basic Internet Protocol connectivity and connection less and connection oriented wireless Communications to the end users.

4. Traffic and Mobility:

Traffic: Traffic Patterns describe how the [8] data is transmitted from source to destination. The widely used traffic pattern in CBR and TCP.

Constant Bit Rate: The qualities of Constant Bit Rate traffic pattern are Unreliable, Unidirectional and Predictable.

Transmission Control Protocol: In such a traffic scenario, TCP represents the data type. The three basic characteristics offered are Reliable, Bi-directional and conforming.

5. Simulation Parameters:

Simulation Parameters is as follows

Parameter	MAC-802.16 (WiMax)	
	TCP	CBR
Traffic Agent Type	FTP	UDP
Channel	Wireless	Wireless
Network Size	1200x500m	1200x500m
Routing Protocol	AODV	AODV
Number of Nodes	50	50
Node Placement	Random	Random
Simulation time	100s	100s
Mobility Model	Random Way Point	Random Way Point
Connection rate	2 Mbps	2 Mbps
Pause Time	1.0s	1.0s
Seed	1	1
Maximum Speed	10 to 50 m/s	10 to 50 m/s
Simulator	NS-2.31	NS-2.31

6. Performance Metrices:

We report performance metrics for the protocols:

Packet Delivery Ratio (Fraction): It is calculated by dividing the number of packet received by destination through the number packet originated from source**.**

$$PDF = (Pr/Ps)$$

Where Pr is total Packet received and Ps is the total Packet sent.

Average End to End Delay: It is defined as the time taken for a data packet to be transmitted across an MANET from source to destination.

$$D = (Tr - Ts)$$

Where Tr is receive Time and Ts is sent Time.

Normalized Routing Overhead: It can also be defined as the ratio of routed packets to data transmissions in a single simulation. It is the routing overload per unit data delivered successfully to the destination node

Packet loss (%): Packet loss is the failure of one or more transmitted packets to arrive at their destination.

7. Simulation Model:

In this section, The Simulation environment consists of an area of 1200x500, where randomly 50 mobile nodes are placed. A source and a destination is selected randomly. Data sources generate data according to CBR and TCP traffic pattern. Source destination pairs are spread randomly over the network. A packet size of 512 bytes is used. Mobility pattern of the mobile nodes is generated using Random waypoint model. By observing the performance of the network under mobility we can test the stability of design in real time scenario with varying speed. Data rate of 2Mbps is used [6, 9].

8. Simulation Results Analysis:

In this section shows the result using X graph with discussion:

A significant researched on TCP have been carried over wireless network. But, many of them related studies are limited to the cases with only one wireless link. The behaviors of TCP still have not well understood in the multi-hop wireless networks. In this traffic and mobility scenarios play an important role in evaluating the performance of these networks, despite comment and belief from various researches on TCP's weaknesses on MANET. In this work to evaluate the performance of CBR over TCP on MANET using AODV routing protocol. Although CBR and TCP have significant different manufacture behavior on MANET the overall metrics results with varying maximum speed show below by using graph: The purpose of this paper is to compare the

performance of TCP and CBR traffic in AODV Mobile Ad hoc network. When the TCP protocol is used there is a "guaranteed delivery". The CBR service category is used for connections that transport traffic at a consistent bit rate, where there is an inherent dependence on time synchronization between the traffic source and destination. Simulation results have also shown the difference characteristics of the MANETs routing protocols where the on-demand protocols performs show the result in metrics namely Packet Delivery Fraction (PDF) and Average end-to-end delay by varying Simulation.

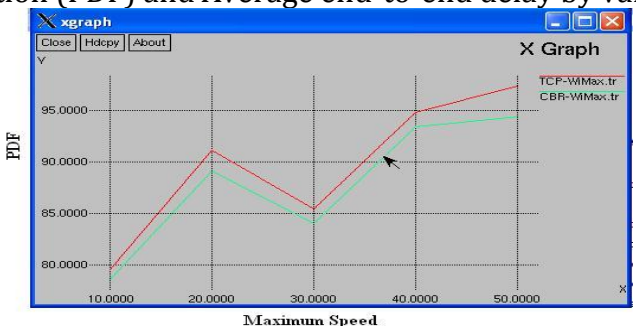

Figure 1: Packet Delivery Fraction with varying maximum speed

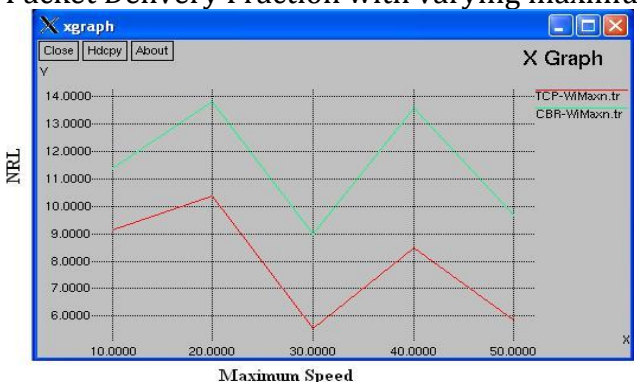

Figure 2: Normalized routing Load with varying maximum speed

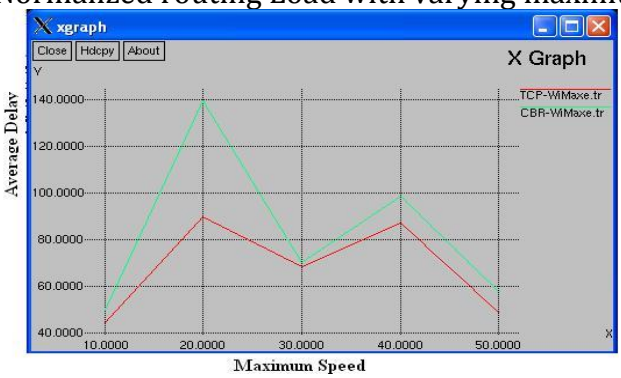

Figure 3: Average End to End Delay with varying maximum speed

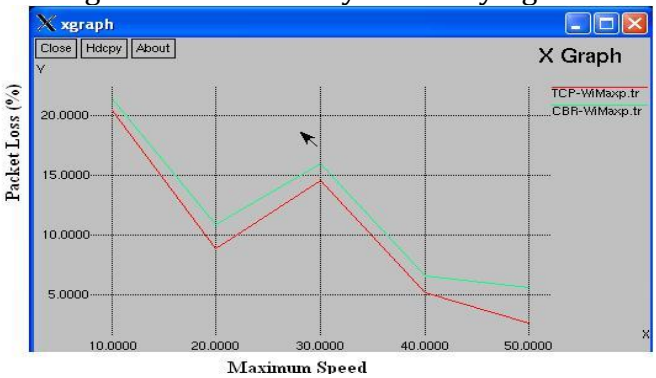

Figure 4: Packet Loss (%) with varying maximum speed

9. Conclusion:

In this paper evaluated and analyze the performance of WiMAX over WiFi through Network simulator NS-2 in AODV MANET. The data traffic received with different traffic sources TCP and CBR, Network Traffic Load and delays were measured. By using wimax technology effective data transmission average end to end delay and network traffic load very low. The analysis of TCP results are better compare than CBR Results. The overall result shows using x graph in the section of simulation and results.

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