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INVESTIGATE THE PERFORMANCE OF WIMAX OVER WIFI USING DSR ROUTING PROTOCOL

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Abstract:

This work presents an existing wireless technology Wi-Fi and WiMAX. These works try to compare the performance of Wi-Fi and WiMAX, and which technology provides a better solution to build a wireless access infrastructure. In this work, we investigate the performance of 802.16 WiMAX over WiFi environment is done under varying mobility conditions. By using DSR routing protocols analyzed the performance of Mac/802.11 and Mac/802.16 using simulation for mobile ad hoc networks discover and maintain only needed the design and follows the idea and compare various parameters like as packet Delivery Fraction, average end to end delay, normalized routing load and Packet Loss with varying maximum Speed. These simulations are carried out using the ns-2 Network simulator.

Key Words: CBR, AODV, MAC/802.11 & MAC/802.16, NS-2

1. Introduction:

In the 1990s, data transmission went into the wireless era. Wireless transmission includes Bluetooth, Infrared, RF, IEEE 802.11, IEEE 802.16 and 3G. Currently there are several competing communication technologies for providing wireless Internet access. The primary competitors are 3G, Wi-Fi (IEEE 802.11) and WiMax (IEEE 802.16). 3G is a cellular technology and is currently evolving into all-IP network. Wi-Fi is a wireless local area network technology designed for home and small area implementations. WiMax is a wireless metropolitan area network technology which can cover larger area and support mobile Internet access at speeds up to 120km/hr. Each individual technology is designed for a particular application, but their capabilities at least partially overlap. WiMax is a newer technology that promises longer ranges and mobile access. Wi-Fi has been used for ten years, but has recently been implemented in campus-wide and city-wide networks.

In recent years due to the immense demand for internet access and cellular services has led to the Demand of communication standard which provides high data rate, coverage and mobility. Broadband wireless access is increasingly gaining popularity as an option for the last mile connection replacing cable modems and DSL connections [21]. To be specific, WiMAX, the IEEE 802.16 standard, came as a follow-up to the successful 802.11 wireless local area network (LAN) standard; with deployments of the IEEE 802.16 wireless metropolitan area network (MAN) standard. The standard offers both fixed broadband wireless access for rural as well as remote areas, and also provides mobility for users to support portable devices.

The rest of this paper is organized as follows; section II discusses the used routing methodology this work in the area of multipath routing. In section III, IV, and V we present the details of Wifi, 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 IX. Finally, section X provides our conclusions and then last section XI is References.

2. DSR Routing Protocol:

Dynamic source routing is an on-demand routing protocol for wireless ad hoc networks. DSR is based on the concept of source routing [2,]. DSR is a reactive unicast

protocol implementing source routing. In which a source node indicates the sequence of intermediate routes in the header of a data packet. Like other on-demand routing protocols, the operation of DSR can be divided into two procedures: route discovery and route maintenance.

Route discovery starts only on demand by broadcasting a new Route Request message tagged with a unique Request ID set by the source. The Request ID, with the source node address, helps nodes to be aware of and discard any duplicate Route Requests. When receiving a non-duplicate Route Request, if the node is neither the destination nor a node with a valid route to the destination, it appends its own address into the message and re-broadcasts it to its neighbors; otherwise, the node can send back a Route Reply with a complete and ordered list of intermediate nodes from the source to the destination.[19]When a node needs to send a packet to some destination, it first checks its route cache to determine whether it already has an up-to-date route to the destination. If no route is found, the node initiates the route discovery procedure by broadcasting a route request message to neighboring nodes. This route request message contains the address of the source and destination nodes, a unique identification number generated by the source node, and a route record to keep track of the sequence of hops taken by the route request message as it is propagated through the network. When an intermediate node receives a route discovery request, it checks whether its own address is already listed in the route record of the route request message. If not, it appends its address to the route record and forwards the route request to its neighbors. The formation of the route record as the route request propagates through the network

Route maintenance uses route error messages and acknowledgement messages. If a node detects a link failure when forwarding data packets, it creates a route error message and sends it to the source of the data packets. The route error message contains the address of the node that generates the error and the next hop that is unreachable. When the source node receives the route error message, it removes all routes from its route cache that have the address of the node in error. It may initiate a route discovery for a new route if needed. In addition to route error message, acknowledgements are used to verify the correct operation of links. To reduce the route search overhead, an important optimization is allowing an intermediate node to send a route reply to the source node if it already has an up to- date route to the destination.

3. WiFi:

WiFi stands for a short-range wireless transmission technology. Wi-Fi technology builds on IEEE 802.11 standards and still using local area network. WiFi is a technology means to interconnect devices using wireless medium such as Laptops, smart phone etc. It is a service of wireless network communication technology which is held by the WiFi Alliance. The purpose is to improve the interoperability between wireless network products based on the IEEE802.11 standards. Generally, to set up a wireless network, an access point and wireless network adapters are the basic necessity. This way it can use the wireless medium and coordinate with the structure of the existing wired network to share network resources. Cost of this network compare the traditional wired network is Low.

4. WIMAX:

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. The technology provides basic Internet Protocol connectivity and connection less and connection oriented wireless

Communications to the end users. 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.

5. Traffic and Mobility:

- **Traffic**: - Traffic Patterns describe how the [8] data is transmitted from source to destination. The widely used traffic pattern in CBR.
- **Constant Bit Rate -** The qualities of Constant Bit Rate traffic pattern are
- **Unreliable:** It has no connection establishment phase; there is no guarantee that the data is transmitted to the destination.
- **Unidirectional:** there will be no acknowledgment received from destination for confirming the data transmission.
- **Predictable:** In transmission fixed packet size, fixed interval between packets, and fixed stream duration.

6. Simulation Parameters:

Simulation Parameters is as follows

Parameter	Value
MAC Layer	MAC/802.16, MAC/802.11
Traffic Type	CBR
Simulation Time	100 sec.
Number Of Nodes	50
Pause Time	10s
Maximum Connection	20
Maximum Speed	10 to 50 m/s
Transmission Rate	2.0 packets per second
Area of Networks	1500m X 800m

7. 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.

8. Simulation Model:

In this section, The Simulation environment consists of an area of 1500x800, where randomly 50 mobile nodes are placed. A source and a destination is selected randomly. Data sources generate data according to Constant bit rate 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 Maximum speed 10 to 50 m/s. Data rate of 2Mbps is used [6, 9].

9. Simulation Results Analysis:

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

Figure 1: Packet Delivery Fraction with varying maximum speed

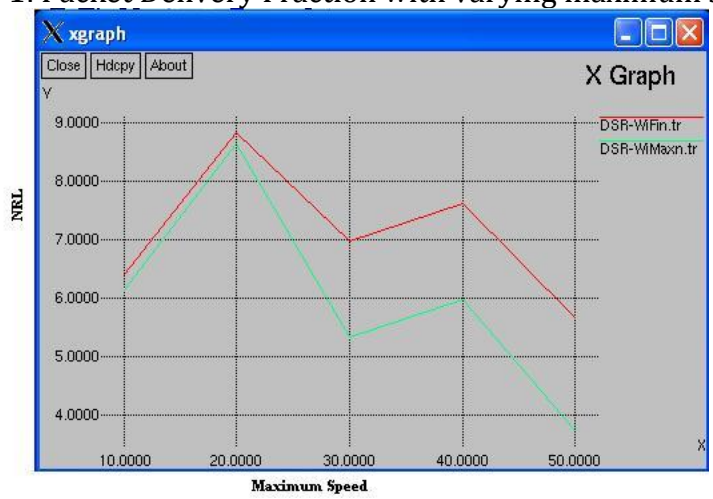

Figure 2: Normalized Routing Load with varying maximum speed

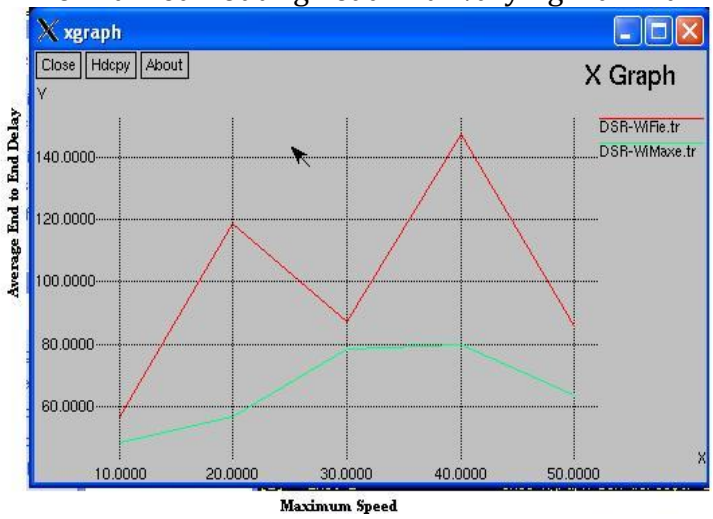

Figure 3: Average End to End Delay with varying maximum speed

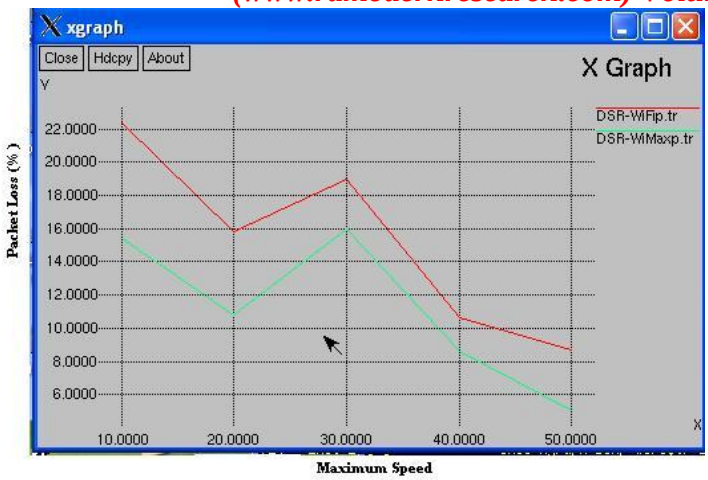

Figure 4: Packet Loss (%) with varying maximum speed

Fig. shows the simulation screen in which 50 packets are sent and received properly. Here, in this packets are transmitted between the source and destination with WiFi and WiMax using DSR routing protocol. The average values for each parameter discussed above. It has been observed from the simulation scripts. The overall point the less delay, low packet loss compare than WiFi performance in WiMax Network compare WiFi Network is better for comparing all parameters.The all graph shows the performance of DSR routing protocol for WiMax and WiFi means 802.16 and 802.11.

10. Conclusion:

In this research paper we evaluated and analyze the performance of WiMAX over WiFi through Network simulator NS-2 using Reactive DSR Routing Protocol. The data traffic received, 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 overall result shows using x graph in the section of simulation and results. The PDF is better so packet loss is reduced and finds the better results WiMax over WiFi.

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