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Improving the Performance of WIMAX Using Various Routing Protocols

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Abstract-- Worldwide Interoperability for Microwave Access (Wimax) is one of the upcoming generations (4G) promising networks to cover some of the consumers' needs. It is an promising technology that is intended to deliver fixed, and more newly, mobile broadband connectivity. It is an upcoming technology it is mainly intended to overcome the drawbacks of previous version. It is developed mainly due to the coverage area is larger compare all other networks, high data rates, it is easily deployable and guaranteed Quality of service. In this paper our focus on the performance of Wimax in proactive, reactive and hybrid routing protocols by considering the parameters like throughput, average jitter, average end-to-end delay and finally packet delivery ratio.

Keywords-- Wimax, QoS, Proactive, Qualnet, Throughput.

I. Introduction:

The IEEE 802.16 standard has been planned as an access network to complete the user needs of multimedia applications. WMAN provides cost efficient infrastructure to service providers and promised QoS to end users without growing the difficulty in the core network as well as at the user side Wimax is simple to deploy and put together with the active IP core network, which acts as a backbone infrastructure. The IP core offers the support of advanced technologies and protocols to Wimax that fulfils the necessary Quality of Service (QoS) and security features. Wimax promises to convey the internet throughout the globe connecting the last mile of communications services. It can also work in the point-to-point backhaul trunk with the capacity of transmission over 72mbps and also it covers the range up to 30miles. The key advantage of the Wimax is that providing high bandwidth with QoS deployed over large area. Wimax supports multimedia application like video conferencing and online gaming. It is based on the WMAN that is wireless metropolitan area networking. Wimax provides constantly increasing demands on the broadband networks. Results indicate that better quality of service is achieved by using service flows designed for specific applications. The data rate degrades slightly when the distance between base station and Mobile station is more than 10000 meters. This paper is done using simulator Qualnet 5.0.2. It overcomes the drawbacks of previous networks. It is an improved version compare to 3G networks or wireless LAN networks easy access and low cost. To reduce the capacity of Wimax channel the source of noise is introduced to achieve the jamming. Jamming is detected in Wimax communication by hearing the receiving equipment. Wimax device selection criteria over four key attributes they are,

- Performance
- Convenience
- Control
- Reliability

A. PERFORMANCE:
High performing Wimax devices not only develop the connections that individual end-user receives, but also improve the use the system resources, the system capacity also be improved, and finally decrease the number of supporting sites in a coverage area.
B. CONVENIENCE:
While an end-user activates his device for the primary occasion, he should effortlessly achieve a trouble-free, broadband connection. Now it is important, each following time he logs on to the service he should experience a reliable, speedy verification. This type of fulfilling end-user experience will give to customer loyalty over the long-term.
C. CONTROL:
The operators of the networks should have complete control over their network and the control management. Wimax device manufacturers should need to support industry leading device management standards to tender all operators the chance to effectively control their device population without adding needless systems difficulty and cost overhead.
D. RELIABILITY:
In this system the operators of the Wimax should know about their concern for the selected Wimax devices generally supported by the high quality management process and testing is consider as an rigorous process.

II. Proactive Routing Protocols:

In this proactive routing, every node has a routing one or more routing tables is maintain to contain the newest information for the routes to any other node in the network. The table driven protocols will vary in the way how the information is propagates all the way through each node in the network will react at a time when the topology changes. In this paper protocols we have consider is OLSR (Optimized link state routing).

A. Optimized link state routing (OLSR):

In these proactive routing protocols all routes are available when it is needed by the protocols. It is an optimized version of untainted link state routing. The flooding is caused due to the topological changes in the network. The topological information will cause the available information in the network. Multipoint relays are used in order to reduce the possible control overhead in the network. Decreasing the time interval in between control messages the broadcast brings the additional reactivity to the topological changes. Hello and topology control are the two kinds control messages used in the OLSR. The link status and hosts neighbour are two in sequence the hello message can find the network. Topology control messages are used for broadcasting information about its own advertised neighbours, which includes at least the MPR selector

III. Reactive Routing Protocols:

The reactive routing protocols is also known as on demand protocols because there is no need to maintain the routing information or routing activity for the network there is no need of communication. If a node wants to send a packet to another node than the protocol wants to searches for the route for sending the packets in an on-demand manner. The reactive protocols are Dynamic source routing (DSR).

A. Dynamic source routing (DSR):

In dynamic source routing the source node sends route request to all the nodes at the wireless transmission range. It is mainly based on the two mechanisms one is route discovery and one route maintenance. The source and the target is recognized by the route request packet. If there is any problem in finding the route the destination will generate its own route discovery mechanism in order to achieve the source. When the sources do not have a routing path to the destination, then it performs a route discovery by flooding the network with a route request (RREQ) packet. Any node that has a path to the target in query can reply to the RREQ packet by sending a route reply (RREP) packet. The reply is sent using the route recorded in the RREQ packet. The compensation of this routing is to provide multiple routes and stay away from loop formation where as drawbacks are large end-to-end delay, scalability trouble caused by flooding and source routing mechanisms.

IV. Hybrid Routing Protocols:

The hybrid routing protocols is the combination merits of proactive and reactive routing protocols by overcoming the disadvantages. The hybrid routing protocol we consider the Zone routing protocols (ZRP).

A. Zone routing protocols:

The proactive routing protocol uses excess bandwidth in order to maintain routing information, while reactive routing protocol uses long request delays for determination. It overcomes the drawbacks of proactive and reactive routing protocols. There are two types zone routing protocol they are Intra zone routing protocols and Inter zone routing protocols. For node inside the routing zone it is called as intra zone routing is used for proactive schemes. For node outside the routing zone it is called as inter zone routing is used for reactive schemes. ZRP decreases the proactive capacity to a zone centred on each node. In a partial zone, the maintenance of routing information is simple. The routing information is maintained only for the nodes within the routing information. It is the first hybrid routing protocol which has both proactive and reactive component. The performance of the routing protocols like proactive routing protocol OLSR is used, for reactive routing protocol DSR is used and finally hybrid routing protocol ZRP is used.

V. Simulation Model And Platforms:

In this paper network simulator we have used is Qualnet and the version is 5.0.2. To evaluate the performance like proactive (OLSR), reactive (DSR) and hybrid (ZRP) routing protocols for Wimax. The MAC protocol used in this work is 802.16. The performance will calculate using with mobility and without mobility. The simulation are carried out through node densities 25, 50 75, 100. The parameters we have consider is that throughput, average jitter, average end-to-end delay and packet delivery ratio. For the simulation model we have used dimension area 1000m x 1000m. The channel frequency used for this network 2.4Ghz. The radio type we have used is 802.16. The simulation is performed using the network simulator Qualnet 5.0.2 these are simulation parameter we used in this scenario to develop the network. This is the simulation scenario for protocols we used in this paper in order to identify which protocols gives better output when compare to other two.

Table.1 Simulation parameter:

Routing protocols	DSR, OLSR, ZRP
Radio type	802.16
No. Of Channels	One
Channel frequency	2.4 GHz
Simulation time	300s

Simulation area	1000m x 1000m
No of nodes	25, 50, 75, 100
Simulator	Qualnet

VI. Results And Discussions:

In this work various performance of routing protocols with node densities using the Qualnet simulator 5.0.2 with different node densities such as 25, 50, 75, 100. The simulation area used for this network is 1000m x 1000m, the number of channels used in this scenario is one. The fig-1 shows that the representative snapshot of Qualnet 5.0.2 simulation scenario of 100 nodes.

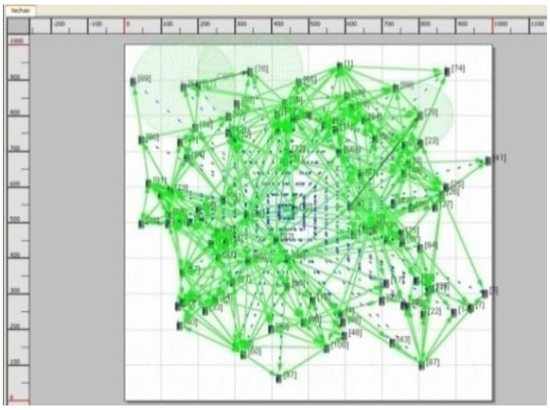

Fig-1:Snapshot for the simulation scenario.

The IEEE 802.16 for Wimax is used as the MAC layer protocol. In this scenario constant bit rate (CBR) is applied between source to the destination. The nodes are placed randomly over the region of 1000m x 1000m.

A. THROUGHPUT:

There are different routing protocols with different node densities such as 25, 50, 75, 100. This graph indicates that throughput for three protocols with respect to Wimax. From this graph we have identified that the OLSR will give better results when compare to others.

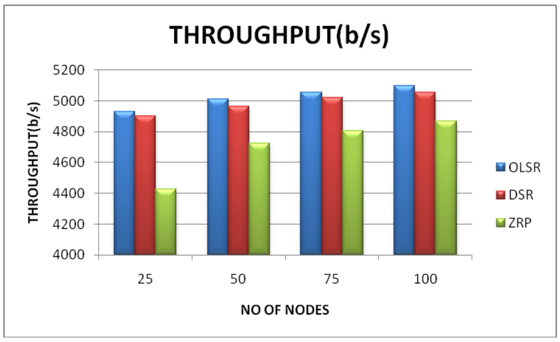

Fig-2: Throughput for three protocols OLSR, DSR, ZRP.

B. AVERAGE JITTER:

There are different routing protocols with different node densities such as 25, 50, 75, 100. This graph indicates that avearge jitter for three protocols with respect to Wimax. From this graph we have identified that the OLSR will give better results when compare to others.

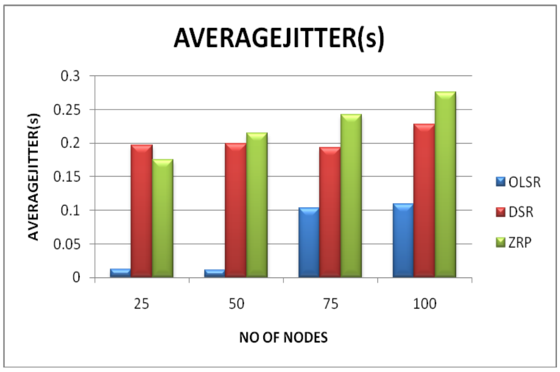

Fig-3: Averagejitter for three protocols OLSR, DSR, ZRP.

C. AVERAGE END-TO-END DELAY:

There are different routing protocols with different node densities such as 25, 50, 75, 100. This graph indicates that avearge end-to-end delay for three protocols with respect to Wimax. From this graph we have identified that the OLSR will give better results when compare to others.

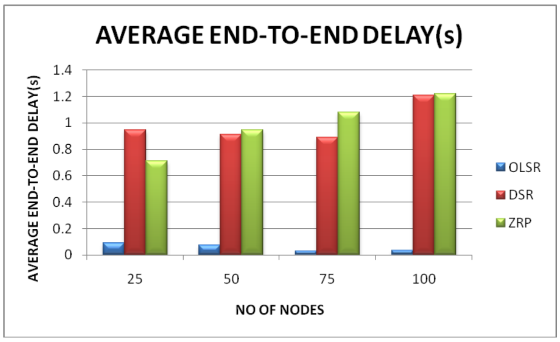

Fig-4: Average end-to-end delay for three protocols OLSR, DSR, ZRP.

D. PACKET DELIVERY RATIO:

There are different routing protocols with different node densities such as 25, 50, 75, 100. This graph indicates that packet delivery ratio for three protocols with respect to Wimax. From this graph we have identified that the OLSR will give better results when compare to others.

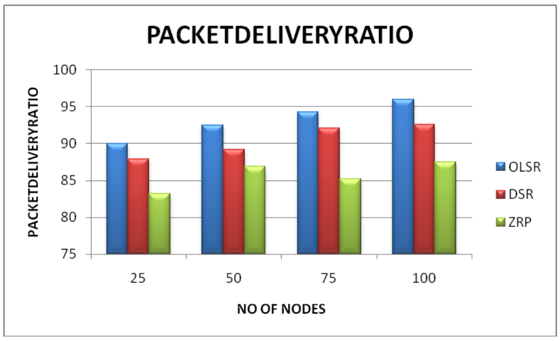

Fig-5: Packet delivery ratio for three protocols OLSR, DSR, ZRP.

VII. Conclusion:

From this output we have identified that the OLSR that is optimised link state routing will give better ouput in all the four parameters we consider for this paper. The OLSR is suited for the Wimax networks. The other two protocols we used in this paper is giving better results but not equal to the OLSR protocol.

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