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Performance Analysis of AODV and QAODV Protocol

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Abstract: *Mobile Ad-Hoc Network (MANET) is an active research area these days. In this paper AODV protocol is extended by adding Quality of Service constraint on AODV. The two protocols i.e. AODV and QAODV, are then compared on parameter metric such as Packet delivery ratio, Average end-to-end delay, Total dropped packet and Throughput.*

Keywords: *MANET, AODV, QAODV, Performance Metrics, NS2.*

1. INTRODUCTION

Mobile Ad-Hoc Network (MANET) is an infrastructure-less, multi-hop network. The nodes in these network are mobile nodes such as mobile phones, laptops etc.In these networks , as the nodes are mobile hence topology of the network changes dynamically. For providing communication in such network routing protocols are used. The main aim of using MANET is to provide communication in the areas where the infrastructure for communication cannot be built i.e. in military rescue operation, emergency situations etc.

1.1 Types of Routing Protocols

1.1.1. Table-Driven Routing Protocol-(Proactive Protocol)

In this type of protocol, every node maintains the topological information of the network in its routing table. When the network topology changes the nodes propagate update messages throughout the network in order to maintain consistent and up-to-date routing information. Thus when the route is required for source to destination, such routing information are used.

1.1.2. On-Demand Routing Protocol-(Reactive Protocol)

In this type of protocol, nodes maintain the routing information only on-demand. Here the route request packets are generated and flooded throughout the network only when a route to an unknown destination is required.

1.1.3. Hybrid routing protocol proactive/Reactive Protocol)

This type of protocol combines the merits of reactive and proactive protocol. It has the characteristics of adaptive to network conditions [1][2].The key concept used in this protocol is to use a proactive routing within a zone in the r-hop neighbourhood of every node and use a reactive routing for nodes outside this zone.

2. OVERVIEW OF AODV

Ad-Hoc On Demand Distance Vector Routing(AODV) is a reactive routing protocol that searches for the route only when the two nodes wishes to communicate. When a node wants to send the data to a destination whose route is unknown, the source node firstly broadcasts the Route Request Packet(RREQ) as shown in figure 1.The intermediate nodes after receiving RREQ packet ,updates their routing tables for reverse route. When RREQ packet reaches the destination node, the destination node generates the Route Reply Packet(RREP) and traverses it to reverse route. As the RREP packet traverses back to the source node, the intermediate nodes updates the forward route to destination in their routing tables. When a link failure occurs because of moving away or getting down of any intermediate node, Route Error Packet (RERR) packet is generated and propagated by the upstream neighbour of that

node to source node using corresponding route.

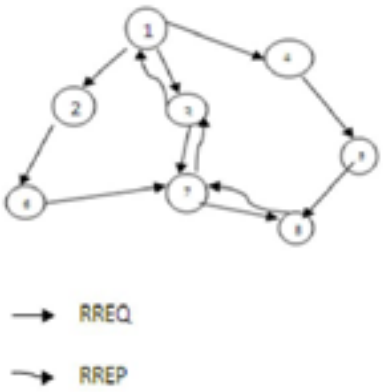


Figure 1. R*oute Discovery Cycle*

AODV has characteristics like simplicity, low computational cost, and low processing overhead[3].The main advantages of AODV protocol is its reactive nature, which reduces the routing overhead in the network and use of sequence number that determines whether the routing information is up-to-date and it also prevents lopping

3. Overview of QAODV

Quality of service Ad-Hoc on Demand Distance Vector Routing Protocol (QAODV) is an extension of AODV protocol. In QAODV the message field can be extended by adding fields like data rate, delay etc in order to improve the parameter metrics.

In this paper the simulations are performed by adding data rate constraint as an additional field in the RREQ packet. Every node after receiving the RREQ packet, verifies if it can satisfy the condition, if not then it discards the RREQ packet otherwise writing the RREQ entry into its table flood the packet again into the network.

4. Simulation and Result

4.1 Performance Metrics

The performance of AODV and QAODV protocol is measured on the basis of below parameter metrics.

1.Packet Delivery Ratio = It is the ratio of successfully delivered packets to destination, to the packets generated by the source for that

Destination.

2)Throughput = This is the effective share of bandwidth that the application is getting from the network.[4]

3) Average End to End Delay=It is the ratio of time difference between data packet received and sent, over the total number of data packets received. This end-to-end delay includes all possible delays in the network caused by route discovery latency, retransmission by the intermediate nodes, queuing delay, processing delay and propagation delay.

4)Packet Loss Ratio : It is the ratio of total dropped packets during transmission.

Table 1. *Simulation Scenario*

Parameter	***Value***
Simulator	NS2
Area	500m X 400m
Node Placement	Random
Number Of Nodes	20,40,60,80,and so
	on upto180
Channel type	Wireless Channel
Queue Length	50
Simulation Time	120 sec

4.2 Result and Analysis

The implementation of AODV and QAODV is done on NS2.

Figure 2 shows Packet Delivery Ratio versus No. of Nodes. Packet Delivery Ratio of QAODV is better than AODV. The data packet in QAODV has additional field i.e data rate field in its header, and. during simulation, every node is verified if it can satisfy the need of the packet and then the packet is transmitted. Whereas in AODV protocol, with increase in no. of nodes due to traffic,the collision and loss of packets occur

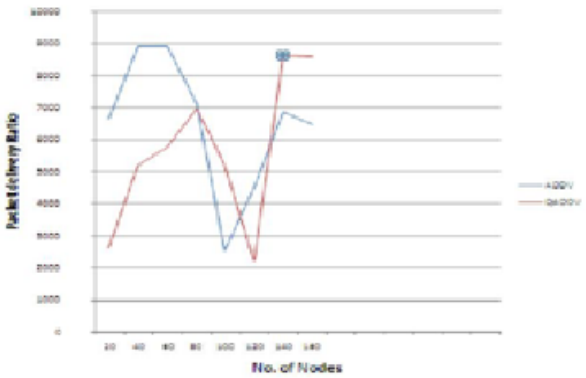


Figure 2. *Packet Delivery Ratio v/s No. of Nodes*

Figure 3 shows Average End-to-End Delay versus No. of Nodes. During simulation we found that when the number of nodes increases in the network, average end-to-end delay increases in QAODV in comparison to AODV. The reason behind this is the exchange of hello messages during the transmission of the data packets. Hello messages have higher priority than data packets.

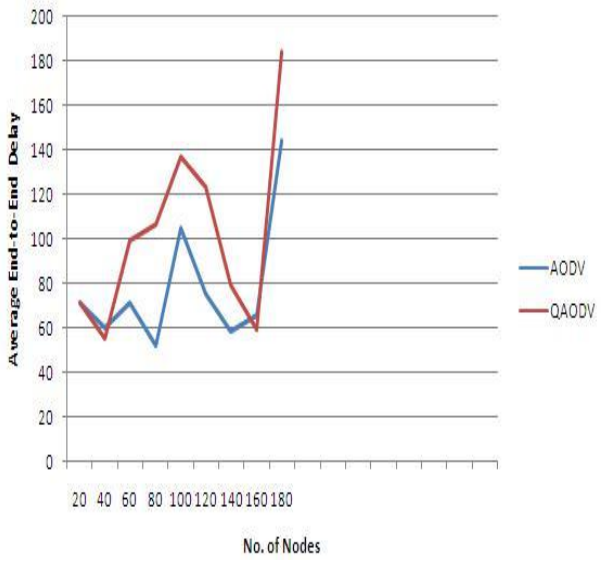
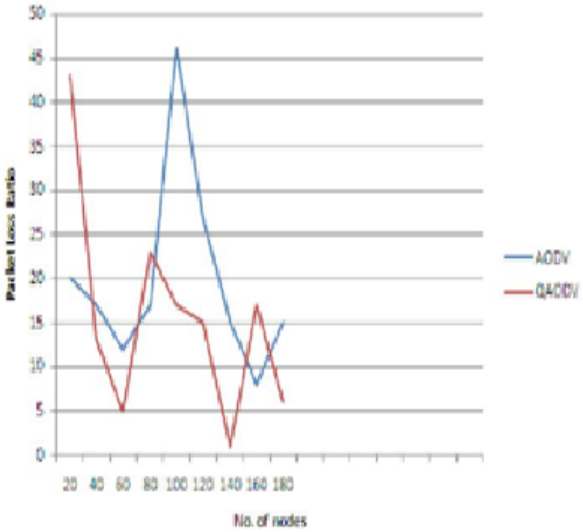


Figure3. *Average End-to-End Delay v/s No. of Nodes*

Figure 4 shows Packet Loss Ratio and Number of Nodes. When the node density increases in the network, packet loss probability decreases in QAODV in comparison to AODV.

Figure 4. *Packet Loss Ratio and Number of Nodes*

Figure5 shows the variation of throughput in



AODV and QAODV. Throughput in QAODV is moderately same as AODV

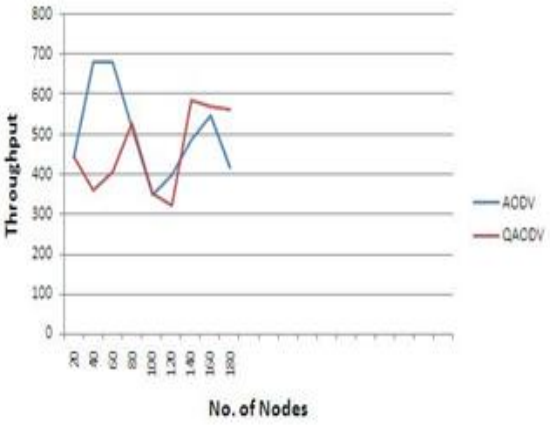


Figure 5. *Throughput v/s No. of Nodes*

5. CONCLUSION

Data rate metric is considered as an additional metric in Quality of service, in improved AODV protocol. This QoS has shown improvement in PDR, and total dropped packet with increasing number of nodes in the network. But due to exchange of Hello Messages, End-to-End delay increases in QAODV. Thus in future scope, focus can be on improving end to end delay.

During simulation traffic is considered to be real time having same priority but in real life, traffic have different priorities. Hence simulation on different priorities can be considered in future work.

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