A Proposed Scenario for Performance Evaluation (QOS) of DSR, AODV and MP-OLSR Routing Protocols in MANETs

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Abstract - *MANET (Mobile Ad-Hoc Network) is an interconnection of similar and different kinds of nodes in a systematic way. These nodes are dynamically created as per the requirement and capable to communicate with each other without help of any infrastructure based centralized system. Since these nodes are basically communicating devices like mobile, tablet etc, so that it can create various quality of services issue regarding the performance of networks. Routing is basically main challenging issue in mobile ad-hoc network. Routing protocols are efficiently improving the quality of services in terms of better throughputs, packet delivery fraction and lesser end to end delay. The basic purpose of this analysis behind, the comparison of routing protocol regarding various qualities of services parameters for improving QoS. Simulation results prove that the proposed scenario gives better analysis of evaluation quality of services of routing Protocol in MANET.*

Key Words: Mobile ad-hoc Network, DSR, AODV, MPOLSR Routing Protocols.

1. INTRODUCTION

MANET is highly adaptable network, where so many nodes can be freely move and Connect with others node without any fixed infrastructure. In MANET,[1] the purpose of this routing protocol, is to maintain the way in which nodes are itself decide how to detect, connect and transfer the packets to other nodes. These protocols are primarily categorized as proactive, reactive and hybrid protocols. *Proactive protocols* maintains all the possible path between all existing nodes similarly In *Reactive protocols*, only communicating nodes are connected with supporting nodes which they are explicitly needed to forward the packets and *Hybrid protocols* combines the features of the two discussed protocols methods to find an efficient path for packets forwarding in mobile ad-hoc network. In MANET [2] due to mobility factor nodes can change their current location with different directions regularly so that various routing issues are arising. The most challenging issue is to find the efficient path between two nodes with multiple hops in the network on the basis of quality of services parameters like throughput, delay and packet delivery fraction by changing the network load and size in MANET.

2. RELATED WORK

By experiments performed on NetSim Simulator, it had already shown that DSR is restricted scalability than AODV when large network is considered. On the other hand AODV is proved to be more vulnerable to attacks than DSR as it involved many coordinating nodes [1]. Also it is established that DSR routing protocol improves the VANET performance compared to AODV protocol in terms of higher throughput, lower packet loss, improved delivery ratio and reduced delay even for a large network of vehicles [2].However based on the NS-2 simulation results tested on 4 parameters viz. end-to-end delay, throughput, packet loss & energy consumption on DSR & AODV protocols under selfish and black hole attacks, again it was exposed by overall tests and results that DSR was affected more by selfish nodes attack than AODV. Conversely, DSR performed better than AODV under black hole attacks. As far as individual parameters were concerned like average packet delay and throughput, AODV has better performance i.e lesser packet delay as compared to higher packet delay in DSR. In the same way for other parameter like energy consumption per byte under selfish nodes attack, DSR consumed less energy than AODV. However, under black hole attack, DSR consumed more energy than AODV. So in a nutshell, both DSR and AODV protocols have been affected by the attacks and their performance varies according to different parameters. Also choosing accurate routing protocols according to the network finally influences the efficiency of that network in an impressive way. On the contrary the hybrid category of protocol (MP-OLSR) is analyzed better than AODV & DSR but its performance would effect and change with different type of network and variation on scalability and mobility. [3][4].Due to its ability to maintain connection by periodic exchange of information AODV functioning is the best than DSR. AODV indicates its highest competence and implementation under high mobility than DSR for real-time applications as conceived from the simulation results. Even for checking the correctness of the results using Analysis of Variance test (1-way ANOVA), AODV shows better routing performance than conventional routing methods i.e DSR. It seems that AODV ensures higher packet delivery ratio (PDR) & throughput [5].While performing the simulation experiments on MATLAB 2018a simulator it is observed that the numerous amendment in the network topology increase the computational

complexity of existing MP-OLSR routing processes as the route computation process for discovery of new routes becomes more intricate [6].Using Netsim 10.2 simulator it is observed that DSR outperforms AODV in terms of throughput, Pkt Delivery Ratio and Pkt. Loss Ratio with varying the number of nodes and network size [7].Using Riverbed Simulator Modeler, AODV, MPOLSR and DSR were analyzed & it is conceived that MPOLSR protocol has performed better than the other two protocols AODV and DSR in terms of E2E delay, data dropped and throughput [8]. Analyze performance using Riverbed Simulator Modeler, AODV, DSR, OLSR and GRP were analyzed with respect to all performance parameters' & it is found that OLSR protocol has performed better than the other three protocols AODV, GRP and DSR in terms of end to end delay, throughput and drop packets[9]. By setup on Net Simulator, it had already shown that when we increase number of node in network MPOLSR protocol phase more delay as compared to other AOMDV protocol than AOMDV is efficient for large network [10]. Analyzing of various routing protocols, the authors has reviewed each protocol having unique feature and only methods of determining route is to make them differentiate.[11]

3. METHODOLOGY

This literature analysis is carried out on different routing protocols in MANET. We have taken three different routing protocols DSR, AODV and MPOLSR protocol and discussed the performance and effect on the various performance parameters changing on the regular intervals. DSR is an on-demand protocol use reactive approach, AODV is proactive protocols where AODV discover route as and when required approach and finally MPOLSR as a kind of hybrid multipath routing protocol, [4] which is combining the property of reactive and proactive periodically maintain the network topology. Comparatively analyzed the performance of routing protocol based on mobility network size and the result is verified the performance of routing protocol. The proposed simulation scenario for QoS having different parameters for routing protocols in this literature and also provides the comparison between them. They are categorized as proactive reactive and hybrid approach the comparative analysis of these protocol are given performance evaluation of various routing issues. The finding of this literature survey is to design efficient routing protocol with different parameters for improving the quality of services in MANET. [11]

4. ROUTING PROTOCOL IN MANET

4.1 DSR

When data packets routes between source to destination in order to determine source route path, address of each device between the source and destination is to be collected by the nodes during the route discovery and it has to be traversed for routing packets.[10] This may result in high overhead for IPV6 types of address. To avoid using source routing, a new protocol called **Dynamic Source Routing** (**DSR**) is generated which doesn't depends on the routing table at each intermediate device, but instead it optionally defines a flow id option that allows packets to be forwarded on a hop-by-hop basis.[5] It's on demand feature provides the advantage that it restrict the packet to bandwidth consumed by control packets by eliminating the periodic table-update beacon messages (Hello message) required otherwise. On the other hand like every protocol it has some drawbacks also. It does not locally repair a broken link due to route maintenance mechanism. Also the connection setup delay is higher than in table-driven protocols. Its performance degrades rapidly with increasing mobility of nodes.

4.2 AODV

Ad hoc on Demand Vector (**AODV**) **Routing** is a routing protocol in MANET. It is a proactive routing protocol which does not rely on pre maintains routes, but builds their on demand routes depending on the requirements. This protocol is developed to overcome the drawbacks of degraded performance of DSR protocol when there is large number of nodes between source to destination. Also it overcomes other limitations of DSR protocol i.e. it is having multiple routes for packet sending between source to destination which requires maintenance of multiple routing tables. In AODV protocol along with routing tables, additional 2 counters are maintained which helps it to determine updated path between source to destination.[4]

4.3 MPOLSR

MP-OLSR or the Multipath Optimized Link Source Routing Protocol of MANET [9] is a hybrid protocol, which uses Dijakstra's algorithm to find multiple paths for routing packets. As its name suggests this protocol interchange the data without mainly depending on single base station and it provides dynamic routing tables as per the requirement generates in order to route data packets to various possible paths. Apart from this the other important features of this protocol is having a scalable & not rigid cost functions, mechanism for recovery of routes and to detect loops (if any) in the suggested loop. This protocol has some limitations also.[7] It is sometimes not sufficient to balance the data load in various paths due to chosen scheduling algorithm (Round Robin). Also sometimes when network are not compliance with the conditions, a pre decided value given by cost function which isn't computed properly.

5. PERFORMANCE PARAMETERS AND SCENARIO

Some important performance parameters can be evaluated:-

5.1 Packet delivery Ratio - The ratio of the data packets delivered to the destinations to those generated by the CBR sources.

5.2 Throughput- It is the number of packets/bytes received by source per unit time. It is an important parameter for analyzing network protocols.

5.3 End to End Delay. It is defined as the time a data packet is received by the destination minus the time the data packet is generated by the source.

6. Proposed Simulation Scenario

Table 1- Proposed Scenario

Parameters	Values
Number of nodes	10, 30, 50, 100 and 150
Simulation Time	10 sec
Pause Time	5ms
Network Size	1000x1000 meters
Transmission Range	250 m
Traffic Size	CBR (Constant Bit Rate)
Packet Size	1000 bytes
Packet Rate	5 packets/s
Maximum Speed	20 m/s
Simulator	NS 2.29

In scenario the simulation time is taken as 10 sec and the numbers of nodes are varied from 10, 30, 50, 100 and 150 nodes. The grid area (Network Size) is taken as 1000 X 1000 meters which is square.

7. PERFORMANCE EVALUATION

The following three important performance metrics are considered for evaluation of these routing protocols.

7.1 Throughput :- The number of packets delivered to the receiver provides the property of the network from the below figure 5.1.We can say that throughput is an approximately average in AODV and MPOLSR but when we compared to DSR throughput is low in minimum node and its high when we increase nodes in the network.
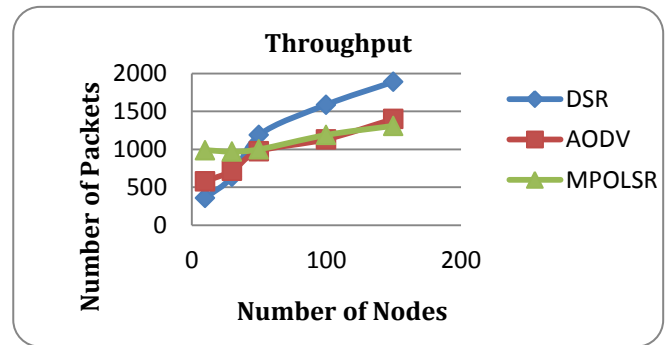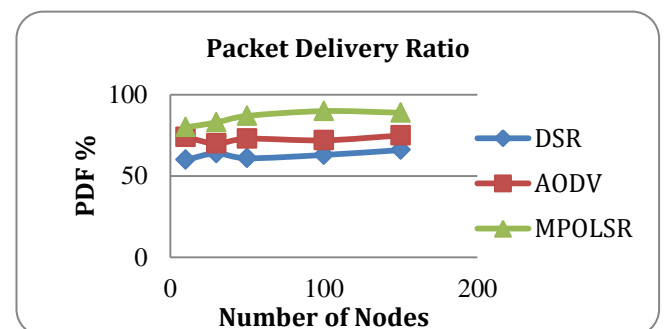

Throughput Fig 5.1

7.2 Average End to End Delay: - Is the end-to-end delay average over all surviving the data packets for each source destination pair from the below figure 5.2. We can say that delay is lesser in MPOLSR as compared to DSR and AODV which is having on an average delay.
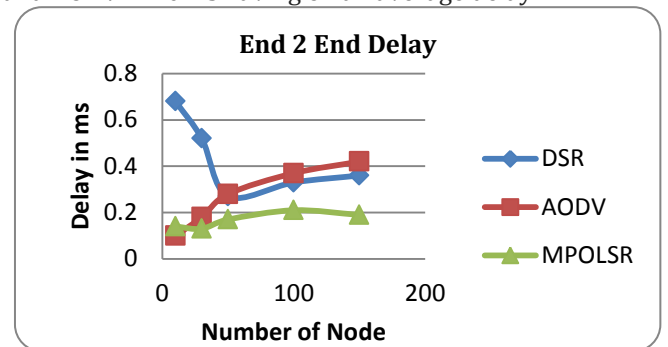
End to End Delay Fig 5.2

7.3Packet Delivery Ratio: - It shows the percentage of data packets which are dropped during their journey to destination from the below figure 5.3. We can say that dropping of packet is lower in DSR as comparative to AODV and MPOLSR.

Packet Delivery Ratio Fig 5.3

8. CONCLUSION- DSR routing protocol has better in terms of throughput parameter that was done, but in the largest network it will give an average delay. When we compare to other routing protocols. MPOLSR performs better than DSR and AODV in terms of average network delay and

approximately equal to network throughput. From the simulation and analysis it is perceived the performance of routing protocols improve with selection of network and appropriate routing protocol according to the network. The authors has analyze the packet delivery ratio is approximately on an average with respect to DSR, AODV and MPOLSR.

In this literature analysis three different routing protocols has shown MPOLSR protocol has better performance in MANET according to the simulation results, but it is not always best in the entire network. Its performance and effectiveness is changed with different kinds of networks and variation on scalability and mobility. Finally selection of appropriate routing protocol according to the network it gives the better performance with respect to throughput and efficiency.

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BIOGRAPHIES

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