Performance Evaluation of Reactive Routing protocols in MANET using NS-3 Simulation

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ABSTRUCT

Mobile ad-hoc network (MANET) is a part of wireless network where each node acts as a router and they can communicate with each other without using any base station. Performance evaluation in MANET can be done based on the quality of service parameters like end to end delay, packet delivery ratio, throughput, routing overhead and also loss of packet under various circumstances like speed of mobility, number of nodes, simulation time etc. In this paper for reactive routing protocols like DSR, AODV we measure the quality of services in terms of performance parameters like end to end delay, packet receiving rate per second and throughput using NS-3 simulator.

Keywords: *DSR, AODV, MANET, End to End Delay, Packet Receiving rate, Throughput*.

1. INTRODUCTION

Mobile ad hoc network is also known as wireless ad hoc network, is a continuously self-configuring, infrastructure-less network of mobile nodes. So here mobile nodes can act as a router as well as host and they can make direct communication between them. In MANET, nodes are mobile and topology changes frequently because nodes can connect or leave at any moment. Reactive routing protocol is a one type of MANET routing protocol, also known as on-demand routing protocol. In this protocol routes to destination are not maintained in advance. The route to the destination is only created when route discovery process initiates the route request. Reactive protocols perform better for ad-hoc wireless network. It causes lower overhead since routes are determined on demand. In this paper I have compared end to end delay, throughput, packet receiving rate per second for two reactive routing protocols DSR and AODV. This paper organized as follows. Operations of routing protocols DSR and AODV we summarized in section 2. Section 3 presents the proposed work for routing protocols. Section 4 shows experiments results and analysis. Section 5 gives conclusion.

2. RELATED WORK

A. Dynamic-Source Routing (DSR)

DSR is a purest example of on-demand routing protocol which uses the concept of Source routing. In DSR each source determines the route to be used in transmitting its packets to selected destinations. It is designed especially for use in multi-hop ad hoc networks of mobile nodes. DSR composed of two mechanisms Route Discovery and Route Maintenance.

The route discovery process can be generated when source wants to transmit packet to destination node. Then source broadcast a Route Request message that can be received by all neighbor nodes within its wireless transmission range. Route request (RREQ) message contain IP address for source, destination host, route record field and a unique identification number. If a host saw the packet before, discards it. Otherwise, the route looks up its route caches to look for a route to destination, if not find, appends its address into the packet and rebroadcast. If it finds a route in its route cache, it sends a route reply packet, which is sent to the source by route cache or the route discovery.

In Route maintenance process whenever a node transmits a data packet, a route reply, or a route error, it must verify that the next hop correctly receives the packet. If not, the node must send a route error to the node responsible for generating this route header.

Then source deletes route, tries another if one cached, or the source restart the Route discovery.

A. Ad hoc On-demand Distance vector Routing (AODV)

AODV is another type of reactive routing protocol designed for use in MANET. In AODV each node maintains a routing table that contains information about reaching destination nodes. It uses four types of messages like RREQ (Route request), RREP (Route reply), RERR (Route error) and HELLO (for link status monitoring).

A RREQ message is broadcasted when a node needs to discover a route to a destination. It also contains the most recent sequence number for the destination. A valid destination route must have a sequence number at least as great as that contained in the RREQ.

When a RREQ reaches a destination node, the destination route is made available by unicasting a RREP back to the source route. A node generates a RREP if it is itself the destination or it has an active route to the destination. As the RREP propagates back to the source node, intermediate nodes update their routing tables.

RERR are used mainly when nodes get moved around and connections are lost. If a node receives a RERR, it deletes all routes associated with the new error. Error messages are sent when a route becomes invalid, or if it cannot communicate with one of its neighbors.

HELLO messages are simple messages that nodes send at certain time intervals to all its neighbors to let them know that it is still there. If a node stops receiving hello messages from one of its neighbors, it knows that any routes through that node no longer exist.

3. PROPOSED WORK

In this paper Reactive routing protocols are simulated and end to end delay, packet receiving rate per second and throughputs are determined based on the number of mobile nodes. Here we compare two routing protocols DSR and AODV by using Network simulator NS-3 and which gives end to end delay, packet receiving rate per second and throughputs for different numbers of mobile nodes.

Table1. Experimental Simulation Parameters:

Constraints	Description
Simulator	NS-3
Total simulation seconds	100
Type of traffic	Constant Bit Rate
Mobility model	Random way point
Simulation area	300 x 1500
Packet size	64 bytes
Routing protocol	DSR, AODV
Internet protocol	IPV4
Number of nodes	10,20,30,40,50,60

In this simulation we used the NS-3 simulator and we have taken the 100 simulation seconds as a total time for simulation. Packet size of each node is 1024 bytes and mobility type is Random way point. The maximum numbers of nodes for simulation are 60. We are using IPV4 internet protocol. End to end delay, packet receive rate per second and throughputs are taken for around 60 nodes and we take the commutative values to get for the proper comparison.

4. EXPERIMENT RESULT & ANALYSIS

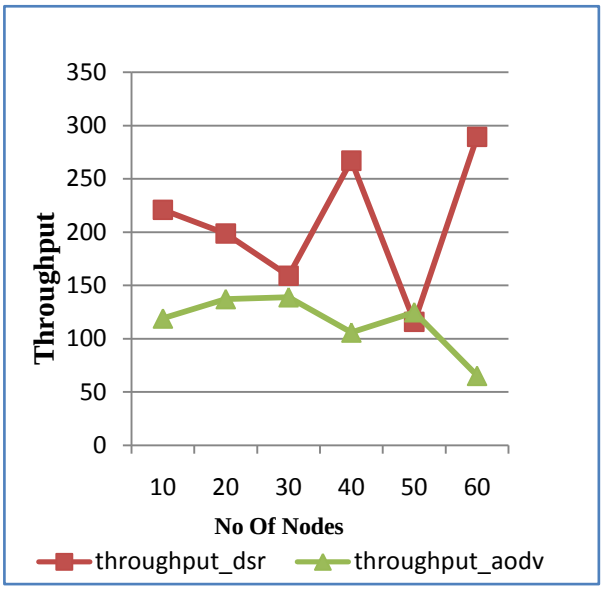
In NS-3 simulator experiments are performed and get the analysis of two protocols DSR and AODV. The analysis of result is mentioned in the table as following.

Table2:-

No of node	Delay DSR	Delay AODV	Packet receiving rate DSR	Packet receiving rate AODV	Throughput DSR	Throughput AODV
10	795.5	677.5	7.32	4.95	220.89	119.09
20	659.7	780.9	5.99	5.74	198.55	137.32
30	549	770.8	4.95	5.82	158.94	139.04
40	1621.7	610.2	11.96	4.42	266.97	105.93
50	285.4	758.0	2.9	5.56	115.78	125.01
60	1301.4	358.8	10.59	2.75	289.33	65.27

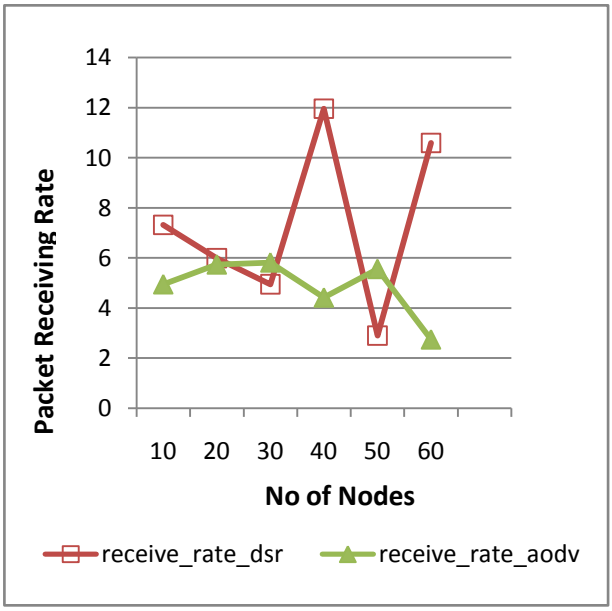
a) Throughput:-

Throughput is the number of total packets delivered per unit time. Following figure shows the graphical representation of throughput versus number of nodes for DSR and AODV protocol.



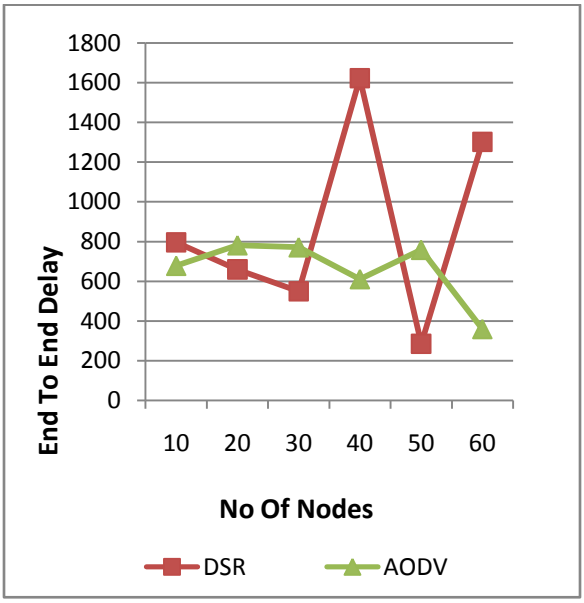
b) Packet receiving rate :-

It is defined as the ratio of the number of packets successfully received at the destination to the number of packets generated by the source. Following figure shows the graphical representation of packet receiving rate per second versus number of nodes for DSR and AODV protocol.



c) End-to-end delay:-

It is defined as the time taken for a packet to transmit over the networks from source to destination. Following figure shows the graphical representation of end-to-end delay versus number of nodes for DSR and AODV protocol.



5. CONCLUSION

In this research paper, we calculate the end to end delay, throughput, packet receiving rate per second for reactive routing protocols in MANET like DSR and AODV for various numbers of mobile nodes using NS-3 simulator. Here we have seen that DSR protocol gives us better results in most of the cases as compared to AODV protocol.

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