RESEARCH ARTICLE

Quality of Service Parameters Evaluation of Reactive Routing Protocols in Mobile Ad Hoc Networks

Ankul Sharma[1], Sunil Kumar[2]

[1]Computer Science & Engineering Department, IFTM University, Moradabad, India
[2]Department of Computer Applications, IFTM University, Moradabad, India
[1] ankulsharmaankul@gmail.com; [2] skiftm@rediffmail.com

Abstract: Mobile ad-hoc network are decentralize system of connected mobile node with warless links. Every node is performing both type of faction such that end system and as well as router for forwarding a data packet in over all ad-hoc network. In ad-hoc network the mobile node are free for move anywhere and MANET or organize them in a network. The every node is changing over position quickly. The mainly are use of routing protocol such as proactive protocol, reactive protocol and hybrid routing protocol for forwarding a data packet in a network. But most of the routing protocol is reactive routeing protocol. This routing protocol is known as on demand routing protocol. This protocol is providing the better result or salutation in large network topology. Its protocol are reduced route over al network whenever a transmission or broadcast a data packet from source to destination in ad-hoc network. This paper is evolution of quality of service parameter with using a reactive routing protocol such as AODV and DSR. These routing protocols gather algorithms when a mobile node is connected in MANET when only needed. As per analysis the different parameter such as throughput, packet delivery ratio as well as end to end delay and packet drop in ad-hoc network. The quality of service parameter is analysed using ns2 simulation.

Keywords— Mobile Ad-Hoc Networks, Dynamic Source Routing (DSR), NS-2.35 Simulator, Ad-Hoc On-Demand Distance Vector Routing (AODV) and PDR.

I. INTRODUCTION

Mobile Ad-Hoc Wireless Network (MANET) is a set of collection self-regulating mobile nodes such that communicate with each other though forming an electronic device, restricted network and irrespective of their prefix infrastructure that will allow user to access information and service [1, 2]. Ad-hoc network is a collection of node that can be transmission of the data amongst them using wireless links and without use of any additional communication support device facilities or infrastructure. The nodes in a MANET can be PDAs and laptops or any other device that is able to broadcast and receiving the information. Each node of the network acts as a host or destination system (broadcasting and receiving data over all networks) as well as a router at the same time. The nodes in a MANET are generally mobile and may go out of range of other nodes or other mobile node in a network. Consequently, Routing protocol in MANET is difficult since

protocol causes frequent network topology changes and requires more healthy and flexible system to search for maintain the routes for the destination. If the ad-hoc network is established paths may break and the routing protocols must dynamically search for other sufficient routing path. With a changing routing topology in MANET even maintain connectivity is very hard and keeping the routing loop free is very complicated. When a mobile Node move then handling the topology changes, routing protocols in Mobile Ad-Hoc Wireless Network (MANET).It must deal with other constraints as low bandwidth and limited energy as well as error rates of the entire wireless environment lick as in MANET.

In this paper is to evaluation of reactive routing protocols in IEEE 802.11 based on MANET. We have tack Two different routing protocol mechanisms such that AODV (Ad hoc on demand Distance Vector) and Dynamic Source Routing (DSR). Their simplicity and performance when implement in various mobile using ns-2.35 simulation. These papers to be concentrates on performance parameters evaluation of these two protocol schemes (AODV and DSR) in order to better understand the protocol efficiency and flexibility and the basic functionalities of these protocols. If possibilities for advance improvements results in possible development of more advanced routing protocol schemes as a future work. This paper is planned as follows in the Section II is an impression of the Protocols used in Ad-Hoc and Wireless networks and detail explains the protocol mechanism used in these study and Section III given the simulation scenario and next Section IV show the Performance Parameter evaluation and results obtained using simulation in ns-2.35 and final Section V is concludes the paper.

II. PROTOCOLS USED FOR SIMULATION

In this section are discus the reactive routing protocol and is routing formatting. This routing protocol is use for simulation and find out the results of service of quality parameter.

A *Dynamic Source Routing (DSR):*

DSR is a reactive routing protocol which allows nodes in the MANET to dynamically find out a source route across multiple ad-hoc networks for any destination [3]. In these routing protocols is need to remove loops or loop free path as well as also the need for up-to-date broadcasting information in the intermediate mobile mode through if the data packet is forwarded into the next mobile node.

The source node collects all the information between itself or source and destination. During the route detection process this information is utilized by all other nodes involved in ad-hoc network. It uses a flow id to facilitate node by node forwarding. The DSR protocol is follows two mechanisms for its operation. First one is the Route detection and another one is a Route Maintenance.

Route detection operation has route information is known by sender from source node to destination node. Route cache is maintained for this process. Source route node is kept in packet header when the destination route is not known and then send data packet to destination node address, it use route detection operation for route detection phase of DSR contains two type of messages such as RREQ and RREP. If a node wants to send a message then first it broadcast an RREQ packet to its neighbour's node. Then neighbouring nodes add its ID in the RREQ packet and then transmitted the packet next neighbour's node. Broadcast message will reach to the destination node which contain route of the destination node. Each node maintains a route cache. Node checks its cache before rebroadcasting the RREQ packet.

Route Maintenance operation has two types of packets are used such as RERR and acknowledgement (ACK). DSR confirm the reality of the route on the basis of ACK received from the neighbouring node and describing that packet has been delivered to the next neighbour's node. ACK packet also contains passive acknowledgements. As an RERR packet is also generated, when a node are not receive an ACK message. This RERR packet is send to the source for reinitializing the route detection operation if

the unnecessary route to the destination is not available. When RERR packet is received by the node, it remove the route entries from their route cache which uses those failed links [11, 12]. To reduce the transparency, DSR also maintain current state to be established in intermediate neighbour nodes. This current state provide facility of node by node broadcast information with the same source based route as provided by the original source route.

B *Ad-Hoc on-Demand Distance Vector Routing (AODV):*

AODV is basically an enrichment of Dynamic Destination-Sequenced Distance-Vector (DSDV) routing protocol [4]. But AODV protocol is a reactive routing protocol as an alternative of being proactive protocol and it minimize the number of broadcast message by creating routes based on demand. This is not the case for DSR. When any source node wants to broadcast a data packet to a destination mobile node, it broadcasts a route request (RREQ) packet. The neighbouring nodes in turn transmitted the packet to their neighbour's mobile node and the process continues until the data packet reach to the destination node. During the process of forwarding the RREQ, then the intermediate nodes record the address of the neighbour mobile node from which the first copy of the transmitted packet is received and this record is stored in their route tables and helps for establishing a reverse path. If the path has addition copies of the same route request are later received, when this packet are discarded. The reply to the node is sent using the reverse path. For route maintenance. If when a source node moves. That can be reinitiating a route detection process. If any intermediate node moves within a particular route and the neighbour of the drifted node can detect the link failure and sends a link failure notification to its upstream neighbour node. This process will be continues until the failure notification reaches the source node or destination node. Based on the received information, the source might decide to reinitiate the route detection process. Each of the routing protocols was tested in our simulation experiments in simulation lab. The details of our works and our built prototype are mentioned in the following sections.

III.   SIMULATION PARAMETERS

Simulations have been passed out by the Network Simulator version 2.35 (NS2) [4]. Hardware and operating system (OS) configuration for performing simulations is specified as a Table 1.

Table 1: Performance Parameters

Parameter	Value
Channel type	Wireless channel
Simulator	NS2 (Version 2.35)
protocols	AODV and DSR
Simulation duration	400sec
Number of nodes	10,20,30,40,50,60,70
Queue length	200
MAC Layer Protocol	802.11
Antenna	Omni antenna
Traffic type	CBR(Constant Bit Rate)
Environment Size	1000m * 1000m
No. of connections per Sec.	5,10,15,20,25,30,70

For every simulation results and the position as well as movements of the nodes are put randomly, the traffic among them. Setting the randomly variables exactly is a key point, because if this is do the work done wrong some simulations results can be associated and we can come up with bad results. If we think, we have performed a enough data amount simulation then explain a general case [11]. Each protocol must

be checked or analysed in order to see how much time is necessary to be skipped. Additionally, according to [12, 17], CBR traffic below UDP must be used to compare accurately the different protocols in MANET.

IV.   PERFORMANCE PARAMETER AND RESULTS ANALYSIS

A. Performance Parameters

The management of routing protocols in the following significant Quality of Services (QoS) metrics for routing parameter:

1. *Packet Delivery Ratio (PDR):*

Packet delivery ratio is an important parameter as it defines the loss rate, which will be seen by the transport protocols. Those run on top of the network layer. It evaluates the loss rate and measures up both the correctness and efficiency of ad-hoc routing protocols, a higher packet delivery ratio is hoped in any network. It is defined in [9, 10] as the ratio between the number of packets originated by the application layer CBR sources and the number of packets are received by the CBR sink at the final destination address [14,16].That is considered with dividing the number of packets received by destination node through the number packet originated from the source in ad-hoc network.

$$PDR = (TPr\ T/Ps)*100$$
Where TPr is Total Packet received & TPs is Total Packet sent.

2. *Average End-to-End Delay:*

All average End to end delay include all possible delays caused by buffering during route detection latency, queue at the interface queue, retransmission delay at the MAC layer, and propagation and transfer times [9,10]. That is defined as the time taken for a data packet to be transmitted across an Ad Hoc network from source node to destination nodes.

$$Delay = (Tr - Ts),$$
Where Tr is total receive Time and Ts is total sent Time.

3. *Packet Drop:*

A packet has dropped with in two cases. First one is the buffer is full then packet needs to be buffered and the time that packet has been buffered exceed the border. And second one is packet falling was observed for several nodes and varied the nodes each time and the falling was counted at destination node during complete simulation time period

Packet Drop = (Ts-Tr), where Ts is Total packet send and Tr is Total packet received

4. *Throughput:*

Throughput is also known as the average rate of successful data packet delivery over a broadcasting channel. This data packet may be transmitted over a logical or physical link layer, or pass through a certain network in MANET. The throughput is usually calculated in bits per second, from time to time in data packets per second and data packets per time slot. That is the calculate of, how soon a destination mobile node is able to receive data packet and it is determined as the ratio of broadcast

information send and receive data packet in ad-hoc network. A superior throughput will directly impact the user's understanding of the quality of service performance (QoS).

$$Throughput = (Ts/Ti)$$

Where Ts is the total number of packets delivered successfully and Ti is taking time for sending a packets

B. Result Analysis

We have analysis results of the quality of service parameters as show in Figure 1, 2, 3, 4 and the simulations are focusing in analysing the performance on routing overhead, throughput, Average End-to-End Delay, Packet Drop and packet delivery ratio. The analysis results are also compared with two reactive routing protocol such that AODV and DSR. The result will show the performance with respect to protocols.

1) Packet delivery ratio (PDR):

Packet delivery ratio is an important parameter for performance analysis it explain the loss rate that will be observed by the protocols. Thus the packet delivery ratio in turn reflects the highest throughput that the network cans support. In the above discussed scenario the performance of DSR is far better than the AODV due to its route discovery mechanism. The given graph produced the comparatively result of AODV and DSR on the different node such as, 10 nodes, 20 nodes, 30 nodes, 40 nodes, 50 nodes, 60 nodes and 70 nodes. At lower speed 10 of node movement, the routing protocols AODV performed particularly well, they delivering the large amount of data packets regardless of delivery rate from DSR but in all cases of nodes speed, protocols AODV and DSR always perform better at low speed of nodes; When movement speed of nodes greater than 2 m/s the routing protocols AODV can delivered data packet between 80% to 70% and DSR routing protocols can delivered data packet between 20% to 30%, unlike when the speed greater than 20m/s the ratio of delivered packet will go to decreasing in all routing protocols. AODV Perform particularly well, delivering over 95% of the data packets regardless of delivery rate.
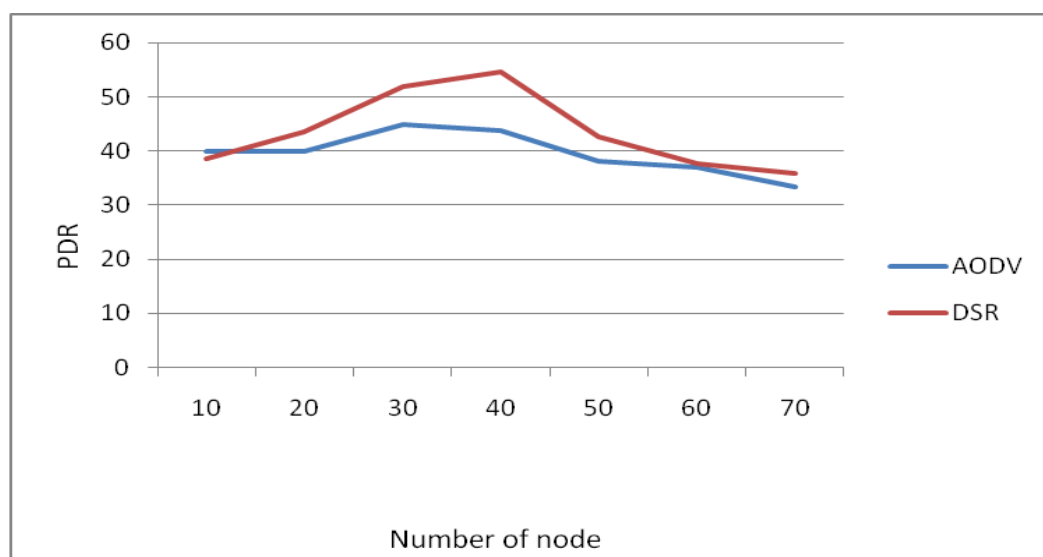

Fig 1: Packet Delivery Ratio

2) *Average End-to-End Delay:*

As shown in Figure:2, this simulation experiment results show that AODV protocol are having higher end to end delays if the number of node and data packet minimum but increases the number of node and as well as number of data packet then DSR routing protocols are having higher end to end delays with in AODV routing protocol, indicating that the speed of simulation in big scale ad-hoc networks will be affected by this. Shows the significant amount of data packet is delay in scaled up background. This analysis results completely deals with in large ad-hoc network with speed and communication efficiency.
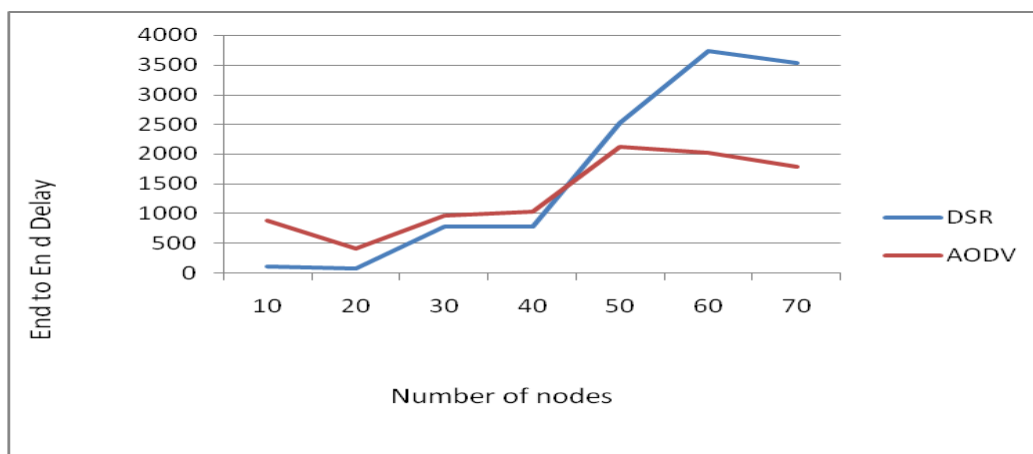

Fig 2: Average End-to-End Delay

3) *Packet Drop:*

The result shows both the cases. First one is the buffer is full then packet needs to be buffered and the time that packet has been buffered exceed the border. And second one is packet falling was observed for several nodes and varied the nodes each time and the falling was counted at destination node during complete simulation time period whose amount was as in Figure: 3.
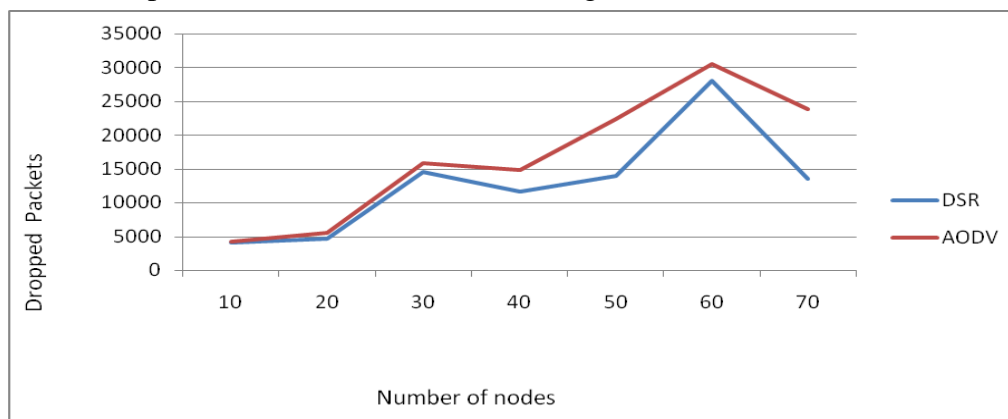

Fig 3: Packet Drop

C. *Throughput:*

Throughput of the network is calculated by extracting the data from tcl file and two curve for protocol: DSR and AODV. In this fig 4 are show the no. of node 10,20,30,40,50 ,60,70 on X axis and No. of packet 50, 100,150,200,250,300 on Y Axis as shown in given Figure 4. It is visible that as the number of mobile node is increase throughput is decreasing. But variation of DSR is as lesser as than AODV

protocol because increased overhead. As AODV is unpredictable so curve of throughput has much variation and does not depend on as no of node is increasing.
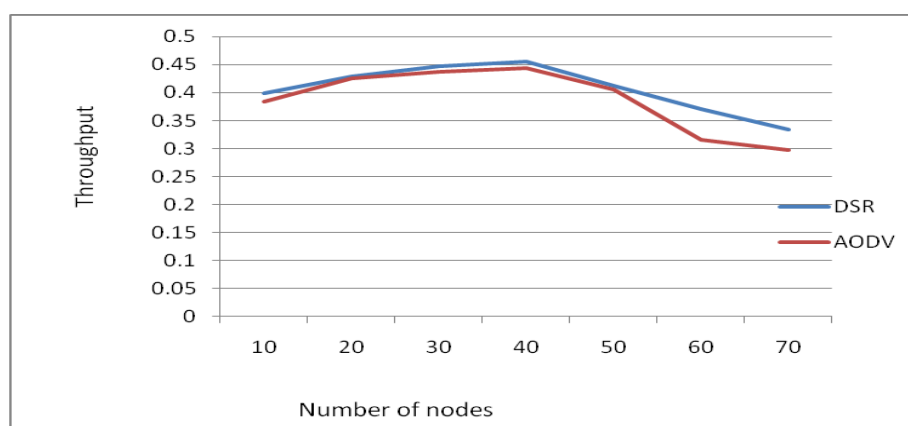

Fig 4: Throughput

V. CONCLUSIONS

In this work we have concentrated the quality of service parameter in MANET using reactive routing protocol lick AODV and DSR. This is measured of parameter such that PDR, packet drop during the broadcasting data packet, regular End to End delay during transmission amount of data and the throughput of packet send and received in ad-hoc network environment. DSR is a commonly used routing protocol for MAMET. It has good delivery rates and better performance in highly loaded networks with high node movement comparative with AODV routing protocol. This paper presents two simple routing protocols techniques restrictive reply sent by target node, keeping only one route per target node, and prefers fresher routes improve the performance of DSR routing protocol. While multiple routes may benefit at higher traffic loads, keeping only one route per target node helps sender nodes gather routes when the topology change. On the other hand DSR protocol perform better when the numbers of nodes are minimum but it will fails when the numbers of nodes increase but AODV routing protocol are very low throughput and end to end delay in al large network. Without using any complex strategy, our proposed techniques perform considerably better than earlier proposed change at very minimum traffic load or about the same at higher traffic load.

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