Adaptive Enhancement of routing protocol under CBR and TCP traffic source

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Abstract—**The main objective of this article is to study and enhance on demand routing protocol under different traffic consideration so that our proposed routing protocol give an better result then other reactive and proactive routing protocol . we used TCP and CBR based traffic to analyze the above said protocol based on the basis of Average end-to-end delay and Number of data packet received. We will investigate how proposed algorithms are for routing in MANET will behave under highly congested network. This paper also results the comparison graph of Enhanced-AODV, AODV, DSR, DSDV done on ns2.**

Keywords-E-AODVs, NS-2(Network Simulator)

I. INDRODUCTION

As the importance of computers in our daily life increases it also sets new demands for connectivity. A Mobile Ad-Hoc Network (MANET) is a multi-hop wireless network which forms a temporary infrastructure-less network and communicates with each other and support de-centralized administration. Quick and easy deployment of ad-hoc network makes them feasible to use in battlefield environments, disaster relief and conference. In MANET, nodes can move independently thus, each node function as a router and forward packet. Due to high node mobility network topology changes frequently. Therefore, routing in ad-hoc network becomes a more challenging task. Therefore it become recent research area in MANETs, Many routing protocol have proposed for ad hoc network for finding routes in the literature[1][4][6], with the advance of wireless communication low cost and powerful trans-receiver are widely used in mobile application. The main aim of this paper is to perform comparative analysis between reactive and proactive routing protocol. They are Ad hoc on Demand Distance Vector(AODV), Dynamic Source Routing(DSR) are reactive and Destination Sequence Distance Vector(DSDV) are proactive routing protocol in variable pause time for a constant number of nodes to bring out their relative advantages. The main objective is to understand their internal mechanism of working and suggest in which situations where one is preferred than the other.

II. DESCRIPTION OF ROUTING PROTOCOL

A. Ad-Hoc on Demand Distance Vector (AODV)

AODV [1][2] routing algorithm is a reactive routing protocol designed for ad hoc mobile networks. AODV builds
routes using a route request / route reply query cycle. When a source node desires a route to a destination for which it does not already have a route, it broadcasts a route request (RREQ) packet across the network. Nodes receiving this packet update their information for the source node and set up backwards pointers to the source node in the route tables. In addition to the source node's IP address, current sequence number, and broadcast ID, the RREQ also contains the most recent sequence number for the destination of which the source node is aware. A node receiving the RREQ may send a route reply (RREP) if it is either the destination or if it has a route to the destination with corresponding sequence number greater than or equal to that contained in the RREQ. If this is the case, it uni-casts a RREP back to the source. Otherwise, it rebroadcasts the RREQ. Nodes keep track of the

RREQ's source IP address and broadcast ID. If they receive a RREQ which they have already processed, they discard the RREQ and do not forward it. As the RREP propagates back to the source nodes set up forward pointers to the destination. Once the source node receives the RREP, it may begin to forward data packets to the destination. If the source later receives a RREP containing a greater sequence number or contains the same sequence number with a smaller hopcount, it may update its routing information for that destination and begin using the better route. When a link is broken due to movement of nodes or any other reason, the node that discover the failure link will send Route Error to the Source. When the source gets the Route Error Packet it will delete the path from the cache and will find another route in its cache, if it didn’t find any route it will run Route Request again.

B. Dynamic Source Routing (DSR)

Dynamic Source Routing (DSR) [3][4] is an Ad Hoc routing protocol which is based on the theory of source based routing rather than table-based. This protocol is source-initiated rather than hop-by-hop. This is particularly designed for use in multi hop wireless ad hoc networks of mobile nodes. Basically, DSR protocol does not need any existing network infrastructure or administration and this allows the Network to be completely self-organizing and self-configuring.

This Protocol is composed of two essential parts of route discovery and route maintenance. Every node maintains a cache to store recently discovered paths. When a node desires to send a packet to some node, it first checks its entry in the cache. If it is there, then it uses that path to transmit the packet and also attach its source address on the packet. If it is not there in the cache or the entry in cache is expired (because of long time idle), the sender broadcasts a route request packet to all of its neighbors asking for a path to the destination. The sender will be waiting till the route is discovered. During waiting time, the sender can perform other tasks such as sending or forwarding other packets. As the route request packet arrives to any of the nodes, they check from their neighbor or from their caches whether the destination asked is known or unknown. If route information is known, they send back a route reply packet to the destination otherwise they broadcast the same route request packet. When the route is discovered, the required packets will be transmitted by the sender on the discovered route. Also an entry in the cache will be inserted for the future use. The node will also maintain the age information of the entry so as to know whether the cache is fresh or not. When a data packet is received by any intermediate node, it first checks whether the packet is meant for itself or not. If it is meant for itself (i.e. the intermediate node is the destination), the packet is received otherwise the same will be forwarded using the path attached on the data packet. Since in Ad hoc network, any link might fail anytime. Therefore, route maintenance process will constantly monitors and will also notify the nodes if there is any failure in the path. Consequently, the nodes will change the entries of their route cache

C. Destination sequence distance vector

In DSDV [6] routing messages are exchanged between neighboring mobile nodes Routing updates may be triggered or routine. Updates are triggered in case routing information from one of t he neighbors forces a change in the routing table. A packet for which the route to its destination is not known is cached while routing queries are sent out. The packets are cached until route-replies are received from the destination. There is a maximum buffer size for caching the packets waiting for routing information beyond which packets are dropped.

The main contribution of the algorithm was to solve the routing loop problem. Each entry in the routing table contains a sequence number, the sequence numbers are generally even if a link is present; else, an odd number is used. The number is generated by the destination, and the emitter needs to send out the next update with this number. Routing information is distributed between nodes by sending full dumps infrequently and smaller incremental updates more frequently. If a router receives new information, then it uses the latest sequence number. If the sequence number is the same as the one already in the table, the route with the better metric is used. Stale entries are those entries that have not been updated for a while. Such entries as well as the routes using those nodes as next hops are deleted.

III. DECRIPTION OF ENHANCED-AODV

This article presents E-AODV (Enhanced Ad hoc on demand distance vector routing protocol), which is an enhance version of AODV routing protocol to effectively use for MANET applications, where nodes [11] travel rapidly and where the channel density is higher. The speed and reliability of communication application mode data transmission are focused in our proposed work.

The proposed algorithm E-AODV would work as a network of can be in active mode p or sleep mode 1-p state .Each node maintain a control variable which contain the information of number of active node of the current node.

Step 1) Let C is a control variable which contain initial value C-1
Step 2) X broadcasts data packets to *Y*.
Step 3) At *Y*, calculate,

Throughput = Number of successful packets received /times

Step 4) *Y* sends D as a feedback to *X*.
Step 5) at *X*, If *Throughput* < *Threshold then*,

5.1. C = C +λ , where λis the scale factor.
5.2. Repeat from 3.

Step 6) Else. If *Throughput* ≥ *Threshold*, then,
6.1. If C > 1, then,
6.1.1. C = C –λ
6.1.2. Repeat from 3.
6.2. End If
Step 7) End If
Step 8) Repeat from 3

IV. EXPERIMENT AND RESULT

For simulation we have used NS-2.34[8] which is a discrete even simulator in the platform Linux. We have generated 36 scenarios (6 for each mobility scenario) and four traffic patterns with varying number of sources for each type of traffic (CBR and TCP). The simulation is run using these scenarios and traffic patterns for both these protocols. To overcome the effect of randomness in the output we have taken the averages of the results to get their realistic values. We have varied mobility and the number of sources to measure their performance. Simulations are carried out by varying the number of speed 1, 5, 10, 15, 30 and 50 (meter/second). The simulation results reveal some important characteristic differences between the routing protocols. The different basic internal working mechanism leads to the performance differences in the protocols.

TABLE I

Simulation Parameters for CBR and TCP Scenario

S. No.	Parameter	Value
1	Routing Protocols	E-AODV,AODV,DSR and DSDV
2	MAC Layer	802.11
3	Topology	1500x1500
4	Nodes	60
5	Mobility Model	Random Way Point
6	Data Traffic	CBR , TCP
7	Simulation Time	200 second
8	Pause Time	10
9	Mobility	1,5,10,15,30,50 m/s
10	Connection rate	3 packet/second

A. Simulation Set up and Result

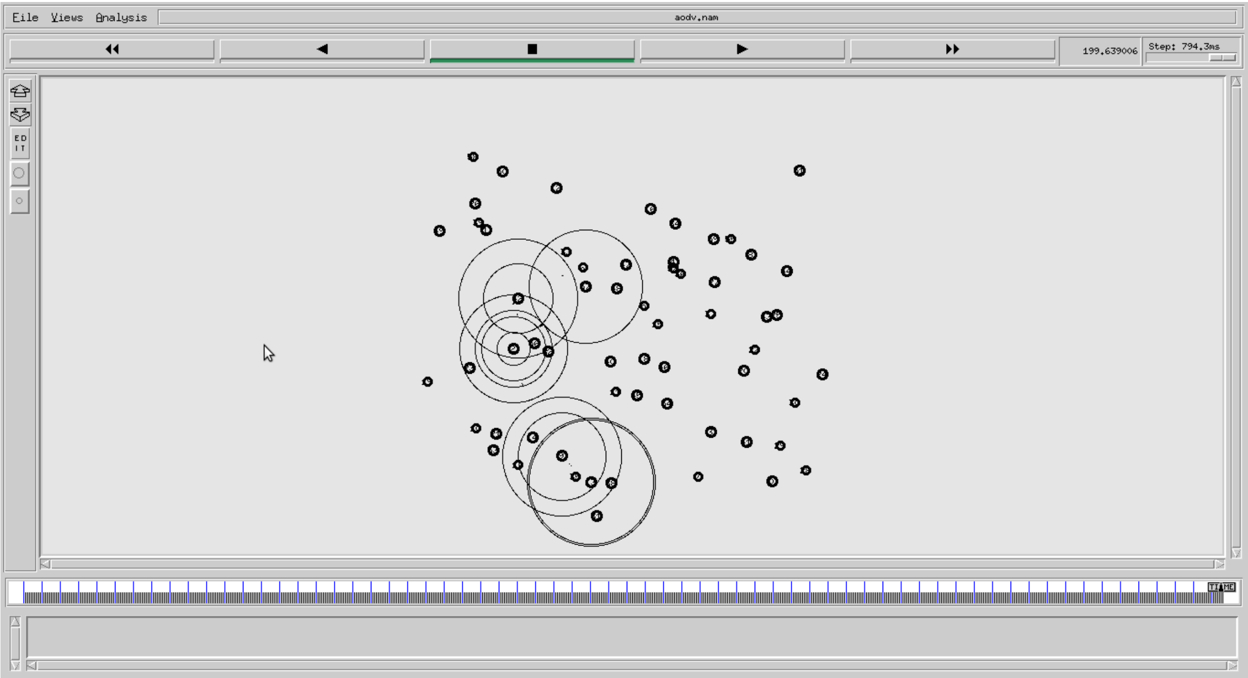

Figure 1

Fig.1 shows the simulation topology of 60 mobile nodes that does the communication by sending the data packet to the node which are in active mode.

B. Theoretical Results

Performance of E-AODV, AODV, DSDV and DSR protocols is evaluated under both CBR and TCP traffic pattern.
The following table results that, the percentage of delay in CBR is reduced 86% and in TCP traffic it reduced to 48% in E-AODV.

TABLE II

Speed	End-End delay For E- AODV (in milliseconds)		End-End delay for AODV (in milliseconds)		End-End delay for DSR (in milliseconds)		End-End delay for DSDV (in milliseconds)	
	CBR	TCP	CBR	TCP	CBR	TCP	CBR	TCP
1	0.0205982	0.118548	0.765024	0.396052	3.49052	0.73777	0.0607813	0.440741
5	0.0808323	0.142194	1.09994	0.278656	4.28069	0.619612	0.102665	0.18847
10	0.144632	0.123275	0.808698	0.200409	4.19878	0.592351	0.0512004	0.166798
15	0.265122	0.119865	0.775882	0.191011	4.33658	0.449635	0.254994	0.136215
30	0.138388	0.120281	0.971793	0.156325	6.73448	0.37784	0.457432	0.0982903
50	0.102194	0.103578	1.09957	0.185672	4.70923	0.278389	1.35418	0.13655

1) For CBR Traffic

Mean of E-AODV = 0.12529
Mean of AODV = 0.920150
Mean of DSR = 4.625
Mean of DSDV = 0.3802

So the variance ($\sigma 2$) of E-AODV, AODV, DSR and DSDV is 5.5947 X 10-3 ,0.041323, 1.021248 ,1.257578 respectively. The precision calculation [9] is based on the formula given in equation (1).
Precision = $1/\sigma 2$ --------------- (1)

Therefore,
Precision of E-AODV =178.74
Precision of AODV = 24.199
Precision of DSR = 0.979194
Precision of DSDV = 0.79518

2) For TCP Traffic

Mean of E-AODV = 0.1213
Mean of AODV = 0.23469
Mean of DSR = 0.509266
Mean of DSDV = 0.1945

So the variance (σ2) of E-AODV, AODV, DSR and DSDV is 1.2754 X 10- 4 ,6.5933 X 10-3, 0.0241 ,0.0129 respectively. The precision calculation is given in equation (1).
Therefore,

Precision of E-AODV =7840.7
Precision of AODV = 151.67
Precision of DSR = 41.49
Precision of DSDV = 77.52

A higher precision determines higher efficiency [9,10]. The precision comparison of E-AODV, AODV, DSR and DSDV leads to the inference that E-AODV is more efficient.

C. Packet Received.

The figure 2 and figure illustrate that the number of successful data packet that have been received by the destination, as the mobility of node increase in highly congested network it become difficult for other routing protocol to with high load and traffic(see figure 2 and 3) , but are proposed algorithm that is the E-AODV (Enhanced AODV) can withstand in the stress for both the Traffic.

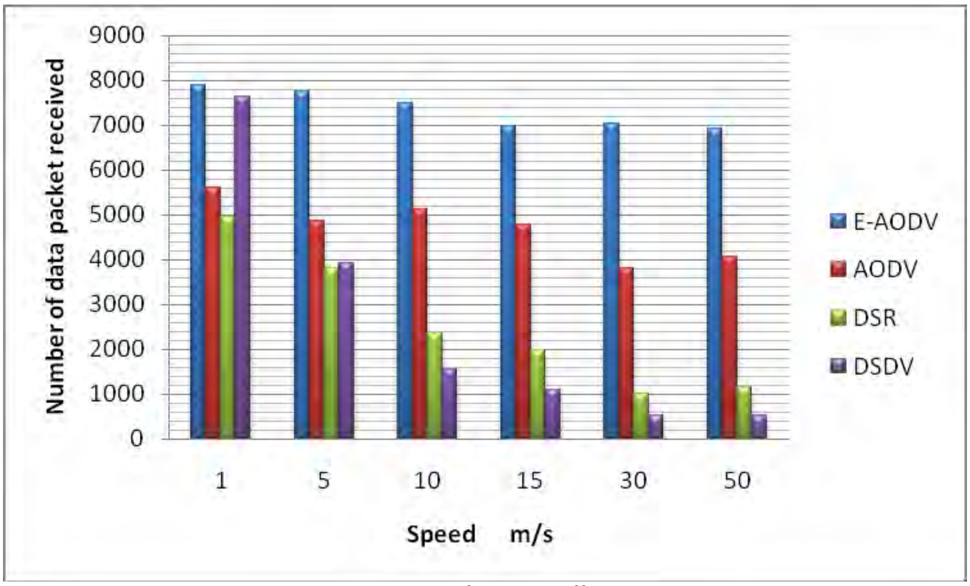

Figure 2 for CBR Traffic

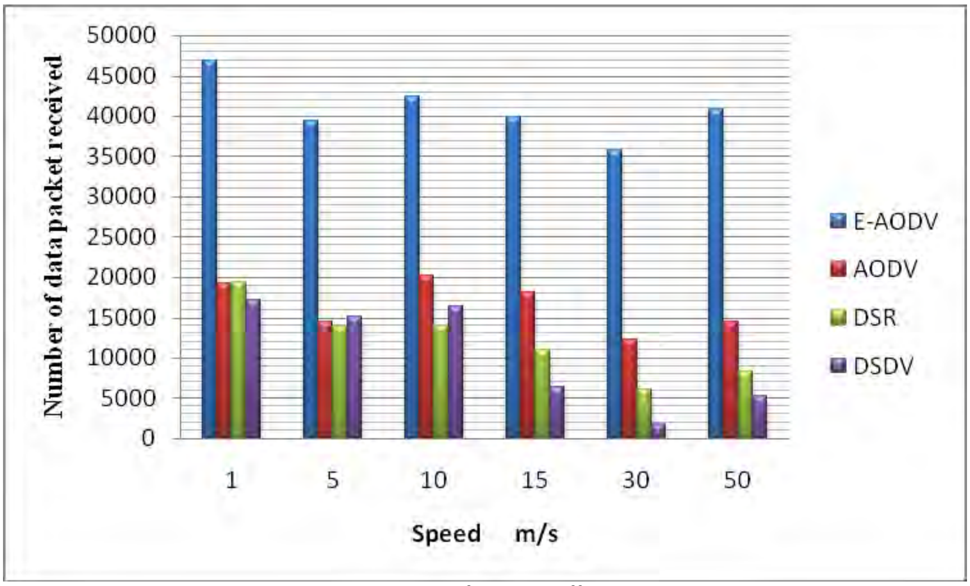

Figure 3 for TCP Traffic

V. CONCLUSION AND FUTURE WORK

In this paper, we introduce a channel availability algorithm to improve the performance of Ad Hoc network with frequent topology change and heavy loads of the traffic in Ad Hoc networks. The strategy results 86% reduction in delay in CBR and 48% in case of TCP traffic and also it giving better results in receiving data packet at destination Simulation analysis using NS2 platform shows that our algorithm remarkably improves the performance of Ad Hoc network in the end-to-end delay and the number of data packet received comparing to other routing protocols. In future, this work can be extended to include the study of energy efficiency, normalized routing load also.

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