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Impact of Density Models Using MANET Routing Protocols

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Abstract: A mobile ad hoc network (MANET) is a collection of wireless dynamic mobile nodes forming a network Topology without the use of any existing network infrastructure or centralized administration. Each node participating in the network acts both as host and a router and must therefore is willing to forward packets for other nodes. Random waypoint is the most common mobility model in most of the simulation based studies of various MANET routing protocols. The existence of number of nodes in a square are can define the density of node. In the present communication PDR, Average End to End delay, Average Throughput, Normalized Routing Load and number of Drop packets in CBR traffic model with Low and High Density Models are measured using routing protocols namely AODV and DSDV. Research efforts have focused much in evaluating their performance when applied to different density (number of nodes in an area) and constant pause times, we perform extensive simulations using NS-2 simulator.

Keywords: MANET, CBR Traffic, Low Density, High Density, PDR, NS-2.

I. INTRODUCTION

A Mobile Ad hoc Networks (MANET) represents a system of wireless mobile nodes that can freely and dynamically self-organize in to arbitrary and temporary network topologies, allowing people and devices to seamlessly communicate without any pre-existing communication architecture. Such infrastructure less networks are usually needed in battlefields, disaster areas, and meetings, because of their capability of handling node failures and fast topology changes. The most important characteristics are dynamic topology, where nodes can change position quite frequently, so we require such routing protocol that quickly adapts to topology changes.

Normal routing protocol, which works well in fixed networks does not show same performance in Mobile ad-hoc Networks. In MANET routing protocols should be more dynamic so that they quickly respond to topological changes [5].

MANET routing protocol must have the following characteristics:

1) Keep the routing table up-to-date and reasonably small,

2) Select the best route for given destination and

3) Converge within an exchange of a small amount of messages[2].

Hassan et. al. [3] have studied performance of mobility speed over MANET routing protocols with random waypoint model. In the present paper, we have compared two routing protocols (AODV and DSDV) with CBR traffic under Low, Medium and High density models. PDR, Average End to End delay, Average Throughput, Normalized Routing Load and number of Drop packets has been evaluated as the function of density and constant pause time.

This paper is organized in five sections. Section 2 gives brief description of studied routing protocols. Section 3 describes simulation environment, CBR traffic, density models and performance metrics. Simulation results are discussed in section 4. Section 5 describes our conclusion and future scope.

II. Description of MANET Routing Protocols

Description of routing protocols AODV and DSDV in brief are as follows:

A. AODV (Ad-hoc On Demand Distance Vector)

AODV[4] is a reactive protocol, which performs Route Discovery using control messages route request (RREQ) and route reply (RREP) whenever a node wishes to send packets to destination. To control network wide broadcasts of RREQs, the source node uses an expanding ring search technique. The forward path sets up an intermediate node in its route table with a lifetime association RREP. When either destination or intermediate node using moves, a route error (RERR) is sent to the affected source node. When source node receives the (RERR), it can reinitiate route if the route is still needed. Neighbourhood information is obtained from broadcast Hello packet. As AODV protocol is a flat routing protocol it does not need any central administrative system to handle the routing process. AODV tends to reduce the control traffic messages overhead at the cost of increased latency in finding new routes. The AODV has great advantage in having less overhead over simple protocols which need to keep the entire route from the source host to the destination host in their messages. The RREQ and RREP messages, which are responsible for the route discovery, do not increase significantly the overhead from these control messages. AODV reacts relatively quickly to the topological changes in the network and updating only the hosts that may be affected by the change, using the RRER message. The Hello messages, which are responsible for the route maintenance, are also limited so that they do not create unnecessary overhead in the network. The AODV protocol is a loop free and avoids the counting to infinity problem, which were typical to the classical distance vector routing protocols, by the usage of the sequence numbers [3].

B. DSDV (Destination Sequenced Distance Vector)

The Destination Sequenced Distance Vector is a table driven or proactive routing protocol. Which provide independence from loops in routing tables, much dynamic and less convergence time. Each node in the MANET manage and maintain a routing table which contains list of all destination nodes present within the network along with number of hops required to reach to particular node. Each entry is marked with a sequence number provided by the destination node. The sequence numbers are used to identify stable routes thus avoiding loops formation. In DSDV [3], each node maintains a routing table, here each table must contain the destination node address, the minimum number of hops to that destination and the next hop in the direction of that destination.

The tables in DSDV have an entry for sequence numbers for each destination. These sequence numbers built a key factor of DSDV protocol as they assure that the nodes can differentiate between pre-existing and new routes. Here each node poses a sequence number and the previous value of the sequence number is increased only by the node with which the sequence number is belonging to. These increased sequence numbers here emulate a logical clock. Suppose any node receives two updates from the same source node then the receiving node here makes a decision as to which update to place in its routing table based on the sequence number. A higher sequence number denotes more fresh update sent out by the source node. Therefore, it can update its routing table with latest information and avoid route loops or false routes.

III. Simulation Environment

The simulation is done with the help of NS-2 simulator version 2.34 [7]. The network contains 10, 30 and 50 nodes randomly distributed in a 800m X 800m area with speed of 2m/s, 20m/s and 50m/s as basic scenario. The simulation time is 100s.

TABLE I: Basic Simulation Scenarios

Parameter	Value
No. of nodes	10, 30, 50
Simulation Time	100s
Mobility Speed	2m/s, 20m/s, 50m/s
Traffic Type	CBR
Packet Size	512byte
Wireless Range	250m

A. CBR Traffic

CBR generates traffic at a deterministic rate. It is not an ON/OFF traffic. It consists of randomly chosen source-destination pairs as the traffic pattern [2].

B. Density Model

Density means number of node in a square area. In our studies we have considered two models, defined as.

I) Low Density Model: Low density model uses 10 nodes in 800m X 800m area.

II) Medium Density Model: Medium density model uses 30 nodes in 800m X 800m area.

III) High Density Model: High density model uses 50 nodes in 800m X 800m area.

C. Performance Metrics

In present performance metrics, that we have been used for performance evaluation of ad-hoc network protocols. The following metrics are applied to comparing the protocol performance. These metrics are suggested by MANET working group for routing protocol evaluation [1].

Average Throughput: The sum of the data packets generated by every source, counted by k bit/s.

Average End to End Delay: This includes all possible delays caused by buffering during routing discovery latency, queuing at the interface queue, and retransmission delays at the MAC, propagation and transfer times.

Packet Delivery Ratio: The ratio between the number of data packets originated by the "application layer" CBR sources and the number of data packets received by the CBR sink at the final destination [9].

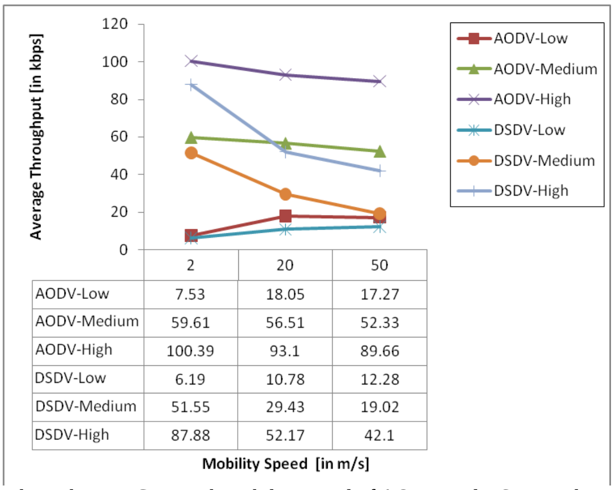
Normalized Routing Load: The sum of the routing control messages such as RREQ, RREP, RRER, HELLO etc, counted by k bit/s.

Number of Drop Packets: The number of the data packets originated by the sources failure to deliver to the destination.

IV. RESULTS

We have made an attempt to evaluate the performance of one reactive routing protocol, AODV and one proactive routing protocol, DSDV over low, medium and high density in a area of 800m x 800m with node mobility speed of 2m/s, 20m/s and 50m/s. The results, which obtain are as discussed.

The Average Throughput in CBR traffic with mobility speed of AODV and DSDV with Low, Medium and High density are shown in the Fig. 1.

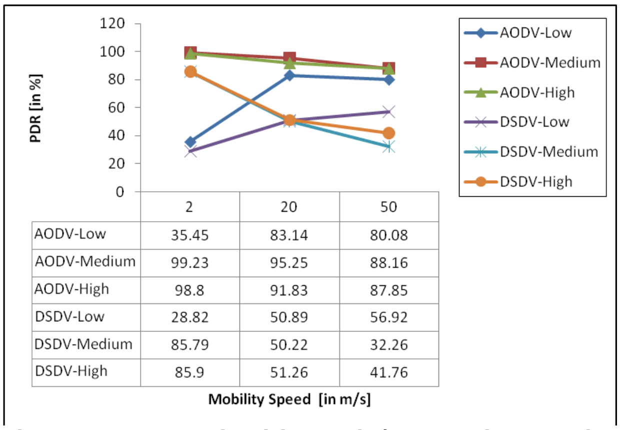


	2	20	50
AODV-Low	7.53	18.05	17.27
AODV-Medium	59.61	56.51	52.33
AODV-High	100.39	93.1	89.66
DSDV-Low	6.19	10.78	12.28
DSDV-Medium	51.55	29.43	19.02
DSDV-High	87.88	52.17	42.1

Fig. 1 Average Throughput in CBR with mobility speed of AODV and DSDV with Density Models

Fig. 1. show Average throughput performance in CBR traffic. The Average throughput of AODV is more than DSDV with all the three Density models with increasing mobility speed. The Average throughput performance of AODV and DSDV with Low Density is increases with increasing mobility speed in Low Density, while in Medium and High Density the Average throughput is decreases with increasing mobility speed. The Average Throughput with Low Density is less than High Density along with both the protocols. At all Density models AODV perform well over the DSDV in terms of Average Throughput.

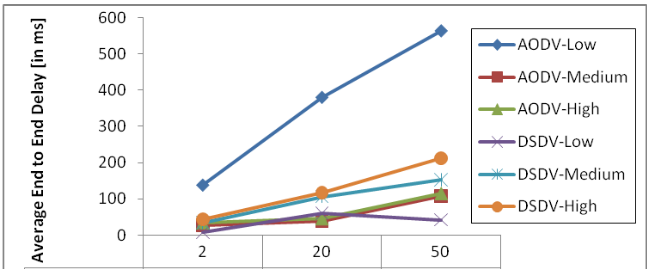
Fig. 2. shows that Packet Delivery Ratio in CBR traffic of both AODV and DSDV with Low Density is less with low mobility speed and increased with increasing mobility speed. The Packet Delivery Ratio of both AODV and DSDV with Medium and High Density is more in comparison of low mobility speed and decreased with increasing mobility speed. The Packet Delivery Ratio of DSDV with Medium and High Density is decreases rapidly with increasing mobility speed because due to high mobility, the chances of link breaks are high. In all Density Models, AODV perform well over the DSDV in terms of Packet Delivery Ratio, due to its on demand source initiated route discovery mechanism.



	2	20	50
AODV-Low	35.45	83.14	80.08
AODV-Medium	99.23	95.25	88.16
AODV-High	98.8	91.83	87.85
DSDV-Low	28.82	50.89	56.92
DSDV-Medium	85.79	50.22	32.26
DSDV-High	85.9	51.26	41.76

Fig. 2 Packet Delivery Ratio in CBR with mobility speed of AODV and DSDV with Density Models

Fig. 3 show Average End to End Delay performance in CBR traffic of AODV and DSDV with Low, Medium and High Density. The Average End to End delay of AODV and DSDV with all Density Models are contrast with each other. In Low Density DSDV perform well over AODV in term of Average End to End Delay, while at Medium and High Density AODV perform well over DSDV in term of Average End to End Delay. Both the protocols show increment in Average End to End Delay with increment in mobility speed. The DSDV protocol performs well over the AODV because it performs less End to End Delay along with Low density. The AODV protocol performs well over the DSDV because it performs less End to End Delay with Medium and High density along with increasing mobility.

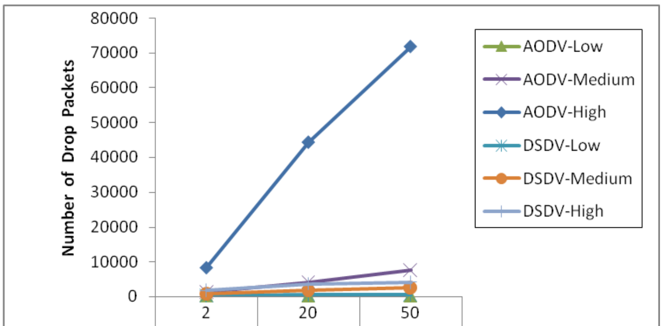


	2	20	50
AODV-Low	137.79	380.13	563.98
AODV-Medium	27.56	39.73	107.26
AODV-High	33.93	45.14	114.25
DSDV-Low	8.62	59.95	42.45
DSDV-Medium	34.51	106.59	153.42
DSDV-High	43.94	117.84	211.56

Mobility Speed [in m/s]

Fig. 3 Average End to End Delay in CBR with mobility speed of AODV and DSDV with Density Models

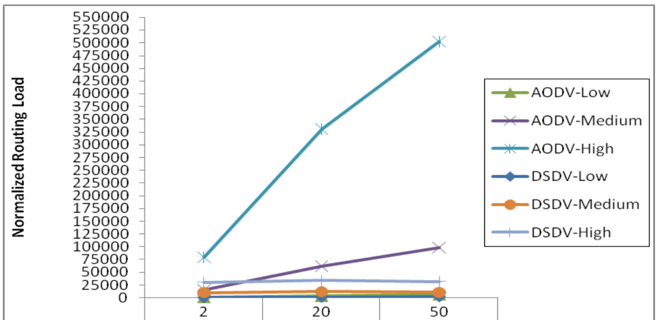
Fig.4 show Number of Drop Packets in CBR traffic of AODV and DSDV with Low Density is less than the DSDV. The Number of Drop Packets of AODV with Medium Density is more than the DSDV with Medium Density. The Number of Drop Packets with Low Density is less than High Density along with both the protocols. In Low Density Number of drop Packets is increased for DSDV and decreased for AODV with increasing mobility speed. In Medium and High Density Number of Drop Packets is increased with increasing mobility speed. At Medium and High Density DSDV perform well over the AODV in terms of Number of drop Packets while at Low Density AODV perform well over the DSDV.



	2	20	50
AODV-Low	236	165	138
AODV-Medium	1315	4243	7708
AODV-High	8338	44402	71894
DSDV-Low	338	577	617
DSDV-Medium	767	1836	2513
DSDV-High	1832	3726	4167

Mobility Speed [in m/s]

Fig. 4 Number of Drop Packets in CBR with different mobility speed of AODV and DSDV with Density Models



	2	20	50
AODV-Low	905	3261	6222
AODV-Medium	15514	62060	98738
AODV-High	79561	330752	502307
DSDV-Low	694	1460	2356
DSDV-Medium	10167	11868	10628
DSDV-High	30713	33882	32020

Mobility Speed [in m/s]

Fig. 5 Normalized Routing Load in CBR with different mobility speed of AODV and DSDV with Density Models

Fig.5 shows that Normalized Routing Load in CBR traffic of both AODV and DSDV with Density Models with increasing mobility speed. The Normalized Routing Load in both AODV and DSDV is increases with increasing mobility speed. The Normalized Routing Load of DSDV is always less than the AODV with all Density models. The Normalized Routing Load is increases with increasing mobility speed because due to high mobility, the chances of link breaks are high. In all Density Models, AODV perform less over the DSDV in terms of Normalized Routing Load, due to its on demand source initiated route discovery mechanism.

V. Conclusion and Future Scope

From the above simulation results, we observe that in CBR traffic; Average Throughput performance with Low Density High Density and Medium density, AODV perform well over the DSDV.

In CBR traffic; in case of Average End to End Delay, the DSDV protocol performs well over the AODV protocol with Low Density and AODV performs well over the DSDV with Medium and High density models along with increasing mobility.

In all Density Models in terms of Packet Delivery Ratio; AODV perform well over the DSDV with CBR traffic.

The Normalized Routing Load in CBR traffic with Low Density, DSDV perform well over the AODV.

In CBR traffic with Low Density AODV perform well over the DSDV in terms of Number of Drop Packets whereas in Medium and High Density DSDV perform well over the AODV protocol.

The conclusion is presented in following tables:

TABLE II: Performance of AODV and DSDV in CBR traffic with Low Density

Parameter with Increasing Mobility Speed	**Performance with Low Density**	
	AODV	**DSDV**
Average Throughput	Better	Better
Packet Delivery Ratio	Less	Less
Average End To End Delay	Better	Better
Number of Drop Packets	Less	Less
Normalized Routing Load	Less	Less

TABLE III: Performance of AODV and DSDV in CBR traffic with Medium Density

Parameter with Increasing Mobility Speed	**Performance with Low Density**	
	AODV	**DSDV**
Average Throughput	Better	Less
Packet Delivery Ratio	Better	Less
Average End To End Delay	Better	Less
Number of Drop Packets	Less	Better
Normalized Routing Load	Less	Better

TABLE IV: Performance of AODV and DSDV in CBR traffic with High Density

Parameter with Increasing Mobility Speed	**Performance with Low Density**	
	AODV	**DSDV**
Average Throughput	Better	Less
Packet Delivery Ratio	Better	Less
Average End To End Delay	Better	Less
Number of Drop Packets	Less	Better
Normalized Routing Load	Less	Better

These results state that in CBR traffic, DSDV perform well in case of End to End Delay with Low Density, while AODV perform better with Medium and High density Model. DSDV perform better with Medium and High density Model in case of Normalized Routing Load and Number of Drop Packets, whereas AODV perform better with Low Density in CBR traffic.

In future we will try to evaluate and measure performance of various other MANET routing protocols with these Density Models under different traffic types.

References

1. Natrajan and Mahadevan, "A Comparative Analysis and Perform Evaluation of TCP over MANET Routing Protocol", in Jounral of Wireless Network and Microsystems, Vol. 4, No. 1-2, January-December, 2015, pp. 9-20.
2. Sharma, Rizvi, Sharma, Malhan, Sharma, "Performance Evaluation of MANET Routing Protocols under CBR and FTP traffic classes", International Jounral of Computer Technology and Application, Vol 2 (3), 2014.pp.392-400.
3. Chavhan and Asole, "Comparative Analysis and Performance Evaluation of MANET Routing Protocols", International Journal of Computer Science and Mobile Computing, Vol.3 Issue.12, December-2014, pp. 369-375.
4. Dhenakaran and Parvathavarthini, "An Overview of Routing Protocols in Mobile Ad-hoc Network", International Journal of Advance Research in Computer Science and Software Engineering, Vol.3, Issue 2, February 2013, pp.251-258
5. Gupta, Sadarwati and Verma, "Performance Analysis of MANET Routing protocols in Different Mobility Models", International Journal of Information Technology and Computer Science, 2013, 06, pp.73-82.
6. Paul and Das, "Performance Evaluation of MANET Routing Protocols", IJCSI International Journal of Computer Science Issues, Vol 9, Issue 4, No 2, July 2012 pp.449-456.
7. Agrawal, Daigavane and Kulat, "Performance Evaluation of Routing Protocols for Wireless Ad-hoc Network", International Journal of Advance Technology, Vol. 3, Issue 1, January-March,2012, pp.13-17
8. Vinit Garg, Manoj Kr. Shukla, Tanupriya Choudhury and Charu Gupta. "Advance Survey of Mobile Ad-Hoc Network", International Journal of Computer Science and Technology (IJCST), Vol. 2, Issue 4, Oct-Dec 2011, pp 552-555.
9. G. Vijaya Kumar, Y. Vasudeva Reddy and Dr. M. Nagendra, "Current Research Work on Routing Protocols for MANET: A Literature Survey", International Journal of Computer Science and Engineering (IJCSE) , Vol. 2, No. 3, 2010, pp 706-713.
10. Vikas Singla ,Rakesh Singla and Ajay Kumar, "Performance Evaluation and Simulation of Mobile Ad-hoc Network Routing Protocols", International Journal of Engineering and Information Technology (IJEIT) , Vol. 1, No. 1, Oct 2009, pp 49-53.