MANET PROTOCOLS ANALYSIS WITH VARYING PAUSE TIME SIMULATION TIME AND SPEED

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ABSTRACT

In this paper we are doing comparison of different routing protocols in MANET and these routing protocols are AODV, DSDV, and DSR [1]. The parameters on which the comparison is to be performed are speed, no. of packets transmitted, lost, bit rate and packet delay. The term MANET refers to a multi hop packet based wireless network composed of a set of mobile nodes that can communicate and move at the same time, without using any kind of fixed wired infrastructure. MANET is actually self organizing and adaptive networks that can be formed and deformed on-the-fly without the need of any centralized administration. The network topology is highly dynamic due to the movements of the nodes.

GENERAL TERMS

MANETS-Mobile Ad-hoc Networks, AODV, DSR, DSDV, CBR, Packet Delivery Ratio, Average End to End Delay, Throughput, Loss Packet Ratio.

1. INTRODUCTION

A mobile ad-hoc network (MANET) is a self configuring infrastructure-less network of mobile devices connected by wireless links. Each device in a MANET [2] is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use and therefore be a router. Mobile Ad-hoc Networks (MANET) have attracted substantial research efforts recently, partially due to their appealing applications in infrastructure less situations. In MANET each mobile node functions as both a host and a router. Mobile nodes are typically powered by batteries, and have less powerful computing resources than desktop computers. Moreover, the network topology is highly dynamic due to the movements of the nodes. In MANET, Routing protocols are divided in two categories Proactive protocols (Distance Sequence Distance Vector) and Reactive protocols (Ad Hoc on Demand Distance Vector – AODV, Dynamic Source Routing – DSR). The Proactive Protocols are table driven. They usually use Link State Routing Algorithms. Link State Algorithm maintains a full or partial copy of network topology and costs for all known links.

Reactive Protocols find a route on demand by flooding the network with RREQ packets. They usually use Distance Vector Routing Algorithms [3,4] that keep only information about the next hops to adjacent neighbors and costs for all paths to all known destinations.

2. RELATED WORK

There are several papers [3, 5, 6, 7, 8,15] related to performance analysis of MANET protocols. In [7] they have analyzed these protocols on the basis of packet delivery ratio, loss packet ratio and routing over head. Analysis has been done by varying mobile speed only but in another different paper [5, 12] it has shown different result by varying pause time keeping mobile nodes constant .Here we are proposing a survey according to that we will vary simulation time, speed, pause time and then we can analyze performance of these protocols. We take AODV, DSR, DSDV protocols for reflecting our results and will analyze which one is better in particular environment.

3. ROUTING PROTOCOLS

An ad hoc routing protocol [2] is a standard that maintains routing of packets. It decides how to route packets between various mobile nodes. Routing protocols can be classified in two categories.

I. Source Initiated on demand routing protocols: AODV, DSR

II. Table driven protocol: DSDV

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AODV

The AODV protocol is an on-demand routing protocol, which initiates a route discovery process only when desired by an originating node. When an originating node wants to send data packets to a destination node but cannot find a route in its routing table, it broadcasts a Route Request (RREQ) message to its neighbors. Its neighbors then rebroadcast the RREQ message to their neighbors if they do not have a fresh enough route to the destination node. This process continues until the RREQ message reaches the destination node or an intermediate node that has a fresh enough route.

Every node has its own sequence number and RREQ ID. AODV uses sequence numbers to guarantee that all routes are loop free and contain the most recent routing information. The RREQ ID in conjunction with the originator IP address uniquely identifies a particular RREQ massage. The destination node or an intermediate node only accepts the first copy of a RREQ message, and drops the duplicated copies of the same RREQ message.

After accepting a RREQ massage, the destination or an intermediate node updates its reverse route to the originating node using the neighbor from which it receives the RREQ message. The reverse route will be used to send the corresponding Route Reply (RREP) message to the originating node. Meanwhile, it updates the sequence no. of the originating node in its routing table to the maximum of the

ISSN: 2278 – 1323
International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)
Volume 1, Issue 8, October 2012

one in its routing table and the one in the RREQ message. When the originator or an intermediate node receives a RREP message, it updates its forward route to the destination node using the neighbor from which it receives the RREP message. It also updates the sequence no. of the destination node in its routing table to the maximum of the one in its routing table and the one in the RREP message. A Route Reply Acknowledgment (RREP-ACK) message is used to acknowledge receipt of a RREP message. Though not required, AODV may utilize the HELLO message to maintain the local connectivity of a node.

In AODV, each node maintains two separate counters:

Sequence no. : A monotonically increasing counter used to maintain freshness information about the reverse route to the source and forward route to the destination.

Broadcast ID: It is incremented whenever the source issues a new RREQ message. Each node also maintains information about its reachable neighbors with bi-directional connectivity.

DSDV

DSDV is a table driven, hop- by- hop distance vector routing protocol, in which each node has a routing table that stores the next hop and no. of hops for that destination. DSDV is based on the distributed Bellman –Ford algorithm where each node maintains a table that contains the shortest distance and the first node on the shortest path to every other node in the network. Each entry in the routing table contains a sequence no, the sequence numbers are generally even if a link is present; else, an odd no. is used. A route with higher sequence no. is more favorable than a route with lower sequence no. However, if two routes with same sequence no., the route with fewer hops is more favorable. It incorporates table updates with increasing sequence no. tags to prevent loops, to counter the count- to- infinity problem, and for faster convergence.

DSDV requires some time to converge before a route can be used because DSDV is dependent on periodic broadcasts. In static wired networks, where the topology is not frequently changing, this time is negligible. On the other hand, in ad-hoc network, where the topology is expected to be very dynamic, this high converging time will probably mean a lot of dropped packets before a valid route are detected. The periodic broadcasts also add a large amount of overhead in to the network.

DSDV protocol guarantees loop free paths, and count to infinity problem is reduced in DSDV [4].

DSR

DSR is an on-demand routing protocol [4, 14]. Dynamic source routing (DSR) is a source initiate routing protocol. Source routing means that each packet in its header carries the complete ordered list of nodes through which the packet must pass. DSR does not use periodic routing messages, thus reducing network bandwidth overhead, conserving battery power and avoiding large routing updates throughout the ad-hoc network. Instead DSR relies on support from the MAC layer (the MAC layer should inform the routing protocol about link failures).

The Dynamic Source Routing protocol (DSR) is a simple and efficient routing protocol designed specifically for use in multi-hop wireless ad hoc networks of mobile nodes. DSR Permits the network to be completely self-organizing and self-configuring, without the need for any existing network infrastructure or administration. The protocol is composed of the two mechanisms of "Route Discovery" and "Route Maintenance", which work together to allow nodes to discover and maintain source routes to arbitrary destinations in the ad hoc network. In DSR there is no need to keep routing table because entire route is contained in the packet header.

4. PERFORMANCE PARAMETERS

For network simulation there are several parameters which are used to evaluate performance of network. In This paper we use.

4.1 Packet Loss Ratio

Loss Packet Ratio is the ratio of number of packets that never reached the destination to the number of packets originated by the source.

4.2 Average End to End Delay

This includes all possible delays caused by buffering during route discovery latency, queuing at the interface queue, retransmission delays at the MAC, and propagation and transfer times.

4.3 packet delivery ratio

Packet delivery ratio is the ratio of number of packets received at the destination to the number of packets sent from the source.

4.4 End-to-end delay

It refers to the time taken for a packet to be transmitted across a network from source to destination.

$$D_{end-end} = N [d_{trans} + d_{prop} + d_{proc}]$$

Where

$d_{end-end}$ = end-to-end delay

d_{trans} = transmission delay

d_{prop} = propagation delay

d_{proc} = processing delay

N= number of links (Number of routers + 1)

4.5 Throughput

Throughput is the average rate of successful message delivery over a communication channel. This data may be delivered over a physical or a logical link, or pass through a certain network node. Throughput is measured in bits per second.

5. SIMULATION SCENARIO

For simulation we used random waypoint mobility model.

Simulation has been done by network simulator. We simulated there protocols AODV, DSR, DSDV.

5.1 Simulation parameters

In our simulation, we used 500m x 500m environment size we have fixed node density that is 50 nodes with variable speed and variable simulation time with maximum 10 connections. The network parameters we have used for simulation purpose shown in table 1.

Table 1 network parameters

Statistic	value
Channel type	wireless
Radio propagation model	Random waypoint
MAC type	802.11
Antenna	Omni Antenna
Source type	UDP
Environment Area(m, m)	500,500
Maximum connection	10
Number of mobile nodes	50
Pause time (s)	Variable(1,5,10,15,20,25)
Speed(m/s)	Variable(10,20,30,40,50)
Simulation time(s)	Variable(100,200,300,400,500)
protocols	AODV,DSR,DSDV
Traffic type	CBR

5.2 Performance script

In ns 2 when we run the program two types of file created they are NAM file and TR file .the first one is Network Animator file which is use to visualize the simulation.TR file stands for trace file which keep records of various quantities. Gawk files are used to calculate various parameters these parameters are calculated by using TR file using this file we can calculate no. of sent packets, no. of received packets, throughput, and e to e delay packet loss.

5.3 Result Analysis

The performance of AODV,DSR,DSDV has been analyzed with varying simulation time(100,200,300,400,500)s ,pause time(1,5,10,15,20,25)s, speed(10,20,30,40,50)m/s.
we measured packet delivery ratio, packet loss ratio, average end to end deal and throughput .

5.4 Graph

Based on simulation result we generated the graph which shows the different performance of AODV, DSR, and DSDV. These graphs are generated between varying simulation time, varying speed, varying pause time and performance parameter as we can see in the graph that every protocol responds in different manner with regarding to associated quantity. By analyzing these graphs we can give a conclusion remark about protocol performance and can also give a prediction that in which particular situation which protocol is better to perform. Moreover of it protocol selection for different scenario can also be made.

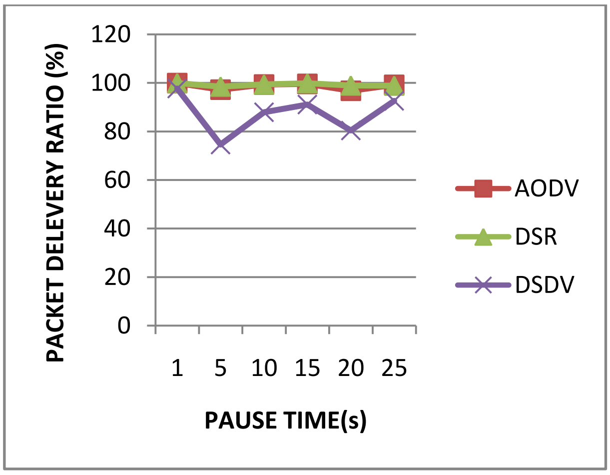

Figure1.Packet Delivery Ratio vs. Pause Time

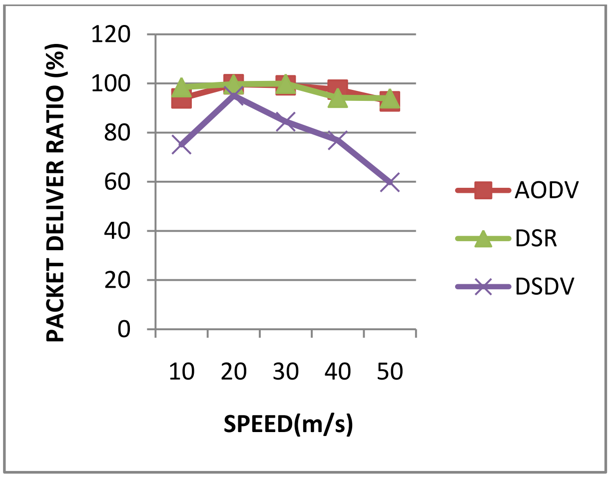

Figure 2.Packet Delivery Ratio vs. Speed

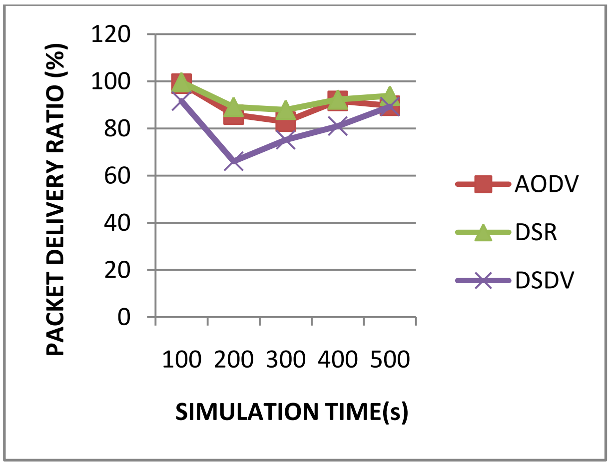

Figure 3.Packet Delivery Ratio vs. Simulation Time

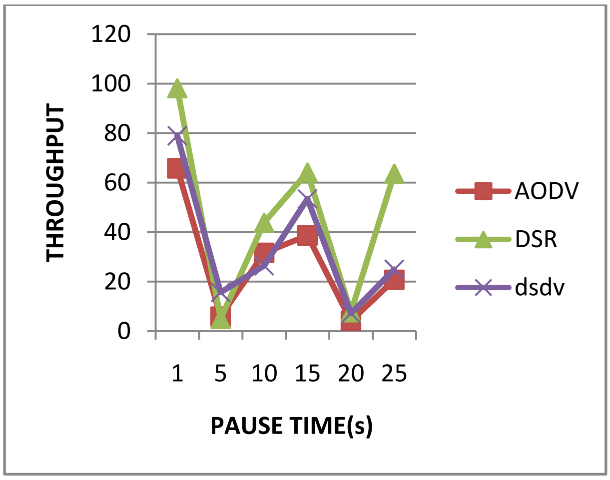

Figure 4.Throughput vs. Pause Time

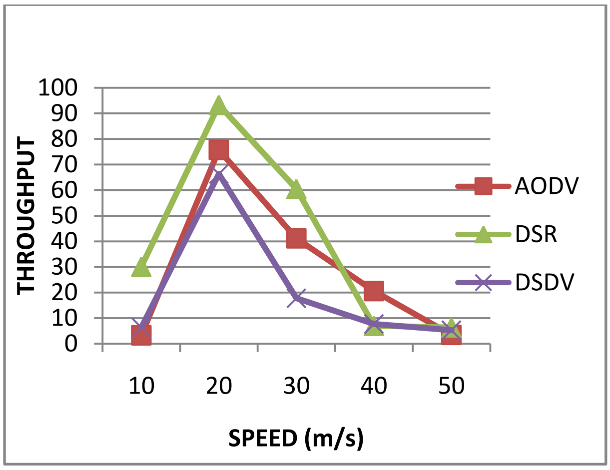

Figure 5.Throughput vs. Speed

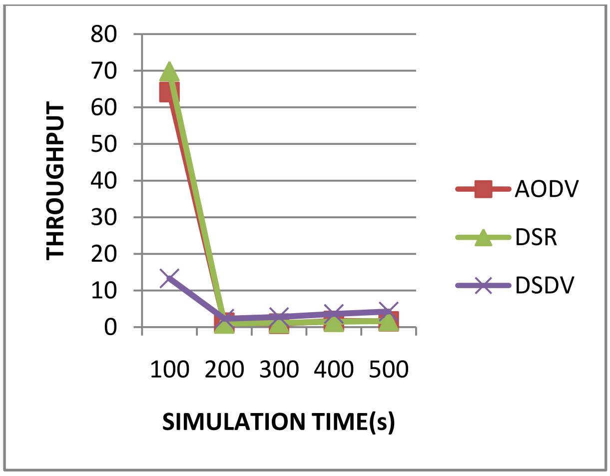

Figure 6.Throughput vs. Simulation Time

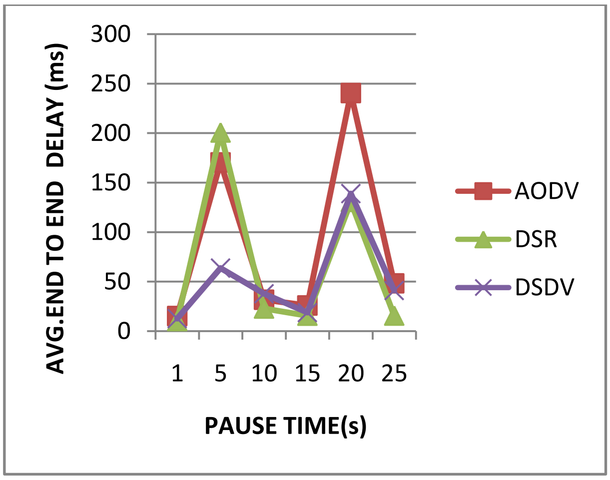

Figure 7.Avg.E2E Delay vs. Pause Time

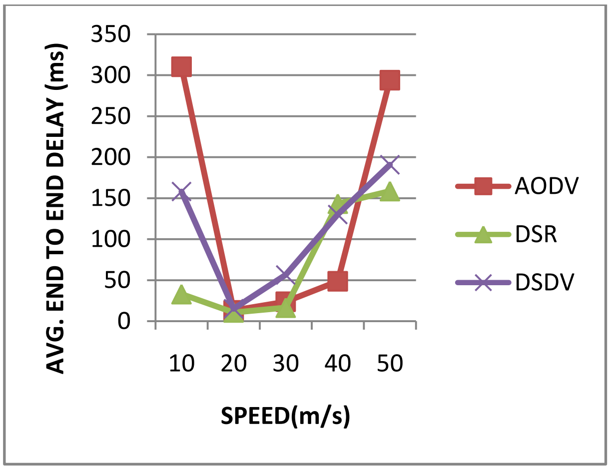

Figure 8.Avg. E2E Delay vs. Speed

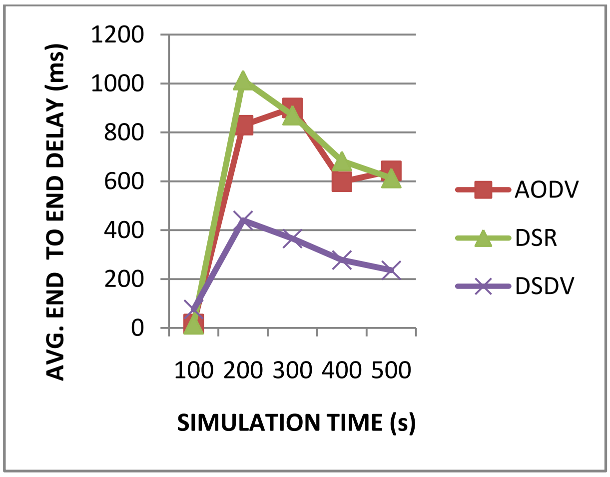

Figure 9.Avg. E2E Delay vs. Simulation Time

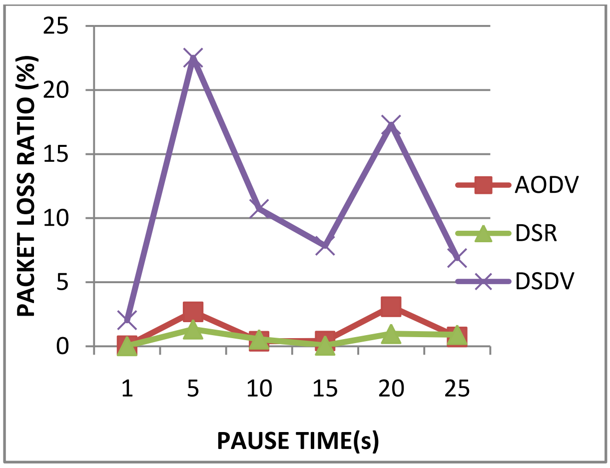

Figure 10.Packet Loss Ratio vs. Pause Time

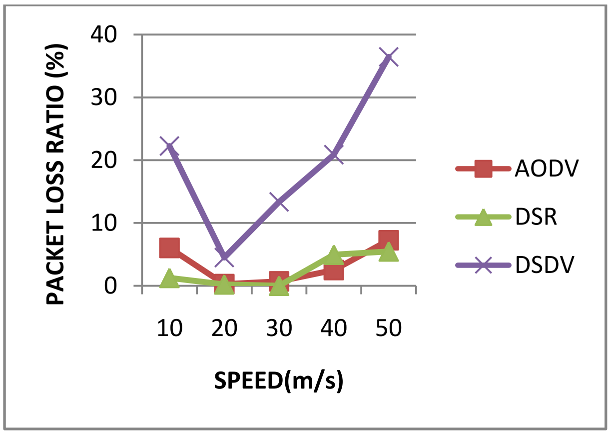

Figure 11.Packet Loss Ratio vs. Speed

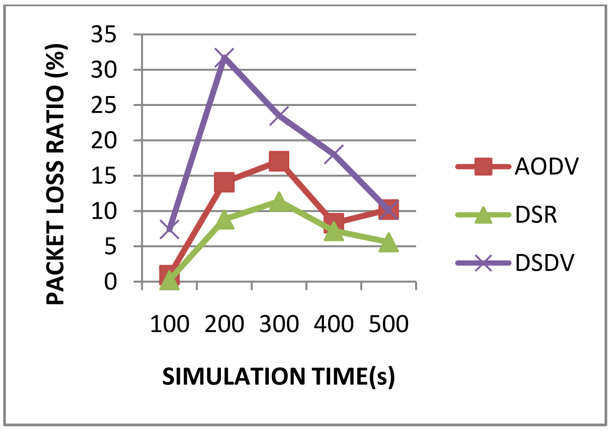

Figure12. Packet Loss Ratio vs. Simulation time

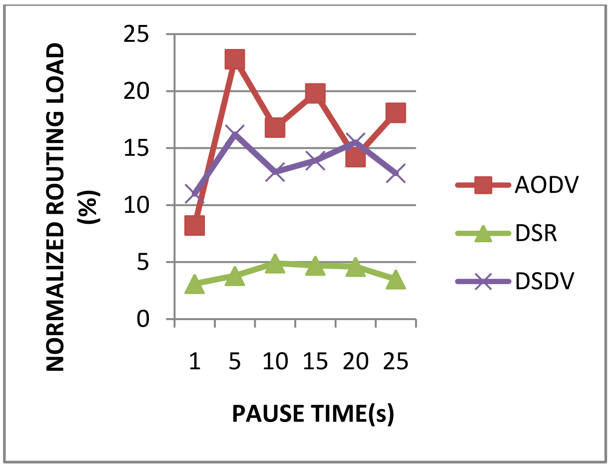

Figure 13.Normalized Routing Load vs. Pause Time

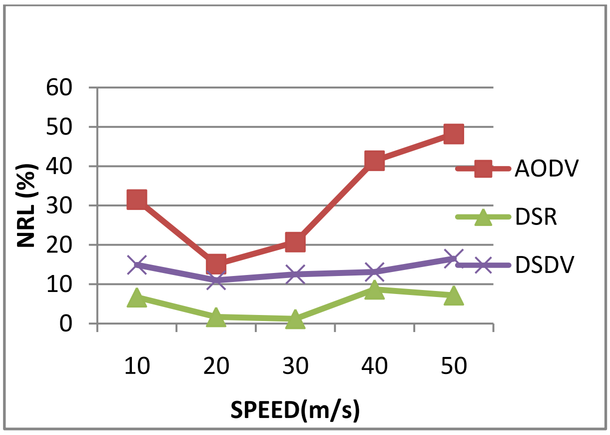

Figure 14.Normalized Routing Load vs. Speed

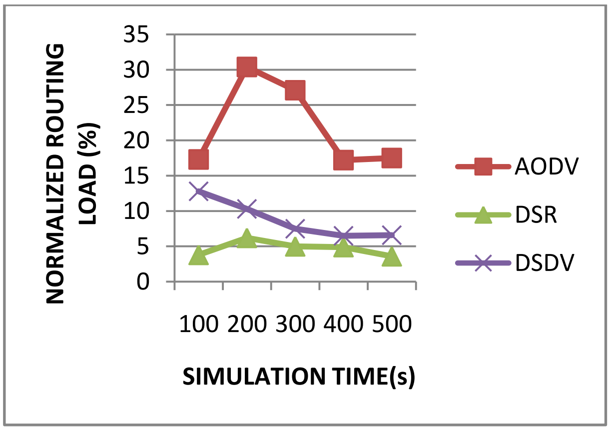

Figure 15.Normalized routing Load vs. Simulation Time

5. DECISION

Table2. Varying pause time

Performance metrics	AODV	DSR	DSDV
PDR	High	High	Low
Throughput	Low	High	Avg.
NRL	High	Low	Avg.
PLR	Low	Low	High
Avg.E2E Delay	High	High	Low

Table3. Varying Speed

Performance metrics	AODV	DSR	DSDV
PDR	High	High	Low
Throughput	High	High	Low
NRL	High	Low	Avg.
PLR	Low	Low	High
Avg.E2E Delay	High	Low	Avg.

Table4. Varying Simulation Time

Performance metrics	AODV	DSR	DSDV
PDR	High	High	Low
Throughput	Avg.	Avg.	Low
NRL.	High	Low	Avg.
PLR	Avg.	Low	High
Avg.E2E Delay	High	High	Low

6. CONCLUSION

In this research paper we analysis between two on demand routing protocols AODV and DSR & one Table driven protocol DSDV we done this comparison on the basis of packet delivery ratio, packet loss ratio, normalized routing and throughput. This comparison shows that whatever be the scenario AODV and DSR always performs better than DSDV in terms of packet delivery ratio. AODV also performs better in case of normalized routing load. And also AODV and DSR perform better than DSDV when packet loss is concern. But in the case of delay DSDV performs better in any scenario. We compared these protocols by varying pause time, speed, simulation time we can also compare these protocols by varying no. of deployed mobile nodes. This work can motivate further research on modifying current protocols or creating new protocols to meet the challenges of wireless networks.

7. Reference

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