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PERFORMANCE COMPARISION OF TWO ON DEMAND ROUTING PROTOCOLS AODV AND DSR IN MANET

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Abstract: A mobile Ad hoc Network (MANE T) is a collection of wireless mobile nodes forming a temporary network without using fix communication .It means that Nodes are connected through a wireless medium forming rapidly changing topologies and nodes are free to move about and organize themselves in to a network. These nodes change positions frequently. The main classes of routing protocols are Proactive, Reactive and Hybrid. A Reactive (On Demand) routing strategy is a popular routing category for wireless Ad hoc routing. Routing protocols are analyzed against several performance matrices: Average throughput, Normalized routing load (NR L), Packet delivery fraction (PDF), Average end to end delay. In this paper the performance e differentials are analyzed using varying Pause time, Number of nodes and Speed of mobile nodes. These simulations are carried out using the ns-2 network simulator. The results represent the importance in carefully evaluating and implementing routing protocols in an ad hoc environment.
Keywords: Performance, Routing Protocol, AODV, DSR, Mobile Ad-hoc Networks

I. INTRODUCTION

A Mobile ad hoc network is a group of wireless mobile computers (or nodes) in which no des collaborate by forwarding packets for each other to allow them to communicate outside range of direct wireless transmission. Ad hoc networks require no centralized administration or fixed network infrastructure such as base stations or access points, and can be quickly and inexpensively set up as needed. A MANET is an autonomous group of mobile users that communicate over reasonably slow wireless links. The network topology may vary rapidly and unpredictably over time, because the nodes are mobile. The network is decentralized, where all network activity, including discovering the topology and delivering messages must be executed by the nodes themselves. Hence routing functionality will have to be incorporated into the mobile nodes. MANET is a kind of wireless ad-hoc network and it is a self-configuring network of mobile routers (and associated hosts) connected by wireless links the union of which forms an arbitrary topology. The routers, the participating nodes act as router, are free to move randomly and manage themselves arbitrarily; thus, the network's wireless topology may change rapidly and unpredictably. Such a network may operate in a standalone fashion, or may be connected to the larger Internet.

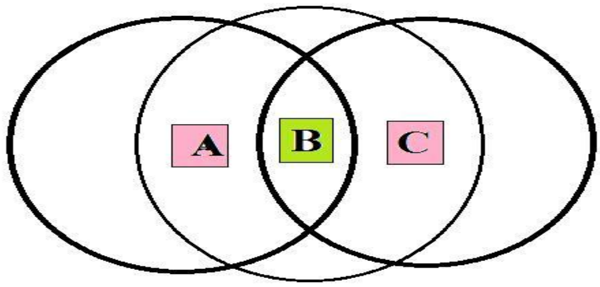
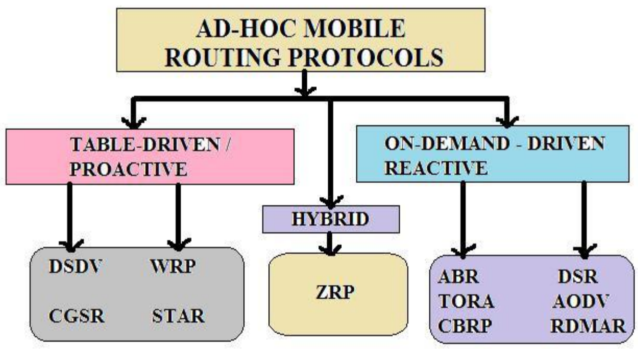


Fig.1 Example of a simple Ad hoc network with three participating nodes

The mobile nodes can directly communicate to those nodes that are in radio range of each other, whereas others nodes need the help of intermediate nodes to route their packets. These networks are fully distributed, and can work at any place without the aid of any infrastructure. This property makes these networks highly robust. In Figure 1.1 nodes A and C must discover the route through B in order to communicate. The circles indicate the nominal range of each node’s radio transceiver. Nodes A and C are not in direct transmission range of each other, since A „s circle does not cover C.

II. ROUTING PROTOCOLS OF AD HOC NETWORKS

There are several routing protocols have been developed for Ad Hoc Mobile networks [1]. Such protocols must deal with typical limitations of these networks which include high power consumption, low b and width and high error rates.



A. Table-Driven Routing Protocols

In table driven routing protocols, consistent and up to date routing information to all nodes is maintained at each node.

B. On-Demand Routing Protocols

In On-Demand routing protocols, the routes are created as and when required. When a source wants to send to a destination, it invokes the route discovery mechanisms to find the path to the destination.

III. AD HOC ON-DEMAND DISTANCE VECTOR ROUTING (AODV)

AODV [2] discovers routes on an as needed basis via a similar route discovery process. However, AODV adopts a very different mechanism to maintain routing information.
It uses traditional routing tables, one entry per destination. This is in contrast to DSR, which can maintain multiple route cache entries for each destination. Without source routing, AODV relies on routing table entries to propagate an RREP back to the source and, subsequently, to route data packets to the destination. AODV uses sequence numbers maintained at each destination to determine freshness of routing information and to prevent routing loops. All routing packets carry these sequence numbers. An important feature of AOD V is the maintenance of timer-based states in each no de, regarding utilization of individual routing table entries. A routing table entry is expired if not used recently. A set of predecessor nodes is maintained for each routing tab le entry, indicating the set of neighbouring nodes which use that entry to route data packets. These nodes are notified with RERR packets when the next-hop link breaks. Each predecessor node, in turn, forwards the RERR to its own set of predecessors, thus effectively erasing all routes using the broken link. In contrast to DSR, RERR packets in AODV are intended to inform all sources using a link when a failure occurs. Route error propagation in AODV can be visualized conceptually as a tree whose root is the node at the point of failure and all sources using the failed link as the leaves.

IV. DYNAMIC SOU RCE ROUTING (DSR)

The key feature of D SR [4] is the use of source routing. That is, the sender knows the complete hop -by-hop route to the destination. These routes are stored in a route cache. The data packets carry the source route in the packet header. When a node in the ad hoc network attempts to send a data packet to a destination f or which it does not already know the route, it uses a route discovery process to dynamically determine such a route. Route discovery works by flooding the network with route request (RREQ) packets. Each node receiving an RREQ rebroadcasts it, unless it is the destination or it has a route to the destination in its route cache. Such a node replies to the RREQ with a route reply (RREP) packet that is routed back to the original source. RREQ and RREP packets are also source routed. The RREQ builds up the path traversed across the network. The RREP routes itself back to the source by traversing this path backward. The route carried back by the RREP packet is cached at the source for future use. If any link on a source route is broken, the source node is notified using a route error (RERR) packet. The source removes any route using this link from its cache. A new route discovery process must be initiated by the source if this route is still needed. DSR makes very aggressive use of source routing and route caching.

V. PERFORMANCE METRICS

A. Packet delivery fraction
The ratio of the data packets delivered to the destinations to those generated by the CBR sources. Packets delivered and packets lost are taking in to consideration.

B. Throughput
There are two representations of throughput; one is the amount of data transferred over the period of time expressed in kilobits per second (Kbps). The other is the packet delivery percentage obtained from a ratio of the number of data packets sent and the number of data packets received.

C. End to End Delay

The time taken by the packet to reach the destination is called end to end delay so it is the time taken to travel between two ends i.e. source and destination.

VI. SIMULATION RESULT AND ANALYSIS

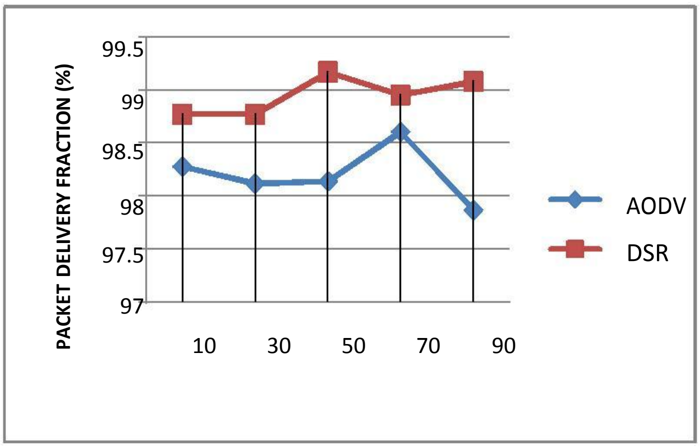
A. Simulation Environment
The simulation experiment is carried out in LINUX (UBUNTU-12.04.3). The detailed simulation model is based on network simulator-2 (ver-2.35), is used in the evaluation. The NS instructions can be used to define the topology structure of the network and the motion mode of the nodes, to configure the service source and the receiver, to create the statistical data track file and so on.

B. Traffic Model
Continuous bit rate (CBR) traffic sources are used. The source-destination pairs are spread randomly over the network.

C. Mobility Model
The mobility model used is Random waypoint mobility model because it models the random movement of the mobile nodes. We have taken two On-demand (Reactive) routing protocols, namely Ad hoc On-Demand Distance Vector Routing (AODV) and Dynamic Source Routing (DSR). The mobility model used is Random waypoint mobility model because it models the random movement of the mobile nodes.

Parameter	Value
Protocols	AODV , DSR
No. of Nodes	10, 30, 50, 70, 90

Area Size	1000*1000m
Traffic Type	CBR (Constant bit rate)
Packet Size	512 bytes
Queue length	50
Propagation path loss Model	Two Ray Ground
Antenna Type	Omni - directional
Simulation Time	900 sec
Pause Time	5 sec
Maximum Speed	20 m/s



FIig.1 A Pdf Comparisons Of AODV and DSR Varying Pause Time

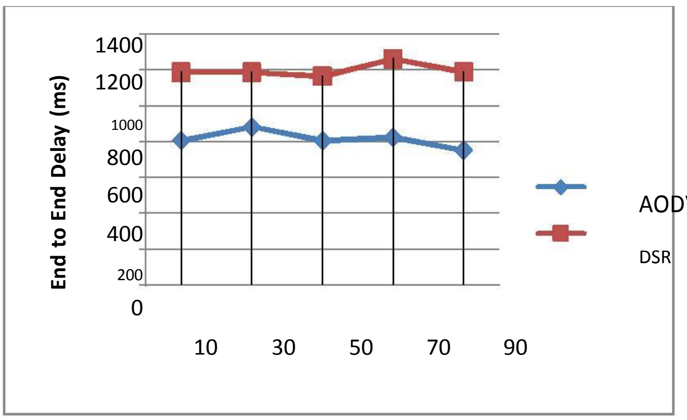


Fig.2 Average End To End Delay of Comparisons of AODV and DSR Varying Pause Time

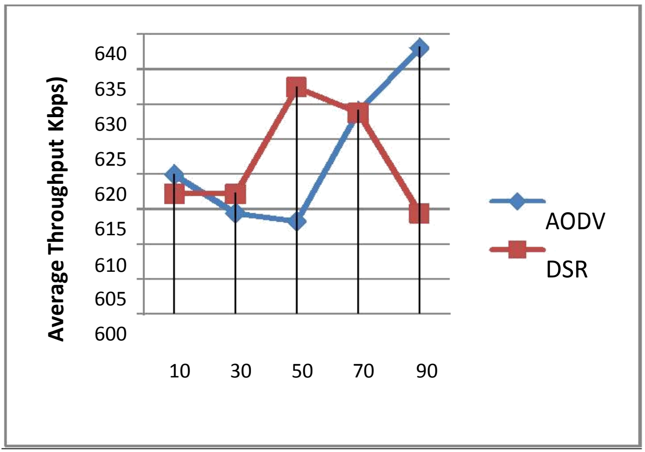


Fig.3 THROUGHPUT OF Comparisons of AODV and DSR Varying Pause time

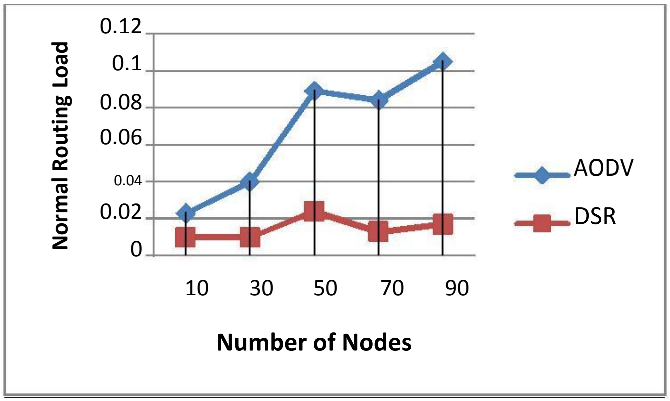


Fig.4 Normalized Routing load OF Comparisons of AODV and DSR Varying Pause time

Parameter	**Value**
Protocols	AODV, DSR
Pause Time	0,20,40,60,80,100 sec
Area Size	1000*1000 m
Traffic Type	CBR(Constant bit rate)
Packet Size	512 bytes
Queue length	50
Propagation path loss Model	Two Ray Ground
Antenna Type	Omni-directional
Simulation Time	900 sec
Speed	20 m/s
Number of nodes	30,50

For Fixed – 30 Nodes

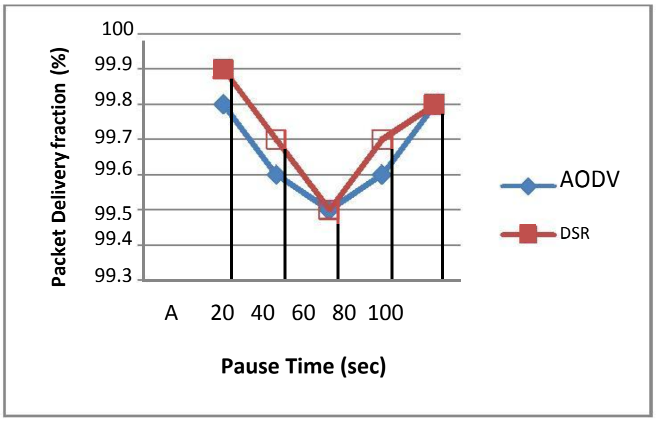


Fig.5: A PDF Comparisons of AODV and DSR Varying Pause time.

For Fixed – 50 Nodes

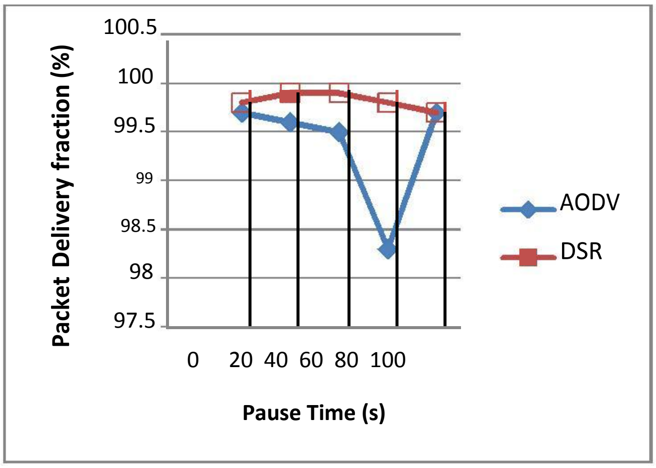


Fig.6: A PDF Comparisons of AODV and DSR Varying Pause time.

For Fixed – 30 Nodes

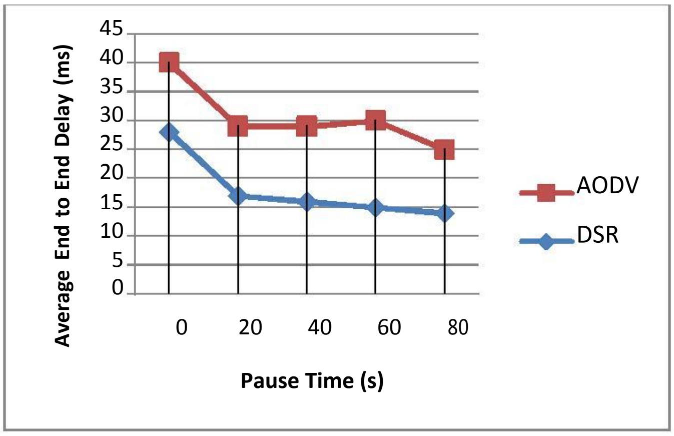


Fig.7 Average End To End Delay Of Comparisons of AODV and DSR Varying Pause Time

For Fixed – 50 Nodes

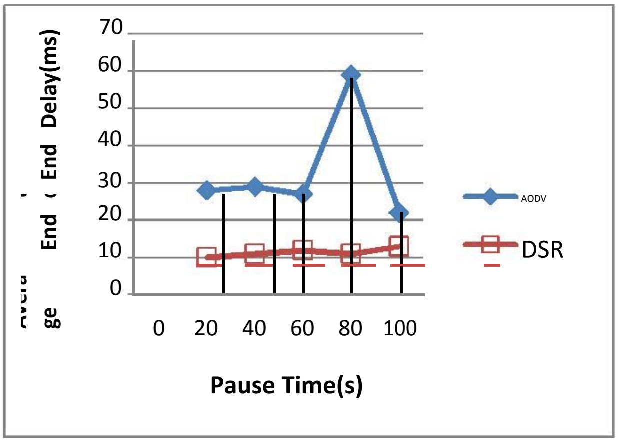


Fig.8 AVERAGE END TO END DELAY OF Comparisons Of AODV and DSR Varying Pause Time

For Fixed – 30 Nodes

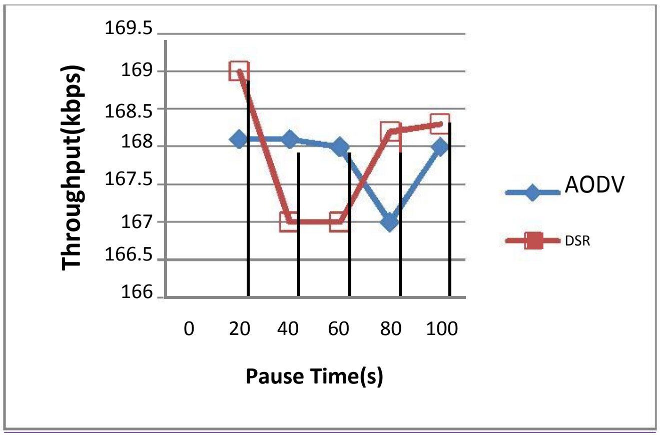


Fig.9 THROUGHPUT OF Comparisons of AODV And DSR Varying Pause Time

For Fixed – 50 Nodes

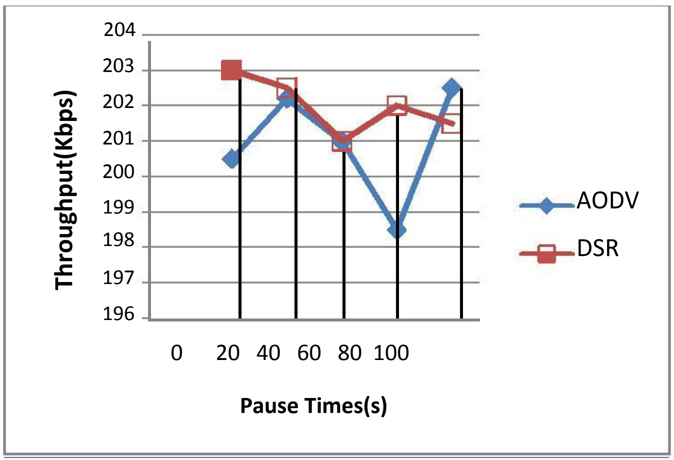


Fig.10 THROUGHPUT OF Comparisons of AODV and DSR Varying Pause time

Parameter	Value
Protocols	AODV, DSR
Pause Time	0,20,40,60,80,100 sec
Area Size	1000*1000 m
Traffic Type	CBR(Constant bit rate)
Packet Size	512 bytes
Queue length	50
Propagation path loss Model	Two Ray Ground
Antenna Type	Omni-directional
Simulation Time	900 sec
Speed	10,20,30,40,50,60,70,80 m/s
Number of nodes	20,80

For Fixed – 20 Nodes

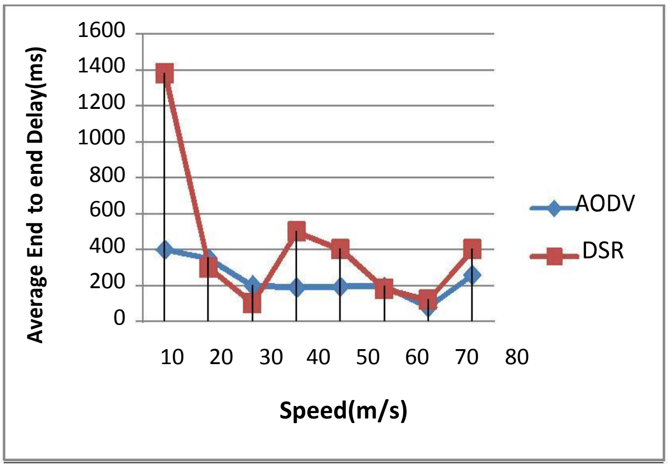


Fig.11 AVERAGE END TO END DELAY OF Comparisons of AODV and DSR Varying Pause time

For Fixed – 80 Nodes

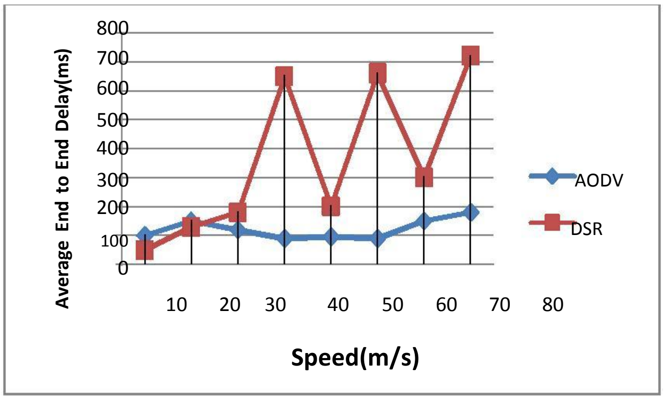


Fig.12 AVERAGE END TO END DELAY OF Comparisons of AODV and DSR Varying Pause time

For Fixed – 20 Nodes

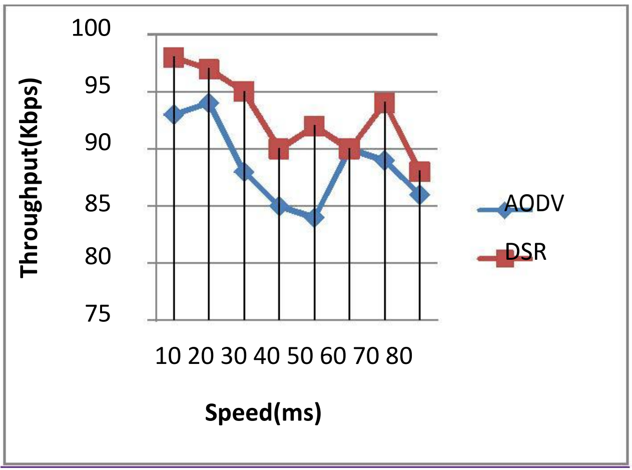


Fig.13 THROUGHPUT OF Comparisons of AODV and DSR Varying Pause time

For Fixed – 80 Nodes

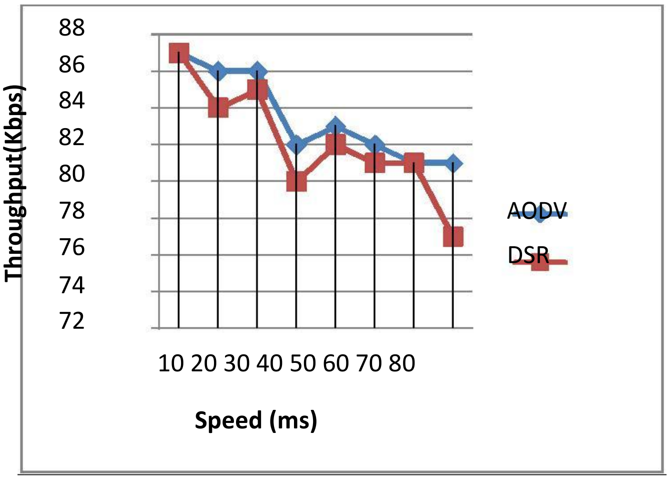


Fig.14 THROUGHPUT OF Comparisons of AODV and DSR Varying Pause time

For Fixed – 20 Nodes

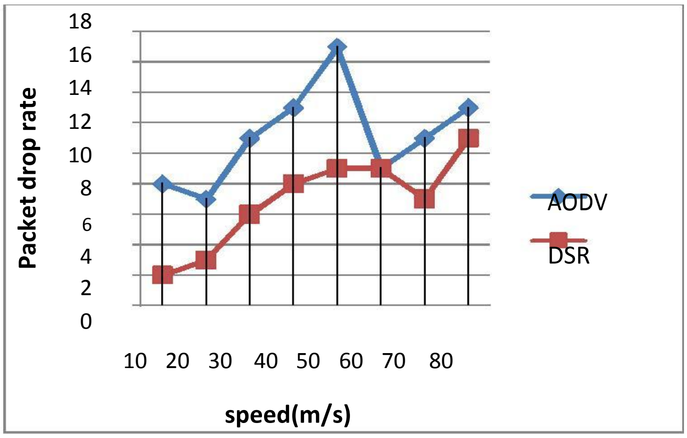


Fig.15 Packet drop rate OF Comparisons of AODV and DSR Varying Pause time

For Fixed – 80 Nodes

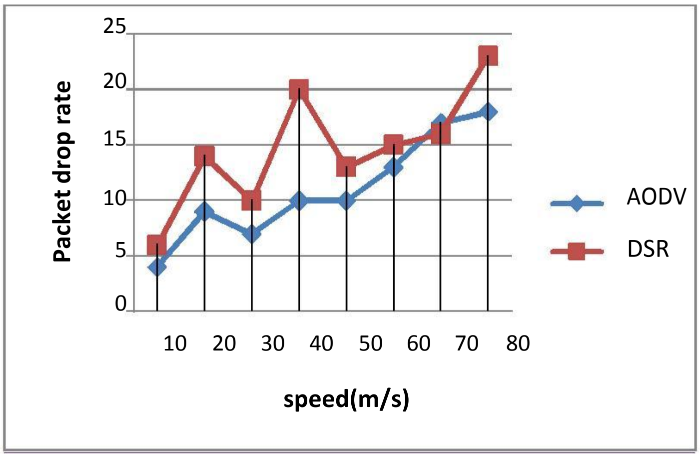


Fig.16 Packet drop rate OF Comparisons of AODV and DSR Varying Pause time

VII. CONCLUSION

This paper provides explanation and simulation analysis of on demand routing protocols like AODV and DSR for ad-hoc mobile networks and also provides a classification of these protocols according to the routing strategy (i.e. table driven, on-demand and hybrid routing protocol). It has also presented a comparison of these on-demands routing protocol under variation of number of nodes and Pause Time, and speed of mobile nodes simultaneously measured performances under various performance metrics including end to end delay and throughput. From different analysis of graphs and simulations it can be concluded that DSR performs well than AODV. DSR protocol shows best results in measuring end to end delay and throughput than AODV protocol. Different initial node position patterns, more sources, additional metrics (such as path length difference from shortest) may be used in future.

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