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Simulation Based Performance Comparison Of Various Routing Protocols In MANET Using Network Simulation Tool

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ABSTRACT

A Mobile Ad hoc Network (MANET) is a collection of wireless mobile nodes forming a network temporarily without any centralized administration of the mobile networks. Each node in MANET moves arbitrarily making the multi-hop network topology to change randomly at unpredictable times. Two nodes in such a network can communicate in a bidirectional manner if and only if the distance between them is at most the minimum of their transmission ranges. When a node wants to communicate with a node outside its transmission range, a multi-hop routing strategy is used which involves some intermediate nodes? Because of the movements of nodes, there is a constant possibility of topology change in MANET. There are several familiar routing protocols like DSDV, AODV, DSR, etc., Which have been proposed for providing communication among all the nodes in the network? This paper presents a performance comparison of proactive and reactive protocols AODV, DSDV and DSR based on metrics such as throughput, packet delivery ratio and average end-to-end delay by using the NS-2 simulator.

Key words: **MANET, DSDV, DSR, AODV, throughput, packet delivery ratio and average end-to-end delay.**

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1. INTRODUCTION

A network can be characterized as wired or wireless. Wireless can be distinguished from wired as no physical connectivity between nodes is needed. Routing is an activity or a function that connects a call from origin to destination in telecommunication networks and also plays an important role in architecture, design and operation of networks. Ever increasing days, Mobile ad hoc network is becoming the latest thrust era for researchers. **MANET** (**M**obile **A**d Hoc **NET**works) is an independent system [1] and also collection of various cooperative mobile terminals. In present scenario, there are currently two variations of mobile wireless networks [2,3]. The first kind is known as the infrastructure networks or Base Stations. This network communicates with the nearest base station which lies within the range. Typical applications of this type of network include office Wireless Local Area Networks (WLANs) [4]. The second type of wireless network is called as infrastructure less mobile network, commonly known as an Ad hoc Network. Due to no stationary infrastructure, all nodes can move freely, topology may change rapidly and unpredictably over time, and nodes have to form their own mutual infrastructures. To find a path between two hosts using routing protocol is a very herculean task due to their highly dynamic topology, absence of centralized administration [1].

MANET is wide network so different node may communicate over the same limited bandwidth. So there may be the problem of congestion, so to cover such problem appropriate routing is required to be done. The routing protocol is structured for purposes such as fully distributed, adaptive frequent and stable topology, loop free and minimum number of collisions.

MANET routing protocols are traditionally divided into three categories which are Proactive Routing Protocols, Reactive Routing Protocols, Hybrid. The most popular routing protocols [5,6] in MANET are AODV (reactive) [7,8], DSR (reactive) [9], DSDV [10] (proactive) and GRP (hybrid) [10]. Reactive protocols find the routes when they are needed. Proactive protocols are table driven protocols and find routes before they need it. And finally hybrid routing protocols offer an efficient framework that can simultaneously draw on the strengths of proactive and reactive routing protocols.

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We consider three parameters to evaluate the performance of these routing protocols: Throughput, Packet delivery ratio and Average end-to-end delay by using the NS-2 simulator. The rest of this paper is organized as follows. In section 2 we briefly describe the routing protocols that we evaluate. In Section 3 presents the Simulation environment used for evaluation of the said protocols. In Section 4 we present our simulation results. Finally, section 5 concludes the paper.

2. ROUTING PROTOCOLS IN MANETS

In this section, a brief overview of the routing operations performed by the familiar protocols AODV, DSDV and DSR are discussed.

2.1. Ad Hoc On-demand Distance Vector Routing (AODV) protocol:

The Ad Hoc On-demand Distance Vector Routing (AODV) protocol [11, 12] is a reactive unicast routing protocol that means to maintain the routing information about the active paths. Routing information is maintained in routing tables at nodes and every mobile node keeps a next-hop routing table, which contains the destinations to which it currently has a route. When the nodes need to send data to the destination, if the source node doesn't have routing information in its table, route discovery process begins to find the routes from source to destination. In AODV, when a source node S wants to send packets to the destination node D but no route is available, it initiates a route discovery operation. In the route discovery operation, the source broadcasts route request (RREQ) packets. A RREQ includes addresses of the source node S and the destination node D, the broadcast ID, which is used as its identifier, the last seen sequence number (Seq. no) of the destination as well as the source node's sequence number (Seq. no). Sequence numbers (Seq. no) are used for remove the duplicate route and provides loop-free, up-to-date routes. Discovery operation reduce the flooding overhead, a node discards RREQ. The main feature of AODV is quick response to link breakage in active route. AODV [13, 14] builds routes using a route request and route reply query cycle. For destination source nodes with no prior information it broadcasts a route request (RREQ) packet. Nodes receiving RREQ update their information and set-up backward pointers to the source node. When the source node receives the RREP it begins to forward data packets to the destination. Another important feature of AODV is the maintenance of timer based states in each node, regarding utilization of individual routing table entries. A routing table entry is expired if not used recently. The advantage of this protocol is low Connection setup delay and the disadvantage is more number of control overheads due to many route reply messages for single route request.

2.1.1. Critiques of AODV

AODV is an on demand approach but still use periodic broadcast of "hello!" message to track neighboring nodes. This propagation causes network overhead in AODV [15]. In AODV a route has to discover the actual data packet transmission. This initial search latency may degrade the performance of interactive applications [15]. The quality of path must be monitored by all intermediate nodes in an active session at the cost of additional latency and overhead penalty [15]. In AODV is not suitable for real life applications. AODV cannot utilize routes with asymmetric links between nodes and thus require symmetric links [15]. Nodes in AODV store only route that are needed. Nodes use the routing caches to reply to route queries. The result is "uncontrolled replies and repetitive updates in hosts".

2.2. Destination-Sequenced Distance-Vector (DSDV) protocol:

Destination-Sequenced Distance-Vector Routing (DSDV) is a table-driven routing scheme for ad hoc mobile networks based on the Bellman-Ford algorithm that was used successfully in many dynamic packet switched networks [16]. The Bellman-Ford method provided a means of calculating the shortest paths from source to destination nodes, if the metrics (distance-vectors) to each link are known. It eliminates route looping, increases convergence speed, and reduces control message overhead.

DSDV maintains consistent network view via periodic routing updates. Routing information is stored inside routing tables maintained by each node. New route broadcasts contain the address of the destination, the number of hops to reach destination, the sequence number of the destination and a new sequence number unique to broadcast. In DSDV, each node is required to transmit a sequence number, which is periodically increased by two and transmitted along with any other routing update messages to all neighboring nodes. On reception of these update messages; the neighboring nodes use the following algorithm to decide whether to ignore the update or to make the necessary changes to its routing table:

Step 1: Receive the update message

Step 2: Update the routing table if any one of the following condition satisfies:

i) $Sn > Sp$

ii) $Sn=Sp$, Hop count is less

Otherwise, ignore the update message.

Here, Sn and Sp are the Sequence numbers of new message and existing message respectively. When a path becomes invalid, due to movement of nodes, the node that detected the broken link is required to inform the source, which simply erases the old path and searches for a new one for sending data. The advantages are latency for route discovery is low and loop-free path is guaranteed. The disadvantage is the huge volume of control messages.

2.2.1. Critiques of DSDV

DSDV requires nodes to periodically transmit routing table updates packets regardless of the network traffic [15]. When the number of nodes in the network grows the size of the routing tables and the bandwidth required to update them also grows [15]. This is considered as the main weakness of

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DSDV. A period of convergence before which routes will not be known and packets will be dropped [15]. It also limit the number of nodes that can connect to the network since the overhead grows as O (N^2). It works only with bidirectional links [15]. In addition, in DSDV routing loops can occur while the network is reacting to a change in the topology.

DSDV use distance vector shortest-path routing as the underlying routing protocol. It has a high degree of complexity especially during link failure [15]. Maximum settling time is difficult to determine in DSDV. DSDV does not support multi-path routing. Fluctuation is another problem of DSDV. In some simulation studies, DSDV is much more conservative in terms of routing overhead but because link breakages are not detected quickly more data packets are dropped. Specification of DSDV is silent over security issue [15]. DSDV assumes that all nodes are trust worthy and cooperative. Once the false sequence has been established the attacker will continuously send out new packets to update the value. Therefore more hosts will be cheated [15] as a single misbehaving node can pose a serious threat for the entire network.

2.3. Dynamic Source Routing (DSR)

Dynamic source routing protocol [17] is a reactive protocol. DSR requires no periodic updates of any kind at any level within the network.DSR uses source routing through which sender knows the complete hop-by-hop route to the destination. These routes are stored in a route cache. A data packet carries the source route in the packet header. There are two major phases in DSR such as: Route discovery and Route maintenance.

When a source node wants to send a packet, it first consults its route cache [18]. The source node initiates a route discovery process by broadcasting route request packets. Receiving a route request packet, a node checks its route cache. If the node doesn't have routing information for the requested destination, it appends its own address to the route record field of the route request packet. Then, the request packet is forwarded to its neighbors.

If the route request packet reaches the destination or an intermediate node has routing information to the destination, a route reply packet is generated. When the route reply packet is generated by the destination, it comprises addresses of nodes that have been traversed by the route request packet. Otherwise, the route reply packet comprises the addresses of nodes the route request packet has traversed concatenated with the route in the intermediate node's route cache.

Whenever the data link layer detects a link disconnection, a ROUTE_ERROR packet is sent backward to the source in order to maintain the route information. After receiving the ROUTE_ERROR packet, the source node initiates another route discovery operation. Additionally, all routes containing the broken link should be removed from the route caches of the immediate nodes when the ROUTE_ERROR packet is transmitted to the source. The advantage of this protocol is reduction of route discovery control overheads with the use of route cache and the disadvantage is the increasing size of packet header with route length due to source routing.

2.3.1. Critiques of DSR

DSR is not designed to track topology changes occurring at a high rate [15]. Two sources of bandwidth overhead in DSR are route discovery and route maintenance [15]. These occur when new routes need to be discovered or when the network topology changes. In DSR this overhead can be reduced by employing intelligent caching techniques in each node at the expense of memory and CPU resources. The remaining source of bandwidth overhead is the required source route header included in every packet. This overhead cannot be reduced by techniques outlined in the protocol specification [15].

DSR is based on source routing thus requires considerably greater routing information. In DSR a route has to discover prior to the actual data packet transmission. This initial search latency may degrade the performance of interactive applications [15]. Moreover, the quality of path is not known prior to call setup. It can be discovered only while setting up the path. This quality of path needs monitoring by all intermediate nodes during a session. It increases the cost of additional latency and overhead penalty [15].

Due to source routing DSR has major scalability problem. Nodes use routing caches to reply to route queries. This results in an "uncontrolled" replies and repetitive updates in hosts caches. In addition, early queries cannot stop the propagation of all query messages which are flooded all over the network. Therefore when the network becomes larger, the control packets and message packets also become larger. This could degrade the protocol performance after a certain amount of time.

A comparison of the characteristics of the above three ad hoc routing protocols AODV, DSDV, DSR is given in following Table 1.

Protocol Property	**AODV**	**DSDV**	**DSR**
Loop free	Yes	Yes	Yes
Multicast Routes	No	No	Yes
Distributed	Yes	Yes	Yes
Unidirectional Link support	No	No	Yes
Multicast	Yes	No	No
Periodic Broadcast	Yes	Yes	No
QoS support	No	No	No
Routes maintained in	Route Table	Route Table	Route Cache
Route Cache / Table Timer	Yes	Yes	No
Reactive	Yes	No	Yes

Table 1: Property Comparison of AODV, DSDV and DSR

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3. SIMULATION ENVIRONMENT

The simulation study is to analyze the performance of AODV, DSDV and DSR routing protocols in Wireless MANET Networks environment. The simulations have been performed using Network Simulator 2 version 2.34, a software that provides scalable simulations of Wireless Networks and an open source software. In our simulation, we consider a network of 5 nodes (one source and one destination) that are placed randomly within a 500m X 500m area and operating over 280 seconds. Multiple runs with different node speed and number of nodes are conducted for each scenario and collected data is averaged over those runs. To evaluate the performance of routing protocols, both qualitative and quantitative metrics are needed. Most of the routing protocols ensure the qualitative metrics. Therefore, we use different quantitative metrics to compare the performance. They are

Throughput: Ratio of the packets delivered to the total number of packets sent.

Packet Delivery Ratio: Packet Delivery Ratio in this simulation is defined as the ratio between the number of packets sent by constant bit sources (CBR) and number of packets received by CBR sinks at destination.

Packet Delivery Ratio = Σ CBR Packets received / Σ CBR Packets sent. It describes the percentage of packets, which reach the destination.

Minimum Delay: Minimum Time taken for the packets to reach the next node.

Maximum Delay: Maximum Time taken for the packets to reach the next node.

Average End-to-End Delay: Time taken for the packets to reach the destination.

Simulation Time: The time for which simulations will be run i.e. time between the starting of simulation and when the simulation ends.

Network size: It determines the number of nodes and size of area that nodes are moving within. Network size basically determines the connectivity. Fewer nodes in the same area mean fewer neighbors to send request to, but also smaller probability of collision.

Number of nodes: This is constant during the simulation. We used 5 nodes for simulations.

Pause time: Nodes will stop a "*pause time*" amount before moving to another destination point.

A simulation study was carried out to evaluate the performance of MANET routing protocols such as DSDV, AODV and DSR based on the metrics throughput, packet delivery ratio and average end-to-end delay with the following parameters:

Parameter	**Value**
Radio model	Two Ray Ground
Protocols	DSDV,AODV,DSR
Traffic Source	Constant Bit Rate
Packet size	512 bytes
Max speed	10 m/s
Area	500 x 500
Number of nodes	50, 75, 100
Application	FTP
MAC	Mac/802_11
Simulation time (Sec)	20, 40, 60, 80 & 100

4. PERFORMANCE RESULTS OF AODV, DSDV, DSR

4.1. Throughput:

It is the ratio of the total amount of data that reaches a receiver from a sender to the time it takes for the receiver to get the last packet. When comparing the routing throughput by each of the protocols, DSR has the high throughput. It measures of effectiveness of a routing protocol. He throughput values of DSDV, AODV and DSR Protocols for 50, 75 and 100 Nodes at Pause time 20s, 40s, 60s, 80s and 100s are noted in Table-2 and they are plotted on the different scales to best show the effects of varying throughput of the above routing protocols (Fig. 2,3 & 4). Based on the simulation results, the throughput value of DSDV increases initially and reduces when the time increases. The throughput value of AODV slowly increases initially and maintains its value when the time increases. AODV performs well than DSDV since AODV is an on-demand protocol. The throughput value of DSR increases at lower pause time and grows as the time increases. Hence, DSR shows better performance with respect to throughput among these three protocols.

Pause Time (Sec)	Protocol								
	DSDV			AODV			DSR		
	50N	75N	100N	50N	75N	100N	50N	75N	100N
20	314333	304192	173867	999851	892566	691435	680597	680997	680997
40	326862	315232	903909	547095	581015	587314	579319	575991	579794
60	230399	207078	575215	474272	495708	499404	492096	490886	498155
80	290288	242423	127322	439949	459666	498331	451614	450615	452834
100	278990	260093	168829	419988	432564	439074	428177	426776	429315

Table 2: Comparison Table of Throughput

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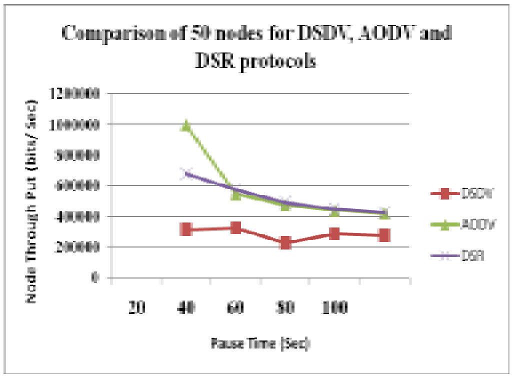

Figure 2: Comparison of Node Throughput for 50 Nodes

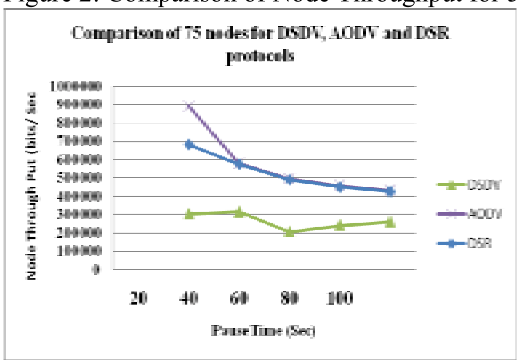

Figure 3: Comparison of Node Throughput for 75 Nodes

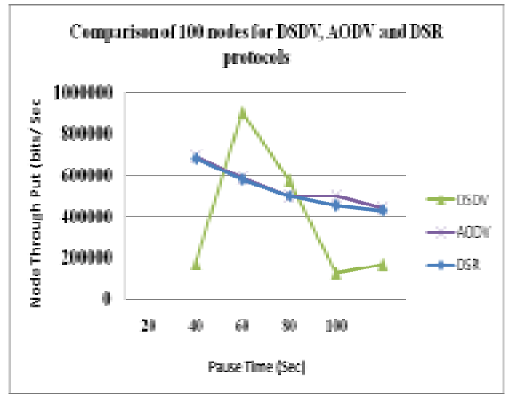

Figure 4: Comparison of Node Throughput for 100 Nodes

4.2. Packet delivery Ratio:

Packet Delivery Ratio (PDR) is the ratio between the number of packets transmitted by a traffic source and the number of packets received by a traffic sink. It measures the loss rate as seen by transport protocols and as such, it characterizes both the correctness and efficiency of ad hoc routing protocols. A high packet delivery ratio is desired in any network.

The ratio of the Originated applications' data packets of each protocol which was able to deliver at varying time are shown in Fig. 5, 6 & 7 as per Table 3. As packet delivery ratio shows both the completeness and correctness of the routing protocol and also measure of efficiency the Table 3.

Pause Time (Sec)	Protocol								
	DSDV			AODV			DSR		
	50N	75N	100N	50N	75N	100N	50N	75N	100N
20	97.618	96.866	80	99.066	99.061	99.183	99.191	99.19	99.183
40	98.868	58.565	96.61	99.12	99.108	99.179	99.243	99.121	99.208
60	98.406	58.119	96.434	99.352	99.346	99.385	99.438	99.416	99.404
80	98.851	97.991	97.252	99.438	99.484	99.508	99.546	99.583	99.523
100	98.441	58.097	97.422	99.576	99.513	99.59	99.622	99.611	99.602

Table 3: Comparison Table of Packet Delivery Ratio

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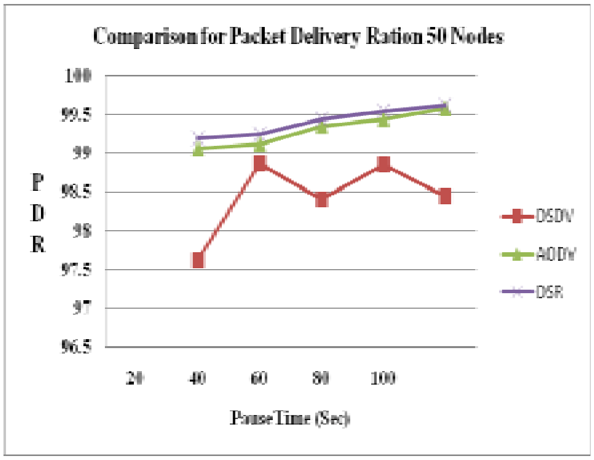

Figure 5 : Comparison of PDR for 50 Nodes

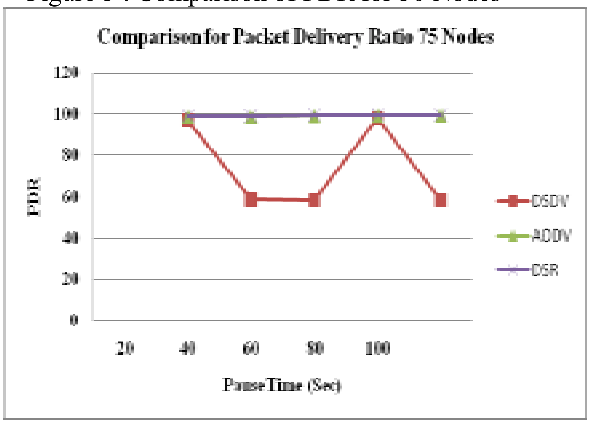

Figure 6 : Comparison of PDR for 75 Nodes

PDR value of AODV is higher than all other protocols. The PDR values of DSR and AODV are higher than that of DSDV. The PDR value of DSDV is worse in lower pause time and gradually grows in higher pause time. From the above study, in view of packet delivery ratio, reliability of AODV and DSR protocols is greater than DSDV protocol.

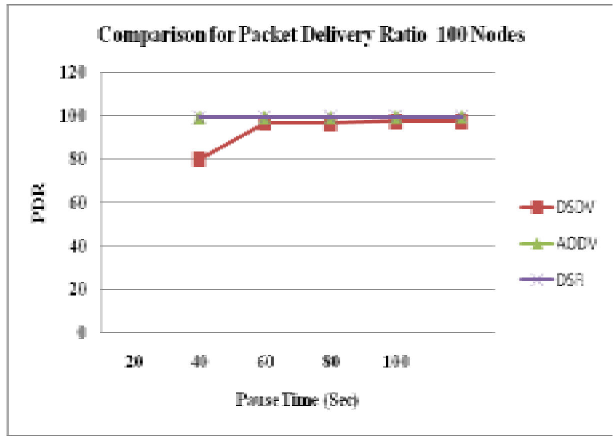

Figure 7 : Comparison of PDR for 100 Nodes

4.3. Average End-to-End delay:

The packet End-to-End delay is the average time that a packet takes to traverse the network. This is the time from the generation of the packet in the sender up to its reception at the destination's application layer and it is measured in seconds. It therefore includes all the delays in the network such as buffer queues, transmission time and delays induced by routing activities and MAC control exchanges.

Various applications require different levels of packet delay. Delay sensitive applications such as voice require a low average delay in the network whereas other applications such as FTP may be tolerant to delays up to a certain level. MANETs are characterized by node mobility, packet retransmissions due to weak signal strengths between nodes, and connection tearing and making. These cause the delay in the network to increase. The End-to-End delay is therefore a measure of how well a routing protocol adapts to the various constraints in the network and represents the reliability of the routing protocol.

The Fig. 8, 9 & 10 depict the average End-to-End delay for the DSDV, AODV and DSR protocols for the number of nodes 50, 75 & 100 respectively as per Table 4. It is clear that DSDV

Pause Time (Sec)	Protocol								
	DSDV			AODV			DSR		
	50N	75N	100N	50N	75N	100N	50N	75N	100N
20	0.1209	0.12271	0.32939	0.16027	0.15404	0.17863	0.09408	0.16907	0.08187
40	0.08996	0.11878	0.12486	0.17764	0.15607	0.17468	0.11929	0.16137	0.1074
60	0.09036	0.11678	0.16708	0.19782	0.17982	0.1933	0.16996	0.18714	0.13823
80	0.13211	0.14668	0.24473	0.20944	0.19398	0.20469	0.18436	0.20473	0.13837
100	0.13813	0.15047	0.23451	0.21646	0.20357	0.21308	0.20101	0.22017	0.14435

Table 4: Comparison Table of Average End To End Delay

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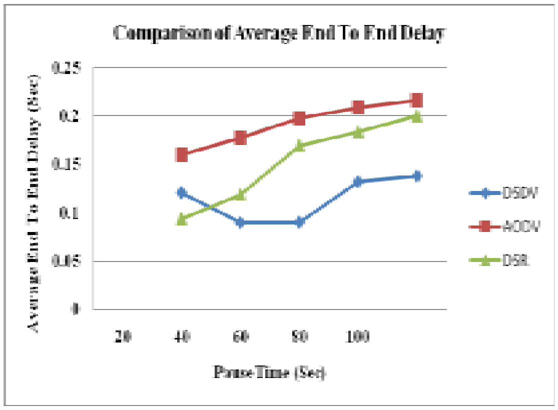

Figure 8: Comparison of Average End-to-End delay for 50 Nodes

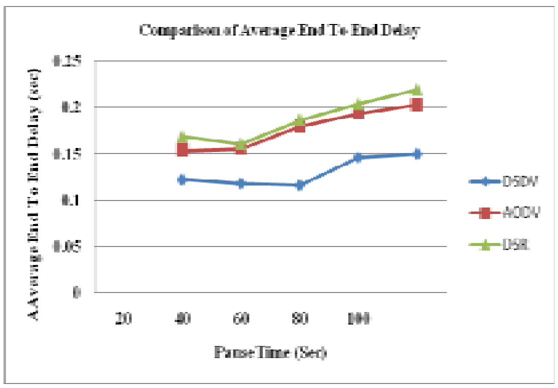

Figure 9: Comparison of Average End-to-End delay for 75 Nodes

has the shortest End-to-End delay than AODV and DSR, because DSDV is a proactive protocol i.e. all routing information are already stored in table. Hence, it consumes lesser time than others. On average case, DSR shows better performance than AODV but worse than DSDV. As AODV needs more time in route discovery, it produces more End-to-End delay. From the above study on End-to-End delay, DSDV has high reliability than AODV and DSR.

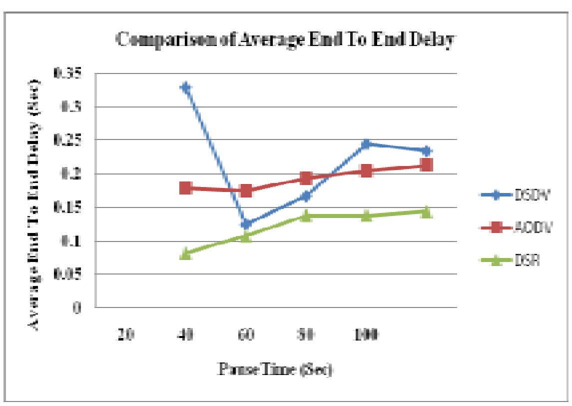

Figure 10: Comparison of Average End-to-End delay for 100 Nodes

5. CONCLUSION

In this paper, the performance of the three MANET Routing protocols such as DSDV, AODV and DSR was analyzed using NS-2 Simulator. We have done comprehensive simulation results of Average End-to-End delay, throughput, and packet delivery ratio over the routing protocols DSDV, DSR and AODV by varying network size, simulation time.

DSDV is a proactive routing protocol and suitable for limited number of nodes with low mobility due to the storage of routing information in the routing table at each node.

Comparing DSR with DSDV and AODV protocol, byte overhead in each packet will increase whenever network topology changes since DSR protocol uses source routing and route cache. Hence, DSR is preferable for moderate traffic with moderate mobility. As AODV routing protocol needs to find route by on demand, End-to-End delay will be higher than other protocols. DSDV produces low end-to-end delay compared to other protocols. When the network load is low, AODV performs better in case of packet delivery ratio but it performs badly in terms of average End-to-End delay and throughput.

DSR and AODV reached approx 100% packet delivery ratio when pause time equal to 200 while DSDV obtained only approx 94% packet delivery ratio. DSR and DSDV has low and stable routing overhead as comparison to AODV that varies a lot. Avg. End to End delay of DSDV is very high for pause time 0 but it starts decreasing as pause time increases.

DSR performs well as having low end to end delay. When we compare the three protocols in the analyzed scenario we found that overall performance of DSR is better than other two routing protocols.

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7. REFERENCES

[1] C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks, Architectures and Protocols," first Indian reprint 2005, pearson publication. ISBN 81-297-0945-7.
[2] C.K.Toh, "Adhoc Mobile wireless networks: Protocols and Systems", Prentice Hall, New Jersy, 2002.
[3] Dr. Yogesh Chaba and Naresh Kumar Medishetti, "Routing protocols in Mobile Ad hoc Networks-A Simulation Study Final", JCS Vol1, No.1, August 2005.

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[4] Jim Geier, Wireless System Architecture: How Wireless works. http://www.ciscopress.com/ articles /article.asp?p=344242&rl=1
[5] V.Ramesh, Dr.P.Subbaiah, N. Koteswar Rao and M.Janardhana Raju, "Performance Comparison and Analysis of DSDV and AODV for MANET "in (IJCSE) International Journal on Computer Science and Engineering Vol. 02, No. 02, 2010, 183-188. Optimization ad-hoc on-demand muitipath distance vector routing for mobile ad-hoc networks, WICOM'09, 2894-2899.
[6] C. Tschudin, P. Gunningberg, H. Lundgren, and E. Nordstrom, "Lessons from Experimental MANET Research," Elsevier Ad Hoc Networks Journal, Vol. 3, Issue 3, March 2005.
[7] M. Conti and S. Giordana, "Multihop Ad Hoc Networking: The Reality," IEEE Communications Magazine, April 2007.
[8] Perkins, C., Belding, E., Das, S., Ad hoc On- Demand Distance Vector (AODV) Routing - RFC 3561, 2003.
[9] Thomas Staub,' "Performance Comparison of MANET Routing Protocols in Ad-hoc and Hybrid Network", Computer Science Project, University of Berne, Switzerland, February 2004.
[10] R Ogier, P. Spagnolo, "MANET Extension of OSPF using CDS Flooding, draft-ogier-manet-ospf-extension-06.txt, December 2005.
[11] Parma Nand, Dr.S.C.Sharma," Routing Load Analysis of Broadcast based Reactive Routing Protocols AODV, DSR and DYMO for MANET" International journal of grid and distributed computing vol.4, No.1, March 2011
[12] SreeRangaRaju, Jitendranath Mungara," Performance Evaluation of ZRP over AODV and DSR in Mobile Adhoc Networks Using Qualnet" European Journal of Scientific Research ISSN 1450-216X Vol.45 No.4 (2010), pp.658-674
[13] Charles E. Perkins and Elizabeth M. Royer, Ad-hoc On-Demand Distance Vector Routing. Proceedings of the 2nd IEEE Workshop on Mobile Computing Systems and Applications, February 1999: p. pp. 90-100.
[14] Gautam Barua and Manish Agarwal. Caching of routes in ad hoc on-demand distance vector routing for mobile ad hoc networks. in Proceedings of the 15th international conference on Computer communication. 2002. Mumbai, Maharashtra, India.
[15] M.Asim and A.J. PullinM.Asim and A.J. Pullin, Comparison analysis of MAODDP with some other prominent wireless ad hoc routing protocols, in IBITE Computing. 2005, Liverpool Hope University: Liverpool. 2000.
[16] D.Johnson, "The Dynamic Source Routing Protocol (DSR)", RFC4728, Feb 2007.
[17] D. B. Johnson and D.A. Maltz, Dynamic Source Routing in Ad hoc wireless Networks. Mobile Computing, 1996. 353.
[18] C.Perkins ,Praving Bhagwat, "Highly dynamic destination sequenced distance vector routing (DSDV) for Mobile computers".
[19] Allan Johnson,"Routing Protocols and Concepts", CCNA Exploration Labs and Study Guide.
[20] Tanu Preet Singh, Shivani Dua, Vikrant Das, "Energy Efficient Routing Protocols in MANET", International Journal of Advanced Research in Computer Science and Software Engineering,Vol.2,No.1,Jan 2012.
[21] Dr.Kamaljit I.Lakhtaria, "Analyzing Reactive Routing Protocols in MANET", International Journal Advanced Networking and Applications,Vol.3,No.06,2012.
[22] Humayun Bakht, "Survey of Routing Protocols for MANET", International Journal of information and Communication Technology Research, Vol.1,No.6,Oct 2011.
[23] Ammar Odeh, Eman AbdelFattah and Muneer Alshowkan,"Performance Evaluation of AODV and DSR Routing Protocols in MANET", International Journal of Distributed and Parallel System, Vol.3, No.4, July 2012.

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