RESEARCH ARTICLE OPEN ACCESS

Comparative Analysis and Implementation of DSDV and AODV Routing Protocol for MANET

Snehal Goverdhan*, Aakanksha Choubey**

*(*Computer Science & Engineering, Shri Shankaracharya Group of Institutions, and Bhilai*)

** (*Computer Science& Engineering, Shri Shankaracharya Group of Institutions, and Bhilai*)

--************************--

Abstract:

Mobile ad hoc network is a collection of mobile nodes communicating through wireless channels without any existing network infrastructure or centralized administration. The main objective of such an ad hoc network routing protocol is accurate and efficient route establishment between a pair of nodes so that messages may be delivered in a well-timed manner. In this paper we examines two routing protocols for mobile ad hoc networks– the Destination Sequenced Distance Vector (DSDV), the table- driven protocol and the Ad hoc On- Demand Distance Vector routing (AODV), an On –Demand protocol and evaluates both protocols with varying pause time, sources based on:-Average End-to-End Delay, Packet Delivery Ratio, Packet Drop Ratio, Throughput, Normalizing Routing Load. In this research work we try to switch nodes between active and inactive states to save energy. In Ad hoc network nodes does not sleep. However, not every routing node is involved in the data delivery all the time so, allowing redundant routing nodes to sleep may save other routing paths when the previous ones run out of energy. In ad hoc network nodes switch between active and inactive states to save energy, thus improving the throughput of AODV routing protocol. The performance comparison has been evaluated using widely recognized and improved network simulator NS-2 version 2.34.

Keywords — AODV, DSDV, MANET, Routing Protocol, NS2, Performance Parameters.

--************************--

I. INTRODUCTION

Mobile ad hoc network are formed by collection of wireless nodes that can dynamically self-organize into an arbitrary and temporary topology to form a network without necessarily using any pre-existing infrastructure or centralized administration. In ad hoc networks, each node may communicate directly to with other nodes. In adhoc network nodes are not directly connected they communicate by forwarding their packets through intermediate nodes. Every ad hoc node acts as a router. Due to the mobility of the nodes, routes between the nodes may change. Therefore, it is not possible to establish fixed routing path between the networks. So, Because of this, routing is the most studied problem in adhoc networks and a variety of routing protocols have been proposed.

Routing protocols for mobile adhoc network can be generally categorized as: (a) Table-driven or Proactive routing protocols (b) Reactive or Source initiated on demand routing protocol. Despite being designed for the same type of underlying network, the characteristics of each of these protocols are quite distinct. The table-driven or proactive routing protocols attempt to maintain consistent, up-to-date routing information from each node to every other node in the network. These protocols require each node to maintain one or more tables to store routing information, and they respond to changes in network topology by propagating updates throughout the network in order to maintain a consistent network view. On the other hand reactive or source initiated routing protocol creates routes only when desired by the source node. When a node requires a route to a destination, it initiates a route discovery process within the network. This process is completed once a route is found or all possible route permutations have been examined. Once a route has been established, it is maintained by some form of route maintenance procedure until either the destination becomes inaccessible along every path from the source or until the route is no longer desired. [29]

Fig 3 shows the categorization of routing protocols .the table driven is categorize further as DSDV, WRP, CGSR,STAR . And the On-demand routing protocol is classify as AODV, DSR,TORA, ARB.

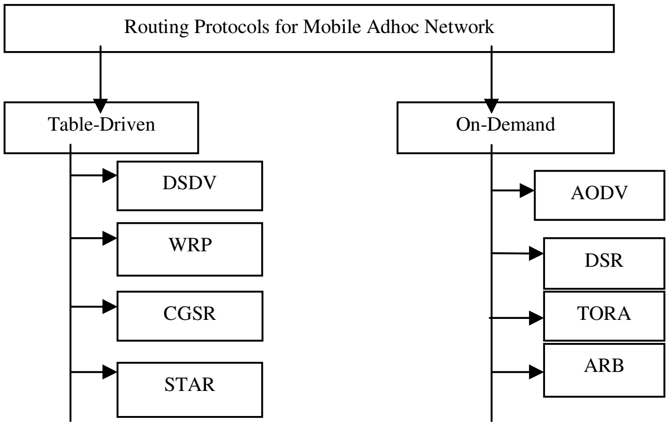

Fig 1 Classifications of mobile adhoc routing protocols.

II. LITERATURE REVIEW

The author Narendra Singh Yadav,R.P Yadav(2008) proposed the examination of two routing protocols DSDV, the table driven protocol and AODV, an On-demand protocol and evaluates relative performance of both protocols on the basis Packet delivery ratio, Normalized routing load, Average delay and throughput while varying no of nodes, speed and pause time. The author A. BoomiraniMaalny,V.R.SarmaDhulipaland,RM.Chandrasekaran (2009) proposed the performance of a variety of routing protocols such as AODV, Fisheye, DYMO,STAR,RIP, Bellman Ford, LANMAR,LAR results were graphically compared and analysis has been done on average end to end delay & throughput. The author Nilesh P. Bobade, Nitiket N. Mhala (2010) proposed the major method for evaluation of MANETs is simulation and it is subjected to evaluate the performance of DSDV, AODV through the performance metrics namely PDF, Average end-to-end delay, normalized routing load and throughput by varying network size up to 50 nodes . The author Fengying Xu, Zhimin Liu and Yongchun Xu(2011) proposed the examination of AODVSE,AODV and DSR protocols by reducing the routing load, expiration time and extending the network lifetime. The author Ginni Tonk, Indu Kashyap and S.S. Tyagi(2012) proposed a evaluation performance of routing protocol such as DSR, AODV, DSDV on the basis of PDF, Average end to end delay, and Normalized Routing Load by varying pause time, number of nodes and maximum speed using NS2. The author Mina Vajed Khiavi, Shahram Jamali Sajjad and Jahanbakhsh Gudakahriz(2012) proposed the comparison between AODV, DSDV, DSR and TORA routing protocol measured in terms of Packet Delivery Ratio, Network Life Time, System Life Time, End-to-End Delay and Routing Overhead. The author Patil V.P(2012) proposed the examination of two routing DSDV, AODV, evaluates both protocols based on packet delivery fraction ,average end to end delay, throughput and routing overhead while varying pause time using NS2. The author Niranjan Kumar Ray , Ashok Kumar Turuk (2012) proposed the comparison of AODV, DSR and ZRP based on some given set of parameters like PDR, average end to end delay, average jitters and energy consumption behaviours while varying no of nodes and pause time. The author Dr.Umadevi Chezhian ,Mr. Raja Adeel Ahmed(2013)proposed the performance evaluation and comparison of four typicalrouting protocols AODV,DSR,DSDV,TORA of ad hoc networks with the different simulation model and performance metrics such as throughout, delay. The author Ajay Prakash Rai, Rasvihari Sharma, Vineet Srivastava, Rashmi Tikar, Rinkoo Bhatia (2013) proposed the performance analysis of AODV & DSDV routing protocols on the basis of parameters such as PDR, packet loss, and average end to end delay using NS2 with variable speed & pause time. The author Subhrananda Goswami, Subhankar Joardar & Chandan Bikash Das (2014) proposed the performance comparison between two routing protocols DSDV and AODV based on Quality of Service metrics: such as throughput, PDR and delay using Mobireal simulator with varying speed & nodes. The author Jay Kumar Tiwari, Neha Bharadwa(2015) proposed the comparison of DSDV, AODV, DSR based on performance parameters such as throughput, average end to end delay, packet delivery ratio with fixed no of nodes using Ns2.

III.PROBLEM IDENTIFICATION

The Ad Hoc on Demand Distance Vector (AODV) routing algorithm is a source initiated, on demand driven, routing protocol. The routing is “on demand”, a route is established when a source node wants to communicate with a specific destination node. The route remains established as long as it is needed for next communication. Hence, after studying algorithm of AODV routing protocol and various research papers we have identified some difficulties. The important characteristics of adhoc network are that in adhoc networks nodes do not sleep. However, not every routing node is involved in the data delivery all the time, as only the least delayed routing path is positively reinforced due to this AODV routing protocol increases routing expiration time, delay, energy consumption, as each node remains in its active state.

IV. METHODOLOGY

Mobile ad hoc network is a set of mobile nodes communicating through wireless links without any existing network infrastructure or centralized administration. The main objective of such an ad hoc network routing protocol is accurate and efficient route establishment between a pair of nodes so that messages may be delivered in a appropriate manner. Route construction should be done with a minimum of overhead and bandwidth consumption. These paper examines two routing protocols for mobile ad hoc networks– the Destination Sequenced Distance Vector (DSDV), the table- driven protocol and the Ad hoc On-Demand Distance Vector routing (AODV), an On – Demand protocol. From problem identification section we have found some limitations in AODV routing protocol. Hence for this problem we devised our methodology.

A. DESTINATION SEQUENCED DISTANCE VECTOR (DSDV)

DSDV, an enhanced version of the distributed Bellman- Ford algorithm, belongs to the proactive or table driven family where a correct route to any node in the network is always maintained and updated [29].In DSDV, each node maintains a routing table that contains the shortest distance and the first node on the shortest path to every other node in the network. A sequence number created by the destination node tags each entry to prevent loops, to counter the count –to-infinity problem. At regular intervals the tables are exchanged between neighbours to keep an update of network topology and if a node discover an important change in local topology. This exchange of table imposes a large overhead on the whole network. To reduce these control overheads, routing updates are classified into two categories. The first is known as "full dump" which includes all available routing information. This type of updates should be used as infrequently as possible and only in the cases of complete topology change. In the cases of infrequent movements, smaller "incremental" updates are sent carrying only information about changes since the last full dump. Each of these updates are carried out in a single Network Protocol Data Unit (NPDU), and therefore considerably decreasing the amount of traffic. Table updates are initiated by a destination with a new sequence number which is always greater than the previous one. Upon receiving an updated table a node either updates its tables based on the received information or waits until receives the best metric from multiple versions of the same update from different neighbours. Routes availability to all destinations implies that much less delay is involved in the route setup process. The data broadcast by each node will contain its new sequence number, the destination's address, the number of hops count. Fig 2 shows the routing table of DSDV

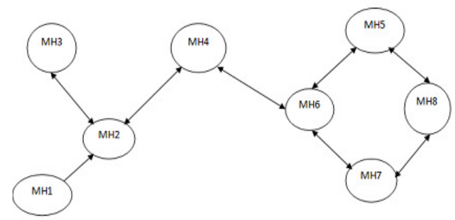

Fig 2 DSDV Operation

TABLE I

ROUTING TABLE FOR ABOVE NODES

Destination Address	Next Hop Count	Metric	Sequence Number
MH4	MH4	0	S406_MH4
MH1	MH2	2	S128_MH1
MH2	MH2	1	S564_MH2
MH3	MH2	2	S710_MH3
MH5	MH6	2	S392_MH5
MH6	MH6	1	S076_MH6
MH7	MH6	2	S129_MH7
MH8	MH6	3	S050_MH8

1) IMPLEMENTATION OF DSDV ALGORITHM

Step 1:- A source node wants to transmit the data packet to the destination node.

Step 2:- If the packet is received by the intermediate nodes, go to step 3.

Step 3:- The nodes check the routing table if the destination address lies in local topology, go to step 3a.

Step 3a:- Forward the packet to local topology routing.

Else

Step 3b:- Identify the nearest neighbour nodes that can forward the packet to local topology routing.

Step 4:- Packet transmitted.

Step 5:- END.

B. ADHOC ON- DEMAND (AODV)

AODV is an improvement on the DSDV. AODV uses an on- demand approach for finding routes [29].As it is an on - demand algorithm, a route is established only when route discovery process initiated by a source node for transmitting data packets and it maintains these routes as long as they are needed by the source. AODV uses a destination sequence number, created by the destination, to determine an up to data path to the destination. Route information is updated by a node only if the destination sequence number of the current received packet is greater than the destination sequence number recorded at the node. It indicates the newness of the route accepted by the source. To prevent multiple broadcast of the same packet AODV uses broadcast identifier number that ensure loop freedom since the intermediate nodes only forward the first copy of the same packet and discard the duplicate copies. To find a path to the destination, the source a initiates Route Request (RREQ) packet across the network and it contains the source address, destination address, source sequence number, destination sequence number, the broadcast identifier and the time to live field. Nodes that receive RREQ either if they are the destination or if they have a fresh route to the destination, can respond to the RREQ by unicasting a Route Reply (RREP) back to the source node otherwise, the node rebroadcasts the RREQ. When a node forwards a RREQ packet to its neighbours, it also records in its routing table the node from which the first copy came and it is required by the node to construct the reverse path for the RREP packet. AODV uses only symmetric links because the route reply packet follows the reverse path of route request packet. Information about the preceding node from which the packet was received is recorded when a node receives a RREP packet, in turn to forward the data packets to this next node as the next hop toward the destination. Once the source node receives a RREP it can begin using the route to send data packets. The source node rebroadcasts the RREQ if it does not receive a RREP before the timer expires. If it does not discover a route after this maximum number of attempts, the session is aborted and the source moves to reinitiate route discovery to the destination. Hello message is broadcasted periodically among the nodes in order to detect link break and if the intermediate nodes moves or changes then this information send to its upstream neighbours and so on till it reaches the source upon which the source can reinitiate route discovery if required. Fig 3 shows the route creation procedure for AODV

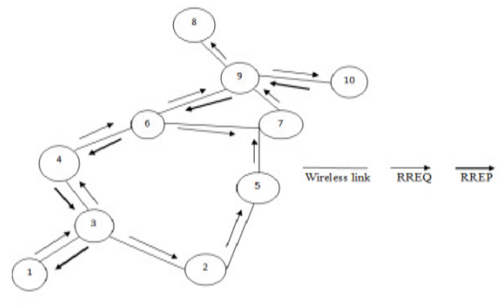

Fig 3 AODV Route Discovery Process

1) IMPLEMENTATION OF AODV ALGORITHM

// Node process an incoming message.

Step 1:- A node receives an incoming message.

Step 2:- Nodes checks to verify the type of message it receives.

Step 3:- If the message type is RREQ request it update its route to the originator and go to step 6.

Step 4:- If the message type is RREP it update its route table, precursor node and outgoing list and go to step 7.

Step 5:- If the message type is RRER remove the affected nodes and go to step 8.

Step 6:- If it is the destination node send RREP to it and go to step 9.

Step 6(a):- Otherwise check whether it is a fresh route. If yes, then send RREP to it, go to step 9. And if not, go to step 6b.

Step 6(b):- If it is not stored in the buffer forward RREQ to the neighbouring nodes and go to step 9.

Step 7:- If it is the originator send queued message and go to step 9

Step 7(a):- Otherwise forward RREP to next hop and go to step 9.

Step 8:- If At least one node removed then go to step 8a, otherwise go to step 9.

Step 8(a):- Forward RRER to precursors node and go to step 9.

Step 9:- END.

2)IMPLEMENTATION OF DEVISED ALGORITHM

Let us assume that AODV protocol is supposed to be implementing in MANET and at starting all the nodes are in ideal state then:

Step 1: -If a node S is source node and wants to send data then:
Becomes active and Broadcasts RREQ to network and won't be going to sleep state.
Else
Go to step 2:
Step 2:- In sleep mode until a RREQ or RREP or Hello signal arrives.
Step 3:- If a node is Receiver then after reception of RREQ it will be in active state and sends RREP.
Step 4:- If an intermediate node receives RREP or RREQ then it will be active throughout the transmission period.
Step 5: -As soon as transmission is over all nodes involved in transmission becomes ideal.

C. COMPARISON OF DSDV AND AODV ROUTING PROTOCOLS

TABLE IIIComparison Table

Parameters	DSDV	AODV
Broadcasting	Done periodically	Hello messages are propagated
Loop Free	No	Yes
Route	Routing Table	Routing Table
Sending data to a specific	Route discovery procedure	Routing table contains all the
Flooding	Yes	Yes
Power	High	Medium
Packet	More	Comparatively
Multicast	No	Yes
Routing	Flat	Flat
Scalability	Up to 100 nodes	Higher than DSDV
Storage Requirement	Higher than On-Demand	Depends on the number
Control Traffic	Usually higher than On-Demand	Increases with mobility
Sequence	Yes	Yes
Path	Shortest path	Freshest and
Time complexity	O (D):-Diameter of the network	O (2D):-Diameter of the network
Critical Nodes	No	No
Communication complexity	O (N) :-Number of nodes in the network	O (2N) :-Number of nodes in the network
Advantages	Small delays	Adaptable to
Disadvantages	Large overhead	Large delays

D. SIMULATION AND PERFORMANCE METRICS

The simulation were performed using Network Simulator2 (NS-2) widespread popular in mobile networks. The traffic sources are CBR (continuous bit rate).The source-destination pairs are spread randomly over the network. The packet rate is 1 packet per second for 20, 30 & 40 nodes. The packet size is 1000bytes.The mobility model uses random waypoint model in the rectangular field of 500 m * 500m. In this mobility model, each node starts its journey from a random selected source to random selected destination. Once the destination is reached, another random destination is chosen after a pause time. The speed of nodes is varied between 0 to 20m/s and pause time is between 0 to 10 seconds. Different network scenario for different numbers of node & pause time. The propagation model is the Two-way ground model. Simulation parameters are listed in table III.

TABLE IIII

Simulation Table

Parameter	Value
Simulator	NS2
Protocols Studied	DSDV & AODV
Simulation Area	500m X500m
Simulation Time	300seconds
Nodes movement Model	Random way point
Speed	0-20m/s
Traffic load	CBR
Data Payload	1000 bytes/packet
Packet Rate	1 packet/sec for 20,30,40 nodes
Node Pause Time	0-10 in steps of 2s

1)Performance Metrics

We use the following metrics to found the performance and overhead of the routing protocols to compare relative performance of DSDV and AODV protocols.

• Packet delivery ratio: The ratio between the number of packets that are received and the number of packets sent.
• Average End-to-End Delay: This delay includes processing and queuing delay in each intermediate node i.e. the time elapsed until a demanded route is available. Unsuccessful route establishments are ignored.
• Throughput: Total no. of packets sends per unit time.
• Packet Drop Ratio: Number of Packets drop during transmission.
• Normalize Routing Load: The number of routing packets transmitted per data packet delivered at the destination.

V. SIMULATION RESULTS

The simulation results are shown in the following section in the form of graphs. Graphs also show comparison between two protocols by varying different no. of sources on the basis of the above mentioned metrics as a function of pause time.

Figure 4 shows a comparison between both the routing protocols on the basis of packet delivery ratio as the function of different no of traffic sources.

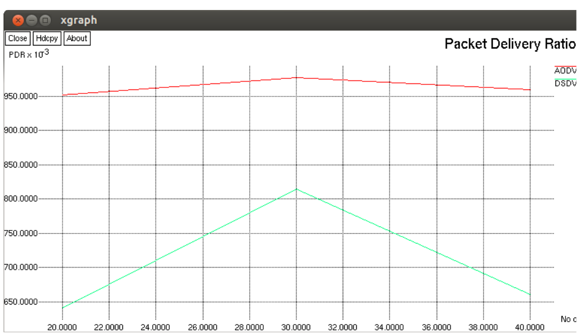

Fig 4 Packet delivery ratio vs. No. of nodes 20, 30, 40

Fig 4 shows On –demand protocol, AODV performed particularly well, delivering approximately above 95% of the data packets regardless of the no. of sources. The PDR is almost independent of the number of sources that is varying number does not affect AODV that much. DSDV performance is low because DSDV keeps only one route per destination, therefore lack of alternate sources and presence of stale in the routing table when node are moving at higher speed leads to packet loss.

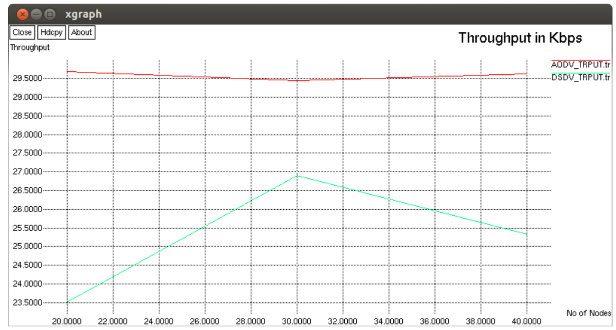

Fig 5 Throughput vs. No. of nodes 20, 30, 40

Fig 5 shows On –demand protocol, AODV performed well, delivering approximately a constant throughput regardless of the no. of sources. DSDV performance is low as compared to AODV due to large overheads in DSDV.

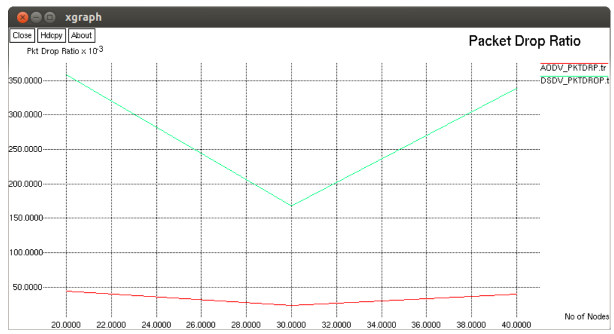

Fig 6 Packet drop ratio vs. No. of nodes 20, 30, 40

Fig 6 shows AODV Packet loss is less because AODV uses route request route reply techniques for searching a route b/w source & destination. While in DSDV is a table driven protocol. When the N/W Load increased it is very difficult to maintain routing table. So some time routing tables are not updated continuously so the packet loss increased.

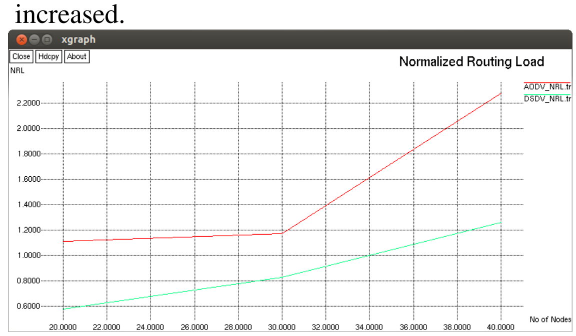

Fig 7 shows the normalized routing load increases drastically for AODV as the no. of nodes increases as DSDV is a table driven routing protocol so when overhead increases it not able to delivers a better normalizing routing load

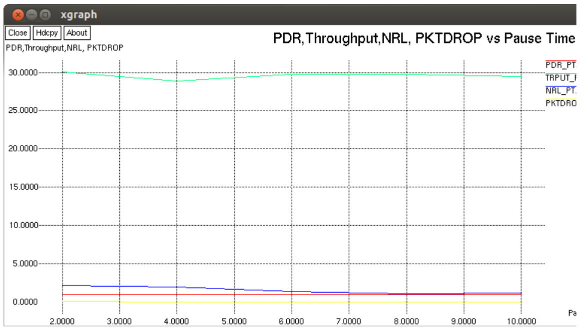

Fig 8 PDR, Throughput, NRl, Pktdrop vs. Pause time

Fig 8 shows the packet drop, throughput, normalized routing load, packet loss with respect to pause time. Pause time vary between 0-10 m/s in steps of 2m/s.

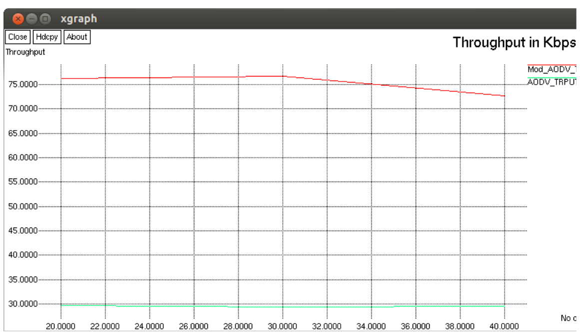

Fig 9 Throughput (MOD_AODV&AODV) vs. No of nodes for 20,30,40

Fig 9 shows the throughput analysis of modified AODV is considerable better than AODV as in Mod_AODV nodes switch between active and in active state thus saving the energy of node and improving the throughput of routing protocols.

Fig 10 shows AODV perform pretty stable delay as AODV is on demand protocol it establishes route only when it is required. When the link failure occurs it keeps alternate routes to reach the destination where as in DSDV since it is proactive it keeps only one route information when topology changes or failure occurs it updates its routing table. All this leads to delays in the delivery of data packets

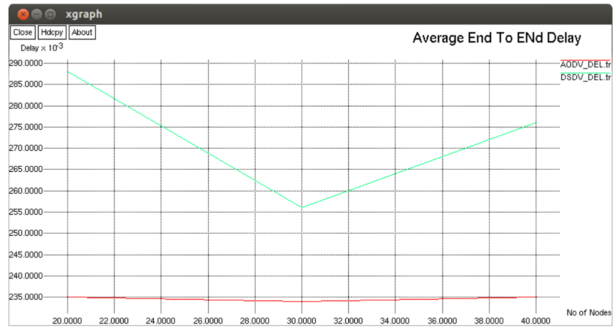

Fig 10 Average end to end delay vs. No. of nodes 20,30,40

VI. CONCLUSION

In this research work we implemented DSDV and AODV routing protocols. Simulation results shows that protocols AODV deliver a greater percentage of the originated data packets. Packet delivery ratio increases in AODV as compared to DSDV when no of nodes increases. Average delay in AODV is less as compared to DSDV.AODV delivers a better throughput as compared to DSDV. In DSDV, AODV as the number of nodes increases normal routing load increases but AODV provides a increased normalizing load than DSDV.DSDV delivers a greater percentage of packet drop ratio as nodes increases than AODV. In AODV energy consumption is high so we modified the AODV in which nodes switch between active and inactive state so that energy consumption decreases and provides an increased throughput as compare to AODV.

REFERENCES

[1]Bobade.P.Nilesh. Mhala.N.Nitiket. 2010. *Performance Evaluation of Ad Hoc On Demand Distance Vector in MANETs with varying Network Size using NS-2 Simulation.* International Journal on Computer Science and Engineering. Volume No.2, Issue No,8,Page No.2731-2735.

[2]Dr.Chezhian.Umadevi.Ahmed.Adeel.Raja. 2013. *Average Delay and Throughput Analysis on Ad Hoc Network Protocols*. International Journal of Advanced Research in Computer Science and Software Engineering. Volume No. 3, Issue No. 2.

[3]Goswami.Subhrananda. Joardar.Subhankar. Das.Bikash.Chandan. 2014. *Reactive and Proactive*

Routing Protocols Performance Metric Comparison in Mobile Ad Hoc Networks NS 2. International Journal of Advanced Research in Computer and Communication Engineering.Volume No.3, Issue No.

[4]Gaharwar. Preeti. Gupta.R.Sunil. 2011. *Performance Comparison of Routing Protocols*. International Journal of Advanced Research in Computer and Communication Engineering. Volume No.2, Issue No.4

[5]Gupta.kumar.Sachin. Saket.K.R. 2011. *Performance Metric Comparison of AODV and DSDV Routing Protocols in MANETS using ns2.* IJRRAS. Volume No.7 ,Issue No.3

[6]Jaya.kumar.Geetha. Ganapathy.Gopinath. 2007. *Performance Comparison of Mobile Ad-hoc Network Routing Protocol.* IJCSNS International Journal of Computer Science and Network Security.Volume No.7,Issue No.11

[7]Jitendra.J.Patel. Dalal.Pankaj. 2013. *A Comparative Study of the AODV and DSDV Routing Protocols for Smaller Mobile Ad Hoc*. International Journal of Science and Research. Volume No.2,Issue No.11.

[8]Jagdale.N.B. Patil.Pragati. Lahane.P. Javale.D. 2012. *Analysis and Comparison of Distance Vector, DSDV and AODV Protocol of MANET*. International Journal of Distributed and Parallel Systems (IJDPS).Volume No.3, IssueNo.2.

[9]Kaur.Dilpreet. Kumar.Naresh. 2013. *Comparative Analysis of AODV, OLSR, TORA, DSR and DSDV Routing Protocols in Mobile AdHoc Networks*. I.J.Computer Network and Information Security. Volume No.3, Page No. 39-46.

[10]Khandakar.Amith. 2012. *Step by Step Procedural Comparison of DSR, AODV and DSDV Routing Protocol*. International Conference on Computer Engineering and Technology. Volume No 4.

[11]Khiavi.Vajed.Mina.Jamali.Shahram.Gudakariz.Jahanbakhsh.Sajjad.2012.*Performance Comparison of AODV, DSDV, DSR and TORA Routing Protocols in MANETs*. International Research Journal of Applied and Basic Sciences. Volume No.3,Page No 1429-1436.

[12]Khan.Ur.Khaleel.Rahman.Zaman.U.Rafi. Reddy.Venugopal.A. 2008. *Performance Comparison of On-Demand and Table Driven Ad Hoc Routing Protocols using NCTUns.IEEE.* 978-0-7695-3114-4/08

[13]Kondaiah.B. Dr.Nagendra.M. 2014.*A Comparative Analysis of Proactive Routing Protocols in MANET.* International Journal of Computer Science and Mobile Computing. Volume No.3,Issue No.6.

[14]Kumar.Awadhesh. Singh.Prabhat. Kumar.Vinay. Dr.Tyagi Neeraj. 2013. *Performance Analysis of AODV, CBRP, DSDV and DSR MANET Routing Protocol using NS2 Simulation*. I.J.Computer Network and Information Security. Volume No.9, Page No.45-50.

[15]Longjam.Teressa. Bagoria.Neha. 2013. *Comparative Study of Destination Sequenced Distance vector and Adhoc on Demand Routing Protocol of Mobile Adhoc Network.* International Journal of Scientific and Research Publications. Volume No 3. Issue No 2.

[16]Malany.Boomarani.A.Dhulipala.Sarma.Chandrasekaran.RM.V.R. 2009. *Throughput and Delay Comparison of MANET Routing Protocols.* Int. J. Open Problems Compt. Math. Volume No.2,Issue No.3.

[17]Manickam.P. Baskar.Guru.T. Girija.M. Dr.Manimegalai.D. 2011. *Performance Comparisons of Routing Protocols in Mobile Adhoc Networks*. International Journal of Wireless & Mobile Networks. Volume No.3,Issue No.1.

[18]Patel.K.Mitul. Uchhula.V.Vasundhara. Banerjee.Bannishikha. 2013. *Comparative Analysis of Routing Protocols in MANET Based on Packet Delivery Ratio using NS2.* International Journal of Advanced Research in Computer Science and Software Engineering. Volume No.3,Issue No. 11.

[19]Patil.P.V. 2012, *Performance Evaluation of on demand and Table driven Protocol for Wireless Ad hoc Network.* International Journal of Computer Engineering Science. Volume No 2. Issue No 9.

[20]Perkins.E.Charles. Roye.M.Elizabeth Das.R.Samir. Marin.K.Mahesh. 2001. *Performance Comparison of Two On-Demand Routing Protocols for Ad Hoc Networks.IEEE.* Personal Communications. Volume No. ,Issue No.

[21]Ray.Kumar.Niranjan. Turuk.Kumar.Ashok. 2012. *Performance Evaluation of Different Wireless Ad hoc Routing Protocols.* International Journal of Wireless & Mobile Networks. Volume No.4, Issue No.2.

[22]Ramesh.A.Dr.Bhashini.Sumitha.P. Bharathi.Jaya.K. 2014. *Performance Comparison and Evaluation of Proactive, Reactive and Hybrid Routing Protocols in MANET.* International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering Volume No.3, Issue No.6.

[23]Rai.Prakash.Ajay.Sharma.Rasvihari.Srivastava.Vineet.Tikar.Rashmi.Bhatia.Rinkoo. 2013. *Performance Comparison of AODV& DSDV Adhoc Network Routing Protocols On The Basis Of Variable Speed & Pause Time.* International Journal of Engineering and Innovative Technology .Volume No.2,Issue No.10.

[24]Rajeshkumar.V Sivakumar.P. 2013. *Comparative Study of AODV, DSDV and DSR Routing Protocols in MANET Using Network Simulator ns2.* International Journal of Advanced Research in Computer and Communication Engineering. Volume No.2, Issue No.12.

[25]Royer.M.Elizabeth. Keong.Chai. 1999. *A Review of Current Routing Protocols for Ad Hoc Mobile Wireless Networks.* IEEE. 1070-9916 /99.

[26]Sharma.Aditi. Rana.Sonal. Kalia.Leena. 2014, *Performance Comparison of AODV and DSDV Routing Protocols in Mobile Ad Hoc Networks.* International Journal of Emerging Research in Management &Technology. Volume No.3,Issue No.7.

[27]Tonk.Ginni. Kashyap.Indu. Tyag.S.S. 2012. *Performance Comparison of Adhoc Network Routing Protocol using NS2.* International Journal of Innovative Technology and Exploring Engerring.VolumeNo.1,IssueNo.1.

[28]Xu.Fengying. Liu.Zhimin. Xu.Yongchun.2011. *A Simulation on the Improved Energy Saving Protocol of AODV for Mobile Ad Hoc Network.* I.J.Education and Management Engineering. Volume No.2,Page No. 24-29.

[29]Yadav.Singh.Narendra. Yadav.P.R. 2008. *Performance Comparison and Analysis of Table-Driven and On-Demand Routing Protocols for Mobile Ad-hoc Network.* Information Journal of Information Technology. Volume No.4,Issue No.2.