A Comparative Analysis of Traffic Flows for AODV and DSDV Protocols in Manet

Ranichitra.A[1], Radhika.S[2]

[1]Assistant Professor, [2]M.Phil Scholar, Department of Computer Science, Sri S.R.N.M College, Sattur, India

Abstract *— Mobile Ad-hoc Network (MANET) is an autonomous collection of mobile nodes with wireless communication having capability of communicating without any centralized control. Routing Protocols for an ad-hoc network is complicated because the nodes move haphazardly and also unite or depart the network randomly. The highly vibrant behaviour of the nodes in ad-hoc networks results in persistent and fickle changes of network communications, which also adds convolution and complexity to launch the routing path among the nodes. Hence an optimal route that has been established in the network will not work efficiently some seconds later.*

In this paper, two widely used routing protocols AODV and DSDV are used to analyze the behavior of the nodes using NS2 for different number of connections by varying the pause time. The two routing protocols are compared and evaluated using the performance metrics Packet Delivery Ratio, Dropped packets, Throughput and End-to-End Delay.

Keywords — AODV, DSDV, MANET, Reactive, Proactive, Routing, NS2.

I. INTRODUCTION

Mobile Ad-hoc Network (MANET) is a self-configuring network of mobile routers attach by wireless links without any access point. Each mobile device in a network is autonomous. The nodes in the MANET communicate through the wireless medium and the topology of the network changes randomly and dynamically and organize themselves arbitrarily [1]. In MANET, breaking of communication link is very frequent, as nodes are free to move everywhere. MANET has given rise to many applications like Military applications, Commercial sector, Data Networks, Sensor, Networks, Emergency Operations and etc. In many applications there are still some design issues and challenges [2].

The major goal of Mobile Ad hoc Networking is to extend mobility into the kingdom of independent mobile nodes, in which the nodes may act as a router or a mobile host in an ad-hoc trend. A sample Mobile Ad hoc Network is shown in Figure 1.

Figure 1 Mobile Ad hoc Network [3]

[4]-[8] describes the contribution of various researchers in the field of MANET. In this paper, AODV from reactive group of protocols and DSDV from the proactive group of protocols is compared and analyzed for the various simulation parameters to find its suitability in MANET environment.

The paper is organized as follow Section II discusses the various routing protocols of MANET; Section III discusses performance of AODV and DSDV routing protocols; Section IV compares the performance of AODV and DSDV to find its suitability in MANET and the paper concludes in Section V.

II.ROUTING PROTOCOLS IN MANET

Routing Protocols for an ad-hoc network is complicated because the nodes move randomly and also join or leave the network randomly. The highly exciting behavior of the nodes in the ad-hoc networks results in constant changes in the topology of network communications. Routing protocol aims to establish the route, forwards the packets and updates the routes. The complexities in routing lead the way to most active research in the routing areas of the ad-hoc network. The Ad-hoc protocols can be categorized as proactive protocols and reactive protocols. Proactive or table driven protocols maintains a fresh lists of destinations and their routes by distributing the routing table information. A Reactive or on-demand protocol finds a route on demand by broadcasting the Route Request packets. This paper has considered the protocols one from each: Ad-hoc On Demand Distance Vector (AODV)[9] from reactive routing group and Destination Sequenced Distance Vector (DSDV)[10] from Proactive routing protocol to compare and analyze the performance of them[11].

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

AODV is a reactive routing protocol which initiates a route discovery process only when it has data packets to transmit and it does not have every route. Path towards the destination node, that is, route discovery in AODV is termed as on-demand. AODV uses sequence numbers conserved at each destination to determine freshness of routing information and to avoid the routing loops that can occur during the routing calculation process. All routing packets take these sequence numbers [12]. The two main phases are Route Discovery phase used to find the shortest path to the destination [13] and Route Maintenance used to maintain the route until the communication ends between the source and destination and will be updated whenever the topology changes [14].

B. Destination Sequenced Distance Vector (DSDV) Routing Protocol.

DSDV is a proactive routing protocol which is a variation of conventional Bellman-Ford routing algorithm. This protocol improves a new attribute, sequence number, to every route table entry at each node. Routing table is maintained at every node and with this table; the node transmits the packets to other nodes in the network.

The broadcasting of the information in the DSDV protocol is of two types namely: full dump and Incremental dump. Full dump broadcasting will transmit all the routing information while the incremental dump will carry only information that has changed since previous full dump [15].

III. Performance Evaluation of AODV and DSDV

NS-2 (Network Simulator-2)[16] is used to analyze the performance of AODV and DSDV using the various performance metrics Packet Delivery Ratio, Dropped Packets, End to End Delay and Throughput.

A. Simulation Result

In this study, the performance of the protocols has been evaluated by varying the maximum number of connections with 100 nodes. The simulation parameters are summarized in Table 1. In this paper the following two parameters has been considered for analyzing the reactive routing protocol AODV and Proactive routing Protocol DSDV with fixed number of nodes.

1. Pause time as 10, 20 and30.
2. Traffic Sources (CBR) as 10, 20, 30, 40 and 50.

Table 1
Simulation Parameters

Parameters	Value
Number of nodes	100
Simulation Time	300sec
Area	1000*1000m
Max Speed	10 m/s
Traffic Source	CBR
Pause Time (sec)	10,20,30
Packet Size	512 Bytes
Transmission rate	0.064 kbps
Number of connections	10,20,30,40 and 50
Routing protocols	AODV,DSDV
Mobility model	Random way point

*B.*Reactive Routing Protocol - AODV

The performance of the AODV protocol has been evaluated by considering 100 mobile nodes by varying the maximum number of connections as 10, 20, 30, 40 and 50 with the pause time as 10, 20 and 30.

Figure 2a-2d summarizes the performance of AODV routing protocol. From the graphs it is clear that PDR value increases, Dropped packets decreases, delay decreases and throughput increases with the increase in the pause time irrespective of the number of connections. The reactive routing protocol, AODV shows acceptable results for the pause time greater than 10 and does not show acceptable results for the pause time greater than 20.

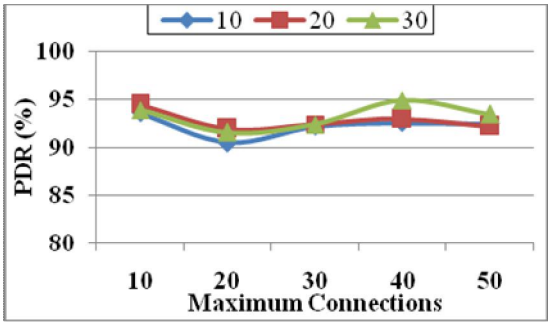

Figure 2a Maximum Connection vs PDR

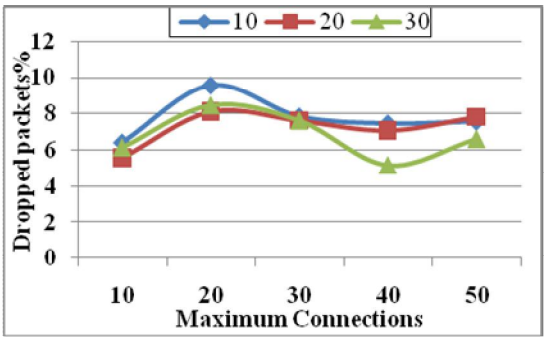

Figure 2b Maximum Connection vs Dropped packets

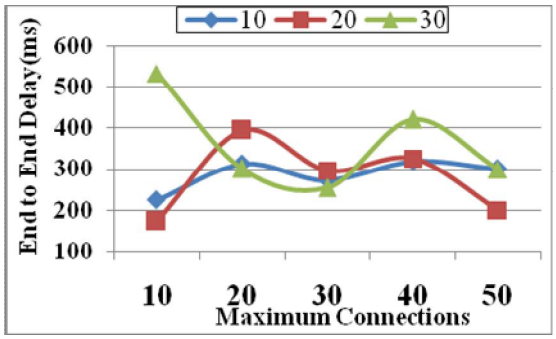

Figure 2c Maxim um Connection vs Delay

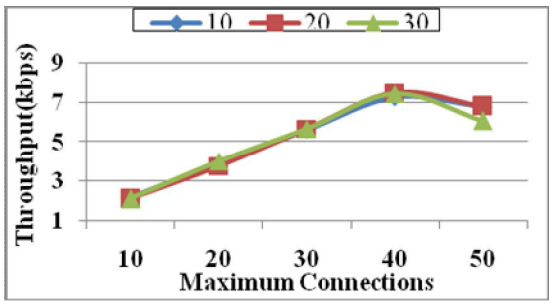

Figure 2d Maximum Connection Vs Throughput

C. Proactive Routing Protocol - DSDV

The performance of the DSDV protocol has been evaluated by considering 100 mobile nodes by varying the maximum number of connections as 10, 20, 30, 40 and 50 with the pause time as 10, 20 and 30.

Figure 3a-3d summarizes the performance of DSDV routing protocol. From the graphs it is clear that the PDR value gradually increases, Dropped packets decreases, delay decreases and throughput increases with the increase in the pause time irrespective of the number of connections. The proactive routing protocol, DSDV shows acceptable results for the pause greater than 10 and does not show acceptable results for the pause time greater than 20.

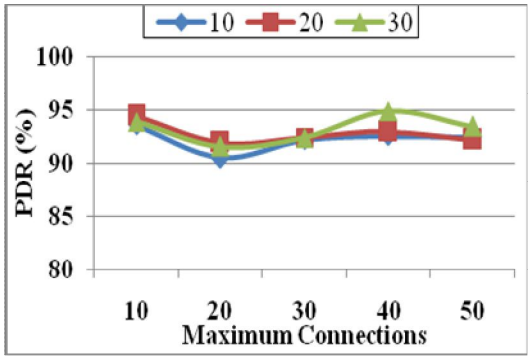

Figure 3a Maximum Connection vs PDR

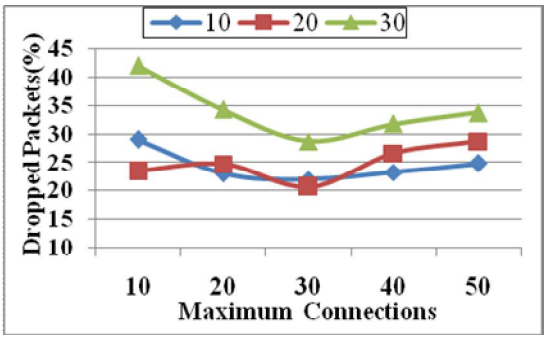

Figure 3b Maximum Connection vs Dropped Packets

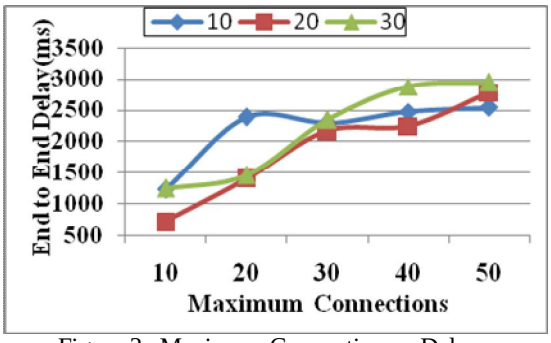

Figure 3c Maximum Connection vs Delay

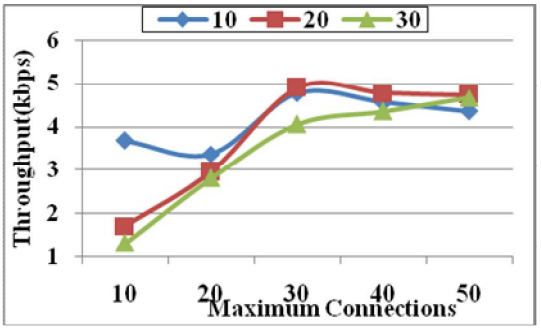

Figure 3d Maximum Connection vs Throughput

From the above analysis, it is clear that both the protocols AODV and DSDV shows better performance with the pause time as 20 ms irrespective of the number of connections. Hence in

this paper, for the further analysis to identify the suitability of the considered protocols, they were studied by varying the maximum number of connections as 10,20,30,40, and 50 with pause time as 20ms.

IV. AODV vs DSDV

In this scenario, the performance of the protocols AODV and DSDV have been compared and analyzed by varying the maximum number of connections with 100 nodes. The experiment uses fixed number of nodes by changing the maximum number of connections (CBR Traffic). The simulation parameters are summarized is Table 2.

Table 2 Simulation Parameters

Parameters	Value
Number of nodes	100
Simulation Time	300sec
Area	1000*1000m
Max Speed	10 m/s
Traffic Source	CBR
Pause Time (sec)	20
Packet Size	512 Bytes
Transmission rate	0.064 kbps
Routing protocol	AODV,DSDV
Mobility model used	Random way point

Figure 4a-4d summarizes the performance of AODV and DSDV routing protocols. From the chart, it is clear that while comparing the performance of AODV and DSDV in NS2 environment, AODV shows better results compared to DSDV in terms of PDR, dropped packets, delay and throughput irrespective of the maximum number of connections.

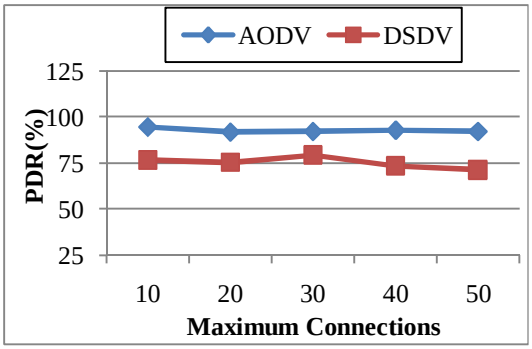

Figure 4a Maximum Connections vs PDR

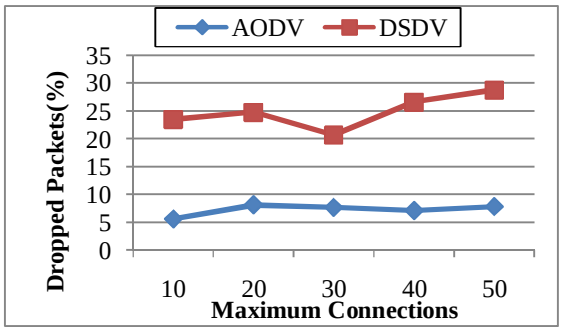

Figure 4b Maximum Connections vs Dropped Packets

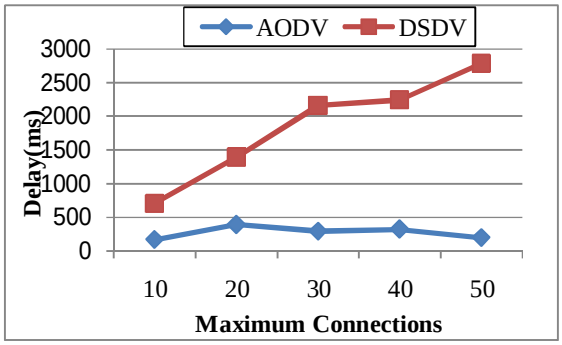

Figure 4c Maximum Connections vs Delay

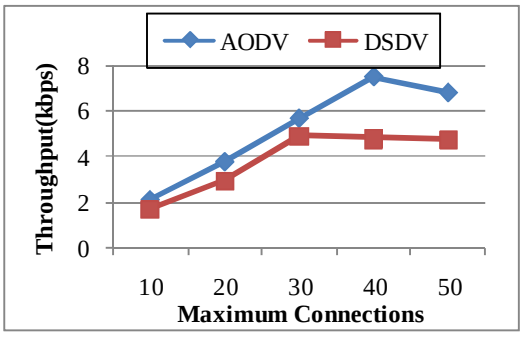

Figure 4d Maximum Connections vs Throughput

From the results it is clear that AODV outperforms DSDV for the considered metrics with the pause time as 20ms and maximum number of connections as 30 and the performance improvement of AODV than DSDV for the considered metrics is shown in Table 3.

Table 3
Performance improvement of AODV

Metrics	AODV	DSDV	% of Improvement
Packet Delivery Ratio (%)	92.39	79.34	16.44
Dropped packets (%)	7.61	20.66	63.16
End-to-End Delay (ms)	295	2163	86.36
Throughput (Kbps)	5.66	4.9	15.51

V.Conclusion

Mobile Ad-hoc Networks (MANETs) are future wireless networks consisting entirely of mobile nodes that communicate without any base stations connectivity. This paper focuses reactive protocol AODV and proactive protocol DSDV. To analyze the suitability of these routing protocols in MANET Environment, the performance of the protocols is studied using NS2 simulator with Packet Delivery Ratio, Dropped Packets, End-to-End delay and throughput as the metrics.

From the analysis, it is observed that AODV shows 16.44% increase in PDR, 63.16% decrease in Dropped packets, 86.36% less delay and 15.51% more routing overhead compared to DSDV. It is observed that the results obtained clearly indicate that the reactive protocol AODV always outperforms proactive protocol DSDV for the considered performance metrics.

REFERENCES

[1] LoayAbusalah, AshfaqKhokhar, and Mohsen Guizani, "A Survey of Secure Mobile Ad hoc Routing Protocols," IEEE communications surveys & tutorials, Vol. 10, no. 4, pp. 78-93, 2008.

[2] PreetiGaharwar Mr. Sunil R. Gupta "Performance Comparison of AODV, DSDV & DSR Routing Protocols in MANET" International Journal of Advanced Research in Computer Science and Software Engineering ISSN: 2277 128X April 2013.

[3] A.Ranichitra, A.Mallairaj," IMPACT OF BLACKHOLE ATTACKS IN MANET –A STUDY",International Journal of Innovative Research in Science and Engineering", Volume 3, Issue 2,pp 1-8,2017, ISSN(O):2454-9665,pp 1-8.

[4] Rakesh Kumar Jha, PoojaKharga"A Comparative Performance Analysis of Routing Protocols in MANET using NS3 Simulator" I. J. Computer Network and Information Security, 2015, 4, 62-68.

[5] Prachi Mishra, Neelesh Gupta "Performance Evaluation of AODV and DSR Protocols in MANET"International Journal of Innovative Research in Engineering & Multidisciplinary Physical Sciences (IJIRMPS) Volume 3, Issue 1, February 2015.

[6] G Shenbagavalli "PERFORMANCE ANALYSIS OF MANET ROUTING PROTOCOL "International Journal of Advanced Science and Engineering Research www.ijaser.in Volume 1, Issue: 1, June 2016 ISSN: 2455-9288.

[7] LaxmiShrivastava, SaritaS.Bhadauria, and G.S.Tomar, "Performance Evaluation of Routing Protocols in MANET with different traffic loads" International Conference on Communication Systems and Network Technologies, pages 13-16, 2011.

[8] 1 Neelam Singh and 2Laxmi Shrivastava "Performance Evaluation of Two Reactive Routing Protocols for RWP Mobility Model with Different Speed"International Journal of Future Generation Communication and Networking Vol. 9, No. 2 (2016), pp. 95-102.

[9] C.E Perkins and E.M Royer, " Ad hoc On Demand Distance Vector Routing", in Proceeding of the IEEE Mobile Computing Systems and Applications, New Orleans, LA, February 199, pp 90-100.

[10] C.E Perkins, P. Bhagwat, "Highly Dynamic Destination Sequenced Distance Vector routing (DSDV) for mobile computers", in proceedings in SIGCOMM ″94 Conference on Communications Architectures, Protocols and Applications, August 1994, pp 234-244.

[11] V.Lakshmi Praba and A.Ranichitra, "REACTIVE VS PROACTIVE IN VANET SCENARIOS." *International Journal of Advanced Research in Computer Science*, Volume 2, Issue 6, pp 455-460, 2011

[12] VikasGoyal, Ashish, and Govind Kumar, "Review paper on AODV & DSR routing protocol," International Research Journal of Advanced Engineering and Science, Volume 1, Issue 4, pp. 136-141, 2016.

[13] DilpreetKaur, Naresh Kumar "Comparative Analysis of AODV, OLSR, TORA, DSR and DSDV Routing Protocols in Mobile Ad-Hoc Networks"I. J. Computer Network and Information Security, 2013, 3, 39-46

[14] 1K. Tamizarasu and 2 Dr. M. Rajaram "The Effective and Efficient of AODV Routing protocol for Minimized End-to-End Delay in MANET" International Journal of Advanced Research in Computer and Communication EngineeringVol. 1, Issue 4, June 2012.

[15] SubhranandaGoswami "A Simulation Based Performance Comparison of AODV and DSDV Mobile Ad Hoc Networks"I.J. Information Technology and Computer Science, 2014, 10, 11-18.

[16] NS2 Network Simulator http://www.isi,edu/nsnam/ns.