

Relative Performance Analysis of Reactive Routing Protocol in MANET using Varying Node Density

Monika Kartikey*, Ajay Kumar Lala**

*(Computer Science & Engineering, Gyan Ganga Institute of Technology and science, Jabalpur)

** (Computer Science & Engineering, Gyan Ganga Institute of Technology and science, Jabalpur)

Abstract:

In wireless mobile ad-hoc network (MANET), path routing and selection of routing protocols are very important concepts to design any wireless network. Comparison of the routing protocols shows very significant role for performance evaluation. A MANET is one of the ad-hoc network that does not need centralized control, it works like distributed network and self-created. The goal of MANETs is to enhance the performance of ad-hoc network in terms of Packet Delivery Ratio (PDR), Normalized routing load (NRL), Total Dropped Packets. In this paper, the performance analysis of Ad hoc On-Demand Distance Vector (AODV) and Dynamic source routing (DSR) routing protocols implementation are carried out using NS2.34 network simulator. The performance is evaluated on the basis of common measure parameters like Packet Delivery Ratio (PDR), Normalized routing load (NRL), Total Dropped Packets for better results.

Keywords — Mobile ad-hoc network (MANET), Routing protocols Dynamic source routing (DSR), Ad hoc On-Demand Distance Vector (AODV) and NS2.

I. INTRODUCTION

Mobile ad-hoc network (MANET) is a set of selecting communication devices that are communicate to each other with infrastructure less network. MANET routing work can be done by flooding. However, when the number of nodes is increases to hundred or even thousands, the mass control message will even block the data transmission which results is congestion and energy consumption, this kind of network is mainly useful for emergency search, military communication, satellite transmission, education and meeting, commercial sector, recovery sites etc., where shareholder share information dynamically using their mobile devices.

The quality of these network routing protocols show an outstanding and extended role in their overall performance and scalability. Through limited radio frequencies or radio transmission range, at the same time multiple nodes want to exchange data among various communication nodes. So, here the selection of major elements of

dynamic or well-organized routing protocol is to find a routing between two communicating moveable nodes rapidly and obtain better performance with low bandwidth over-heads.

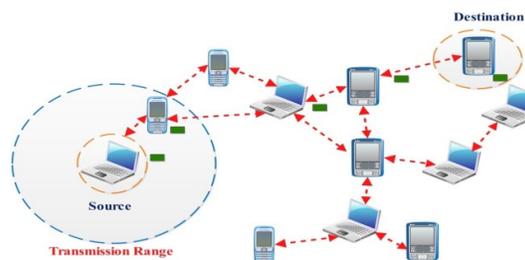


Figure 1 Mobile Ad hoc Network

Performance analysis of two reactive routing protocols Ad hoc On-Demand Distance Vector (AODV) and Dynamic source routing (DSR) are carry out using NS2 network simulator. AODV is efficient based on Packet Delivery Ratio (PDR) and DSR is efficient in Normalized Routing Load (NRL) and Total Drop Packets [2, 3].

II. ROUTING IN MANET

In MANET, to provide data transmission from sender to receiver each node broadcast or forward data packets on its neighboring nodes to forward data packet to other nodes which are not in its transmission range. Therefore each in network performs to roles one as natural node and second as router. The major problem in MANET is dynamic routing of the network where frequently changing routes which must be simply solved by routing protocols. Another problem is energy and computing power must be manage by routing protocol to provide impressive routing [4].

Another major problem is to find intermediate nodes in an ordered series from and that can share information in the range of network from a sender to a receiver node by these intermediate nodes. Routing is one of the important processes where data packets are transmitted from one node to another node. Sometime data packet routing is very difficult when MANET shift their topology many times. Routing protocol manipulates the flow of data in network and also finds the optimal routing path.

2.1 Classification of Routing Protocol

In MANET each node plays as a router that identifies and manages paths to other nodes in network [1]. The main goal of MANET is to provide a right and dynamic path between sender and receiver. There are different types of routing protocols for MANET. Routing protocols can be classified into following categories as Reactive routing protocol, Proactive routing protocol and Hybrid routing protocol [5]. Such protocol contract with imperative limitations of MANET which add low bandwidth, high power utilization and high error rates [DSR AODV]. The first type of protocol is on demand routing protocols (reactive routing protocol). The second protocol is called proactive routing protocol or table driven routing protocol and third types of protocol is called hybrid protocol which have both proactive and reactive metrics.

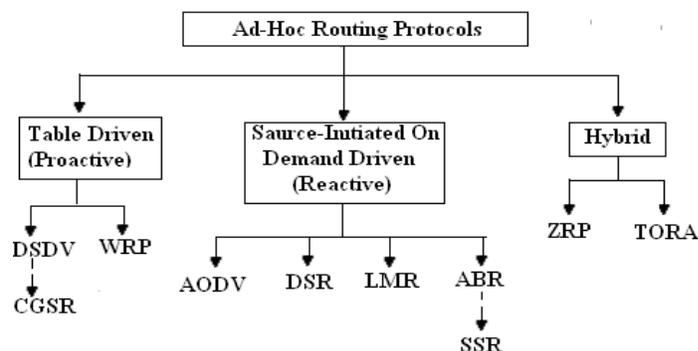


Figure 2 Classifications of MANET

A. Proactive Routing Protocol

In proactive routing protocol each node maintains routing information to every other node in its routing table. These tables are automatically updated, if the network topology changes. Therefore control traffic is more compact but consistent and paths are immediately achievable [4]. This grants to send less overall control packets. The proactive routing protocol maintains great accuracy on network topology [5]. Every node maintains their routing table to quick determined a new route according to updated information of the routing table. The proactive routing protocol gives more accuracy and security on the network topology. Examples of proactive routing protocols are DSDV, OLSR and GSR etc.

B. Reactive routing protocol

Reactive routing protocol is also called on demand routing protocol. In reactive routing protocol a request is broadcast in network to find a route for communication between sources to destination node [1]. Reactive routing protocol normally provides lesser routing overhead as compare to the proactive routing protocols because they act on demand. Proactive routing protocol is also call table driven routing protocol and they are not forward large number of flooding of route request packets because if the receiver or destination nodes are not found, the request data packets are discarded at any intermediate nodes or source node [2]. Proactive routing protocol reduced the performance of reactive routing protocols. Reactive routing protocols have some disadvantages that they have reason for high congestion during route

discovering process [5]. Examples of reactive routing protocols are DSR, AODV and AOMDV etc.

C. Hybrid routing Protocols

Hybrid routing protocols is combo of proactive and reactive routing protocol and it takes advantages of these two protocols and through this concept routes are establish immediately in the routing zone. These protocols are essaying to resolve the problem of routing in Mobile ad hoc network by hybrid routing protocol which has the advantage of both routing protocols. There is no actual application of this protocol. The example of hybrid routing protocol are ZRP (Zone routing Protocol) and CBRP (Cluster Based Routing Protocol). The network is subcategories into regions called clusters and one a node uses a proactive routing protocol for routing surrounding its adjacent neighborhood region and a reactive routing protocol for routing exterior of this region [5].

2.2 Ad hoc On Demand Distance Vector (AODV)

Ad hoc on demand distance vector routing protocol (AODV) is one of on-demand reactive routing protocol for Mobile Ad Hoc Network. It is a combination of Dynamic Source Routing (DSR) and destination sequenced distance vector (DSDV) [6]. AODV contribute DSR's on-demand temperament so when it want identical route discovery it uses route discovery process. However, AODV supports traditional routing tables, one entry per destination which is in diverse to DSR that manage various route cache entries for each end every destination. The introductory design of AODV is initiated after the wisdom with DSDV routing algorithm. AODV provides loop free routes like DSDV. AODV also has another important feature. A route is accessible between source and destination. It does not add any overhead in packets. In this case route discovery process is only proposed.

Advantages of AODV: AODV is an on-demanded in nature, so it supports unicast and multicast data transmission. AODV answers immediately to topological changes.

Disadvantages of AODV:Overhead on bandwidth will be arise as compared to DSR, when an RREQ packet forward in network it travels from node to node in the mechanism of discovering the route information "On-Demand", it establish reverse path itself.

2.3 Dynamic Source Routing (DSR)

The Dynamic Source Routing (DSR) is also a reactive routing protocol. It determines the appropriate route only when packet needs to be forwarded. For defining the bandwidth, the process to find a path is only executed when a path is required by a node (On-Demand Routing). In DSR the sender determines the whole path (from the source to the destination node) and stores the addresses of the intermediate nodes of the route in the packets. In the mobile ad hoc network it provides dynamic route discovery mechanism for a new route from source node to destination node. Each route node forward data packet and attach its own header on the data packet in complete order and avoiding up-to-date routing table information need [2].

Advantages of DSR: DSR grants multiple paths to any destination and also grant each sender to choice and manage path used in packet routing. When a data packet gets a link breakage on its source route, an intermediate node can use another route from its own route cache

Disadvantages of DSR: In DSR each node of the network must consume a lot of time for data control process. The connection setup delay is higher as compare to the table driven protocol.

III. LITERATURE REVIEW

Pankaj Kumar Varshney, G.S. Agrewal and Sudhir Sharma et al in 2016 in their work compared the performance matrices of proactive routing protocols like Optimized Link State routing (OLSR) and Source Tree Adaptive Routing Protocol (STAR) for CBR traffic by varying number of moveable devices in terms of Throughput, Average E2E Delay, Packet Delivery Ratio (PDR), Normalized routing load (NRL), Total Dropped Packets by using NS2 simulator. As a result when increasing the number of nodes the overall performance of AODV is better than DSR routing protocol [1].

MeenakshiYadav and NishaUparosiya et al 2014 this paper shows analysis of routing protocols in MANET. This paper objective is at the advantages and problems of MANET with the issue of developing the future security. The main goal of this paper is to provide efficient energy aware and secure routing schemes of routing protocols in MANET. The paper summarized characteristics, features advantages and disadvantages of MANET [4].

Uma Rathore Bhatt, NeeleshNema and RakshaUpadhyay et al in 2014 in MANET selection of routing protocol is essential part, when may increase the performance of mobile ad hoc network through these parameters residual battery, average end to end delay, average jitter and throughput. To achieve this objective an enhanced DSR (DSR1) is expends more power and bandwidth of the network. It also produces high congestion and delay in network. In this paper DSR1 provide a better solution to overcome this problem. As a result increased throughput and average residual battery of node and decreased average E2E delay and jitter. DSR1 protocol may be useful at the place where node density is very high and delay is to be minimized [7].

Anil Kumar Sharma and Neha Bhatia et al in 2011 this paper represents an overview of different types of routing protocols for MANET and also provides classification of proactive and reactive routing protocols according to their routing strategy. The main goal this comparison of AODV, DSR and DSDV routing protocols. The performance of these three routing protocol is analysed with NS2 simulator with 5 nodes and the result shows AODV performs well than DSDV and DSR under throughput and average delay while DSR provides

best in case of packet delivery ratio. Finally in all aspect, AODV performs better [5].

Mr.Nirmal Singh and Mrs.MamtaKatiyar et al 2012 this paper provides overview and simulation performance analysis of an On-Demand routing protocols like AODV and DSR for mobile ad hoc network and also provide a classification of routing protocol (Proactive, Reactive and Hybrid routing protocol). This paper presents the performance evaluation between these two On-Demand routing protocol in terms of variation of number of nodes and pause time. And performance metricsthroughput and E2E delay. The result and simulation analysis shows that DSR performs well as compare to AODV [9].

IV. METHODOLOGY AND PERFORMANCE MATRICES

A. Simulation Setup

Every single extend replication were manage utilizing NS-2.34. The refurbish system contained of 100, 150 and 200 hubs arbitrarily distributed in 800x800m territory at the beginning time of the replication. All replica parameter are characterized in below table 1:

In this situation 1, I have taken two On Demand (Reactive) directing conference, in particular AODV, DSR and one proactive driving conference DSDV. For all reproduction result determine at distinct reproduction time like 97, 99 sec 100 sec. at high rate of the hubs is 50 m/s and stop time is regular set to 10 sec and the quantity of hubs is vary as 100, 150, and 200. Communication details of the system for transmission the package starting with one hub then onto the next in transmission range.

TABLE ISIMULATION PARAMETER

S. N	Parameters	Value
1	Source Type	MAC
2	MAC Layer Protocol	802.11
3	Traffic Type	Constant bit rate (CBR)
4	Mobility Model	Random Way Point
5	Number of Nodes	100, 150 and 200
6	Packet Size	512 Bytes
7	Node Placement	Random
8	Terrine Dimensions	800 X 800
9	Simulation Time	100sec
10	Pause Time	10 sec
11	Maximum Speed	50 m/s
12	Performanc e Matrices in Application Layer	Throughput, Average E2E Delay, PDR, NRL, Total Dropped Packets

B. Performance Matrices

Theperformanceanalysis of reactive routing protocols DSR, AODV is done according to the performance metricsthat are based on Packet Delivery Ratio (PDR), Normalized routing load (NRL), TotalDropped Packets. So we use different matrices to compare the performance.

Some following important performance metrics can

be evaluated:-

- **Packet Delivery Ratio:** - The ratio of data packets received by the destinations node to accomplished by the sources node. This performance metricswill give us how well the protocol is operating in terms of packet transmission at different speeds.
- **Normalized routing load:** - The normalized routing load is characterized as the fraction of all routing control packets forwardedby all nodes over network the number of received data packets at the destination nodes. In other words, it is the ratio between the total numbers of routing packets sent over the network to the total number of data packets received.
- **Total Dropped Packets:** -Packet drop occurs when one or more than one data packets forwarding over computer network break down to reach their destination. Packet drop is caused by network congestion. A total dropped packet is calculated as a percentage of data packets dropped with respect to packets sent.

V. RESULTS AND DISCUSSION

In figure 3 by increasing node speed packet delivery ratio (PDR) decrease in AODV same as DSR so in terms of packet delivery ratio, AODV gives better results.

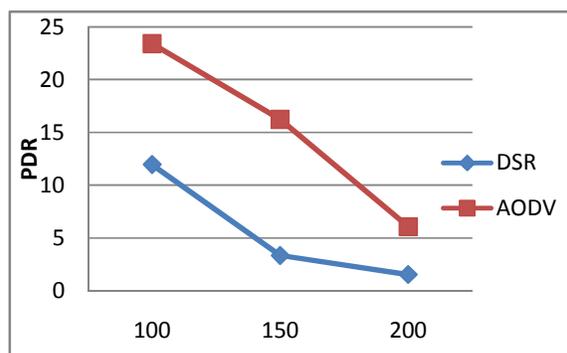


Figure 3 Comparisons of DSR and AODV with Nodes vs. PDR

In figure 4 the value of normalized routing load vs. pause times are operated. In this figure it is clear that AODV has lower routing load. In case of 100 to 150 nodes, routing load of AODV and DSR are slightly similar. And after 150 to 200

nodes AODV gives lower performance then DSR.

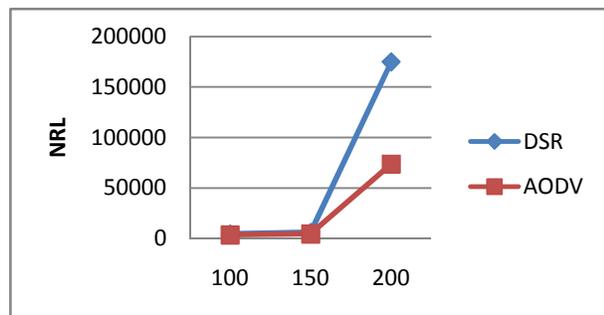


Figure 4 Comparisons of DSR and AODV with Nodes vs. NRL

A data packet is dropped in case of buffer is full when the data packet wish to be buffered and the data packet has been buffered top of the boundary. Packet dropping is occurring where more data packet needs to buffered out of boundary limit. Thus packet dropping speed scale down for them. In figure 5 Total dropped packet for AODV is lower than DSR.

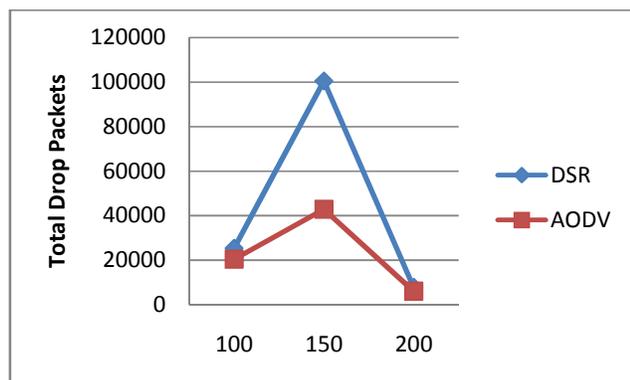


Figure 5 Comparisons of DSR and AODV with Nodes vs. Total dropped packet

VI. CONCLUSIONS

This paper evaluated the performance of two reactive routing protocols (AODV, DSR) using NS2.34. Comparison was based on Packet Delivery Ratio (PDR), Normalized routing load (NRL), Total Dropped Packets by varying the number of nodes density. As a result AODV performed rapid than DSR in terms of PDR while DSR gives better in case of NRL and total drop packet.

SUGGESTION FOR FUTURE WORK

MANET is popular and full of opportunity field area research. In this dissertation to reactive routing protocol worked considered for measuring various parameter metrics with increasing number of nodes. In near future other routing protocols will be measured under different traffic types, mobility models and increase area scenario.

REFERENCES

- [1] Pankaj Kumar Varshney, G.S. Agrawal and Sudhir Sharma, "Relative Performance Analysis of Proactive Routing Protocols in Wireless Ad hoc Networks using Varying Node Density", *Invertis Journal of Science and Technology*, Vol. 9, No. 3, 2016 ; pp. 1-9.
- [2] Sujata Agrawal¹ Dr. M.B. Daigavane² Dr. K.D.Kulat³, "PERFORMANCE EVALUATION OF ROUTING PROTOCOLS FOR WIRELESS ADHOC NETWORK", *International Journal of Advanced Engineering Technology, IJAET/Vol.III/ Issue I/January-March, 2012/13-17*.
- [3] S. Mohapatra, P.Kanungob, a*, "Performance analysis of AODV, DSR, OLSR and DSDV Routing Protocols using NS2 Simulator", *International Conference on Communication Technology and System Design 2011*
- [4] Meenakshiyadav and NishaUparsiya, "Survey on MANET: Routing Protocols, Advantages, Problems and Security", *International Journal of Innovative Computer Science & Engineering Volume 1 Issue 2; Page No. 12-17; 2014*.
- [5] Anil Kumar Sharma and Neha Bhatia, "Behavioral Study of MANET Routing Protocols by using NS-2", *IJCEM International Journal of Computational Engineering & Management*, Vol. 12, April 2011 ISSN (Online): 2230-7893 www.IJCEM.org.
- [6] Anuj K. Gupta, *Member IACSIT*, Dr. Harsh, Sadawarti and Dr. Anil K.Verma, "Performance analysis of AODV, DSR & TORA Routing Protocols", *IACSIT International Journal of Engineering and Technology*, Vol.2, No.2, April 2010 ISSN: 1793-8236.

- [7] Uma Rathore Bhatt, NeeleshNema and RakshaUpadhyay, "Enhanced DSR: An Efficient Routing Protocol for MANET", 2014 International Conference on Issues and Challenges in Intelligent Computing Techniques (ICICT) 978-1-4799-2900-9/14/\$31.00 ©2014 IEEE.
- [8] Manish Sharma¹&Gurpadam Singh², "Evaluation of Proactive, Reactive and Hybrid Ad hoc Routing Protocol for various Battery models in VANET using Qualnet", International Journal of Smart Sensors and Ad Hoc Networks (IJSSAN) ISSN No. 2248-9738 (Print) Volume-1, Issue-2, 2011.
- [9] Mr.Nirmal Singh¹, Mrs.MamtaKatiyar(Asst. Professor)², "Performance Analysis of AODV and DSR Routing Protocols in MANET'S", International Journal of Research in Computer and Communication technology,IJRCCT, ISSN 2278-5841, Vol 1, Issue 6, November 2012.IJRET: International Journal of Research in Engineering and Technology.
- [10] SaifulAzadm, ArafaturRahman and Farhat Anwar, "A performance Comparison of Proactive and Reactive Routing Protocols of Mobile ad-hoc network (MANET)", Journal of Engineering and Applied Science 2(5): 891 - 896, 2007, MedwellJournal,2007.