Journal of Basic and Applied Engineering Research
Print ISSN: 2350-0077; Online ISSN: 2350-0255; Volume 2, Number 10; April-June, 2015 pp. 842-846

http://www.krishisanskriti.org/jbaer.html

Performance Evaluation of Routing Protocols in Mobile AD HOC Network based on Different Parameters

Sandhya Pathak[1], Kuldeep Tiwari[2] and Vibha Tripathi[3]

[1]Pursuing M.Tech LIG 906, Sec. 10, AwasVikas Colony, Sikandra, Agra [UP]
[2]Pursuing M.Tech 82 A ShardaVihar, City Center, Gwalior
[3]Pursuing M.Tech Balwant Nagar Thatipur Gwalior
E-mail: [1]sandhyapathak2010@gmail.com, [2]kuldeepbvm@gmail.com, [3]Vibha.tripathi1990@gmail.com

Abstract—*A Mobile Ad hoc Network is a kind of wireless network that is continuously self-conFig. uring and infrastructure-less network of mobile devices connected without wires.A Mobile Ad hoc Network is a collection of mobile nodes that are dynamically and arbitrarily located in such a manner that the interconnections between nodes are capable of changing on continual basis. The dynamic topology of MANETs allows nodes to join and leaves the network at any point of time. An Ad hoc routing protocol is a standard that controls how nodes decide which way to route packets between computing devices in a mobile ad hoc network.*
Security has become a primary concern in order to provide protected communication between mobile nodes in a hostile environment. Unlike the wire line networks, the unique characteristics of mobile ad hoc networks pose a number of challenges to security design, such as shared wireless medium, stringent resource constraints and highly dynamic network topology. These challenges clearly make a case for building the security solutions that achieves both broad protection and desirable network performance. In this paper, our aim is to focus on different routing protocols. We discuss about the performance of routing protocols base on various protocol property parameters such as Route Discovery, Periodic Broadcast, and Network Overhead etc.

Keywords: *MANET, AODV, DSDV,ad hoc, Network topology, protocols.*

1. INTRODUCTION

Mobile Ad-hoc Network (MANET) is a collection of communication devices or nodes that wish to communicate with infrastructure less support and without predetermined organization of available links.In MANET, Routing is main problem to route the data packets from one source node to destination node in networks.The Mobility influencesongoing transmissions, since a mobile node that receives and forwards packetsmay move out of range. As a result, links fail over time. In such cases a new routemust be established. Thus, a quick route recovery procedure should be one of themain characteristics of a routing protocol. It is also important to study the variousperformance metrics for better understanding and utilization of the routingprotocols.

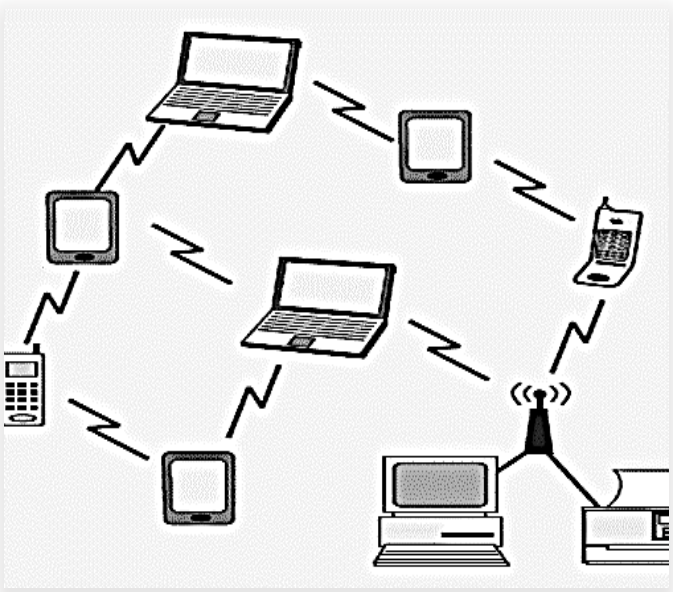

Fig. 1: Mobile Adhoc Network

MANET has several salient characteristics. These are:
1) No fixed infrastructure
2) Dynamic changing topology – Mobile devices join/leave the network unexpectedly; they can also move freely.
3) Energy constrained operation
4) Limited physical security.
*5)*Each node also serves as router – Help to relay packets received from neighbors

2. PROBLEM FORMULATION

The objective of our work is to compare the performanceof three routing protocols based on Table Driven and

Ondemandbehavior, namely, Destination SequencedDistance Vector (DSDV), Ad-hoc On-Demand Distancevector (AODV) and Dynamic Source Routing (DSR), for wireless ad hoc networks based on theperformance, and comparison has been made on the basisof their properties like throughput, packet delivery ratio(PDR), End to End Delay and data packet loss with respectto four different scenarios – one by varying the number ofnodes, again by varying the mobility of the nodes**,** other byvarying the number of connecting nodes at a time andlastly by varying pause time.

The general objectives can be outlined as follows:

1) Study of Ad-Hoc Networks.

2) Get a general understanding of MobileAd-Hoc Networks.

3) Study on different types of MANET routingprotocols.

4) Detailed study of DSDV, AODV and DSR

5) Generate a simulation environment that could beused for simulation of protocols.

6) Discuss the result of the proposed work andconcluding by providing the best routingprotocol.

3. CLASSIFICATION OF ROUTING PROTOCOLS

Ad-hoc network routing protocols may be classified in many ways depending on their routing algorithm, network structure, communication model, and state of information etc, but most of the protocols depending on their routing algorithm, and network structure. Based on the network structure, ad-hoc network are classified as following:

Reactive Routing: AODV (Ad-hoc on-demand distance vector routing protocol), DSR (Dynamic source routing)

Proactive Routing: DSDV (Destination Sequence Distance Vector Routing)

AODV: The AODV is a Reactive on demand ad-hoc distance vector routing algorithm. AODV is an improvement on DSDV because it typically minimizes the number of required broadcasts by creating routes on demand basis as opposed to maintaining a complete list of routes, as in the DSDV algorithm. When a source node desires to send a message to some destination node and does not already have a valid route to that destination, it initiates a path discovery process to locate the destination. In AODV, each router maintains route table entries with the destination IP address, destination sequence number, hop count, next hop ID and lifetime.

RREQs route requests and RREPs route replies are the two message types defined by the AODV. When a route to a new destination is needed, the node uses a broadcast RREQ to find a route to destination. A route can be determined when the request reaches either the destination itself or an intermediate node with a fresh route to the destination. The route is made available by unicasting a RREP back to the source of RREQ. Each node maintains its own broadcast id, sequence number. The broadcast ID is incremented for every RREQ packet. Since each node receiving the request keeps track of a route back to the source of the request, the RREP reply can be unicast back from the destination to the source, or from any intermediate node that is able to satisfy the request back to the source.

DSDV: DSDV destination sequenced distance vector routing protocol is a table driven algorithm based on the classical Bellman –Ford routing mechanism. The improvement is made include freedom from loops in routing tables. Every mobile node in the network maintains a routing table for all possible destinations within the network and the number of hops to each destination node. Each entry is marked with a sequence number, number assigned by the destination node Routing table updates are periodically transmitted throughout the network in order to maintain table consistency.

Large amount of network traffic, route updates can employ in two types of packets they are first is the “Full Dump” and second is the “Incremental routing”. A full dump sends the full routing table to the neighbors and could cover many packets whereas, in an incremental update only those entries from the routing table are sent that has a metric change since the last update and it must fit in a packet. When the network is relatively stable, incremental updates are sent to avoid extra Traffic and full dump are relatively infrequent. In a fast changing network, incremental packets can grow big, so full dumps will be more frequent,.

4. PERFORMANCE METRICS

The main objective of this paper is comparing the performance of DSDV, AODV and DSR routing protocols using following metrics:

A. Packet Delivery Fraction

The ratio of the data packets delivered to the destinations to those generated by the CBR sources is known as packet delivery fraction.

$$PacketDeliveryRatio = TotalReceivedPackets/TotalSentPackets \times 100\%$$

B. End-to-End Delay

Network delay is the total latency experienced by a packet to traverse the network from the source to the destination. At the network layer, the end-to-end packet latency is the sum of processing delay, packet, transmission delay, queuing delay and propagation delay. The end-to-end delay of a path is the sum of the node delay at each node plus the link delay at each link on the path.

C. *Routing overh*ead

It gives the total number of routing packets transmitted during the simulation. It is the ratio of

Routing packets to the total no. of packets generated by the source.

$$RoutingOverhead=TotalRoutingSignalingPackets/TotalTransmittedPackets$$

D. Throughput

Throughput of the routing protocol means that in certain time the total size of useful packets that received at all the destination nodes. The unit of throughput is Kilobits per second (Kbps).

$$Throughput=AmountofDataTransferd/TotalSimulation\ (Kbps)$$

5. RELATED STUDY

A number of routing protocols have been proposed and implemented for MANETs in order to enhance the bandwidth usage, more throughputs, less overheads per packet, least consumption of energy and others. All these protocols have advantages and disadvantages under certain circumstances. In a proposal by KuldeepTiwart, discussion of the various MANET routing protocols and various studies is done on the performance evaluation of MANET. They study the performance of MANET routing protocols based on TCP traffic patterns and also analyzed the performance of AODV, DSR and DSDV protocols for TCP traffic pattern on the basis of Packet Delivery Ratio, Throughput and Jitter**.** It is concluded that DSDV protocol performs better as compared to AODV and DSR protocols for TCP traffic pattern. It is also concluded that performance of these protocols is more affected while subject to change in pause time as compared to change in number of connections. In a proposal by VibhaTripathi description of the simulation of AODV, DSDV and DSR routing protocols using Manhattan Grid Mobility Model. The reactive AODV, DSR and proactive DSDV protocol's internal mechanism leads to considerable performance difference. It has been observed that, AODV and DSR perform better than DSDV in terms of Packet Delivery Fraction and Throughput under Manhattan Grid mobility model. Although in term of Average end-to-end Delay, DSDV appears to be the best one. In a proposal bySandhya Pathak,evaluation of the performance of MANET Routing Protocols DSR, AODV and DSDV under different performance metrics like Packet Delivery Fraction, Average End-to-End delay, NRL, Throughput, Routing Overhead and Packet Loss. The performance evaluation is done in different network sizes using network simulator NS-2. The comparison result shows that AODV gives highest Packet Delivery Fraction and Throughput, DSR gives lowest packet loss and DSDV gives the lowest NRL, End-to-End Delay and Routing Overhead.

6. LITERATURE SERVEY

We have surveyed many of the papers for the current work carried out by most of the researchers. The abstract, methodology, parameters focused for performance evaluation of Ad-hoc routing protocols is briefly discussed below:

Morshed, M.M. ; Dept. of Computer Sci. & Eng., Dongguk Univ. wrote a paper"Performance evaluation of DSDV and AODV routing protocols in Mobile Ad-hoc Networks". This paper tells that Mobile Ad-hoc Network is an infrastructure less and decentralized network which need a robust dynamic routing protocol. Many routing protocols have been proposed to accommodate the needs of communications for MANET. In this paper, we have compared the performance of traditional proactive DSDV routing protocol along with on-demand reactive routing protocols for MANET: AODV. From analysis, the On-demand protocol, AODV has given better performance than table driven DSDV routing protocol. To compare the performance of DSDV and AODV routing protocol, the simulation results were analyzed by graphical manner and trace file based on QoS metrics such as Delay, Jitter.

Elizabeth Royer and Chai-KeongToh wrote "A Review of Current Routing Protocols for ad hoc Mobile Wireless Networks" in 1999, ad hoc networks have made significant progress. Many new classes of protocol have been developed, expanding the two main classes considered in, namely Source driven and Table driven protocols, to a whole collection of more specific classes.

In contrast to DSR, AODV does not use source routing but rather dynamically creates routing entries in intermediate nodes between the source and destination. ADOV adopts a similar approach DSR in that the source wanting to send information initiates a Route Request, RREQ, which is broadcast throughout the ad hoc network until it reaches a node, that maybe the destination itself, which has a route to the destination. This node then propagates back a Route Reply, RREP to the source. The traversal of the network by the RREQ and RREP packets is the mechanism used to establish routing entries in the intermediate tables. Various mechanisms are used to ensure that routing loops do not occur and that only a single path through the ad hoc network is established.

7. SIMULATION TOOL

In this paper, simulation of proactive and reactive routing protocols is done by using network simulator (NS2) software due to its simplicity and availability. NS is a discrete event Simulator targeted at networking research. NS provides substantial support for simulation of TCP, routing, and multicast routing protocols over a wired and wireless network. NS2 is written in C++ and OTCL. C++ for data per event packets and OTCL are used for periodic and triggered event. NS2 include a network animator called network animator

which provides visual view of simulation. NS2 preprocessing provides traffic and topology generation and post processing provide simple trace analysis. AWK programming is used for trace file analysis.

8. SIMULATION

Suppose if there are n number of nodes, then the total delaycan be calculated by taking the average of all the packets,source destination pairs and network conFig. Uration

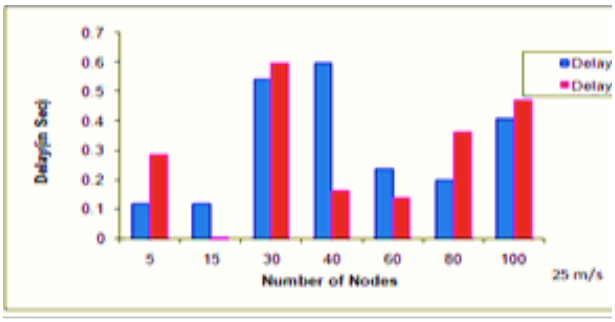

Fig. 2: Delay at 25*m/s*.

In this above Fig. at 25*m/s* we say that DSDV showscomparatively more delay.

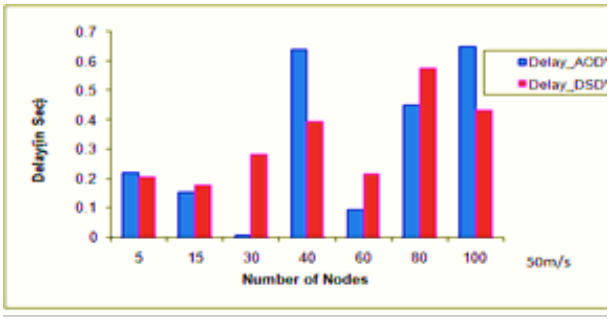

Fig. 3: Delay at 50*m/s* .

In this above Fig. at 50*m/s* we say that AODV may bebetter in the long run.

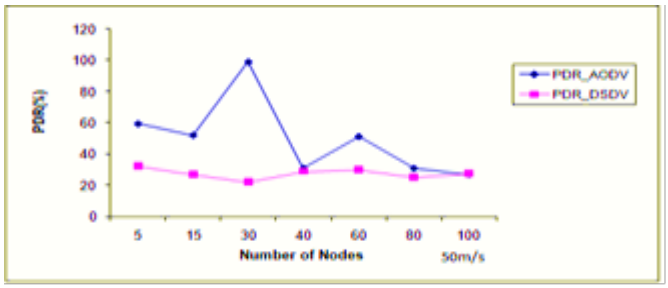

Fig. 4: Packet Delivery Ratio (PDR) at 25*m/s*

In this above Fig. at 25*m/s* we say that AODV is betterthan DSDV

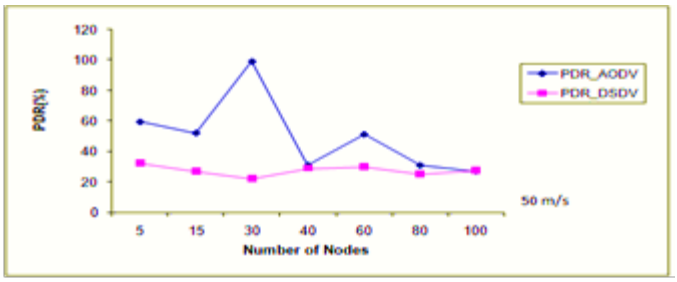

Fig. 12: Packet Delivery Ratio (PDR) at 50*m/s* .

In this above Fig. at 50*m/s* we say that AODV isbetter than DSDV , but when the number of nodes isincreased we see that AODV shows linear increase whileDSDV shows constant rate.

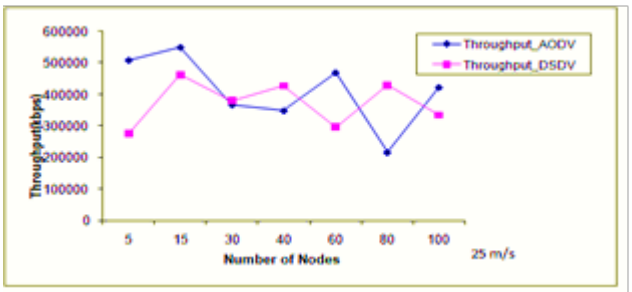

Fig. 5: Throughput at 25*m/s* .

In this above Fig. at 25*m/s* we say that AODV is showsgood result and in the long run its shows constantthroughput.

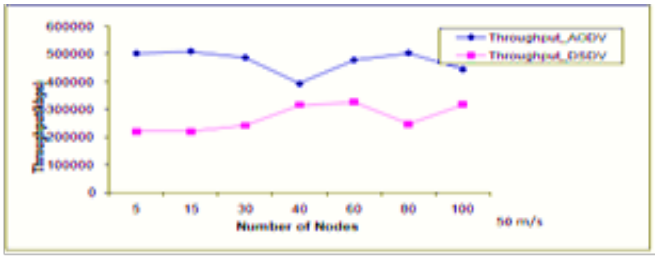

Fig. 6: Throughput at 50*m/s* .

In this above Fig. at 50*m/s* we say that AODV is betteras compared to DSDV.

9. CONCLUSION

AODV shows the best performance with its ability tomaintain connection by periodic exchange of informationrequired for TCP network.AODV performs best in case of packet delivery ratio andDSDV outperform others in case of throughput. Varyingpause time, DSDV outperform others in case of packetloss and throughput, but overall AODV outperformsDSDV and DSR as in high mobility environment topologychange rapidly and AODV can adapt to the changes,but with taking everything into account DSDV is

betterthan others. At higher node mobility, AODV is worst incase of packet loss and throughput but performs best forpacket delivery ratio. DSDV performs better than AODVfor higher node mobility, in case of end-to-end andthroughput but DSR performs best in case of packet loss.

Hence, for real time traffic DSDV is preferred over DSRand AODV. Finally, from the above research workperformance of AODV is considered best for Real-time andTCP network.

REFERENCES

[1] Ramesh, V., Subbaiah, P., Rao, N.K. And Raju, M.J. (2010)`Performance comparison and analysis of DSDV and AODV for MANET',International Journal on Computer Science and Engineering, 02, 183-188.
[2] Hong, X., Xu, K. and Gerla, M. (2002) `Scalable routing protocolsfor mobile ad-hoc networks'.
[3] Royer, E.M. And Toh, CK. (2003) `A review of current routingprotocols for ad-hoc mobile wireless networks', Technical report, Universityof California and Georgia Institute of Technology.
[4] David Oliver Jörg, “Performance Comparison Of MANET Routing Protocols in Different Network Sizes”,University of Berne, Switzerland, 2003.
[5] S. Corson and J. Macker, “Mobile Ad hoc Networking(MANET): Routing Protocol Performance Issues andEvaluation Considerations”, University of Maryland,January 1999.
[6] Shikhar Kr. Sarma, SumitaDhar Choudhury, FakharUddin Ahmed, & Abdul Hannan, “Efficiency Analysis ofRouting Protocols for Mobile Ad Hoc Networks forHeterogeneity”, International Journal of ComputerNetworks, Volume 2, Issue 1.
[7] Marc Greis, “Tutorial for the network simulator NS”, http://www.scribd.com/doc/13072517/Tutorial-Ns-Full-by-MARC-GREIS
[8] Tanenbaum, S.A. (2002) `Computer Networks' PRENTICE HALL.