

Performance Analysis for Routing Protocols in MANETS by using NS2(Network Simulator)

B.Nageswara Rao¹,B.N.S.Ramya Sri², K.Sumanjali³, Ch.Sai⁴,A.S.R.Raju⁵

¹Assistant professor, ^{2,3,4,5} Student,
Department of CSE, LENDI Institute of Engineering and Technology,
Vizianagaram, India

Abstract—A Mobile Ad-Hoc Network [MANETs] is a collection of wireless mobile nodes forming a temporary network without using any centralized access point, infrastructure, or centralized administration. In a MANET network topology can dynamically change in an erratic manner since nodes are free to move. In this paper, we analyse Ad-hoc On-Demand Distance Vector (AODV) and Dynamic Source Routing (DSR) Reactive Routing Protocols in mobile ad hoc networks to determine the best equipped circumstances for each protocol. The simulation results of two routing protocols are analyzed by using Network Simulator(ns-2) by considering the performance metrics such as End-to End delay, Packet delivery ratio,Throughput.

Keywords—MANETS, AODV, DSR, NS-2

I.INTRODUCTION:

A Mobile adhoc network (MANET)[1],sometimes called a mobile mesh network,is a self-configuring network of mobile devices connected by wireless links.In otherwords,a MANET is a collection of communication nodes that wish to communicate with each other.Adhoc networks require no centralized Administration or fixed network infrastructure such as base stations or access points and can be quickly and inexpensively setup as needed. A MANET is an autonomous group of mobile users that communicate over reasonably slow wireless links.The network topology vary rapidly and unpredictably over time because the nodes are mobile .Manet is kind of wireless adhoc network and it is a self-configuring network of mobile routers connected by wireless links the union of which forms an arbitrary topology .The earlier manets are called “Packet radio networks” and were sponsored by DARPA in the earlier 1970’s.

II. MANETS APPLICATIONS:

1.Military Battlefield: Military equipment now routinely contains some sort of computer equipment[2]. Ad- hoc networking would allow the military to take advantage of common place network technology to maintain an information network between the soldiers, vehicles, and military information headquarters. The basic techniques of ad hoc network came from this field.

2.Commercial Sector: Ad hoc can be used in emergency/rescue operations for disaster relief efforts, e.g. in fire, flood, or earthquake. Emergency rescue operations must take place where non-existing or damaged communications infrastructure and rapid deployment of a communication network is needed. Information is relayed

from one rescue team member to another over a small hand held [2]. Other commercial scenarios include e.g. ship-to-ship ad hoc mobile communication, law enforcement, etc.

3.Local Level: Ad hoc networks can autonomously link an instant and temporary multimedia network using notebook computers or palmtop computers to spread and share information among participants at e.g. conference or classroom [2]. Another appropriate local level application might be in home networks

III. CLASSIFICATION OF ROUTING PROTOCOLS

Routing is the process of information exchange from one host to other host in the network.Routing is the mechanism of forwading packets to the destination using efficient path is measure by various metrices like no.of hops,traffic,security,...etc[3].In ADHOC network each host node acts as a specialized route itself. It is act of moving information from source to destination in and inter network. Atleast one intermediate node within the inter network is encountered during the transfer of information.

1.PROACTIVE ROUTING PROTOCOLS:

Proactive protocols perform routing operations between all source destination pairs periodically, irrespective of the need of such routes. These protocols attempt to maintain shortest path routes by using periodically updated views of the network topology[4]. These are typically maintained in routing tables in each node and updated with the acquisition of new information. Proactive protocols have the advantage of providing lower latency in data delivery and the possibility of supporting applications that have quality-of-service constraints. Their main disadvantage is due to the wastage of bandwidth in sending update packets periodically even when they are not necessary, such as when there are no link breakages or when only a few routes are needed Examples of Proactive MANET Protocols include: Optimized Link State Routing (OLSR), Fish-eye State Routing (FSR), Destination-Sequenced Distance Vector (DSDV) etc.

2.REACTIVE ROUTING PROTOCOLS:

Reactive protocols are designed to minimize routing overhead. Instead of tracking the changes in the network topology to continuously maintain shortest path routes to all destinations, these protocols determine routes only when necessary[4]. Typically, these protocols perform a route discovery operation between the source and the desired destination when the source needs to send a data packet and the route to the destination is not known. As long as a route is live, reactive routing protocols only perform route

maintenance operations and resort to a new route discovery only when the existing one breaks.

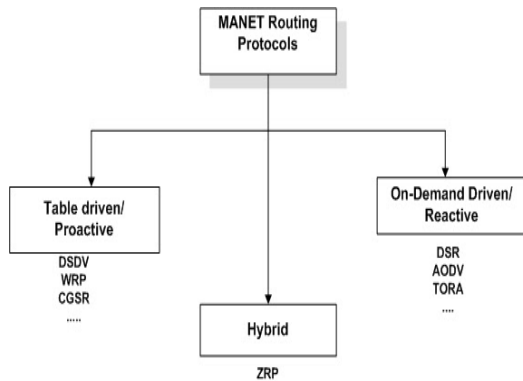


Figure1:classification of Routing Protocols in MANETS

IV. AODV ROUTING PROTOCOL:

The main aim of AODV routing algorithm is to provide reliable and secure data transmission over the MANETS.

The AODV[5] Routing Protocol uses an on demand approach for finding routes ,that is a route is established only when it is required by a source node for transmitting data packets.It employs destination sequence numbers to identify the most recent path the major difference AODV and DSR trunk out from the fact that DSR uses source routing in which a data packet carries the complete path to be traversed. In AODV the source node and the intermediate nodes store the next-hop information analogous to each flow for data packet transmission. In reactive routing protocol ,the source node floods the Route Request(RREQ) packet in the network when a route is not available for the preferred destination. AODV and other on-demand routing protocols is that it uses a destination sequence number to determine an up-to-date path to the destination.

A Route Request carries the source identifier,destination identifier, source sequence number, destination sequence number, broadcast identifier, and time to live field.Destination sequence number indicates indicates the freshness of the route that is accepted by the source.when an intermediate node receives a RouteRequest,it forwards a route reply if it has a valid route to the destination.The validity of a route at the intermediate node is determined by comparing the sequence number at the intermediate node is determined by comparing the sequence number at the intermediate node with the destination sequence number in the Route Request packet.

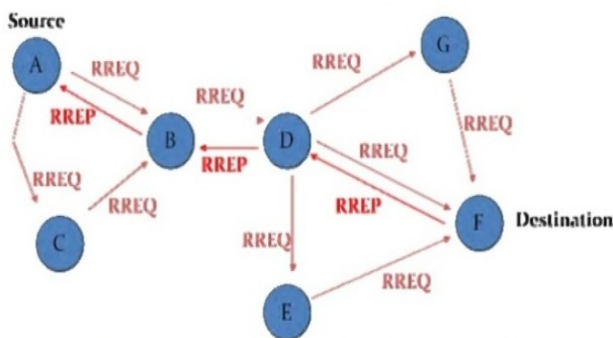


Figure2:AODV Path Discovery Process

V.DYNAMIC SOURCE ROUTING PROTOCOL:

Dynamic source routing protocol (DSR) [6] is simple and robust routing protocol designed specially for use in multi hop wireless adhoc networks.Dynamic source routing(DSR) is based on source routing,which means that the source must specify the path of orderd nodes through which the packet must pass on its way to reach the destination.DSR protocol consists of two basic mechanisms:Route Discovery and Route Maintainance.

1)ROUTE DISCOVERY:

Route discovery is used only when the source attempts to send a packet to the destination node and when it does not the route to destination node.To initiate Route Discovery the source transmitts route request with unique ID as a single local broadcast packet.When some intermediate node receives the route request, it first checks whether it had seen route request earlier or not.If the node had already seen the request it will discard the packet.Otherwise it will check the route cache whether there is a route to the packet.If it has a route to target node in the cache it will return Route Reply to originator of the packet.

2)ROUTE MAINTAINANCE:

DSR implements route maintainance when the packets are communicating from source to destination.But when a communication link between the source and destination is broken or change in the topology leads to failure of communication between the source and destination.In such scenario DSR protocol uses route mechanism to detect any other possible route to transmitt the data to the desired target.If the route maintainance mechanism fails to find the alternative route to establish communication,then it will invoke route discovery to find new route to the destination.

Protocol property	DSR	AODV
Loop free	Yes	Yes
Multicast routes	Yes	No
Distributed	Yes	Yes
Unidirectional link support	Yes	No
Multicast	No	Yes
Periodic broadcast	No	Yes
QoS support	No	No
Routes maintained in	Route Cache	Route Table
Route cache/table timer	No	Yes
Reactive	Yes	Yes

VI. PERFORMANCE METRICS

Packet delivery ratio:

The ratio of the data packets delivered to the destinations to those generated by the continuous bit rate sources.packets delivered and packets lost are taking in to consideration.

$$PDR = \frac{\text{No.Of received packets}}{\text{No. Average Of sent packets}}$$

End-to-end delay:

The time taken by the packet to reach the destination is called end to end delay so it is the time taken to travel between two ends i.e. source and destination.

$$AED = \frac{\sum (\text{Received time} - \text{sent time})}{\text{Total data packets received}}$$

Throughput:

One of the representation of throughput is the amount of data transferred over the period of time expressed in kilobits per second(kbps).

$$\text{Throughput} = \frac{\text{Total Received Bytes}}{\text{Elapsed Time}}$$

VII. SIMULATION ENVIRONMENT

Network Simulator:

According to dictionary, Simulation can be defined as —reproduction of essential features of something as an aid to study or training. In simulation, we can construct a mathematical model to reproduce the features of a phenomenon, system, or process often using a computer in order to information or solve problems. Nowadays, there are many network simulators that can simulate the MANET. In this section we will introduce the most commonly used simulators. We will compare their advantages and disadvantages and choose one to as platform to implement reactive/proactive protocol and conduct simulations in this project.

The parameters were different routing protocols like as AODV and DSR are chosen for simulation using the performance metrics such as Packet Delivery Ratio,End-to-end Delay and Throughput in different scenarios i.e., for 50,100,125 and 150 nodes

Table 1: simulation parameters

Parameter	value
Simulation	Ns-2.35
MAC Type	802.11
Protocols	AODV,DSR
No Of Nodes	50,100,125,150
Antenna Model	Omni Antenna
Simulation Time	150s
Channel Type	Wireless Channel
Simulation Area	1600m*2550m
Traffic Type	TCP

VIII. RESULTS AND DISCUSSIONS:

As already outlined we have taken On-demand (Reactive) routing protocols, namely Adhoc OnDemand Distance vector(AODV) and Dynamic source Routing(DSR).Packet delivery ratio, end to end delay and throughput are calculated for AODV and DSR. The results are analyzed below with their corresponding graphs.

Table 2: Acquired results of AODV and DSR

Protocol	Metrics	50 Nodes	100 Nodes	125 Nodes	150 Nodes
AODV	Packet Delivery Ratio	97.70 %	98.20 %	97.66 %	98.36 %
	End-to-End delay	143.847	163.512	158.357	140.127
	Throughput	22015.1	20068.6	19970.4	21111.1
DSR	Packet Delivery Ratio	85.56 %	85.29 %	87.17 %	86.06 %
	End-to-End delay	124.421	130.281	121.246	95.5009
	Throughput	653.10	681.19	664.93	699.36

The above outcomes are viewed by considering 50,100,125 and 150 nodes and their related Xgraphs are generated below.

Packet delivery ratio:



Figure3: Comparison of Packet Delivery Ratio in AODV and DSR

End to End delay:



Figure 4: Comparison of End To End Delay in AODV and DSR

Throughput:

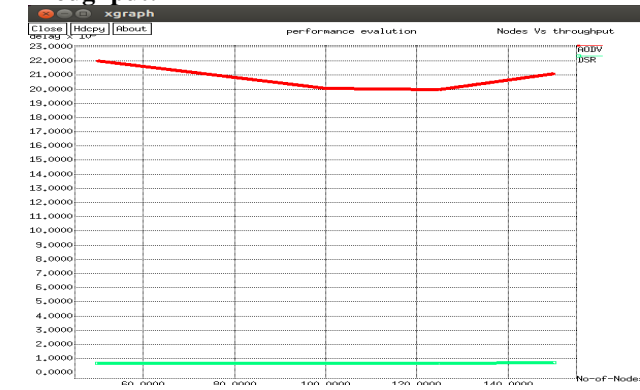


Figure 5: Comparison of Throughput in AODV and DSR

As per our simulation results we observed AODV routing protocol produces the effective results for maximum number of nodes. For, throughput the protocol which produces the best is AODV.

CONCLUSION

We have compared two reactive routing protocols AODV and DSR.Using NS-2 simulator, the simulation of these protocols has been carried out.

Parameters are performed to calculate the performance of these routing protocols. So, we can conclude that if the MANET has to be association for a minute quantity of moment then AODV should be desire due to low initial packet loss and DSR should not be prefer to bond a MANET for a minute quantity of moment because initially there is packet loss is very high.

The two protocols Ad hoc On-Demand Distance Vector Routing (AODV) and Dynamic Source Routing (DSR) Protocols have been compared using simulations. it would be fascinating to note the behaviour of these protocols on a real life test cradle. Network parameters such as packet delivery ratio, End-to-End delay and throughput are taken into the consideration we analyse that Throughput and Packet Delivery ratio is high in AODV Protocol and low in DSR Protocol where as coming to End-to-End delay is low in AODV protocol and high in DSR protocol.

REFERENCES

- [1]. Fenglien Lee, Routing in Mobile Ad Hoc Networks, University of Guam, Guam 96923, USA.
- [2] V. ANJI REDDY, M. MERCY MONICA, S. BHARGAV, Performance Evaluation For Routing Protocols In Mobile Adhoc Networks (MANETs) By Using Network Simulator 2 (NS Version 2), India. International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue 3, March-2013
- [3] <http://cs.lamar.edu/faculty/disrael/COSC5100/Seminar.pdf>
- [4] Manveen Singh Chadha, Rambir Joon, Sandeep, Simulation and Comparison of AODV, DSR and AOMDV Routing Protocols in MANETs International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-2, Issue-3, July 2012
- [5] http://en.wikipedia.org/wiki/Ad_hoc_OnDemand_Distance_Vector_Routing
- [6] Rajendra V. Boppana, Anket Mathur, Analysis of the Dynamic Source Routing Protocol for Ad Hoc Networks. CS Department, UT San Antonio, San Antonio, TX 78249. USA