Performance Evaluation of DSR Protocol in MANET Using OPNET

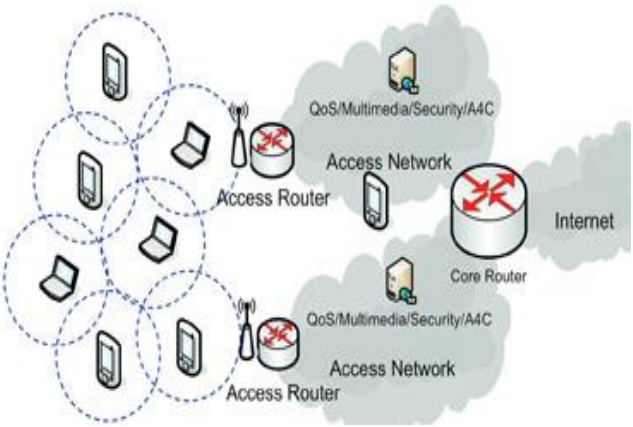
Sahil Sharma [#1], Rupinder Kaur Gurm [#2]
[#]*CSE Dept, RIMT Mandi Gobindgarh*
[1]sssahil529@gmail.com
[2]rupindergurm@gmail.com

ABSTRACT
MANET is the ad-hoc network that is a collection of mobile nodes in which it is needed that each node performs together. A node is called cooperative when it sends the data correctly to another node in a wireless network. In the mobille adhoc networks,the main role is played by the routting protocols in sequence to route the data from one mobile node to the other mobile node.But due to openness character of ad-hoc network, it is risk to face various kinds of attacks like black hole node attack etc .The ordinary used routing protocols in MANET are proactive, reactive and hybrid types but the reactive routing method is very trending method for the wireless network that supplies a scalable solution for network topologies used at a large scale. The routing protocols of MANET are not safe and hence resulted into the network in producing the malcious mobile nodes.There are different types of routing protocol avilable which have been recently focused to perform the secure routing in the networks. In this paper, For the identification of malicious nodes,DYNAMIC SOURCE ROUTING PROTOCOL(DSR) has been proposed to create a safe route between source and destination with the searching single and the cooprative black hole attack by enhencing the dsr routing protocol and we will also modifying the default value of the parimeters in an arrangement to improve the quality ofprotocol and prepare a enhenced DSR.

Keywords: MANET, DSR, OPNET.

I. INTRODUCTION

Mobile Ad-Hoc Networks are the decentralized wireless systems. MANETs contain of mobile nodes that are free to move in and out in the network. Nodes are the systems or devices i.e. mobile phone, laptop, personal MP3 player and personal computer that are involved in the network .Nodes in a manet can take action as either a host/router or both at the same time. They can form unpredictable topologies based on their connectivity with each other in the network. Mobile Ad-Hoc network is defined as an independent or self ruling system, such that there are no limit conditions and nodes can join or leave a network freely. Mobile Ad-Hoc network topology is dynamic that can change very quickly because the nodes move freely and can set themselves randomly. This property of the nodes makes the mobile Ad-Hoc networks unsure or arbitrary from the point of view of scalability and topology.MANETS have differents characterstics like it has limited bandwidth limited security,energy constrained operations etc.and are used in day-to-day life like in entertainment and various medical services, emergencies, commercial and civilian environment etc.MANET has few security issues in the network because of its characterstics like lack of centralizing monitoring,dynamically changing network topology , open medium , cooperative algorithm etc and due to these security issues ,the network has to to go through the various types of attacks like black hole,grey hole attacks etc in which the malcious nodes generated and stop the data to transfer forward which is tranmitted from its source to the destination nodes in the network.



EXAMPLE OF MANET

II. ROUTING IN MANET:-

Routing in MANET include to establish a route from source to destination in sequence to send or receive the data packets. But due to the mobility of nodes the path established may not exist in the network for a long.

Routing protocols in MANET:- The routing protocols in the MANET is categorized into -

- Proactive routing protocol
- Reactive routing protocols
- Hybrid routing protocol

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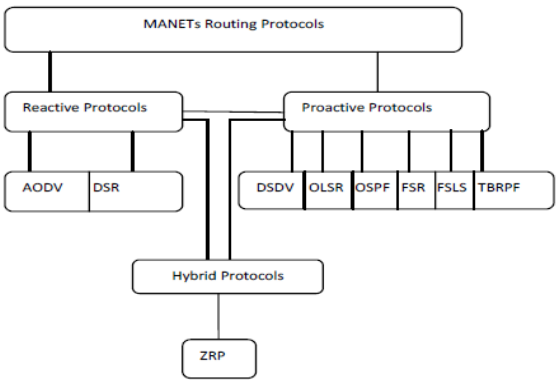


Fig 1: Classification of Routing Protocols

Proactive routing protocol

In proactive routing every node continuously maintains complete routing data of the network. Proactive routing protocols is achieved by Filled up the network periodically with network status information to search for any possible change in network topology. It is maintained by the nodes to use to store the packet. It is table-driven which contain routing entries. These routing protocols constantly maintaining the updated topology of the network. Every node in the network knows about the other node in advance , in other words the whole network is known to all the nodes making that network. All the routing information is kept in the tables ,whenever there is a change in the network topology ,these tables are updated according to the change. The nodes can exchange topology data ,with each other ,they can have route information any time when they needed.
Examples of Proactive Routing Protocols are:
a) Global State Routing (GSR).
b) Hierarchical State Routing (HSR).
c) Destination Sequenced Distance Vector Routing (DSDV).

Reactive routing protocol

Reactive protocols also known as on demand driven reactive protocols. The fact they are known as reactive protocols is ,they do not initiate route discovery by themselves ,until they are requested. when a source node request to find a route then these protocols setup routes when demanded. Every node in this routing protocol maintains information of only active paths to the destination nodes. A route search is required for each new destination therefore the communication overhead is minimized at the expense of delay to search the route. Quickly changing wireless network topology may break active route and cause subsequent route search .when a node wants to communicate with another, reactive routing protocols will establish a route for the source to destination node. Normally reactive protocols don't find the destination "on demand", it uses flooding technique to solve the query. these do not consume bandwidth for sending the data, they only consumed the bandwidth only when the node start transmitting the data to the destination node.
Examples of reactive protocols are:
. a) Ad hoc On-demand Distance Vector Routing (AODV).
b) Dynamic Source Routing (DSR).
c) Location Aided Routing (LAR).
d) Temporally Ordered Routing Algorithm (TORA).

Hybrid routing protocols in MANET

Hybrid protocols utilized the strength of both proactive as well as reactive protocols ,and combine them together to get better results. the network is divided into two zones, and used different protocols in two different zones i.e. one protocol is used within the zone, and the other protocol is used between them.
Examples of hybrid protocols are:
Zone based routing protocol(ZRP)

WORKING OF DSR

Dynamic Source Routing protocol called DSR. It is a reactive protocol. DSR is used to update its route caches by searching new routes. It updates its cache with new route discovered or when there does exist a direct route between source and destination node. When a node wants to convey the data, it defines a route for the transmission and then starts transmitting data through the defined route.
DSR are of two types:-

Route Discovery Process: When a source node wants to start information transmission with the another node in the network, it checks its routing cache. When there is no route available to the destination in its cache or a route is expired, it sends RREQ. When the destination is located or any intermediate node that has fresh enough route to the destination node, RREP is generated. When the source node receives the RREP it updates its caches and the traffic is routed through the route.

To initiate the *Route Discovery* :- The source A transmits a ROUTE REQUEST (RREQ) message as a single local broadcast packet, which is received by all nodes B,C,AND D available within wireless transmission range of **source.** Each RREQ message finds the initiator and target of the Route Discovery, and also consist of a *unique request id,* determined by the initiator of the REQUEST. Each RREQ also consist a record listing of the address of each intermediate node through which this particular copy of the RREQ message has been forwarded. This route record is initialized to an empty list by the initiator of the Route Discovery.

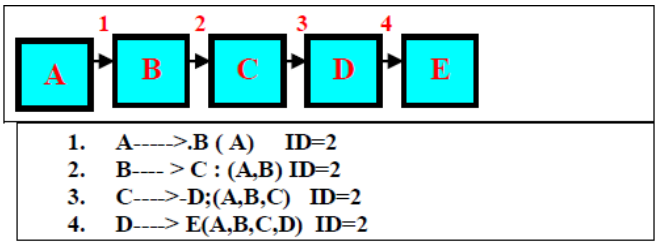
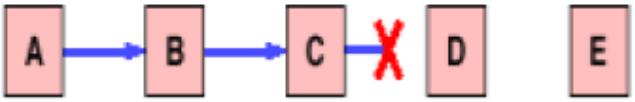


Figure.1. Route Discovery Process

data started, it is the responsibility of the node that is transmitting data to confirm the next hop received the data along with source route. The node generates a route error message, if it does not receive any confirmation to the originator node. The originator node again performs new route discovery process.

Route maintenance process:-A node forwarding or otherwise overhearing any packet may add the routing information from that packet to its own Route Cache. In particular, the source route used in a data packet, the
accumulated route record in a ROUTE REQUEST, or the route being returned in a ROUTE REPLY may all be cached by any node.



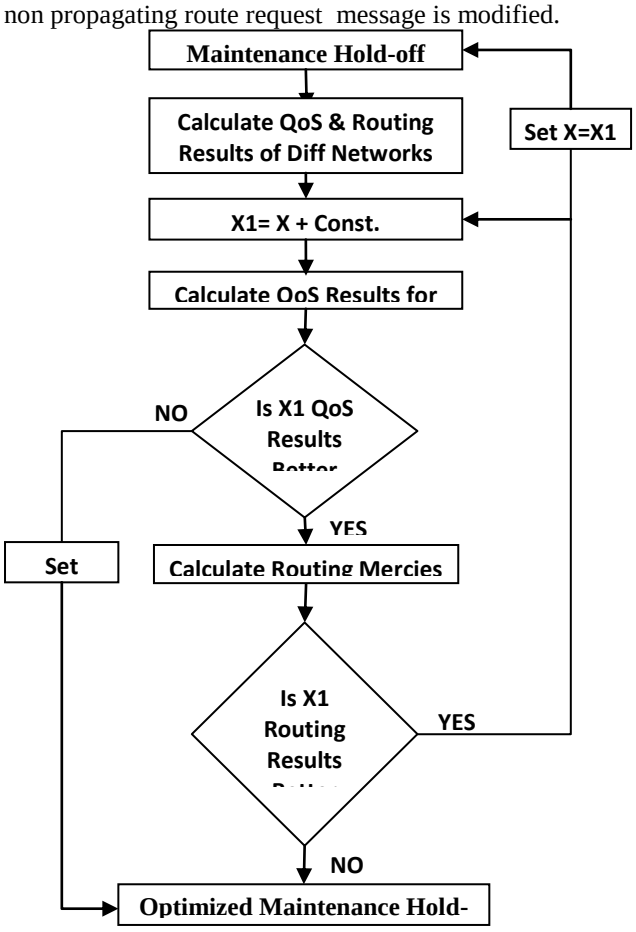
Route maintenance process

IV PROPOSED METHODOLOGY

Here, we present different adaptable parameters to optimize DSR routing algorithm. The parameters we target to optimize DSR routing algorithm are the route maintenance hold off time, route expiry time, route export and non propagating route request. Route maintenance hold off time helps in monitoring of the correct operation of a route in use in the network. When it detects a problem with a route in use, route discovery may be used again to discover a new, correct route to the destination. Route expiry time plays a critical role in determining the performance of the routing protocol. Inefficient choice of route expiry time results in stale routes or early expired routes which degrade the overall performance of the protocol. The route expiry time should be chosen in such a way that it reduces the control overhead caused by the route discovery process.. and to end delay packet delivery ratio . For each parameter, we present a discussion on how the parameter affects energy consumption through routing QoS and present an adaptation policy to reduce energy consumption by finding the appropriate value of these parameters considering the current channel conditions.

A) PROPOSED ALGORITHM

The proposed algorithm shows the effect of different parameters on energy consumption through routing QoS. And also helps us to find the appropriate value of the parameters. First we take an example of maintenance route hold off time interval i.e. The lifetime of a routing table entry if a route is not used and refreshed within this "maintenance route hold off" period, DSR marks the route as "valid" and adds it to the IP Common Table. The constant value is used to modify the values of the parameters. First of all Set maintenance route hold off time as any value X and calculate the results of Quality of service and routing results for that value X. After taking the previous value suppose the constant value is added in this value then the value becomes XI. Then again the simulation takes place in different scenarios and calculates the result of QoS for XI if the result becomes better than X then calculates results for routing parameters, and if the result is not better than previous one then the value remain X. Then again simulation takes place for routing parameters if this result become better than X then the value of X become XI. If the result will not better than the previous one then the value of X will change. Similarly the value of route expiry, route export non propagating route request message is modified.



Algorithm to modify DSR

SIMULATION SETUP

Using OPNET 14.5 simulator, we have designed and investigate Ad-hoc wireless network scenarios with different network size of [100*100 m^2, 200*200 m^2, 400*400 m^2, 600*600 m^2]having with different number of [20, 40, 60, 80] nodes respectively. Mobility model used is random waypoint model with mobility of 400 meters, the performance of the reactive ad-hoc routing DSR and EDSR protocol is evaluated by implementing different scenarios. The buffer size of data is set to 256Kbps for each mobile workstation at data rate of 54Mbps with 802.11b PHY layer & DCF MAC Protocol implementation. The traffic flows randomly between different Voice applications workstations placed at different distances. We take the different network size according to the number of node as on increasing the number of nodes in a MANET; there will obvious increase power consumption. So by changing the value of maintenance route hand off time, route export and non propagating route request, route expiry time, we make a scenario (EDSR) and compare with the standard scenario (DSR). The simulation parameter of both scenarios is given in table 2 and table 3. The WLAN parameter is common to all mobility scenarios as Table 1.

TABLE1: SIMULATION PARAMETERS

Routing Protocol	DSR
Wireless LAN MAC Address	Auto Assigned
Physical Characteristics	IEEE 802.11g (OFDM)
Data Rates(bps)	54 Mbps
Network Traffic	Heavy FTP Load
Network Size	20,40,60,80
Net protocol used	DCS
Mobility Speed	(1.5-3)m/s
Buffer Size(bits)	256000

TABLE2: SIMULATION PARAMETERS-DSR

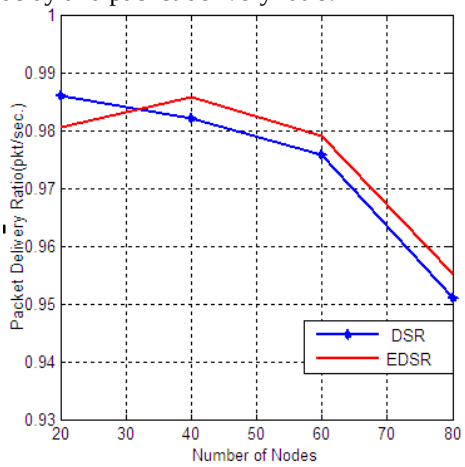
Maintenance route hand off time interval	1.0
Route expiry time	300
Route export	disable
Non propagating route request	0.3

TABLE3: SIMULATION PARAMETERS-EDSR

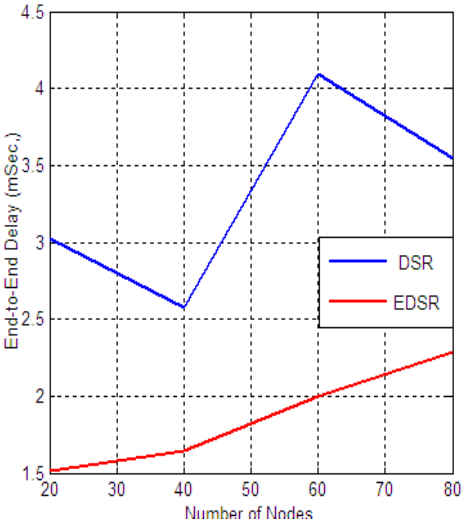
Maintenance route hand off time interval	2.0
Route expiry time	500
Route export	enable
Non propagating route request	enable

V RESULT AND ANALYSIS

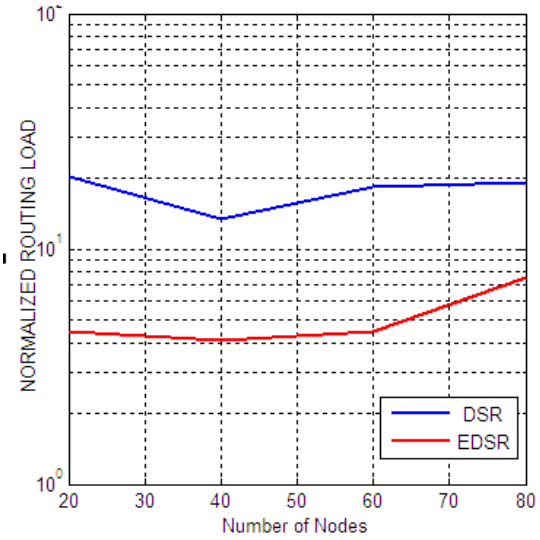
To evaluate the various performances of DSR and EDSR in different scenarios we have determined the various QOS and routing parameter such as normalize routing load, End to end delay and packet delivery ratio.



Packet Delivery Ratio



End To End Delay



Normalized Routing Load

VI CONCLUSION

The simulation model of MANET network is developed using OPNET 14.5 simulator and analyzed for DSR routing protocol. We applied some methodology to improve the performance of DSR protocol by modifying the values of perimeters like maintenance route hold of time, non propagating route request, route expiry time and route export and make EDSR. We applied this modified EDSR to different numbers of nodes like 20, 40, 60, and 80 and concluded that this is effective in all the cases. It is concluded that EDSR has better Quality of service and Routing results than DSR protocol. In future work we will apply this algorithm to other routing protocols.

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