Volume 3, Issue 7, July 2013 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Performance Analysis & Implementation of Enhanced DSR Routing Protocol of MANET using Selfish Behavior

Rooshabh.H.Kothari
M.Tech CSE
Arya Institute of Engineering & Technology
Jaipur, India

Deepak Dembla
Associate Professor CSE
Arya Institute of Engineering & Technology
Jaipur, India

Abstract— A MANET is referred as an infrastructure less network because the mobile nodes in the network dynamically locate paths among themselves to transfer packets provisionally. Security is core concern in routing protocol of MANET and affects the performance. Here, a innovative request forwarding mechanism is proposed in which source node generates route request packet and broadcast packet to other neighbor nodes to locate destination by implementing black hole attack. Enhanced DSR Routing is proposed & implemented by using selfish nodes in network, and it is found from results that enhanced DSR routing protocol is better than existing DSR protocol on performance measures such as throughput, routing overhead, end to end delay and packet delivery ratio. As mobility increases, there is significant decrease in communication overhead that is almost about 60% than DSR protocol which is one of the main beneficial point of our proposed protocol and also as speed increases end to end delay is also decreases almost 45% than DSR, It has been found that on dense network certain numbers of selfish nodes are supportive to reducing communication overhead.

Keywords— DSR, ES-DSR (Enhanced Selfish DSR), Secured Routing, Selfish nodes, Ad hoc network, security, selfish behavior, malicious nodes.

I. INTRODUCTION

A collection of wireless nodes communicating in a confined wireless environment in the absence of any centralized organization and any fixed infrastructure, is known as a mobile ad hoc network (MANET).It means that the technology cannot work efficiently in that places where there is no permanent infrastructure. Easy and fast deployment of wireless networks will be expected by the future generation wireless systems. This fast network deployment is not possible with the existing structure of present wireless systems. A collection of wireless nodes communicating in a confined wireless environment in the absence of any centralized organization and any fixed infrastructure, is known as a mobile ad hoc network (MANET).It means that the technology cannot work efficiently in that places where there is no permanent infrastructure. Easy and fast deployment of wireless networks will be expected by the future generation wireless systems. This fast network deployment is not possible with the existing structure of present wireless systems. Due to Dynamic nature of MANETs requires execution of proper routing protocols, which should be malleable to frequent changes in network topology and the nodes should be able to exchange information regarding topology changes to establish routes. These types of such frequent changes very often bring about the security issues in ad hoc networks [1] [2]. Routing protocols are fundamental for a MANET in order to discover network topology and build routes, MANET routing protocols in spite of frequent topology changes caused by nodes' mobility, they are intended to dynamically maintain routes between any pair of communicating nodes. The main dilemma of all the current ad hoc routing protocols is that they trust all nodes and believe that they behave properly; therefore they are in danger to attacks launched by misbehaving of selfish nodes [7]. According to nodes misbehave because they are malfunctioning, or selfish. Malfunctioning nodes are simply suffering from hardware failure or software errors. Selfish nodes can agree to forward packets on behalf of other nodes but silently drop the packets in attempt to save their resources.

II. RELATED WORK

Routing is the act of moving information from a source to a destination in an internetwork. At least one intermediate node within the internetwork is encountered during the transfer of information. Basically two activities are involved in this concept: determining optimal routing paths and transferring the packets through an internetwork. The transferring of packets through an internetwork is called as packet switching which is straight forward, and the path determination could be very complex. Routing protocols use several metrics as a standard measurement to calculate the best path for routing the packets to its destination that could be number of hops, which are used by the routing algorithm to determine the optimal path for the packet to its destination. The process of path determination is that, routing algorithms find out and maintain routing tables, which contain the total route information for the packet. The information of route varies from one routing algorithm to another. The routing table's are filled with entries in the routing table are ip-address prefix and the next hop.

G. Lavanya and A. Ebenezer Jeyakumar [7] proved that DSR has increased traffic overhead by containing complete routing information into each data packet, which degrades routing performance. *Shailendar Gupta, C.K.Nagpal and Charu* proposed that as no. of selfish nodes increases quality of service becomes poorer and poorer and also throughput comes down to nearly 50 % as its peek and also percentage of packet drop gets nearly 60%. *Hemang Kothari et al* [8] anlyzed that in dense adhoc network, where route breakages are frequent, routing control packets consume significant node energy, so by implementing selfish behavious of nodes by certain amount reduce overall routing overhead, which is helpful to other performance metrics to show the results positively. *Rajendra Nath et al* [9] proposed a protocol for verifying the effect of routing attack on network performance and anlyzed that when no countermeasures are taken, the defined nodes behave malciously which degrades performance of network.

DSR [6] is an on-demand routing protocol which is based on source route approach. The Dynamic Source Routing (DSR) is a reactive unicast routing protocol that utilizes source routing algorithm. In source routing algorithm, each data packet contains complete routing information to reach its dissemination. Additionally, in DSR each node uses caching technology to maintain route information that it has learnt. In this approach, each packet carry in its header the source route which contains the complete, ordered list of nodes through which the packet must pass.

The DSR [10][12] protocol consists of two mechanisms: Route Discovery and Route Maintenance. Route Discovery is the mechanism by which a node **S** wishing to send a packet to a destination **D** obtains a source route to **D**. To perform a Route Discovery, the source node **S** broadcasts a ROUTE REQUEST (RREQ) packet that is flooded through the network in a controlled manner and is answered by a ROUTE REPLY (RREP) packet from either the destination node or another node that knows a route to the destination. To reduce the cost of Route Discovery, each node maintains a cache of source routes it has learned or overheard. Route Maintenance is the mechanism by which a packet's sender **S** detects if the network topology has changed. When Route Maintenance indicates a source route is broken, **S** is notified with a ROUTE ERROR (RERR) packet. The sender **S** can then attempt to use any other route to **D** already in its cache or can invoke Route Discovery again to find a new route.

III. PROBLEM STATEMENT

MANET characteristic acquire many security challenges. There are certain attack from literature and found that selfish nodes have harmful effect on network. Selfish nodes are also working according to their naming characteristics which are harmful to network. Density play important role to reduce effects of security attack. Cooperation based network works with cooperation of participate nodes. As number of nodes is increasing cooperation gets better. Basic characteristic of adhoc network suggest cooperation from participating nodes and DSR works with only cooperation, It has been found that DSR protocol works with source routing mechanism in which source node generates route request packet and broadcast packet to other neighbor nodes to find destination which increases routing overhead and collision in network and indirectly affects throughput of network.

IV. PREPARE IMPLEMENTATION METHODOLOGY OF PROPOSED ALGORITHM ES-DSR

DSR and Proposed DSR are tested on NS-2 [11] which is a discrete event simulator targeted at networking research. It provides substantial support for simulation of TCP, routing and multicast protocols over wired and wireless networks. It consists of two simulation tools. The network simulator (ns) contains all commonly used IP protocols. The network animator (nam) is use to visualize. Ns-2 fully simulates a layered network from the physical radio transmission channel to high-level applications. Version 2 is the most recent version of ns (ns-2). The ns-2 simulator has several features that make it suitable for experimental result.Ns-2 is an object-oriented simulator written in C++ and OTcl. The simulator supports a class hierarchy in C++ and a similar class hierarchy within the OTcl interpreter.. The reason to use two different programming languages is that OTcl is suitable for the programs and configurations that demand frequent and fast change while C++ is suitable for the programs that have high demand in speed. Ns-2 is highly extensible. It not only supports most commonly used IP protocols but also allows the users to extend or implement their own protocols. It also provides powerful trace functionalities, which are very important in our project since various information need to be logged for analysis.

Algorithm for Proposed ES-DSR

Step-1 Read Selfish Nodes information from file.
Step-2 Check whether current node is selfish or not
Step-3 If selfish then drop all route request and route reply Packets and also drop data packets
Step-4 else forward route request and route reply as well as Data packets.
Step-5 Based on No. of Selfish nodes participating in Enhanced Selfish DSR Protocol its effect being reflected in throughput, routing overhead, End 2 End Delay and packet delivery ratio.

V. SIMULATION SETUP

The performance is analyzed against parameters such as mobility, no. of nodes. Experiments have been carried out in order to evaluate performance of MANETs under various routing attacks with the effect of density of network.
The objective is to reduce no. of routing request packets [5].DSR and Proposed ES-DSR is simulated in same settings of parameters and scenarios. Experiments are run on 4 different mobility and also on different no. of nodes. The mobility model is Random Waypoint model of 1000 * 1000 metres [5].

Table 5.1 Simulation setup

General Parameter	
Number of Nodes	10,20,30,40,50
Number of traces	10
Topology	Mobile
Mobility model	Dynamic (Random Way Point Model)
Simulation Time	1000 sec
MAC Layer	802.11
Transmission Range	250 meters
Simulation Area	1000 x 1000 meter
Routing Protocol	DSR
Traffic Model Parameter	
Traffic Model	Constant Bit Rate
Packet Size	512 Bytes
Interval	1 Sec

VI. DENSITY BASED PERFORMANCE EVALUATION OF DSR AND PROPOSED ES-DSR

In this section the experimental results is shown for mobility based performance of DSR routing protocol and Proposed ES-DSR.Some of important Performance Parameters are analyzed for DSR and ES-DSR [3] [7]:

(i) Throughput:

Throughput or network throughput is the average rate of successful message delivery over a communication channel. This data may be delivered over a physical or logical link, or pass through a certain network node. The throughput is usually measured in bits per second (bit/s or bps), and sometimes in data packets per second or data packets per time slot.

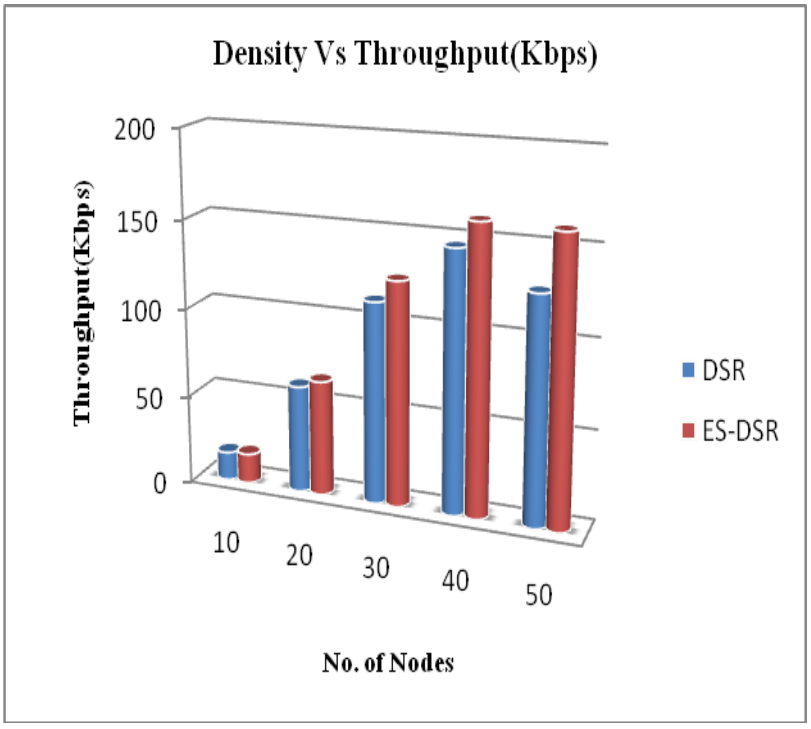


Figure 1: Density Vs Throughput

Performance of DSR and Selfish Behavior in DSR (ES- DSR) is analyzed through various experiments conducted on NS-2. As shown in a Figure 1, as density increasing in DSR throughput tends to get better but as no. of nodes increasing much more chances of breaking of connection is also more so throughput is also decreasing after specific density, whereas in proposed ES-DSR throughput is increasing as no. of selfish is nodes is less but throughput increases marginally as no. of selfish nodes increasing because communication overhead reduces which is beneficial for network and affect marginally on throughput.

(ii) Routing Overhead Nodes often change their location within network. So, some musty routes are generated in the routing table which leads to unnecessary routing overhead.

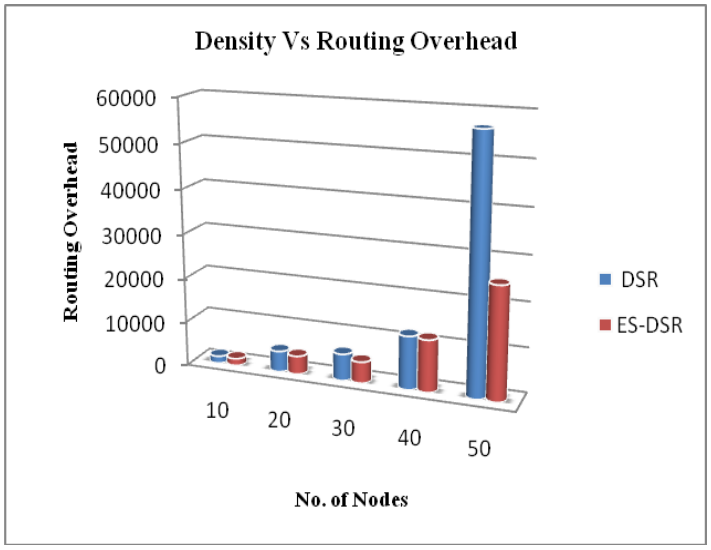
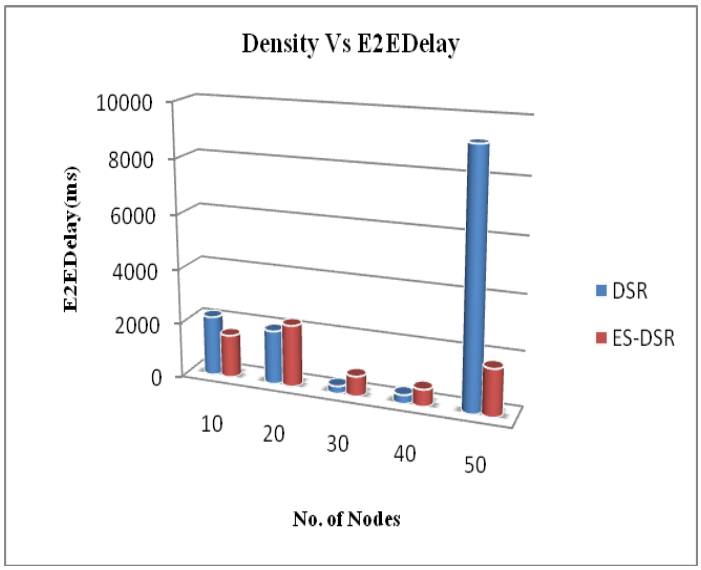


Figure 2: Density Vs Routing Overhead

In this Performance Evaluation of DSR and ES-DSR, On X-Axis, no. of nodes are increased like 10, 20, 30 40 and 50, and on Y-Axis, Routing Overhead is being measured. Routing Packets are having significant influence on network performance. As no. of routing packets increase in a network nodes will waste significant energy, generate more collision, reduces throughput. As shown in figure 2 that as no. of selfish nodes increases in a network more routing packets will drop, which intern reduces collision and routing packets in a network which improves energy saving and throughput. so selfish behavior which is proposed ES-DSR reduces communication overhead almost 50% then DSR which in turn increases throughput.

(iii) Average end-to-end delay of data packets

There are possible delays caused by buffering during route discovery latency, queuing at the interface queue, retransmission delays at the MAC, and propagation and transfer times. Once the time difference between every CBR packet sent and received was recorded, dividing the total time difference over the total number of CBR packets received gave the average end-to-end delay for the received packets. This metric describes the packet delivery time: the lower the end-to-end delay the better the application performance



. Figure 3: Density Vs End to End Delay

Figure 3 shows experimental results of DSR as well as Selfish behavior in DSR (ES- DSR). As density increasing in DSR end 2 end delay decreasing to some extent of increasing no. of nodes but after that delay is increasing because collision increases between no. of nodes and those results in dropping of packets. But as in ES-DSR it is shown that as no. of selfish nodes increasing in network end to end delay is increasing because of route request and route reply packets are dropped. but as selfish activity increases beyond the network can bear end to end delay increases so this is according to over observation that selfish activity can be helpful in network to some extent compared to DSR.

(iv) Packet Delivery Ratio

In this Performance Evaluation of DSR and ES-DSR, On X-Axis, no. of nodes are increased like 10, 20, 30 40 and 50, and on Y-Axis, Packet Delivery Ratio is being measured. Figure 4 show experimental results analysis of DSR as well as Selfish behavior in DSR (Proposed ES- DSR).

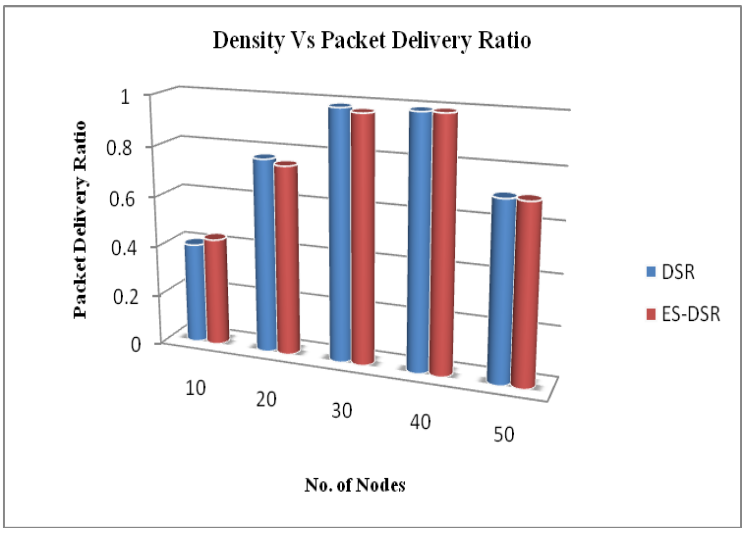


Figure 4: Density Vs Packet Delivery Ratio

As it has been analyzed from graphical results that as no. of nodes increases in DSR the packet delivery ratio is increases due to more no. of establishment of routes and connection between nodes which can also be helpful to increases throughput but after increasing nodes much more in network traffic and routing overhead is increasing which creates collision between nodes thus packet delivery ratio is also decreasing which affects the network.

VII. CONCLUSION

In this paper, the simulation of DSR and proposed ES-DSR protocols has been carried out using NS-2.34 simulator. Simulation has been done for 10, 20, 30, 40 and 50 nodes in ad hoc network. On an average of 15 experimental results are taken to make result more appropriate. It has been analyzed both protocols in terms of throughput, routing overhead and end to end delay and Packet Delivery Ratio. If we include concept of selfish behavior node in DSR protocol then in enhanced version of protocol, the results of simulation show that this has far above the ground effect on DSR protocol. From the simulation results and as shown in graphs that if we include selfish behavior node in DSR protocol then there is significant decrement in routing overhead which reduces connection breakage among nodes which is proved advantageous to tremendous percentage decrement in end to end delay among no. of nodes and so throughput is increasing and packet delivery ratio is showing subsidiary effect than DSR protocol. From this paper it has been proved that the effect of density in network is observed during experiment of selfish behavior on DSR. During this attack selfish node tends to drop route request packets which intern improve network performance, reduces collision and saving resources for whole network. In a way density always reduce the effect of attack because more no. of good nodes will do more work to solve problem.

VIII. FUTURE SCOPE

In this paper it has been proved that security attacks are somewhat beneficial to mobile adhoc network. It has been proved that selfish nodes are also encouraging the different parameters of mobile ad hoc network. In this paper selfish nodes drop route request and route reply packets and isolates them from the active data forwarding and routing and hence saves their battery power. The paper represents the analysis of the selfish behavior over the proposed scheme to analyze its performance. In future we will analyze the protocol over Grey hole and other types of Attacks and will implement it by combining different scenarios and further we will include different other routing protocols.

REFERENCES

[1] Rooshabh Kothari and Deepak Dembla , "Implementation of Black Hole Security Attack using Malicious Node for Enhanced - DSR Routing Protocol of MANET", *International Journal of Computer Application(IJCA),*Vol.64, No.18, pp 1-8, February 2013

[2] Rooshabh Kothari and Deepak Dembla, "Modeling, Implementation and Analysis of Selfish behavior in Enhanced Selfish – DSR Routing Protocol of MANET", *International Journal of Computer Application (IJCA),* Vol.66 No.23, pp. 47-54, March 2013.

[3] Shailender Gupta, C. K. Nagpal and Charu Singla," Impact of Selfish node concentration in MANETs" , *International Journal of Wireless & Mobile Networks (IJWMN)* Vol. 3, No. 2 pp 29-37 , April 2011

[4] Shin Yokoyama, Yoshikazu Nakane, Osamu Takahashi and Eiichi Miyamoto," Evaluation of the Impact of Selfish Nodes in Ad Hoc Networks and Detection and Countermeasure Methods," *Proceedings of the 7th International Conference on Mobile Data Management* (MDM'06) pp 95, IEEE 2006

[5] Mahesh Kumar Yadav, Ram Kishan Khola and Deepak Dembla, " Modeling, Analysis & Implementation of Improved AODV Routing Protocol in MANETs, *International Journal of Computer Applications(0975-8887)* Volume 41-No.21 pp 37-42 ,September-2012

[6] Deepak Dembla, Dr.Yogesh Chaba, "Modeling and Analysis of an intelligent AODV Routing Protocol based on Route Request Retransmission Strategy in MANETs", *International Journal of Computer Applications* (0975-8887) Volume 30-No.11 pp 6-13, September-2011

[7] G.Lavanya, A. Ebenezer Jeyakumar," An Enhanced Secured Dynamic Source Routing Protocol for MANETS", *International Journal of Soft Computing and Engineering* (IJSCE) ISSN: 2231-2307, Volume X, Issue-4 pp 135-140, September 2011

[8] Hemang Kothari and Manish Chaturvedi, "Effect of Selfish behavior on power consumption in mobile Adhoc Network", *Proceedings of the Asia-Pacific Advanced Network* 2011 v. 32, pp . 91-100, APAN-2011

[9] RajenderNath, Pankaj Kumar Sehgal, Atul Kumar Sethi, "Effect of Routing Misbehavior in Mobile Ad Hoc Network" ISBN 978-1-4244-4791-6/10, IEEE 2010.

[10] Abdelaziz Babakhouya, Yacine Challal, Abdelmadjid Bouabdallah," A Simulation Analysis of Routing Misbehaviour in Mobile Ad hoc Networks", "NGMAST/Workshop on Mobile Security, Europe (2008)"

[11] The ns Manual (formerly ns Notes and Documentation) http://www.isi.edu/nsnam/ns/ns-Documentation.

[12] David B, Johnson David A, Maltz Josh Broch, DSR: The Dynamic Source Routing Protocol for Multi-Hop Wireless Ad Hoc Networks, Ad Hoc networking 2001; Vol 5, pp. 139-172, 2001.

