

Research Article

Implementation of MANET Routing Protocols in Hostile Ad-hoc Networks

Richika Singh*, Ashish Xavier Das, Rohini Saxena and A. K. Jaiswal

SHIATS-DU, India

Accepted 10 Aug 2016, Available online 15 Aug 2016, Vol.6, No.4 (Aug 2016)

Abstract

Mobile Ad-hoc Network is an infrastructure less multi hop ad-hoc network where the intermediate nodes are used to transmit their recorded data from source to destination from source to destination. Due to the use of mobile ad-hoc network many issues in communication has been solved, as MANET can be deployed in those areas where a fixed network is a big problem. A hostile network is a network which is considered to be of mobile nodes deployed in a particular area where communication is very feeble. This hostile network may be made by natural calamities or disaster activities which have shut down the entire available infrastructure network. In this paper we have compared the performance of three MANET routing protocols i.e. FSR, LAR1 and ZRP whereas the random waypoint mobility model is considered for the movement of nodes. All the situation considered are done by using Qualnet Simulator 6.1.

Keywords: MANET, FSR, LAR1, ZRP, RWP

1. Introduction

In past few years, wireless network has been use prominently in the field of disaster management and hostile network. In these networks, it becomes very crucial and critical situation for proper networking due to frequent change in the network scenario it becomes to gather proper data from the nodes in the considered hostile network now in present time, with the arrival of MANET it is quite believable to manage and secure the network. MANET is a collection of autonomous wireless networks without any infrastructure s and centralize administration for this purpose the mobility model has been considered which is examined for the random motion of nodes in particular network a mobility model specifies the dynamic characteristics of nodes movement. In this paper we compared the performances of four different routing protocols (FSR, LAR1 and ZRP). We have simulated performances of these routing protocols on random way point mobility model to affect the hostile network, whereas the mobile nodes are connected to each other.

2. Routing protocol

Routing protocol is a protocol that defines how the routers can communicate with each other. A routing protocol shares the information among the closest and

then throughout the networks. Proactive routing protocols: It is also known as table-driven routing protocols. Each node sends a broadcast message to the entire network if there is a change in the network topology. The examples of proactive routing protocols are OLSR, DSDV and STAR etc. Reactive routing protocols: It is also known as on-demand driven routing protocols. Each node in a network discovers or maintains a route based on-demand. The main advantage of this protocol needs less routing information but the disadvantages are that it produces huge control packets due to route discovery during topology changes which occurs frequently in MANETs and it incurs higher latency. The examples of reactive routing protocols are DSR, AODV, and ABR etc. Hybrid routing Protocols: Hybrid routing protocols combination of both reactive and proactive routing protocols. It was proposed to reduce the control overhead of proactive routing protocols and also decrease the latency caused by route discovery in reactive routing protocols. Hybrid routing protocols are ZRP and TORA. In this paper, the evaluations of three routing protocols have been discussed as follows.

2.1 Fisheye State Routing (FSR)

FSR is a table-driven or proactive routing protocol. It maintains the full topology map at each node i.e. periodic exchange of hello packet and periodic exchange of topology tables within the local neighbors only. Every node holds the neighbor list, topology table, next hop table and distance table. As a result fisheye

*Corresponding author Richika Singh is a M.Tech Scholar; Ashish Xavier Das and Rohini Saxena are working as Assistant Professor; A. K. Jaiswal as HOD

captures with high detail the points near the focal point. Mobility can be adjusted to react correctly by adjusting the number of scopes. The benefit is to control the traffic overhead was manageable. As a packet approaches destination, the route becomes progressively more accurate. The technique was used to reduce the size of information required to represent the graphical data. The eye of a fish captures with high detail the pixels near the focal point.

2.2 Location Aided Routing (LAR1)

LAR is a reactive routing protocol that uses the location information of the mobile nodes. Location information about nodes is obtained using global positioning system (GPS). Location information of the mobile nodes is used to flood a route request packet in a forwarding zone only called as request zone. Routing overhead in an ad-hoc network is reduced by the use of location information. The disadvantage of this protocol is every host requires a GPS device.

2.3 Zone Routing Protocol (ZRP)

ZRP is an example of a hybrid routing protocol that uses both proactive and reactive routing protocols when sending information over the network. It can be safely being assumed that most communication takes place between the nodes close to each other. It provide framework to other protocols. The behavior of ZRP is adaptive. ZRP consists of several components; this component together gives the benefits of ZRP. Each component work independently to give the better results.

3. Simulation environment and performance evaluation

3.1 Random waypoint mobility model (RWP)

Random waypoint model is a random model for the movement of mobile users and it changes their location, velocity and acceleration. Mobility models are used for simulation purposes when new network protocols are evaluated. It is one of the most popular mobility models to evaluate mobile ad-hoc network routing protocols, because of simplicity and wide availability. The mobile nodes move randomly and freely without any disturbances. The destination, speed and direction are all chosen randomly and independently of other nodes. The nodes select an arbitrary position and move towards the straight line with a constant speed that is randomly selected from a range and pauses at that destination.

3.2 Simulation setup

We performed simulations on QualNet 6.1 for the performance evaluation of FSR, LAR1 and ZRP routing protocols. For simulation we have used random waypoint mobility model. The simulation parameters

are summarized in table I. Traffic source for network is Constant Bit Rate (CBR). We have considered the simulation model based on the concept of mobility models. We are taking four multiple groups. For the group movement, the four groups of equal number of nodes are considered.

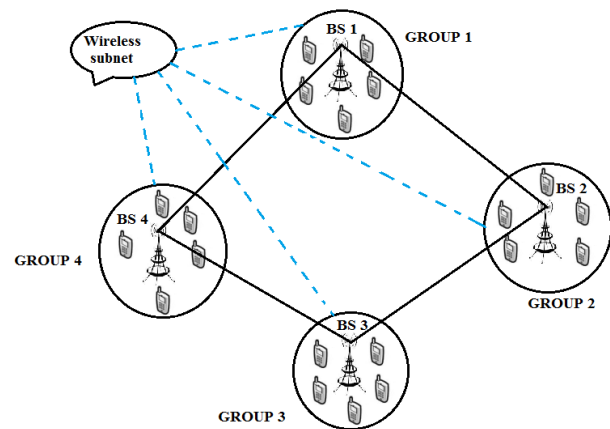
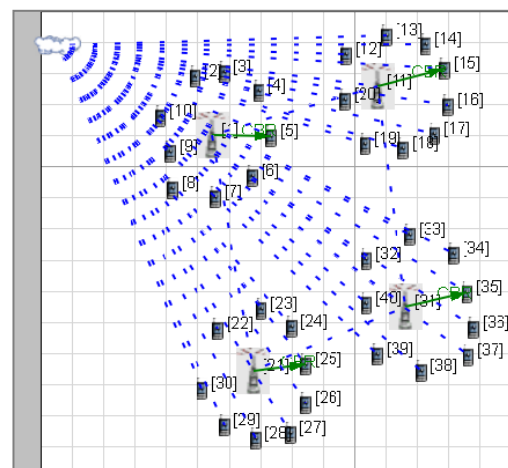


Fig 1 Scenario of hostile network

In simulation, we create a scenario considering the area 1500m×1500m, where 40 nodes have been deployed which are divided into four groups. These four groups are based on the concept of mobility models. The four different groups have been considered with randomly movement of nodes, whose speed taken (5-10m/s) and pause time (30sec). Four groups are considered with group mobility with the same network condition. There are four base station model have been taken and all are static in nature.

In this simulation, the average numbers of nodes in different four groups are (10) with MAC protocol as IEEE 802.11b. There are four Data traffic types (CBR) whose packets rate is (4packets/sec), maximum packet size used in simulation is 512 bytes and the number of packets sends (100). The channel frequencies of four different groups are 2.4Hz, 2.5Hz, 2.6Hz and 2.7Hz. The simulation time is taken (1000sec) respectively.



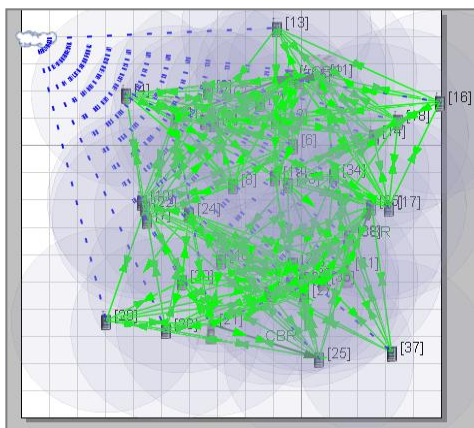


Fig 2 Simulated scenario of hostile networks

3.3 Simulation parameters

Dimension	1500m×1500m
Number of nodes	50
Mobility model	Random way point
Minimum speed	5m/s
Maximum speed	10m/s
Average number of nodes in groups	10
Pause time	30 sec
Channel Frequency	2.4, 2.5, 2.6, and 2.7
Base station model	4
Traffic types	4 CBR
Packets Rate	4 packet/sec
Packets size	512 bytes
Simulation time	1000

4. Results and discussion

The QualNet 6.1 network simulator has been used to analyze the parametric performance of Fisheye State Routing Protocol (FSR), Location Aided Routing (LAR1) and Zone Routing Protocol (ZRP). The metric based analysis is shown below in figures.

4.1 Average end to end delay

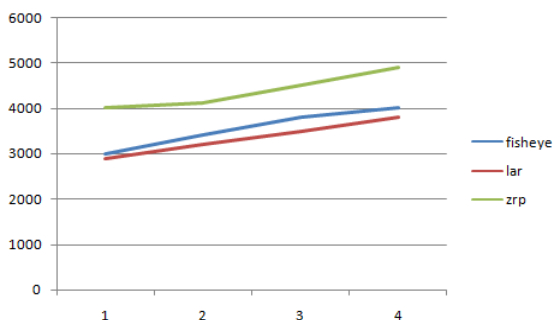


Fig 3: Average End-to-End Delay

End to end delay indicates the duration for a packet to travel from the CBR source to the application layer of the destination. In this analysis, it is observed that the delays are increasing traffic loads. The average end to end delay is very high in LAR1 than FSR and ZRP.

4.2 Received throughput

The throughput is defined as the total amount of data transferred from one place to another in a specified amount of time. Throughput is measured in bits per second. It is observed that ZRP perform better than FSR and LAR1. Here the performance of LAR1 is totally weak in case of throughput.

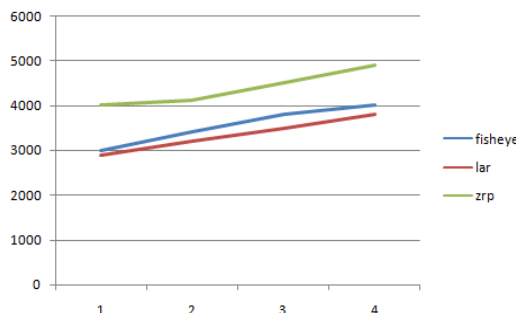


Fig 4: Throughput

4.3 Jitter

Jitter is the variation in the time between packets arriving, caused by network congestion, timing drift or route changes. Jitter should be small for a routing protocol to perform better. It is observed that LAR1 has largest jitter.

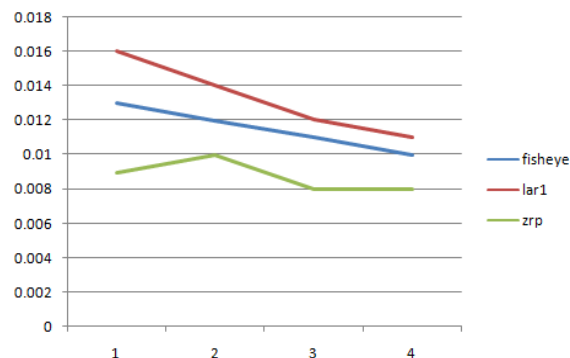


Fig 5: Jitter

Conclusion

According to our simulation, we conclude that the performance of ZRP routing protocols is much better than the other two considered protocols, the performance of ZRP is better because of its hybrid ability.. The performance of FSR and LAR1 were poor. FSR and LAR1 were not able to up with the frequent change in the considered network.

References

C.K. Toh (2002), Ad Hoc Mobile Wireless Networks: Protocols and Systems, Prentice Hall PTR: 55-77
 S. R. Chaudhry, A. N. A. Khwildi, Y. K. Casey (2006.), WiMob Proactive and Reactive Routing Protocol Simulation Comparison, in Proc. Information and Communication Technologies, vol. 2, pp.2730-2735

- Bai, Fan; Helmy, Ahmed (2006), A Survey of Mobility Models in Wireless Adhoc Networks
- V. N. Talooki and K. Ziarati (2006), Performance Comparison of Routing Protocols For Mobile Ad Hoc Networks, in Proc. Asia-Pacific Conference on Communicatios, pp. 1-5.
- I.F. Akyildiz, S.M. Joseph and Yi-Bing Lin, Movement-based location update and selective paging for PCS networks, IEEE/ACM
- G. Pei, M. Gerla, and T. W. Chen, Fisheye state routing: a routing scheme for ad hoc wireless networks, IEEE International Conference on Communications, 2000.
- Allen C. Sun (May 2000), Design and Implementation of Fisheye Routing protocol for mobile Ad Hoc Networks, Dept of Electrical and computer science, Massachusetts institute of Technology.
- Ko. Young-Bae and Nitin H. Vaidya, Location -Aided Routing (LAR) in mobile Ad hoc networks. Department of Computer Science, Texas A&M University, College Station, TX 77843-3112, USA
- Shaily Mittel and Prabhjot Kaur (2009) Performance comparison of AODV, DSR and ZRP Routing protocol in MANET's.
- S.S.Dhenakaran, A. Parvathavarthini(2013) a overview of routing protocols in MANETs, International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 3, Issue 2.
- Jim M.Ng and Y.Zhang, Reference region group Mobility Model for Adhoc Networks, Nanyang Ave, Singapore.