Performance Examination of GPSR and AODV Routing Protocols in MANETS

Vanitha K. S., S. V. Uma

Abstract: ***Mobile ad hoc networks (MANETs) are collection of nodes connected through wireless medium and do not require infrastructure for operation. Network Topology keeps on changing because mobility of nodes are high. Therefore, it is important for MANETs to provide excellent routing and security features. Since MANETs do not require any pre-existing infrastructure, they are extensively used in emergency and rescue and military applications. MANETs thus will form essentially an important part in wireless networks. In this paper, Ad hoc On-Demand Distance Vector (AODV) and Greedy Perimeter Stateless Routing (GPSR) routing protocol performance is compared with respect to Throughput and E2ED and observed that there is an improvement in throughput by 11% in case of GPSR. Simulation is performed using NS3.***

Keywords: AODV, GPSR, E2ED, MANET, Throughput.

I. INTRODUCTION

A MANETs are collection of nodes such as mobile, laptops, sensors which communicate and exchange information over wireless medium .These nodes which acts as routers help in routing data in the network.
Wireless network are supported by infrastructure where as MANETS are infrastructure less network and hence destination node will be out of range of source nodes transmitting data.

II. CLASSES OF ROUTING PROTOCOLS IN MANET'S

Protocols of MANETs are categorized in to Proactive; Reactive and Hybrid protocols based on strategy of routing and network structure as shown in Fig 1.

A. Proactive Protocols

Proactive protocols maintains routing table at every node, these nodes send message to every other node to detect changes in the network topology. Optimized Link Source Routing is an proactive protocol.

B. Reactive Protocols

Reactive protocols maintain the routes on demand when required. Destination Route is found by route discovery mechanism. Adhoc On Demand Distance Vector is an reactive protocols.

Revised Manuscript Received on December 22, 2019.
***** Correspondence Author
Vanitha K. S., Department of Electronics and Communication Engineering, RNS Institute of Technology, Bangalore, Karnataka, India vanithamuralidhar@gmail.com
Dr. S. V. Uma, Department of Electronics and Communication Engineering, RNS Institute of Technology, Bangalore, Karnataka, India umakeshava2000@gmail.com

C. Hybrid Protocols

Hybrid protocols are combination of proactive and reactive protocol, it maintains routes proactively to nearby nodes and determines routes using a route discovery strategy (reactive) to far away nodes. Greedy Perimeter Stateless routing is an Hybrid protocol.

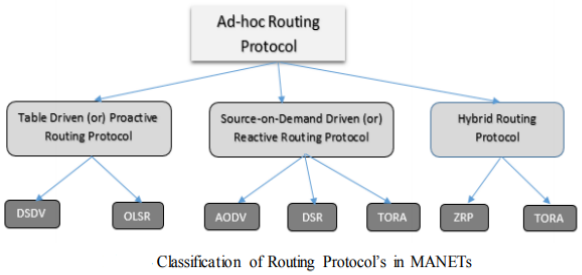

Fig. 1 Protocols in Manet

III. SUMMARY OF AODV AND GPSR ROUTING PROTOCOL

A. AODV Working

Working of AODV which is a reactive protocol is discussed in this section .AODV [2] on demand establishes a route to a destination by maintaining Route Discovery and Route Maintenance operating modes:
In route discovery mode, if an active route is not available route request packet broadcasted from source to all neighboring nodes to find destination route. To the request packet, route reply which is a unicast packet is sent back to source. Source node after receiving route reply sends data to destination. If source use best route to destination node and receives a packet with less number of hops routing table is updated.
In route maintenance, route error packet is sent to initiates a new route for destination, if a connection between the nodes breaks an active route.

B. B. GPSR Working

Greedy Perimeter Stateless Routing (GPSR) make packet forwarding decisions based on packets destination address and nodes geographical position. To make the packets forward from source to destination, GPSR uses greedy forwarding and perimeter forwarding. Every node within the transmission range use beacon message with its one hop neighbor, to exchange its own coordinates information.
In greedy mode, packets are forwarded to the immediate neighboring node which is near to the destination node.

if greedy forwarding route does not exist, Perimeter approach is used and the condition is called Local Maximum. In this approach packet successively travel closer to the faces of a planar sub graph and right hand rule is followed to transmit the packet to the next node.[4][5]

IV. RESULTS AND DISCUSSION

A. Delay vs Nodes

NS3 simulation software is used to simulate the Delay and Throughput with respect to number of nodes for AODV and GPSR protocol. The nodes are randomly distributed in an 500m x 500m simulation scenario.

Fig. 2 shows the Delay vs No. of nodes analysis of AODV. Up to a limit of 20 nodes delay increases linearly ,further increase in node number delay remains constant. The highest delay obtained in the transmission is 3.12357 ns.

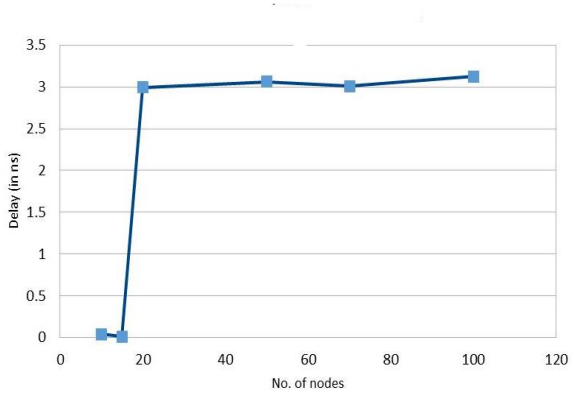

Fig. 2 Delay vs No. of nodes (Aodv)

B. Throughput vs Nodes

Fig. 3 shows the Throughput vs Number of nodes analysis for AODV routing protocol, At the initial stages when the nodes size are less , throughput is less and after reaching around 20 nodes the throughput attains maximum value. The highest throughput obtained is 4.6Mbps

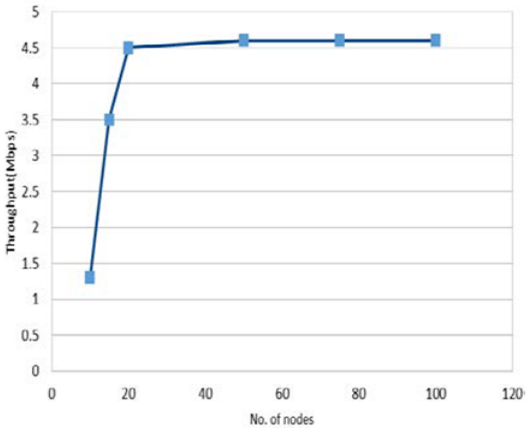

Fig. 3 Throughput vs No. of nodes (Aodv)

C. Delay vs Nodes

Fig 4 shows the Delay vs No. of nodes analysis of GPSR, it is observed that delay decreases substantially as the nodes size decreases. Additionally, it is seen that the magnitude of delay is very less when compared to other protocol.

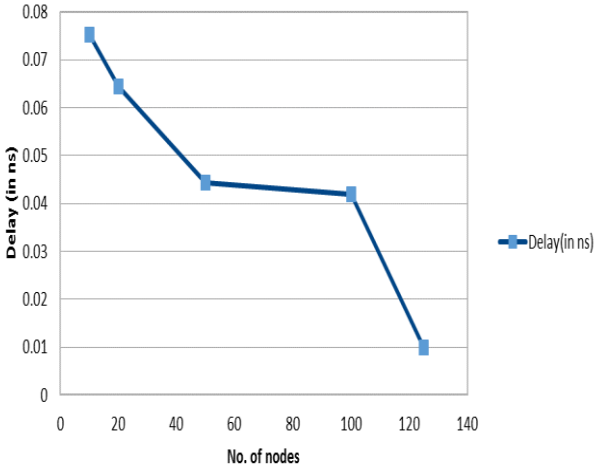

Fig. 4 Delay vs No. of nodes (GPSR)

D. Throughput vs Nodes

Fig.5 shows the Throughput vs No. of nodes analysis for GPSR protocol. It is seen that the throughput obtained is almost constant and is independent of nodes. This proves that GPSR has very high scalability when compared to other protocols. Additionally, we obtain maximum throughput of 5.18 Mbps which is far superior to other protocols.

E. Comparison of Throughput vs Number of Nodes

Fig. 6 Comparison result shows that, at the initial stages when the node size is small , throughput is less and after reaching around 20 nodes the throughput attains maximum. With respect to GPSR, it is observed that the throughput obtained is almost constant.

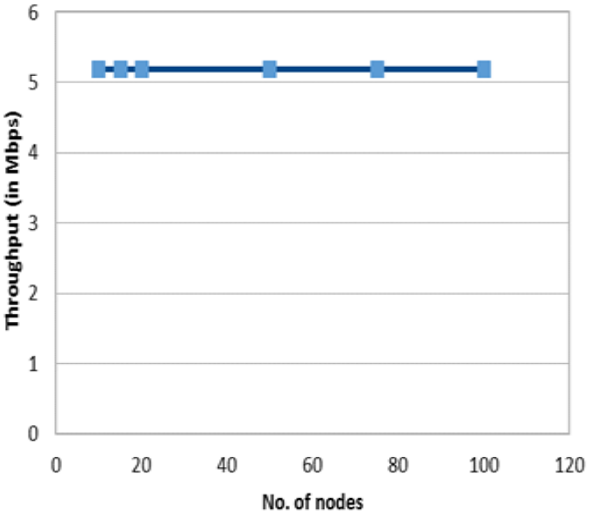

Fig. 5 Throughput vs No. of nodes (GPSR)

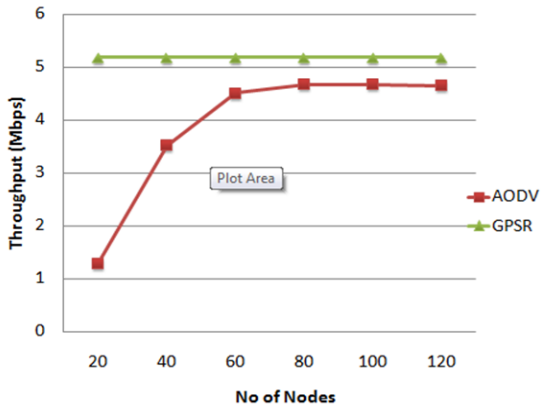

Fig. 6 Comparison Throughput vs No. of Nodes

F. Comparison of Delay vs Nodes

Fig. 7 shows the Delay vs No. of nodes analysis of AODV and GPSR, in AODV up to a limit of 40 nodes delay increases linearly and with the increase in node numbers delay remains constant. In case of GPSR, it is observed that delay decreases substantially when the no. of nodes increases. Additionally, magnitude of delay is very small when compared to other protocol

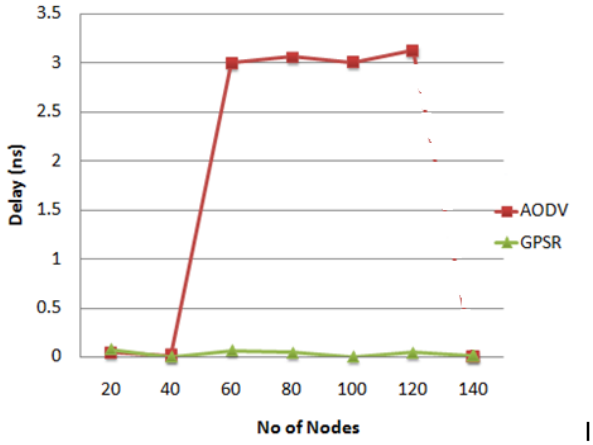

Fig. 7 Comparison Delay vs No. of Nodes

V. CONCLUSION

In this paper, we have compared the AODV and GPSR protocol performance using the parameters, throughput and delay in NS3. We have analyzed the output by varying node number. It is seen that there is an improvement in throughput by 11% in case of GPSR also delay remains constant as the number of node is increased.This concludes GPSR performs better than AODV.

REFERENCES

1. Zahain Ismail,Rosilah Hassan, "Performance of AODV Routing Protocol in Mobile Ad Hoc Network", International Symposium in Information Technology (ITSim), 2010
2. HoudaMoudni ,Mohamed Er-rouidi, HichamMouncif, Benachir El Hadadi, "Performance Analysis of AODV Routing Protocol in MANET under the Influence of Routing Attacks", 2nd International Conference on E Electrical and Information Technologies ICEIT'2016.
3. Yanbin Yang, Hongbin Chen, "An Improved AODV Routing Protocol for MANETs", 5th International Conference on Wireless Communications, Networking and Mobile Computing , 2009.Wicom'09.
4. Brad Krap,H.T.Kung," GPSR: Greedy Perimeter Stateless Routing for Wireless Networks", MobiCom '00 Proceedings of the 6th annual international conference on Mobile computing and networking.
5. Raj Bala,C.Rama Krishna "Scenario Based Performance Analysis of AODV and GPSR Routing Protocols in a VANET", IEEE International Conference on Computational Intelligence & Communication Technology 2015.
6. Yan Sun,Junpeng Guo, Yuhui Yao, "Speed Up-Greedy Perimeter Stateless Routing Protocol for Wireless Sensor Networks (SU-GPSR)",IEEE 18th international Conference on High Speed Switching and Routing (HPSR), 2017.
7. Asad Amir Pirzada,Chris McDonald, "Trusted Greedy Perimeter Stateless Routing", 15th International Conference on Network, 2007. ICON 2007.
8. G.R.Vijayavani, G. Prema, "Performance Comparison of MANET Routing Protocols with Mobility Model derived based on Realistic mobility pattern of Mobile Nodes", IEEE Intemational Conference on Advanced Communication Control and Computing Technologies(ICACCCT)2012.
9. Andreysilva, Niazreza, OLiveira,"Improvement and Performance Evaluation of GPSR-Based Routing Techniques for Vehicular Ad Hoc Networks."IEEE Access(2019).

AUTHORS PROFILE

Vanitha K S is a research scholar at R.N.S Institute of technology, Bengaluru. She received M.Tech degree in VLSI and Embedded systems, in 2013 from Dr.AIT under Visvesvaraya technological university. She received B.E degree in Electronics and Communication Engineering, in 2001 from Dr.AIT under Bangalore University. Her research area is Mobile Adhoc Networks. She has a teaching experience of 6 years. Her subjects of interest include Computer networks, Operating systems, Cryptography, and Network Security.

Dr. S V Uma is working as Associate professor at R.N.S Institute of technology, Bengaluru. She received Ph.D. degree in the area "Congestion control and improved QOS in multimedia networks" from Bangalore University, in 2015. She received M.Tech in Digital Communication from BMSCE under Visvesvaraya technological University, in 2002. She received B.E degree in Electronics and Communication Engineering from Malnad College of engineering, in 1996. She has a teaching experience of 22 years. Her research interests include Communication Networks, Network security, Cryptography, Signal and Image Processing. She has authored book on "Constraint based network design using Genetic algorithm" under Lambert Academic publishing, Germany. She has authored and co-authored several technical publications in National Conferences, International Conferences and International Journals. She received "Best paper Award" for paper titled "A cross Layer UDP-IP protocol for efficient Congestion Control in wireless Networks", in International Journal of Computer Science and Information Security. She has guided more than 50 UG projects and more than 12 PG students for their final year projects. She has delivered invited talks on "Advanced Communication Technologies", "Basics of Engineering", etc. She is currently guiding 5 doctoral students in different areas of Computer Networks.