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PERFORMANCE ANALYSIS OF ZRP AND GPSR ROUTING PROTOCOLS IN MANET

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Abstract- Mobile ad hoc network is a self configuring infrastructure-less network of nodes connected through wireless link. Every node in the network can act as host or router to find paths to exchange information. Many routing protocols have been developed to find paths for mobile ad hoc networks. This paper presents the performance analysis of Zone Routing Protocol and Greedy Perimeter Stateless Routing based on metrics such us delay, packet delivery, packet loss ratio, signal strength, throughput.
Keywords- MANET, GPSR, ZRP, Metrics.

I.INTRODUCTION

Mobile ad hoc network is a self configuring infrastructure-less network of nodes connected through A Mobile ad hoc Network MANET) is an collection of mobile nodes. A MANET is an infrastructure less network which contains source node, sink node and intermediate nodes. Mobile nodes in the network will configure themselves based on the network topology changes. A node in a network receives information from the source node, and intermediate node forward the information to the sink node. Routing process is needed to find a path from source to sink node to transfer the packets. MANET technology can be applied in many areas. It can be applied in wireless network or pre-existing infrastructure.

Various routing protocols have been proposed and variety of comparison has been carried out on these protocols. Performance of those protocols is analyzed using the metrics like, packet loss, packet delivery ration, delay ratio, throughput, and signal strength. This paper presents a comparison of two routing protocols ZRP and GPSR with the use of Ns2 simulation. These protocols are used to find the location of the target node and help to find path to exchange information. The performance of these protocols is analyzed using Random walk mobility model.

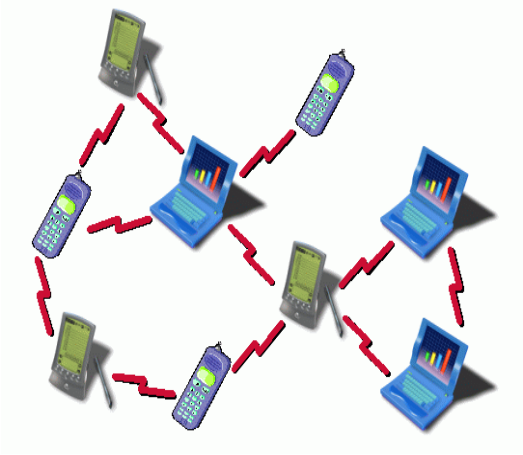


Figure 1: Mobile Ad hoc Network

II. RELATED WORK

P. Manickan and T.P Manikan and T.G Baskar et al.[1] compared performance of three routing protocols, DSDV, AODV, DSR. They analyzed these routing with Network Simulator version 2 (NS-2). They concluded that DSR performance is better than AODV and DSDV due to routing overhead and packet deliver ratio.

Sree Raga Raju, et al. [2] compared the performance of DSR, AODV, and ZRP. They found that the performance of ZRP was not up to the task and it performed poorly throughout all the simulation sequences.

Ajay Prakash Rai and Rasvihari Sharma et al. [3] compared the performance of routing protocols (AODV and DSDV). They concluded that for large wireless network performance of AODV is much better than DSDV in terms of PDF, packet loss and delay.Parma Nand, compared the performance of FSR, ZRP and AODV Routing Protocols for MANETS, they concluded that ZRP works better than in MANET compared to FRP and AODV.

III.CLASSIFICATION OF ROUTING PROTOCOLS

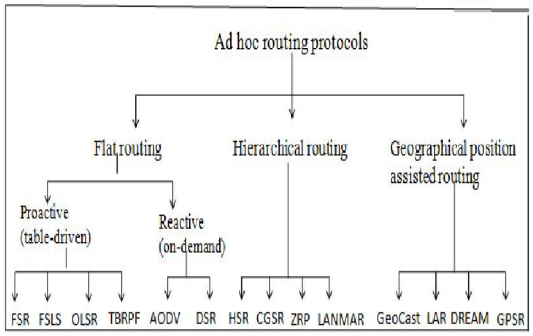


Figure 2: Classification of Routing Protocols

A. Flat Routing

Flat routing protocol is a network communication protocol implemented by routers in which all routers are each other's peers. Flat routing protocol distributes routing information to routers that are connected to each other without any organization or segmentation structure between them.

B. Hierarchical Routing

Hierarchical routing is the procedure of arranging routers in a hierarchical manner. A good example would be to consider a corporate intranet. Most corporate intranets consist of a high speed backbone network. Connected to this backbone are routers which are in turn connected to a particular workgroup.

C. Geographic Position Routing

Geographic routing is a routing principle that relies on geographic position information. It is mainly proposed for wireless networks and based on the idea that the source sends a message to the geographic location of the destination instead of using the network address.

D. Proactive Routing Protocol

In proactive protocol all the nodes maintain the list of information about the next node. Proactive protocol is also called as table-driven routing protocol and the source node does not need route discovery to find destination. In networks utilizing a proactive routing protocol, every node maintains one or more tables representing the entire topology of the network. These tables are updated regularly in order to maintain a up-to-date routing information from each node to every other node. To maintain the up-to-date routing information, topology information needs to be exchanged between the nodes on a regular basis, leading to relatively high overhead on the network. One the other hand, routes will always be available on request.

E. Reactive Routing Protocols

Reactive protocols also called as on-demand routing protocol is based upon query-reply dialog. Unlike proactive routing protocols, a reactive routing protocol does not make the nodes initiate a route discovery process until a route to a destination is required. This leads to higher latency than with proactive protocols, but lower overhead.

F. Hybrid Protocol

These types of protocols combine proactive and reactive protocols to try and exploit their strengths. One approach is to divide the network into zones, and use one protocol *within* the zone, and another *between* them.

IV. ZONE ROUTING PROTOCOL (ZRP)

Zone Routing Protocol or ZRP is a hybrid Wireless Networking routing protocol that uses both proactive and reactive routing protocols when sending information over the network. ZRP was designed to speed up delivery and reduce processing overhead by selecting the most efficient type of protocol to use throughout the route. In ZRP, each and every node has a parameter referred to as the zone radius which is the Hop Count (HC). For the nodes beyond the zone radius reactive routing protocol is used, and for the node within the zone radius proactive routing protocol is used.

Therefore based upon the zone radius value the protocol acts like proactive and reactive protocol. ZRP is used for various network environment by setting proper value of zone radius. Fig 3 shows the routing zone. ZRP uses three different route discovery protocols, Interzone routing protocol (IERP), Intrazone routing protocol(IARP).

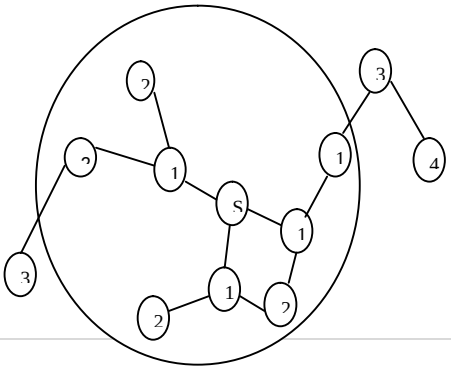


Figure 3: Routing Zone (Radius =2)

A.Interzone Routing Protocol (IERP)

IERP is similar to the classical route discovery protocols. The reactive routing is carried out for nodes beyond a zone. In ZRP, when there is a data sending request, the route searching is done outside the zone. IERP is initiated when there is no node is locally available to reach zone within the zone. The source generates a route query packet, which is the combination of source nodes address and request number.

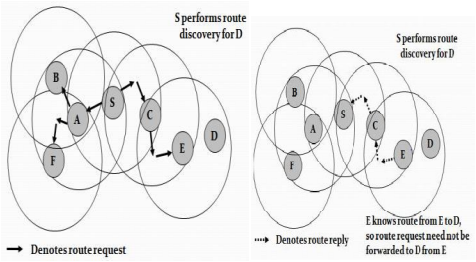
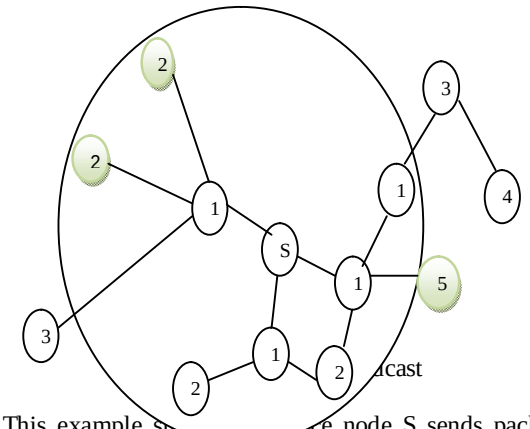


Figure 4: Path Discovery of ZRP

The query is transmitted to all the border nodes are called border cast. Bordercast is used to reduce the number of redundant forwarding in route discovery of interzone routing protocol.



This example sh ce node S sends packet to destination i.e. node 3. The radius of the zone is 2. Request is broadcast to the peripheral nodes represented in gray in fig 4.

B.Intrazone Routing Protocol (IARP)

The Intrazone Routing Protocol (IARP) is used to maintain the local topology. Usually IARP provide a complete view of network connectivity.

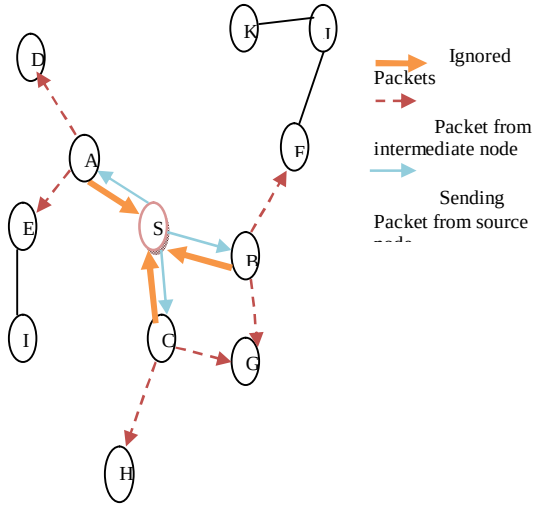
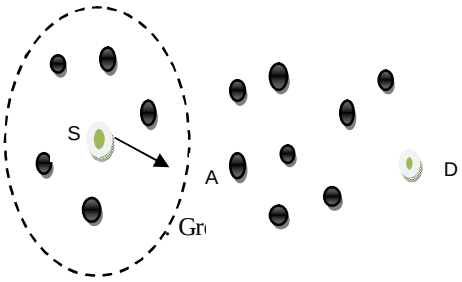


Figure 5: Transmission of packets in IARP

V.GREEDY PERIMETER STATELESS ROUTING (GPSR)

Greedy Perimeter Stateless Routing (GPSR) specifies only the GPSR's data forwarding algorithm and the geographic forwarding strategy. These two algorithms comprised of two components called perimeter routing and greedy forwarding.



A. Greedy Forwarding:

In greedy forwarding the source node knows the geographic location of the destination node. Route request packet is the integration of the information about the

position. Entire neighbor nodes of each node are maintained in a local table. The node which have to send the route request packet checks its local table for a nearest node with destination and forwards the data packet to the corresponding node.

Fig 6, shows the example of greedy forwarding, S receives a packet from D. X range is represented in dotted circle. The packet is forwarded from S to A, therefore the distance between A and D is less than that between D and any of S's other neighbors. This process repeats until the packets reach its destination D. When the packet cannot find a neighbor node nearer to the destination, other strategy called perimeter forwarding is used.

B.Perimeter Routing

When a node cannot find a neighbor node closest to the destination perimeter mode is changed from greedy mode.

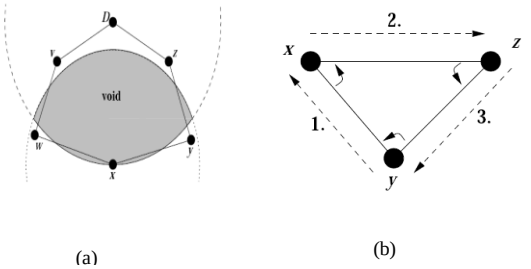


Fig 7: (a) Node X's void with respect to destination D (b) The right-hand rule (interior of the triangle)

In fig 7(a), x is closer to D than its neighbor w and D. Although two paths two paths (X-y-z-D) and (X-w-v-D), X will not choose w or y to forward using greedy forwarding. X is local maximum to D. Here the second algorithm will be active; therefore packet mode will be placed to perimeter mode. In perimeter routing, the right hand rule is used for traversing the edges of the shaded region without nodes. This algorithm finds a possible path around a void to the destination node.

VI.PERFORMANCE METRICS:

NS-2.5 is used for the simulation. Tcl script is used to run NS-2 simulation for analyzing the performance of the protocols in MANETs. Those TCL files are used for simulation and a trace file is generated as output. The trace files is noted for various performance metrics. These trace files is used to visualize the simulation run with Network Animator (NAM). Graph is generated through Network Simulator by scanning those trace file.

Following performance metrics is used to analyze protocols.

Signal strength- signal strength denotes the protocol signal strength, which is very important to find a route path.

Throughput – Throughput is the total number of packets that have been successfully delivered from source node to destination node.

End-to-End Delay – End-to-end delay is the average time delay for data packets from the source node to the destination node.

Packet Delivery Fraction – Packet delivery fraction is the ratio of total number of packets received by destination over total number of packets sent by source.
Routing Overhead – Routing overhead is all packets sent or forwarded at network layer.

Packet loss ratio-Packet loss ratio is the number of packets dropped by using these protocols.

Parameters	Value
Routing protocols	ZRP,GPSR
Mobility Models	Random Walk
Propagation Model	Two Ray Ground
MAC Layer Protocol	IEEE 802.11
Antenna Model	Omni Antenna
Channel Type	Wireless Channel
Simulation Area	250m x 250m
Simulation Time	120s
Number of nodes	10, 15, 20, 25
Node Speed	1, 2, 3, 4,5
Packet size	512 bytes

Table 1: Simulation Parameters

VII.SIMULATION RESULTS AND ANALYSIS

Simulation is done using Network Simulator, trace file of NS-2 contains the output generated, using the trace file graph is generated through Gnuplot in Network Simulator.

The protocols are analyzed for throughput workload, delay ratio, total losses, channel measurement, drop node, protocol frequency, and source frequency under Random walk mobility. Figure 8 shows the delay measurement of ZRP and GPSR. This graph shows that the GPSR End to End Delay is better than ZRP. Figure 9 shows the comparative protocol frequency of ZRP and GPSR. This shows the frequency of GPSR is better ZRP. Figure 10 shows the packet loss of ZRP and GPSR. The graph

results that, using GPSR protocol reduces packet loss. Figure 11 shows the channel measurement of ZRP and GPSR, which shows that GPSR has better channel measurement. Figure 12, shows the Packet delivery ratio of GPSR and ZRP, which shows that packet delivery ratio of GPSR is better than ZRP. Figure 12, shows the Protocol throughput of ZRP and GPSR. Figure 13, shows the source signal strength of ZRP and GPSR.

Figure 8: Delay measurement of ZRP and GPSR

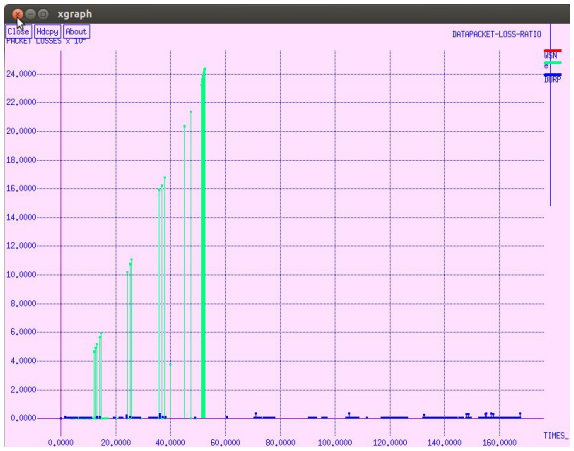


Figure 10: Packet loss of ZRP and GPSR

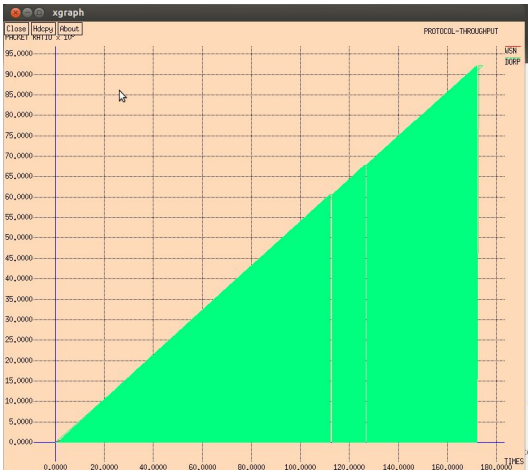


Figure 9: Protocol frequency of ZRP and GPSR

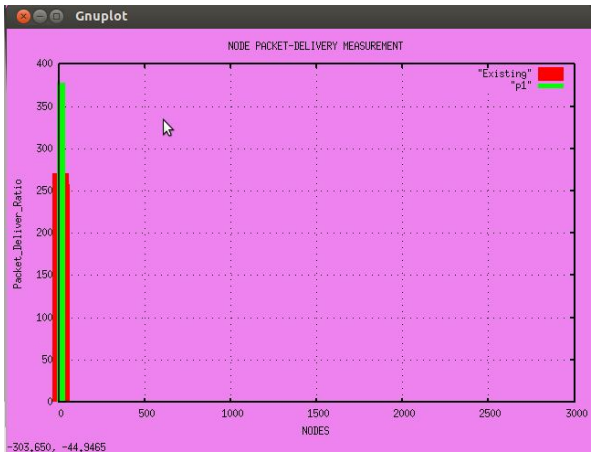


Figure 12 Packet Delivery Ratio of ZRP and GPSR

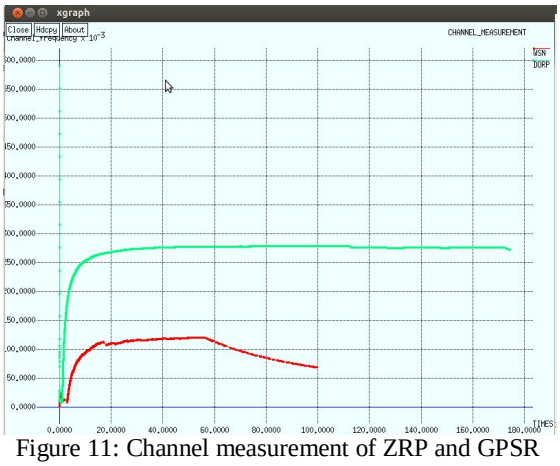


Figure 11: Channel measurement of ZRP and GPSR

Figure 13: Protocol throughput of ZRP and GPSR

Figure 14: Source Signal Strength of ZRP and GPSR

VIII. CONCLUSION

In this paper, performance of two routing protocols called ZRP and GPSR are analyzed. All the simulation is performed in Mobile ad hoc Network. GPSR and ZRP is analyzed interms of throughput, signal strength, channel measurement, delay, packet loss, and packet delivery. From the analysis, performance of ZRP is very low compared to GPSR protocol. Therefore it is better to use GPSR in Mobile ad hoc Network.

REFERENCES

[1]. Sree Ranga Raju, Kiran Runkana, Jitendranath Mungara, " ZRP versus AODV and DSR: A comprehensive study on ZRP performance", International Journal of Computer Applications (0975 – 8887) Vol 1– No12, 2010.

[2]. P. Manickam and T. G. Baskar, "*Performance Comparisons of Routing Protocols in Mobile Ad Hoc networks*," Vol. 3, no. 1, pp. 98–106, 2011.

[3]. Ajay Prakash Rai and Rasvihari Sharma, "Performance Comparison of AODV & DSDV Ad-Hoc Network Routing Protocols On The Basis Of Variable Speed & Pause Time", Vol 2, Issue 10, April 2013.

[4]. Parma Nand, Comparative Study and Performance Analysis of FSR, ZRP and AODV Routing Protocols for MANET, Wireless Computing Lab. IIT Roorkee India (91), 2011.

[5]. Sanku Sinha and Biswaraj Sen, Effect of Varying Node Density and Routing Zone Radius in ZRP: A Simulation Based Approach, Sikkim Manipal Institute of Technology, ISSN: 0975-3397, Vol.4 No. June 2012.

[6]. Biswaraj Sen, *A Simulation Based Performance Analysis of AODV and DSDV Routing Protocols in MANETs*, Department of Computer Sc & Engineering, Sikkim Manipal Institute of Technology, India, Vol.2, Issue.4, July-Aug. 2012.

[7]. V.Kanakaris, D.Ndzi and D.Azzi., "Ad-hoc Networks Energy Consumption: A review of the Ad-Hoc Routing Protocols", Journal of Engineering Science and Technology Review 3 (1) (July 2010).

[8]. Brad Karp, *GPSR: Greedy Perimeter Stateless Routing for Wireless Networks*, Harvard University/ ACIRI, in Proc. Of the 6th Annual ACM/IEEE International Conference on Mobile Computing and Networking (MobiCom 2000).

[9]. R.Jain, A.Puri, and R.Sengupta, "Geographical routing using partial information for wireless ad hoc networks," IEEE Personal Communications, pp.48–57, Feb.2001.

[10]. S.kannan, *An Investigation about Performance Comparison of Multi-Hop Wireless Ad-Hoc Network Routing Protocols in MANET*, SSNS College of Technology, Sathy Main Road, Coimbatore- 641035, Tamil Nandu, Issue 3, No 6, May 2010.