iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 4 **Issue:** VI **Month of publication:** June 2016

DOI:

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

Volume 4 Issue VI, June 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Performance Evaluation of Enhanced Location-Aided ZRP in MANET

Er. Neha Gupta[#1], Er Maninder Singh[*2]
[1,2]Department of Electronics and Communication, Haryana Engineering College, Jagadhari, Haryana, India

Abstract- MANET is the infrastructure less and self-configuring network, in which nodes are free to move without the need of localised base station. Zone Routing Protocol (ZRP) is a hybrid protocol which is used to allow communication between the nodes, and provides framework for other protocols. Location information, as obtained by using GPS or global positioning system, is used by the Location-Aided Routing protocols for the process of route discovery. In this paper, ZRP is enhanced by reducing the routing overhead by the use of location information; and zone leaders keep track of all the nodes in the zone by maintaining a table. Also, performance evaluation of enhanced ZRP is done in terms of throughput, packet delivery ratio and routing overheads by using NS-2 simulator.
Key words: MANET, ZRP, LAR, Zone Leaders, Normalized Routing Overhead

I. INTRODUCTION

MANET is a network made up of group of mobile devices that are wirelessly communicating; it is a self-configuring and infrastructure less network. Each device in a mobile ad hoc network is able to freely shift in any direction, and regularly changes its links with other devices. MANET has the ability to communicate without any central base station as the nodes have unlimited mobility and connectivity with others. Routing & network management are done side by side by every node. As MANET is mobile, it utilizes wireless connections such as general Wi-Fi connection, cellular or the satellite transmission to establish connection with other networks. [1]

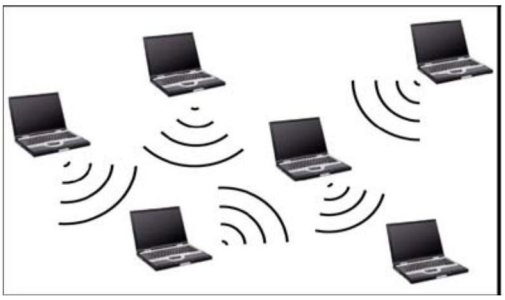


Fig.1: A mobile ad-hoc network [2]

A. Introduction to ZRP

The Zone Routing Protocol or ZRP takes advantage of proactive scheme within the local zone, and reactive scheme for communication between these zones and thus it combines the benefits of both into a hybrid scheme. It can be assumed that most of the communication takes place between the nearby nodes.

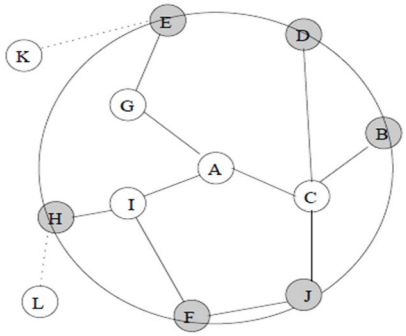


Fig.2: Routing Zone of node A With ρ=2[3]

Volume 4 Issue VI, June 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

The addition or the removal of any node has a narrow effect on the local zone but the change in topology has an important role to play. The ZRP provides the framework for the other protocols. Every node may be present in various overlapping zones. Every zone differs in size. The size of the zone is given by the radius of the length ρ, where ρ is the number of hops for the perimeter of the zone. Each node has its own zone, and does not depend on the fixed nodes that are impossible in MANETs. Figure 1 gives an example of the routing zone with ρ=2 [3]

B. ZRP Architecture

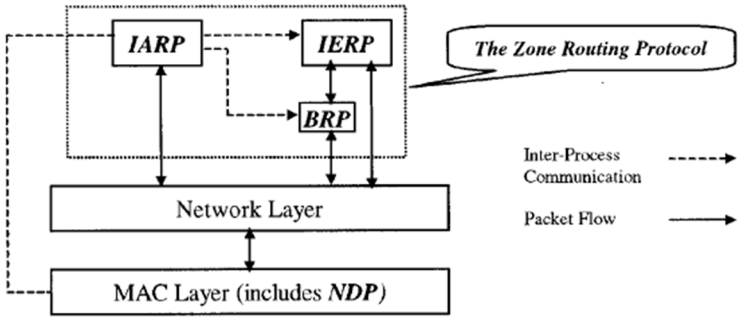


Fig.3: ZRP architecture [4]

The above figure illustrates the relationship among different ZRP components.

1) IARP proactively maintains the routing zone topology, through the interchange of the route updated packets. The route updates are initiated by the MAC-level NDP, which alerts the IARP whenever any route to the neighbour is built up or broken.

2) IERP reactively achieves the routes to the nodes even beyond the routing zone through the query-reply technique. IERP transmits the queries by using the border cast packet delivery of BRP. The border casting takes advantage of the IARP's updated look of the local topology to direct the route queries away from source of query efficiently. ZRP can be categorized as a flat routing protocol, rather than the hierarchical protocol. [4]

C. Location-Aided Zone Routing Protocol

It decreases overhead of route discovery by using location information for mobile host. Location information can be obtained by using GPS or global positioning system. The location information can be used by two LAR or Location-Aided Routing protocols for the route discovery. The LAR protocol uses location information to decrease the search spaces for a required route. By limiting the search space, route discovery messages decrease. [16]

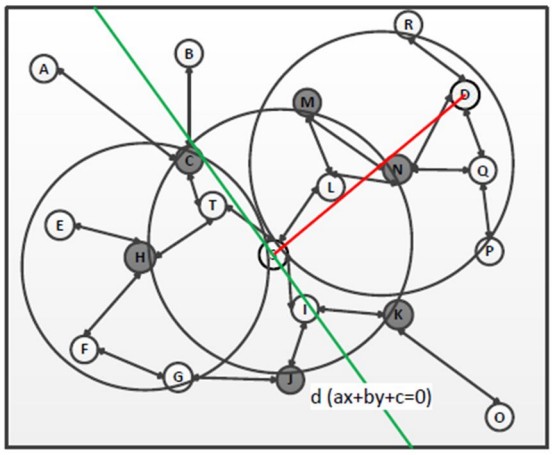


Fig.4: Location-Aided Zone Routing Protocol [5]

The explanation of the zone routing of a particular node is the area covered by the nodes that have the shortest paths to the node

which is equal to the count by hop or radius of the zone. The border nodes of every zone are known the peripheral nodes. For instance, in the Figure 1, nodes C, N, M, K, H, J are peripheral nodes in routing zone of the source node 'S'. Each node is having the same radius two hops in the first part & three hops in second part. After the finish of the first stage, if the source 'S' cannot find any route to the destination 'D', then it will go to the second stage which is the global reactive routing. In the second stage, instead of blindly broadcasting RREQ packets, the ZRP use the border-casting that allows the RREQ packets to be transferred directly to the peripheral nodes. [5]

II. RELATED WORK

A. Genetic Zone Routing Protocol or GZRP is an extension of ZRP by using Genetic Algorithm (GA). GZRP is studied for its better performance compared to ZRP in many areas like scalability for packet delivery and has been proven to give improved results.

B. Various routing protocols have been proposed for MANET and important ones are DSR, ZPR, WRP, AODV, TORA, FSR. This research paper gives an analysis of these protocols by showing their characteristics, advantages, functionality and limitations. The aim is to give conclusions to improve the performance of these protocols.

C. This document describes & analyses the Zone Routing Protocol (Z.R.P.) which is a hybrid mobile ad-hoc protocol that divides the network into superimposing routing zones, allowing for the use of independent protocols within and between the zones.

D. The efficiency of route query control method for the Zone Routing Protocol for ad hoc networks has been studied.

E. The paper proposes a geographical routing algorithm based on ZRP or Zone Routing Protocol for limiting the area to discover a novel route by the utilization of location information of the nodes. For reducing routing overhead, an approach named as the Location-Aided Zone Routing Protocol is proposed.

III. PROBLEM FORMULATION

A Mobile ad-hoc network includes a group of mobile nodes which forms a temporary network without using any centralized point. Reduction in the energy consumption of the mobile nodes batteries is possible by limiting the route discovery process only to specified nodes.

IV. PROPOSED WORK/ METHODOLOGY

In ZRP, network is divided into zones and each zone is headed by a zone leader. Zone leader keeps track of all the nodes in the zone by maintaining a table. When route discovery process initiates, then instead of flooding the RREQ packets to the whole network area, the RREQ packets are sent only to the respective zone leaders. The zone leaders maintain and update routing table which stores all the information about its zonal nodes. The protocol proposed by us will be implemented using NS-2 simulator.

The proposed scheme uses distance of the previous location from the destination as a parameter for defining the request zone. Thus, any intermediate node B receiving the route request forwards it if B is closer to or not much farther from the destination's previous location than node A transmitting the request packet to B. Location information is used to restrict the flooding to a certain area.

V. SIMULATION

NS-2 is a type of open-source simulation tool which can run on Linux. It is the event-simulator that targets at the networking research. It also provides substantial support for the simulation of routing and multicast & IP protocols, like UDP and TCP over wireless (local & satellite) networks.

Following parameters of the performance metrics are necessary to verify the simulation results:-

Table 1: Simulation Parameters

S.NO.	PARAMETER	VALUE
1.	Number of Nodes	50
2.	Simulation Area(m^2)	1200*1200
3.	Transmission Range(m)	200,250,300,350,400
4.	Antenna Type	Omni Antenna
5.	MAC type	802_11
6.	Routing Protocol	ZRP
7.	Radius(cm)	3
8.	Total Packets Sent	614

Volume 4 Issue VI, June 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Through our proposed scheme to enhance ZRP, we have attempted to improve these parameters.

Table 2
List of Performance-Metrics

S.NO.	PARAMETERS
1.	Normalized Routing Load
2.	Throughput
3.	End-to-end delay
4.	Packet Delivery Ratio

VI. RESULTS AND ANALYSIS

The transmission of packets from node to node in the given network is shown by using NAM file which is an attribute of NS-2 simulator.

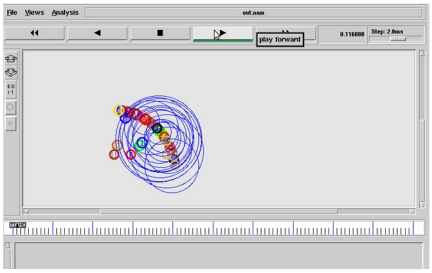


Fig 5 Status of packets at 0.2sec

The screen-shots in the given section shows how the packet routing is performed using the proposed system.

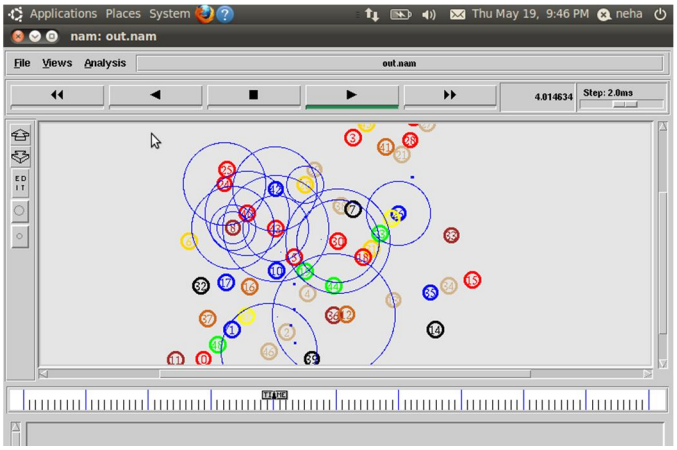


Fig 6: Status of packets at 4 sec

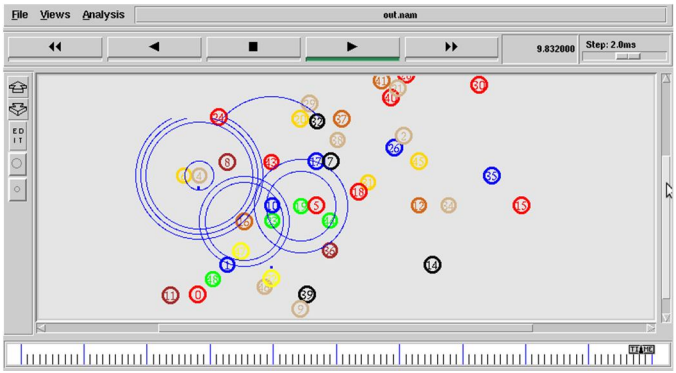


Fig 7: Status of packets at 10 sec

We have obtained the values of the following parameters by varying the transmission range of the nodes as shown in the graphs below. The number of packets sent was 614.

Volume 4 Issue VI, June 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

A. Total Packets Received

It indicates the number of packets received by the destination node. The number of packets sent was 614. As the transmission range increases, it also increases but after 300m, it starts decreasing with the increase of transmission range.

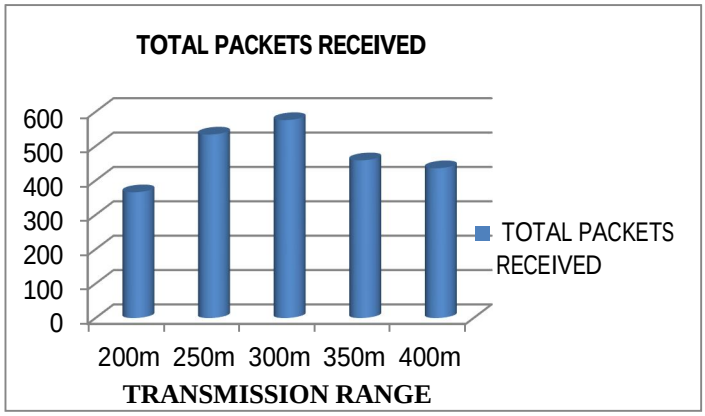


Fig 8: Total Packets Received

B. Total Packets Dropped

It indicates the number of data packets which have been dropped in the route. It should be the least as much possible. As the transmission range increases, it also decreases but after 300m, it starts increasing with the increase of transmission range.

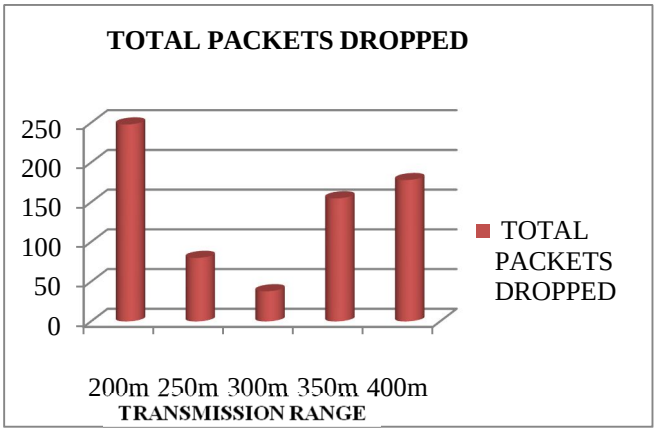


Fig 9 Total Packets Dropped

We can show the total packets received and dropped by means of x graphs. The x graph for 200m transmission range is given below:

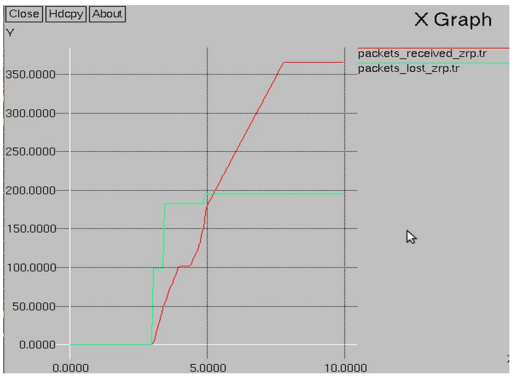


Fig 10: X-graph for transmission range=200m

Similarly we can draw x-graphs for other transmission ranges.

Volume 4 Issue VI, June 2016
ISSN: 2321-9653

C. Normalised Routing Load

It represents the number of routing packets transmitted per data packets sent to the destination. Every forwarded packet is counted as one transmission. As the transmission range increases, it also increases but after 300m, it starts decreasing with the increase of transmission range.

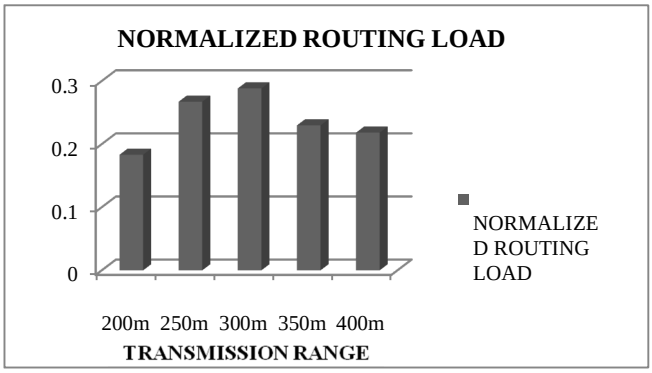


Fig 11 Normalized Routing Load

D. Average Delay

It represents the average time taken to send any packet from the source to the destination. It also includes buffering during the route discovery phase, waiting at the inter-phase queue, and the retransmission time at the MAC layer. As the transmission range increases, it also increases.

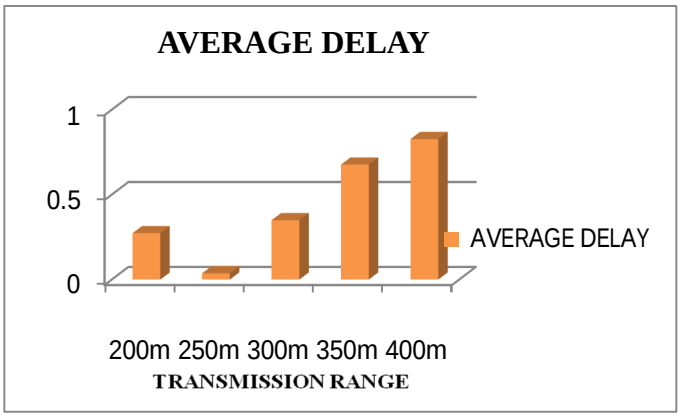


Fig 12 Average Delay

E. Throughput

It is the ratio of number of data packets received in a given simulation time. Firstly as the transmission range increases, then it starts decreasing with the increase of transmission range.

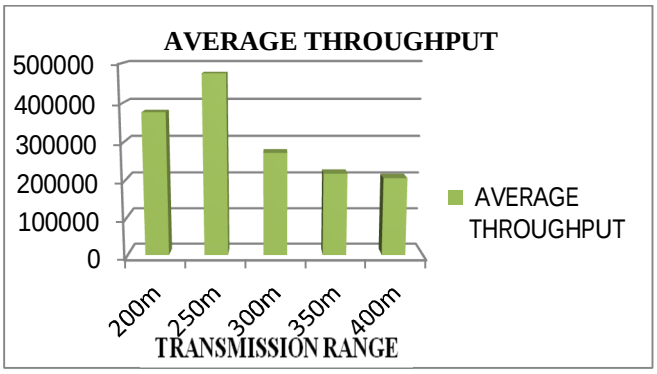


Fig 13 Average Throughput

Volume 4 Issue VI, June 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

F. Packet Delivery Ratio (PDR)

The ratio of packets that are successfully delivered at the destination compared to the number of packets that have been sent out by the sender. In this figure, firstly the PDR is increasing with the increase of transmission range and then it starts decreasing.

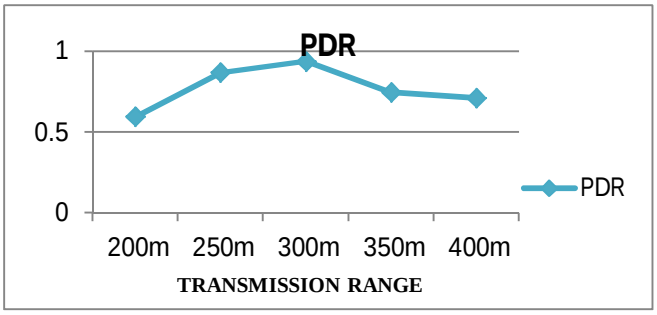


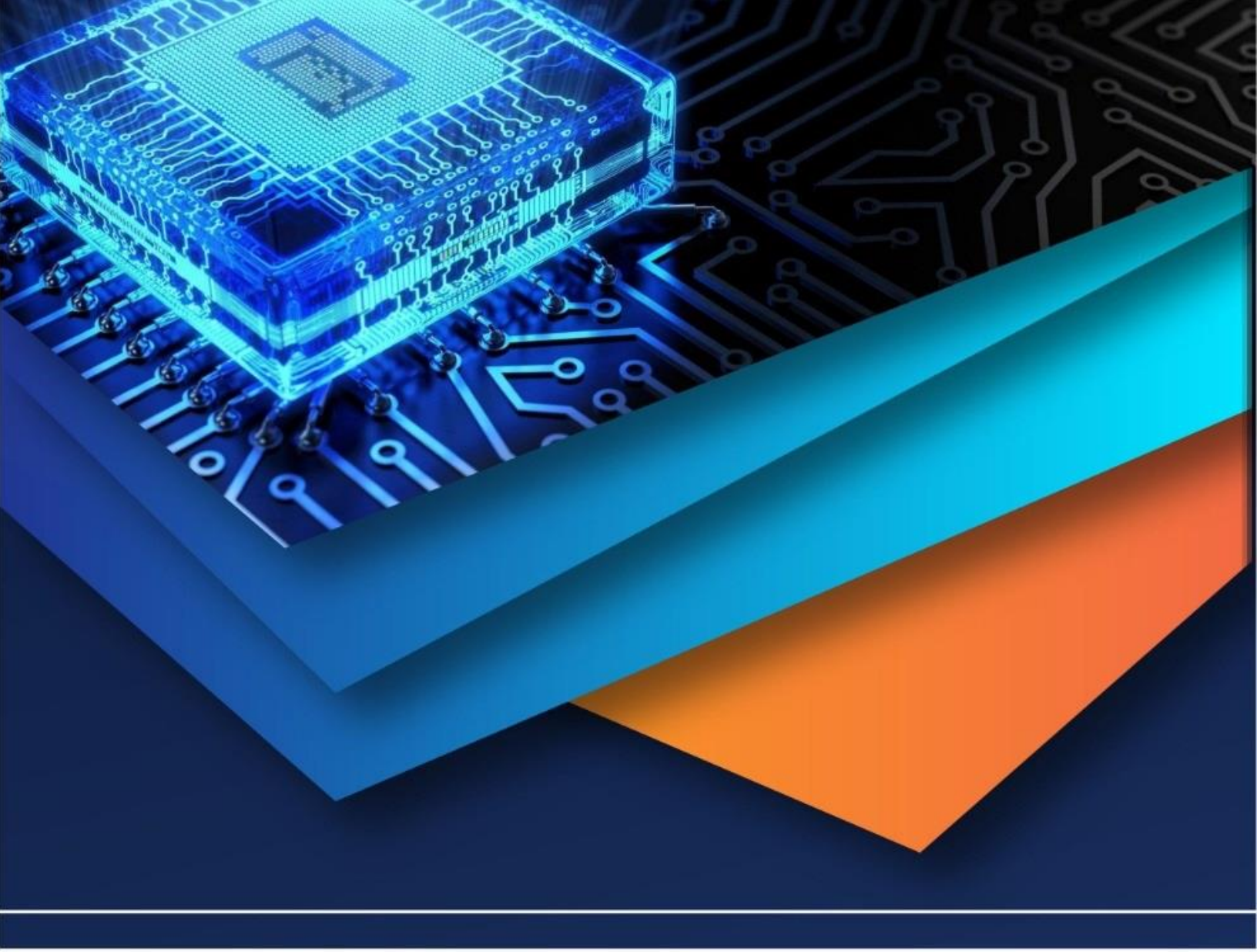
Fig 14 Packet Delivery Ratio (PDR)

VII. CONCLUSION

We have used the technique of Location-Aided ZRP for broadcasting the packets, based on the concept of zone leaders. The parameters evaluated include the average delay and the total packets received. Average Delay remains minimal within the range 200 to 250m, and increases beyond 250m. Total Packets Received as well as the normalised routing load is more within the range of 200 to 300m, and decreases beyond 200m. Hence 200-300m is the optimum range for transmission.

REFERENCES

[1] Kumar, P. Sateesh and Ramachandram, S., "Load Balancing in Genetic Zone Routing Protocol for MANETs", International Journal of Computer and Information Engineering, vol. 3(4), 2009, pp. 261-266
[2] Soujanya, B., Sitamahalakshmi, T. and Ch., Divakar, "STUDY OF ROUTING PROTOCOLS IN MOBILE AD-HOC NETWORKS", International Journal of Engineering Science and Technology (IJEST), vol. 3(4), 2011, pp. 2622-2631
[3] Schaumann, Jan, "Analysis of the Zone Routing Protocol", 2002, pp. 1-21
[4] Haas, Zygmunt J. and Pearlman, Marc R., "The Performance of Query Control Schemes for the Zone Routing Protocol", IEEE/ACM TRANSACTIONS ON NETWORKING, vol. 9(4), , 2001, pp. 427-438.
[5] Pham Thi Minh Thu, Nguyen Trong Tien and Dong-Seong Kim, "Location Aided Zone Routing Protocol in Mobile Ad Hoc Networks" IEEE, 2015.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY