AUGMENTED ZRP AS A ROUTING PROTOCOL FOR MANET

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ABSTRACT

A Wireless ad hoc network is a collection of mobile nodes like Laptop computers and personal digital assistants with no pre-defined infrastructure and has wireless interface and communicate independently with each other via radio or infrared. With the recent advances in infrastructure less network MANET came into existence. MANETs have several salient characteristics such as Dynamic topologies, Bandwidth-constrained, Energy-constrained operation, Limited physical security etc. Routing is an important challenge in wireless adhoc networks. Proactive and Reactive both have some disadvantages therefore we use hybrid routing protocols to enhance the performance of adhoc networks In this paper, an attempt has been made to compare performance of existing ZRP with modified one (Extended ZRP) on basis of their performance in MANETs. While analyzing existing ZRP some undesirable effects as longer delays, higher routing overhead and lower packet delivery are encountered due to increase in congestion. Subsequently, ZRP is extended by introducing some new parameters so that enhanced performance in MANETs can be achieved while using ZRP as a routing protocol.

KEYWORDS: *MANET (Mobile ad hoc Network), ZRP, Modified ZRP*

I. INTRODUCTION

Mobile Adhoc Network (MANET) is an autonomous collection of mobile devices over relatively bandwidth constraint network or wireless link. A mobile adhoc network (MANET) is infrastructure less and self configuring network. Wireless adhoc or on-the-fly networks are those in which nodes are free to move and organize themselves in an arbitrary fashion. An adhoc network is a temporary connection between computers and devices used for emergency/ rescue operations and for sharing documents during a meeting. Wireless ad hoc networks are very easy to implement and cost effective networks as they do not require any pre-existing infrastructure and base stations. The network topology changes rapidly and unpredictably over time since nodes are mobile. In MANETs all network activities including topology discovery and delivering messages must be executed by nodes themselves. Hence it is said that an adhoc network is decentralized. MANET comprises of mobile router. MANETs are able to operate in a stand-alone fashion or could possibly to a larger network such as internet [5]**.** For users of computing systems mobility is becoming increasingly important. Technology has made possible smaller, more powerful and less expensive wireless communicating devices and computers. Due to which users gain flexibility and the ability to exchange information and maintain connectivity while roaming through a large area. By installing base stations and access point's necessary mobile computing support is being provided in some areas. Mobile users can maintain their connectivity by accessing this infrastructure from office, home, or while on the road.

In all locations where mobile communication is desired this mobility support is not available. Access points may not be set up due to low expected usage, high cost, or poor performance. This may happen in emergency situations like natural disasters and military maneuvers in enemy territory or during outdoor conferences. If mobile users want to communicate in the absence of a support structure, they must form an *adhoc network.* In this chapter, we look at mobile adhoc networking in closer detail.
Application area of MANET is diverse, ranging from small, static networks to large scale mobile, highly dynamic networks. For e.g. mobile adhoc network can be used to provide crisis management service applications where any infrastructure could be setup in hours for example is case of disaster recovery. Also uses of MANETs involve business environment where collaborative computing is more important [12].

II. MANET ROUTING PROTOCOL

Pro-active protocols follow an approach similar to the one used in wired routing protocols. Pro-active or table-driven protocols require constants updates, in order to maintain the

constantly changing network graph due to new, moving or failing nodes, which may consume large amounts of bandwidth. And since the bandwidth is often sparse it is clearly a drawback of the wireless world. Additional to this drawback, much of the accumulated routing information is never used, as routes may be active only for very less amount of time.In contrast, reactive protocols determine the proper route only when it is needed, which means, when a packet needs to be forwarded. When the packet needs to be forwarded, the network is flooded with a route request by the node and builds the route on demand from the responses it got. The drawback of this technique is that's it can causes delays since the routes are not already available but advantage is that it does not require constant broadcasts and discovery. Additionally, the flooding of the network with a route request may lead to additional control traffic, again putting extra effort on the limited bandwidth.
As explained above, both a purely proactive and purely reactive approach to implement a routing protocol for a MANET has their disadvantages. The *Zone Routing Protocol*, or ZRP, combines the advantages of both of these routing protocols into a *hybrid protocol*, using advantage of pro-active discovery within a node's local neighborhood, and taking advantage of communication between these neighborhoods of reactive protocol [4]. But its performance is also not up to the mark. So we use centrality and varying zone radius concept to modify the ZRP to increase its efficiency so that problems like routing overhead, congestion, packet loss, etc can be minimized.Therefore efficient functioning of MANETs requires something extra which can be fulfilled by modifying ZRP.

III. PROPOSED WORK

3.1 Approach used for modification in ZRP:

While comparing original ZRP with we notice that ZRP gives an average performance [4]. For ZRP there are some concerns. Our main idea is to modify ZRP in such a way so that instead of simple hop count a new routing metric decide a route. This new routing metric depends on centrality and varying zone radius. In case of multiple paths from source to destination, a route with lowest centrality is chosen. Proposed Pseudo Code: To determine less loaded routes we make use of two concepts namely Path Rating and Centrality.

A. Computation of Centrality

1. Source node S sends a Route Request (RREQ) message including the size of its routing table as its centrality:
   $E_1 = size(rtable(s))$
2. Upon receipt of this message, neighbor node V_1, not knowing a route to the solicited destination, acquires $p(n) = p(1)$ and $n = 1$ from the received RREQ message and diffuses a modified replica with the novel average centrality:

$$E_2 = \frac{1}{2}E_1 + \frac{1}{2}size(rtable(X_1))$$

3. Iteratively, for an n^{th} intermediate node V_n, the novel average eccentricity:

$$E_{n+1} = \frac{n}{n+1}E_n + \frac{1}{n+1}size(rtable(X_n))$$

4. Finally, when destination node 'D' receives messages from various possible paths to S, it simply chooses the route having smallest average centrality.

Therefore, we will choose the path which is having lowest centrality and will use varying zone radius for ZRP as for highest zone radius performance of ZRP will also be high.

3.2 Performance Metrics used

The metrics which are used to evaluate performance of MANETs routing protocols are as follows:

1. Packet Delivery Fraction: It is defined as the ratio of all received packets at the destinations to all transmitted packets from CBR source. The packet delivery ratio is the fraction of packets that successfully arrive at their destination.
2. Throughput: It is defined as the ratio of data packets received to the destination to those generated by source. Throughput is average rate of packets successfully transferred to their final destination per unit time.
3. End-to-End Delay: It is the average delay time for a data packet travelling from its source to destination. It signifies the amount of time taken by packet from source to destination. The delay time of all successfully received packets is summed, and then the average delay time is calculated.

All the above mentioned performance metrics are quantitatively measured. For a good routing protocol, throughput should be high where as other three parameters value should be less. We used the above performance metrics and quantitatively measured against number of nodes and pause time.

IV. RESULT AND ANALYSIS

Simulation is the imitation of the operation of a real world process over time. Various simulation are available like QualNet ,OPNET and NS2 etc .Here , simulation work is done on NS2.NS2 is an object orient simulation and is extensively used by research community. It consists of C++ core methods and uses Tcl and Object Tcl shell as interface allowing the input file (simulation script) to describe the model to simulate [8].This section will do analysis on ZRP and Modified ZRP .Also performance evolution is done on the basis of different parameters.

Simulation Parameters Used

Parameter	Value
Platform	Linux CentOS 5
NS Version	Ns-2.33
Mobility Model	Random Way Point
Traffic Type	CBR
Area	500 * 500 m
Experiment Duration	150 sec
MAC Layer Protocol	Mac/802_11
Packet Size	512 bytes
Radio Propagation	TwoRayGround
Packet Interval	0.2 second
Protocols	ZRP, Modified ZRP
Antenna Type	OmniAntenna
Packet Size	512 bytes
Pause Time	5, 10, 20, 40, 100
Number of nodes	10, 20, 30, 40, 50

Results are analyzed on the basis of different performance metrics. Graphs shown below shows simulation results are according to network and pause time model i.e. varying number of nodes and changing pause time respectively.

Throughput

Throughput is measured as the ratio of data packets received to the destination to those generated by source. Throughput is average rate of packets successfully transferred to their final destination per unit time.
Figure 4.1 illustrates the simulation results of the throughput for number of nodes for ZRP and modified ZRP. It is evident from the graph that throughput is less when number of nodes is lower and it increase when number of node increases. It is clear from the graph that after doing the modification in ZRP it is showing increased throughput as compared to existing ZRP.

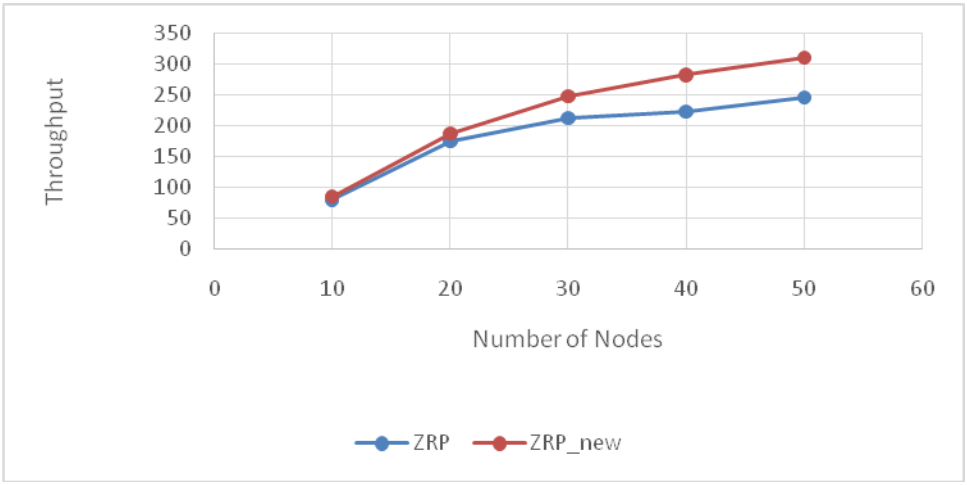

Figure 4.1 Comparison of Throughput v/s Number of Nodes

Figure 4.2 illustrates the simulation results of the throughput against pause time for ZRP and modified ZRP. It is evident from the graph that throughput is less when pause time is lower and it increase when pause time increases. It is clear from the graph that after doing the modification in ZRP it is showing increased throughput as compared to existing ZRP.

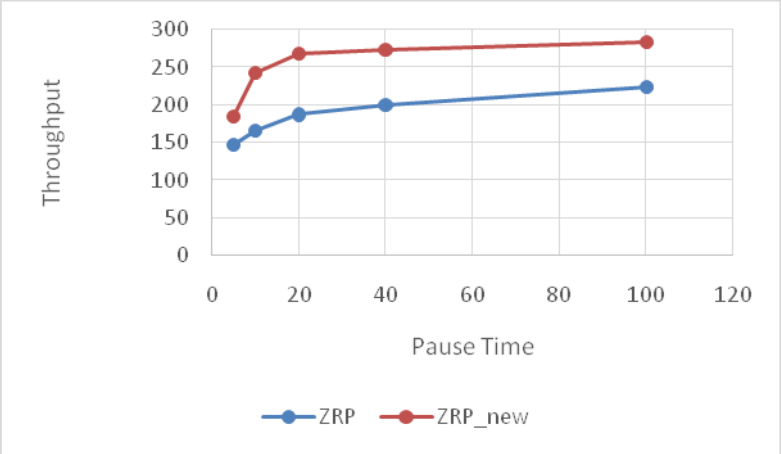

Figure 4.2 Comparison of Throughput v/s Pause Time

V. CONCLUSION

In this study we have concluded that each protocol performs well in some cases while have drawbacks in other cases. We have also incorporates the concept of path metric and centrality in ZRP and shown that it has very good effect on the performance of existing ZRP. Therefore we conclude that by considering concept of zone radius and centrality [3] in ZRP gives better performance as compared to ZRP in almost every the cases. Simulation results demonstrated that the modified ZRP performs lot better as compared to existing ZRP. Simulation result is shown in terms of throughput against number of nodes and pause time.In future work we aim to enhance performance of modified ZRP with the help of 2ACK algorithm which we will use for detection and eliminate of miss behaving nodes that comes in a our path, the path which we adopting for routing (transferring of packet).

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