A Survey on Zone Routing Protocol in MANETs

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Abstract— A Mobile Ad hoc Network is popularly known as MANET and is encompassed of mobile nodes that can interconnect with each other using wireless network. Zone routing protocol or ZRP is a type of hybrid type of routing protocol which gains the benefits of both proactive and reactive protocols. MANET is a self-organizing type of network which means that any mobile nodes can enter or exit the network when they want. This paper discusses various performance issues related to zone routing protocol in MANET.

Keywords—Ad hoc network, ZRP, MANET

1. INTRODUCTION

MANET has promised to be the most favorable area of interest for research and development due to the design challenges and the unique features of MANET such as varying topology and decentralized administration [1]. MANET has found attractive as a research issue for designing of routing protocols for diverse applications requiring various aspects to fulfill. In MANET, dissimilar types of routing protocols are introduced. The routing protocols are generally classified into three main classes. They include reactive protocols, proactive protocols and hybrid protocols. These protocols of MANET have to face the challenge of asymmetric link capacity and changing topology. The most encouraging and famous hybrid routing protocols for ad-hoc networks is ZRP utilizes the advantageous features of both the proactive and reactive approaches. It preserves information of an efficient topography of a zone centered on each node. It is not necessary to start route discovery as routes which are existing immediately within zone. But external to the zone, the ZRP works a route discovery procedure based on the local routing information of the zones.

The routing protocols in MANET suffer from security vulnerabilities, the wireless networks opens to attacks due to the different malicious nodes. All the data packets have been absorbed by black hole attack in the ad-hoc network. They have high packet loss problem. A hybrid detection technique detects the black hole node and removes it which adopts the best features of both reactive and proactive technique. ZRP is the most remarkable and generally accepted and well proved hybrid routing protocol in MANETs based on the performance. This is compared with table-driven and on-demand method of routing. Most of the communication in MANET takes place between nodes which are close to each other. Therefore, ZRP decreases the practical scope to a zone centered on each node. Since all the nodes proactively store

local routing information, all the nodes farther away can be reached with reactive routing.

The overall structure of the paper is defined as follows. In Section II related work is reviewed. Section III gives the architecture of ZRP and Section IV concludes the paper.

2. RELATED WORK

The goal is to concentrate on designing routing protocols which is needed for energy management. To increase the working for longer time of the MANET, it is required to find new methods by the combination of existing protocols. Different types of routing methods have been proposed achieving performance improvement [2].

The process of routing has gained significantly importance in MANETs and considerable attention from researchers within organizations. This has geared up the development of different routing protocols in MANET. These protocols developed arguing and evidencing the performance improvisation gained over a number of different strategies considerations. This has become difficult to decide best suitable for different network scenario and to choose [3]. Normally MANETs prescribes low transmission range and hence they cannot interact with each other. The routes in MANETs consist of multiple hops, and each node can act as potential router also [4].

By adjusting just a single parameter as radius within Zone the ZRP can be configured for a particular network. This in turn allows individual nodes to identify these changes given with only limited knowledge of the network behavior. The authors in [5] introduced two different schemes that allow individual nodes to identify and appropriately react to changes in network configuration, based only on information received from the amount of received ZRP traffic. As the routes get changed due to the movement of hosts within MANETs,

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initiates the process to find new routes. These consequences affect a significant reduction in the number of routing messages [6]. Mean delay, TTL based hop count and packet delivery ratio are used as measures of performance to compare and study the AODV routing, DSR routing and ZRP routing protocols in MANET [7].

The protocols for routing discussed include three types based on the network architecture as flat, hierarchical and geographical routing schemes. The security aspect is the major challenge to be considered for the design of routing protocol in MANET [8-9].

A loop free Distributed Dynamic Routing (DDR) proposed in [10] is bandwidth-efficient distributed algorithm in MANET. DDR benefits from classical concepts like zone forest, it also achieves several goals at the same time. This is infrastructure less means it does not even require physical location information. The zone naming is performed dynamically and broadcasting is reduced prominently.

3. PERFORMACE STUDY OF ZRP

The Fisheye State Routing concept is utilized in ZRP which takes the benefit of a zone with bigger size with reduced overhead to maintain. There are two levels of routing zone in FZRP named as the basic zone and extended zone protocol. Different updating frequencies of changes of link connectivity are associated with the basic zone and extended zone. The FZRP proves to be more efficient when compared with ZRP by simulation based on route calculation [11-12].

The performance of ZRP is considered to be enhanced than the other protocols. However, many waste control packets are used subsequent in the upsurge of network load and decrease of network efficiency. The reduction in the network load due to small number of control packets involvement to search a new route in Selective Border-casting Zone Routing Protocol (SBZRP) and providing better performance enhancement in SBZRP than ZRP[13]. The performance evaluation of ZRP is conducted considering the throughput, load, data dropped and delay as performance parameters using simulators [14]. The decentralized, infrastructure-less MANET allows the mobile nodes to communicate with each other. These features of MANET have posed greater challenges while designing efficient routing protocols.Authors in [15] discussed that ZRP gives high throughput and load increases with the increase in number of nodes. A comparative study of Landmark Ad-hoc Routing Protocol (LANMAR), Location Aided Routing scheme 1 (LAR1), Dynamic MANET on Demand (DYMO) and ZRP is done by varying the pause time. Average jitter,

packet delivery ratio, average end-to-end delay and throughput are considered as the performance metrics [15].

The information about routing in the local neighborhood is maintained by route query method for ZRP in network. ZRP work with the combination of intra-zone routing and inter-zone routing ZRP cannot provide the control traffic reduction which is expected. The zone routing structure for improved detection and prevention of overlapping queries [16] is used by query control schemes proposed in [17]. To improve delay experienced and to limit control traffic these techniques can be used for single or multiple channel.

The multicast ZRP [18] comprises of three elements. Multicast intra zone, Multicast inter zone and border casting routing protocols. The tracking of groups and group members is done by the nodes within their local zone. With reduced route request and hence reduced routing overhead node can join to a group by this tracking. The Multi cast routing protocol (MZRP) architecture has been depicted in Figure 1. The MZRP refers to a kind of multicast routing protocol, which uses proactive approach at each node to maintain the multicast tree membership for node's local routing zone and establishes multicast form of tree reactively. The overall performance is improved with the use of IP tunnel mechanism for data transmission [20].

In a multicast tree, there are two categories of nodes. They include multicast forwarding nodes and multicast group members. The functions of multicast forwarding nodes are to inter connect Multicast Inter zone Routing Protocol (MIERP) and Multicast Intra zone ARP (MIARP). It is finally connected to BRP.
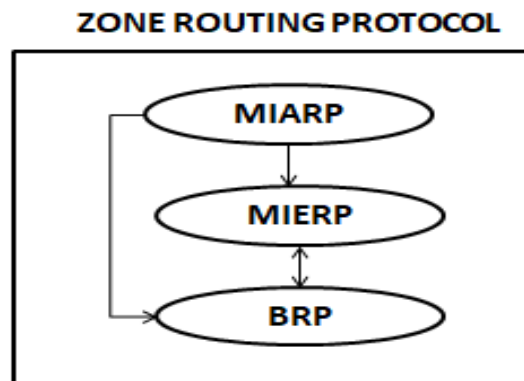

Fig 1: Architecture of MZRP

Authors in [19] have discussed routing being the main part of wireless ad hoc network, approaches proactive and reactive routing have some substantial disadvantage and design of hybrid protocols overcome these. ZRP being hybrid takes best feature of proactive approach by providing reliability within the scalable zone, and uses the reactive approach outside the

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scalable zone. To get best performance the zone radius parameter has to be changed when node density increases.

The Security analysis and security requirements of applications have been focused in [20]. To design and develop efficient secure zone routing protocol for various kinds of security attacks the effect of mobility of the nodes has been studied.

The following are the major advantages of using zone routing protocols usage in MANET.

1. ZRP has the properties of different routing protocols: Performance improvement is gained in ZRP as it is the combination of top features of different routing protocols.
2. Traffic within the network can be reduced: The routing area is divided into manageable zones, hence the traffic can be reduced significantly.
3. Reduces the control overhead: Since the range of distance of routing packets to be forwarded is limited in ZRP, it therefore reduces the control overhead.

4. CONCLUSION

MANET comprises of a number of nodes with moving nature which can communicate with each other without the administration. ZRP protocol sends the network packets without using the node's position within the zone limits. Because of this, the node can discard the packets and waste the power usage if the distance between the source and the destination taken is less compared to the other nodes.

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