International Journal on Future Revolution in Computer Science & Communication Engineering
Volume: 4 Issue: 3
ISSN: 2454-4248
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A Review of Hybrid Algorithm deployed for Mobile Ad-hoc Wireless Network

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***Abstract*—** Networks are developed to share information, they may be wired or wireless. But among the two, wireless networks are widely used such as wireless sensor networks, mobile ad-hoc networks, vehicular ad-hoc networks and Flying ad-hoc networks. While designing wireless networks many issues generated viz. routing, security and reliability, quality of service, power consumption, Energy efficient and multicasting. In this paper a Mobile ad-hoc network is considered which consists of mobile nodes that are communicating with each other without any infrastructure and centralized control. Routing issue that is finding a path from source to destination is discussed using hybrid routing protocol. Hybrid protocol is basically combined form of pro-active and reactive protocols that is to be reviewed in this paper. Zone routing protocol is used to find path from source to destination. This protocol combines the advantages of both proactive and reactive approaches by maintain topological map of a zone centered on each node. Within the zone, routes are immediately available. For destinations outside the zone, ZRP employs a route discovery procedure, which can benefit from the local routing information of the zones.

Keywords- *Mobile ad-hoc network (MANET); Routing; Zone routing Protocol (ZRP); Protocols*

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I. INTRODUCTION

A mobile ad-hoc network is a collection of wireless mobile nodes that dynamically establish the network in the absence of fixed infrastructure. In this type of network mobile hosts, sometimes, simultaneously acting as a router, are connected to one another by wireless links and they can easily move randomly hence network topology dynamically change so this makes an autonomous system of mobile nodes having no base station. In MANET each node has limited transmission range so packets are forwarded from any initiating node to any end point node in a network with the help of multiple hopes [1].MANET has routable networking environment on the top of a link layer. Here each node in a network act at the same time, and these nodes are independent to move freely. Flooding is used to forward data from one node to other one. So because of this the topology changes frequently and suddenly. MANET, the data should be routed by intermediate nodes, and these intermediate nodes will act as a router. Each node can be switched ON/OFF without identify other nodes.

In ad-hoc network, nodes communicate with each other by way of radio signals, which are broadcast in nature. Broadcast is unique case of multicast, wherein all nodes in network should get the broadcast message. Multicasting is a communication process in which the transmission of packets (message) is initiated by a single user and the message is received by one or more end users of the network. Multicasting in wired and wireless networks has been advantageous and used as a vita l technology in many applications such as audio/ video conferencing, corporate communications, collaborative and groupware applications, stock quotes, distribution of software, news etc. Under multicast communications, a single stream of data can be shared with multiple recipients and data is only duplicated when required.

A. Characteristics of Manet

In MANET each node act like as a router and host. Nodes have less memory, power and light weight features. It doesn't require any backbone infrastructure support. MANET is flexible in nature and have dynamic network topology.

B. Applications of Manet

- Local Level: MANET may be used at local level for example at home networks where devices can communicate directly to exchange information between them.
- Military environment: Military equipment consists of some sort of computer equipments. Ad-hoc network can be used in military to maintain the information network between the soldiers, vehicles, and military information head-quarters.
- Commercial Sector: In rescue or emergency operations mobile ad hoc network can be used, e.g. flood, earthquake or in fire.
- Wireless sensor Networks: Mobile nodes contain small sized sensors that can be used to collect real time data i.e. pressure, temperature, etc.

C. MANET Challenges

- Restricted wireless transmission range: The radio group will be restricted in the wireless networks and as a result data amounts it can provide much slighter than what a bound network can provide. This

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involves routing procedures of wireless networks must be use bandwidth in ideal way. This can be achieved through protecting the overhead as minimum as conceivable. The restricted transmission range also enforces restraint on routing procedures for sustaining the topographical information. Particularly in MANETs because of regular variations in topology, preserving the topological data for every node includes more controllers overhead which results in additional bandwidth depletion.

- Time-varying wireless link characteristics: Wireless channel is liable to a range of broadcast disorders such as path harm, declining, intervention and obstruction. These features resist the series, data rate, and consistency of these cordless transmissions. The range of which these features disturb the transmission that rest on atmospheric situations and flexibility of receiver and transmitter. Even two dissimilar key restraints, Nyquist's and Shannon's theorems that rule over capability to communicate the information at diverse data degrees can be measured.

- Routing: In MANETs routing is an important challenge for the performance degradation due to uni-casting, multicasting and geo-casting demands by the network nodes in contrast to single hope wireless networks. It is because of rapid change in network topology and with different mobility speeds.

- Quality of Service: In MANETs quality of service is an important challenge for the differed kind of quality level demands by the network nodes. Its becomes very difficult to fulfill the different levels or priority demands related to quality of service so these network required best control of Quality of Service (QoS)specially in case of multimedia [2].

- Security: In MANET, security is one the important challenge due to its wireless environment. The data of users from one node to another node must be transferred safely and completely. The least privilege principle can also enhance the security of MANET systems as proposed for organizations. Moreover, there are hybrid models are also available that are offering benefits of two access control models with implementations [3] [4].

The rest of paper is organized as: Section II provides the information regarding Routing protocols. Zone routing protocol is described in detail in section III.

II. ROUTING PROTOCOLS

One of the most important and a difficult method to maintain in ad hoc networking is the routing mechanism. An ad hoc routing protocol is nothing but a concurrence between nodes as to how they control routing packets in the middle of themselves. The nodes in an ad hoc network discover routes as they do not have any previous knowledge about the network topology. Routing protocols in MANETs are classified into three different categories.

A. Reactive protocols: It is On Demand routing protocol. Route only create when it required. If a node needs to transmit a packet to another node first check route through on demand and after that create the connection between the nodes. The source node initiates the route discovery segment. There are mainly two stages in reactive routing mechanism after the node needs to send data to the destination. The source node broadcasts Route Request messages and is extend across the complete network. Routes are added to the list one time the Route Reply packets derive from the destination reach the source using different forwarders. Reactive protocols such as DSR, AODV.

B. Proactive Protocols: It preserves the route data when it is needed. It uses an already existing route. These protocols maintain routes to all possible destinations even while a few of the routes may not be required. Every node in the network maintains tables of routes and when the network topology changes, updates are sending across the network. These protocols require nodes to send control packets sometimes to maintain the routes. To maintain all possible routes in a network is difficult because the control packets for route preservation use a lot of bandwidth on links where there is no need of data transfers. These protocols invite a lot of routing overhead. Proactive Protocols are DSDV, OLSR.

C. Hybrid protocols: It is association of proactive And reactive routing. ZRP and TORA are Hybrid Protocols.

III. ZONE ROUTING PROTOCOL

The Zone Routing Protocol is based on the concept of zones. A routing zone is defined for each and every node separately. It is also defined for the zones of neighboring nodes which overlap. Proactive routing uses excess bandwidth in order to maintain routing information. The whole network is flooded by reactive routing for determination of route. The ZRP Protocol defines various problems by combining the best properties we can classify ZRP as hybrid or reactive/proactive routing protocol, in an ad-hoc network the longest part of the traffic would be directed to nearby nodes. Therefore, in ZRP the scope of the proactive is minimized to a zone which is centered on each node. The maintenance of routing information can be done easily. Therefore, the overhead which is related to hierarchical protocols can be easily discarded. These protocols are dependent on the strategic assignment of gateways, so that all levels can be accessed by nodes, mainly the top level. Nodes that should send their belonging to communication to a subnet that is common to both nodes. Congestion may occur in the parts of the network. We can categorize ZRP can be as a flat protocol because different zones overlap each other. Hence, routes can be detected and congestion in the network can be reduced. Further, ZRP has

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adaptive nature. The behavior basically depends on the recent configuration of the network and the various nodes.

A. Routing Zones

Each node S n the network has routing zone. This is the proactive zone for S as S collects information about its routing zone in the manner of DSDV protocol.
If the radius of routing zone is k, each node in the zone can be reached within K hops from S.
The minimum distance of peripheral node from S is k (the radius).

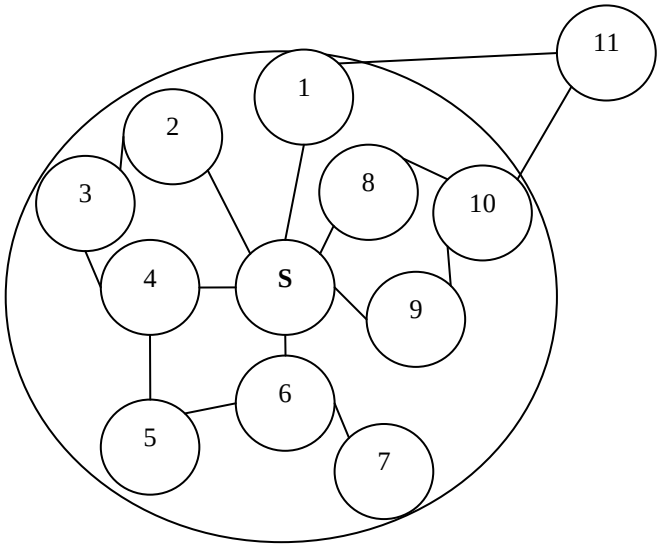

Figure 1: All nodes except 11 are in routing zone of S within radius 2

B. Basic Strategy in ZRP(Zone routing Protocol)

The routing in ZRP is divided into two parts:

1. INTRAZONE ROUTING**:** In intra-zone routing the packet is send within the routing zone of source node to reach the peripheral nodes.

- Each node collects information about all the nodes in its routing zone proactively. This is similar to a proactive protocol like DSDV
- Each node maintains a routing table for its routing zone, so that it can find route to any node in the routing zone from its table.
- Intra-zone routing is done by maintaining a link state table at each node.
- Each node broadcast a message known as a zone notification message.

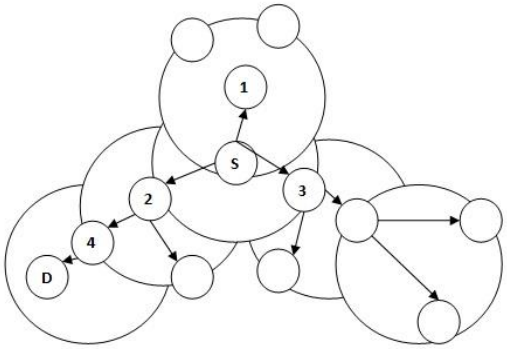

Figure2: S perform route discovery for D

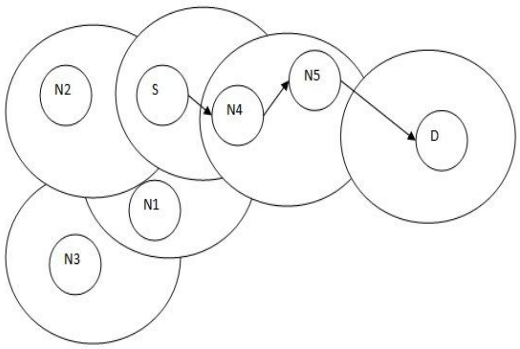

Figure 3: This denotes route reply, E knows route from E to D so route request need not be forwarded to D from E

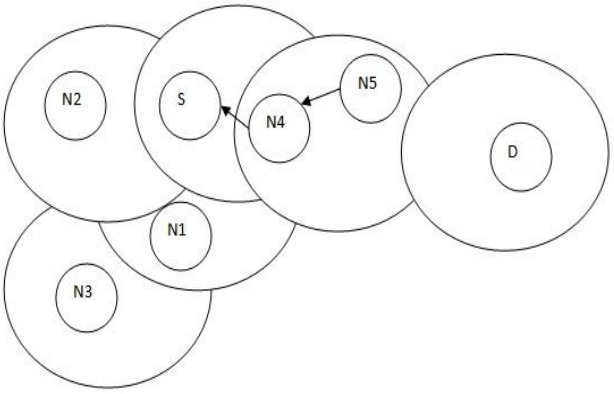

Figure 4: Denotes route taken by data

2. INTERZONE ROUTING: The packet is sent from the peripheral nodes towards the destination node.

- The inter-zone routing discovers routes to the destination reactively.
- Consider a source(S) and destination (D). If D is within the routing zone of S, the routing is completed in the intra-zone routing phase.
- Otherwise, S sends the packet to the peripheral nods of its zone through border casting.

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- The border casting to peripheral node can be done mainly in two ways:
- By maintaining a multicast tree for the peripheral nodes. S is the root of this tree.
- Otherwise, S maintains complete routing table for its zone and routes the packet to the peripheral nodes by consulting routing table.
- S sends a route request (RREQ) message to the peripheral nodes of its zone through border casting.
- Each peripheral node executes the same algorithm.
  -First, Peripheral node checks whether the destination D is within its routing zone and if so, send the packet to D.
  -otherwise, node sends the packet to the peripheral nodes of its routing zone through border casting.

A. ROUTE REPLY IN INTERZONE ROUTING:

- If a node Peripheral node finds that the destination D is within its routing zone, it can initiate a route reply.
- Each node appends its address to the RREQ message during the route request phase, which is similar to route request phase in DSR (Dynamic Source Routing Protocol).
- This accumulated address can be used to send the route reply (RREP) back to the source node S.
- An alternative strategy is to keep forward and backward links at every node's routing table similar to the AODV protocol (ad-hoc on demand distance vector routing protocol). This helps in keeping the packet size constant.
- A RREQ usually results in more than one RREP and ZRP (Zone routing protocol). Keeps the track of more than one path between S and D. An alternative path is chosen in case one path is broken.
- When there is broken link along an active path between S and D, a local path repair procedure is initiated.
- A broken link is always within the routing zone of some node.

B. ROUTE MAINTAINENCE

- Hence, repairing a broken link requires establishing a new path between two nodes with the routing zone.
- The repair is done by the starting node of the link viz. node A by sending a route repair message to node B within its routing zone.

This is like a RREQ Message from A with B as the destination.

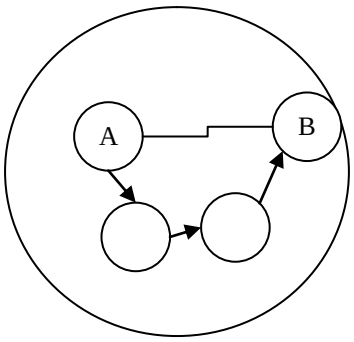

Figure 5:

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