AN EFFICIENT APPROACH FOR COOPERATIVE ROUTING IN MANETS

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ABSTRACT — a mobile ad hoc network (MANET) is also a cluster of volatile nodes, self configuring and infrastructure less and will set at anytime and at any site. Cooperative Communication is a latest research area, it combines the link-quality and broadcasting nature of wireless channels. It is a clearly defect less network layer scheme. Survey created for various MANET routing algorithms. The routing algorithm is to classify three categories: proactive (table driven) and reactive (on demand) and hybrid. The algorithms here considered are CORMAN [1], AODV [7], and ZRP. The evaluation among three routing protocols based on various protocol property parameters [4] such as Route finding, Network transparency, Periodic broadcast, Node overhead, Robustness of link quality variation etc.,

Keywords - Mobile Ad hoc Network, Cooperative communication, AODV, ZRP, Flooding, Route Discovery, Forwarder List

I. INTRODUCTION

A mobile ad hoc network is a wireless environment network [4], where nodes that are not with the direct transmission range will require intermediate nodes to pass the data. It normally works in infrastructure less environment. While working in infrastructure less environment, network layer has most significant problems when it communicates with other nodes. The two most important functions in the network layer are data forwarding and routing. Data forwarding means it shows that how packets are transferred from one link to another. Routing identifies which path a data packet should transfer from source to destination. It finds the path of transferring data packets to the destination through intermediate nodes. Cooperative communication is achieved by using EX OR at the link and network layers of fixed multi hop wireless networks. EX OR is the elegant way for broadcasting packets to the wireless network. Ex OR ensure that packets are forwarded by best forwarder list through intermediate node to avoid duplication. Ex OR [2] transfer data in the form of groups. It reduces the transmission cost by passing data in a group. Here additional functionality is added to Ex OR named as Cooperative Opportunistic Routing in Mobile Ad hoc Networks (CORMAN) [1].

Performance of CORMAN

Light weight routing protocol has the ability of information collection about each nodes in network and it passes the data to all nodes in the network at any time.

It allows opportunistic data routing to another level. When particular packets are missing, it allows some other forwarders that are not listed in forwarder list used to retransmit data.

II. TAXONOMY FOR ROUTING PROTOCOLS

2.1 TABLE-DRIVEN OR PROACTIVE PROTOCOLS

Protocols in this category each node should maintain network topology information in the form of updating routing tables by periodically exchanging routing information. Each node in the group has routing table that contains the information

- Source address
- Destination address
- No of neighbors
- Sequence number
- Path to data transfer

Examples of Proactive Routing Protocol are Destination Sequenced Distance Vector (DSDV), CORMAN, Proactive source routing protocol (PSR).

2.2 REACTIVE OR ON-DEMAND ROUTING PROTOCOLS

On-demand routing don't use table to store the network information. It finds the path to transfer the data packets in an on-demand manner by flooding the route request throughout the entire network. Once a path is established, source node starts send the data packets and receive the acknowledgement from the neighbor nodes.

Example of reactive routing protocol is ad hoc on-demand distance vector routing (AODV).

2.3 HYBRID ROUTING PROTOCOLS

Hybrid routing combines the best features of the reactive and on-demand routing scheme. Nodes are separated into particular zone of the network. Group of nodes are joined in a particular zone. All the nodes in the zone have similar properties. Table driven approach maintains table for storing information about nodes. Table driven approach is used for internal zone routing. On-demand approach is used for the nodes outside a particular zone.

Example of hybrid routing protocol is zone routing protocol (ZRP).

III COOPERATIVE OPPURTUNISTIC ROUTING SCHEME

It is a pure network layer solution for data transfer in MANETs. It enables good data transmission in networks and resolves the problem of path failure. It is an extension to Ex OR [2] for storing information about node location. In MANETS nodes are not stable. Movement of nodes mobility is stored for future use.

3.1 CHALLENGES [4]

1) Overhead in route calculation

Every source node has complete routing information about how to transfer data packets to any node within the network at any time.

2) Forwarder list adaptation

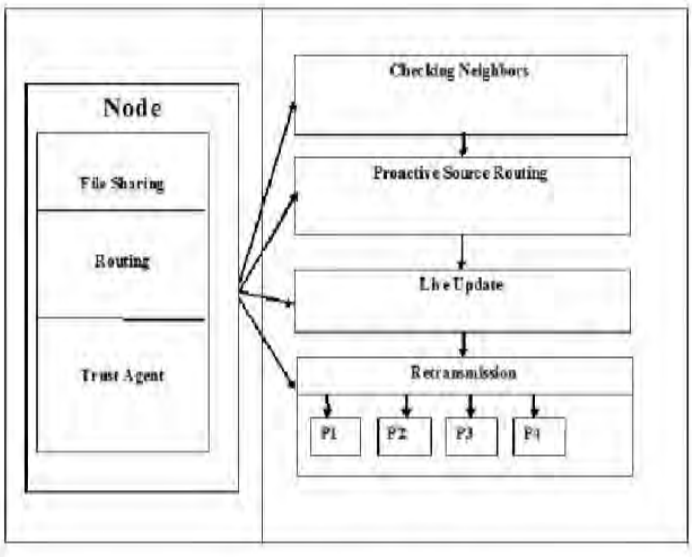
Intermediate nodes are listed in the forwarder list before packets transfer. Nodes listed as intermediate are stored in the forwarder list. It has the ability to update the path in the network. If path failure occurs,

it suddenly updates the new route to the destination.

3) Robustness against link quality deviation

Routing faces the problem of link quality deviation because of the overload or congestion. It results path failure in the network. A small forwarder list is maintained within the network. Forwarder list contains list of intermediate nodes. It forwards the packets towards the weak links in the network.

3.2 ARCHITECTURE DIAGRAM OF COOPERTIVE ROUTING



NEIGHBOUR LIST

It finds the information about the neighbor and stores the nodes information in the neighbor list. It maintains the list of neighbor to communicate. It can send and receive the packet through the neighbors to the destination. It maintains the node id, distance, hop no, in the neighbor list. It selects the desired route for data transfer. Each source node finds the path to the destination for data transfer in the network.

PROACTIVE SOURCE ROUTING

It is a source routing algorithm. Every node collects information about all the nodes in the network. Each node broadcast information to its neighbors. It performs BFS search among all the nodes. It finds the shortest path to the destination. It converts general rooted tree into binary tree. Two bits are attached to indicate as left and right child in compact tree representation. It provides

- Overhead reduction
- Loop prevention
- High data transportation services in MANETs.

LARGE SCALE LIVE UPDATE

Group of packets are forwarded towards the target node. Source node transfers the packet to the subsequent intermediate node. Intermediate node forwards the data packets to the next node in the forwarder list. If any route failure occurs, intermediate node should have capability of updating new route to the destination. Forwarder list are maintained according to the new route in the network.

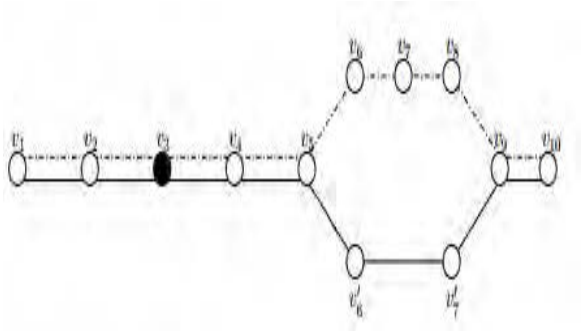


Fig 1.Route Update

Figure shows that the source node v1 passing the data towards destination node v10. Routing path decides the best path to v10 is v1v2v3v4v5v6v7v8v9v10. It is named as original forwarder list. Changes in routing indicates a fresh route to the destination e.g. v3v4v5v6'v7'v9v10 it replaces the forwarder list from source to the target (i.e., v3v4v5v6v7v8v9v10) with this novel route. Forwarder list carried by these data packets are v1v2v3v4v5v6'v7'v9v10 replaces the original forwarder list it indicates change in path to the destination.

SMALL SCALE RETRANSMISSION

CORMAN splits data packets in the form of batches and it transfer the packets throughout the network. Based on our assumption in figure, there are two repeated forwarders on the batch list. F1 and f2 are the forwarders and node r is located anywhere between f1 and f2. After f2 has completely transmitted the packets, node r compares data packets in f1 and f2. Node r knows which packets are missing in f2. It is able to retransmit the missing packets within the network. CORMAN guarantees at most one node should able to retransmit the missing packets.

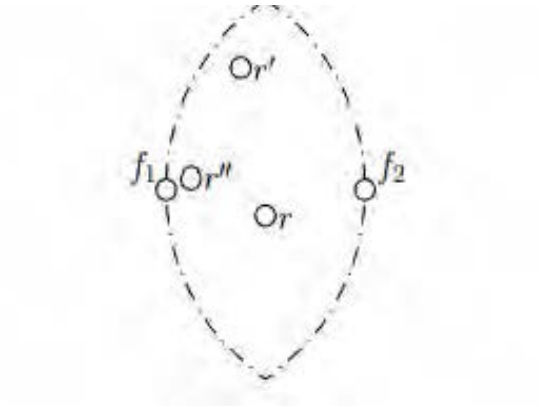


Fig 2.Retransmission Region

IV ADHOC ON-DEMAND DISTANCE VECTOR ROUTING PROTOCOL

AODV [7] is an on-demand approach for path finding, it finds the needed path when source node has data packet to send to the destination node within the network. Main concept in AODV, source node and intermediate nodes should have information about next hop for dataflow. It enables data transmission in the selected path of the network. In on-demand routing protocol when route is not available, it flood the Route Request to all the nodes within the network. It finds multiple different routes by flooding a single Route Request within the network. While comparing AODV with other reactive routing protocol, AODV use destination sequence number (Dest Seq Num) to find the path to the destination. A Route Request carries the identity of source (Src ID), identity of destination (Dest ID), source sequence number (Src Seq Num), destination sequence number (Dest Seq Num), broadcast identifier (Bcast ID), and time to live field (TTL). In an on-demand routing, route request are flooded to all the nodes within the network to form the path. It delivers the packet to all nodes, if it has valid path to the destination.

V ZONE ROUTING PROTOCOL

Zone routing protocol is a hybrid routing protocol combines best features of both proactive and reactive routing protocols. It employs proactive routing scheme for the nodes within a zone and reactive routing scheme is used for the nodes outside the zone. An intra-zone routing protocol (IARP) is used for a particular zone which employs proactive routing. The reactive routing protocol is used outside the zone and is referred to as inter-zone routing protocol (IERP). Zone routing splits the nodes into the separate group. Group of nodes are joined together to form a zone of the network. Nodes which have similar properties are joined together to form a zone. When a source node ‘s’ has packets to sent to the destination node ‘d’, it identifies whether node d is belongs to its zone or outside the zone. If the destination node belongs to the zone of the network, then it delivers the packet directly to all the nodes in the zone through the path. If not, node s floods the route request packets to all the nodes which are located outside the zone.

VII COMPARITIVE STUDY

TABLE1 PERFORMANCE OF ROUTING IN HIGH MOBILITY

High mobility and High traffic				
Protocol	End to end Delay	PDR	Throughput	Jitter
CORMAN	Low	Average	Good	Low
AODV	Average	Average	Average	High
ZRP	High	Low	Average	Average

VIII CONCLUSION

The evaluation among the three routing protocols CORMAN, AODV, and ZRP are analyzed in NS2 simulator. Measurement of routing protocols show that CORMAN has better performance among all the three protocols. In CORMAN, it transfer a data packet along the route, it continues its approach from the source to the destination node. It finds the route earlier by using proactive source routing protocol. It collects all nodes information before transmitting the packets. It identifies all the possible paths and the shortest route to the destination in the network. The CORMAN protocol is mainly designed for the purpose of cooperative communication and observed the major routing performance in MANETs.

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