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Performance Comparisons of AODV, CORMAN and ICORMAN

Ashwini R. Jadhav[1] and Navnath D. Kale[2]

[1]PVPIT, Pune, India
[2]PVPIT, Pune, India
E-mail: [1]jadhavashwini567@gmail.com, [2]navnath1577@yahoo.co.in

Abstract: *Sometimes there is need for creating immediate network; in that case we use mobile ad-hoc networks. This type of network can be form without any wired and without any centralized control. There is no any pre existing infrastructure available. The nodes are always moving randomly and hence topology control becomes the critical issue in this type of networks. Therefore, routing is the major problem in MANET. Various routing scheme are there in MANET like DSR, DSDV, AODV, CORMAN, ICORMAN etc. All these are protocols in MANET and they are best suited for different network condition. However, from the recent survey, AODV, CORMAN and ICORMAN are good performance driving protocols. This paper attempts to presents comparative performance of AODV, CORMAN and ICORMAN.*

1. INTRODUCTION

Mobile Ad-hoc network (MANET) can be defined as a network that has free nodes often composed of mobile devices or other mobile pieces that can arrange themselves in various ways. A mobile ad hoc network is a decentralized network of nodes with radios, possibly mobile, sharing a wireless channel and asynchronously sending packets to each other, generally over multiple hops [1]. The most notable characteristics of mobile ad hoc network are a lack of infrastructure, multihop communication by cooperative forwarding of packets, distributed coordination among nodes, dynamic topology, and the use of a shared wireless channel [4, 6]. All these characteristics affect on the routing mechanism of MANET. To find and maintain routes between nodes in a dynamic topology using minimum resources is called as routing in MANET. The network layer provides the critical service of routing packets between remote nodes. The dynamic nature of ad-hoc networks coupled with the lack of hierarchy makes routing very difficult in mobile ad hoc networks. To make this process simple we can use routing protocols. A generic term routing protocol refers to a formula, or protocol, used by a router to determine the appropriate path over which data is transmitted. The routing protocol also specifies how routers in a network share information with each other and report changes. The routing protocol enables a network to make dynamic adjustments to its conditions, so routing decisions do not have to be predetermined and static [11]. Various routing protocols presented in the MANET like DSR, DSDV, ZRP, AODV, CORMAN, ICORMAN, etc.[7] Performance of each protocol is different and each of them is best suitable for different network scenarios [2]. However, AODV is one of the best performances driven routing protocol in most of the network scenario. But, CORMAN gives higher throughput in some network problems. Also, ICORMAN works well than CORMAN and AODV. In this paper we attempt to present the comparative performance of AODV, CORMAN and ICORMAN.

2. AD-HOC ON DEMAND DISTANCE VECTOR ROUTING PROTOCOL (AODV)

Ad-hoc On Demand Distance Vector Routing (AODV), a novel algorithm for the operation of ad-hoc networks. In this protocol routes are obtained as needed i.e. on demand with little or no reliance on periodic advertisements. In general there are three factors which need to consider for the on demand routing protocols such as route discovery, data forwarding and route maintenance. First step to transmit the data from source to destination is to do the route discovery, and then transfer the data packets. As we know that the network topology of the MANET is not fixed and is changing frequently which leads to the frequent route changes even while transmitting the data, in such conditions again better routes formed and start the data transmission from the point from which routes got disconnected, this mechanism is called the route maintenance [5].

3. COOPERATIVE OPPORTUNISTIC ROUTING PROTOCOL IN MANET (CORMAN)

CORMAN is a network layer the opportunistic data transfer scheme in the mobile ad hoc networks. In that node coordination is largely than EXOR and is extension to EXOR in order to accommodate node mobility [14]. CORMAN supports to the proactive source routing (PSR), the large scale live update and small scale retransmission. CORMAN tackle the problem of opportunistic data transfer in MANET [8].

Nodes in the network use a lightweight proactive source routing protocol to determine a list of intermediate nodes that the data packets should follow en route to the destination. Here, when a data packet is broadcast by an upstream node and has happened to be received by a downstream node further along the route, it continues its way from there and thus will arrive at the destination node sooner. This is achieved through cooperative data communication at the link and network layers. The following steps are used for the implementation of communication among mobile nodes using CORMAN [9].

Step 1: Forwarder list info and Neighbor list creation
A node called "Forwarder node info" which invokes to create a list called neighbor list. The neighbor list holds all nodes information like distance, node id, tiers etc. From the neighbor list each source nodes get their destinations node id and other details for the data transfer [10].

Step 2: Proactive Source Routing (PSR)
PSR, a routing protocol, runs in the background so that nodes periodically exchange network information. PSR is inspired by path finding and link-vector algorithms but is lighter weight. The source node gets the destination list by which the shortest path route will be evaluated with their neighbor nodes list. In that neighbor list searching for the destination will be taking place. If the information about the destination is not available means forward to that neighbor node, from which the searching for the destination happens. The process will be repeated till a shortest path to the destination become available [13].

Step 3: Live Update
When data packets are received by and stored at a forwarding node, the node may have a different view of how to forward them to the destination from the forwarder list carried by the packets. Since this node is closer to the destination than the source node, such discrepancy usually means that the forwarding node has more updated routing information. In this case, the forwarding node updates the part of the forwarder list in the packets from this point on towards the destination according to its own knowledge. When the packets with this updated forwarder list are broadcast by the forwarder, the update about the network topology change propagates back to its upstream neighbor. The neighbor incorporates the change to the packets in its cache. When these cached packets are broadcast later, the update is further propagated towards the source node. Such an update procedure is significantly faster than the rate at which a proactive routing protocol disseminates routing information [14].

Step 4: Retransmission
A short forwarder list forces packets to be forwarded over long and possibly weak links. In case a packet of message missed mean we retransmit the packet from last sending node not from the source, due to that packet delay was reduced [12, 14].

4. IMPROVED COOPERATIVE OPPORTUNISTIC ROUTING PROTOCOL IN MANET (ICORMAN)

ICORMAN is nothing but an Improved Cooperative Opportunistic Routing Protocol in MANET. This protocol is based on CORMAN routing protocol in MANET. The CORMAN protocol tackles the problem of opportunistic problem in MANET and hence ICORMAN also having the ability of opportunistic data transfer. But CORMAN does not make the proper utilization of available bandwidth and hence the channel reuse. Simply, CORMAN does not make proper allocation of channel for communication. ICORMAN remove this limitation of CORMAN by using ant colony optimization algorithm. ACO select path with minimum cost and makes the better utilization of channel by making proper utilization of available bandwidth of channel & improves the routing performance of MANET than AODV as well as CORMAN routing protocol [3].

5. COMPARATIVE PERFORMANCES OF AODV, CORMAN AND ICORMAN

Following graphs shows performance of AODV, CORMAN and ICORMAN for five numbers of nodes.

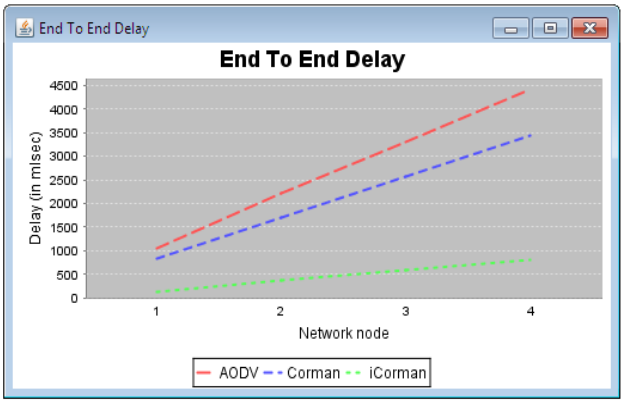

Fig. 1: End to End Delay Vs. Network Node

Above Fig. 1 shows the end to end delay performance of AODV, CORMAN and ICORMAN for 5 numbers of mobile nodes. In this when communication takes place using AODV protocol end to end delay is higher from sender to each receiver. For CORMAN it is little bit less than AODV but for ICORMAN end to end delay is very less.

Above Fig. 2 shows the throughput performance of AODV, CORMAN and ICORMAN for 5 numbers of mobile nodes. When communication takes place using AODV protocol throughput result of communication is less. For CORMAN it is little bit higher than AODV but for ICORMAN throughput result is high than both AODV and CORMAN.

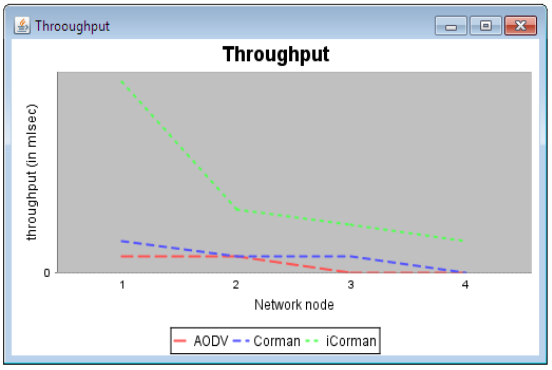

Fig. 2: Throughput vs. Network Node

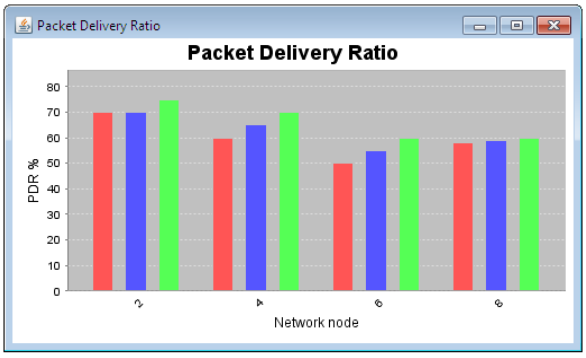

Fig. 3: Packet Delivery Ratio vs. Network Node

Above Fig. 2 shows the packet delivery ratio of AODV, CORMAN and ICORMAN for 5 numbers of mobile nodes. When communication takes place using AODV protocol packet delivery ratio is less. For CORMAN it is little bit higher than AODV but for ICORMAN throughput result is high than both AODV and CORMAN.

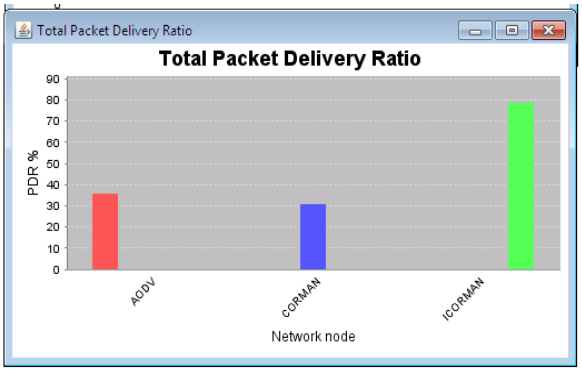

Fig. 4: Packet Delivery Ratio Vs. Network Node

Above Fig. 4 shows the total packet delivery ratio of AODV, CORMAN and ICORMAN for 5 numbers of mobile nodes. When communication takes place using AODV protocol, PDR is 35% only, where as CORMAN shows 30% PDR and ICORMAN have more PDR than both AODV and CORMAN which is 78%.

6. CONCLUSION

The routing performance in MANET is depends upon the use of routing protocols. Comparative graphs shows ICORMAN have higher performance than CORMAN and AODV for packet delivery ratio, throughput and end to end delay. AODV shows very less performance among all. Using ICORMAN performance of MANET can be improved.

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