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MULTICAST ROUTING IN MANET AND PERFORMANCE MEAUUREMENTS OF MULTICAST ROUTING PROTOCOL

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Abstract:-

The widespread use of mobile and handheld devices is likely to popularize ad hoc networks, group-oriented processing has grown extremely. Even so, tiny has become done to-date within combining your systems for group-oriented communication and also mobile phone network. Especially, modern wireless/mobile and also ad hoc systems usually do not supply assistance for multicast broad casting. An essential difficult task is based on changing multicast communication in order to conditions in which mobility can be limitless and also outages/failures are recurrent. Multicasting is the transmission of packets to a group of zero or more hosts identified by a single destination address. Multicasting is intended for group-oriented computing. Typically, the membership of a host group is dynamic: that is, hosts may join and leave groups at any time. There is no restriction on the location or number of members in a host group. Host could be a new member of more than a single class during a period. Host doesn't have to become person in friends to help post packets with it. The principle goal on most ad hoc multicast practices should be to create and look after any multicast sapling or mesh in the face of any mobile phone setting, having rapid side effects to help network modifications in order that the packet damage is actually decreased.

Keywords:- MANET, Multicast Routing protocol, Routing Performance,

1. INTRODUCTION

Multicasting would be the transmission associated with packets in order to a gaggle of zero and up serves discovered by a solitary getaway address. Multicasting is supposed for group-oriented research. Normally, your membership right of a host class is dynamic: that may be, serves may sign up for and leave organizations whenever they want. There isn't any constraint about the location as well as quantity of associates inside a host class. A number might be a associate in excess of 1 class at a time. A number won't have to become a person in friends in order to deliver packets for it. Presently, tough setting for multicast is often a mobile ad hoc circle (MANET). The MANET includes a dynamic variety of nodes using at times easily changing multihop topologies which might be made up of fairly low-bandwidth mobileular back links. There isn't any predictions of actual set infrastructure. Nodes are free to shift with little thought. Due to the fact just about every node carries

a constrained transmission variety; don't assume all packets may accomplish all the intended serves. To deliver connection through the total circle, any source-to-destination path could possibly pass through a number of advanced beginner next door neighbor nodes. For instance, two nod as may communicate immediately with one another on condition that they may be in just about every other's transmission variety.
Within mobile ad hoc systems, three essential types of multicast algorithms are discovered. The trusting technique is usually to just overflow the circle. Each node getting information huge amounts it in order to a directory of neighborhood friends. Inundating any circle serves just like a chain response in which can result in rapid expansion. This positive technique pre computes path ersus to any or all possible places and outlets these records in redirecting dining tables. To keep up an up-to-date repository, redirecting data is periodically dispersed throughout the circle. A final technique is usually to create pathways in order to different serves with need. The theory is founded on any query-response procedure as well as reactive multicast. Inside the problem cycle, any node explores the earth. When the problem extends to your getaway, the response cycle commences and determines the road.

2. MULTICAST PROTOCOLS IN MOBILE AD HOC NETWORKS

In the highly dynamic environment of mobile ad hoc networks, the traditional multicast approaches used in wired networks are no longer suitable. Because nodes in these networks move arbitrarily, network topology changes frequently and unpredictably. Moreover, bandwidth and battery power are limited. These constraints, in combination with the dynamic network topology, make multicasting in mobile ad hoc networks extremely challenging. The general solutions used in the protocols to solve these problems are: avoid global flooding and advertising, dynamically build routes and maintain memberships, etc.Multicasting techniques in MANETs can be classified based on group dynamics or network dynamics. Multicast communication is a means of achieving one-to-many and many-to-many communication. A source or a set of sources send data to a group of interested receivers. Broadcast is a special case of multicast where all the nodes in the network are interested receivers or group members. Multicasting is an interesting and important communication paradigm as it models several application areas viz. subscription services (news groups, TV, radio), collaboration or conferencing services (eg. virtual conferencing) etc. In an ad hoc environment, hosts generally co-operate as a group to achieve a given task, thus the MANET model is a suitable environment for the multicast paradigm. Also the multicast model improves network utilization through mass data distribution, which is ideal for bandwidth constrained networks like MANETs. Therefore multicast communication is very important in ad hoc networks. Multicasting techniques in MANETs can be classified based on group dynamics or network dynamics.

2.1 On Demand Multicast Routing Protocol (ODMRP)

ODMRP is mesh-based and uses a forwarding group concept. A soft- state approach is taken in ODMRP to maintain multicast group members. No explicit control message is required to leave the group. In ODMRP, group membership and multicast routes are established and updated by the source on demand. Consider the example in Fig 2.1. The source *S*, desiring to send packets to a multicast group but having no route to the multicast group, will broadcast a JOIN_DATA control packet to the entire network. This JOIN_DATA packet is periodically broadcast to refresh the membership information and update routes.

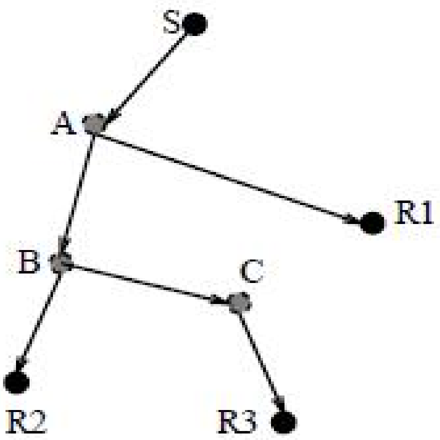

Figure 2.1: An example of ODMRP

When an intermediate node receives the JOIN_DATA packet, it stores the source ID and the sequence number in its message cache to detect any potential duplicates. The routing table is updated with the appropriate node ID (i.e., backward learning) from which the message was received for the reverse path back to the source node. If the message is not a duplicate and the time-to-live (TTL) is greater than zero, it is rebroadcast. When the JOIN_DATA packet reaches a multicast receiver, it creates and broadcasts a JOIN_TABLE to its neighbors. When a node receives a JOIN_TABLE, it checks to see if the next hop node ID of one of the entries matches its own ID. If it does, the node realizes that it is on the path to the source and thus is part of the forwarding group and sets the FG_FLAG (forwarding group flag). It then broadcasts its own join table built on matched entries. The next hop node ID field is filled by extracting information from its routing table. In this way, each forward group member propagates the JOIN_TABLE until it reaches the multicast source *S* via the selected path (shortest). Fig 2.2 shows how these packets are forwarded to *S*. On receiving JOIN_TABLEs, a node also has to build its multicast table for forwarding future multicast packets. The final multicast table for each host is shown in Fig 2.3. This whole process constructs (or updates) the routes from sources to receivers and builds a mesh of nodes called the forwarding group.

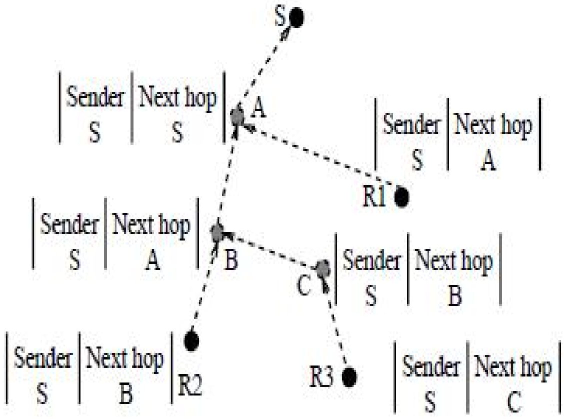

Figure 2.2: Propagation of JOIN_DATA packets

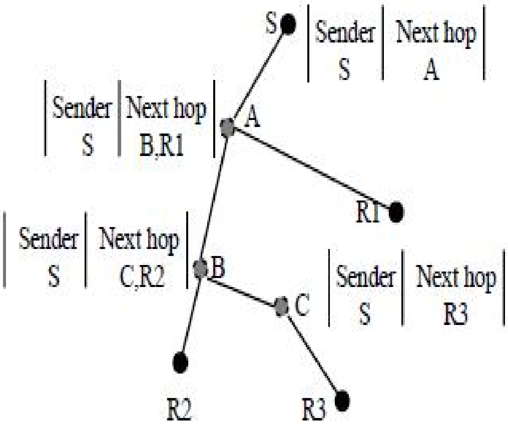

Figure 2.3: Propagation of JOIN_TABLE packets

After the forwarding group establishment and route construction process, sources can multicast packets to receivers via selected routes and forwarding groups. While it has data to send, the source periodically sends JOIN_DAT A packets to refresh the forwarding group and routes. When receiving the multicast data packet, a nod e forwards it only when it is not a duplicate and the setting of the FG_FLAG for the multicast group h as not expired. This procedure minimizes the traffic overhead and prevents sending packets through stale routes.

2.2 Multicast Ad-Hoc on Demand Distance Vector Routing Protocol (MAODV)

As the multicast protocol associated with AODV, MAODV uses the conventional tree-based approach for multicast routing. Besides the routing table, each node maintains a Multicast Route Table (MRT) to support multicast routing. A node adds new entries into the MRT after it is included in the route for a multicast group. Each entry records the multicast group IP address, group leader IP address, group sequence number and next_hops (neighbors on the multicast tree). Each multicast group also needs its own sequence number in order to indicate the freshness of a multicast route, which is maintained by the group leader.

When a node wishes to join a multicast group and it does not know who isthe leader, it broadcasts a RREQ packet with destination field set as the group ID address. If it does not receive a RREP before timing out, it will retry for certain number of times. Subsequent unsuccessful attempts would mean that there are no other members of the group within its connected portion of the network. In such cases, it assumes the group leadership. It initializes the group sequence number to one, and broadcasts a Group Hello packet across the network periodically with step-wise incremented sequence number.

Every node keeps record of who is the leader of which group by promiscuously listening to RREPs. Thus, if it wants to join a group, it may have the address of the leader. If it also has a route to the leader in its routing table, it cans unicast the join RREQ to the leader directly. Otherwise, it will broadcast the join RREQ packet. If a member node loses its route to the group, it broadcasts a normal RREQ when it wants to send data to the group.

If a node receives a join RREQ, it can reply if it is a router on the group's multicast tree and it holds a group sequence number that is high enough, while the group leader always can reply join RREQ. RREP is unicasted, and the responding node updates its MRT accordingly. RREP contains the last known group sequence number, address of group leader, and a special field called Mgroup_Hop.

This field is initialized to zero. When a node on the path to the source node receives the RREP, it increases its Mgroup_Hop field, and updates to its multicast route table.

When the source node receives the RREP, it can determine the hop distance to the nearest router on the group's tree, and a new branch of the tree is also built at the same time. Moreover, the whole multicast tree is gradually built up while branches are added one by one. When a node on the tree receives a packet targeting its group address, it will multicast the packet to all its neighbors on the tree. To ensure loop-free property, it is necessary to make sure only one router on the tree responds the join RREQ. If multiple responses do arrive, the source node should accept only one. All the other responses will be ignored and finally invalidated by expiration timers.

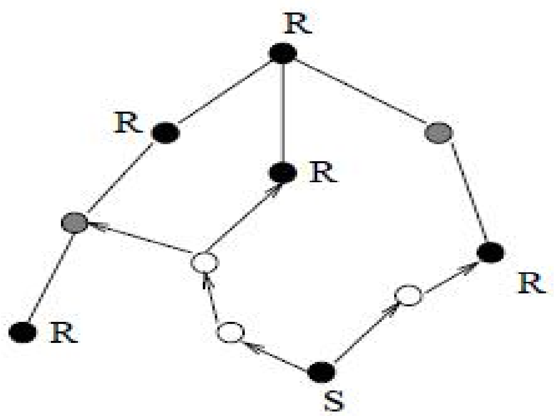

Figure 2.4: The propagation of RREQ packets.

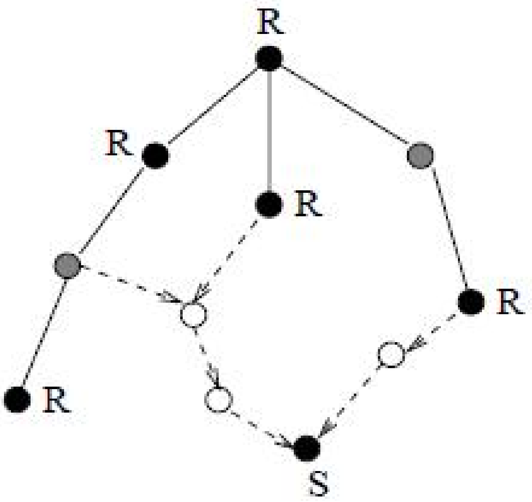

Figure 2.5: The propagation of RREP packets

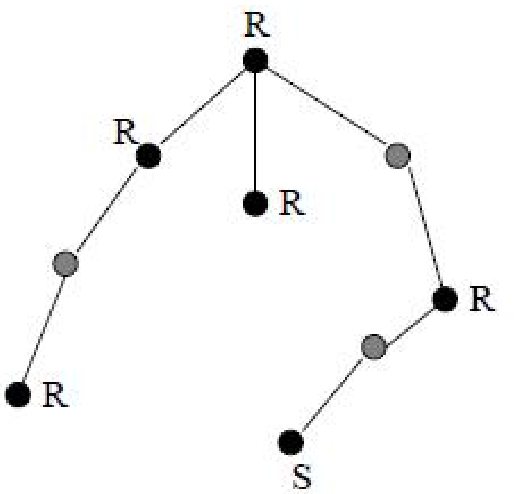

Figure 2.6: The final multicast tree

Since AODV maintains hard state in its routing table, the protocol has to actively track and react to changes in this tree. If a member terminates its membership with the group, the multicast tree requires pruning. Links in the tree are monitored to detect link breakages. When a link breakage is detected, the node that is furthest from the multicast group leader (downstream of the break) is responsible for repairing the broken link.

3. PERFORMANCE MEASUREMENTS

It is difficult to make a quantitative, side-by-side comparison of all existing ad hoc multicast protocols due to the lack of such kind of performance evaluation results. In the context of ad hoc broadcasting, a good comparison can be found in. For ad hoc multicasting, however, different research group have used different simulation environments and parameters, which greatly diminishes the comparability of the simulation result.

In this section, mainly consider three factors,

1. Packet Delivery Ratio – Mobility Speed.
2. Multicast Group Size.
3. Network Traffic.

The research discusses how each of these factors may affect the performance of an ad hoc multicast protocol, and which class of existing protocols is most suited in these conditions.

SNO	Mobility Speed	Packet Delivery Ratio	
		ODMRP	MAODV
1	0.1	1	0.6
2	2	1	0.45
3	4	0.99	0.39
4	8	0.98	0.39
5	19	0.99	0.33
6	37	0.97	0.32
7	71	0.96	0.35
8	71	0.95	0.3
9	72	0.94	0.25

Table 3.1: Comparision of ODMRP and AODV

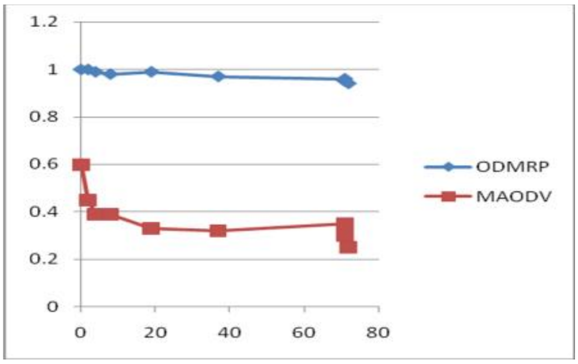

Figure 3.1: Mobility Speed

SNO	Multicast Group Size	Multicast Group Size	
		ODMRP	MAODV
1	5	0.98	0.29
2	10	0.99	0.22
3	20	0.97	0.32
4	30	0.98	0.35
5	40	0.95	0.39

Table3.2Copmparision of Multicast Group Size

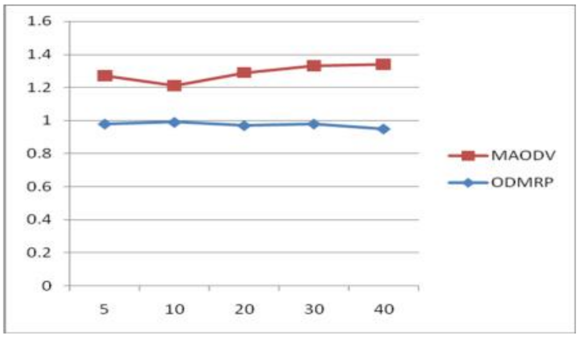

Figure 3.2: Multicast Group Size

SNO	Multicast Group Size	Network Traffic	
		ODMRP	MAODV
1	1	1	1
2	5	1	0.85
3	8	0.99	0.65
4	10	0.94	0.55
5	26	0.95	0.35
6	50	0.8	0

Table 3.3 Network Traffic

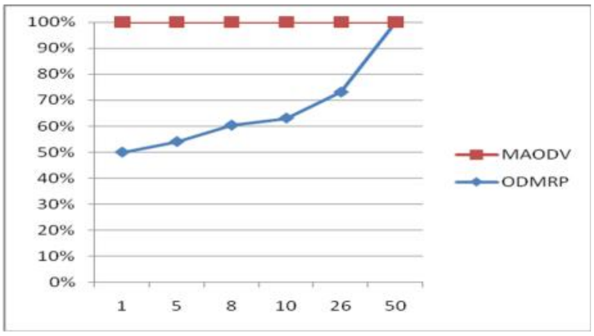

Figure 3.3: Network Traffic

Due to different application scenarios, network size may vary in a vast range, from a small network with tens of nodes, to a large scale network with tens of thousands of nodes. Large scale network surely raises more challenges than a small network. Ad hoc networks may have different degrees of mobility. In a network with high degree of mobility, nodes move relatively fast, which results in rapidly changing topology. In a low mobility or static network, since nodes move slowly or remain stationary, the topology is relatively stable. For a network with high mobility, mesh-based multicast protocols will outperform other multicasting methods. The path redundancy in mesh structure provides robustness against link breaks. In addition to the network size, the multicast group size may be a more interesting factor affecting multicast performance. Reliable group communication is a challenging task due to the dynamic nature in MANETs. When the node mobility is very high, flooding is a viable approach for reliable group communications in MANETs. When the mobility is too high, even simple flooding is insufficient for reliable multicast/broadcast in MANETs.

4. CONCLUSIONS

Several potential purposes of mobile ad-hoc networks hold the need regarding point-to-multipoint verbal exchanges. It is actually thus necessary to provide multicasting support in random networks. In this particular chapter some sort of classification involving multicasting protocols is presented by their dependence on different kinds of nodes or even networking layers. Protocols regarding broadcasting techniques happen to be also presented. Several interesting overarching conditions are common to all or any protocol happen to be also studied. With your advances inside wireless technology plus the applications of random networks, efficient multicasting support can be very essential. Future effort within this context should be targeted to help energy successful multicasting, QoS-aware multicasting as well as cross-layer support for multicasting.

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