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Analysis Of Multicast Routingprotocols (Gbdsr And Maodv)InManet

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Abstract:*Mobile ad-hoc network (MANET) is a collection of mobile nodes and they can communicate without any centralized administrator and hence they can act as a host as well as a router. In an ad hoc network many applications require to share information for group of mobile host. So multicasting plays an important role in ad hoc wireless network. In this paper we discussed the multicasting technique that to be applied on two reactive routing protocols like DSR and AODV. Then compare their performance using NS3 simulator. The performance evaluation can be done based on the quality of service parameters like end to end delay, packet delivery ratio, packet loss ratio for various speed of mobility.*
Keywords:*DSR,AODV, GBDSR, MAODV, End to End Delay, Packet delivery ratio, Packet loss ratio.*

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I. Introduction

Mobile ad hoc network is also known as wireless ad hoc network, is a collection of mobile nodes. Since nodes are mobile, they can change their position at any time and hence topology changes. Since mobile nodes can act as a router as well as host, theycan make direct communication between them or via the intermediate node. In MANET, to send same data to multiple receivers, simply we are using broadcasting, but it consumes more bandwidth and power. So it is better to use multicasting for transmitting same data to groups of destinations.The routing protocols in MANETs are classified as three categories: Proactive (table-driven), Reactive (on-demand) and Hybrid.Here we are choosing the Reactive routing protocolssince they perform better for ad-hoc wireless network.In Reactive routing protocol routes to the destination are not maintained in advance. The route to the destination is created only on demand and soit causes lower overhead.In this paper we have compared end to end delay, packet delivery ratio, packet loss ratio for twomulticast routing protocolsGBDSR and MAODV. This paper organized as follows. Operations of routing protocolsGBDSRandMAODVwe summarized in section 2. Section 3 presents the proposed workforrouting protocols. Section 4 showsexperiments results and analysis. Section 5 gives conclusion.

II. Related Work

2.1 Group BaseDynamic-Source Routing (GBDSR)

GBDSR is an enhancement of DSR protocol, which is a reactive routing protocol which is used for multicast routing in ad hoc wireless network. In GBDSR each node can send the data packets for other nodes and multiple distribution data packets are turned into public distribution data packets while the data packets are distributed across the tree of multiple distribution groups. Here each group has a unique address. Each group is organized on the basis of tree structure and it contains number of members and route finders. Route finders are not group members but they are used for finding the traffic between the group members.

In GBDSR each node contains three tables: Unicast route table, Multicast route table and Group leader table. Unicast route table contains the information about the subsequent hop for the route to the destination and Multicast route table contains the lists of hops for the tree structure of each group. On the other hand Group leader table stores the information about the address of the multicast group with the address of its group leader and the subsequent hop towards the group leader.

2.1.1 Detection and maintenance of route to a special node:

Like DSR protocol, detection and maintenance of route to a node is the main duty of GBDSR protocol. It includes two important facts and they are as follows:

- ✓ The MAC layer is responsible for the detection of the broken in an active route. For that it first checks whether the active route is to the specific node or to the multicast tree. After that it uses Group Hello message for the detection of the broken link.

- ✓ In GBDSR, source node finds a new route for the broken link.

2.1.2. Detection and maintenance of route to a tree

In GBDSR, if the origin node is not a member of the tree, how data packets can be transferred to the other members of the tree, is discussed in this section.

It uses two stage methods. In first stage, if the origin node has the route to the member of the multicast tree, then when message reached to that member from the origin node, easily reached to all the members of the tree. For this it uses the route detection and maintenance mechanism. Here the RREQ message is used, which is similar to the RREQ message of DSR. While sending RREQ message reverse route is created to the origin node, same way as in DSR protocol. This node uses the group leader table where it stores the information about the route for reaching the group leader. Based on this information, RREQ message is send to the group leader. The member of the tree having the information about the group leader can create the route by sending RREQ response packet. All the intermediate nodes and origin node update their route from origin node to the members of the tree using destination address. Thus this route is stored in the unicast route table.

The second stage is used for multicast tree formation. During sending the data packets each nodes checks whether it is placed in the tree or not. If node id not member of the tree, unicast route table seeks itself for finding the subsequent hop to this address. If the information is available in this field it will send packet for that hop. Otherwise it will send the clear RREQ message packet to the origin node. If this is the case, origin node tries to find another route to the multicast address. If a node is the member of the tree, it can easily send packets to multiple destinations based on available information.Otherwise, if a node is not member of the tree, but it wants to become the member, it changes its identification number in its multicast route table from route finder to the group member.

Maintenance of the multicast tree is more complex than that of the detection. The maintenance includes group hello message cast, maintenance of the neighbor connection, selection of group leader, cancellation of membership and merge of tree.

2.2 Multicast Ad-hoc On-demand Distance vector (MAODV)

MAODV is an extension of unicast routing protocol Ad hoc On-demand Distance vector (AODV). Like GBDSR, it is also used for multicasts data packets from a source to number of destination nodes. It uses a bidirectional shared tree where multicast member can join or leave the multicast group. MAODV uses sequence number for each multicast group and from this sequence number user can easily get an idea about the most recent route found to the group. Sequence number is incremented periodically. When a node has more than one route to the multicast tree, it chooses the route with the largest sequence number. Like GBDSR, in MAODV, each node uses three tables: Unicast route table, Multicast route table and Group leader table.

MAODV uses the RREQ and RREP message which are similar to the RREQ and RREP messages for AODV. But it also uses another two messages like MACT and GRPH.

When a node has data packets to send to multicast group, but no route to the member of the group, it uses the RREQ message. When node join the multicast group it set join flag (J) in RREQ message. In RREQ message, destination address is the multicast group address. If the node has a route to the group leader, it places the address of the group leader in the Multicast Group Leader Extension and unicasts the RREQ message to the next for the destination. Otherwise, it broadcast the RREQ for searching the route to the group leader. When a node broadcasts the RREQ message, this can be received by more than one nodes and after receiving, it unicasts RREP message back to the originator of RREQ using the reverse route. So there may be the possibilities of receiving more than one RREP messages by a node. When a node receives more than one RREPs, it chooses the RREP message with the greatest sequence number and lowest Hop Count and discards all other RREPs. If the RREP message is received by intermediate node, it create multicast group next hop entry for the node from which it receives RREP message. When a node broadcast the RREQ message it waits for RREP within RREQ_RETRIES_additional_time. If node receives,updates its route table entry after receiving RREP. Then increment Hop Count and Multicast Group Hop Count field in RREP. A node can send the RREP message only if it is a member of the multicast tree. Otherwise set the Hop Count value as sending node's distance towards the multicast tree.

When a node receives the RREP message, it selects the route it wants to use as its link to the multicast tree and this informed by using MACT message. Node that receiving the MACT message update its Multicast routing table, where it sets the source of a message as a downstream next hop neighbor. When node join the multicast group, set join flag (J) and unicasts the MACT message to the selected next hop and so on up the tree until a node which was already a part of the multicast tree is reached and set the Activated flag for the next hop in the Multicast route table for that node. MACT message contains the field destination IP address which is the multicast group address.

A node wants to join the multicast group and if it is a first node, becomes the multicast group leader. The group leader initializes and maintains the multicast group destination sequence number. It handles the sequence number by periodically broadcasting the GRPH message. GRPH message is used for forwarding group information and repairing the partitioned multicast tree. It contains three fields: Multicast group, Group leader IP and Group sequence number.

III. Proposed Work

In this paper MAODV and GBDSR are simulated and compare this two routing protocols by using Network simulator NS-3.

We have run several simulations for GBDSR and MAODV. The simulation environment is used as follows:

a) Area: 1500 X 300 meters.
b) Number of nodes: 50.
c) Simulation duration: 900 second.
d) Number of repetitions: 7
e) Physical/ MAC layer: IEEE 802.11 at 2Mbps, 250 meter transmission range.
f) Mobility model: random waypoint model with no pause time and node movement speed 5 m/s, 10 m/s, 15 m/s, 20 m/s and 25 m/s
g) Each sender sends two data packets, each 250 bytes long, in second.
h) Each receiver is multicast group member but each sender is not group member unless all 50 nodes are receivers and members of group.
i) Each receiver belongs to a group at the beginning of simulation and senders starts sending data after 30 seconds all senders stop sending data after 900s.
j) Traffic used in this simulation is only multicast.
k) Number of senders is 10 and number of receivers is 20.
l) Traffic model Constant Bit Rate (CBR) is used.

Three criteria measured for the assessment of GBDSR and MAODV are End-to-End delay, Packet delivery ratio and Packet loss ratio.

IV. Experiment Result & Analysis

In this paper, the performance of GBDSR and MAODV is investigated and analyzed based on the result obtained from the simulation. A number of experiments are performed to explore the performance of these two protocols with respect to a parameter mobility speed. Taking CBR as a traffic model the values of end-to-end delay, packet delivery ratio and packet loss ratio are finding out with respect to mobility of nodes.

- End-to-End delay:

End-to-end delay is the time taken by a packet to route through the network from a source to its destination. The End-to-End delay includes all possible delays in the network i.e. buffering route discovery latency, retransmission delays at the MAC and thepropagationandtransmission delay. The following formula is used to calculate end-to-end delay.

$D = 1/n \left({}^{n}\sum_{i=1} (Tr_i - Ts_i) * 1000 \right)[ms]$

Where

D = End-to-End delay
i = Packet identifier
Tr_i = Reception time
Ts_i = Send time
n= number of packets successfully delivered

Mobility speed(m/s)	Delay of GBDSR(ms)	Delay of MAODV(ms)
5	90	150
10	100	160
15	122	205
20	125	255
25	130	310

Table 1: Table shows end-to-end delay for GBDSR and MAODV in various mobility speeds

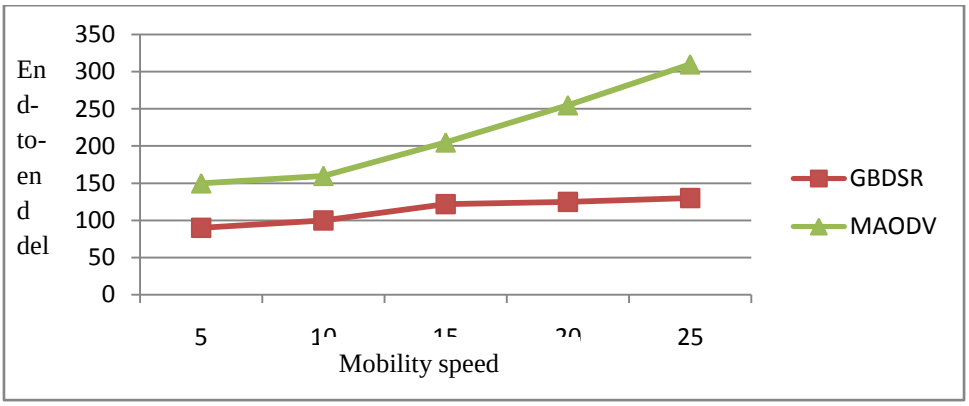

Figure 1: Graph shows end-to-end delay for GBDSR and MAODV vs.mobility speed

- Packet delivery ratio:

Packet delivery ratio is an important metric to measure the performance of routing protocol in any network. The packet delivery ratio can be obtained from the total number of data packets arrived at destinations divided by the total data packets sent from sources. The following formula is used to calculate packet delivery ratio (PDR).

PDR=∑Total packets received by all destination node
Total packets sent by all source nodes.

Speed Mobility(m/s)	PDR of GBDSR(%)	PDR of MAODV(%)
5	91	93
10	90	91
15	85	82
20	82	80
25	75	78

Table 2: Table shows packet delivery ratio for GBDSR and MAODV invarious mobility speeds

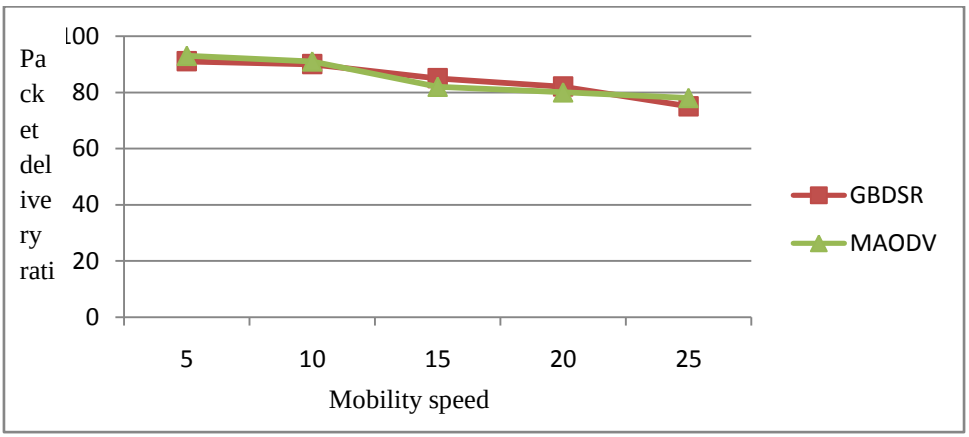

Figure 2: Graph shows packet delivery ratio for GBDSR and MAODV vs. mobility speed

- Packet loss ratio:

Packet loss is the ratio of the number of packets that never reached the destination to the number of packets originated by the source. The following formula is used to calculate packet loss ratio (PLR).

PLR= (nSPackets – nRPackets)/ nPackets * 100
Where
nSPackets = Number of sent packets
nRPackets = Number of received packets

Speed Mobility(m/s)	PLR of GBDSR(%)	PLR of MAODV(%)
5	5	4
10	6.2	6
15	7	6.8
20	8.1	8.8
25	9	9.2

Table 3: Table shows packet loss ratio for GBDSR and MAODV invarious mobility speeds

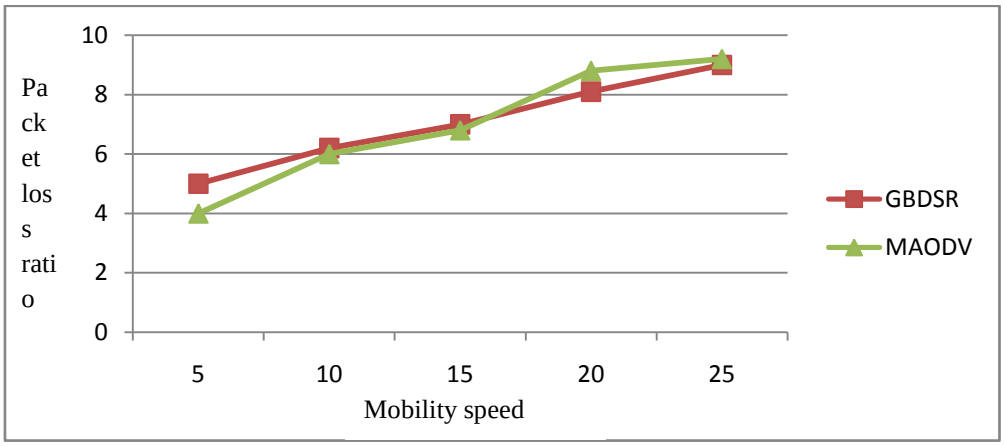

Figure 3: Graph shows packet loss ratio for GBDSR and MAODV vs. mobility speed

V. Conclusion

In this research paper, we calculate the end to end delay, packet delivery ratio, packet loss ratio for Multicast routing protocols in MANET like GBDSR and MAODV for various mobility speed using NS-3 simulator. Here we have seen that MAODV protocol gives us better results in most of the cases as compared to GBDSR protocol.

References

[1]. Ali NorouziB.BerkUstundag,"Improvement of DSR protocol using group broadcasting", International Journal of Computer Science and Network Security, VOL.10 No.6, June 2010, pp. 319-324.
[2]. C. Siva Ram Murthy, B.S. Manoj, "Ad Hoc Wireless Networks", 14 impression-Pearson-2012, Chapter (5-11), pp. 191-641.
[3]. [3] Broch, J.; Maltz, D. A.; Johnson, D. B.; Hu, Y.-C. andJetcheva. J.; "A Performance Comparison of Multi-Hop Wireless Ad Hoc Network Routing Protocols", Proceedings of the 4th Annual ACM/IEEE International Conference on Mobile Computing and Networking (MOBICOM'98), Dallas, TX, USA, October 1998, pages 85-97.
[4]. Cheng. E.; "On-Demand Multicast Routing in Mobile Ad Hoc Networks", M. Eng. Thesis, School of Computer Science, Carleton University, January 2001.
[5]. Perkins, C. E. and Royer, E. M.; "Ad-hoc On-Demand Distance Vector Routing", Proceedings of the 2nd IEEE Workshop on Mobile Computing Systems and Applications (WMCSA'99), New Orleans, LA, USA, February 1999, pages 90-100.
[6]. Tuteja A, Gujral A, Thalia A, "Comparative Performance Analysis of DSDV, AODV and DSR Routing Protocols inMANET using NS2", IEEE Comp. Society, 2010, pp. 330-333.
[7]. Royer, E. M. and Perkins, C. E.; "Multicast Ad hoc On-Demand Distance Vector (MAODV) Routing", IETF, Intemet Draft: draft-ietf-manet-maodv-00.txt, 2000.
[8]. C. E. Perkins, E. M. Royer, I. D. Chakeres, "Ad hoc On-Demand Distance Vector (AODV) Routing Protocol".draft-perkins-manet-aodvbis-00.txt, October 2003.
[9]. David B. Johnson, Davis A. Maltz," The Dynamic Source Routing in Ad Hoc Wireless Networks", October 1999 IETF Draft, 49 pages.
[10]. The ns-3 Network Simulator", http://www.nsnam.org.