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Implementation of Selective Forwarding Technique on AODV Protocol in MANET

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Abstract— A mobile ad hoc network (MANET) is a collection of wireless mobile nodes. MANET nodes without the need for any centralized control function are able to create a cooperative network among them. The change in topology in MANET makes routing as a crucial issue in the design of the MANET. Because of the decentralized infrastructure, MANET has to rely on flooding based route discovery/maintenance mechanisms, which generates control overhead. In this paper, we have studied the routing overhead and proposed a routing protocol in which each node exchange "Hello message" with its immediate neighbor. Hello message contains list of one hope neighbor of sender node. On the basis of this information Multi point Relay (MPR) point will be decided for that node. MPR points of a node are the minimal set of one hop node through which all two hops can be covered. Thus we can limit the routing overhead due to flooding of message.

Keywords- *Mobile Ad Hoc Network (MANET), Hello Message, Multi Point Relay (MPR), Route Request (RREQ), Route Reply (RREP), Route Error (RRER).*

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I. INTRODUCTION

A Mobile Ad Hoc Network (MANET) is wireless networks without any fixed infrastructure. An Ad Hoc wireless network consist set of mobile nodes those communicate via multi hop wireless link. The network topology in such a network may keep changing randomly due to mobility of nodes. Routing protocol that find a path to be followed by a packet from source node to destination node used in traditional wired network cannot be directly applied in ad hoc wireless network due to their highly dynamic topology, absence of established infrastructure for centralized administration, bandwidth-constrained wireless links and resource (energy) constrained node [1].Thus for MANETs some different routing protocol is needed that can work in dynamic topology and should be energy efficient. For routing in MANETs various routing protocol have developed. On the basis of routing information and update mechanism there are three types of routing protocol named as Table driven (proactive), on demand (reactive) and hybrid routing protocol. In table driven routing protocols each node maintains the network topology information in the form of routing table by periodically exchanging the routing information. Routing information is generally flooded in in the whole network.
Destination-Sequenced Distance Vector (DSDV) [2], Wireless Routing Protocol (WRP) [3], Optimized Link State Routing (OLSR) protocol [4] are proactive routing protocol.
In case of on demand or reactive routing protocol there is no need to maintain routing table. It finds the route whenever it required by using a connection establishment process. Hence these protocols not exchange routing information periodically. Ad hoc On-Demand Distance Vector Routing protocol (AODV) [5] and Dynamic Source Routing (DSR) [6] are reactive routing protocol.

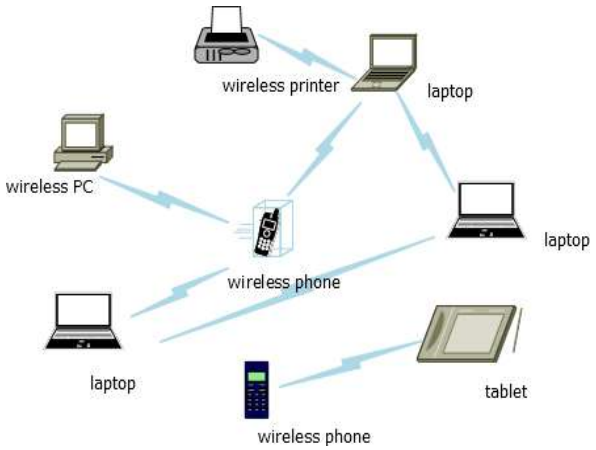

Figure 1: Mobile Ad Hoc Network

The protocol that belongs to hybrid routing protocol combines the best features of both proactive and reactive routing protocols. Node within certain distance from the node concerned or particular geographical region are said to be within the routing zone of given node. For routing within the zone a table driven approach is used. For nodes that are located beyond the zone an on demand approach is used. Zone Routing Protocol (ZRP) is a hybrid routing protocol [7].
There are many issues in routing for MANET. To address these issue various routing protocols have been implemented, but still there no routing protocol that can perform well in all scenarios, like when we use a proactive routing protocol, due to the mobility of the nodes link breaks frequently between nodes i.e. its required to find the new route within very short time to keep routing table updated. When we use a reactive or an on demand routing protocol like AODV, DSR an additional delay is included because route is establish only when needed and need to initiate and route request in the network that consume some bandwidth of the network. In

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AODV when a node request for the route it broadcast the route request in the network. It increases the traffic in the network due to broadcasting nature.

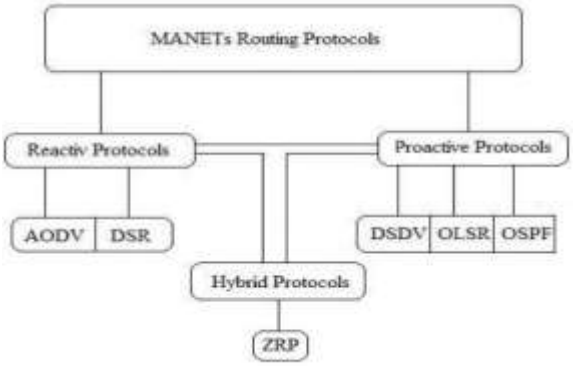

Figure 2: MANET Routing Protocols [11]

Proposed routing protocol is the combination of both proactive and reactive routing protocol. In proposed routing protocol each node exchange "Hello message" with its immediate neighbor, Hello message contains list of one hope neighbor of sender node. On the basis of this information multipoint relay (MPR) [8] point will be decided for that node. MPR points of a node are the minimal set of one hop node through which all two hops can be covered. In proposed routing protocol route up to two hop neighbor path will be readily available beyond the two hop node route will be establish by flooding of route request packets. To restrict flooding of route request packet only few of one hop neighbor will broadcast route request (RREQ) packet that are the multipoint of that node.

II. DETAILED PROBLEM DESCRIPTION

In general routing protocols are set of rules through which two or more devices (computers, mobile nodes) communicate with each other. Routes are multi hop in ad hoc networks because the propagation range (250 meters in an open field) of wireless radio is limited. Nodes in the network moves independently and randomly and routes are often find connection or disconnection between them. The main task of routing protocols is to establish, maintain and reconstruction of strong routes. Routing protocols should perform above all responsibilities except excessive control message overhead. Data packets should be used efficiently by the control packets of routing protocols and should only occur when needed. Routing protocols efficiency in bandwidth and energy consumption could be made by reducing the control overhead.
The major challenges that a routing protocol designed for ad hoc wireless networks face are mobility of nodes, resources constraints, and error-prone channel state, and hidden and exposed terminal problems.
In generally mobile ad hoc wireless networks routing protocols can be classified by their routing strategy. Pure distance vector algorithms do not give a good result in mobile networks because of some limitation. Then some new protocols were proposed to modify and enhance the distance vector algorithm such as Wireless Routing Protocol (WRP), Destination Sequence Distance Vector (DSDV) routing protocol, and the protocol by Lin and Liu.

The protocols which are based on link state algorithms. Theses protocols include Optimized Link State Routing (OLSR) protocol, Adaptive Link-State Protocol (ALP), Fisheye State Routing (FSR) protocol, and Source Tree Adaptive Routing (STAR) protocol.

The third one is on-demand routing protocols which are planned only for ad hoc network. Route to every destination of the networks on a regular basis is not maintained by on-demand routing protocols. The source establishes routes on demand. The source floods a route request (RREQ) packet to construct a route when it needed. The destination use route selection algorithm and select the best route for which destination receives request. Then route reply packet (RREP) is sent to the source through new best route. There is no requirement of periodic exchange of route tables and control traffic overhead is greatly reduce by on-demand routing protocols. Several protocols of this type have been proposed. Ad-Hoc on Demand Distance Vector (AODV) routing, Dynamic Source Routing (DSR) are on demand routing protocol.

III. PROPOSED METHOD

To control the routing overhead due to unnecessary flooding of Route Request (RREQ) packet we have proposed the implementation of selective forwarding technique on AODV protocol in MANET. It uses Multipoint relay (MPR) to optimization of flooding of route request packet. MPR works as routing backbone, for packet transmission between the nodes.

A. Comparison with OLSR

OLSR is a proactive routing protocol which use Multi Point Relay (MPR) to update link state information OLSR is not suitable for MANET because the topology in case of MANET is highly dynamic. If we use OLSR in case of MANET it will create a lot of traffic overhead in MANET due to frequently route break occurs.

B. Comparison with AODV

In case of AODV protocol, route request (RREQ) packet is of broadcast nature some nodes may receive duplicate route request packet from their neighbors. In proposed routing protocol for optimization of route request (RREQ) packet MPR technique will be used.

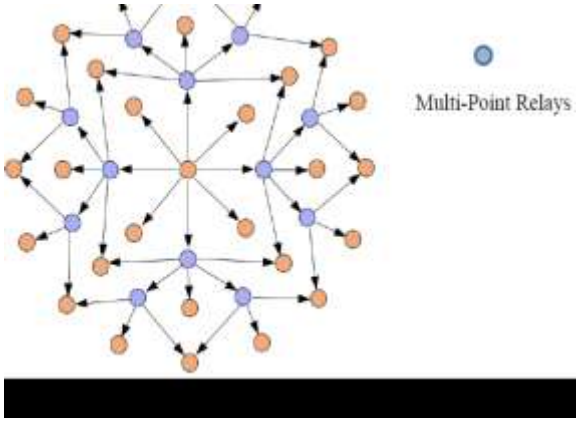

Figure 3: MPR as Routing Backbone [10]

So nodes that are only in MPR will forward route request (RREQ) packet. Proposed approach will work as hybrid routing protocol means up to two hop neighbor it will work as proactive routing protocol and after that it will work as hybrid routing protocol [9],[10].

C. Comparison with ZRP

In case of ZRP beyond the radius of the zone route request (RREQ) is broadcasted that create traffic in the network whereas in case of proposed approach we have apply MPR for optimization of route request (RREQ) and control packet.

D. Selective Forwarding Technique

In this protocol by using "Hello Message" each node inside the network exchanges its neighbor list with its immediate neighbor. One hop node and strictly two hops neighbor tuple is created by processing hello message. The route request (RREQ) packet includes the list of MPR node. To build a new route this protocol uses a route request / route reply query cycle. If a source node needs a route to a destination and if it does not already have a route, it broadcast a route request (RREQ) packet across the network. Each node which receives this RREQ packet, update their information for the source node and maintains a backward pointer to the source node in the routing table. The RREQ packet contains the source node's IP address, current sequence number, broadcast ID and the most recent sequence number for the destination of which the source node is aware. Upon receiving the RREQ packet the node may send a route reply (RREP) packet if it is either destination node or it has a route to the destination with corresponding sequence number is greater than or equal to that contained in the RREQ packet. If the condition matches, it unicasts a RREP back to the source. Otherwise, if the node is in MPR list this node again broadcasts the RREQ to the neighboring nodes. Node keeps the record of RREQ's source IP address and broadcast ID. If they receive a duplicate RREQ packet which they have already processed, they discard the RREQ packet and do not forward it. As the RREP propagates back to the source, node set up forward pointers to the destination. When the source node receives RREP packet, it may use the path to forward data packet to the destination. If the source node later receives a RREP packet which contains a greater sequence number or if it contains the same sequence number with a smaller hop count, it may update its routing information and start using the better route. As long as data packets periodically traveling from source to destination along that path, it remains active and continues to be maintained. If the source stops sending data packets, the time out occurs to the link and it eventually be deleted from the routing table. If the route is active but the link breaks, the node propagates a route error (RRER) message to the upstream nodes to inform the source that the destination node is now unreachable. If the source node still desires the route, after receiving RRER packet, it can reinitiate route discovery process.

Multipoint relay flooding is a broadcast mechanism used in this ad hoc routing protocol. The principle is that each node has computed a multipoint relay (MPR) set, and only these selected neighbors, will retransmit a packet broadcasted by the node. Obviously, the smaller this set is, the more efficient the mechanism will be (i.e., the greater the optimization).

IV. CONCLUSION

In this paper, an implementation of selective forwarding technique on AODV protocol in MANET has been proposed to reduce the redundant retransmission of route request packet and to avoid collision. The current AODV protocol has major control overhead which is caused by "Route Query" flood packets. The AODV routing protocol is improved by reducing routing overhead using an efficient flooding technique – multipoint relay. This technique selects the dominated nodes throughout the entire network to forward route query flood packets.

REFERENCES

[1] Al-Hemyari, K.Jumari, Mahamod Ismail and Sabri Saeed, "A comparative Survey of Multicast Routing protocol in MANETs", International Conference on Future Communication Network 2012.

[2] C. E. Perkins and P. Bhagwat, "Highly dynamic destination-sequenced distance-vector routing (DSDV) for mobile computers". In Proceedings of the ACM Special Interest Group on Data Communications (SIGCOMM), August 1994, pages 234-244.

[3] Murthy, Shree; Garcia-Luna-Aceves, J. J. (1996-10-01), "An efficient routing protocol for wireless networks", Mobile Networks and Applications (Hingham, MA: Kluwer Academic Publishers) 1(2): 183–197, doi: 10.1007/BF01193336.

[4] T. Clausen, Ed., P. Jacquet, "Optimized Link State Routing Protocol (OLSR)", Network Working Group, Request for Comments: 3626.

[5] C. E. Perkins, E. M. Royer, and S. R. Das, "Ad Hoc On-Demand Distance Vector (AODV) Routing," IETF Mobile Ad Hoc Networks Working Group, IETF RFC 3561.

[6] D. B. Johnson, D. A. Maltz, and Y-C Hu. "The Dynamic Source Routing Protocol for Mobile Ad Hoc Networks (DSR)", IETF Mobile Ad Hoc Networks Working Group, Internet Draft, work in progress, 24 February 2003.

[7] Z. Haas, M. Pearlman, "The Zone Routing Protocol (ZRP) for Ad Hoc Networks", Internet Draft, draft-ietf-manet-zone-zrp-01.txt, August, 1998. Work in progress.

[8] A.Qayyum, L.Viennot and A.Laouiti, "Multipoint relaying: An efficient technique for flooding in mobile wireless networks".35th Annual Hawaii International Conference on System Science (HICSS'2001).

[9] S. Das, R. Castaneda, and J. Yan, "Simulation-Based Performance Evaluation of Routing Protocols for Mobile Ad Hoc Networks," Mobile Networks and Applications, 2000, Vol. 5, No. 3, pages 179-189.

[10] Mittal, S.; Kaur, P.; "Performance Comparison of AODV, DSR and ZRP Routing Protocols in MANET'S," Advances in Computing, Control, & Telecommunication Technologies, 2009. ACT '09.International Conference on, vol., no., pp.165-168, 28-29 Dec. 2009.

[11] Nagham H.Saeed,Maysam F. Abbod andHamed S. Al-Raweshidy, "*MANET Routing Protocols Taxonomy*", Wireless Computing Group(WNCG),International Conference on Future Communication Networks 2012.