



Modified Route Maintenance in AODV Routing Protocol: A Review

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Abstract – Characteristic of wireless ad-hoc network is continuously varying in topology. Route between source to destination breaks due to change in topology. There are two methods of route maintenance after route break. One is route repair by source node. Another is route repair by local route repair technique. Here in this paper some different kind of local route repair techniques are describes.

Keyword: AODV, Local route repair (LRR), Delay constrain.

I. Introduction

Now a day's ad-hoc network [1] is very popular due to mobile and computer devices such as laptop and palmtops. These types of devices have minimum configuration, and also no need to create infrastructure to quick deployment, in emergency operations and especially for military operations. In ad-hoc network nodes are mobile. Mobile nodes are continuously moving and also frequent changes in topology. So, maintenance of Ad-hoc network is very difficult as compared to wired network. Sometimes it may possible that source node or destination node moved out of the network. Ad-hoc routing protocol [1] classified into Proactive and Reactive routing protocols. In proactive routing protocols exchange their periodic table at each node to get information of topology. Example DSDV, WRP. Reactive routing protocols [1] exchange routing table on-demand. When it establish route between source to destination. Reactive protocol likes DSR, AODV etc. Every protocol has its limitations on different metrics, but in general the reactive protocols show better performance than the proactive protocols.

II. AODV Routing Protocol

AODV [2] protocol provides quick and efficient route establishment between nodes desiring communication and AODV was designed specifically for ad hoc wireless network, it provides communication between mobile nodes with minimal control overhead and minimal route acquisition latency.

A. AODV Route Discovery

When a node [2] wishes to send packet to destination node, it checks to route table to determine whether it has a current route to the node. If so, it forwards the packet to the suitable next hop toward the destination. However, if the node does not have a route to the destination, it must begin a route discovery process. To start such a process, the node creates RREQ packet. This packet contains the source node's IP address and current sequence number as well as destination's IP address and last known sequence number. The RREQ has a broadcast ID, which is incremented every time the source node generates a RREQ. In this way broadcast ID and the IP address of the source node from a unique identifier for the RREQ. After generating the RREQ, the source node broadcasts RREQ and then sets a timer to wait for a reply.

When a node receives a RREQ, it first checks whether it has seen before by observing the source IP address and broadcast ID pair. Each node maintains a record of the source IP address/broadcast ID for each RREQ it receives, for a definite length of time. To respond to the RREQ, the node must have known the route to the destination in its route table. The sequence number of destination node must be indicated in the RREQ. This prevents the formation of routing loops by ensuring that the route returned is never old enough to point to a previous intermediate node. If the node is able to satisfy these two requirements, it responds by unicasting RREP back to the source.

B. Route Maintenance

Once a route has been discovered [2] from source to destination. Movement of nodes in the ad hoc network affects only the routes containing those nodes; such a path is called an active path. If the source node moves during data transmission process, it can restart route finding to build a new route, to the destination. When either the destination or some intermediate node moves, however, a Route Error (RERR) message is sent to the affected source nodes. This RERR is started by the node upstream of the break. It lists each of the destinations that are now unreachable because of the loss of the link. Broken node of route broadcasts the RERR to the neighbours. When the neighbours receive the RERR, they mark their route to the destination as invalid by setting the destination equal to infinity. When a source node receives the RERR, it can reinitiate route finding if the route is still needed.

There are two type of route maintenance. One of them is source route recovery is mentioned above that like source broadcast RREQ to its neighbour RREQ having source and destination IP address and broadcast ID and sequence

numbers. When destination sends RREP it receives by source node through intermediate node. Second method is local route recovery using intermediate node. In this method broken link is recovered by intermediate node. Intermediate node broadcast RREQ to its neighbour and route request reach at destination. Destination gives reply with RREP and route is once again established between source to destination.

III. Existing Techniques

1. Enhancing Route Recovery for QAODV

In 2008, Nityananda Sarma, Sukumar Nandi And Rakesh Tripathi [3] proposed that sending RERR back to the source to re-initiate route discovery by the source, for route recovery due to link failure, gives large control overhead, packet loss and delay. For providing QoS support, we need an efficient and faster route recovery/maintenance mechanism. So in this proposed method each node in an active route remembers the node ID of the second downstream node and updates this information during local route recovery process. When a link of an active flow breaks, there still exists some neighbour of the upstream node through which the downstream node and/or the 2-hop downstream node of the broken link reachable with the single hop. In the case, the node detecting the link failure finds one such neighbour, it can repair the path very fast by adding an extra node in the repaired path very little amount of extra control overhead. In this method local route repair in QAODV, a number of control packet are used as follows. When detects link break it sends LRREQ (Local Route Repair Request) is used to locally broadcast. LRREP (Local Route Repair Reply) is used to reply LRREQ. If LRREP not received with in time period, Node sends RERR packet to source node follow the normal route recovery procedure.

2. Stability based Route Repairing

In 2010, Saleem Sheikh Aalam and Dr. T.Arul Doss Albert Victorie [4] proposed that AODVSRR the intermediate node finds a new shortest and maximum stability route to the destination; it updates its route table with new route, even if the forwards neighbour node repairs the link break and received a RROK message from repaired node. After establishing the new route the intermediate node sends packet which are stored in its cache. In worst case each intermediate node cannot repair the break link and cannot find a new route to the destination. Then, RERR message will receive by source node. In this case, AODVSRR source node selects the already found the shortest path with maximum stability route broadcasts a data packet with maximum stability route broadcasts a data packets to the destination.

3. Multi-hop

In 2009, Harisavan Somnuk and Mayuree Lertwatechakul [5] proposed that Multi-hop partial route recovery. The methodology based on local repair mechanism of AODV – 2T that has improved route maintenance in Ad hoc network by preparing backup route in a proper time. The mechanism works quite well in decreasing number of route breaks and then gains more network throughput. There are three steps:

Step 1: Detects link break & received signal link compared with threshold.

Step 2: Broken link node send Sub_RREQ to its neighbours.

It sends source address & destination of damaged route using Sub_RREQ.

Step 3: Node receives Sub_RREQ packets lookup its forwarding table.

If forwarding table contain routing information for specified destination or not.

If it available it sends with Sub_RREP.

4. AODV Backup routing

In 2000, Sung-Ju Lee and Mario Gerla [6] proposed that when a node detects a link break, it performs the one hop data broadcast to its immediate neighbour. The node specifies that in data header the route is break and the packet is sending for “alternate routing.” When neighbour node receiving this packet, it finds alternate route in its alternate route table. And send this packet to its next node. Data packet can be delivered through one or more alternate routes and are not dropped when route break occur.

5. Adaptive Route Selection

In 2009, Yuh-Chung Lin and Chu-Wei Ke [7] proposed that when source node likes to transmit data to destination node, the intermediate node will receive RREQs from other nodes. If the first RREQ received from intermediate node. The other route will record in cache table. So, these values in cache table will be referenced when intermediate node receives a RREP and needs to select appropriate route. When receiving a RREQ, the intermediate node will check if the value of Route_record in RREQ exists in the cache table. If yes, the RREQ will simply be discarded; otherwise, it represents a new disjoint and is recorded in the cache table.

6. Delay Constraint AODV

In 2012, Shijie Li, Xu Li, Qijing Feng [8] proposed that Nodes use Hello message for keeping the neighbour relationship. If nodes cannot hear HELLO messages shows that the link is broken. Then the upstream node at the broken link begins to initiate the repairing action locally. The repairing intermediate node broadcast a RREQ with Source's IP address instead of the repairing node's IP address in AODV. Hence, the RREP created by destination node is replied to source node. And each node in the path updates the route information.

IV. Comparison of various techniques for local route repair

TABLE I

Technique Name	Method Summary
Enhancing Route Recovery for QAODV	End-to-end delivery ratio and throughput using QAODV-I are higher compared to QAODV. (QAODVI – Qos AODV Intermediate node)
Stability based Route Repairing	In AODVSRR algorithm use maximum stability field to establishing new route. Adding the routing repair mechanism to the RREQ message instead of initiating routing discovery as far as possible. These improvements not only reduce the packet loss rate and the end-to-end latency. And also enhance utilization rate of the network resources.
Multi-hop AODV-2T	Multi-hop AODV-2T gives a better performance compared to the original AODV. Route maintenance concept inherits most the features of AODV-2T that is proved as practical idea to be used in reactive Ad-Hoc network.
AODV Backup routing	In route repairs problem data packets can be delivered through one or more alternate routes and are not dropped when route breaks occur.
Adaptive Route Selection	When route will discover by source at that time multipath found. This path will be used when route recovery process needed.
Delay Constraint AODV	DC-AODV has a good performance in average latency of packet delivery, and still has a high delivery ratio.

V. Conclusion

Changes in topology will break route source to destination. At that time two types of route maintenance procedures are available. One of them route maintenance procedure is local route repair. Here, in this paper several techniques for local route repair are discussed, which can be used for further research work.

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