Explanation of AODV

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Abstract— The Ad hoc on Demand Distance vector (AODV) routing algorithm is a routing protocol designed for ad hoc mobile networks. It provides both unicast and Multicast routing. It is a reactive routing protocol, meaning that it establishes a route to a destination only when there is a demand for that route. An important feature of AODV is the maintenance of time-based states in each node: a routing-entry not recently used is expired. In case of a route is broken the neighbors can be notified.

Keywords: Introduction, AODV Explanation, query cycle.

I. INTRODUCTION

AODV is a relative of the Bellman-Ford distant vector algorithm, but is adapted to work in a mobile environment. AODV determines a route to a destination only when a node wants to send a packet to that destination. Routes are maintained as long as they are needed by the source. Sequence numbers ensure the freshness of routes and guarantee the loop-free routing.

AODV builds routes using a route request/route reply query cycle. When a source node desire a route to a destination for which it doesn't already have a route, it broadcast a route request (RREQ) packet across the network. Nodes receiving this packet update their information for the source node and set up backwards pointers to the source node in the route tables. A node receiving the RREQ may send a route reply (RREP) if it is either the destination or if it has route to the destination with corresponding sequence number greater than or equal to that contained in the RREQ. If this is the case, it unicasts a RREP back to the source. Otherwise, it rebroadcasts the RREQ. Nodes keep track of the RREQ's source IP address and broadcast ID. If they receive a RREQ which they have already processed, they discard the RREQ and do not forward it.

Route remain active, it will continue to be maintained. A route is considered active as log as there are data packets periodically travelling from the source to destination along that path. Once the source stops sending data packets, the link will time out and eventually be deleted from the intermediate node routing tables. If a link break occur while the route is active, the node upstream of the break propagates a route error (RERR) message to the source node to inform it of the now unreachable destination(s).After receiving the RERR, if the source still desire the route, it can reinitiate route discovery. Multicast route are set up in similar manner.

II. AODV EXPLANATION

Let's start the explanation:
Imagine node 1 wants to talk with node 8.

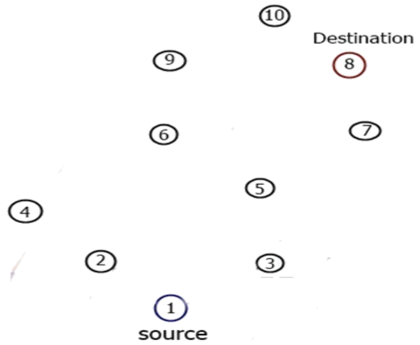

Fig. 1: Imagine node 1 wants to talk with node 8

Node 1 start sending route request message (RREQ) in broadcast. These message have an ID of the route query, the source and destination, and the maximum lifespan of the request.

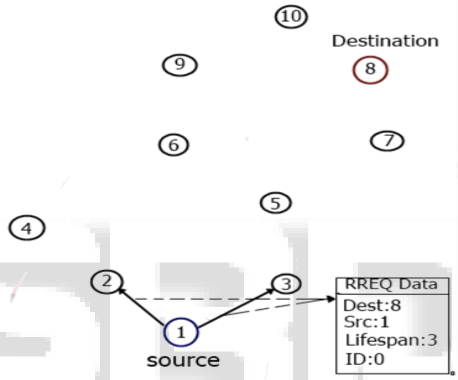

Fig. 2: Node 1 start sending route request message (RREQ) in broadcast

When node 2 and 3 receive the RREQ message, they check if they have already received a RREQ query with that same source and ID.As it is not the case of node 2 or 3, they rebroadcast.

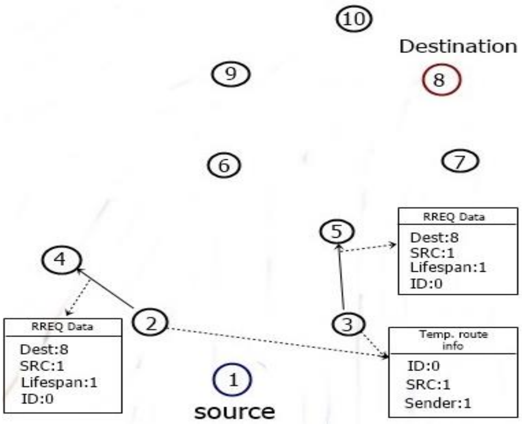

Fig. 3: Node 2 and 3 receive the RREQ message

When node 2 and 3 rebroadcast the RREQ, node 1, 4 and 5 receive the message. Node 1, as it already knows that ID and source simply ignores it. Node 4 and 5 are in the situation where it is the first time they receive a message with that source and ID so, they rebroadcast the RREQ.

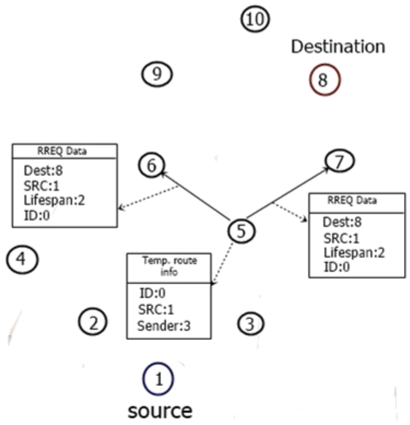

Fig. 4: Distance vector (AODV) routing algorithm

Nodes that have already received that RREQ, once again ignore it. Node 4, don't have any next node they simply ignore these message. Node 5, again rebroadcast the message. Node 6 and 7 are in the situation where it is the first time they receive a message. So, they rebroadcast the RREQ.

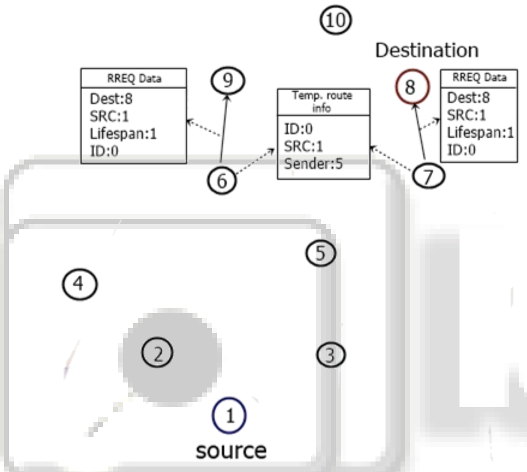

Fig. 5: Nodes that have already received that RREQ

Node 8, the destination, receives the RREQ. It is now time to make the inverse path using Route Reply Message (RREP).This is done by looking at the temporary routing information tables that show the various hops performed to reaching the destination.

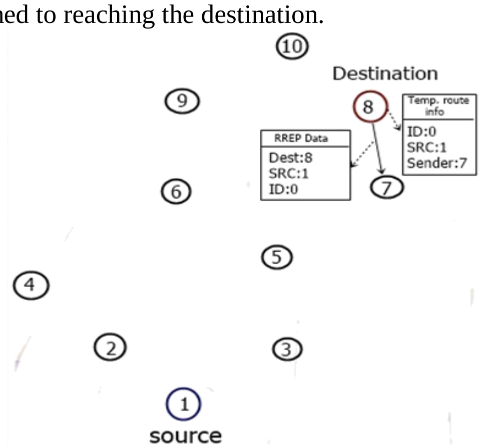

Fig. 6: Node 8, the destination, receives the RREQ

Node 7, upon receiving the RREP creates a new route entry. Where he indicates that to messages with destination 8, the next node he sends message is node 8 (because it is in his range). He then sends the RREP to the previous node present in his temporary routing information, node 5.

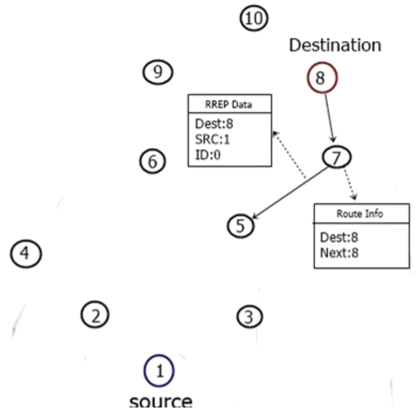

Fig. 7: Node 7, upon receiving the RREP creates a new route entry

Node 5, upon receiving the RREP creates a new route entry. Where he indicates that to messages with destination 8, the next node he sends message is node 7. He then sends the RREP to the previous node present in his temporary routing information, node 3.

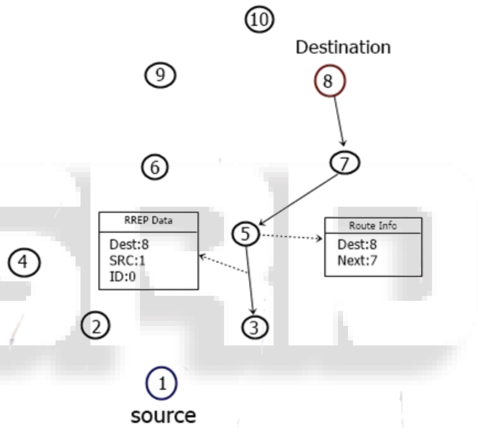

Fig. 8: Node 5, upon receiving the RREP creates a new route entry

Node 3, upon receiving the RREP creates a new route entry. Where he indicates that to messages with destination 8, the next node he sends message is node 5. He then sends the RREP to the previous node present in his temporary routing information, node 1.

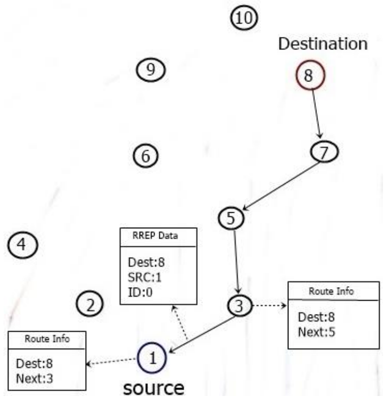

Fig. 9: Node 3, upon receiving the RREP creates a new route entry

Node 1, upon receiving the RREP creates a new route entry. Where he indicates that to messages with destination 8, the next node he sends message is node 3.As he is the source the process ends here.

Main advantages of AODV:

- No central administrative system to handle routing.
- Reduced control messages.
- Quickly reacts to changes in network.

III. CONCLUSION

The weaknesses of AODV include its latency and scalability. The main conclusion of this paper is that the choice of which protocol to use depends on the properties of the network.

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