A Hybrid Reactive Routing Protocol for MANETs

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Introduction

A lot of research effort has been put by researchers in developing routing protocols for Mobile Ad-hoc Networks (MANETS). Each protocol proposed and designed so far has its own merits and demerits. Designing hybrid protocols that combine the preferred properties of existing protocols results in better performing protocols.

Motivation

In this work we take two well known MANET routing protocols, namely, the Ad-hoc On-demand Distance Vector routing protocol[1] and the Epidemic routing protocol[2], and combine their preferred properties to formulate a new Hybrid routing protocol. We propose this routing protocol again as a reactive protocol with the objective of increasing the message delivery ratio while utilizing minimum mobile device resources.

The AODV routing protocol is a reactive routing protocol. It reactively establishes a path between a source and a destination when there is a need to forward a message.

Methodology

Basically in the hybrid routing protocol mobile nodes use the AODV routing protocol routing. Whenever there is a problem in finding an end to end path, at that point Epidemic routing is introduced in order to maximize the chances of forwarding the message towards the destination. Here we consider two possible cases:

❖Case 1: Initially there exists a route between source and destination, and then it gets broken during the routing.

❖Case 2: There does not exist a path between the source and the destination.

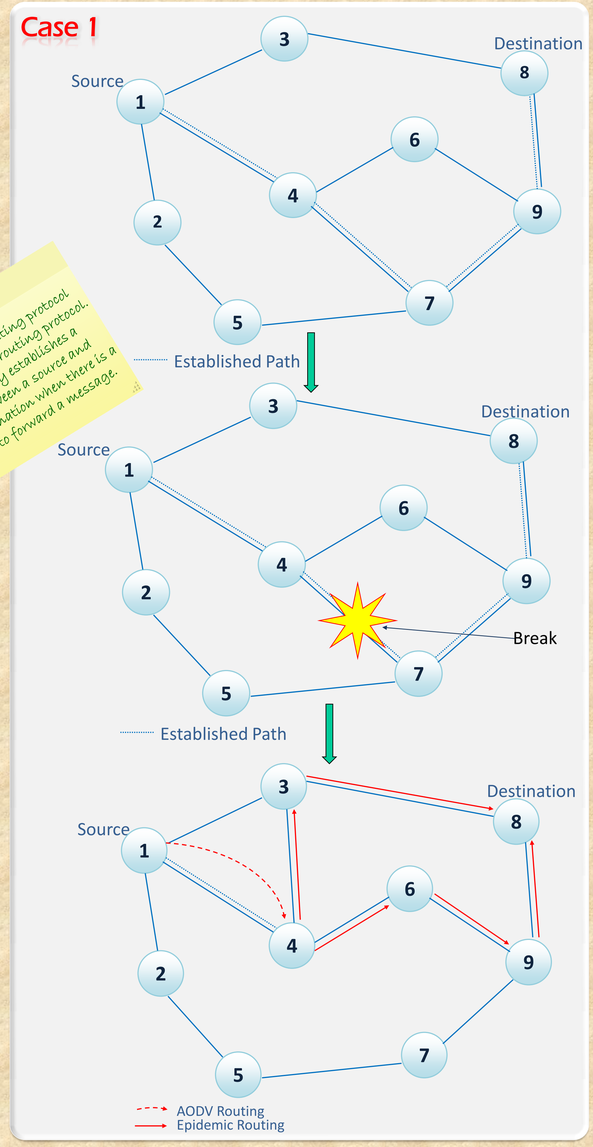
Input: available buffer space in the node
if *There is a path between sender and receiver then*
repeat
set *sender gets next hop address from routing table*
set *forward the message to the next hop*
if there is no next hop **then**
Save the message in Message queue
exchange messages with neighbors
end if
until the destination is reached
end if

Figure I :Algorithm for Case 1

Input: available buffer space in the node
if *There is a path between sender and receiver then*
repeat
save the message in the buffer
exchange with neighbors the saved message id
until the destination is reached
end if

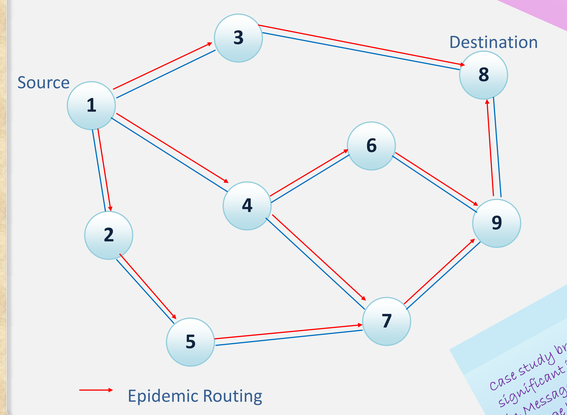
Figure II :Algorithm for Case 2

Case 1



Case 2

The Epidemic routing protocol, nodes flood the network with the messages which they want to forward with the hope of that somehow the message will get disseminated from one node to another, finally reaching the destination node.



case study brought significant improvement in Message delivery ratio, Message loss ratio and delay in one hour and two hour cases.

Experimental Setup

We use the JiST/SWANS[3][4] discrete event simulator to model and simulate the operational behavior of our Hybrid protocol and the other two protocols[1][2] which are used for the performance comparison purposes.

Protocols	AODV, Epidemic and The Hybrid
Area dimension	1000 X 1000 meters
Number of nodes	10; 20; 30; 40; 50
Mobility model	RandomWayPoint
Simulation time	1; 2and3hours
Pause time	60seconds
Precision	1
Minimum speed	1 meter/second
Maximum speed	10 meters/second

Performance Metrics

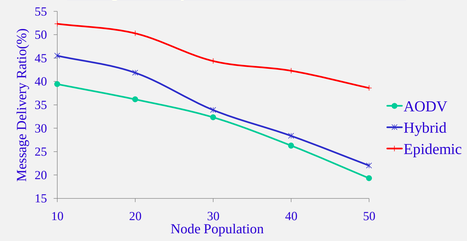
$$message\_lost\_ratio = \frac{total\_sent\_message - total\_received\_message}{total\_sent\_message} \times 100\%$$

$$message\_transmission\_delay = message\_received\_time - message\_sent\_time$$

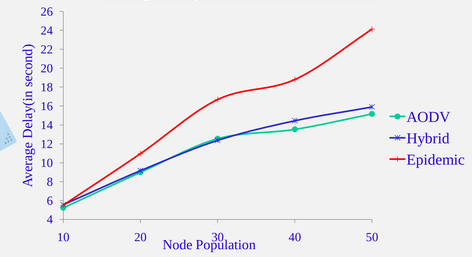
$$message\_delivery\_ratio = \frac{total\_sent\_message - total\_received\_message}{total\_sent\_message} \times 100\%$$

Results

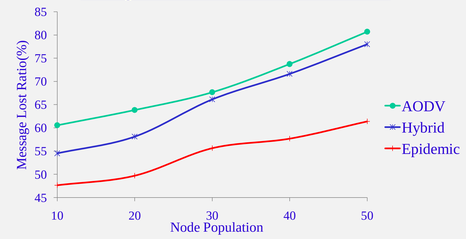
Message Delivery Ratio for Three Hours Duration



Average Delay for Three Hours Duration



Message Lost Ratio for Three Hours Duration



Discussion & Conclusion

❖The Hybrid protocol outperforms the other two protocols in the considered performance metrics.
❖Testing this protocol under various testing scenarios in order to optimize the performance of it is one top priority future work

References

[1] C. E. Perkins and E. Royer, "Ad-hoc on-demand distance vector routing,"in Proceedings of the 2nd IEEE Workshop on Mobile Computing Systems and Applications (WMCSA), 1999, pp. 90–100.
[2] A. Vahdad and D. Becker, "Epidemic routing for partially connected ad-hoc networks," Duke University, Tech. Rep., April 2000.
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[4] R. Barr, "Swans user guide," March 2004, available at http://jist.ece.cornell.edu/docs/040319-swans-user.pdf