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Efficiency Enhancement in AOMDV to Reduce the Chances of Packet Loss in MANETs

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Abstract: ***MANET is a self configuring network which has no fixed infrastructure. Topology in MANET changes frequently. During data transmission, there is a problem of link failure which degrade the performance of the network. The nodes are deployed in the network and path is established according to EAOMDV protocol from source to destination. There are some nodes in the path having much movement than other nodes. Due to these nodes packet loss occur in a higher manner and link failure problem occurs. So link failure problem is responsible for performance degradation and low reliability of the network.In this work the AOMDV based technique and enhanced technique have been implemented in the Network Simulator 2(NS2) and results have been analysed for efficiency and throughput.***

Keywords: AODV, AOMDV, EAOMDV, MANET, Link Failure.

1. Introduction

MANET is a group of dissemination nodes that wish to communicate with one another. It has no stable infrastructure and no pre-decided topology of radio links. Nodes that lie within each other's send range can communicate straight and are dependable for dynamically discovering each other. In order to enable communication between nodes that are not directly within each other's send range, intermediate nodes act as routers that relay packets generated by other nodes to their destination[1]. These nodes are often energy-constrained—that is, battery-powered—devices with a great diversity in their capabilities.

In MANET, Routing protocols are divided in two categories are Proactive protocols (Distance Sequence Distance Vector) and Reactive protocols (Ad Hoc on Demand Distance Vector-AODV, Dynamic Source Routing – DSR)[2]. The Proactive Protocols are table driven and usually use Link State Routing Algorithms. Link State Algorithm perpetuate a full or partial copy of network topology and costs for all known links whereas Reactive Protocols detect a route on demand by flooding the network with RREQ packets. They usually use Distance Vector Routing Algorithms that store single information about the next hops to adjacent neighbors and costs for all paths to all known destinations[3].

2. Ad Hoc Network Design Issue

The Ad Hoc architecture has many profits, such as self-recompose, ease of deployment, and on and on. Although the networks elasticity and convenience come at cost[4]. Ad hoc wireless networks derive the established problems of wireless communications, such as power control,bandwidth optimization, and transmission quality enhancement, meanwhile, in addition, their mobility, multi-hop nature, and the deficiency of fixed infrastructure generate a number of entanglement and design issues which are peculiar to mobile ad hoc networks.

- Network Scalability
- Dynamically Changing Network Topologies
- Variation in Link and Node Capabilities
- Network Robustness and Reliability
- Limited Link Bandwidth and Quality\
- Quality of Service
- Energy Constrained Operation
- Infrastructure-less

3. Link failure in MANETs

Link failure is a major problem in AOMDV[5] which produce the network degradation and the packet loss. The network consists of numeral nodes where source is host node from which data has to be send and destination node is endmost node. There is an active node which is responsible for table entry. New route discovery begin, when source node move. If intermediate nodes or the destination switch then following conditions possible:

- Route error messages are informed by all active neighbors.
- Link failure arise when the next hop links break.
- Routing tables updation occur when link fails.

At the time of link failure, the source is informed regarding the failure in the network so that either it may reduce the packet transmission rate or find an alternate route which may not necessarily be an optimal route[6]. It specify that all the congestion control methods are able to inform the source about the congestion problem because they use Transmission Control Protocol. Utmost issue among collection of users is to perpetuate and assign network resources effectively and fairly. The resources shared generally are the bandwidth of the relations and the queues on the routers or switches with these awaiting queue transmission, packets are in the wait list. During too many packets challenging for the similar link, the queue overflows and packets have to be dropped. When such drops become common events, the network is said to be congested and link failure problem occurs. In Ad-hoc networks, since there is no fixed infrastructure there are no separate network elements called routers and hence the mobile nodes themselves act as the routers.

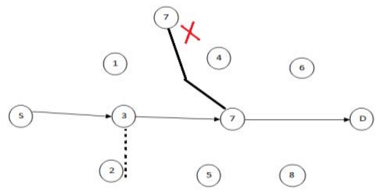

Figure 1: Link Failure in MANET[7]

In figure 1, Network is deployed with finite numbers of nodes. After that, Path is established between source to destination for data transmission. In this case node 7 ,which is intermediate nodes switch from its position, due to this packet loss occurs at node 3.

4. AOMDV based link failure in MANET

In this technique, the network floods the route request packets in the network to establish path from source to destination. Source receive various route reply packets from the adjacent nodes of destination. Calculate SINR value of each path which is available from source to destination. The path which has higher SINR value will be defined as the reliable for data communication[8].

4.1 Simulation in NS2

The Network Simulator 2 has been used to implement the simulated version of the protocol. Network Simulator is a discrete event simulator targeted at networking research. Ns provides considerable support for simulation of TCP, routing, and multicast protocols over wired and wireless (local and satellite) networks. NS2 is an object oriented simulator, written in C++, with an OTCL interpreter as a frontend. It is used for simulating a variety of network scenarios or topographies with varying features and parameters.

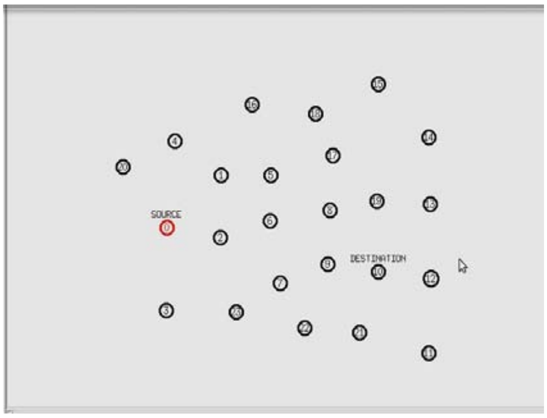

Figure 2: Source and destination declared

After the network deployment the source node flood route request packets in the network to establish path to destination. The adjacent nodes of destination which is having direct path to destination which reply back with route reply packets. The source receive route reply packets from various paths. The source node select best path from source to destination on the basis of hop count and sequence number.

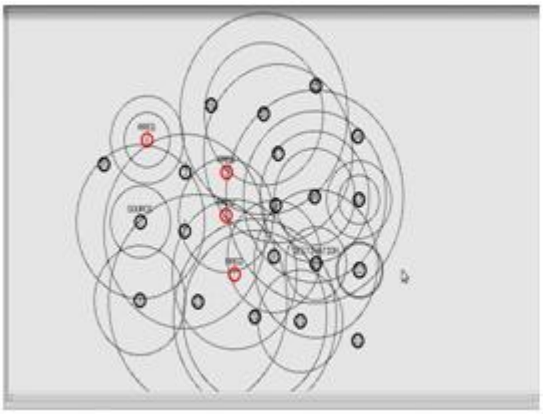

Figure 3: Flooding of route request packets

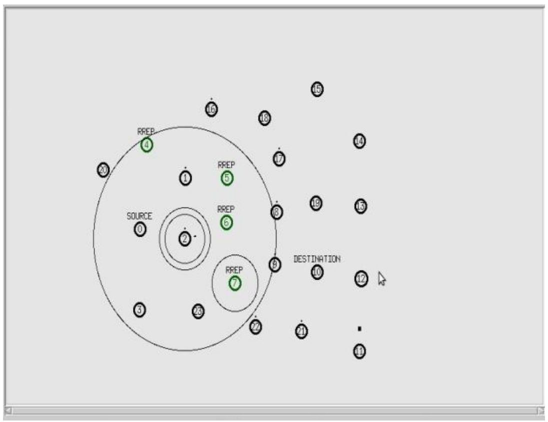

Figure 4: Receiving route reply packets

The path which is selected has minimum hop count and maximum SINR value. In the selected path, mobile node change its position due to which link failure occurred and results in a maximization of packet loss.

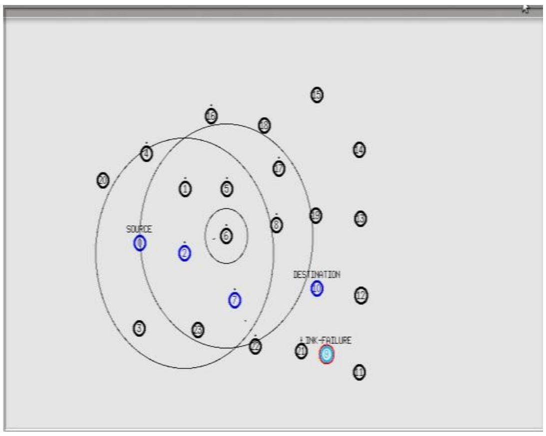

Figure 5: Path establishment and link failure

5. EOMDV based path establishment

In enhanced technique, when the link fails the Node which detect link failure will send ping message to its adjacent node. Adjacent nodes will reply back with its battery powers . Path will be recovered through node which has higher batter power. Communication starts between source and destination[7].

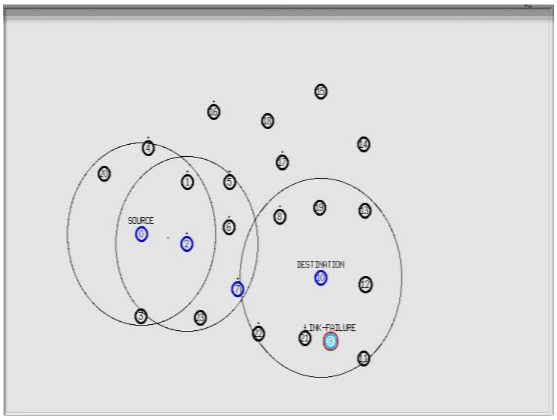

Figure 6: Path recovered through higher battery power

6. Comparison and Analysis

The results provided by NS2 simulation of both the strategies have been used to compare the packet delivery ratio of the two. It has been found that although the absolute AOMDV has different advantages but this approach leads to degradation due to maximization of packet loss in the network(shown in red). On the other hand, enhanced technique(shown in green) shows that it is much better than former technique.

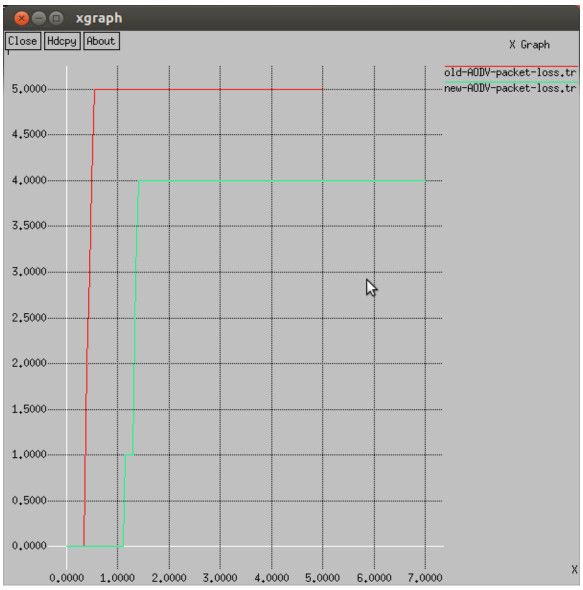

Figure 7: Packet loss graph

Here x-axis represents mobility and y-axis shows the packet loss in the data transmission.The minimization in the packet lost of the enhanced technique provide the following advantages to the network:

1. It improve the throughput of the network.
2. Links are sustained for longer period.
3. It will improve all the delays encountered by the packets at various hops from source to destination.

7. Conclusion

Link failure and packet loss considerations are the two important and inter linked areas of concern in MANETs to maintain link stability. In this work two protocols namely: AOMDV and EAOMDV have been comparatively analyzed. The NS2 simulation results shows that substantial improvement in the network performance by using enhanced technique(EAOMDV) when compared with existing technique.

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