Enhancement of the Multipath Routing Protocol for Route Recovery in MANET

Raksha.R,Rashinkar, Ramlathunnisa V.A, Ranjana Hebbar V.S, Sumukh Bharadwaj V

***Abstract*— Route failure is a vigorous issue in MANET that is mainly responsible for interrupted service between source and destination, so there should be some mechanism to handle this issue as soon as it is detected, to continue the transmission. In this paper we have proposed "Enhancement of Multipath Routing Protocol for Route Recovery (EMPRR) in MANET", a routing protocol which provides multipath discovery, efficient utilization of bandwidth and controlled traffic load route recovery at the time of failure. Approach: At the time of failure the recovery node is selected from the neighboring nodes of node detecting failure ,by performing route discovery from node detecting failure and the neighboring node which is first to send the route reply packet from the destination to the node detecting failure is selected as recovery node and if the two neighbors of failure node send the route reply packet at the same time then the node with higher available bandwidth is selected in the mean while we send stop transmission till route recovery packet to source node through reverse path, as soon as new path is selected start transmission packet is sent to source to start transmission again and updates its cache by storing new route for transmission. Results: The proposed protocol is efficient in overcoming the problem of stale routes in multipath routing protocols. Also proposed protocol shows significant improvement in packet delivery ratio and reduced end to end delay**

***Index Terms*—Fault Tolerance, Link Failure, MANET, Multipath Routing protocol.**

I. INTRODUCTION

Mobile Ad-Hoc network (MANET) is a self organizing network with autonomous mobile nodes connected dynamically in arbitrary manner through wireless links. These autonomous nodes can communicate with each other if and only if they are in transmission range of each other. As ad hoc network is beneficial, it is utilized in the military application, collective and distributed computing, emergency services, and wireless mesh and sensor networks and even in hybrid networks

Routing

Routing protocols are mainly used for determining optimal packet routes for sending data between source and destination. Exchanging route information, gathering information about route breaks, repairing broken routes, load balancing are also some useful features of routing protocols.

Unipath Routing Protocols

Unipath Routing Protocols provide single route between source and destination for each data transmission session. In these protocols every node acts as a router that find route for transmission, maintain them and relay packets along the route. There are two types of unipath routing protocols. First one is Proactive or Table Driven routing protocols.

These protocols provide up-to-date topological view of network by constantly monitoring the known routes. If there is any change in the network all nodes in the network receive updates and also if source wants to send packet to destination route is already known. Examples of these protocols are DSDV, OSPF etc. Second type referred to Reactive or On Demand routing protocols, these protocols does not required constant updates as in these protocols route is discovered only when there is need to transmit data between source and destination. Examples of these protocols are DSR and AODV.

Hybrid Routing Protocols are combination of the above two unipath protocols. Examples of these protocols are ZRP and TORA.

Multipath Routing Protocols

Multipath Routing Protocols discover multiple routes between source and destination at the time of route discovery as alternate routes such that if there is any failure in primary path an alternate path can be used for recovery. These protocols are generally extensions to unipath routing protocols. Due to limited channel bandwidth, limited power and frequent mobility of nodes in MANET, the path connecting the source and destination may go down at any time. To abate these issues multipath routing came into existence in which alternate paths are determined.

Multipath Routing Protocols for Fault Tolerance

These types of routing protocols provide mechanisms to deal with faults in MANET. Due to random movements of node in MANET, it is prone to various faults like failure of nodes, failure of link, breakage of routes and congested links These protocols follow proper route maintenance mechanism to provide appropriate route recovery at the time of failure by selecting the alternate route discovered at the time of route discovery in optimal way. Node Disjoint, Link Disjoint and Non Disjoint provide more fault tolerance.

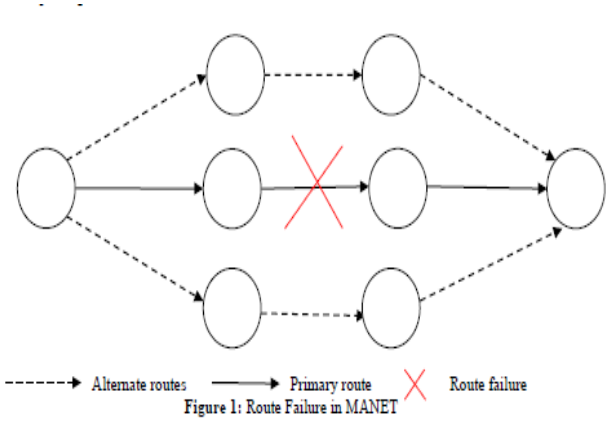

Figure 1: Route Failure in MANET

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II. PROBLEM STATEMENT

Traditional on demand routing produces heavy routing traffic by blindly flooding the entire network with RREQ packets during route discovery. The routing overhead associated with dissemination of routing packets is quite huge especially when topology changes Multipath routing protocols cache multiple routes to a destination in a single route discovery. However, in presence of mobility, multipath protocols incur additional packet drops and delay due to their dependency on potentially stale routes from caches Protocols using either limited broadcast or local recovery have focused on reducing packet drops and not on utilizing the bandwidth efficiently during route recovery. Multipath routing protocols involving multipath discovery and local route recovery at the time of node mobility creates additional burden and heavy traffic load on the network by selecting recovery node as random overhearing node.

So we propose an enhanced routing protocol which provides multipath discovery and controlled traffic load route recovery at the time of failure. Whenever a link or a route break occurs, a route recovery is performed which in turn invokes the alternate route selection from the available nodes on the basis of the neighboring node which is first to send route reply packet from destination if there are more than one node sending packet at same time then node with higher available bandwidth will be selected. The proposed routing protocol has the following advantages:

- Provide optimal routes
- Utilize bandwidth efficiently
- Loop-free
- Reduce stale routes problem
- Reduces packet drops
- Controlled traffic load at the time of route failure

III. LITERATURE SURVEY

This section focuses on literature survey, it present a critical appraisal of the previous work published in the literature pertaining to the topic of the investigation.

Mahesh K. Mariana et al. (2006) proposed AOMDV multipath extension to AODV (single path routing protocol). The proposed protocol provides loop freedom and disjointness of alternate paths also the proposed reduces packet loss and improved end-to-end delay. Sirisha Medidi and Jiong Wang (2007) proposed a location-based route self-recovery technique for source-initiated routing protocols. The purpose of route self-recovery is to reduce overhead and delay during route maintenance as well as allowing continuous packet forwarding for fault resilience. Ha Duyen Trung and Watit Benjapolaku (2007) proposed (MLAR) A Caching Strategy for Multiple Paths in Mobile Ad Hoc Network to provide efficient search and selection basis for multiple paths. The proposed method also provides efficient routing for Mobile Ad Hoc Networks. Aminu et al. (2009) proposed a new probabilistic counter-based (PCBR) method that can significantly reduce the number of RREQ packets transmitted during route discovery operation. There simulation results reveal that equipping AODV routing protocol which traditionally uses the blind flooding. The effect of traffic load, mobility and topology size on the performance of PCBR-AODV route discovery is not considered. Kang and In-Young Ko (2010) proposed a location-based hybrid routing protocol to improve data packet delivery and to reduce control message overhead in mobile ad hoc networks. In mobile environments, where nodes move continuously at a high speed, it is generally difficult to maintain and restore route paths and to enhance the performance of Split Multipath Routing protocols by using route update mechanism.

IV. PROPOSED WORK

We propose an enhanced routing protocol which provides multipath discovery and controlled traffic load route recovery at the time of failure. When the source wants to forward packets to the destination it broadcast the route request packets (RREQ) to whole network. The RREQ propagation from source to destination establishes multiple reverse paths both at intermediate nodes and destination. The multiple paths discovered are loop free and disjoint paths. The destination node upon receiving all RREQ packets attaches the route code consisting of route bandwidth and feedback Route Reply (RREP) packets. These multiple RREPs traverse reverse paths back to from multiple forward paths to the destination at the source and intermediate node. After receiving RREP packets, the source node selects the primary route on the basis of route with higher bandwidth. In case of route failure in primary route the node detecting failure performs the route recovery procedure. The route recovery technique is performed to avoid congestion and degradation in network.

Enhancement of Multipath Routing for Route Recovery Route Discovery

Step 1: Whenever data packets are needs to be forward by the source node to the destination, the RREQ packets are flooded to entire network. Since RREQ is flooded network-wide, a node may receive several copies of the same RREQ. These duplicate copies can be gainfully used to form alternate reverse path.

Step 2: The reverse paths are formed only using those copies that preserve loop freedom (never form a route at a downstream node via upstream node) and disjointness (ensure the last hops and the next hops before destination are unique) among the resulting set paths to the source.

Step 3: If route information to the destination is present in the route cache of intermediate node, it has no permission to send Route Reply (RREP) back to the source, permission is given only to the destination node.

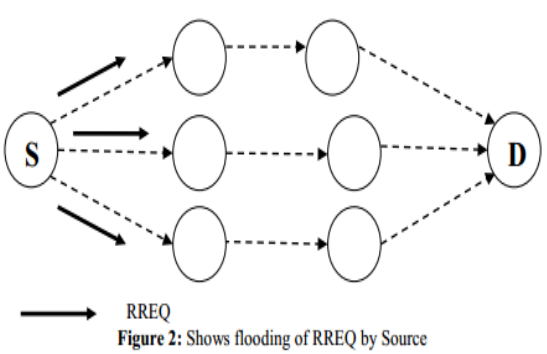


Figure 2: Shows flooding of RREQ by Source

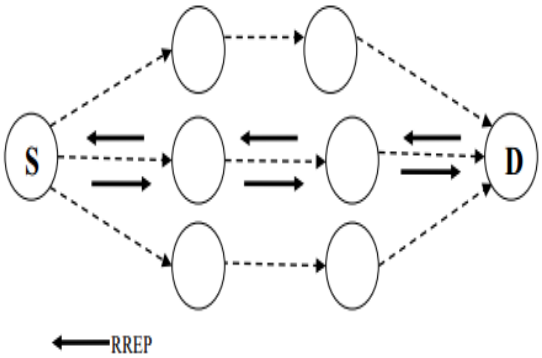


Figure 3: RREP by Destination

Step 4: The destination upon receiving all RREQ packets attaches route code and sent it as RREP packet. Upon reception of RREP packets the source selects the primary route on the basis higher bandwidth.

Route Recovery

Step 5: In case of route failure in primary route the recovery node is selected from the neighboring nodes of node detecting failure by performing route discovery from node detecting failure. Now the node detecting failure starts route discovery.

Step 6: In the mean time send Stop Transmission till route recovery packet to source node through reverse path to control congestion.

Step 7: The neighboring node which is first to send the route reply packet from the destination to the node detecting failure is selected as recovery node.

Step 8: If the two neighbors of failure node send the route reply packet at the same time then the node with higher bandwidth is selected as recovery node.

Step 9: As soon as new path is selected a start transmission packet is sent to source to Start transmission again and updates its cache by storing new route for transmission.

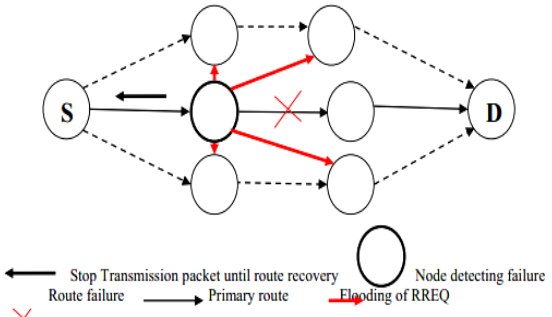
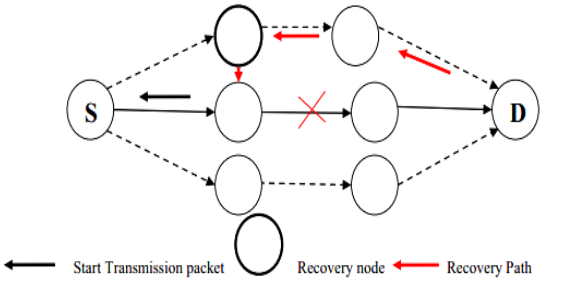
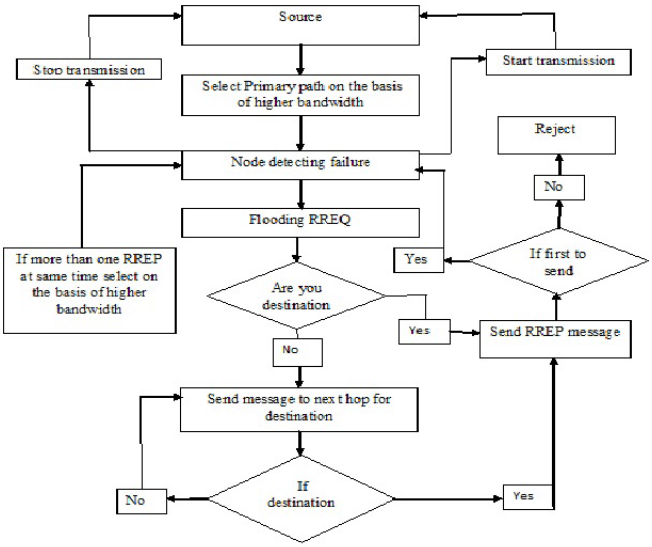


Figure 4: Route Failure in Primary Route and Re Route Discovery by Node Detecting Failure



Neighboring node first to send route reply packet is considered as recovery path and after that start transmission packet is sent to source to start transmission again.

Figure 5: Shows Recovery Path and Start Transmission Packet to Source



V. CONCLUSION AND FUTURE WORK

In this paper we have proposed "Enhancement of Multipath Routing Protocol for Route Recovery (EMPRR) in MANET", a routing protocol which provides multipath discovery, efficient utilization of bandwidth and controlled traffic load route recovery at the time of failure. The proposed protocol is efficient in overcoming the problem of stale routes in multipath routing protocols. Also proposed protocol shows significant improvement in packet delivery ratio and reduced end to end delay. In future researchers can develop hybrid multipath routing protocols that will provide feature of fault tolerance at the time of failure of node, failure of link and breakage of route and also balance load at the time of large volume traffic and finally increase quality of service aspects of multi path routing protocols. As in our protocol throughput didn't show large variation.

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The success and final outcome of this project, **Enhancement of Multipath Routing Protocol for Route Recovery in MANET**, required a lot of guidance and assistance from many people and we are extremely fortunate to have got this all along the completion of our project work.

It was quiet exciting and worthwhile for us to work on this project , as during this work, we have gained a lot of practical and theoretical knowledge of great significance. The satisfaction would be incomplete without acknowledging the people without whom this project wouldn't have had been a success.

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