AnEnhanced Approach To Improve Energy Of TORA Routing Algorithm In MANET

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***Abstract*: Temporary ordered routing algorithm (TORA) is highly adaptive and distributed MANET routing algorithm.Mobile Ad-hoc network is fully battery operated therefore Energy aware routing algorithm is needed for Performance enhancement of mobile Ad-hoc network. In this paper, TORA selects path based on Residual Energy of node and multipath methodology. Purpose of selecting multipath is for the Fair battery consumption of the nodes and load balancing purpose. The node that have more energy that have higher probability choses for data transfer. In this paper, based on TORA we consider energy and multipath therefore this modified TORA called as ME-TORA. Simulation results of ME-TORA compared to conventional TORA in NS-2 show that ME-TORA decreases energy consumption of nodes and ultimately increases life time of the network.**

***Index Terms*—Mobile ad-hoc network, TORA, Energy, Multipath.**

I. INTRODUCTION

Mobile ad-hoc [6] network (MANET) doesn't needed any pre-organized infrastructure. It can be established anytime anywhere. MANET does not need any central unit to control all the nodes [7]. Also it is self-organized and self-configurable network. MANET does not have anycentrally installed device to control data transfer of the network. The major issue [8] of MANET are security, limited energy, efficient routing, bandwidth etc.

In MANET,because of dynamic nature of nodes routing is one of the major issue. Routing simply means guiding data between source and sink node in network. Performance of MANET totally depends upon the type of routing scheme adopted.

In today's world developing and modifying routing protocols for MANET has become the extensive research area.Here the work of the routing protocol is to select the shortest path for transmission of the data through the network.In MANET there is many mobile node which is connected wirelessly to each other. Here all the node can discover only its neighbor node and can't reach the other node directly but node can discover the other node which is indirectly in the range of transmission. Here the data transfer between source to destination can be done in many ways. Mainly routing can be done in two ways: 1. Proactive (table driven) 2. Reactive (source initiated). In proactive protocol, the routing table is predefined for each node and created when the MANET established. Whereas reactive protocol generates routing table when it is needed.

II. OVERVIEW OF THE TORA ROUTING PROTOCOL

TORA [13] is areactive routing protocol which is highly adaptable, scalable and distributed [10]. It uses the link reversal algorithm [9].It is also loop free algorithm and therefor it is suggested for the highly dynamic mobile and multi-hop wireless networks. Link reversal algorithm gives a mechanism for routing in MANET and maintain the route for the sink node even for instantly physical changing structure of the node. Due to this adaptable and stabilizing skill TORA is used in the highly dynamic environment.

TORA searches all the possible path from source to the destination. During this, each and every node maintain routing information of the neighbor node. If the topology of the network changes during the data transfer then the control packets are exchanged between the set of the node which are involved in communication [12].For this purpose TORA has three main task:

- Route creation
- Route maintenance
- Route erasure

A. Route creation in TORA[12]

In TORA to reach from source to destination, creation of the route between source to destination is done by means of two packets: QRY (query) and UPD (update) packets.

Step 1: source node broadcastsQRY packets which consist of destination ID.

Step 2: Reference level height of the destination node is set to 0 and the value of the intermediate node is set to NULL by QRY packet.

This two steps shown in Fig.1.

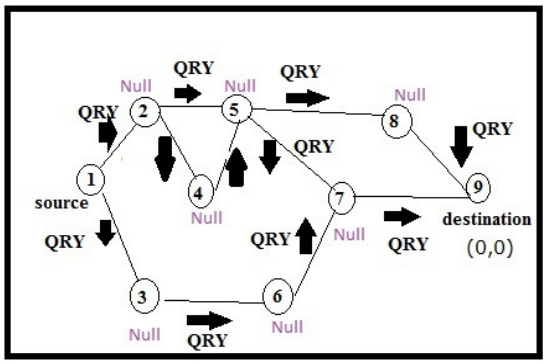

Fig1.broadcast of QRY message

Step 3: destination node replies by sending UPD packet in reverse direction towards source node.

Step 4:node which receives the UPD packet sent by the neighbor node will increase itshight value by one.

Step 3 and 4 have been describe in Fig.2.

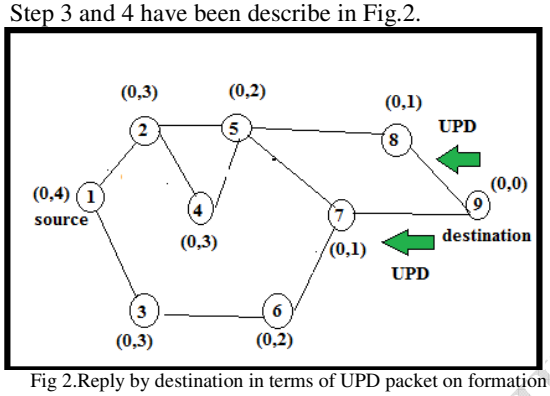

Fig 2.Reply by destination in terms of UPD packet on formation of DAG

Fig 2. Shows the UPD packets sent by the destination node 9,the arrow shows the direction in which the UPD packets are traveling in thedirected acyclic graph (DAG). UPD packetis sent to every node between source to the destination.

B. Route maintenance

Data transfer from the higher value Node to the Lower node is called the downstream link, and the Data transfer from the lower value node to higher value node is called upstream link. When the physical topology of the network changes, the link of DAG breaks. Therefore the route between source to the destination needs to bemaintained, it can be termed as route maintenance. In this phase another path is established between same source and destination node. If there is a link failure detection between two node, then new reference level isassigned to the node which possess lower value in the height matrix. This new reference level is further broadcasted in the network with the help of UPD packets, and new path established in the network. As shown in Fig 3, the link reversal [13] algorithm is used in TORA. Here node 8 changesits location therefore link between node 5 and node 8 are disconnected or link failure occurs. Due to this, node 5 can't find any downstream link. Therefore node 5 setitsnew height value as shown in Fig 3 and broadcast its new heightvalue to the neighbor node, to inform source node about link failure, this mechanism is called as link reversal algorithm. So in TORA this link reversal algorithm is executed when there is no downstream link in it.[11]

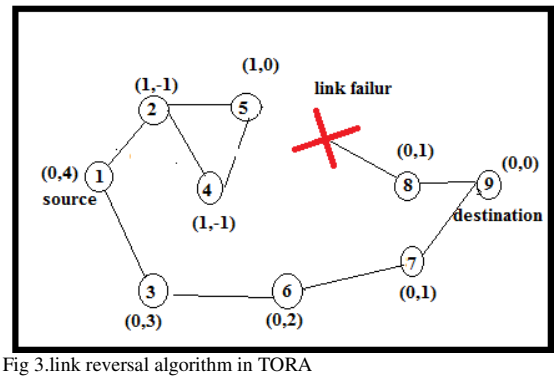

Fig 3.link reversal algorithm in TORA

C. Route Erasure

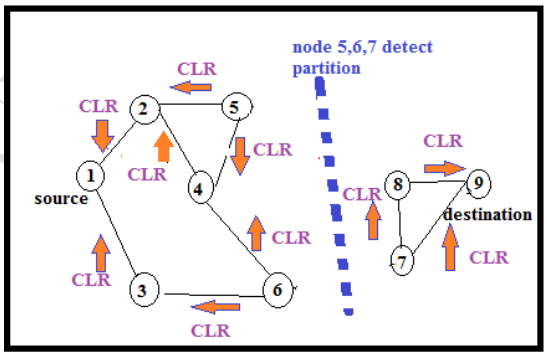

Fig 4. Route erasure by CLR packet

In TORA protocol route erasure phase is initiated when any node in the network fill the partition, and node floods clear (CLR) packet[14] in the network. Node which receives this clear packet is reset its height value to NULL. By this process, network erasesthe entire unnecessary route. Further network initiates the re-establishment of the route, from where clear packet was received by last node. This process is shown in Fig 4. Here node 5, 6, 7 detect the partition and broadcast the clear packet.

III. Simulation Approach

In this section encompasses the proposed system, in which destination node replies with the modified UPD packet, by which residual energy of the node will be calculated at the time of route creation process. And secondly source node selects two paths which are having highest energy path and second highest energy path for data transfer.

Proposed Work

- Ad-hoc network is an independent network for mobile node. So we require load balancing for equal data transmission.
- Here we are going to use load balancing technique, consider energy parameter and modify routing parameter.
- We are changing the route selection mechanism. Instead of hop count, we use residual energy and multipath methodology.

Proposed Algorithm

Step 1: Modification of the UPD Packet to calculate residual energy of the node.

Step 2: With the help of this Modified UPD Packet source node calculate the energy of the all received path to destination.

Step 3: Using this calculation source node select two best path for particular destination.

- Two best paths are selected as highest energy path and second highest energy path.
- This multipath mechanism is used during link failure as well as load balancing purpose.

Parameter	Value
Operating system	Ubuntu 14.04
NS-2 Version	2.35
Channel type	Wireless Channel
Number of nodes	5/10/15/20/25/30
Antenna	Omni directional Antenna
Routing Protocol	TORA
Simulation time	15 sec
Simulation Area	500m *500m

Figure 5Simulation Scenario

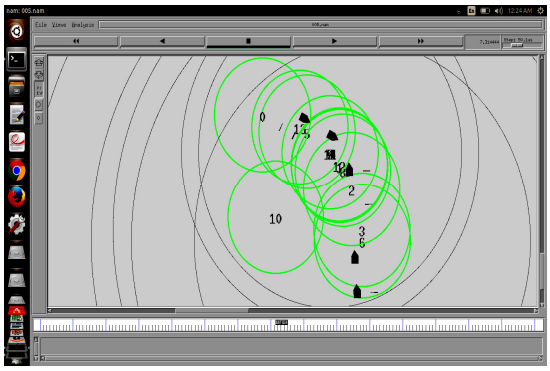

Figure6Network Animator Scenario

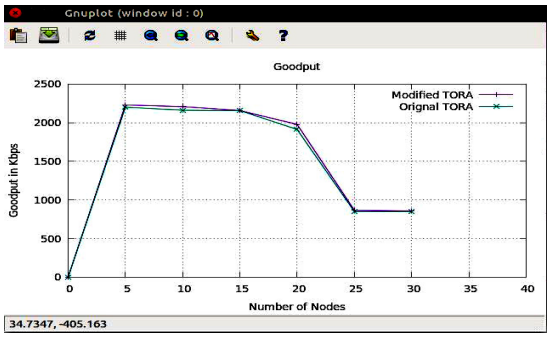

Figure 7 Goodput

From figure.7 it can be seen that goodput in modified TORA is better than the original TOARA. As the number of node increases improvement in goodput results also identified.

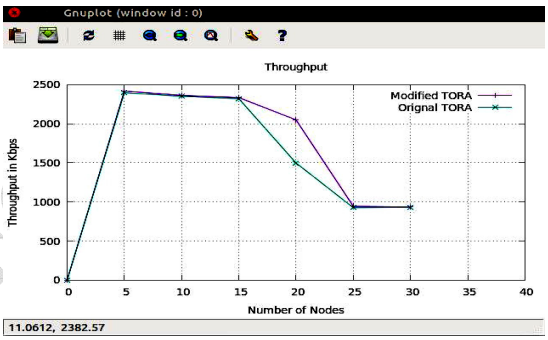

Figure 8 Throughput

From figure.8 it can observed that Throughput in modified TORA is better than the original TORA. As the number of node increases improvement in Throughput results also identified.

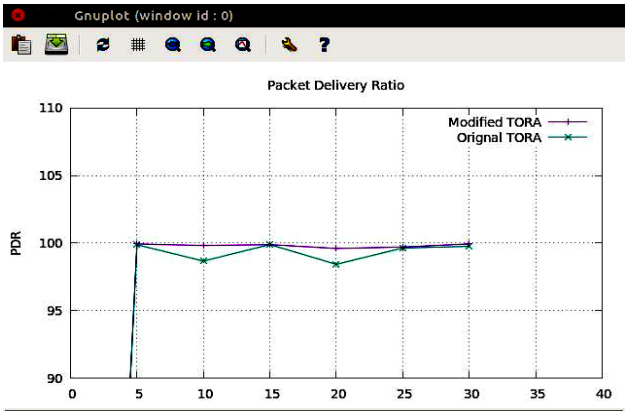

Figure 9 Packet Delivery Ratio

As per the observation in figure.9that PDR in modified TORA is better than the original TORA. As the number of node increases improvement in PDR results can be identified.

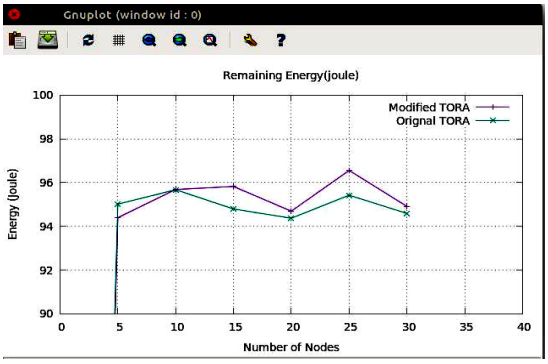

Figure 10 Energy (Joule)

From the figure.10 it can be observed that Energy in modified TORA is better than the original TORA. As the number of node increases improvement in Energy results also identified.

IV. CONCLUSION & FUTURE WORK

TORA uses two types of packet QRY and UPD. The project work presently uses UPD packet for finding the cost value and based on that multipath are calculated. Previously link sensing mechanism had been used to modify TORA, presently in this project work multipath is used to resolve the issue. If one link goes down, there is no requirement to find cost function again. The proposed algorithm chooses the path based on energy and hop count. In this way modified TORA increases throughput, goodput, PDR and balance energy consumption. In future, further modification can be done in TORA based on bandwidth and mobility and considering the boundary node as well with different transmission range.

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