

REQUIREMENTS FOR ALTERNATE ROUTES IN MANET

Ela Kumar*

Ravinder Nath Rajotiya**

ABSTRACT

The evolution of next generation wireless technologies, have given birth to new kind of communication techniques. It permits more frequent use of the license free frequency to communicate among the peer nodes. The network so formed with these fall under different categories. One such network is a self configurable and can be established without the need of any pre-established infrastructure and is called MANET. The nodes in these networks may join as a friend node on trust base and may leave or may be asked to leave the network. Though, such type of networks has been extensively used in military applications, but has started penetrating the commercial and general type of applications. A number of routing protocols have been developed for forwarding the packets from source to destination. These protocols have some advantages and disadvantages over each other, but basic functionality is to find a route from source to destination via some intermediate nodes and the route maintenance. In this paper we explore certain situations that warrant the need for an alternate route towards destination.

Keywords: MANET, ALTERNATE ROUTE, ROUTING

*Dean, School of ICT, Gautam Budhha University, Greater Noida, U.P, India

**Deptt. of CSE, Advanced Institute of Technology & Managemet, Palwal, India,

1. INTRODUCTION

Mobile Ad Hoc Network are the infra-less collection of self configurable wireless network using handheld portable devices. The nodes communicate to any other node in the network through the cooperative approach of the intermediate nodes. These intermediate nodes act as routers, and help in transmitting the packets to their final destination. MANETs [2] are applicable in situations where no infrastructure is available; a common example is a disaster relief scenario. They are also the foundation for vehicular ad-hoc networks, where communication between cars is used to increase vehicle safety and driving comfort. Figure 1 shows tentative arrangement of a number of mobile nodes to form such type of network.

A number of routing protocols have been developed each with certain advantages and disadvantages over one another. New approaches are proposed to cater to the need of specific application. A set of factor at physical layer [3] that affect the performance are signal reception, path loss, fading, interference and noise computation, and preamble length.

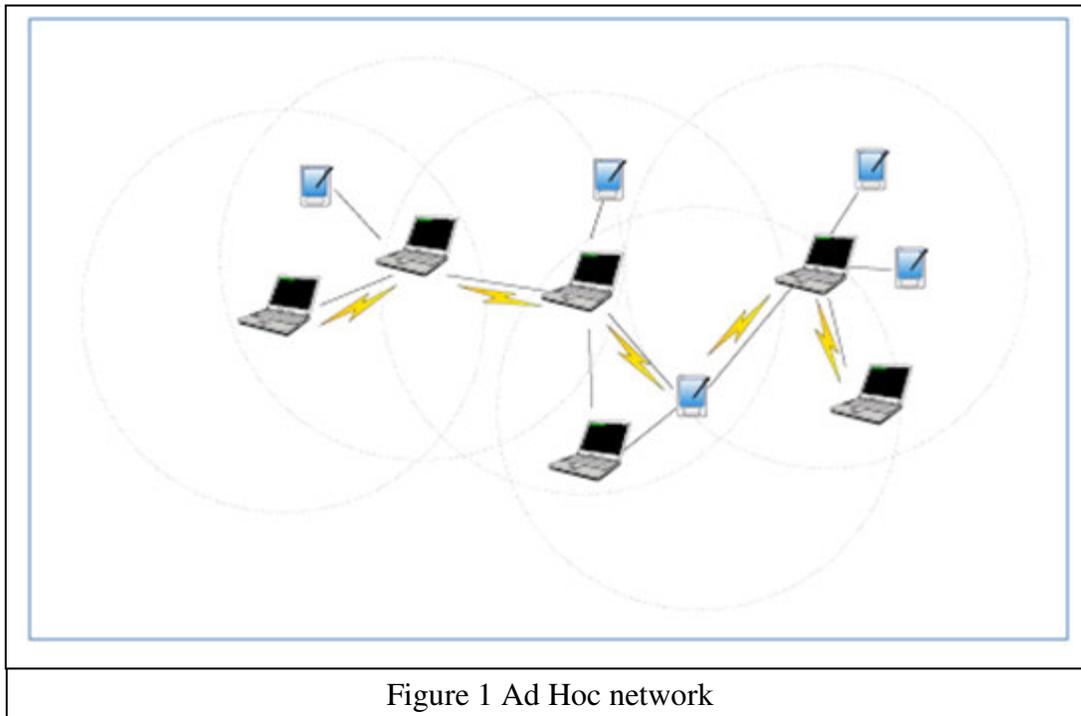


Figure 1 Ad Hoc network

In this paper we explore the factors other than those at the physical layer that are relevant to the performance of higher layer protocol and warrant the need of forwarding the

packets through one of the multi-path or alternate routes. Multipath routing allows the establishment of multiple paths between a single source and single destination node. Multipath routing [4] is typically proposed in order to increase the reliability of data transmission (i.e., fault tolerance) or to provide load balancing and hence the quality of service [QOS] [1]. Load balancing is of especially importance in MANETs because of the limited bandwidth between the nodes.

2. REQUIREMENT OF ALTERNATE ROUTE

Two hop routing mechanism offers multi-paths to destination. In case of link failure, a node may check its route table for alternate route to the desired destination. If one such route is available, the packet is then sent through that route else the packet is buffered and fresh route discovery is initiated.

Continuing with the modification in the said approach, we now include some real time scenario, which will further enhance the routing performance. Below are some of the observations of the real time situation.

After a route has been established, and routing tables constructed, a node may /or may not be able to contribute in transmission. Some of the situations in which a node may not be able to perform its duties are given below.

- a. Health condition---battery
- b. Congestion in the network
- c. Signal strength
- d. Link condition (Uni-directionality)
- e. Trust relationship—Most trusted nodes will be in the Two Hop area others will be further;
- f. When role is changed(Promoted/Demoted)
- g. When moving out of the network (When a node has dual/multiple responsibilities—it goes to its area of assigned duty—this could be performed at fixed and predefined time slots. This could also be performed without node movement but diverting the traffic meant for the original node to this new assigned node for that task.

h. Assigning responsibility: Permanent / temporary

The following sub sections discuss the requirement for the alternate routes in MANET.

The study of these areas will have motivated us for the work on alternate route protocol.

i) Health Related Problem:

A node may go down due to the health problem. The health we mean here is the battery condition. As a node is expected to be carried by its user, either the user himself observe and act beforehand and inform its peer node about its dying condition so that the corrective action of forwarding the data mean to be through this node via some alternate path.

ii) Congestion in the network:

Major causes of congestion [2] at the node are either because of bandwidth of the output media is low as compared to source bandwidth, or multiple sources sending the data. The congestion leads to drop in packets. Also when the input buffer in a node is full, either a newly received data packet or a stored data packet has to be discarded [5] to avoid buffer overflow. One solution to get rid of the transmission congestion on media is to provide alternate route to the packets to flow, this will reduce the load on the link.

iii) Signal Strength:

The signal strength affects the range of the transmission. Lower the signal strength, smaller will be the area that a signal can propagate. In order for the signal to travel longer distance, it will require large power. With low signal strength a node may not be able to participate in high bandwidth environment thus leading to packet drop and warranting for the requirement of buffering the packet and transmit over alternate /or fresh route.

iv) Link Condition:

The wireless nature of the node is such that the signal strength in one direction may be much higher than that in reverse direction or there might even be a condition of link failure[1] (a very weak signal strength). So this may cause problems for the reverse route. If the link is bidirectional (Symmetric) the route used for sending the data to destination may also be used as reverse route for acknowledgement. In the absence of symmetric link, the reverse route has to be

discovered for such activity and thus putting certain overhead in terms of performance.

v) Trust Building:

We also propose to put the most trusted (in terms of health, directionality) nodes as the cluster head of the two hop routing protocol. These nodes are expected to live longer and have healthy life, so that they can cater for the communication requirement of the overall network.

vi) Changing Role of a node:

As in real working environment, a node may be promoted to carry out crucial tasks or be demoted to restrict to data collection and forwarding activity as in case of field jobs. Whenever the role of the node changes it should be published so that other node knows the kind of protocol to follow for transmission with this node. The role may decide on assigning the priority for the packets of this node.

vii) Due to mobility and power limitations:

Due to mobility and power limitations, links in MANETs are opportunistic. *Link failures* may happen at any time during the packet-transmission process, which may disrupt the transmission of a data packet. If no mechanism is employed to discover and replace failed links, packet losses will occur.

viii) Movement into/out from the network/range:

A node may move to new location or even out of the network or even completely become invisible. Whenever a node moves from its old position to a new position, will cause a disturbance in the transmission because of the unavailability of that route for future transmissions. To take care of movement of the node to ensure smooth packet transmission, whenever a node move out of its parent position must intimate to its peer or the superior node of such motive so that an alternate route available to a destination, can either be discovered or the available alternate route flashed on the network for the information of other nodes.

It becomes very clear from the above discussions that in order to have seamless transmission, nodes need to become intelligent. They must learn from the environment, about the behavior of the node so that a node may predict its own or the behavior of the other nodes. Such knowledge will help in building a knowledgebase that will help the

node to switch the transmission route through alternate available route. But for now we leave it up to the dynamic node to intimate by setting certain bits in its control packet

3. CONCLUSION

A number of situations requiring alternate route and buffering mechanism have been suggested in the preceding section. The inclusion of these approaches in the protocol will help in achieving better performance with significant less overhead as compared to table driven routing mechanism.

REFERENCES

- [1] S.Sridhar, R.Baskaran," A Survey on QoS Based Routing Protocols for MANET", *International Journal of Computer Applications (0975 – 8887) Volume 8– No.3, October 2010*
- [2] Christian Lochert, Bjorn Scheuermann, Martin Mauve," A Survey on Congestion Control for Mobile Ad-Hoc Networks", published in *Wiley Wireless Communications and Mobile Computing 7 (5)*, pp. 655–676, June 2007 <http://www.interscience.wiley.com>.
- [3] Mineo Takai, Jay Martin, Rajive Bagrodia," Effects of Wireless Physical Layer Modeling in Mobile Ad Hoc Networks", UCLA Computer Science Department Los Angeles, CA 90095-1596
- [4] Stephen Mueller, Rose P. Tsang, and Dipak Ghosal," Multipath Routing in Mobile Ad Hoc Networks: Issues and Challenges", a funded project from Sandia National Laboratories, CA, USA
- [5] Yuecheng Zhang, Liang Cheng," Improving Reliability of Packet Delivery in MANETs by a Holistic Routing Approach", Department of Electrical and Computer Engineering Lehigh University
- [6] Ela Kumar, Ravinder Nath Rajotiya," MANET Performance Enhancing with Packet Buffering", *IJACT : International Journal of Advancements in Computing Technology*, Vol. 3, No. 2, pp. 1 ~ 7, 2011

- [8] Ela Kumar, Ravinder Nath Rajotiya,” THR : A Two-Hop Look Ahead with Packet Buffering Protocol For Manet”, International Journal of Information Technology and Knowledge Management January-June 2011, Volume 4, No. 1, pp. 109-112