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Role of Link Expiration Time to Enhance DSR Routing Protocol in MANETs

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Abstract

An ADHOC network forms a network which includes wireless mobile nodes or host. In such an environment, to forward a packet from source host to destination host require an intermediate mobile host to forward data packets. These networks have many constrains because of uncertainty of radio interface and its limitations. Major concern is of power source as limited battery energy is available in use. Power sources of any host is to be drain out or if any host moving out of the network in near future than this has to be traced out in advance. Thus a new route will be discovered before the actual route error generates in the network. This will saves lot of transmission time and decrease network overhead.

This work is focused on finding out the role of link lifetime estimation of a link in any network. Estimation of path duration used to enhance the performance in communication in MANET. Mobile nodes have randomly scenario, as estimation of link lifetime duration is difficult to calculate.My research work provides a way to estimate average Link Life Time for a path in mobile ADHOC networks.This has been used to enhance DRS Routing Protocol.

Keywords: MANET, Link Lifetime, Link Estimation, Routing Protocol

1. INTRODUCTION

ADHOCnetworkinearly70scalledaspacketradionetwork wassponsoredbyDefenseAdvancedResearchProjectsAgency.MANET In respect of networkis easilyconfigurable withoutthe need of any centralizedinfrastructure.Theeasilyconfigurable nature is because of fact that MANET is networking that consisting of self-organizing nodes which can act as routersthemselves and thus control the network.

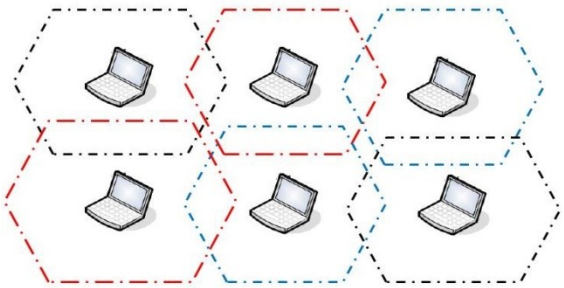

Fig 1: Network Representation

ADHOC networkconsistofnodes/hostswhichcanmovefreelywith each other host by meansofadirectlink (within reach of each other) orbyintermediatenodes/host. Large MANET is more difficult tomanage. Fig1 represents the basic structure of any ADHOC network so formed by the collection of mobile host. [1]

2. Challenges In MANET

- **Limited Wireless Broadcast Range:**

In MANET, the radio bandwidth is limited, routing protocol requires low overhead in comparison with fixed wired network for keeping at working state. Speed of wired transmission is always higher than wireless transmission.

- **Unidirectional Links:**

If host X has a route to communicate with another host Y in the network. In the same network host Y may not be able to communicate with host X through the same reverse route.

- **Battery Constraints:**

Maintain portability in mobile device: Capacity of power source loss occur.

- **Packet Loss:**

In MANET, packet loss occur due to many factors such as transmission error, hidden terminals, interfaces, bit rate high, asymmetric link and mobility. [2]

- **Mobility Route Change:**

MANET supports topology, breakage, as it occurs route discovery in wireless network. [1].

- **Routing Overhead:**

Routes describe in routing table, while host are prone to change location randomly in wireless network. [1][3]

3. LINK & PATH DURATION

In MANET, link duration and path duration are the metrics. In link duration, packet sending should be in communication range, if the packet is too long, the disconnection occurs. The period of time route availability is called duration of routes. The routing protocol increases overhead in the period of time, where the routes become invalid. Selection of path is based on minimum number of hops. Flooding is the essential mechanism in the route discovery process. Another, is the Path duration which determine the best route to the destination, also consists hop count from source to destination over the network.[4][5][6]

4. PROBLEM DEFINITION IN LINK LIFETIME

Following are the problem that appears in the development of link reliable routing protocol. [7][8][9].

- Nodes in the network can disappear due to lack of battery power.
- Communication path between two hosts can be broke down due to free random movement nature of mobile host.
- Power drain rate capacity of a node is not only affected by its own but also by its corresponding data packet forwarding.
- Link expire time along the route proposed is obtained by selecting a path with all nodes has sufficient residual battery power for transmissions up to a certain time. The node contains critical node which has the minimum data packet for broadcasting over the network.
- Each host determines its own lifetime based on its energy and activities in MANET.
- Network contains drain rate capacity and residual capacity of each node in the network, link lifetime will be estimated; protocol will select the longest active path in the network irrespective of shortest path in the network.

5. TRADITIONAL DRAWBACK

Route repair or route maintenance is a process by which an error in the existing working route is detected by the host in any network. Every host in the network forwards data packets in the network to the next hop address mentioned in the header of that packet. Every host that forwards a data packet in the networks attempts to confirm that the packet is received by the next host in the network with the help of acknowledges. After a sequence of data packet forward to next hope if a host is not able to detect the ACK packet from net hope then the host consider that the route is broken. And it returns error message in to the original source in the network. Thus original source will move initiate route discovery process. [10][11][12]

6. NEW PROPOSES SOLUTION

To overcome this tradition drawback I have added concept the node lifetime, connection lifetime and link lifetime in the route maintenance of DSR Protocol. As the ADHOC network is consists of mobile nodes that are operated on battery power. No fixed line power is available to them thus power available to them is limited which can drain out rapidly. New concept will consists of the following sections in the route maintenance of DSR protocol and they are listed as below:

1. Node Life Time Prediction
2. Connection Life Time Prediction
3. Link Life Time Prediction
4. Route Repair

6.1 Node Lifetime Prediction

To estimate the power drain rate at every host in the network we consider the work done at that node in its life time. For this we consider the initial remaining power at every host is max in ideal state. Range of battery power is taken from 0 to 1. Where 0 is for min and 1 is for max power. Fig 2 represents the work done at a host on network for receiving & forwarding a single packet in the network. Node lifetime is based on its current power and activity.

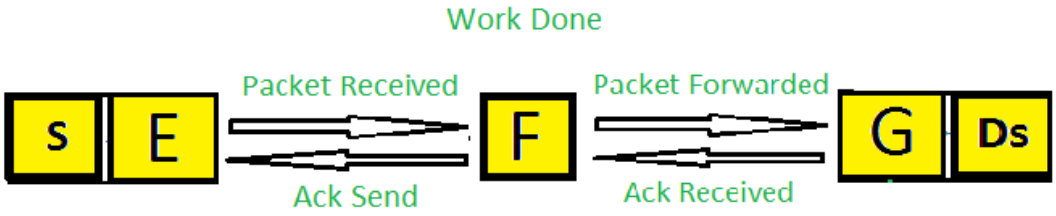

Fig 2: Work Done at Node

Following are the power consumption that I defined in this process.

Dr = Power consume in reception of a packet

As = Power consume in reply of a ACK packet

Dt= Power consume in forwarding of a packet

Ar = Power consume in reception of a ACK packet

With every operation at mobile host power drains out. Thus, combined power loss will be sum of all small consumptions.

$$\mathbf{En = 1 - \sum(Dr, As, Dt, Ar)}$$

"En" represents the left out power at host. And that will be the Node Lifetime in the network. As Node lifetime is directly dependent on the power source.

6.2 Connection Lifetime Prediction

Connection lifetime is the lifetime of connection that will remain in the active state between two nodes as long as two nodes can directly communicate with each other. Fig 3represents the transmission range of the random hosts in the figure. If node B and node D move out from the transmission range of node C at that time the connection. Link between node B & C and Node C & D will end.

Connection lifetime will be dependent on the two factors and they are listed below:

1. Relative transmission Range
2. Current Node Lifetime
3.

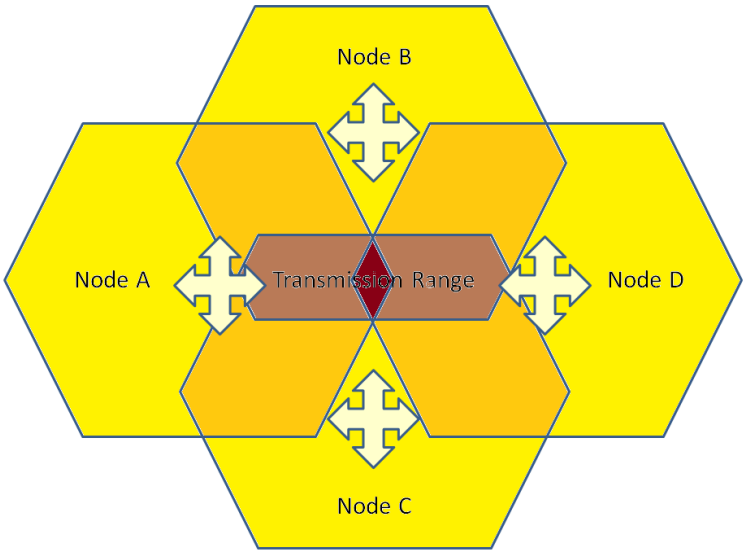

Fig3: Transmission range of Node

6.2.1Relative Transmission Range

Relative transmission range will be inversely proportional to the mobility of the host in the network. Mobility of the network will be depended on the transmission speed and transmission time. Transmission speed will be constant as packet flow in the network at constant speed. Transmission time is the time at which packet is forwarded from the corresponding host in the network. That time is available in the packet header.

Range of relative transmission will be 0 to 1. 1 is for in range and 0 is for out of range. As relative transmission range will be inversely proportional to the mobility. It can be defined as:

$$\mathbf{Rt = 1 - Mobility}$$

Where **Rt** stands for Relative transmission range. And mobility will be defined as:

$$\mathbf{Mobility = Ts\ X\ Time}$$

Where **Ts** stands for transmission speed, **Time** stands for time taken by ack packet to reach from sender node to receiver node. Time will also be added in the packet header at the time of packet forwarding.Times taken will obtains by subtracting packer reply time that is in the header of the ack packet with the time of receiving the ack packet from the source. Thus, following equation will be used to obtain time taken.

$$\mathbf{Time = Time\ of\ Received - Time\ in\ ACK\ Packet}$$

Finally; Combined Connection lifetime will be defined as

$$\mathbf{Cl = [Rt, En]}$$

6.3

6.4 Link Lifetime Prediction

Route expiration time is defined as the minimum value of estimated connection lifetime and node lifetime. We can say that route expiration time is a function of connection lifetime & power available at mobile node (node lifetime). Both of the values we have calculated in previous sections. There for it can be expressed as follow:

$$\mathbf{Lr = Min\ [Cl_i, Cl_{i-1}]}$$

Where ‘i” represents the no of connections from 1 to n in the network. And where Lr stands for Link Lifetime will be added in route reply ack.

6.5 Route Repair

For route maintenance new data is to be added in the header of the reply acknowledgement packet. They can be listed as:

1. Reply Time of packet
2. Link life Time

Whenever a node received an ACK reply from a node in the network its check for the new reply time and the link lifetime in the header of the packet.

It's used both the values to calculate link life time at its location. If link lifetime of the connection seems to be zero that the node sends the route discovery process for finding out the new path to the destination. Otherwise add its own data into the header of the ACK reply packet. And send it to source at time of when new data packet is received from source. Fig 4 represents the complete process at this stage.

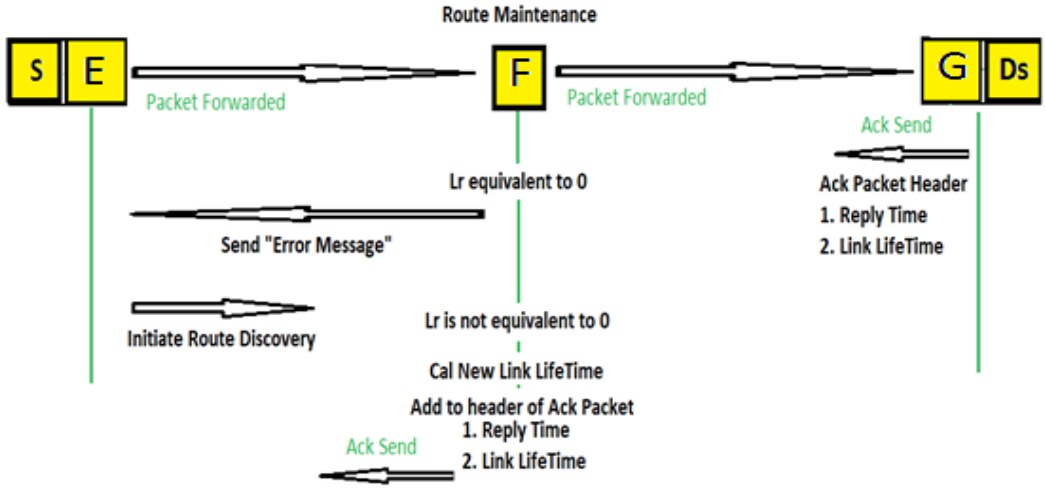

Fig4: Route Maintenance

Table 1 consists of the data that is to be added in the ACK reply packet by the intermediate note to the preceding intermediate node from which node received a data packet. All the figures that are present in table 1 are assumptions and all those will be calculated or will be from the actual outcome when this proposed model will be implemented.

Table 1: New Header Fields of ACK Packet

Node	**Reply Time of Packet "Seconds"**	**Link Life Time [Lr] = [Rt, En]**
Ds	3.005	[0.5,0.8]
G	3.009	[0.9,0.9]
F	3.015	[0.4,0.8]
E	3.018	[0.7,0.3]
S	3.021	[0.2.0.4]

7. CONCLUSIONS

By the help of new defined model to estimate link lifetime,an enhancement over DSR model can be applied in the Route Maintenance part of existing DSR routing protocol. New model will also contains all the advantages of existing DSR routing as it is an enhancement over it. My model will help in calculating in advance whenever any ongoing route is about to expire. Thus it will help in discovery of new route while old route is still working but about to expire. This saves lots of time in communication process as communication link breaks down will become rare to occur.

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