A Review of Methods of Preventing Link Breaks in MANET

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Abstract –Mobile ad hoc networks (MANETs) are autonomously self-organized networks without infrastructure support. In a mobile ad hoc network, nodes move arbitrarily therefore the network may experience rapid and unpredictable topology changes. Because nodes in a MANET normally have limited transmission ranges, some nodes cannot communicate directly with each other. Hence, routing paths in mobile ad hoc networks potentially contain multiple hops, and every node in mobile ad hoc networks has the responsibility to act as a router. The nodes have capacity of moving freely which leads to sometime link breaks .Freedom in movement increases the chances of link breaks in MANET .The link breaks in MANET routing protocols are significant contributor of energy consumption. The continuous breaking causes communication failure .We Study the various methods that have been suggested to decrease the probability of link breakage in MANET.

Keywords: MANET, Link breaks, Routing Protocols.

INTRODUCTION

The MANET is an organized network of mobile Nodes connected by wireless links and requires no infrastructure for communication. The nodes can move freely and in arbitrary manner. All nodes within the range of each other can communicate without the need of a central access point. Each node can act as both a router and as a host for multi hop messages. The nodes in the network forward messages on behalf of other nodes which are not in the transmission range of each other. Hence separate schemes are required for such dynamically changing network. It is anytime, anywhere type of network. Because of this such a network can be quickly deployed in emergence services such as disaster recovery like fire and search and rescue operation, and the ease of data acquisition in inhospitable terrains makes it suitable for military operations. MANET is constructed to work in the situations such that whenever certain number of nodes comes together within transmission range of each other, they should be able to communicate [1]. Its aim was not as for the fixed network, not for long time. So generally in MANET nodes are equipped with low power and computing, having routing capabilities. Because, in MANET, topology frequently changes, and nodes have got limited power so its routing is challenged by these factors. So conventional routing protocols employed for wired networks cannot be used.

Initial routing protocol considered minimum number of Hops as metric, but the problem of overuse of nodes on a Path may result in disruption in communication. It is very Difficult problem considering the operation where all Nodes need to be connected again. This may lead to delay in communication and looking at the demand of real time Applications this may be a serious concern and motivated us to investigate into this field.

In preemptive routing, alternate route discovery process is initiated in anticipation of a link failure. This can be done by examining the signal strength continuously and the age of the path at regular intervals. Once the signal strength falls below a threshold or the age of the path increases beyond a threshold value, the process of route discovery will be initiated.

LINLIKNG MECHANISMS IN MANET

A. DYNAMIC SOURCE ROUTING PROTOCOL (DSR)

DSR is a reactive, source initiated routing protocol. It employs two phases, Route Discovery and Route Maintenance.

Route Discovery

During the route discovery phase DSR discovers routes to previously unknown destinations in the network. When a traffic flow to an unknown destination is initiated, DSR uses expanding ring search to broadcast a route request. The header of the route request packet contains a record of the path the packet has followed. Before a node forwards the route request it appends its address onto the path in the header. If and when the destination receives the route request it generates a route reply and sends it to the source along the reverse of the path stored in the header of the route request. Unique to DSR is the use of a route cache in each node to store routes to destinations. Each time a node receives or forwards a route request it updates it route cache with the path stored in the route request. DSR uses the route cache to store the entire path to a destination, not just the next hop. This allows the routing protocol to store and make use of redundant paths. Each data packet that is sent by a source includes the entire path in the header of the packet. Knowledge about the network helps a node to find alternate paths to destinations using information stored in the route cache. DSR employs a number of optimizing mechanisms that make use of the route cache.

Route Maintenance

During the route maintenance phase, the routing protocol repairs and maintains routes that were constructed during the route discovery phase. When an intermediate node attempts to forward a data packet to the next hop and becomes aware that the link is broken, it generates a route error packet and unicasts it back to the source. Each node that forwards the route error message removes the path from their route cache. After the source receives this packet it removes the path in its route cache and tries to find an alternate path to the destination, once again entering the route discovery phase.

B. AD HOC ON-DEMAND DISTANCE VECTOR ROUTING PROTOCOL (AODV)

AODV is a reactive, source initiated, distance vector routing protocol. AODV's route discovery phase shares functionality with DSR. A source initiated route request is broadcast with expanding ring search across the network until it is received by the destination. The major difference between the two protocols is that AODV is a distance vector routing protocol that only stores the next hop information in its routing table. This allows for a smaller packet header size and routing table, but does not allow AODV to have access to beneficial information about the network. Similarly, the route maintenance phase of AODV operates like that of DSR. Detection of link breakage by an intermediate node in AODV causes a route error message to be generated and unicast back to the source. AODV allows for broken links to be detected using either link layer feedback or with mechanisms at the routing layer. The latter is accomplished through the use of periodic HELLO packets that are generated and broadcasted by each node in the network. Each node sends HELLO packets at a periodic HELLO INTERVAL. If a node does not receive a HELLO packet from its neighbor in some DELETE PERIOD amount of time, it assumes that the link to the neighbor is down and removes the associated table entry.

C. OPTIMIZED LINK STATE ROUTING PROTOCOL (OLSR)

OLSR is a proactive link state routing protocol. Each node Using OLSR periodically broadcasts its routing table so that Each node can have a complete view of the network. In doing so, it incurs a large control overhead. The biggest concern for a proactive protocol is to reduce the amount of periodic control overhead. OLSR addresses this concern by limiting the number of nodes that forward network-wide traffic. This is accomplished through the use of multi point relays (MPRs). A MPR is a node that is responsible for forwarding routing messages. Each node independently elects a group of MPRs from its one hop neighbors. MPRs are chosen by a node such that it may reach each two hop neighbor via at least one MPR. The nodes that have been selected as MPRs are responsible for forwarding the control traffic generated by that node. Figure 1 shows the MPR selection process. Node 2 first announces its presence to node 1. Node 1 then notifies node 0 of its new one hop neighbor. If node 0 previously did not have access to node 2 then node 0 chooses node 1 as a MPR. Then node 1 is responsible for forwarding control traffic generated by node 0. OLSR employs the following forwarding rule: control traffic received from a previous hop is forwarded only if that previous hop has selected the current node as a MPR. Through the use of MPRs OLSR is able to reduce the amount of control traffic in the network.

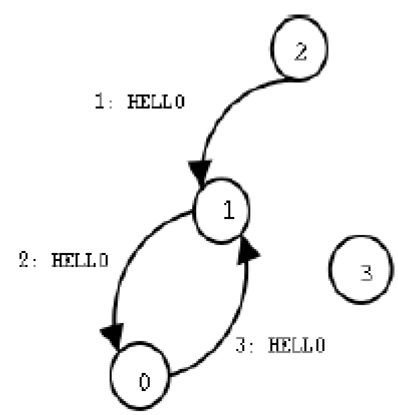

Fig. 1. OLSR Multi-Point Relay (MPR) Selection Process [7]

The two primary control messages used by OLSR are the HELLO message and the topology control (TC) message. The HELLO message is broadcast to each one hop neighbor And includes: a list of one hop neighbors, a list of two hop neighbors a list of nodes that have selected it as a MPR. HELLO messages are never forwarded. Topology Control (TC) messages contain a list of all the nodes that have selected the sender as a MPR. They are forwarded across the network using the forwarding rule stated above.

PROBLEMS IN MAINTAINING CONTINUOUS LINK

In MANET the nodes are dependable upon the power supply. Also because of shared nature of medium, the transmitted packets may also cause energy loss in the surroundings nodes due to overhearing. And compared to wired network there is increased possibility of packet loss and congestion in MANET resulting in energy consumption. Energy consumption can also be due to receiving of data, transmitting the data, traffic, mobility and size of the network. While the problem of network partitioning due to the movement of nodes cannot be handled by routing protocol, partitioning due to outage of battery can be solved by routing decisions. Routing techniques helps in path establishment for communication. MANET consists of different types of overheads such as routing overheads .The overhead caused in managing the link failure is a significant contributor of energy consumption. As the start node of the broken link has to wait/ retry for a time out interval before deciding that the link is failed and cannot be used further and has to inform through to all other nodes using the failed link in their path. Also the packets following this path experience large delays and the source node has to find a new route to destination. And this problem occurs more frequently in wireless networks. Two major challenges introduced by mobility, are the occurrence of disconnection and sub optimality in connection routes. More precisely, if the network topology is dynamically changing due to node movement, at least one of the following two events eventually occurs:

(i) The connection breaks because one of its constituent links becomes disconnected, or

(ii) The route becomes sub-optimal in terms of path length (i.e. number of hops) due to changes in the network topology. Reactive routing protocols generally take care of the former event by initiating local recovery or restarting the route discovery process [2].

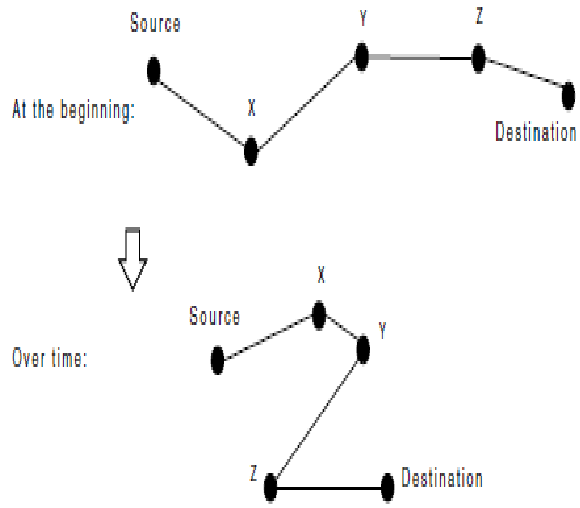

Fig2.Formation of non-optimal route [2]

VARIOUS METHODS OF PREVENTING LINK BREAKS

1. Efficient Packet Delivery Approach for Adhoc Wireless Networks

A technique to improve delay caused due to link failure resulting in route rediscovery has been proposed in [2]. In the technique the power levels of the nodes are computed. And during a transmission whenever the power level of the node N (likely to cause link failure) goes below a certain threshold value, it sends warning message to predecessor of N for determining an alternative path so that remaining packets can be transmitted through alternative path [2].It shows Certain level of success, when power level is important parameter this method better performance than other compared proposed algorithms.

2. Node Stability-Based Location Updating In Mobile Ad-Hoc Networks

In this method [4] the algorithm is based on the stability of the nodes. It updates the Neighbor Table of each node such that the more stable nodes, as preferred choices, send an acknowledgment. So, the network traffic will reduce, since a less number of acknowledgments are transmitted. The proposed algorithm improves upon the following factors [3]:

1) Less number of acknowledgments is transmitted in maintaining the Neighbor Table.

2) Less number of collisions takes place.

3) Updating is required to maintain the Neighbor Table.

4) Always, an updated Neighbor Table is available for each node.

With certain assumptions [4].Stability of a node is determined by the combination of the speed of the node, the range of the node, the location of the node and the battery power of the node. The stability is not constant between two nodes, but changes with the condition such as velocity or battery power. The main focus of the proposed algorithm is to reduce the number of acknowledgment packets by varying the updating information of less stable nodes more frequently compared to the more stable nodes.
The simulation results demonstrate an encouraging support For the proposed algorithm. The performance of algorithm was tested on the following parameters:

• Number of Hello packet acknowledgements transmitted;
•Energy consumed;
• Number of collisions.

Infer from the set of results obtained shows the proposed algorithm works efficiently. It is capable of efficiently decreasing the amount of energy consumption, the number of Hello packet acknowledgements transmitted and the number of collisions in the network [3].

3. Best Route Selection for Energy Efficient Multipath Routing in ad hoc Sensor Network

In this paper [4] Authors have proposed a route selection criterion to choose the best path from available multiple paths based on three important metrics which affect the performance of a routing algorithm. Those factors are:

a) Battery power
b) Mobility
c) End to end delay

In this work consider an energy efficient routing algorithm which discovers multiple paths from source to destination and apply the route selection technique to evaluate the best path [4].

The Simulation shows that selection metric is successful in choosing best route from source to destination. It is also demonstrated that value of any one of the parameters affects the route selection strategy.

4. Exploring the Dynamic Nature of Mobile Nodes For Predicting Route Lifetime in Mobile Ad Hoc Networks

In this [5] the authors proposed algorithm consists of the following three phases: route discovery, data forwarding, and route maintenance. According to author there are three main differences between the EDNR and the DSR. First, in the EDNR protocol, every node saves the received signal strength and the received time of the RREQ packet in its local memory, and adds this information into the RREP packet header in a piggyback manner when it receives the RREP for the corresponding RREQ packet to meet the requirement of the connection lifetime-prediction algorithm. Second, node agents need to update their predicted node lifetime during every period. Finally, the node-lifetime information in the RREP packet is updated when the RREP packet is returned from a destination node to the source node .So In view of the authors EDNR have advantages with respect to DSR so the algorithm is implemented using EDNR and in final result EDNR performed better than DSR.

5. A Dynamic Route Optimization Mechanism for AODV in MANET

In This paper [6] method main function of a routing algorithm is to find an initial path between a source and a destination, and then to maintain data forwarding between the two nodes. Although there have been many reactive routing protocols proposed in the literature, for concreteness, we will cast our proposal as an extension to AODV.

In AODV, when a node (source) requires a connection to another node (destination), a global route discovery operation is initiated by the source, resulting in a flooding of ROUTE REQUEST messages in the network. When (at least) one of these messages is received by the intended destination or by a node which has a fresh enough route to the destination, a ROUTE REPLY message is sent back to the originator of the route discovery process. As the ROUTE REPLY packet travels back towards to the originator of the request, each node along the route inserts next hop information into its routing table for the destination requested. Once the source node receives the ROUTE REPLY message, it can start to forward data towards the destination along the route established.

The Author proposed Shrink mechanism which is initiated periodically by the source node of each connection, as long as the connection is active and has data being sent on it. Rather than considering the period to be a fixed time interval, we view it as stochastically determined by the data rate. Concretely, the source node initiates the shrinking mechanism for a connection with some fixed probability **p** every time a data packet is to be sent.

The authors showed that the proposed extension performs well with respect to routing overhead incurred, while serving to minimize path stretch relative to optimality. The experimental results show that the proposed route optimization mechanism works well.

CONCLUSION

The link break is an important issue in successful connection and quality of service. The mentioned five Methods approaches the problem in different viewpoints and using various parameters such as battery power, mobility, end to end delay etc. into account however there certain assumptions or pre requisite conditions in each method and each methods is for specific scenario having with specific conditions.

REFERENCES

[1] Ashishkumar, M.Q.Rafiq, Kumar, Bansal:Energy Efficient Routing Protocol Avoiding Route Breaks based on DSR:International Journal of Computer Applications (0975 – 8887) Volume 44– No.4, April 2012.

[2] Sharvani G S, Dr. T.M. Rangaswamy, Nabendu Chaki etal.:Efficient Packet Delivery Approach for Adhoc Wireless Networks,‖ (Eds.): NeTCoM 2010,CSCP 01, 2011, pp. 42–49, 2011.

[3] Sudip Misra, Sanjay K. Dhurandher, Mohammad S. Obaidat Fellow, IEEE, Namit Nangia, Nitin Bhardwaj, Pankaj Goyal, and Sumit Aggarwal] Node Stability-Based Location Updating in Mobile Ad-Hoc Networks IEEE SYSTEMS JOURNAL, VOL. 2, NO. 2, JUNE 2008.

[4] Debdutta Banerjee, Prasenjit Choudhury, Tanmay De Best route selection for energy efficient multipath routing in ad hoc sensor network 978-1-4244-8679-3/11/ ©2011 IEEE.

[5] Xin Ming Zhang, Feng Fu Zou, En Bo Wang, and Dan Keun Sung Exploring the Dynamic Nature of Mobile Nodesfor Predicting Route Lifetime in Mobile Ad Hoc Networks 0018-9545/ © 2010 IEEE

[6] Zeki Bilkin, Bilal Khan A Dynamic Route Optimization Mechanism forAODV in MANETs:978-1-4244-6404-3/10/ ©2010 IEEE.

[7] John Novatnack, Lloyd Greenwald and Harpreet Arora Intelligent Time-Critical Systems Laboratory: Evaluating Ad hoc Routing Protocols With Respect to Quality of Service http://itcsl.cs.drexel.edu