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A New Approach of Route Selection in DSR Using Time Routing Metric in MANET

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Abstract- A mobile adhoc network (MANET) consists of mobile nodes with no fixed infrastructure and their topology changes dynamically. Many dynamic routing protocols are designed for efficient transmission of data packets like DSR, AODV, TORA etc. During packet transmission, if a node in the source-destination path detects any link breakage, then many local error recovery techniques are proposed by many researchers. This paper describes two things: 1.Route discovery and route maintenance phase of DSR protocol. 2. Some local error recovery techniques of DSR protocol like packet salvaging, automatic route shortening etc. A new approach for selecting a route from route cache in DSR based on time routing metric and modification in the propagation process of RouteError message during local error recovery is also proposed in this paper.

Keywords- Dsr, ler, manet, promiscuous, source quench

I. INTRODUCTION

A Mobile adhoc network is an autonomous system of associated mobile hosts which are connected by wireless links. As nodes are in moving state, this network does not possess any infrastructure and framework. Due to absence of any infrastructure, each node behaves like a router. These routers help in transferring data packet from one node to another node. To develop dynamic routing protocols is the main issue in the design of MANET. The main purpose of dynamic protocols is to find a best, less time consuming path between nodes in the mobile network. In MANET, nodes position is not static, so topology changes very frequently. The transmission range of nodes is very restricted, so nodes which are far away from each other cannot communicate directly. So many protocols have been proposed by many researchers for achieving the efficient routing over last decades. Every protocol uses a new technique for searching a new route or updating a known route, when hosts move from one location to other. Energy consumption in MANET is very important issue because mobile nodes have limited battery power. Routing Protocols [3] in MANET can be classified into three categories: Proactive Routing Protocols or Table Driven Routing Protocols, Reactive Protocols or Demand Routing Protocols and Hybrid Routing Protocols. Proactive Routing Protocols contain consistent and up-to-date routing information to all nodes which is maintained at each node. e.g. DSDV, LSR, CGSR etc. In Reactive Protocols the routes are created on demand. When source wants to send data to a destination, it invokes the route discovery mechanisms to find the path to the destination. E.g. DSR, AODV, TORA etc. Hybrid protocols have features of both reactive and Proactive protocols. e.g. ZRP, FSR etc.

II. DSR

The Dynamic Source Routing protocol (DSR) [4][5][6] is a simple, reactive and efficient routing protocol where **dynamic** means node that want to send data packets, discover a source route across multiple network hops to any destination dynamically and **Source** means it uses source routing where each data packet contains ordered list of all intermediate nodes of path from source to destination in its header through which it is to be travelled. By including this source route in the header of each data packet, other nodes forwarding or overhearing any of these packets may also easily cache this routing information for future use. It consists of two phases: Route discovery and Route Maintenance phase.

A. Route Discovery

Consider a source node (S) wants to send a data packet to destination node (D) but it has not stored a route to D in its cache, then it initiates the route discovery mechanism and sends a RouteRequest packet to its neighbors. Each route request packet contains four fields [7]: Source address, Destination address, request identifier particular to that mobile node and a list containing all nodes that are traversed by the packet. Each node, further broadcast the packet to its neighbors if it has not forwarded it otherwise discards it. If the neighboring node has a path to D stored in its cache, it will return this path to S through route reply packet. Thus, all nodes except the destination forward a RouteRequest packet during the route discovery phase. Fig.1 [8] shows the propagation of RouteRequest message through each node in the network starting from S.

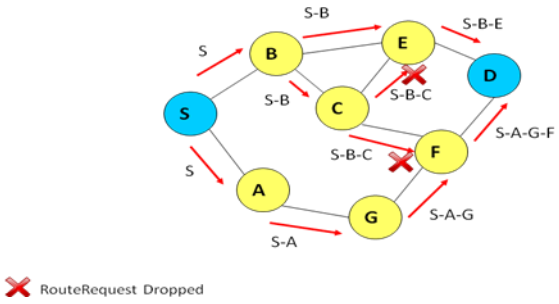

Fig.1 Broadcast RouteRequest

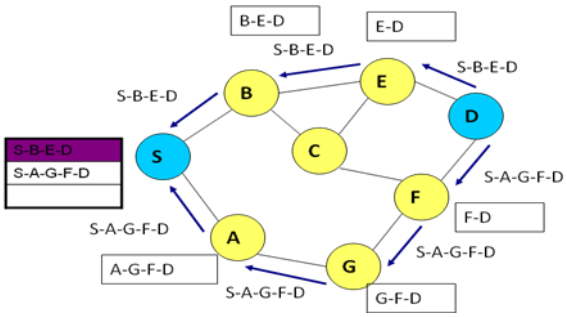

Fig.2 Send Route Reply

When destination node receives the first Route Request packet, it sends a RouteReply message to the source node through the reverse path. Fig.2 [8] shows how the RouteReply packet which is sent by destination node D passed through the network. After completion of route discovery phase, the source node may have multiple paths to destination which are stored in source routing cache. Source can select any path depending on the routing metrics like no. of hops, distance between S & D etc. The basic protocol selects the path having minimum number of nodes.

B. Route Maintenance

It is triggered when a link breaks between two nodes along the path from the S to D occurs during transferring of data packet. The node that detects the break, send a RouteError message to notify the source about the broken link along the intermediate nodes of the path, the packet had traversed yet. After getting route error packet, the source node erase all the routes containing that broken link from cache and either will use other cached route or request a new route using route discovery mechanism. Fig.3 [8] shows how the RouteError message reaches to the source node S.

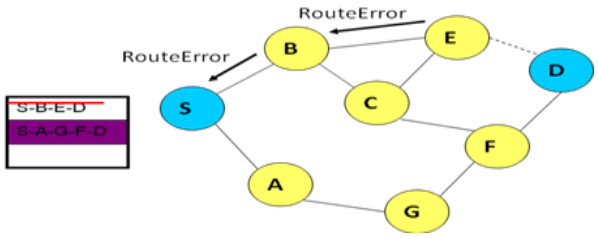

Fig.3 Route Error message

C. Advantages and Disadvantages

It removes the need to periodically broadcast the network with table update packets. A route is constructed only when it is demanded by a source node. The cached route information is coherently used by intermediate nodes in the path from source to destination. It decreases the control overhead over the network. The disadvantage is that false route cache information could also result in inconsistencies during the route discovery phase and the connection setup delay is higher than in conventional proactive protocols. This protocol is suitable for static environment and network having very low movability but the performance reduces very fastly with increasing mobility. It does not offer multicasting and security features. Quality of service is also lacked in this protocol.

III. LER TECHNIQUES OF DSR

Various local error recovery (LER) [2] techniques proposed by many researchers for route maintenance of DSR protocol are described below:-

A. Packet Salvaging

In case of error in the route of transmitted packet inspite of deciding to drop the packet a node may try to reclaim that data packet by sending a RouteError packet to source node. Reclaiming can be performed by a node that firstly notices the link breakage.That node attempt to search a new route from itself to destination in its route cache. In case a new route is found in route cache,it will update the path of the data packet with a new one and reclaim the packet with updated route. The salvaged packet is now forwarded to the next node shown in the new route. For example, in Fig.4 if node **C** has any different route to node **E**, it can reclaim the packet by using this new route inspite of dropping the data packet.

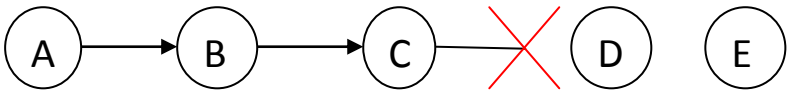

Fig.4 Route Service: Node **C** is failed to transfer a packet from **A** to **E** through the next hop **D**.

At the time of reclaiming, node marked the packet as reclaimed,in order to avoid multiple times reclaiming of the packet. If this type of marking is not done by the node then there may be the chances of packet to enter in a loop.

B. Automatic Route Abridging

A node can scrutinize the unutilized part of the route from source and accordingly abridge the route by neglecting one or more non essential intermediate nodes, if it has the capability to operate its network interface in promiscuous receive mode. In other words we can define that mode-a mode in which node has the listening capability to that data packet which is not intended to send it. Fig.5 illustrates an example in which node **C** can overhear a data packet being transferred from **A** to **B**, which is intended to send to **C** afterwards; the arrow indicates the next hop in the source route of the data packet.

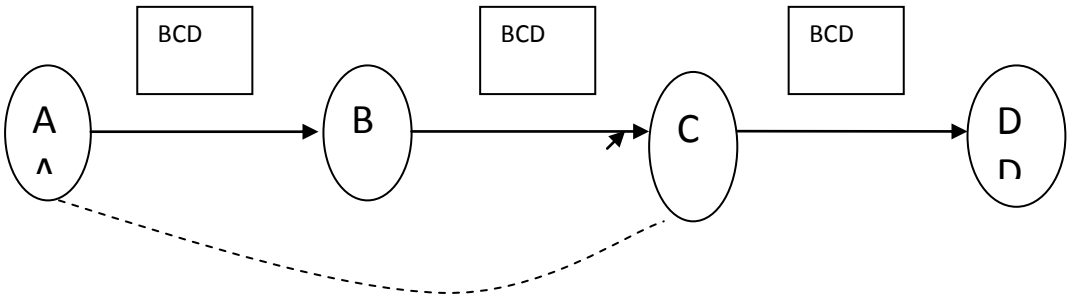

Fig.5 Automatic Route Abridging Example

In the above example node C returns a superfluous RouteReply message to the node A which is the real sender.

C. Increased Growing of ROUTE ERROR Messages

In case there occurs some error in the route and a source node gets a RouteError message from the error detecting node, then this source node informs all of its neighbors about this stale route by piggybacking this RouteError message to its next RouteRequest. By this the inconsistent information about the route will be deleted from the route cache of all the neighboring nodes of source node and thus these nodes will not create any wrong RouteReply.

IV. PROPOSED WORK

In this paper, a new approach is proposed for selecting the best routing path using time parameter in DSR protocol. For this, four changes are made in basic DSR protocol:-

1. Source node will maintain RouteDiscoverTime along with each routing path entry in its routing cache table. When source node sends a route request packet to its neighbors, it will note that time by using digital clock and when a complete path is received through route reply packet through intermediate nodes from the final destination, it will check the time again and will measure the route discover time i.e.

RouteDiscoverTime=RouteReplyReceivingTime-RouteRequestSendingTime

2. Source will choose the path having least RouteDiscoverTime and will transmit packet to this path.

3. Source node will operate its network interface in promiscuous receive mode.

4. During local error recovery, when a link breakage is detected, the detecting node will send RouteError message to the source node directly using Source Quench technique as shown in Fig.6.

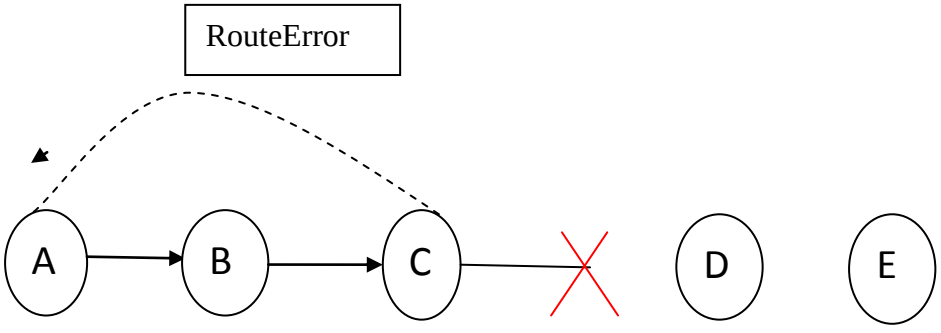

Fig.6 Send RouteError message using source quenching

V. COMPARISON

Differences between basic DSR protocol and the modified DSR are given in table below:-

TABLE 1: DIFFERENCE BETWEEN EXISTING DSR & MODIFIED DSR

Sr.No.	Evaluation Criteria	DSR	Modified DSR
1.	Data maintained in routing cache	Only Routing paths are maintained in routing cache at source node.	RouteDiscoverTime is also maintained along with routing path at each cache entry
2.	Metric for selecting routing path	Routing path having minimum no. of nodes.	Routing path having least RouteDiscoverTime.
3.	Operation of network interface of source node	Operate in normal send and receive mode.	Operate in Promiscuous receive mode.
4.	Transmission of Route Error message	RouteError message is sent back to the source node through intermediate nodes in the traversed path.	RouteError message is sent back to the source node directly by using source quenching.

VI. CONCLUSION

Mobile adhoc networks are widely used in many areas like personal areas networking, military environments etc. It is a current research area in networking today. In the future, the broad range of applications of adhoc network will make it an indispensable part of our lives. This paper presents a review of DSR reactive routing protocol and many techniques of local error recovery for route maintenance. A new approach for route selection in DSR protocol by making some changes in basic DSR protocol through time routing metric is also given in this paper. A theoretical comparison is also made between existing DSR approach and new proposed approach.

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