A Fusion of Routing Information to Find New Topology in DSR Protocol

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ABSTRACT

A mobile ad-hoc wireless network consists of wireless mobile nodes that are capable of communicating with each other without any network infrastructure. This communication is possible using a broadcast medium and nodes move randomly in free environment. Because of this, a dynamic change occurs in the network topology. Due to this, a major change occurs in routing. So routing becomes a big challenge for these networks. In this paper, a fusion of topology and routing information is done using mobile agents for Dynamic Source Routing protocol. We are representing the algorithm with the role of various mobile agents. In this algorithm, fusion of routing metric information of visited node is done and by using mobile agents, a new topology will be discovered in Dynamic Source Routing protocol.

Keywords

MANET, Wireless Network, Ad-hoc network, DSR, Topology discovery.

1. INTRODUCTION

Mobile ad hoc networks are paradigms for mobile communication [1] in which mobile nodes are dynamically and arbitrarily located in such a manner that communication between nodes does not rely on any underlying static network infrastructure. In recent year, on-demand routing protocol have attained more attention in mobile adhoc network as compared to other routing schemes due to their abilities and efficiencies.

They are able to organize themselves dynamically with lower memory overhead and lower bandwidth requirement than a table driven protocols (Proactive protocols).Dynamic Source Routing is a on-demand routing protocol developed for routing in mobile ad-hoc networks and was proposed for MANET by Broch, Johnson, and Maltz [2].DSR allows the network to be completely self-organizing without any present network infrastructure. Network nodes are capable of forwarding packets for each other for communication over multiple "hops" between nodes within wireless transmission range.

The protocol is having two mechanisms called Route Discovery and Route Maintenance, which generally work together to allow nodes to discover and maintain intermediate path to destinations in the ad-hoc network. Source routing allows packets to move in loop free manner All these operate completely on-demand, allowing the routing packet overhead of DSR to scale automatically.

The main focus here in use of mobile agents with the fusion of topology and routing information, which are responsible for finding the new topology for DSR protocol

2. A BASIC COMMUNICATION BETWEEN NODES IN DSR

In a network, a communication between nodes happens as follows: in the network, nodes send out a broadcast ROUTE REQUEST message to all the nodes. All nodes having this message add themselves in the source route to update the routing table. This route is forwarded to their neighbor nodes. If a receiving node is the destination, or has a route to the destination and act as an intermediate node, it does not forward the request packet indeed it sends a REPLY message containing the full source route. It can also that source route in reverse order. ROUTE REPLY messages can be triggered by ROUTE REQUEST messages or are gratuitous. After receiving one or several routes, the source node chooses the best route and stores it in the update routing table. The better the route metrics which is having various parameters like number of hops, delay and bandwidth, the higher the preference given to the route and the longer it will stay in the cache route. When a ROUTE REPLY arrives very quickly after a ROUTE REQUEST has been sent out, then it is an intimation of a best path, since the nodes are required to wait for an arbitrary amount of time corresponding to the length of the route they can advertise, before sending it. This is done in order to avoid unnecessary replies. In case of a link failure due to poor network signal, the node that cannot forward the packet to the next node sends route error message towards the source [6].

3. AN OVERVIEW OF DSR PROTOCOL

The DSR protocol uses two mechanisms for discovering and maintenance of source routes in the mobile ad hoc network:

Route Discovery is the mechanism by which a node **A** trying to send a packet to a destination node **S** obtains a source route to **S**. Route Discovery is used only when **A** needs to send a packet to **S** without having any prior information about route to **S**.

Route Maintenance is the mechanism by which node **A** is able to find the sudden change through route metric, while using a source route to **S**, if the network topology has dynamically changed such that it can't follow that route to **S** because of any link failure due to poor signal or any other reason. When Route Maintenance informs that, **A** can use any other route to **S**, or can call the mechanism of Route Discovery again to find a new route. Route Maintenance is used only when **A** is actually forwarding packets to **S**.

Route Discovery and Route Maintenance both work together on demand. In response to a single Route discovery, a node may find multiple routes to any destination and store them in route cache. This allows fast change in routes since a node with multiple routes to a destination can use another found route if the one gets fail. This caching of multiple routes also

avoids the overhead of performing a new Route Discovery again each time a route in use breaks down.

The operation of Route Discovery and Route Maintenance in DSR are designed to allow uni-directional links and asymmetric routes to be easily supported. In wireless networks, it is possible that a link between two nodes may not work equally well in both directions, due to differing antenna or propagation patterns or sources of interference. DSR allows such uni-directional links to be used when necessary, improving overall performance and network connectivity in the system. DSR also supports internetworking between different types of wireless networks, allowing a source route to be composed of hops over a combination of any types of networks available [3]. For example, some nodes in the ad hoc network may have only short-range radios, while other nodes have both short-range and long-range radios; the combination of these nodes together can be considered by DSR as a single ad hoc network. In addition, the routing of DSR has been integrated into standard internet routing, where a "gateway" node connected to the Internet also participates in the ad hoc network routing protocols; and has been integrated into Mobile IP routing, where such a gateway node also serves the role of mobile IP foreign agent [4][5].

4. WORKING OF DSR PROTOCOL

The key feature of DSR [6] is the use of source routing. That is, the sender knows the complete hop-by-hop route to the destination. These routes are stored in a route cache. The data packets carry the source route in the packet header. When a node in the ad hoc network attempt to send a data packet to a destination for which it does not already know the route, it uses a route discovery process to dynamically determine such a route. Route discovery works by flooding the network with route request (RREQ) packet. Each node receiving a RREQ rebroadcasts it, unless it is the destination or it has a route to the destination in its route cache. Such *n* node replies to the RREQ with a route reply (RREP) packet that is routed back to the original source. RREQ and RREP packets are also source routed. The RREQ builds up the path traversed across the network.

The RREP routes itself back to the source by traversing this path backwards. The route carried back by the RREP packet is cached at the source for future use. If any link on the source route is broken, the source node is identified using a route error (RERR) packet. The source removes any route using this link from its cache. A new route discovery process must be initiated by the source, if this route is still needed.

5. PROPOSED ALGORITHM

This proposed algorithm uses the concepts of static and mobile agents in DSR to find the new topology by using fusion of topology and routing information. As we know, agents are the software programs that run on a node to perform the specific task. This task is assigned by the network architecture in this protocol. An agent has four main characteristics namely: intelligence, communication, autonomy and mobility. We will discuss the function of these static and dynamic agents in next section.

5.1 Basic Functions of Static Agents

Static Agents are the agents that generally reside on a node, and do the task assigned to it. Static agents are permanent resident of a node which will act like interactive host. It performs the following functions:-

a) It will manage the list of one hope nodes in the network.

b) It will update the table by adding the information for each visited mobile agent with their Id.

c) These functions are fixed for static agents.

5.2 Basic Functions of Mobile Agents

Mobile Agents are the agents who are capable of moving from one node to other node in a specific manner to do the particular task. Mobile agents support two main features known as asynchronous communication and flexible query processing. Therefore, the mobile user assigns any task to a mobile agent and mobile agent move in the network, establish a possible communication and complete the given by its mobile user. The main basic function of the mobile agent is to make all the nodes in the network topology aware and secure communications.

In this algorithm, various mobile agents perform different functionality to discover the new topology.

5.3 Functions of Newly Defined Agents

The functionality of all newly defined static and mobile gents on the basis of working of DSR is as follows:

a. **Database System (DS):** In this, all the information regarding neighbor nodes, recent topology, and routing metric is stored. This information can be used and updated by mobile agents. Due to this, there is communication between inter mobile agents. Moreover, various parameters of a node such as node no, delays and threshold signal strength to its neighbors are also stored in this database.

b. **Static Agent (SA):** This agent will update the routing table by adding information of every newly visited node in the network.

c. **Master Static Agent (MSA):** This agent will behave like a static agent who will be capable of creating the database system, Static Monitoring Agent (SMA) and Route Agent (RA). The main two responsibilities of MSA are as follows:
   i. This agent will initiate other agents to find the route in the network.
   ii. It will collect the information regarding routes and other nodes in the network from routing agent.

d. **Static Monitoring Agent (SMA):** This agent performs the following tasks:
   i. It will regularly monitor the neighbor nodes by sending acknowledgements.
   ii. It will update the database by taking permission from MSA.
   iii. It will also monitor some parameters such as delays to neighbors nodes and reliability status.

e. **Routing Agent (RA):** This is mobile agent who will move from one node to another node to find the routes and will fuse the routing information of visited node to update the routing table in DSR.

Now the proposed algorithm uses mobile agents that can move in the adhoc network to discover the new network topology by combined topology discovery and routing

information. This information is used to update the routing metric table in DSR.

ALGORITHM: For finding new topology by fusing the routing metric table in DSR Protocol.

1. For a=0 to M MSA agent acts as a source node in the network will initiate the SMA and database to find the one hop neighbor nodes by sending hi packets in a broadcast way to all nodes.
2. For b=0 to M MSA initiate RA who will move in the network in loop free manner to find the one hope neighbor nodes by sending RREQ packets.
3. Initiate the variables such as one hope=-1 and visit node []=-1.
4. For each RA, RA search unvisited one hope node in the network.
5. If RA gets successful in finding the unvisited one hope node in the network and visit it and mark the node as visited node. After visiting anode, RA collects the information regarding visited node like node-no, delays to neighbors nodes and reliability status.
6. Increment one hope=one hope+1, visited node []=b.
7. Calculate delay[*b*] = delay[*a*] + delay.
8. By using this information, RA will update the routing metric table.
9. RA will fuse the routing metric table by using collecting information after visiting all one hope nodes and find the new topology in DSR protocol.
10. If any link failure occurs then a RERR packet will be sent by RA to the source node.
11. After finding the new topology, RA set the reliable status=1 in the routing metric table.

6. CONCLUSION AND FUTURE WORK

In this paper, we defined new static and mobile agents in DSR Protocol, fused the routing metric table and with the help of these agents, found the new topology. In future, through simulation algorithm can be implemented.

7. REFERENCES

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