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AN EFFICIENT WAY OF FINDING ALTERNATE ROUTE IN AODV USING HIGH ENERGY NODES.

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Abstract

Mobile Ad-hoc Network (MANET) is an ad-hoc network which allows the establishing of a network for mobile nodes. This allows a reliable communication for mobile nodes. Here the nodes communicate in wireless environment by multihop. The whole network depends on other nodes for successful transmission of data. So every node here acts as a transceiver. Several routing algorithms are used for transmission among that AODV is the most popular. In AODV route establishment and roué maintenance phases are present. The main problem in MANETs are link breakage, security of nodes and energy of nodes. This paper explores the need to have an alternate path to be established through a reliable node during link failure through high energy nodes.

Keywords:

MANET

Routing protocol

AODV

DSDV

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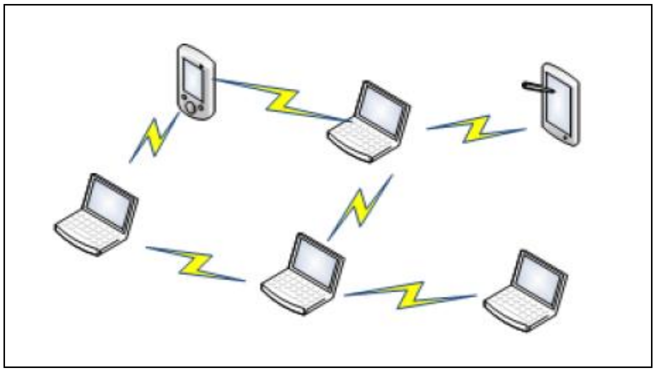
1. Introduction

Ad-hoc networking [5] is one of the most interesting research areas in mobile computing environment. Mobile ad-hoc network consist of wireless nodes. These wireless nodes are mobile and hence they change locations unpredictably thus forming a network without any fixed pattern. Ad hoc networks are very easy to deploy and it is useful when the infrastructure is not practical or destroyed like disaster recovery and very urgent situations. The MANET does not support a central administrator as shown in Figure. 1 and each node can also function as a router, which notices and preserve routes, and forwards packets to other nodes. Here each node is considered as a transceiver, which means each node acts as a transmitter and receiver. That is each node can transmit data as well as receive and store data according to its capacity.

MANETs can be used where infrastructure is not available or very costly. MANETs are very easy to deploy because there is no central administration. They are also reconfigurable since any number of nodes can be added at any time with ease. And hence routing protocol designing for ad-hoc networks are very complex. We cannot use routing protocols that are used for static network in MANETs. Efficient routing protocols [11] are needed for the network as the link failure is high due to the dynamic network topology and the packet drops as it travels through multiple hops.



Many factors like link failure probability, error rate, dynamic topology and power consumption must be considered while designing a routing protocol for MANETs. Usually in MANETs the routing protocols are classified as proactive and reactive [9].At the time of network configuration itself the routes are automatically computed and stored in routing table for proactive networks. The routing table information's are periodically exchanged and information from the networking nodes are used to update the routing tables. This is an efficient method for routing but this considerably increases the overhead. Routing protocols such as DSDV (Destination Sequenced Distance Vector) and OLSR (Optimized Link-State Routing) [13,14] are of this type. Another type of routing is reactive or on-demand routing. In this kind of routing,routes are found whenever a source wants to deliver data to an unknown destination. Ad-hoc routing protocols such as AODV (Ad-hoc On-demand Distance Vector) and DSR (Dynamic Source Routing) [14] are examples of this type. On demand routing protocol does not require the exchange of periodic routing table update and it does not have a map of the network. This considerably reduces the network overhead.

AODV creates and preserves path for transmission of information on demand. It uses hop by hop routing strategy. This paper mainly concentrates on link breakage and how to reestablish the path of transmission through more reliable node, which is the node having more energy. Link breakage happens due to mobility of nodes. Another main factor for link breakage is less energy or power in nodes. If the nodes are having low power then there is a chance that the node may receive data but it will not forward data acting like a compromised node. This will cause a serious threat as the needed information is dropped by the low powered intermediate node. Since MANETs are having a dynamic topology link breakage can happen at any moment causing delay in transmission of information's.

2. Observations in AODV

There are mainly two phases in AODV [9] route establishment and route maintenance. Whenever source needs to send information to destination it has to establish a path for exchanging information's which is done in route establishment phase. There are mainly 2 type of packets exchanged for this purpose RREQ(Route Request) and RREP(Route Reply). AODV uses dynamic route table entries at intermediate nodes. When an intermediate node receives a RREQ packet it first checks whether a valid route is available to destination. If a valid route is available, the intermediate node generates a RREP back to the source. Otherwise the RREQ packets are rebroadcasted. So a large network with many nodes can make use of the benefit of dynamic route setup on demand.

When a source node starts its communication with destination it broadcasts a RREQ packet which has the following format as shown in Table 1

Table 1.RREQ Packet

Type	Reserved Bits	HopCount
RREQID		
Destination IP Address		
Destination Sequence Number		
Originator IP Address		
Originator Sequence Number		

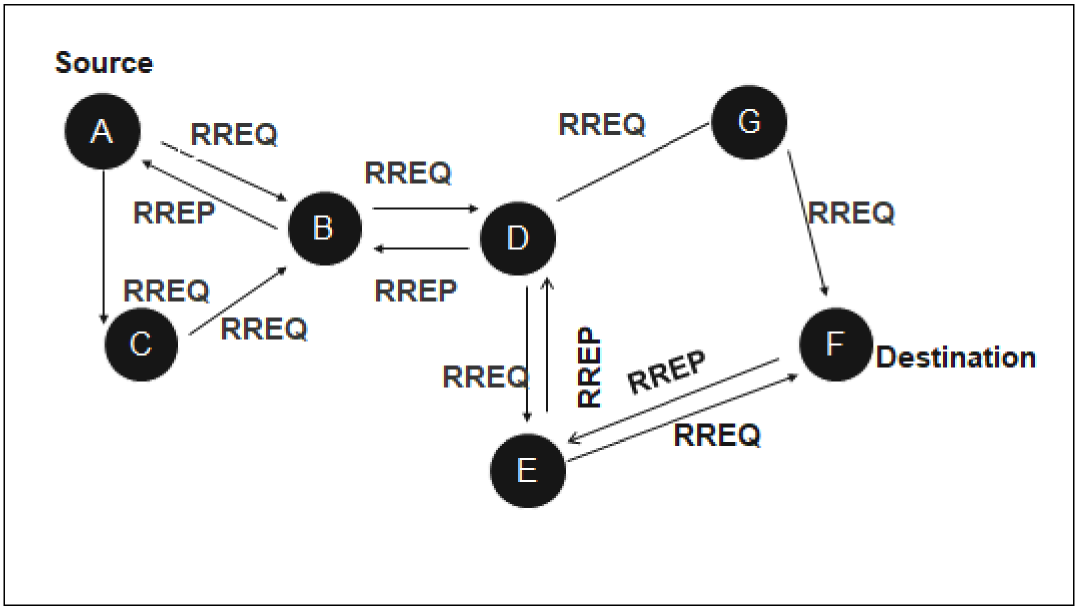
An intermediate node on receiving a RREQ packets first finds if there is a path towards destination, if it finds a path it sends a RREP (Route Reply) packet through the reverse path to its source, else it will rebroadcast the RREQ. Both the sequence numbers, Originator and destination sequence number are used to maintain freshness information about the about the reverse route to the source and how fresh a route to the destination must be before it can be accepted by the source respectively. If the intermediate node has found a route to the destination, it determines whether the route is valid by comparing the destination sequence number in its own table entry to the destination sequence number in the RREQ. A higher Sequence numbers signifies a fresher route. If the destination sequence number is greater than that recorded by the intermediate node, the intermediate node must not use its recorded route to respond to the RREQ. Instead, the intermediate node rebroadcasts the RREQ.AODV uses loop free routes. The intermediate node is responded only when it has a route with a sequence number that is greater than or equal to that contained in the RREQ. A RREP contains some fields, shown in Table 2.

Table 2.RREP Packet

Type	Reserved Bits	HopCount
Destination IP Address		
Destination Sequence Number		
Originator IP Address		
Originator Sequence Number		
Life time		

When the RREP travels back to source, each node along the path records a pointer to the node from which the RREP has come, further it updates the timeout information for route entries to the source and destination, and also records the latest destination sequence number for the requested destination. The data transmission is shown in figure 2

Figure 2 Routing in AODV



AODV informs about the link failure by sending RERR packets (Route Error Packets). Whenever a link fails the message has to be indicated to source and this is done by sending RERR packets. In order to ensure symmetric links and link failure periodic HELLO message are exchanged. A node keeps tracks of its neighbors by receiving a HELLO message that each node broad cast at regular interval.

3. Role of Alternate path.

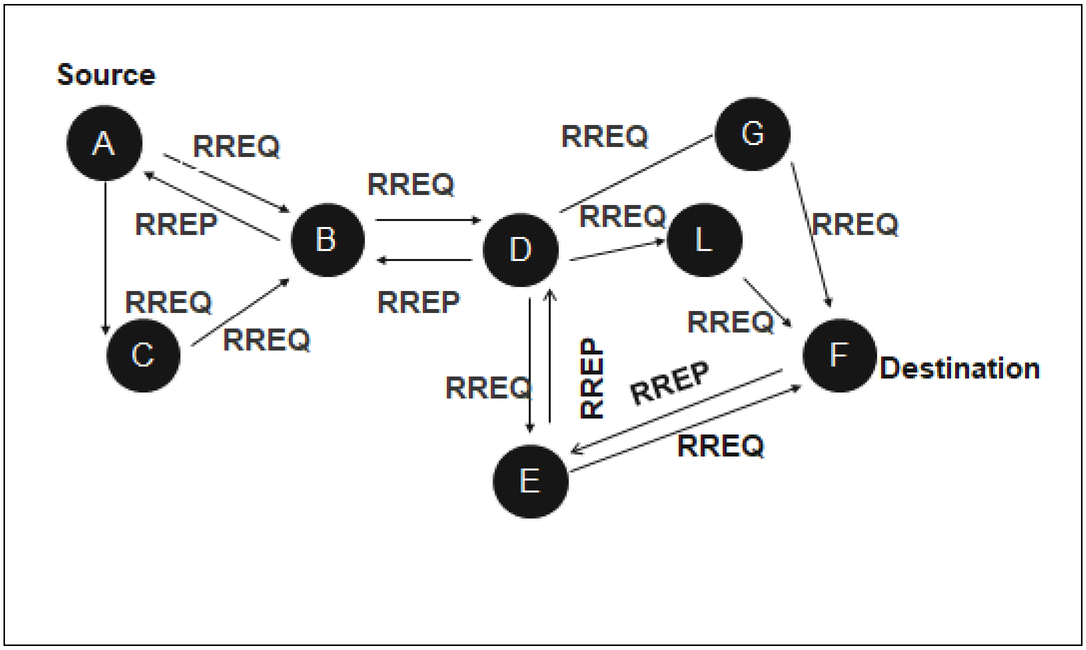
The On-Demand routing protocol instigate a route discovery and route maintenance when there is a need dynamically.The new routes will be taken from existing path. In MANETS there will be multiple paths. This multiple paths can be through same or different nodes. In single path routing only one path is registered so whenever link fails RERR packets are send leading to new route discovery through broadcasting of RREQ packets.

If we consider fig 2 there are two paths to destination and they are A-B-D-E-F and A-B-D-G-F and this is known as multipath. Initially RREQ packets is broadcasted by A and the intermediate nodes receive it. If the intermediate nodes are having a path to destination they send a RREP packet or they broadcast the RREQ packets to its neighbors. Here there are two paths to destination and they are A-B-D-E-F and A-B-D-G-F and they pass through same intermediate node. So currently only one node is selected and stored. Consider if the link E-F fails then again RREQ messages are send and again new path is calculated even if we have an another path with same hop count. Here there is a unnecessary RREQ broadcast and overhead.

4. Proposed System.

In proposed system we are passing the information through highest powered node and with same hop count. Here power or energy of node is considered because an important factor for link failure is power. If the power of a node is low it may not forward packets to destination leading to inconsistency in data and link failure. Consider the Figure 3 here we are having three paths to destination and they are A-B-D-E-F ,A-B-D-L-F and A-B-D-G-F.

Figure 3: Routing through High Energy Nodes.



Here all the 3 routes are having same hop count and if one route fails in normal AODV scenario again there is a need to send RREQ packets creating over head in finding another path. Here in this proposal if we are having the same hop count with multiple path we also consider an another factor that is energy of the node and that path is taken as most best path towards destination. As shown in figure 3 there are three routes to destination and they are A-B-D-E-F ,A-B-D-L-F and A-B-D-G-F. Consider that in this scenario E is having highest power or energy amongE, L and G so as best path we choose A-B-D-E-F, its more reliable to send information through this nodes since the energy is high. Also we will cache the next alternate paths A-B-D-L-F and A-B-D-G-F considering the fact that next high powered nodes are L and G respectively. So in case of a link failure due to mobility or low energy another alternate route of high energy node exist to send data. So rather than again sending RREQ packet and creating overhead directly path can be selected for transmitting data.

Table 3.Source node of proposed System

Type	Reserved Bits	HopCount
Destination IP Address		
Destination Sequence Number		

Originator IP Address
Originator Sequence Number
Next Hop1,HopCount1,Energy
Next Hop2,HopCount2,Energy
Life time

5. Related Works:

Many researchers have done studies and research in enhancing the performance and behavior of AODV. In AODV [1] routing, when a source wants to transmit a data to a destination, it broadcast a RREQ and waits for a RREP and it keeps only one route table entry for transmitting data. If any link breakage during the transmission, the source node must have to initiate another route discovery process.In AODV-BR [3] the source node imitates a route discovery process by flooding the RREQ packet and the receiving node either broadcast it or send back a RREP if it has a route to the destination. In this method the intermediate node overhears the RREP packet from its neighbors and marks it as the next hop node to the destination. The alternative routes are stored and it will create a mesh structure. The Multiple paths from source to destination are valid, only if the intermediate nodes in the path are distinct [6]. When a node receives a RERR message it checks for an alternate route instead of initiating a new RREQ discovery process. The intermediate node respond only once to a RREQ but the destination node respond k times.

In AOMDV [4] it computes multiple loop free and link disjoint paths. It provides efficient fault tolerance by using proficient recovery from route failures in dynamic networks. It establishes multiple routes during route discovery. AOMDV introduces an idea of hop count. It finds link disjoint paths. Unlike in AODV, replicas of RREQ are not immediately discarded by the intermediate node. Each copy is checked to see if it gives a new node-disjoint path to the source. Also, in this approach it does not mention how to maintain the alternative paths. The entries for a given destination will time out eventually, the routing table entries must be refreshed based on how recently they have been used for data forwarding. In AODV the nodes respond at most only once to RREQ, so that it can reduce the total number of RREP messages. Several multipath routing algorithms are proposed by many authors. In EAODV [2] the source node saves only distinct routes to the destination. In EAODV the destination node can respond multiple times to a request but the intermediate node respond only once.

6. Conclusion

This multipath route discovery through high energy nodes will enhance the performance of AODV. This is more reliable than the normal routing method since the routes are cached and at any moment if the route prevails it can be used. This will improve the efficiency of routing. This also improves the performance since there is no need for new route discovery. This scheme is more applicable when there is no disjoint multipath to destination.

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