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Advanced AODV Routing Algorithm with Energy Efficiency in MANET

Shaily Goyal[*1], Prof (Mrs.) Aparna N. Mahajan[2]

[*1] M.tech (Student), Department of ECE Dronacharya College of Engineering, Gurgaon-122506, India

[2] Professor, Department of ECE Dronacharya College of Engineering, Gurgaon-122506, India

shaily.2889@gmail.com

Abstract

Adhoc network are miscellany of dynamic nodes which are self configuring without any framework and mobile devices are connected by wireless network.[1] Adhoc network allows different wireless mobile devices to communicate with each other within a certain range in a peer to peer manner without any role of central authority. Since there is no check of any central authority, numerous kinds of discrepancies may be present like security, inefficient energy management, routing, etc.

In this paper, we are concerned with the issue of routing, which is highly vigorous and scattered in nature. Entire network is affected by the breakdown of single node. Mobile nodes have finite amount of energy and therefore energy exhaustion is inevitable issue and it causes intimidation to the existence of network. Therefore efficient itemization of energy is of paramount nature.

In this paper, we have proposed Enhanced adhoc on Demand Routing, which skillfully consume battery power of mobile nodes and hence results in longer life. Load Balancing and numerous path approaches are used to avoid exploitation of nodes.

Keywords: MANET, Node density, Energy Threshold , Power Control Approach.

Introduction

MANET is a collection of mobile users that communicate over wireless link. They have the capability of arranging the network in various ways and can operate without any strict tear –down network administration. Dynamic connectivity, power and bandwidth are few of the constraints which possess problem in the network routing and thus affect quality of service for the users.

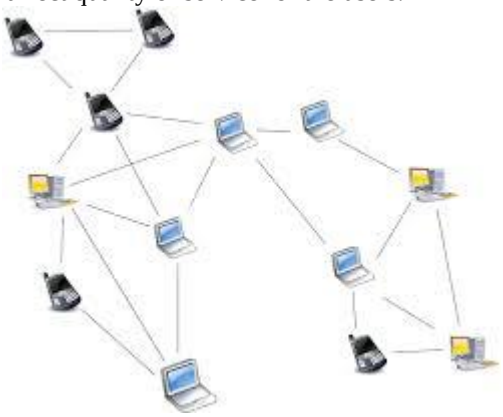

FIG 1. MANET

A routing protocol put to use routing algorithm which resolve optimal network data transfer and communication path between network nodes. Numerous routing protocols have been developed for ad-hoc networks such as table driven or proactive routing protocol, On-demand or Reactive routing protocols and hybrid routing protocols.

Proactive Routing Protocol

In network which resorts to proactive routing protocol, each node maintains the routing tables which depict the topology of the network. These tables are refreshed periodically so as to maintain a up to a minute routing information from each node. This protocol manages routes to all the destination regardless of their need. Because of this behavior, it may waste bandwidth, since control information is broadcasted needlessly[2]. Prime advantage of this protocol is that it makes the route to the destination readily available.

Reactive Routing Protocol

This routing protocol sets up route on demand. If a source node wants to communicate with a destination node, for which it does not have a route, it initiates a route request message to its neighboring nodes and hence try to establish a communication

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link. This route request message will be flooded in a limited way to other node. The route request is broadcasted further by the neighboring nodes if they do not have a route to destination. Finally a route is considered to be found when route request messages reaches either a destination node or to a node which have a destination route. This particular node set up a route path by sending a route reply message to the source node, giving acknowledgment of the route to destination.

This protocol leads to higher latency than the proactive routing protocols, but lower overhead.

Hybrid Routing Protocol

It is network routing protocol that is a miscellany of both reactive and proactive routing protocols. It is basically partitions the network into routing zones. The routing zones of a node include all the nodes which are in the limits of hop distance. This is called zone radius. It proactively maintains the routes which are within the routing zones and reactively explores routes to the destination beyond the zone radius. The hybrid routing protocol can adjust its algorithm as per the network characteristics.[3]

Motivation

One of the evitable issue in MANET is to find precise and profitable path to destination. But more challenging task is to arrange energy efficient path since mobile nodes battery life is one of the limiting factor. Here two imp operations of mobile nodes by which energy can be preserved is discussed. First is Snooze Mode and second is Power Control Mode, which altogether balances the load in the network and increase the efficiency of the protocol.

Review of AODV Routing Protocol

The MANET (Working Group for routing of IEFT Community) in November 2001, has published its first version of the AODV routing protocol.

Basically, AODV belongs to the class of Distance Vector Routing Protocol (DV). Every node in DV is familiar with its neighboring nodes and cost to reach them. All the nodes maintain their Routing Tables, storing information about all other present nodes in the network. If a node is unreachable, the distance is set as infinity. All the nodes share their routing table with their neighbors periodically, so as to check if there is any useful route to another node using this neighbor as next hop.

AODV is an 'on-demand routing protocol' with some delay. Routes to the destination are established when required by the source node. Unicasting, multicasting & broadcasting are supported by AODV routing protocol. Disadvantages of count to infinity and loop are worked out with the help of sequence no.

AODV utilizes IP address in a peculiar manner and treats it as an exclusive identifier. AODV has to maintain a sequence no. for whole subnet and to forward every packet .[4]

AODV Working

AODV working spins around generation of route request (RREQ) when route is requested by the source node. Route reply (RREP) and Route Error (RERR) which occurs when link between two nodes during communication breaks.
It consists of two phases:

Route Discovery

If a node wishes to communicate with some other node, it initially seeks for the route in its routing table. If a node is found, communication begins, otherwise route initiates route discovery phase.

The route discovery process comprises of Rote Request (RREQ) which is broadcasted. If any of the node has a valid route to the destination, it replies to the request with the route reply message (RREP). The replying mode builds a reverse route entry in its routing table which contains the address of the source node, the no. of hops to the source, and the next hop address[5]

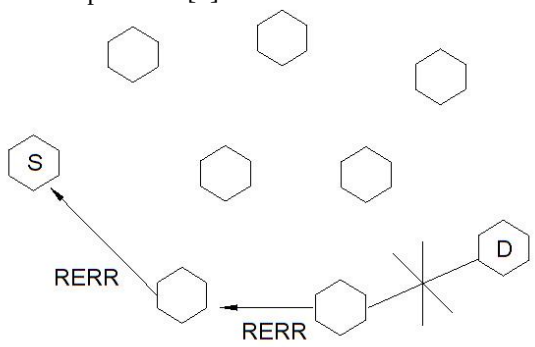

FIG 2. Route Discovery Mechanism

Route Maintenance

Whenever a node transmits a data packet, a route reply must verify that the next hop correctly receives the packet. If not, route error must be send by node responsible for generation off this route header.

The source restarts the route discovery.

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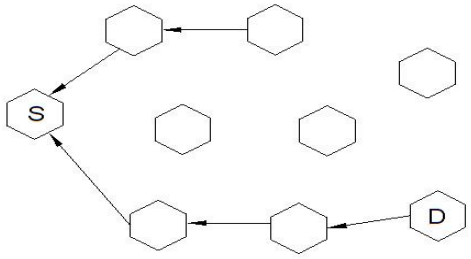

FIG 3. Route Maintenance Mechanism

Related Work

For conservation of energy and increasing the efficiency of AODV routing in MANET, many efficient routing protocols have been proposed. Few of them are as follows:

Power Aware Localized Routing (PLR), Online Max-Min Routing (OMM), Flow Augmentation Routing (FAR).

All these protocols were utilized for minimizing the transmission energy. Minimum Battery Cost Routing (MBCR) has been proposed in [6] it calculates the sum of the remaining power of all nodes in path and utilizes it for choosing the path.

Jin-Man Kim et al., [7] introduced an energy mean value algorithm for increasing efficiency of AODV and to improve life time of MANET.

Problem Statement

In AODV routing protocol, it uses reactive routing mechanism for finding the path to destination. But there is a major factor which affects the route discovery and maintenance of route to destination i.e. limited battery lifetime. This leads to depletion of node energy, if the same route is utilized frequently and moreover, if lifetime is less the node may expires after sometime, which might leads to failure of RREP message to reach source node on reverse path. This causes source node to again broadcast the route request, which ultimately leads to congestion and energy loss.

Proposed Work

Enhanced AODV routing protocol follows two important mechanisms to conserve energy and thus increase the efficiency.

1. Initially we will set the Energy threshold as 50 and Node Density Threshold as Total nodes/3.
2. When source node wants to communicate with destination node, it will broadcast the request if it doesn't have route in its routing table.
3. Path will be selected based upon two thresholds. Firstly energy is compared with Energy threshold, if it greater then it will check node density threshold and if that it also greater then, node is selected and message is forwarded. Otherwise rebroadcast of message takes place and an alternate node is selected.
4. A point will come when Energy of all the nodes will get down to 50 or less than it, at the time we will reduce our threshold to 10 so as to keep the routing continued.
5. Following these steps we can definitely utilize energy of all nodes efficiently.

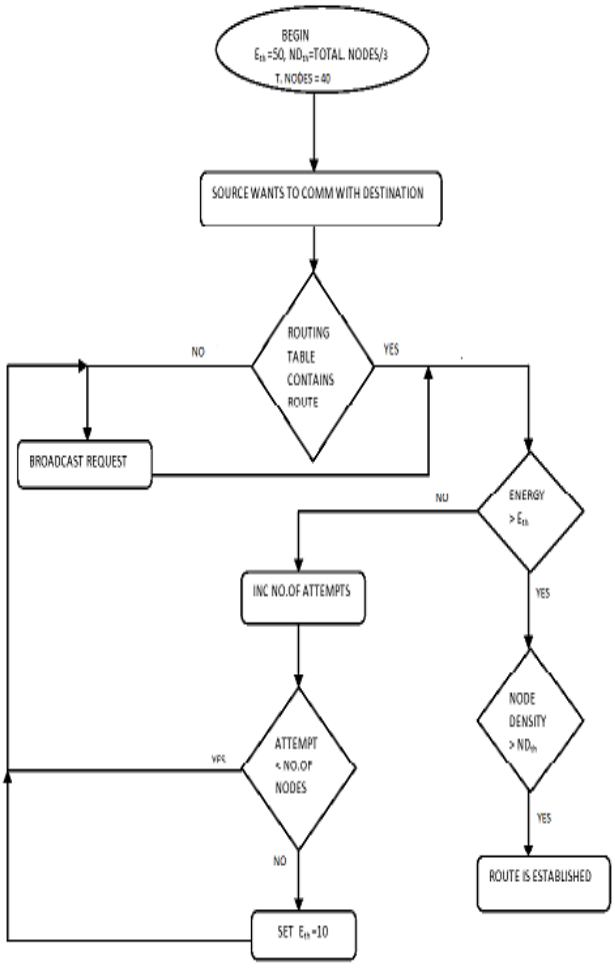

FIG 3. FLOW CHART OF PROPOSED WORK

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