Transsmission Power Control Routing To Alleviate Network

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ABSTRACT

The objective of this paper is to change the Routing strategy of AODV(Ad hoc On Demand Vector) protocol in order to reduce the energy consumption in mobile ad hoc networks (MANET). We are using method which will give information to the neighboring nodes about the energy level of the source. This information is provided in Beacon message, which is transmitted in regular intervals to the neighbor nodes. Each node will store energy information of all neighbor nodes which will used for routing the messages to the respective destination nodes.

Index Terms: Topology control, network capacity, Energy Consumption, MANETs

I INTRODUCTION

Mobile Ad Hoc Networks (MANETs) are wireless networks that offer multi-hop connectivity between self-configuring and self-organizing mobile hosts. A MANET environment is characterized by energy-limited nodes (mobile hosts), band width constrained, variablecapacity wireless links and dynamic topology, leading to frequent And unpredictable connectivity changes. The network size of a MANET is given by the total number of nodes in the network, which is a fixed number (assuming that no nodes enter or leave the network). Routing protocols in such networks can be Classified mainly into three categories:

1)Proactive routing protocols: These are based on the same principle as wired network routing. Paths in this type of routing are calculated in advance. Each node maintains multiplerouting tables by exchanging control packets between neighbors. Indeed, if a node wants to communicate with one another, it has the ability to view local routing table and create path it needs. OLSR (Optimized Link State Routing) and FSR (Fisheye State Routing) are examples of proactive routing protocols.

2) Reactive routing protocols: On the Contrary of proactive protocols, reactive protocols calculate the route on request. If a source node needs to send a message to a destination node,then it sends a request to all members of the network. After receiving the request, the destination node sends a response back to the source.. AODV is an example of reactive protocols which are described below.

3) Hybrid routing protocols: Hybrid routing protocols or "mixed" combine the previous two types of routing (proactive and reactive). The proactive protocol is applied in a small area around the source (limited number of neighbors), while the reactive protocol is applied beyond this perimeter (distant neighbors). This combination is performed in order to exploit the advantages of each method and overcome their limitations. ZRP (Zone Routing Protocol) and CBRP (Cluster Based Routing Protocol) are two major examples of hybrid protocols.

One of the major and most critical factors in adhoc networks is the limited battery energy. We are focusing mainly in this paper is to reduce the energy consumption of batteries. .We are sending only the required information in BEACON to reduce the unnecessary wastage of the source node energy.

AODV (Ad hoc On-Demand Distance Vector Routing Protocol) is a reactive Routing protocol designed by Charles E. Perkins and Elizabeth M. Royer .This protocol uses four types of control messages with the aim to send data packets. The first type is HELLO messages. This type of messages, exchanged periodically to maintain a neighborhood base. RREQ, RREP, RRER, are used to establish a path between source to destination.

To overcome the problem of energy consumption, in this protocol we proposed a new Method that reduces the number of HELLO messages exchanged between source and destination. And also each Beacon message includes the information of energy level of source node. Initially, we minimize the number of Hello messages. We can also reduce the energy consumption by increasing the time interval between the successive BEACON messages for the same node.

The receiver node of this hello message, do the same action to extract information to get the energy level of the opposite node.. Hence we can use the information for the selection of path. We call the new protocol as transmission control -AODV (transmission Control AODV).

2. Ad hoc On-Demand Distance Vector Routing Protocol

2.1. Overview

AODV is a reactive protocol that is to the class of Distance Vector Routing Protocols (DV). In a DV every node knows its neighbors and the costs to reach them. A node maintains its own routing table, storing all nodes in the network, the distance and the next hop to them. If a node is not reachable the distance to it is set to infinity. Every node sends its neighbors periodically its whole routing table. So they can check if there is a useful route to another node using this neighbor as next hop. When a link breaks a Count-To- Infinity could happen.

AODV is an 'on demand routing protocol' with small delay. That means that routes are only established when needed to reduce traffic overhead. AODV supports Unicast, Broadcast and Multicast without any further protocols. The Count-To-Infinity and loop problem is solved with sequence numbers and the registration of the costs. In AODV every hop has the constant cost of one. The routes age very quickly in order to accommodate the movement of the mobile nodes. Link breakages can locally be repaired very efficiently. To characterize the AODV with the five criteria used by AODV is distributed, hop-by-hop, deterministic, single path and state dependent.

AODV uses IP in a special way. It treats an IP address just as an unique identifier. This can easily be done with setting the Subnet mask to 255.255.255.255. But also aggregated networks are supported.

They are implemented as subnets. Only one router in each of them is responsible to operate the AODV for the whole subnet and serves as a default gateway. It has to maintain a sequence number for the whole subnet and to forward every package.

In AODV the routing table is expanded by a sequence number to every destination and by time to live for every entry. It is also expanded by routing flags, the interface, a list of precursors and for outdated routes the last hop count is stored.

AODV performs route discovery request and saves only used routes in the routing table. It uses four different control message called HELLO, RREQ, RREP, and RRER message. In order to transmit data packets, it broadcasts a route request RREQ (Route REQ message) in the networks. Three cases are possible upon receipt of a RREQ message by any node. If a node wants to send a packet to a node for which no route is available it broadcasts a RREQ to find one. A RREP includes a unique identifier, the destination IP address and sequence number, the source IP address and sequence number as well as a hop count initialized with zero and some flags. If a node receives a RREQ which it does not have seen before it sets up a reverse route to the sender. If it does not know a route to the destination it rebroadcasts the updated RREQ especially incrementing the hop count. If it knows a route to the destination it creates a RREP.

The RREP is unicasted to the origin node taking advantage of the reverse routes. A RREP contains the destination IP address and sequence number, the source IP address, a time to life, a hop count as well as a prefix only used for subnets and some flags. When a node receives a RREP it checks if the hop count in the RREP for the emitter of the message is lower than the one in its own routing table or the destination sequence number in the message is higher than the one in its own routing table. If none of them is true it just throws the package away. Otherwise it updates its routing table and if it is not the destination it re unicasts the RREP.

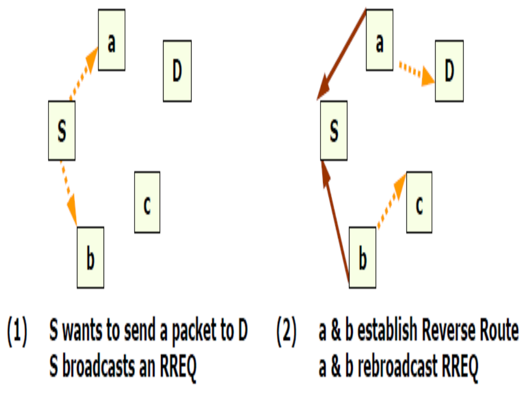
In mobile network link breakage is very common, If a node realises that other nodes are not any longer reachable it broadcasts a RERR containing a list of the unreachable nodes with their IP addresses and sequence number and some flags. A node who receives a RERR iterates over the list of unreachable destinations checking if a next hop in its routing table contains one of these nodes. If yes it updates its routing table. If the receiving node still maintains routes to unreachable nodes it broadcasts its own RERR containing this information.

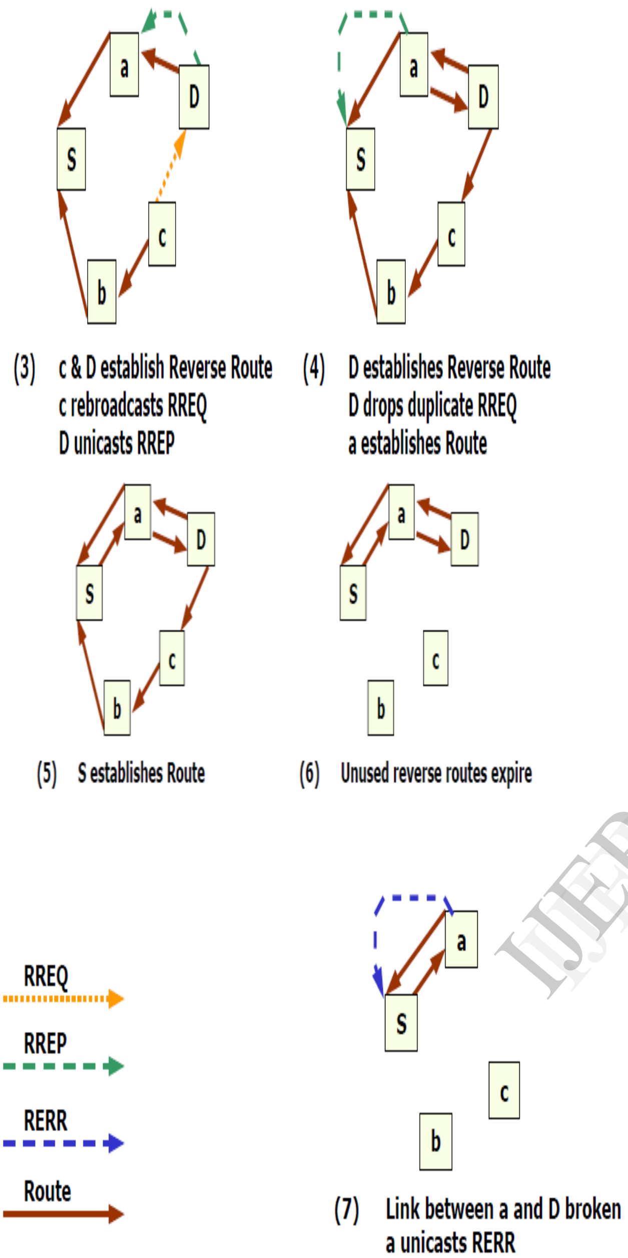
Other than these messages, AODV uses only one type of periodic message is HELLO message, in order to maintain the Neighborhood basis. A hello is a special RRER witch is only valid for its neighbors. A node may broadcast periodically a hello message.so that no link breakages are assumed by its neighbors when they do not hear anything from it for a long time. In either case, the source node waits for a predefined timeout, the route establishment response to the destination, and then it retransmits another RREQ by increasing the maximum number of hops (TTL: Time To Live). If after repeating this process a limited number and the source get nothing, it declares the absence of this destination.

To maintain routes, AODV use an ACTIVE_ROUTE_TIMEOUT (ART) that equal to 3 second. If and defined routes between two nodes, is not used within this period, then this node is not sure if this route is yet available or not, it rebroadcast a RREQ if needs.

AODV ROUTE ESTABLISHMENT

If S want to send a packet to D





3. RELATED WORK

The work done in this paper is grouped into two major groups; the first group describes the methods for reducing energy consumption in the AODV protocol with expanding the route strategy, and the second method present the to control numbers of control messages to be transmitted in order to reduce the cost of consumption of energy and traffic also.

The proposed protocols, does not minimize the number of messages or the overhead, or use geographic coordinates of the nodes or the channel access using the MAC layer. Our proposed methods simply change the periodicity of transmitting Beacon messages by random time. and with power parameter also included . This is an important feature and has a profound effect on energy consumption, This is the one of the feature added in this paper.

USED MODEL

We use a network composed by four nodes (node A, B, C and D) with bidirectional or Symmetric links between them. The communication range is circular with a diameter of 250meters.

Used Variables.

Variable	Designation
E_A	Energy stored in the node A battery
E_R	Resultant energy
K_A	$1/E_A$
$H_{ACK}(A)$	Hello message acknowledgment
T_{ACK}	reception time of HELLO message Acknowledgments
$\blacktriangle t$	acknowledgment period
HI	HELLO_INTERVAL
Nn	Node's neighborhood number nodes

Our goal is primarily to have an idea about the quantity of energy stored in neighbor node batteries. The parameters used to define the model are shown in Table 1. The topology used is shown in Figure 1.

In our model, we decrease the number of HELLO messages by increasing the time interval between two messages. Assuming that the period between two successive HELLO messages is proportional to the number of neighbors nodes. according to the equation (1).

$HI_{TC\text{-}AODV}=N_n * HI_{AODV}$ – (1)

It will also reduce the time interval between Acknowledgment messages, which are having the same content as the hello messages, which allows to know the battery level of the other nodes.

Ki is inversely proportional to the battery's energy. Assuming that the maximum level of thebattery power is 15Kw [29], in our example K_C is the node C factor, then the level of it batterypower is

$E_c=1/K_c*E_{max}=1\backslash 6*15K_w=2{,}5K_w$

Respectively

$E_B=5K_W, E_A=7{,}5K_W, E_D=3{,}75Kw$

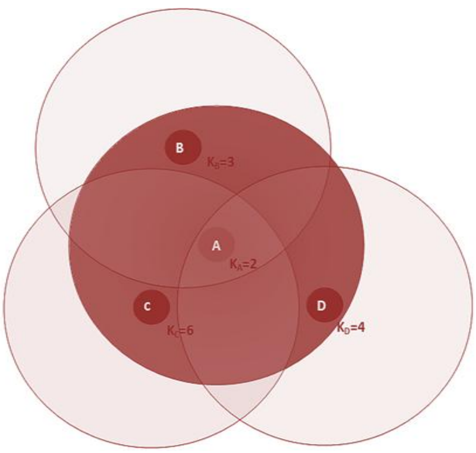


Figure 1. The neighborhood topology used for the description

From the figure (1) After receiving a hello message from node A, all the neighboring nodes will respond with a Hello ack instantly which is proportionally to the factor K. The source node will process the received HELLO ack based on the smallest value of the respective node K value from.

4. TC-AODV CONCEPT

Our proposed method is illustrated in Figure 2. After sending a Hello message, the node A starts receiving acknowledgments from its neighbors. The asumpted parameter δt is known by all nodes and is defined in the HELLO message. If the energy of a node is negligible, for example, you will not receive acknowledgment during the period T_{ACK}.

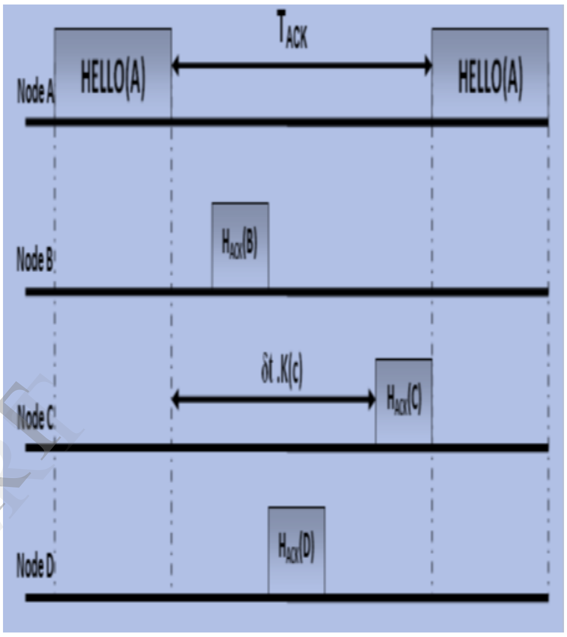


Figure 2. HELLO transmission and reception model

After receiving various Hello acknowledgments node A registers and updates the localization information and battery energy of the neighborhood nodes. Similarly all the neighboring nodes will use the same procedure to update the routing information. The only difference is the non-periodicity of this message in order to have the desired information. Information about energy can be further used for the dissemination of other control messages or data. In the event that a node in the neighborhood has a battery exhausted, the node A avoids the flow of messages using this node.

After collecting information from respective neighbor node batteries level, a source node then chooses more than the shortest path, the safest path. Indeed, after selecting of shorter path, and sending a data message, a node can be left this way and so the link considered broken and then we have loss ofmessage. However, in the case of safe path the source nodes can elect the path that contains nonode with an exhausted battery.

CONCLUSION:

In this paper we presented a new solution for the exchange of HELLO messages in AODVrouting protocol. We have shown that our solution can provide knowledge about the levels ofstored energy of the nodes constituting the network without affecting the operation of theprotocol. After saving this new information, a node given in the network can choose the shortestpath that contains enough energy for the correct routing of data packets, thus winning in termsof the ratio of the packets.

In future work, we will evaluate the TC-AODV performances in different topologies anddifferent types of mobility to demonstrate the robustness of this Protocol and the benefitsprovided.

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