Minimizing Energy Consumption in AODV Protocol

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ABSTRACT

Mobile Ad-hoc network (MANET) are self-configured and individual nodes. Nodes can move independently and maintain themselves randomly and all nodes connected through wireless links .They formed dynamic topology due to high mobility. Battery power of node is essential aspect because node required battery power for communication in the network. Battery power does matter a lot so it is important to make the proper utilization of it. As recharging of the battery and replacement of battery is not possible in MANET. So limited battery power of node affect the entire network. So make the maximum use of energy of node traffic must be routed in a way that it consumes a lesser energy. So we proposed a new energy efficient routing to minimize the energy consumption with AODV routing protocol to improve the data delivery and energy utilization.

Keywords: *MANET, AODV, Energy, Netwrok lifetime*

INTRODUCTION

Wireless networks and mobile devices are recently much popular. MANET do not have any specific infrastructure so topology can change as per the network. MANETs become one of the most widespread areas in research [1]. Two communication approaches for wireless mobile nodes: 1. Infrastructure-based Mobile device communicate with a centralized administration or fixed infrastructure. 2. Infrastructure-less- Mobile nodes exchange the information without any pre-present infrastructure. According to the topology nodes may be far away from each other so it is a multi-hop process. There are many protocols that are used in MANETs based on the end-to-end delay, rate of drop packets, average load of routing and so on. As mobile node has a limited energy there is a limited energy resources. So if one of the node from network fails then it may cause failure of entire network. So energy efficient routing protocol take care of the active communication from source to destination. Various protocol has been developed like TORA (Temporally Order Routing Algorithm), DSDV(Destination Sequence Distance Vector), DSR (Dynamic Source Routing), and AODV (Ad-hoc on demand Distance Vector Routing).

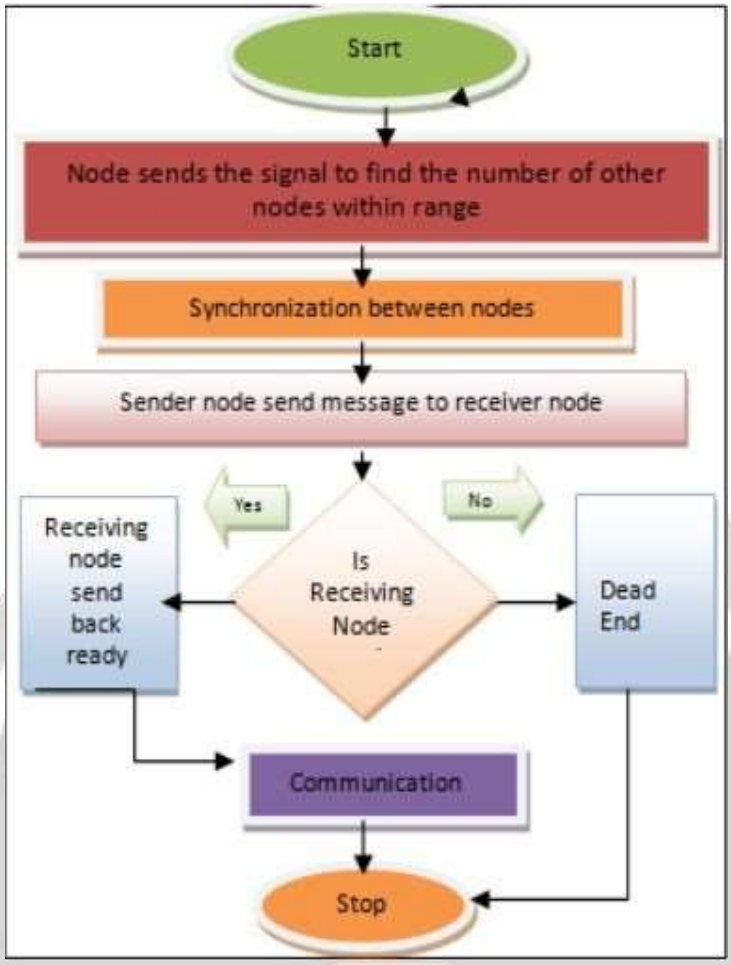

Fig1. Flow of Nodes[5]

Two types of routing protocols are available in MANET. First is Proactive routing and second is Reactive routing. In proactive routing, routing information is maintained at each node in the entire network. Due to mobility if topology changes than it will update the routing information. DSDV(Destination sequence distance vector) is a type of proactive routing protocol. In reactive routing, when a source node require to transmit data to destination node route discovery process comes in picture. So it find the path at that time only. AODV and DSR both are type of reactive protocol[1].

Reactive protocol consist of two phases. First Route Discovery and second is Route Maintenance.

Route Discovery:

When the path from source to destination is unknown and source wants to send the packets to the destination, it uses the route discovery process to discover a perfect path for that particular destination. Route use the flooding technique to make a route request (RREQ) packets. Each and every node receives that particular RREQ and forward it unless it is destination or it has the route to the destination node. Through this once the packet reaches to the destination node, it reply back with the route reply (RREP) to the source with the efficient path.

Route Maintenance:

Routing updates are sent to all the nodes. So if any link between the nodes is fail then route cannot be establish. So it is needed whenever the link failure occurs. Whenever the node forward the request to other node but link is not working then that node sends the RERR packet to the source node. Then source remove all the routes through that link from its cache.

Then source node initiate the new RREQ packets among nodes if path is still unknown.

Applications of Manet:

- Sensor Network
- Rescue operation in remote area
- Remote constuctions sites
- Emergency Operations
- Military battlefield
- Civilian Environments
- Law enforcement activities Commercial Projects

AODV Protocol: As Aodv is reactive routing protocol it invokes route discovery when souce node requires communication with destination node. This type of protocol is also known as on-demand routing protocol. AODV supports both multicast and unicast routing.
It always use short path and it doesn't have issue of count-to-infinity[5].

AODV Advantages:

- Always effective for dynamic networks.
- Best thing it supports multicast.

AODV limitation:

- Route maintenance technique lacks as on-demand routing protocol.
- High latency due to route discovery[1].

Performance Metrics:

Throughput: It is consider as ratio of total packets received at destination node at given simulation time.

Average End-to-End delay:

It is considered as a time required by data packets to reach to the destination node.

Characteristic	DSDV	DSR	AODV
Loop free	Yes	yes	yes
Multicasting	No	yes	no
Distributed	yes	yes	yes
Periodic Broadcast	yes	no	yes
Qos support	No	no	no
Routes maintained in	Route Table	Route Cache	Route Table
Route cache/table timer	yes	No	yes
Reactive	no	yes	yes
Proactive	yes	no	No

Table 1: Routing Protocol Characteristic

Related Work:

In[4] Dr Anupama P Patil, et al. proposed a improve energy efficient AODV(IEE_AODV) protocol using scheme drain count in this AODV protocol to make the better utilization of energy consumption.They initially set the threshold vaue, if node does not have a more energy than set threshold energy value than the value of drain count is raise by 1. Now suppose two paths or more than two paths have a same value of drain count than choose the path which has a less no of hop count. Suppose if same hop count exist for all path than choose the path which has lowest possible transmission power. So it helps to improve network life time. If path is broken which is choosen than select another path which has less merger time.

In [7] Bhagyashri R Hanji, et al. proposed improved AODV(I_AODV) using scheme of restricted route discovery area. In their proposed idea if both communication node are in the range of each other than direct node can communicate with each other using one hop. If one hop is not available then source node finds the intermediate node lies between it self and destination node. And most important thing is energy of that intermediate node should be more than set threshold value. This process will continue untill node reaches to the destintion node.

In [10] Gagandeep Kaur, T. Hamsapriya,et al. they proposed a scheme from source to destination multipath on-demand distance vector routing. They set the initial energy to each node 100. If average energy and energy of node is more than the set threshold value 20 than that route is selected and whatever short path is available there it would be selected for routing.

In [11] Gyanappa A. Walikar, Rajashekar C. Biradar proposed a scheme of energy model to calculate the residual energy of nodes in network. Establishing multiple multicast routes with the help of route request and route reply pakcets. Route maintenance for route break and node failures due to energy drain.

In [12] Uma Rathore Bhatt, Neelesh Nema et al. they proposed new DSR I algorithm. It introduce to forwarding the route request packets by the nodes which lies between source and destination node. Authors made modification in phase of reactive protocol Route discovery.

In [13] Krishna Mahajan, Devesh Malik et al. AODV cant take the whole advantage of all optimal routes which occur beacause of random node movement. An event occur when two non-neighbour node of active route or other route become neighbour s because of initialization of route optimization. If this happen than new optimized route availability is cheked by sending proxy route request to the neighbour for all available destination node. If short route available than node will notify through proxy route reply.

PROPOSED SOLUTION

By the literature review we came to know that battery power of node must be utilize in a better way.

ALGORITHM I:Minimizing the consumption of energy

Parameters

Tx: Transmission power

Rx: Received Power

Deng: Discharge energy

Sid: Source id

Did: Destination id

1. Broadcast the packets (sid,Did)
2. check if node is in range
    a. if node id is valid and if node id matches
    b. forward the packets to next hop
        i. calculate Tx and Rx power of node

   c. Calculate and store the discharge energy of the transmitting node and the receiver node.
3. if node is not in range ,discard the package.
4. if intermediate node is Did and available paths are more than one.
   a. calculate the power consumed of each path using Deng
   b. if power consumption of path 1 is less than power of path 2
      i. select path1
   c. else select path 2

ALGORITHM II: Route Faiure

1. if the path established is broken
2. if the path established energy is zero
   a. search new path
   b. Reroute S to R
3. else node is out of range
   a. find reason for path broken
4. stop

CONCLUSION

In Mobile Ad hoc Network, two nodes communicate either directly or indirectly through other nodes and the aim is only one to deliver the data successfully in network. These nodes are typically powered by batteries with limited energy supply. The failure of node may potentially result in partitioning of the entire network. The limited battery power in MANET is the crucial issue and their utilization is also necessary to improve the routing capability. Energy efficiency continues to be a key performance metric as efficient utilization of energy increases the network longevity hence critical in enhancing the network capacity. So this research effort is made to reduce the energy consumption through proposed scheme. The proposed energy saving scheme aim is to minimizing the total power consumption of all nodes in the group. Our proposed scheme is minimizes the energy consumption and utilizes the energy for data delivery that enhances the network performance.

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