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RESEARCH PAPER

A Review on Energy Efficiency in AODV Routing Protocol in MANET

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ABSTRACT

A Mobile Ad-hoc Network (MANET) is a group of independent mobile nodes communicate with each other and utilize to form a provisional network without any physical infrastructure or standard support services. Energy efficiency is a major issue of mobile ad hoc networks as mobile nodes depends on batteries, which are inadequate sources of energy, and in several environments. Straightly the life of a node is affined to the battery in the instrument operating at the node. Maximize the usage of energy and increase the life of network is still the key defiance of Mobile Ad hoc network. There are various routing protocols in MANET which use to increase the network throughput, to maximize the energy efficiency and network life .The AODV routing protocol is consider one of the best reactive routing protocol in the term of energy efficiency but generally it counters many problems like long path, delay of time, mobility and many other while routing. The nodes low in power level will not be in a place to complete the routing. This paper discussed a general energy efficient routing protocols based on AODV for mobile ad hoc networks.

***Key words**: MANET, AODV routing protocol, energy efficient routing protocols based on AODV*

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INTRODUCTION

MANET [1] is a collection of independent wireless nodes where nodes communicate with each other by promoting packets and allow them to connect directly in wireless range. A Mobile ad hoc network is totally working at any place without centralized base station. The MANETs are facing challenges like, the mobility of nodes in the topology of the network, the bandwidth, the restriction of battery resource and finally, the multi hop routing. MANET has a limited battery power to route the packet data from the source node to destination node and due to mobility of the network topology. There will be an extra effort by the nodes and that will cause depletion of the battery resource which will affect the performance of the network and interrupt communication between the nodes in MANETs [2].

So the big issue is how to accomplish the power of each node in the network, which will extend the lifetime of the network in MANETs. The energy bushed through the process of joining between the nodes in MANET by: Receiving, Idle and remaining energy and Sleeping. If the source node in the network didn't find the destination node through the process of route discovery then it will restart the route discovery again which will consume the battery power of each node in the topology of the network and that will decrease the lifetime of the network [2].

ROUTING PROTOCOLS

Routing protocols enable router communication and overall network topology understanding. A routing protocol is also known as a routing policy. Routing protocol can be classified into three types of routing protocols [3].

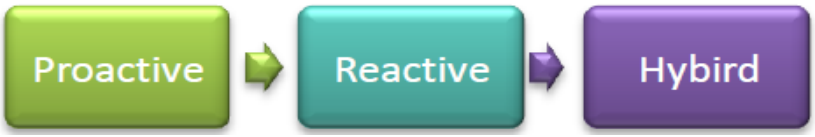

Fig. 1: Classification of Routing Protocols in MANET

REACTIVE ROUTING PROTOCOL

The reactive routing protocols can be used as the way of following a route determination procedure. So if the source node wants to send a data packet to the destination node, initially the route to the destination node is determined and then a connection is established between these nodes. Route demand packets are flooded throughout the network for the path determination procedure. Flooding is the concept of forwarding the packets from any node to other nodes except the node which is arrived, though it makes the use of bandwidth and establishes the network overhead, reactive routing broadcast routing requests whenever a packet needs routing ,so this will cause delay in packet transition as routes are calculated, but features very few control traffic overhead and has typically lesser memory storage usage than proactive routing protocol, this rises the scalability of the protocol.

PROACTIVE ROUTING PROTOCOL

In networks utilization for a proactive routing protocol, every node in the network maintains one or more tables representing the full topology of the network. In order to maintain up to date routing information, these tables are updated regularly. Moreover, to maintain up to date routing, topology of the information requires to be exchanged the nodes on a regular basis, leading to relatively high overhead on the network. A proactive approach to Mobile Ad hoc Network Routing seeks to maintain a constantly upgraded topology understanding. So in theory, the whole network should be known to all nodes.

HYBRID ROUTING PROTOCOL

The combination of the reactive and proactive routing protocol is called the hybrid routing protocol. It's best well-matched for routing protocol in which zone. The proactive and reactive makes use of this protocol. So that is why is suited for the routing in which zone are determined by proactive routing protocols and the routes between the nodes. It also best suited for area routing protocol in which zone are determined by proactive routing protocols and the routes between the nodes are determined by reactive routing protocols.

AODV ROUTING PROTOCOL

Ad hoc on demand distance vector (AODV) [4]. Which is built to use in Mobile Ad hoc network AODV is a reactive routing protocol i.e. it requests for the routes when needed? AODV also based on the distance vector routing algorithm. There are two mechanisms in AODV which are classified as (5, 6).

Route discovery is the essential part in Ad hoc On Demand Distance Vector that can start with broadcast of RREQ to its neighbors for certain destination .once the receiving RREQ message from intermediate node, it checks its routing table for the route to destination, if yes sends RREP to source node. Info, it Rebroadcast to is neighbor node.it will also set up a reverse path to source node in its route table.it refuse the RREP if it is processed

already. Once RREQ reaches to the destination node, it will unicast RREP to source node by using reverse route to source node.

ROUTE MAINTENANCE STAGE

Broadcasting of active nodes is done periodically by hello message. As there is no hello message from neighbor up streams node notifies source with an RERR packet and entire node is invalidated. Initialization is done by source to a new route discovery stage; and then it will floods the RREQ packet. There are two main factors that cause link failures through the process of communication in AODV and they are-

1. Battery life time
2. Mobility

Taking energy in consideration, there are three approaches that are usually used to achieve the energy-efficiency in MANETs [7] - Power-Control, Power-Save and Maximum-Lifetime routing. The Power-Control approach is allowing nodes to decide the least amount of transmission power level which is sufficient to maintain network connectivity and to pass the traffic with least energy, the objectives is to increase network capacity and sinking energy consumption. The Power-Save approach deals with the energy loss during the idle mode and this can be minimized by increasing the amount of time a node spends in the sleep mode. Lastly, the Maximum-Lifetime routing approach looks for the nodes that have minimum energy so that they can be avoided from the path.

LITERATURE REVIEW

Tripti Nema [8] proposed a New-AODV protocol which utilizes to improve the lifetime of the network on the MANETs. It also focused in the way of maximizing the inclusive existence of the node in the network when the source node reach the minimum threshold limit the node goes to sleep mode, save power and share in the event as long as possible. The energy of nodes have a plenty of impact on the fully network lifetime. The presented sleep mode structure make sure significant improvement in the energy aware system. Hence, the success of sleep mode for the systems eventually depends on the wake-up time for several nodes. The starting of the awareness in the energy management is proposed. In order to, defeedthe energy based problem and prevent the link breakage. As a result, one can know that sleep mode to AODV protocol gives a clear result to enrich the complete network lifetime.

R. Rajeshkanna [9] presents an enhancement of the power conservation techniques using the improved AODV energy efficient routing protocols in Mobile Ad hoc networks. This EAODV protocol can be used for energy optimal routes to reduce the energy consumption of nodes. So to make the network survivability and lead to a longer battery life of the terminal is by using the AODV extension. They establish balanced energy consumption with minimum overhead. Reena Singh [10] proposed an EEAODV routing protocol which is enrichment in the existing AODV routing protocol. To save the energy in mobile devices, the energy efficient Ad Hoc Distance Vector protocol (EE-AODV) has enhanced the RREQ and RREP handling process. EE-AODV considers some level of energy as the minimum energy which should be available in the node to be used as an intermediary node. The node should not be considered as an intermediary node when the energy of a node reaches to or below that level. The main concept of this objective is that the source to destination can be selected by keeping energy consumption factor as an important parameter. So, the optimal path is available through the intermediary node having less power and source node has one more route as an alternative to send, then the second route should be opted by the source node.

Nisheeth Khanna [11] proposed an energy efficient path routing (EEPR) protocol, which reduces the variance in residual energies of nodes and thus increases the net-work lifetime of MANET. In addition, it is also proposed to include a link stability parameter while selecting the routing path to further improve the energy efficiency. Using a min-max

formulation for highest residual energy path and link stability parameter, EEPR selects the path that is most energy efficient and with highest stability/reliability. The proposed algorithm aims at addressing the problem of improving the energy efficiency and thus maximizing the network lifetime of a MANET deployed in a typical military scenario. The proposed EEPR routing protocol selects a path based on max-min formulation for finding the ideal residual energy path for reducing the variance in energy consumption/residual energy of the nodes.

Seema Tiwari [12] proposed an Energy Saving Multipath AODV routing protocol, which based on node residual energy and Threshold value based scheme for selecting only two paths that have maximum energy value. Choose one path from two of them that have maximum energy for communication and second path is reserve for future use as alternate route. So, when main route is no longerin use due to link failure, energy exhaustion second route is used for data transmission which conserves energy consumed in reroute initiation process. Choose one path from two of them that have maximum energy for communication and second path is reserve for future use as alternate route. This saves the battery power consumed in reroute discovery process and increase the network lifetime. An Energy Saving Multipath AODV protocol selects the first path as main route for transmission that has maximum total energy value from two of them. And the second route is reserve as alternate route for transmission in case when first route is break or show some error. So besides initiating reroute discovery reserve second alternate route is used for communication. This saves the battery power consumed in reroute discovery process and increase the network lifetime.

Mohamed Er-Rouidi [13] proposed a solution called Enhanced Energy-AODV (EE-AODV), which is an enhancement of the Ad-hoc On-demand Distance Vector (AODV) routing protocol. In this paper proposed solution, we tend to obtain a sufficient result in terms of the stability a lifetime of the different path in the network, by adding the energy consumption among the selection criteria of the AODV routing protocol. The different simulation results show that EE-AODV outperforms EQ-AODV (Energy and Quos supported AODV) and the basic AODV by reducing significantly the energy dissipation, also enhances certain parameters that are affected by the energy issue like Packet Delivery Ratio (PDR) and Normalized Routing Load (NRL).enhanced protocol we introduce the energy among the criteria of selection during the phase of route discovery. The route created between any pair of nodes consists only of nodes whose energy level is higher than a threshold. Therefore, a route with a high residual energy and minimum hop count will be chosen.

K. Mariappan [14] Presented a novel energy aware routing protocols called Node Residual Energy Adhoc On Demand Distance Vector (NREAODV in short) which uses residual energy and hop count as a cost metric to minimize energy consumption, maximize network lifetime and distribute usage of energy among mobile nodes of Mobile Ad hoc Network (MANET). Proposed a new energy aware routing approach which combines the minimum residual energy, sum residual energy and hop count as a cost metric. The approach utilizes minimum residual energy, sum residual energy and hop count to select an energy efficient route that maximize network lifetime and distribute loads among the mobile nodes.

K. Mariyappan [15] designed a novel energy aware routing protocols called Gossip based Node residual energy AODV (GBNRE-AODV) which uses residual energy, hop count, node received signal power and node density as a cost metric to reduce energy consumption, increase network lifetime and distribute usage of energy among mobile nodes of Mobile Ad hoc Network (MANET) presented new gossip based energy aware routing approach for MANETs, named as Gossip based node residual energy AODV (GBNRE-AODV), where the gossiping probability at a node is dynamically computed based on its neighbor density, minimum residual energy from source to the destination node and received signal strength.

CONCLUSION

The biggest defiance in designing Mobile ad hoc network is restricted availability of power resources, all the nodes in MANET are mobile in nature and having restricted battery charge at that point it is important to preserve the battery energy of those nodes to rise the network lifetime, and to defeat the problem of power conservation there exist a lot of routing protocols. In this article icon centering on the various of power-efficient AODV routing protocols in Mobile ad hoc network to get a dependable paths for routing with little power exhaustion and studied diverse research papers on energy efficient routing protocols based on AODV in MANET, to decide the route which minimize delay, overhead and depletes lesser energy. These AODV extensions enhance the survivability of network and make life of the battery longer. They accomplish balanced energy consumption with minimum overhead. There is not a single protocol which can give the best execution in Mobile Ad Hoc Network. Performance of the protocol varies according to the variation in the network parameters and MANET properties continuously differ. So, the choice of the protocol is the basis to implement in a particular type of network. Sometimes the mobility of the node of the network is high and sometimes it is low but power of the node is our prime concern. For future work there is a plan to develop a new energy efficient routing protocol based on the AODV to enhance the energy efficient in MANET and improve the lifetime on the network.

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