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An Efficient EPAR Routing Protocol in Manet Based Upon AACO

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Abstract— MANET are a dynamic and infra structure-less networks. The major constraint of this type of networks are Energy optimization because the nodes involved in these type of networks are battery operated. The lifetime of these network can be improved using the energy levels of the individual nodes of the network. Energy conservation is necessary to reduce gap between the power consumption requirements and power availability. To maximize adhoc networks lifetime traffic should be send through route that prevents the nodes with low energy. Main objective is to use various techniques such as secure routing, power awareness and load distribution with respective of advantages and disadvantages in EPAR routing protocol.

Keywords— OSI, WRP, OLSR, DSR, EPAR

I. INTRODUCTION

A Mobile Adhoc Network is a collection of independent mobile nodes that can communicate to each other via radio waves. The mobile nodes that are in radio range of each other can directly communicate, whereas others needs the aid of intermediate nodes to route their packets. Each of the node has a wireless interface to communicate with each other. These networks are fully distributed, and can work at any place without the help of any fixed infrastructure as access points or base stations.Figure 1 shows a simple ad-hoc network with 3 nodes. Node 1 and node 3 are not within range of each other, however the node 2 can be used to forward packets between node 1and node 2. The node 2 will act as a router and these three nodes together form an ad-hoc network.

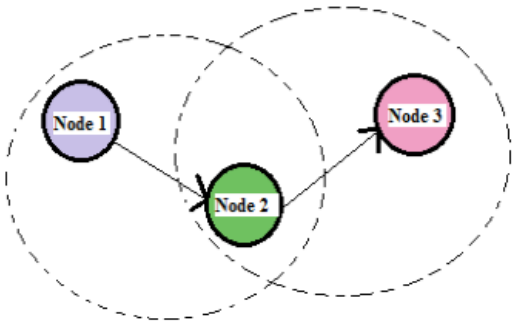

Fig.1: Example of mobile ad-hoc network

Protocol Stack for MANET:

Protocol stack for mobile infrastructure-less networks[12] is described. The protocol stack which consists of five layers (a) physical layer (b) data link layer (c) network layer (d) transport layer (e) application layer. The layers of OSI (a) session (b) presentation (c) application are merged into one section called application layer. It is a layered framework designed for the purpose of network systems that allows for communication across all types of computer systems. TCP/IP was designed first. The last four layers of OSI model are the same but the fifth layer in the TCP/IP suite (the application layer) is equivalent to the three layers (a) session (b) presentation (c)application layers of the OSI model. The difference between two protocol stacks lies in the network layer.

MANETs characteristics

1) Distributed operation: There is no background network for the central control of the network operations, the control of the network is distributed among the nodes. The nodes involved in a MANET should cooperate with each other and communicate among themselves and each node acts as a relay as needed, to implement specific functions such as routing and security.
2) Multi hop routing: When a node tries to send information to other nodes which is out of its communication range, the packet should be forwarded via one or more intermediate nodes.
3) Autonomous terminal: In MANET, each mobile node is an independent node, which could function as both a host and a router.

4) Dynamic topology: Nodes are free to move arbitrarily with different speeds; thus, the network topology may change randomly and at unpredictable time. The nodes in the MANET dynamically establish routing among themselves as they travel around, establishing their own network.
5) Light-weight terminals: In maximum cases, the nodes at MANET are mobile with less CPU capability, low power storage and small memory size.
6) Shared Physical Medium: The wireless communication medium is accessible to any entity with the appropriate equipment and adequate resources. Accordingly, access to the channel cannot be restricted.

II. ROUTING PROTOCOL

It is the process of establishing path and forwarding packets from source node to destination node. It consists of two steps, route selection for various source-sink pairs and delivery of data packets to the correct destination.
Various protocols and data structures (routing tables) are used to meet these two steps. This survey paper is focussed on finding and selecting energy efficient routes. We are going to discuss the main approaches in the routing are proactive, reactive, and hybrid then the general definition of energy efficiency as well as energy efficient routing algorithms.

A. Classification of Routing Protocols for MANET

1) Proactive (Table-Driven) routing protocols: A Proactive protocols continuously maintain fresh list of destinations in the network by exchanging topological information among the network nodes. Thus, when there is a need for a route to a destination, such route information is available immediately. Examples of the proactive protocols are-DSDV [2] (Destination-Sequenced Distance-Vector), Wireless Routing Protocol (WRP)[7], Hierarchical State Routing protocol, Optimized Link State Routing,(OLSR)[4] and Topology Dissemination based on Reverse-Path Forwarding routing protocol (TBRPF). The main disadvantages of such algorithms are high latency time in route finding and excessive flooding can lead to network clogging.
2) Reactive(On demand) routing protocols: The reactive routing protocols are based on some sort of query-reply dialog. It is also called on demand routing. It is more efficient than proactive routing and most of the current work and modifications have been done in this type of routing for making it more and more better. The main idea behind this type of routing is to find a route on demand between a source and destination whenever that route is needed. Discovering the route on demand avoids the cost of maintaining routes that are not being used and also controls the traffic of the network because it doesn't send excessive control messages which significantly create a large difference between proactive and reactive protocols. Time delay in reactive protocols is greater comparative to proactive types since routes are calculated when it is required. e.g. Ad-hoc On Demand Distance Vector (AODV), and Dynamic Source Routing (DSR)[7][9] etc.
3) Hybrid routing protocols: Both of the proactive and reactive routing methods have some advantages and shortcomings. In hybrid routing a well combination of proactive and reactive routing methods are used which are better than the both used in isolation. It includes the advantages of both protocols.

III. DEFINITION OF ENERGY EFFICIENCY

For a wireless networks, the devices operating on battery try to pursue the energy efficiency heuristically by reducing the energy they consumed, while maintaining acceptable performance of certain tasks. Using the power consumption is not only a single criterion for deciding energy efficiency. Actually, energy efficiency can be measured by the duration of the time over which the network can maintain a certain performance level, which is usually called as the network lifetime. Hence routing to maximize the lifetime of the network is different from minimum energy routing.

Minimum energy routes[1][6] sometimes attract more flows, and the nodes in these routes exhaust their energy very soon; hence the whole network cannot perform any task due to the failure on these nodes. In other words, the energy consumed is balanced consumed among nodes in the networks. Routing with maximum lifetime balances all the routes and nodes globally so that the network maintains certain performance level for a longer time. Hence, energy efficiency is not only measured by the power consumption but in more general it can be measured by the duration of time over which the network can maintain a certain performance level. There are lots of ways to categorize routing algorithms One is flooding and broadcast routing, which is often necessary during the operation of the wireless network, such as to discover node failure and broadcast some information. The second kind is multicast routing, which is very common in wireless networks, to communicate in a one-to-group fashion. The last is unicast, which is always in an end-to-end fashion and the most common kind of routing in networks. It goes without saying that node failure is very possible in the wireless network. Hence, saving energy when broadcasting in order to recover from the node failure or to re-routing around the failed nodes is essential. By the same token, multicast has the same challenge to achieve the energy efficiency [11][19]. For unicast, it is highly related to the node and link status, which require a wise way to do routing as well. Sometimes, shortest path routing is possibly not the best choice from the energy efficiency point of view. Energy is a limiting factor in case of Ad-hoc networks[12]. Routing in ad-hoc networks has some unique characteristics. First-energy of nodes is crucial and depends upon battery which has limited power supply. Second-nodes can move in an uncontrolled manner so frequent route failures are possible. Third-wireless channels have lower and more variable bandwidth compare to wired network. Energy efficient routing protocols are the only solution to above situation. Most of the work of making protocols energy efficient has been done on "on demand routing protocols" because these protocols are more energy efficient rather than proactive protocols but still these have some drawbacks which have been discussed in the next section. Energy efficiency can also be achieved by sensible flooding at the route discovery process in reactive protocols.

And energy efficiency can also be achieved by using efficient metric for route selection such as cost function, node energy, battery level etc. Here energy efficiency doesn't mean only the less power consumption here energy efficiency means increasing the time duration in which any network maintains certain performance level.

IV. RESEARCH GAPS

A mobile ad hoc network (MANET) consists of one or more autonomous mobile nodes, each of which communicates directly or indirectly with the neighbor nodes within its radio range. The field of MANET is rapidly growing due to varied advantage and applications. Energy efficiency is a challenge faced especially in designing a routing protocol. A single routing protocol is hard to satisfy all requirements. i.e., one routing protocol cannot be a solution for all energy efficient protocol that is designed to provide the maximum possible requirements, according to certain required scenarios.

1. There is not any alternative path for downlinks.
2. Data packets are dropped due to downlinks.
3. Decrease in throughput.
4. In case of link failure repeat rescan of network decreases the efficiency and reduce power of battery.
5. No improvement for increased delay.
6. Maximize the increased network lifetime.
7. In-secure transmission in routing protocols.

So we'll formulate secure and energy efficient EPAR Protocol due to insecure transmission of packets which is big problem that adversely affects the secure transmission other parameters like throughput, data dropped, power of battery etc [1].

V. PROPOSED APPROACH

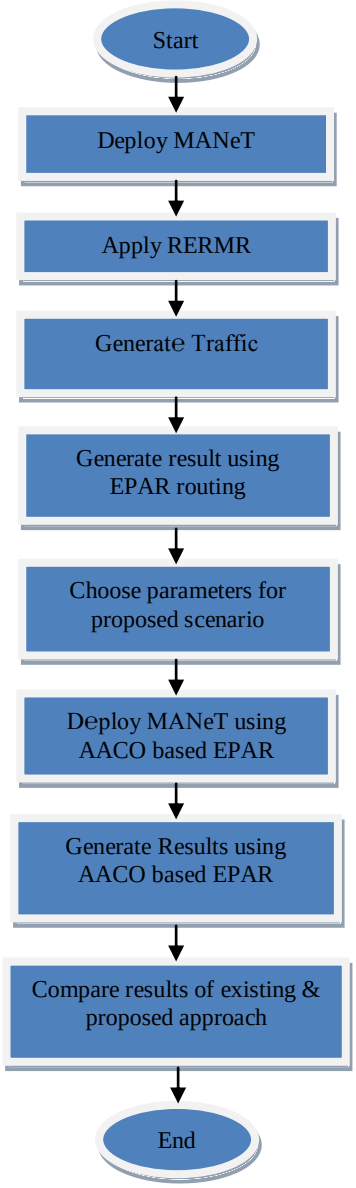

Figure 3: Flow Chart for implementation

VI. RESULTS AND DISCUSSION

In current chapter with the help of comparative study, we can draw all the pros and cons of the above defined scheduling schemes. In this scenario a comparison is made between hybrid routing schemes by taking 25 subscriber stations which is shown below.

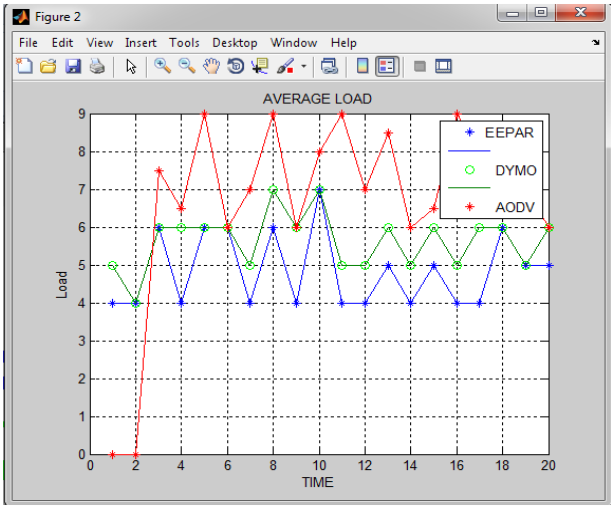

Figure 4: Load

The load in two MANET protocols EEPAR, DYMO and AODV in 25 nodes. From the above graph it is shown that the load in EEPAR is less than that of existing approach. In the proposed approach load is approx $7.5*10^4$ bits/sec whereas in case of proposed it is below $7*10^4$ bits/sec.

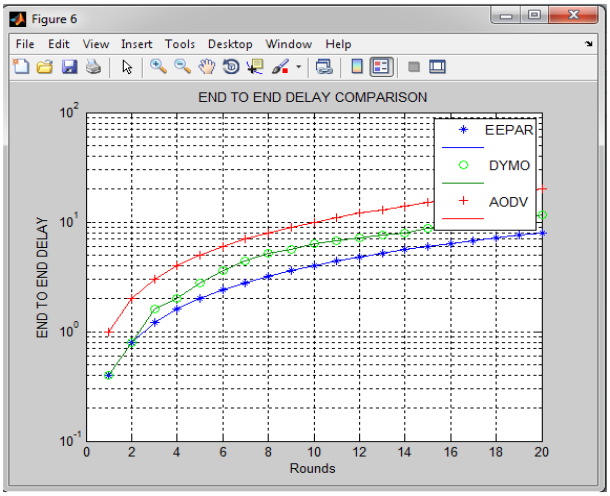

Figure 5: End to End Delay

Delay in EEPAR, DYMO and AODV in MANET in 25 nodes. From the graph it can easily depicted that the delay in proposed algorithm is less than that of existing protocol. Delay in proposed algorithm is approx10 sec where as in existing it is more than 50 sec.

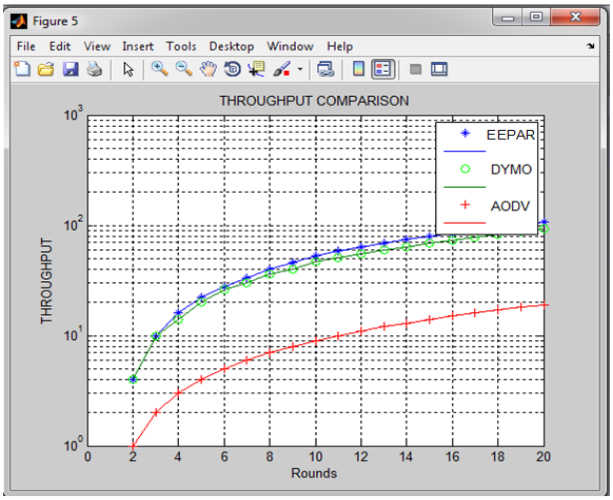

Figure 6: Throughput

Throughput in EEPAR, DYMO and AODV in MANET in 25 nodes. From the graph it can easily depicted that the throughput in EEPAR is more than that of existing protocol. Throughput in case of proposed case is approx 110 packets and in existing case it is approx 100 packets.

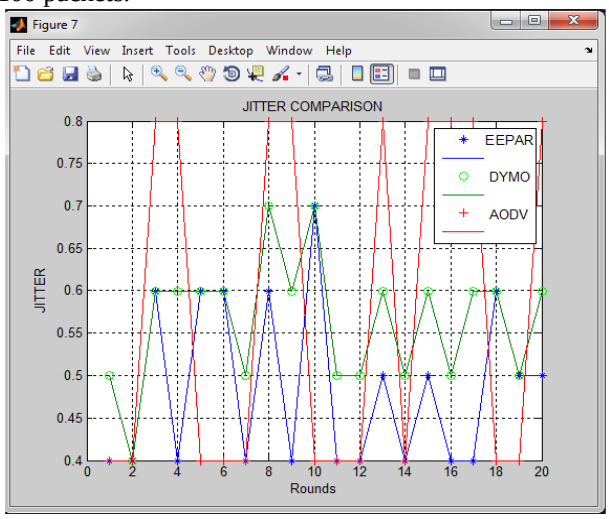

Figure 7: Jitter

Jitter in EEPAR, DYMO and AODV in MANET in 25 nodes. From the graph it can easily depicted that the jitter in EEPAR is less than that of existing protocol. Jitter in case of proposed case is approx 3.5 sec and in existing case it is approx 7 sec.

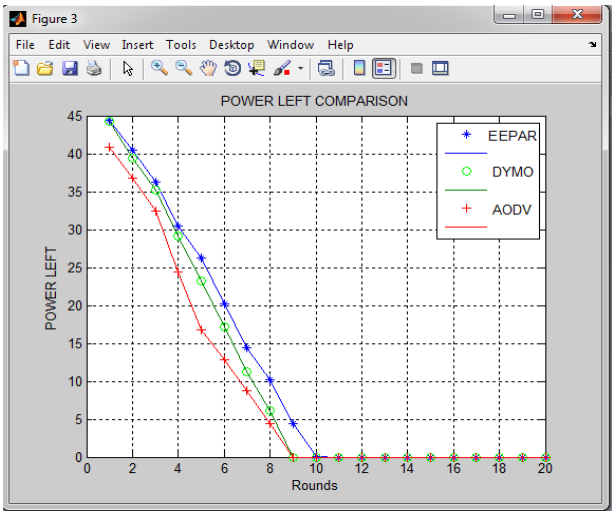

Figure 8: Power Left

Fig 8 is Power Residual in EEPAR, DYMO and AODV in MANET in 25 nodes. From the graph it can easily depicted that the residual power in EEPAR is more than that of existing protocol. Residual power in case of proposed case is retained upto approx 10 rounds and in existing case it is approx 8 rounds.

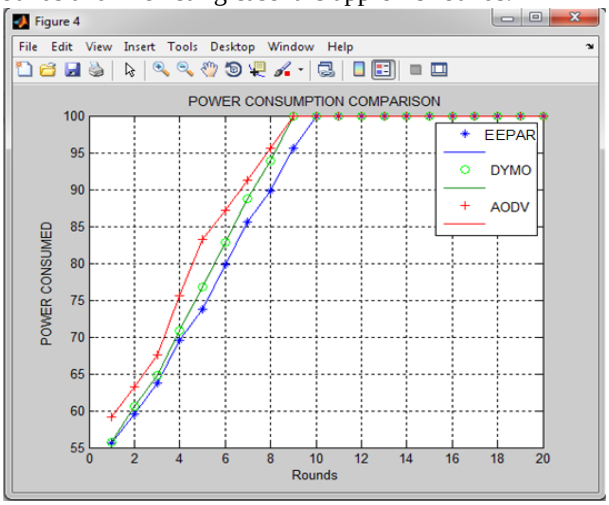

Figure 9: Power Consumption

Table 5.1 Comparative study of various parameters for following algorithms

Algorithm / Parameters	AODV	DYMO	EEPAR
Delay(sec)	100	80	60
Throughput(packets)	80	100	110
Residual power	7 Rounds	8 rounds	10 rounds
Jitter(sec)	8	7	3.5
Average Load(bits/sec)	8000	7000	6000
Power Consumption	7 Rounds	8 Rounds	10 rounds

VII. CONCLUSION

MANETs are the adhoc network that don't have any fixed topology and can easily send data from source to destination in wireless mode through some routing protocol. In the current research the enhancement of the secured MANET routing protocol is done. The protocol chosen for enhancement is EEPAR due to the low QOS in the existing EPAR. To overcome the problem of data dropped and the load in the network is removed using an optimization technique called Adaptive ACO. Using the above mentioned optimization technique the data dropped and the losses in the network are reduced to some extent. The above defined results have shown the parameters that are improved using a network simulator called MATLAB. The EPAR generates much load on the network and the packets start delayed in network. This problem is reduced in the proposed approach using an optimization technique which makes multiple paths to the packets that are sent to the destination. By using the exactly reciprocal path the network can send data through multiple paths and the load in the network can be reduced.

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