

REVIEW ON PERFORMANCE ANALYSIS OF ENERGY EFFICIENT ROUTING PROTOCOLS IN DIFFERENT TRAFFIC BASED MANET'S

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Abstract - Mobile Ad Hoc Networks (MANET)-a system of mobile nodes (laptops, sensors, etc.) interfacing without the assistance of centralized infrastructure (access points, bridges, etc.). Many efficient routing protocols are proposed to discover the paths between the source nodes to a destination nodes in a mobile ad-hoc network. Selection of routing protocols is a big challenge in MANET due to its routing overhead and routing topology changes. In Manet nodes requires energy efficient routing protocols to reduce the power consumption, therefore increases the battery life to improve the life time of network. Further, the simulation and performance is carried through Network simulator (NS-2), depending on various parameters like, throughput, end to end delay and packet delivery ratio. This work proposes an Enhanced Ad-hoc On Demand Vector Routing protocol (E-AODV) which is a modification of AODV (Ad-hoc On Demand Vector Routing).The purpose of this paper is to facilitate the research efforts in combining the existing solutions to offer a more energy efficient routing mechanism.

Key Words: Manet, Energy efficient routing, AODV, EAODV

1. INTRODUCTION

In the last few years, a wireless network architecture has been introduced that do not depend on the fixed infrastructure that means no stationary infrastructure and no base stations. In this architecture all nodes play a major role in forwarding packets from one node to another node in the Mobile Ad hoc Network. The main challenge facing Ad hoc network is to develop a dynamic routing protocol to establish a connection between the nodes.

One example of this architecture [8] is the ad hoc mode architecture of 802.11, as shown in Fig.1. In this architecture, 802.11 nodes do not rely on access points to communicate with each other. In fact, nodes reach other nodes they need to communicate with using their neighbors [6]. Nodes that are close to each other discover their neighbors. When a node needs to communicate with another node, it sends the traffic to its neighbors and these neighbors pass it along towards their neighbors and so on. This repeats until the destination of the traffic is reached [12]. Such architecture requires that every node in the network play the role of a router by being able to determine the paths that packets need to take in order to reach their destinations.

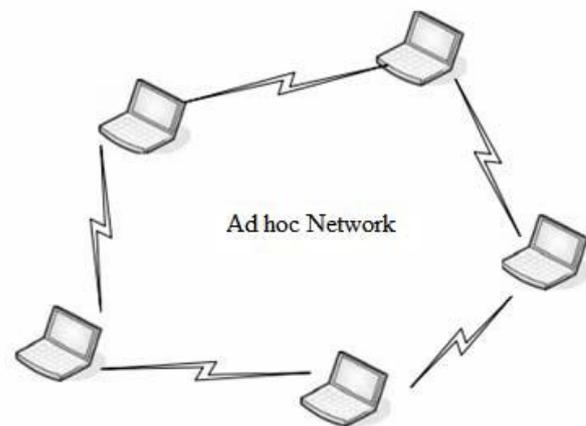


Fig.1. Ad hoc network using IEEE 802.11

Mobile Ad hoc Network (MANET) is rapidly increasing due to its wide range of independent mobile users. Efficient and successful function of manet mainly depend upon energy efficient routing protocols that consume less power in network topology. The performance analysis of a mobile ad hoc network depends on the routing schemes, and conventional routing protocols do not work efficiently in a MANET.

In MANET energy efficient routing protocols are the only solutions to improve the efficient life time of the network. In this the work done is mostly on “on demand routing protocol” because these protocols have better energy efficient than proactive and hybrid routing protocols [2]. The efficient use of cost function node energy, battery level, etc. will help to achieve the improvement in energy efficiency process.

It presents a performance comparisons of all three known routing protocols in MANET, and on their based performance results obtained by simulation with different parameters taken into consideration in Network Simulator (NS2). Some of the parameter are sending rate to evaluate the Packet Delivery Ratio (PDR), end to end delay, throughput.

The rest of the paper is organized as follows: section 2 includes related work done by researchers in the field of wireless ad hoc network related to energy efficient routing protocols in different traffic based manet. In section 3, different types of protocols and some of their features are discussed. In section 4, explores the need for energy efficient routing protocols in Mobile Ad hoc Network (MANET). Section 5 includes the proposed work. Section 6 covers the conclusion.

2. LITERATURE REVIEW

Gopinath. S et.al [1] proposed an energy efficient routing protocol by studying their energy consumption of individual node, overhead and route maintaining issues. Here, On Demand Based Energy Efficient Routing Protocol (ODBEERP) is discussed in detailed and it compared with the minimum energy in any other route. These proposed protocol is evaluated with object discrete event simulators. After seeing simulation results that OBERRRP achieves good throughput, less delay, high packet delivery ratio and better energy efficiency than remaining protocols. Dr. S. S. Dhenakar and A. Parvathavarthi [2] presented an Overview of Routing Protocols in Mobile Ad-Hoc Network. Different scenarios are taken into classification of routing protocols in MANET. In this paper a brief study of reactive, Proactive and Hybrid routing protocols comparison has been presented in the form of table. It also concentrates on routing techniques which is better challenging due to the dynamic topology of ad hoc network. These proposed a different strategies for

efficient routing which claimed to show improved performance. Getsy S Sara et.al [3] presented Evaluation and Comparison of Emerging Energy Efficient Routing Protocols in MANET. Energy Efficient Routing protocols are analyzed and reviewed their performance. The classification here summarizes the many published proposals for energy routing protocols. This paper gives better approach in combining the solution to offer a more energy efficient mechanism. Energy efficient routing protocols for mobile ad hoc networks proposed by Chansu Yu et.al [6]. This paper classifies the energy aware routing protocol proposed for MANETs. Transmission Power control approach and load distribution approach belong to the former category, whereas sleep or power down mode approach belongs to the other category. Efficient routes is an important design in mobile ad hoc network. P. S. Karadge and Dr. S. V. Sankpal [4] presented the Performance Comparison of Energy Efficient AODV Protocols in Mobile Ad hoc Networks. The improvement of the conventional routing protocol by using high energy paths in the network were discussed. The comparative analysis of existing AODV protocol and energy efficient AODV protocol is modified to improve network life span and PDR.

3. CLASSIFICATION OF ROUTING PROTOCOLS IN MANET

The main purpose of routing protocol is to find a suitable routes between two communicating nodes in a mobile ad hoc network. There are different paths to communicate with a node in ad hoc network and it is routing protocols responsible to create an optimum path between them. The basic classification of routing protocols is shown in figure 2 [2].

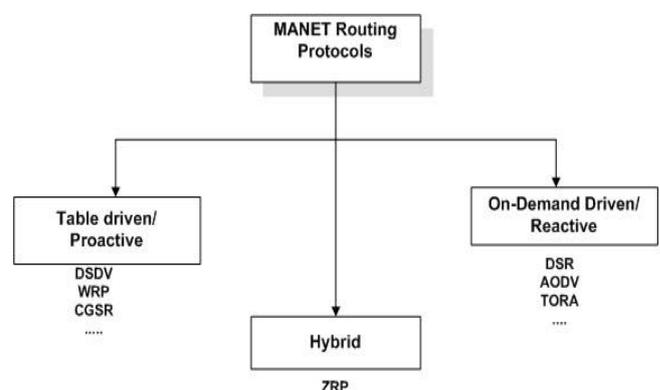


Fig.2. Family tree of MANET Routing Protocols

3.1 Proactive Routing Protocols

Table Driven routing protocol is another name for Proactive routing protocol. In this every node maintain routing table which contains information about the network topology even without requiring it [12]. This feature although useful for datagram traffic, incurs substantial signaling traffic and power consumption [1]. Whenever the network topology changes the routing table is updated automatically. These protocols have lower latency because all the routes are maintained at all the times. Examples of various well known routing protocols are DSDV, WRP, and CGSR etc. [2]

3.2 Reactive Routing Protocols

This routing protocol is also known as Demand Routing Protocol. In this protocol route is discovered whenever it is needed Nodes initiate route discovery on demand basis. When a route is found it initiates a path to connect the communicating node. The main purpose of this protocol is to reduce the overhead messages [2]. Delay in discovering of new route between nodes causes slight drawback in it. Some of reactive routing protocols are DSR, AODV, and TORA etc.

3.3 Hybrid Routing Protocol

It means combination [11] of proactive and reactive protocols to overcome the problems faced by both routing protocols in mobile ad hoc network. As a result hybrid routing protocols are mainly used in large networks to find route discovery easily and maintain fast mechanism between nodes in wireless ad hoc network. Examples ZRP [2].

4. NEED FOR ENERGY EFFICIENT ROUTING PROTOCOL

The energy efficient routing protocols [10] play a significant role in mobile ad hoc networks as the nodes are dynamic in nature and each node can participate in routing the data packets. These goals can be accomplished by minimizing mobile node's energy during both the active as well as inactive communications.

As discussed in the introduction, this goal can be accomplished by minimizing mobile nodes energy not only during active communication but also when they are inactive. Transmission power control and load distribution are two approaches to minimize the active

communication energy, and sleep/power-down mode is used to minimize energy during inactivity.

Before presenting protocols that belong to each of the three approaches in the following subsections (4.1, 4.2 and 4.3).

4.1 Transmission Power Control Approach

A routing algorithm [6] essentially involves finding an optimal route on a given network graph where a vertex represents a mobile node and an edge represents a wireless link between two end nodes that are within each other's radio transmission range. When a node's radio transmission power is controllable, its direct communication range as well as the number of its immediate neighbors are also adjustable. While stronger transmission power increases the transmission range and reduces the hop count to the destination, weaker transmission power makes the topology sparse which may result in network partitioning and high end-to-end delay due to a larger hop count. It [10] will not only save the energy of battery but also reduces the interference and congestion in the networks.

4.2 Load Distribution

The specific goal of load distribution approach [10] is to select a route in such a way that the underutilized nodes will come in play rather than the shortest route. This may [6] result in longer routes but packets are routed only through energy-rich intermediate nodes. Due to the proper load distribution among the node, there is high balance in energy usage of all nodes. This approach certainly do not provide lowest energy route but surely prevent certain nodes from being overloaded and contributes towards longer network life time of the node.

4.3 Sleep/Power-Down Mode Approach

During [10] inactive mode communication this approach is widely used. When any node is not transmitting or receiving any packets to other node, then it is mostly to put the subsystem/hardware into the sleep state or simply turn it off to save energy. When [6] all the nodes in a MANET sleep and do not listen, packets cannot be delivered to a destination node. One possible solution is to elect a special node, called a master, and let it coordinate the communication on behalf of its neighboring slave

nodes. Now, slave nodes can safely sleep most of time saving battery energy.

4.4 Overview of AD HOC ON-DEMAND DISTANCE VECTOR PROTOCOL

AODV [4] [10] is an on-demand routing protocol. It does not maintain routes for every node to every other node in the network. Whenever a route to the destination is needed, it initiates a route discovery process and the routes remains as long as they are necessary. AODV is loop free at all times. The initial design of AODV is based on Destination-Sequenced Distance-Vector (DSDV) routing algorithm. AODV is essentially a combination of both DSR and DSDV. It borrows the basic on-demand mechanism of Route Discovery and Route Maintenance from DSR, plus the use of hop-by hop routing, sequence numbers, and periodic beacons from DSDV.

A. Characteristics of AODV

- 1) Unicast, Broadcast, and Multicast communication.
- 2) On-demand route establishment with small delay.
- 3) Multicast trees connecting group members maintained for lifetime of multicast group [10].
- 4) Link breakages in active routes efficiently repaired.
- 5) All routes are loop-free through use of sequence numbers.
- 6) Use of Sequence numbers to track accuracy of information.
- 7) Only keeps track of next hop for a route instead of the entire route.
- 8) Use of periodic HELLO messages to track neighbors.

5. PROPOSED WORK

We propose a routing algorithm, The Enhanced Ad Hoc Distance Vector (EAODV) based on alternate maximum remaining energy routes in each node to increase the network lifetime and to achieve efficient utilization of node energy. The proposed routing protocol selects the minimum cost and shortest energy path.

The energy-related metrics that have been used to determine energy efficient routing path instead of the shortest path is discussed below.

- Throughput
- End to end delay
- Packet delivery ratio

1) Throughput – Throughput or network throughput is the average rate of successful message delivery over a communication channel.

2) End-End Delay - The packet end-to-end delay is the time of generation of a packet by the source up to the destination reception. So this is the time that a packet takes to go across the network.

3) Packet delivery rate - The total number of data packets received divided by the total number of data packets originated.

In this proposed work we compare the various parametric analysis based on varying the number of nodes to get better performance of EAODV.

6. CONCLUSIONS

In MANET, it is very important to design energy efficient routing protocols. In case if we have not considered a careful design, an energy-efficient routing protocol could have much poor performance than a normal routing protocol. In this paper, we surveyed and classified a number of energy-aware routing protocols. These routing protocols are modifications to the basic routing protocols like AODV, DSR and OLSR etc. They have the common objective of trying to reduce the energy consumption at each node and in increasing the battery lifetime, thereby extending the life time of MANET. Although many of these techniques look promising in terms of energy efficiency, there are still many challenges that need to be addressed such as security, quality of service etc. Performance analysis of various routing protocols in terms of various energy efficient metrics will be simulated by NS-2 simulator.

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BIOGRAPHIES



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