A Review: Energy Efficiency on Multicast Routing in MANETs

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Abstract—In recent years many energy-efficient routing protocols have been proposed. Many efforts have been taken in studying the energy consumption of individual node and route maintaining issues. If the design of energy efficient routing protocol is not consider carefully then it may perform very worst than the normal routing protocol. Establishing correct and efficient routes is an important design issue in mobile ad hoc networks (MANETs), a more challenging goal is to provide energy efficient routes because mobile nodes’ operation time is the most critical limiting factor. Nodes in a Mobile Ad Hoc Network are typically battery-powered SO energy consumption is an important metric to consider in designing routing protocols for such networks. The purpose of this paper is to study the existing solutions to offer a more energy efficient routing mechanism.

Keywords: MANETs; Energy Effective Routing; AODV

I. INTRODUCTION

A mobile ad hoc network is also called a mobile mesh network. This is also known as the self-configuring network of mobile systems which is connected by wireless links. The Ad hoc networks are the current wireless networking paradigm for mobile hosts. Like other traditional mobile wireless networks, ad hoc networks are not based on any fixed infrastructure. Inspite of that, hosts works on each other to keep the network connected. It is representing complex distributed systems that comprise wireless mobile nodes that can freely and dynamically self-organize into arbitrary and temporary, “ad-hoc” network topologies, that allow people and devices to internetwork in areas with no requirement of pre-existing communication infrastructure. The mobile ad hoc networks provide access to information and services regardless of geographic positions. These are independent from central network administrators they are self-configuring networks, here nodes act as routers. The mobile ad hoc networks are less expensive as compared to wired networks. Manets accommodates the addition of more nodes these networks are very flexible and are robust due to decentralization [3]. The big advantage of Manets is that it could be established at any place and time. Some of the important and major applications are its use in the personal area network. A personal area network is a small range, localized network in which nodes are usually associated with a given person. Short-range MANET such as Bluetooth will simplify the inter communication among various mobile devices such as a laptop, and a mobile device. In military battlefield like Ad-Hoc networking will allow the military to take advantage of commonplace network technology to maintain an information network between the soldiers and military information head quarter. For business environments, the need for collaborative computing may be more important outside office environments than inside and where people do need to have outside meetings to cooperate and exchange information on a given project [5]. The Application in Local level Ad-Hoc networks can link an instant and temporary multimedia network using notebook computers to spread and share the other information among participants like in conference. Another appropriate local level application might be in home networks where devices can communicate directly to exchange information.

As MANETs are commonly known by their node mobility and limited bandwidth, there is a need to take these factors into account the energy efficiency of the nodes, change in topology, non-reliable communication and limited bandwidth in their design. In a MANET [3], mobile nodes have the ability to accept and depart the route traffic from their neighbours to their destination, i.e., they can act as both routers and hosts. With the network growth and it is coupled with node mobility, the challenges associated with self-configuration of the network become more renowned. More frequent connection tearing and re-associations place an energy constraint on the mobile nodes. Ad hoc routing protocols are made with mechanisms to cope up with the dynamic nature of MANETs. The energy efficiency of a routing protocol is determined among other things by having its battery power consumption of a participating node and routing of traffic into the network how fast the routing protocol adapts to the connection tearing and mending is also considered paramount. Some instances of ad hoc routing protocols include AODV, OLSR, DSR, Wireless Routing Protocol and the Zone Routing Protocol. The nodes (each node is acting as a router/transmitter/receiver) are free to move around and organize themselves by using random mobility technique. Ad hoc wireless networks are self-depending networks. Hence, they offer unique benefits and flexibility for most of the situations and applications. Due to these features, the Ad hoc networks or wireless networks are more beneficial than wired network or mobile access. Wireless ad hoc networks consists many nodes which can communicate with each other over multiple wireless hops. The intermediate nodes or points are used to forward the ongoing traffic. Since the forwarding nodes are fully connected and usually mobile, energy conservation is critical to extend the lifetime of a functioning network.

II. ENERGY EFFICIENCY IN MANETS

Energy efficiency is the consumption of less energy to provide same level of energy service. As wireless networks become an integral component of the modern communication, energy efficiency is an important design consideration due to the limited battery life of mobile terminals. The design of efficient routing protocols is a fundamental problem in a Mobile Ad-Hoc Network. It is important to reduce the energy consumed by the energy limited sensor nodes to increase the efficiency of the network. Energy consumption is getting an increasingly important issue throughout the community. For network
operators it is a concern as networks are expanded to deliver the increasing traffic levels to increasing numbers of clients. The maximum energy used by the Internet today is getting consumed in the access network and this will continue to be the case for the short-to-mid-term future. Access technologies should be the first and foremost focus for energy use mitigation. In recent years, numerous energy-efficient techniques have been Proposed. However, simply minimizing the energy consumption results in deficient designs. It is more beneficial to strike a tradeoff between the energy consumed and other metrics, such as the attainable throughput.

In contrast to simply establishing correct and efficient routes between pair of nodes, one important goal of a routing protocol is to keep the network functioning as long as possible. 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/powery-down mode is used to minimize energy during inactivity.

III. RELATED WORK

In the paper [6] studied geographic opportunistic routing (GOR), a variant of OR which makes use of nodes’ location information. They identify and prove three important properties of GOR. The first one is on prioritizing the forwarding candidates according to their geographic advancements to the destination. The second one is on choosing the forwarding candidates based on their advancements and link qualities in order to maximize the expected packet advancement (EPA) with different number of forwarding candidates. The third one is on the concavity of the maximum EPA in respect to the number of forwarding candidates. They further propose a local metric, EPA per unit energy consumption, to trade-off the routing performance and energy efficiency for GOR. Leveraging the proved properties of GOR, we propose two efficient algorithms to select and prioritize forwarding candidates to maximize the local metric.

In the paper [13] addresses the problem of energy efficient multicast routing in wireless Mobile Adhoc NETwork (MANET). It is a challenging environment because every node operates on limited battery resource and multi-hop routing paths are used over constantly changing network environments due to node mobility. We define the network lifetime as duration of time until first node failure due to battery energy exhaustion and show that network lifetime for a multicast session can be significantly extended by additionally considering the residual battery energy as a parameter in cost metric functions for constructing a power efficient routing tree. Using simulation results, we show that the lifetime extension can lead to oscillatory behavior of routing path select ion. We propose a solution to stabilize the oscillations by considering a statistical measure in our cost metric and present simulations that show the oscillation can be reduced greatly at a small cost of network lifetime.

In the paper [7] presents an efficient power-saving MAC protocol, called p-MANET, based on a Multi-hop Time Synchronization Protocol, which involves a hibernation mechanism, a beacon inhibition mechanism, and a low-latency next-hop selection mechanism for general-purpose multi-hop MANETs. The main purposes of the p-MANET protocol are to reduce significantly the power consumption and the transmission latency. In the hibernation mechanism, each p-MANET node needs only to wake up during one out of every N beacon interval, where N is the number of beacon intervals in a cycle. Thus, efficient power consumption is achieved. Furthermore, a beacon inhibition mechanism is proposed to prevent the beacon storm problem that is caused by synchronization and neighbour discovery messages. Finally, the low-latency next-hop selection mechanism is designed to yield low transmission latency. Each p-MANET node is aware of the active beacon intervals of its neighbours by using a hash function, such that it can easily forward packets to a neighbour in active mode or with the least remaining time to wake up. As a consequence, upper-layer routing protocols can cooperate with p-MANET to select the next-hop neighbour with the best forwarding delay. To verify the proposed design and demonstrate the favourable performance of the proposed p-MANET, they present the theoretical analysis related to p-MANET and also perform experimental simulations. The numerical results show that p-MANET reduces power consumption and routing latency and performs well in extending lifetime with a small neighbour discovery time.

In the paper [8] present a cluster based routing algorithm. One of our main goals is to design the energy efficient routing protocol. Here they try to solve the usual problems of WSNs. They know the efficiency of WSNs depend upon the distance between node to base station and the amount of data to be transferred and the performance of clustering is greatly influenced by the selection of cluster-heads, which are in charge of creating, clusters and controlling member nodes. This algorithm makes the best use of node with low number of cluster head know as super node. Here they divided the full region in four equal zones and the center area of the region is used to select for super node. Each zone is considered separately and the zone may be or not divided further that’s depending upon the density of nodes in that zone and capability of the super node. This algorithm forms multilayer communication. The no of layer depends on the network current load and statistics. Our algorithm is easily extended to generate a hierarchy of cluster heads to obtain better network management and energy efficiency.

In the paper [12] proposed three algorithms to estimate the stability of the route by considering the energy drain of the nodes and the rate of mobility. Finally they implement our proposed algorithms in AODV and the performance is evaluated against the original AODV. Their protocol improves the network performance and reduces the computation overhead by avoiding frequent route discovery since we select a stable path with longest life time. With the help of network simulator they substantiate that our proposed protocol performs better than the existing stability-based routing protocols with improved packet delivery ratio and reduced routing overhead.

In the paper [9] focuses on the comparison between two Multicast Routing Protocols AAMRP and Improved ODMR (IOMDRP) with SB-PGP security Model. In this paper they have studied two multicast routing protocols i.e. IOMDRP and AAMRP. SB-PGP security...
model can be used effectively in such situations. In future these two protocols can be compared individually and then with the performance of SB-PGP security model. Then the results can be used to analyze the performance and further research in this field.

IV. OVERVIEW OF EXISTING PROTOCOLS

A. AODV protocol: The Ad hoc On Demand Distance Vector (AODV) routing algorithm is a routing protocol designed for ad hoc mobile networks. AODV has the capability of both unicast and multicast routing. This algorithm is very demanding that means, it is building routes between nodes only as intended by source node or input node. It is maintaining these routes as far as they are required by the sources. Additionally, AODV is forming trees which are able to connect all multicast group member. The trees are consisting of some group members and the nodes that are needed to connect the member. AODV has sequences numbers for ensuring the freshness of routes. It is loop-free, self-beginning, and scale for large numbers of mobile nodes. AODV is maintaining routes for as far as the route is being active. AODV builds up the routes using a route request / route reply query cycle.

B. Odbeerp Protocol: The ODDEERP is a source-initiated, on-demand routing scheme. The main scheme to discover the minimum power-limitation route. The power limitation of a route is analysed by the node that has the minimum energy in that particular route. When it is compared with the minimum node energy in any other route, the node that is having minimum energy in the low power limitation route has higher energy. In other way, the value of that node’s energy is the maximum of all minimum node energy in all selected paths. In routing Process of on Demand Based Energy Efficient Routing Protocol (ODDEERP), some assumptions have been made on this basis. First is node can find out the value of current energy and second states that links are bidirectional.

V. CONCLUSION

In this paper, we studied that how nodes energy is responsible for increasing node lifetime and network performance. 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 can have much poor performance than a normal routing protocol. In this paper, we first analysed that how energy consumption affects the networks performance. We have also discussed the energy consumption techniques developed by various researchers but still energy efficient routing is an issue of research. There is a requirement of more energy efficient routing protocols.

REFERENCES

[15] Yu Du, “IMPROVING ON-DEMAND DATA ACCESS EFFICIENCY IN MANETS WITH COOPERATIVE CACHING.”
and Wireless Communications (IJCNWC), ISSN: 2250-3501. Vol.2, No4, August 2012.