

Survey of Energy Efficient techniques in MANETs

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Abstract- The nodes in mobile ad hoc networks communicate wirelessly with each other. The basic function the nodes need to perform is to find path from source to destination node for which the nodes have to broadcast the route request messages. Such mechanisms cause lot of energy to be consumed on the part of the nodes. The following paper presents various energy efficient techniques or protocols that have been implemented or studied by various authors in the past.

Keywords— MANET, Energy efficient, Broadcasting, Routing overhead, M-AODV, Throughput, Delay.

Introduction

Mobile Ad Hoc Networks (MANETs) are self-organizing, infrastructure less, reliable networks of mobile nodes connected through wireless links without any centralized controller. Each node can send and receive data, and also forward the unwanted traffic unrelated to its own use. In MANETs the nodes need to maintain their independence and to preserve its resources like battery power, network lifetime, bandwidth etc. The mobile nodes can also leave the network at any time. So they are suitable for many types of networks like Personal area network, disaster relief, military areas or when the infrastructure is damaged due to earthquakes, floods etc.

Routing and Power Consumption is the main research issue for these type of networks and refers to discovering and maintaining paths between devices. Moreover, it involves selecting the best route where many routes are available. However, due to the freedom of movement of nodes, new routes need to be constantly recalculated. Most routing protocols use pure broadcasting to discover new routes, which takes up a substantial amount of bandwidth. Intelligent rebroadcasting reduces these overheads by calculating the usefulness of a rebroadcast, and the likelihood of message collisions. Unfortunately, this introduces latency and parts of the network may become unreachable.

In MANETS the mobile nodes are connected by multi-hop without any infrastructure requirement. The main aim of the MANETS is to provide robust and efficient operation in mobile environments. In ad-hoc networks all the mobile nodes are dynamically connected in an arbitrary manner. Nodes in such network maintain their own routes to other nodes in the network. Examples like in search and rescue operations, meetings and in defence services.

Related Works

[1] Thomas Chowdhury et.al proposed this paper which gives a new idea to find out many node-disjoint routing paths. This extended AODV balances energy and traffic overhead on full network to increment the network lifetime. The proposed method in this paper increase the performance of AODV by taking the advantage of different routes that can be occurred within route discovery process. This multipath routing effectively decreases the frequency of route discovery therefore the latency for finding another path is reduced when presently used path is broken. This research paper also represents a idea for discovering full node-disjoint routes within a pair of hubs/nodes in an on-demand manner. This method uses the same approach of AODV protocol which is accepted all over, but the memory storage is increased as the different routes are stored. The comparison has been done between the AODV and new method for instance Maximum Multipath AODV also known as (MM-AODV) which shows the better results as compared to AODV in case of packet delivery ratio with low energy consumption and routing overhead.

[2] Gopinath.S1 et.al concentrates on the objective of proposed protocol to find the minimum power-limitation path. The decision of minimum power limitation routes is taken by the node which has less energy from all the nodes in that path. So, this minimum power limitation route has more energy as compared to the minimum node energy in other path. Researchers also give a more accurate idea to track the energy consumption because of various factors, and enhance the performance during route discovery and in mobility scenarios. The proposed protocol is evaluated with NS2 simulator. Simulation results shows that the ODBEERP achieves good throughput, less delay, high packet delivery ratio and good energy efficiency than the existing protocol PEER.

[3] Hassanali Nasehi et.al has proposed an algorithm in this research to find out the different paths between source and destination nodes by the use of Omni directional antennas, to send or carry information through these antennas. So, for this method, the number of active neighbours is counted in each direction by using a strategy. These methods help to select the paths. The new approach is depends upon AODV routing algorithm, and at the end the comparison has been done with the multipath routing protocols like AOMDV, AODVM and IZM-DSR which are based on the AODV and DSR Protocols. The obtained simulation results show that by using this new algorithm, it creates a significant improvement in energy efficiency and reducing end-to-end delay.

[4] In this paper Sunsook Jung taken the energy constrained routing protocols and load balancing methods to improve the MANETS Routing protocols and energy efficiency protocols. Researcher gives a new routing protocol that used the adaptive load balancing method to the MANET routing protocols with node caching improvement. With limited power supply the researcher evaluate the new application of energy efficiency metrics to MANETS. This paper includes the New energy efficient AODV-based node caching routing protocol with adaptive workload balancing (AODV-NC-WLB, New application of energy efficiency metrics to MANET routing protocols; and An implementation and simulation work in NS-2 of energy efficient AODV-NC-WLB having improvement in throughput, overhead, delivery ratio and delay over the standard AODV for high mobility scenarios.

[5] Chansu Yu et.al. surveys this article and classified the energy-aware routing protocols proposed for Mobile ad hoc networks. They decrease the energy of the active communication required to send or receive packets or when the node remains idle not doing any work then the inactive energy is consumed but it listens to the network for any possible communication request from other nodes. Transmission power control technique and load distribution technique belong to the active communication, and sleep/power-down mode technique belongs to the inactive communication where the node stays idle. While it is not clear that whether any particular algorithm or a group of algorithms is the best for all scenarios, each protocol has its advantages/disadvantages and is well suited for certain situations or scenarios. The main purpose of this paper is to facilitate the research efforts in collaborating the previous solutions to grant a more energy efficient routing mechanism.

[6] In this paper Aarti Singh et.al. Discusses MANETs are typically required the battery power which is the limited source of energy and it is not easily replaced or recharged on the way. Therefore, battery power consumption becomes a main issue and this lack of power with nodes which leads to node's selfish behaviour among nodes in case of commercial MANET. This work provides an in depth analysis of literature for routing protocols in MANETs and their effect on selfish behaviour of nodes.

[7] In this research paper Methaq jasam et.al. represents a comparison and evaluation study of Reactive routing protocols; Ad Hoc On-Demand Distance Vector Routing (AODV), Proactive routing protocols; routing information protocol (RIP2) and Position-based routing protocol; Location- Aided Routing (LAR1). And the evaluation of their performance was based on energy consumption metric. The evaluation has been done using the simulator QualNet v5.1. The results of this research paper shows that the AODV has the better performance in energy consumption in the most scenarios. In this paper, the work has been done on the three routing protocols that are AODV, RIP2, and LAR1 in terms of energy consumption which are based on four different scenarios. AODV protocol is analysed or evaluated as the best choice in most of the scenarios compared to the RIPv2 and LAR1 protocols. While LAR1 shows better performance than AODV in static motion as the pause time increase in the fourth scenario. In the other way, AODV shows better performance than RIPv2 in all the scenarios. This is because of AODV as reactive protocol does not need to maintain route to the destination if there is no data to send.

[8] In this paper the researcher Junaid A. Khan et.al. discusses that Mobile Ad Hoc networks are self-organizing without any centralized authority or base station and use multi-hop routing for sending the data from a source node to its destination node. To make MANETs a multi-hop routing technique it needs a routing protocol. Researchers taken the load balancing approach that can enhance the overall communication performance in a network. The researcher also present the better performance for the adopted protocol i.e. Energy Efficient Load Balanced (EFLBAODV) and compared it to the old existing reactive routing protocol Ad Hoc on Demand Distance Vector (AODV) therefore it using the load balancing approach to improve the node to node communication in the network. Also this new protocol is energy efficient as it consumes the less energy and reduced the communication time and communication overhead. The performance metrics like route discovery time, route errors, MAC delay, network load, end-to-end delay and throughput have been taken to evaluate the overall performance of the network.

[9] In this paper the researcher Suvarna P. Bhatsangave et.al. Discusses how energy or battery power is one of the main issue in MANETs. In this paper researcher proposed an Energy efficient AODV routing protocol. This paper represents an Optimized Mobile Ad Hoc Network on Demand routing protocol, which changes the broadcast mechanism of AODV routing protocol. AODV has two main processes that is route request and route reply and for successful delivery of the packets the RREP i.e. route reply is the important in MANETs. If route reply is lost, new path has to be discovered and route request has to be initiated again. OAODV ignores un-necessary sending of Route request. In this proposed technique, the node doesn't have to broadcast the route request (RREQ) again

to find the path if it does not have sufficient battery power and until the node density in its surrounding increased a particular threshold value. At last the comparison has been done between the AODV and OAODV in case of battery lifetime and throughput and the results shows that the OAODV is much better than the AODV and maximize the battery lifetime.

[10] In this paper Anu Kumari et.al. proposed a energy-efficient routing protocol Ad hoc On Demand Distance Vector Multipoint Relay Routing Protocol (AODVMPR) which gives efficient energy to the MANET.. AODVMPR is used to overcome the limitation of energy and the looping problem in a single routing protocol. This protocol helps to improve the performance of the network and traffic load also. The protocol which is used is AODV and with AODV Multipoint Relay Routing Protocol has been used which minimize the flooding of the control packets. In MPR every mobile node has calculated as a multipoint relay group. The node which is out of the MPR group that cannot be transmit or broadcast the message. At last the AODVMPR shows the better performance because it increases the battery lifetime and it also improves the efficiency and QoS. And with this technique the congestion has also been improved.

[11] In this paper the authors May Cho Aye and Aye Moe Aung says energy consumption is an important issue in wireless networks because mobile nodes are battery powered. In order to maximize the battery power lifetime of these networks, it is the main issue to minimize the usage of energy of the nodes. In this paper, researchers proposed a new energy efficient multipath routing protocol for selecting energy efficient route. This proposed technique also take into consideration the residual energy and transmission power of the hubs or devices as the performance metrics in order to increase or maximize the battery power and to minimize the energy usage of the mobile devices. The main goal of this proposed technique is to discover a best route based on two energy metrics mentioned above while selecting a path to transmit data packets. The simulator that has been used is the NS2.34 and the results with performance metrics for instance the residual energy and transmission power of the nodes shows that the proposed technique is better than the traditional techniques and enhance the lifetime of the network and also improves the performance of the network.

[12] The researchers of this paper Sarabjeet Kaur et.al. Discusses that there are many kinds of restrictions in MANETs. The biggest issue is the battery lifetime i.e. the power consumption of the mobile nodes for which an energy efficient protocol has to be made so that the less power should be used and the network lifetime must be increased. Power of the mobile devices is used while transmitting the data from one device to another device. This proposed method utilize the energy sharing technique in multi-hop mobile ad hoc networks to increase the efficiency & lifetime of the mobile nodes. They also discuss that the metrics like response time and throughput is also increases when traffic on the network increases. Therefore the main aim of this proposed method is to reduce the response time and increases the power and throughput of the mobile nodes within the network.

[13] In this paper author Shadi S. Basurra et.al worked on the Zone based Routing protocol with Parallel Collision Guided Broadcasting Protocol (ZCG) that uses parallel and distributed broadcasting methods to decrease duplicate broadcasting and to accelerate the route discovery process, while balancing a high reach ability ratio as well as the node energy consumption must be low. The reliable leaders led the network which is distributed in zones that are mostly static and have full battery resources by the use of ZCG which uses single hop clustering algorithm. The performance of the ZCG protocol is compared with the other routing protocol named as AODV and DSR which gives the results that the ZCG performs good under many circumstances.

[14] Rahul S.Kale et.al. the researchers of this paper elaborate the limitations and benefits of the existing energy efficient routing protocols in mobile ad hoc networks. There are many important issues in MANET like link failure, power failure of node, limited

bandwidth, and limited transmission power and to come over from these issues the energy efficient routing protocols has become an important research issue. To improve battery power or network lifetime, maintaining energy is the main objective in these networks. In this paper, the researchers elaborate the different energy efficient routing protocols which were proposed to sort out the issue of energy consumption of routing nodes in MANET. This paper surveys the various energy efficient protocols and provides parameter wise study of the existing protocols. And the protocols are also compared to provide an overview of the recent technique in this area.

[15] In this paper the authors Getsy S Sara et.al. surveys the few energy efficient routing protocols for MANET reviewed their performance and compared them. There are two types of communications that are active or inactive. In active communication the energy is consumed while transmitting or receiving the packets and in Inactive communication the energy is minimized when the nodes are idle but they still consumes the energy. There are many proposed techniques related to energy efficient routing protocols and mostly the enhanced work has been done to improve the performance of the existing energy efficient routing protocols. The main objective of this paper is to facilitate the research efforts in grouping the existing techniques to offer a more energy efficient routing techniques.

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Conclusion

In this paper we have analyzed various existing approaches in mobile ad hoc networks that focus on reducing the energy consumption of the nodes. In future we would further like to expand our research and improve the lifetime of the networks and other quality of service related parameters such as throughput and packet delivery ratio.

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