Volume 7, Issue 4, April 2017 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Review on Energy Efficient Techniques for Mobile Ad Hoc Networks

Navdeep Kaur
M.tech (cse)& Guru Kashi University
Talwandi Sabo, Bathinda,
Punjab, India

Dr. Dinesh Kumar
Associate Professor&Head, Deptt. of CSE
Guru Kashi University, Talwandi Sabo, Bhatinda,
Punjab, India

Abstract: With the dawn of the new era and rising demands of customers, the mobile ad hoc networks has come into full force. But large amount of data usages and complex applications demands the devices to be more and more efficient in terms of utilization of their batteries thus giving rise to most important energy conservation problem in MANETs. The investigators have put forward many routing algorithms and techniques driven from the bio-inspired food searching behaviors and other traditional methods as well. This paper presents the brief study of the past researches made to augment the lifespan of the network.

Keywords: MANETs, bio-inspired, lifespan

I. INTRODUCTION

In recent years, huge improvements have taken place in the technology used to build digital electronics, Micro-Electro-Mechanical Systems (MEMS)and wireless communications. The basic architecture of MANET consists of nodes that are dynamically self-organized into arbitrary and temporary network topology without any infrastructure support. The advantage of employing MANET is to offer a large degree of freedom at a minimal cost in comparison to other networking solutions. The ease and speed of deployment of these networks make them ideal for recovery after a natural or manmade disaster, business associates sharing information during a meeting or conference, and military communications in a battlefield. Mobile ad hoc systems are networks where the nodes are free to join or withdraw the network any time so wireless connections are continually made and destroyed.

There are a few issues of productive routing, medium access, power administration, security and "Quality of Service" (QoS). Due to the spread of laptops, sensor gadgets, PDAs and other portable electronic gadgets, ad-hoc wireless networks are expanding in fame. In order to communicate with one another without an infrastructure to depend on, these gadgets need routing protocols that can work without any gateway to interface with. Swarm intelligence has been used to solve optimization problems in data networks. One such optimization problem is routing where swarm intelligence has been applied. Due to the absence of any dedicated router, here every node acts as a router and aids in forwarding packets to the destination node. That's how information sharing among mobile nodes is made available. Due to the limited power supply of the batteries carried by portable mobile devices, the processingpower of node is restricted.[10] For a wireless network, the devices operating on battery try consume the energy while performing the various tasks on devices or nodes. Minimum energy paths have more issues like the devices in these paths exhaust their energy very fast. Therefore, the nodes cannot perform any task due to energy consumption. In other way, Routing with large lifetime maintains all the paths and nodes globally so that the network balances certain performance level for a longer time. This paper presents the survey of various studies regarding the energy efficiency of the mobile ad hoc networks. After the survey in section II the conclusion has been given in section III.

II. REVIEW OF LITERATURE

In mobile ad hoc networks (MANET), the existing route discovery may result in traffic overflow and overhead. In order to overcome these issues, in this study [1], the authors proposed an ant based multipath backbone routing for load balancing in MANET. When the source wants to transmit data towards destination, it selects the multiple routes with maximum path preference probability using swarm based ant colony optimization technique. The path preference probability is estimated based on next hop availability, delay and bandwidth. During route discovery, the nodes subjected to faults are found and the relevant path is skipped. Then the network load on the routes is balanced by an index by each backbone node to distribute the data traffic equally on the links from source to destination. By simulation results, the authors show that proposed technique reduces the network load.

In this work [2], the authors have done an extensive survey of fault tolerant protocols and ant colony algorithms applied to routing in MANETs. They have proposed a QoS constrained fault tolerant ant look ahead routing algorithm which attempts to identify valid route and look-ahead route pairs which might help in choosing the alternate path in case of valid route failure. The results prove that the proposed algorithm takes better routing decisions with 20-30 percent

improvement compared with existing ant colony algorithms.

The authors in [3] have studied the estimation of residual link lifetime (RLL) in mobile ad hoc networks (MANETs) using the distances between the link's nodes. They first prove that to compute uniquely the RLL, at least four distance measurements are required. They also demonstrate that random measurement errors are the dominant factor in prediction inaccuracy and that systematic errors are negligible. The authors have then proposed a mobile-projected trajectory (MPT) algorithm, which estimates the relative trajectory between two nodes from periodical measurements of the distances between them. Using the relative trajectory, the algorithm estimates the RLL of the link between the two nodes. For comparison purposes, they derive a theoretical upper bound on the achievable prediction inaccuracy by any distance-based RLL prediction algorithm with unknown but finitely bounded measurement-error distribution. Toaccount for velocity changes, the MPT is enhanced with a velocity-change detection (VCD) test. Performance evaluation demonstrates robustness in RLL prediction for piecewise-linear trajectory and multiple velocity changes during the link lifetime

The authors in [4] have observed that tree-based routing algorithms have high forwarding efficiency and low consumptions of bandwidth, and they may have poor robustness because only one link exists between two nodes. As a tree-based multicast routing protocol, MAODV (Multicast Ad hoc On-demand Vector) shows an excellent performance in lightweight ad hoc networks. As the load of network increases, QoS (Quality of Service) is degraded obviously. In this paper, they analyze the impact of network load on MAODV protocol, and propose an optimized protocol MAODV-BB (Multicast Ad hoc On-demand Vector with Backup Branches), which improves robustness of the MAODV protocol by combining advantages of the tree structure and the mesh structure. It not only can update shorter tree branches but also construct a multicast tree with backup branches. Mathematical analysis and simulation results both demonstrate that the MAODV-BB protocol improves the network performance over conventional MAODV in heavy load ad hoc networks.

A framework for integrated multicast and unicast routing in mobile ad hoc networks (MANETs) is introduced by the authors in [5]. It is based on interest-defined mesh enclaves that are connected components of a MANET spanning the sources and receivers of unicast or multicast flows. The Protocol for Routing in Interest-defined Mesh Enclaves (PRIME) is presented to implement the proposed framework for integrated routing in MANETs. PRIME establishes meshes that are activated and deactivated by the presence or absence of interest in individual destination nodes and groups and confines most of the signaling overhead within regions of interest (enclaves) in such meshes. The routes established in PRIME are shown to be free of permanent loops. Experimental results based on extensive simulations show that PRIME attains similar or better data delivery and end-to-end delays than traditional unicast and multicast routing schemes for MANETs (AODV, OLSR, ODMRP). The experiments also show that signaling in PRIME is far more scalable than the one used by traditional multicast and unicast routing protocols such as AODV, OLSR, or ODMRP.

In this paper [6], the authors have considered the issue of efficient broadcasting in mobile ad hoc networks (MANETs) using network coding and directional antennas. Network coding-based broadcasting focuses on reducing the number of transmissions each forwarding node performs in the multiple source/multiple message broadcast application, where each forwarding node combines some of the received messages for transmission. With the help of network coding, the total number of transmissions can be reduced compared to broadcasting using the same forwarding nodes without coding. They exploit the usage of directional antennas to network coding-based broadcasting to further reduce energy consumption. A node equipped with directional antennas can divide the omnidirectional transmission range into several sectors and turn some of them on for transmission. In the proposed scheme using a directional antenna, forwarding nodes selected locally only need to transmit broadcast messages, original or coded, to restricted sectors. They also study two extensions. The first extension applies network coding to both dynamic and static forwarding node selection approaches. In the second extension, they design two approaches for the single source/single message issue in the network coding-based broadcast application. Performance analysis via simulations on the proposed algorithms using a custom simulator and NS-2 is presented.

The authors in this study [7] have focused on energy efficiency by making use of two bio inspired algorithms namely ant colony optimization and firefly algorithm. While the ant colony optimization would achieve the shortest paths making use of the pheromone value, at the same time the firefly algorithm would take into account quality of the nodes using the attractiveness factor. The shortest path is usually the one having the highest pheromone value whereas the best node to forward the packet is the one having the highest attractiveness. In [7], initially the time stamps of the different pair of the nodes are achieved by using the Hello flooding throughout the network. The timestamps between the two nodes is calculated as the end to end delay. So, after the Hello messages are the flooded in the network, the table for the timestamps is maintained. The authors have put forward the concept of the controlled broadcasting. In this concept the route request messages are not flooded throughout the network, instead they are restricted in a particular area. The area is defined by the factor of spread. This would consequently reduce the energy consumption of the nodes during the path searching process. When the request reaches the destination node, the paths are selected according to highest pheromone value of the paths as well as highest attractiveness of the nodes.

III. DIFFERENT ENERGY EFFICIENCY RELATED TECHNIQUES

This section summarizes different energy efficiency related techniques for mobile ad hoc networks.

1. **ACO based Backbone Routing[1]:**This technique focuses on load balancing for mobile ad hoc networks. The selection of next hop is based on path preference probability which is based on next hop availability, delay and bandwidth. During route discovery, the nodes subjected to faults are found and the relevant path is skipped.

Then the network load on the routes is balanced by an index by each backbone node to distribute the data traffic equally on the links from source to destination.

2. **Hybrid ACO-Firefly Routing[6]:**This technique focuses on selecting the optimal path using the attractiveness factor of the nodes found by applying firefly algorithm. Since firefly would result in single path, so to have multiple paths (in case the node in the first path goes out of the network) ACO is applied.
3. **M-EALBM[8]:**This focuses on the achieving the energy efficiency by transferring the load from lower energy node to high energy node. This transfer of the load eventually leads to increase in the network lifetime.
4. **EAOMDV[9]:**This approach tends to maximize the lifetime of the network by choosing the nodes in the paths having highest residual energy and lowest load over it. This also improves the throughput of the network.

IV. CONCLUSION

The paper has represented various routing schemes in mobile ad hoc networks which result in reducing the energy consumption of the network thereby increasing its lifespan. In [7] the bio inspired algorithms namely ant colony optimization and firefly algorithm have been used to optimize the performance of the network in terms of lesser energy depletion. In future, this study will be used to further improve the performance of the network.

REFERENCES

[1] Pitchaimuthu Francis Antony Selvi, MoolaSeetharamaiyerKasiviswanathanManikandan, "Ant based multipath backbone routing for load balancing in MANET", IET Communications (Volume: 11, Issue: 1, 1 5 2017) 22 December 2016. IEEE.

[2] S. Surendran, S. Prakash, "An ACO look-ahead approach to QOS enabled fault- tolerant routing in MANETs", China Communications (Volume: 12, Issue: 8, August 2015). IEEE

[3] Edward Y. Hua, Zygmunt J. Haas, "Mobile-Projected Trajectory Algorithm with Velocity-Change Detection for Predicting Residual Link Lifetime in MANET", IEEE Transactions on Vehicular Technology (Volume: 64, Issue: 3, March 2015)

[4] Xu Li, Tianjiao Liu, Ying Liu, Yan Tang, "Optimized multicast routing algorithm based on tree structure in MANETs", China Communications (Volume: 11, Issue: 2, Feb 2014), IEEE.

[5] J. J. Garcia-Luna-Aceves, Rolando Menchaca-Mendez, "PRIME: An Interest-Driven Approach to Integrated Unicast and Multicast Routing in MANETs", IEEE/ACM Transactions on Networking (Volume: 19, Issue: 6, Dec. 2011).

[6] Shuhui Yang, Jie Wu, "Efficient Broadcasting Using Network Coding and Directional Antennas in MANETs", IEEE Transactions on Parallel and Distributed Systems (Volume: 21, Issue: 2, Feb. 2010).

[7] SubhrapratimNath, Arnab Seal, SamriddhaBanik, Subir Kumar Sarkar, "Optimizing MANET routing in AODV: AnHybridization approach of ACO and Firefly Algorithm", Second International Conference On Research in Computational Intelligence and Communication Networks, IEEE, 2016

[8] ArvindKushwaha, Prof Nitika Vats Doohan, "M-EALBM: A Modified Approach Energy Aware Load Balancing Multipath Routing Protocol in MANET", IEEE 2016.

[9] Bhavna Sharma, ShailaChugh, Vismay Jain, "Energy Efficient Load Balancing Approach to Improve AOMDV Routing in MANET", 2014 Fourth International Conference on Communication Systems and Network Technologies", IEEE 2014.

