ISSN: 2581-3404 (Online)
International Journal of Innovative Research in Technology and Management (IJIRTM), Volume-3, Issue-6, 2019

Improvement in Performance of Efficient Routing Techniques in Wireless Sensor Network

Afroz Alam[1], Prof. Deepmala Sharma[2], Prof. Jitendra Mishra[3]

[1]M. Tech Scholar, Department of EC, PCST, Bhopal (India)

[2]Assistant Professor, Department of EC, PCST, Bhopal (India)

[3]Head & Professor, Department of EC, PCST, Bhopal (India)

ABSTRACT

A wireless sensor network (WSN) consists of tiny, low-powered sensors communicating with each other possibly through multi-hop wireless links and collaborating to accomplish a common tasks. As a bridge between physical and virtual in-formation worlds, WSN collects data from it surrounding environment and communicate it to the digital world, such as computers. The effectiveness of a wireless sensor network relies on the underlying routing protocol. In this paper we analyze the performance of reactive routing protocol, the simulation shows that the new method gives better results than the old approach.

Keywords: Energy efficiency, Wireless sensor Networks, Routing, Life time, Throughput, End to end delay, Packet delivery ratio.

INTRODUCTION

Wireless sensor networks (WSNs) consist of small and tiny devices that have been scattered over a distant area to monitor many events such as border surveillance, temperature, and humidity [1]. These small nodes suffer from many resource constraints such as battery and computation. Therefore, they should be preserved as long as possible to reach the monitoring goals.

Wireless sensor networks (WSNs) have received significant research attention in recent years, due to their characteristic of low cost and highly adaptive nature [14]. WSNs can be adapted for numerous applications, such as target tracking, disaster warning, and wearable devices, etc. We can foresee that a WSN has broad application prospects in the future, which can greatly impact lives. Meanwhile, there are still numerous research aspects remaining to be explored in WSN applications, including localization, data aggregation, data transmission and energy efficiency.

It is also necessary to design the algorithms that consume low resources from sensor devices. Providing reliability for communication links in WSNs is a challenging problem due to leveraging shared error-prone communication medium, which causes packet loss. Multiple retransmissions may need to forward a packet at each hop resulting in resources consumption and long delays. Provisioning quality of service (QoS) for routing is a challenging issue in WSNs. QoS routing should take into account multiple constraints such as end-to-end reliability, delay, and energy-efficiency. Some of these constraints are contradictory and only soft QoS provisioning is achievable. Here, soft QoS means that the route meets the QoS requirements with a probability that is good enough for the specific purpose.

Several works have been done to utilize multiple paths to meet the QoS requirements. Surely, sending the sensed packets via multiple paths can provision the QoS requirements, but it has some disadvantages such as exploiting more nodes results in consuming more energy from power constraints nodes and sending packets from multiple links may create interference on wireless channels and retransmissions are needed.

Routing technique plays a vital role in the wireless sensor network. It is extremely difficult to assign the global ids for a large number of deployed sensor nodes [16]. Thus, traditional protocols may not be applicable for WSN. Unlike conventional wireless communication networks (MANET, cellular network, etc.),WSN has inherent characteristics. It is highly dynamic network and specific to the application, and additionally it has limited energy, storage, and processing capability. These characteristics make it a very challenging task to develop a routing protocol. In most of the scenarios, multiple sources are required to send their data to a particular base station. The nodes near to the sink deplete more energy and hence eventually die. This causes partitioning of the network; consequently, the lifetime of the network gets to reduce. This phenomenon is known as hotspots or energy hole problem. A mobile sink is used in the network to overcome this problem.

In WSN, the main task of each sensor is to transmit its sensed data periodically to the Base station (BS). The simplistic approach to achieve this is Direct Transmission, which allows nodes to directly communicate with BS. However, it leads to uneven energy depletion among the sensor nodes. Therefore, the nodes which are placed far from the BS, would drain out faster in comparison to the nodes which are placed closer to the BS. The high disparity in energy consumption of nodes, ultimately shortens the overall network lifetime, violating the basic criteria of wireless sensor networks [13].

The rest of this paper is organized as follows in the first section we describe an introduction of about the routing scheme in wireless sensor networks. In section II we discuss about the jamming attacks in wireless sensor networks, In section III we discuss about the related work. Finally in section IV we conclude and discuss the future scope.

II ROUTING PROTOCOLS

In order to facilitate communication within the network, a routing protocol is used to discover routes between nodes. The primary goal of such an ad-hoc network routing protocol is correct and efficient route establishment between a pair of nodes so that messages may be delivered in a timely manner. Route construction should be done with a minimum of overhead and bandwidth consumption.

An Ad-hoc routing protocol is a convention or standard that controls how nodes come to agree which way to route packets between computing devices in a MANET. In ad-hoc networks, nodes do not have a priori knowledge of topology of network around them, they have to discover it.
The basic idea is that a new node announces its presence and listens to broadcast announcements from its neighbors. The node learns about new near nodes and ways to reach them, and announces that it can also reach those nodes. As time goes on, each node knows about all other nodes and one or more ways how to reach them.
Routing algorithms have to:

- Keep routing table reasonably small
- Choose best route for given destination (this can be the fastest, most
Reliable, highest throughput, or cheapest route)
- Keep table up-to-date when nodes die, move or join
- Require small amount of messages/time to converge

In a wider context, an ad-hoc protocol can also mean an improvised and often impromptu protocol established for a particular specific purpose. Since the advent of DARPA packet radio networks in the early 1970s, numerous protocols have been developed for ad-hoc mobile networks. Such protocols must deal with the typical limitations of these networks, which include high power consumption, low bandwidth, and high error rates. As shown in Figure 1 below, these routing protocols may generally be categorized as: (a) table-driven and (b) source-initiated on-demand driven. Solid lines in this figure represent direct descendants while dotted lines depict logical descendants. Despite being designed for the same type of underlying network, the characteristics of each of these protocols are quite distinct.

Routing is the process of finding a path from a source to destination among randomly distributed routers. The broadcasting is inevitable and a common operation in ad-hoc network. It consists of diffusing a message from a source node to all the nodes in the network. Broadcast can be used to diffuse information to the whole network. It is also used for route discovery protocols in ad-hoc networks. The routing protocols are classified as follows on the basis of the way the network information is obtained in these routing protocols.

III PERFORMANCE METRICS

The efficacy of the proposed protocol has been demonstrated by using the standard performance metrics like control packet overhead, energy consumption, end-to-end latency, packet delivery ratio and network lifetime [16].

- ❖ Control packet overhead: It is the energy consumption at each sensor node due to the transmission and reception of control packets. These packets are not data. The control packets are used in neighbour discovery, route construction, cluster formation, maintenance process, and so on. This metric is called an overhead because the packet transmission and reception, other than data, is a burden to the network.
- ❖ Energy consumption: It is the total energy consumption at each sensor node due to transmitting, receiving, listening, processing and sleeping. The routing protocol computes the energy consumption based on the energy model. This metric indicates as to how efficiently a protocol works in the network.
- ❖ End-to-End Latency: The end-to-end latency is measured as the time taken for a data packet to transmit over a network from source to sink. It considers all types of delay such as queuing delay, route discovery delay, processing delay and so on. This metric indicates the robustness of the routing protocol.
- ❖ Packet delivery ratio: It is measured as the ratio of the data packet received at the sink to the data packet sent by the sensor nodes. It defines the successful delivery of the data. The protocol with the better delivery ratio is considered to be consistent. This metric also signifies the reliability of the routing protocol.
- ❖ Network lifetime: This metric indicates the duration for which the sensor network is fully functional. It depends on different applications. The lifetime of the network can be a time span when the first sensor dies, a percentage of sensors die, the network partitions, or the loss of coverage occurs. In this paper, the network lifetime is the time span when the sensor network is partitioned into two or more networks and some of the nodes cannot send their sensed data to the sink. From the perspective of the network layer, the control packets are exchanged for route discovery, establishment, and maintenance reflected the routing overhead, which directly affects the network lifetime.

IV PROPOSED WORK

Energy-efficient data routing is a major research challenge in wireless sensor networks. Researchers are working in this area from long time, still it has research gap when it comes to different kinds of applications.

Fig 1: Simulation environment for the experimental work.

```
node 2: process_data: route to dst 4 updated
node 13: tap: route to src 2 updated
node 13: process_data: route to dst 4 updated
node 4: tap: route to src 2 updated
node 3: hello_send: sending HELLO
node 2: process_data: route to dst 4 updated
node 8: hello_send: sending HELLO
node 13: tap: route to src 2 updated
node 13: process_data: route to dst 4 updated
node 2: generic_process_message: HELLO received in nsif from 8
node 14: generic_process_message: HELLO received in nsif from 8
node 13: generic_process_message: HELLO received in nsif from 8
node 0: generic_process_message: HELLO received in nsif from 8
node 11: generic_process_message: HELLO received in nsif from 8
node 16: generic_process_message: HELLO received in nsif from 8
node 1: generic_process_message: HELLO received in nsif from 8
node 9: generic_process_message: HELLO received in nsif from 8
node 10: generic_process_message: HELLO received in nsif from 8
node 12: generic_process_message: HELLO received in nsif from 8
node 17: generic_process_message: HELLO received in nsif from 8
node 5: generic_process_message: HELLO received in nsif from 8
node 4: tap: route to src 2 updated
node 2: process_data: route to dst 4 updated
node 13: tap: route to src 2 updated
node 13: process_data: route to dst 4 updated
node 2: process_data: route to dst 4 updated
node 4: tap: route to src 2 updated
node 13: tap: route to src 2 updated
node 13: process_data: route to dst 4 updated
node 2: process_data: route to dst 4 updated
node 4: tap: route to src 2 updated
node 13: tap: route to src 2 updated
node 13: process_data: route to dst 4 updated
node 4: tap: route to src 2 updated
node 2: process_data: route to dst 4 updated
node 13: tap: route to src 2 updated
node 13: process_data: route to dst 4 updated
node 4: tap: route to src 2 updaated
```

Fig 2: Simulation environment with the shell script running file.

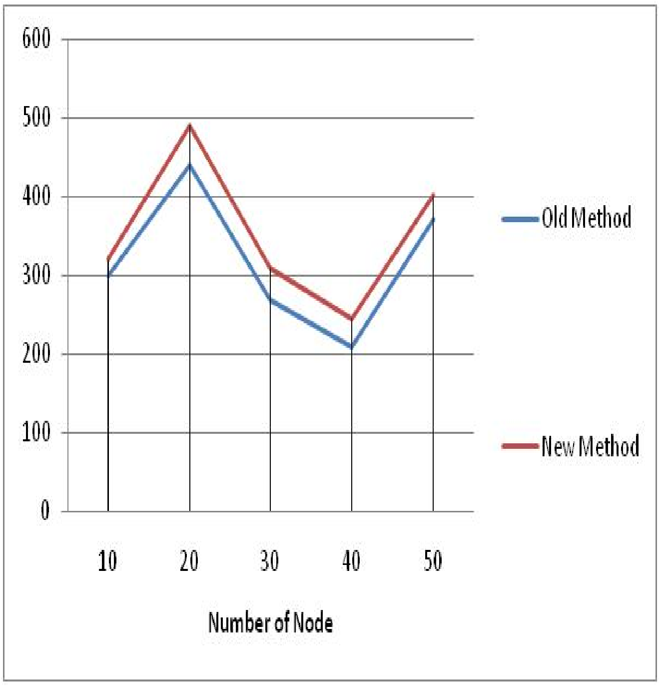

Fig 3: The above picture depicts that the experimental comparison between the old and new approach.

V CONCLUSION AND FUTURE SCOPE

Provisioning quality of service (QoS) for routing is a challenging issue in WSNs. QoS routing should take into account multiple constraints such as end-to-end reliability, delay, and throughput. We propose reliable routing algorithm, which considers dynamics of links in finding a path from a source to a destination by considering QoS constraints such as end-to-end reliability, throughput and delay. In this paper we proposed the approach for routing scheme using reactive protocol and compare the performance with an existing approach, our simulated result shows better results.

REFERENCES:-

[1] Habib Mostafaei, "Energy-Efficient Algorithm for Reliable Routing of Wireless Sensor Networks", IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, VOL. 66, NO. 7, JULY 2019, pp 5567-5576.

[2] Halil Yetgin, Kent Tsz Kan Cheung, Mohammed El-Hajjar, Lajos Hanzo, "A Survey of Network Lifetime Maximization Techniques in Wireless Sensor Networks", IEEE 2016, pp 1-29.

[3] Olayinka O. Ogundile, Attahiru S. Alfa, "A Survey on an Energy-Efficient and Energy-Balanced Routing Protocol for Wireless Sensor Networks", Mdpi, Sensors, 2017, pp 1-51.

[4] N.Kaleeswari, S.Sangeetha, A. Jerwin Prabu, "Optimization Approach for Energy Consumption in Wireless Sensor Networks using Delay Aware Dynamic Routing Protocol", International Journal of Emerging Trends in Engineering and Development, 2017, pp 54-61.

[5] JIA ZHU, YULONG ZOU, BAOYU ZHENG, "Physical-Layer Security and Reliability Challengesfor Industrial Wireless Sensor Networks", IEEE access 2017, pp 5313-5320.

[6] Muhammad Kamran Khan, Muhammad Shiraz, Kayhan Zrar Ghafoor, Suleman Khan, Ali Safaa Sadiq, Ghufran Ahmed, "EE-MRP: Energy-Efficient Multistage Routing Protocol for Wireless Sensor Networks", Hindawi Wireless Communications and Mobile Computing, 2018, pp 1-13.

[7] Souraya Yahiaoui, Mawloud Omar, Abdelmadjid Bouabdallah, Enrico Natalizio, Yacine Challal, "An energy efficient and QoS aware routing protocol for wireless sensor and actuator networks", International Journal of Electronics and Communications, Elsevier, 2018, 83, pp 193-203.

[8] P. C. Srinivasa Rao, Prasanta K. Jana, Haider Banka, "A particle swarm optimization based energy efficient cluster head selection algorithm for wireless sensor networks", Springer 2016, pp 1-17.

[9] Xujing Li, Anfeng Liu, Mande Xie, Neal N. Xiong, Zhiwen Zeng, Zhiping Cai, "Adaptive Aggregation Routing to Reduce Delay for Multi-LayerWireless Sensor Networks", Mdpi, Sensors, 2018, pp 1-18.

[10] Mohammed Zaki Hasan, Fadi Al-Turjman, Hussain Al-Rizzo, "Optimized Multi-Constrained Quality-of-Service Multipath Routing Approach for Multimedia Sensor Networks", IEEE SENSORS JOURNAL, VOL. 17, 2017, pp 2298-2309.

[11] Abdelrahman Abuarqoub, Mohammad Hammoudeh, Bamidele Adebisi, Sohail Jabbar, Ahcène Bounceur, Hashem Al-Bashar, " Dynamic Clustering and Management of Mobile Wireless Sensor Networks", Elsevier ltd., 2017, pp 1-17.

[12] Gaurav Singal, Vijay Laxmi, M.S. Gaur, Swati Todi, Vijay Rao, Akka Zemmari, "MCLSPM: Multi-constraints Link Stable Multicast Routing Protocol in Adhoc Networks", IEEE 2016. Pp 1-6.

[13] Y. Harold Robinson, M. Rajaram, "Energy-Aware Multipath Routing Scheme Based on Particle Swarm Optimization in Mobile Ad Hoc Networks", Hindawi Publishing Corporation The Scientific World Journal Volume 2015, Pp 1-10.

[14] M. Rajesh, J. M. Gnanasekar, "CONGESTION CONTROL USING AODV PROTOCOLSCHEME FOR WIRELESS AD-HOC NETWORK", Advances in Computer Science and Engineering, PP 19-37.

[15] Gaurav Singal, Vijay Laxmi, Manoj S Gaur, D Vijay Rao, Riti Kushwaha, "QoS–aware Mesh based Multicast Routing Protocols in Ad-Hoc Networks: Concepts and Challenges", QOS–AWARE MESH BASED MULTICAST ROUTING PROTOCOLS IN AD-HOC NETWORKS, 2017. pp 1-20.

[16] Geetika Dhand, S.S.Tyagi, " Performance Analysis of various Routing Protocols in Mobile Ad-hoc Networks", International Journal of

Applied Engineering Research ISSN 0973-4562 Volume 13, Number 10 (2018) pp. 7378-7382.

[17] Lubdha M. Bendale, Roshani. L. Jain, Gayatri D. Patil, " Study of Various Routing Protocols in Mobile Ad-Hoc Networks", IJSRNSC, VOL-6, ISSUE-1, 2018.

[18] Priya Kautoo, Piyush Kumar Shukla, Sanjay Silakari, "Trust Formulization in Dynamic Source Routing Protocol Using SVM", I.J. Information Technology and Computer Science, 2014, 08, 43-50.

[19] Qamar Jabeen, Fazlullah Khan, Shahzad Khan, Mian Ahmad Jan, "Performance Improvement in Multihop Wireless Mobile Adhoc Networks", J. Appl. Environ. Biol. Sci., 6(4S)82-92, 2016.

[20] Muhammad Adeel Mahmood, Winston K.G. Seah and Ian Welch, "Reliability in Wireless Sensor Networks: A Survey and Challenges Ahead", Preprint submitted to Computer Networks, 2014.

Afroz Alam received his Bachelor`s degree in Electronics & comunication, AIT, Bangalore, Karnataka., in 2015. Currently he is pursuing Master of Technology Degree in Electronics & Comunication (Digital communication) from PCST, (RGPV), Bhopal, Madhya Pradesh India. His research area include wireless sensor rntworks.

Deepmala Sharma she is Assistant Professor in Department of Electronics and communication in PCST, Bhopal (RGPV). She received Master of Technology and Bachelor's of engineering respectively in Digital communication and electronics & communication. Her areas of Interests are Digital Signal Processing, Wireless Communication, Image Processing etc.

Mr. **Jitendra Mishra** he is Associate Professor and Head of the Department of Electronics and communication in PCST, Bhopal (RGPV). He received Master of Technology and Bachelor's of engineering respectively in Digital communication from BUIT, Bhopal and from RGPV, Bhopal. He has more than 12 years of teaching experience and publish 45+ papers in International journals, conferences etc. His areas of Interests are Antenna & Wave Propagation, Digital Signal Processing, Wireless Communication, Image Processing etc.