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A Survey on Energy Efficient Routing Protocols in WSN

[1]**B.Srimathi,** Department of Computer Science and Engineering, Nandha Engineering College, Erode

[2]**Dr.P.Thirumoorthy,** Department of Computer Science and Engineering, Nandha Engineering College, Erode

[1]PG Scholar, [2]Professor

[1]E-Mail: srimathi.br95@gmail.com

[2]E-mail: thiru4u@gmai.com

***Abstract*-In these paper the computability of distinctive routing protocols for wireless sensor network and routing algorithms are expressed to obtain the efficient network construction and to perform the secure data communication. Wireless Sensor Networks(WSNs) are progressively being implemented in security-basic applications. Recently, there has been dramatic increase in the popularity of the WSN applications. The routing protocols are the hot areas to address quality-of-service (QoS) related issues, ring construction, packet passing, energy consumption, network lifetime, network scalability, and packet overhead. The key issue in WSN is that these systems experience the will effects of the packet overhead, which is the underlying driver of more vitality utilization and debase the QoS in sensor systems. In WSN, there are several routing protocols, which are used to enhance the performance of the network and energy consumption with minimum range. By that we can increase the routing probability. Simulation results shows that our design the existing algorithms in terms of energy consumption and network lifetime maximization.**

Keywords—Wireless Sensor Network, Routing protocols, Energy efficient, Security trust.

I. INTRODUCTION

Wireless sensor networks (WSN), are spatially dispersed self-ruling sensors to *monitor* physical or ecological conditions, for example, temperature, sound, weight, and so forth and to helpfully go their information through the system to a principle area. With the fast improvement of system based innovations for example, Internet and pervasive registering, PC organizing turns out to be progressively unavoidable and imperative. As the center gadget, switches are in charge of associating diverse systems and sending information contents. In expansion to committed switch devices, end hubs in systems such as specially appointed systems likewise execute as switches. The more current systems are bi-directional, likewise empowering control of sensor action. The improvement of wireless sensor systems was roused by military applications, for example, war zone observation; today such systems are utilized as a part of numerous mechanical and shopper applications, for example, modern process checking and control, machine well being observing.

Routing is major to how the Internet functions. Routing conventions coordinate the development of parcels between your PC and some other PCs it is communicating with. The Internet's routing convention, Border Gateway Protocol (BGP) is known to be vulnerable to mistakes and assaults. These issues can actually thump whole systems off the Internet or redirect movement to a unintended gathering. Routing is another very challenging design issue for WSNs. A properly designed routing protocol should not only ensure a high message delivery ratio and low energy consumption for message delivery, but also balance the entire sensor network energy consumption, and thereby extend the sensor network lifetime.

Despite its advantages, the sink mobility brings about the problem of sink localization, requiring frequent advertisement of the changing sink position across the network. This operation may result in a significant overhead, which should be minimized to benefit from the energy savings introduced by the mobile sinks. An effective mobile sink routing protocol should also avoid an extreme increase in the sensor data delivery latencies. Especially for the time sensitive WSN applications, the validity of the sensor data depends on its freshness.

Wireless sensor systems (WSNs) comprise of hundreds or even a huge number of smaller devices each with detecting, preparing, and correspondence abilities to screen this present reality condition. In these systems, an extensive number of sensor hubs are conveyed to screen an immense field, where the operational conditions are regularly brutal or even unfriendly. Nonetheless, the hubs in WSNs have serious asset limitations because of their absence of preparing power, constrained memory and vitality. Since these systems are typically sent in remote places and left unattended, they ought to be outfitted with security components to protect against assaults, for example, hub catch, physical altering, listening stealthily, dissent of administration, and so on. Lamentably, customary security instruments with high overhead are not practical for asset obliged sensor hubs.

II. RELATED WORKS

There have been a lot of work done on secure routing and network construction in WSN. New algorithms and implementation techniques and different methods for lifetime maximization in network are being preferred to make sensor network a best experience for providers as well as users. The surveys on secure routing, techniques, methods have been done and a lot of protocol and algorithms are introduced.

2.1 Ring Routing: An Energy-Efficient RoutingProtocol for Wireless Sensor Networks with a Mobile Sink[1]

A Ring Routing, a novel, distributed, energy-efficient mobile sink routing protocol, suitable for time-sensitive applications, which aims to minimize this overhead while preserving the advantages of mobile sinks. Ring routing is an hierarchical routing protocol based on a virtual ring structure which is designed to be easily accessible and easily reconfigurable. The results show that Ring Routing indeed is an energy-efficient protocol which extends the network lifetime. The reporting delays also confined within reasonable limits which proves that Ring Routing is suitable for time sensitive applications.

2.2 A Virtual Coordinate-Based Bypassing Void Routing for WSN [2]

To solve the routing void problem in geographic routing, high control overhead and transmission delay are usually taken in wireless sensor networks. An efficient bypassing void routing protocol based on virtual coordinates. The basic idea of the protocol is to transform a random structure composed of void edges into a regular one by mapping edge nodes coordinates to a virtual circle. By utilizing the virtual circle, the greedy forwarding can be prevented from failing, so that there is no routing void in forwarding process from source to destination and control overhead can be reduced. Furthermore, the virtual circle is beneficial to reduce average length of routing paths and decrease transmission delay.2]

2.3Fair Routing for Overlapped Cooperative Heterogeneous WSN [3]

WSNs (Wireless Sensor Networks) are diffused widely, multiple overlapping WSNs constructed on the same area become more common. In such a situation, their lifetime is expected to be extended by cooperative packet forwarding. most of them do not consider the heterogeneity in characteristics of each WSN such as battery capacity, operation start time, the number of nodes, nodes locations, energy consumption, packet size and/or data transmission timing. In a heterogeneous environment, naive lifetime improvement with cooperation may not be fair. In this paper, we propose a fair cooperative routing method for heterogeneous overlapped WSNs. It introduces an energy pool to maintain the total amount of energy consumption by cooperative forwarding. A fair cooperative routing method with shared nodes, with the aim to achieve fair lifetime improvement in heterogeneous overlapped sensor networks.[3]

2.4 A Wireless Sensor Network Border Monitoring System: Deployment Issues and Routing Protocols[4]

The linear network topology resulting from the structure of the monitored area raises challenges that have not been adequately addressed in the literature to date. We propose a method to calculate the required number of sensor nodes to deploy in order to achieve a specified level of coverage within the network. Then, we contribute a novel cross layer routing protocol, called Levels Division Graph (LDG), designed specifically to address the communication needs and link reliability for topologically linear WSN applications. The performance of the proposed protocol is extensively evaluated in simulations using realistic conditions and parameters. Compared to DSR, LDG improves the average end-to-end delays by up to 95%, packet delivery ratio by up to 20%, and throughput by up to

60%, while maintaining comparable performance in terms of normalized routing load and energy consumption.

2.5 Bayes Node Energy Polynomial Distribution to Improve Routing in WSN. [5]

To conquer the routing issue and reduce energy drain rate, Bayes Node Energy and Polynomial Distribution (BNEPD) technique is introduced with energy aware routing in the wireless sensor network. The Bayes Node Energy Distribution initially distributes the sensor nodes that detect an object of similar event (i.e., temperature, pressure, flow) into specific regions with the application of Bayes rule. the Polynomial Regression Function is applied to the target object of similar events considered for different sensors are combined. They are based on the minimum and maximum value of object events and are transferred to the sink node. The energy efficient routing path for each sensor nodes are created by data aggregation at the sink based on polynomial regression function which reduces the energy drain rate with minimum communication overhead.

2.6 Secure and Effectual Energy Dynamic Routing Protocol for In-Network Aggregation in WSN [6]

In-network aggregation reduces the redundancy as well as unwanted data forwarding and hence network life time is increased. Previous secure and In-network aggregation schemes have managed these energy scenarios from different angles. In this paper is proposed a secure and energy efficient in-network aggregation approach based on the dynamic routing structure with reliable data transmission throughout the networks. The Network life time of the proposed algorithm is increased by 15 percentages compared to the other schemes and the throughput for this proposed algorithm is increased by 4 percentage. [6]

2.7 Lifetime and Energy Hole Evolution Analysis in Data-Gathering Wireless Sensor Networks [7]

An analytic model to estimate the entire network lifetime from network initialization until it is completely disabled, and determine the boundary of energy hole in a data-gathering WSN. Specifically, we theoretically estimate the traffic load, energy consumption, and lifetime of sensor nodes during the entire network lifetime. Furthermore, we investigate the temporal and spatial evolution of energy hole, and apply our analytical results to WSN routing in order to balance the energy consumption and improve the network lifetime. The analytic model, we have calculated the network lifetime under a given percentage of dead nodes, and analyzed the emerging time and location of energy hole, as well as its evolution process.[7]

2.8 TrustR: An Integrated Router Security Framework for Protecting Computer Networks[8]

TrustR is able to defend against various types of attacks. TrustR integratescollaborating security primitives including cryptography based security mechanisms, trust management system, and trusted platform module. A simple but efficient method for detecting deceptive routing messages is also proposed. To prevent unauthorized access, many cryptographic authentication mechanisms have been proposed. These methods are based on the foundation that authenticated entities are absolutely trusted because intruders cannot get authenticated.The deployment of TrustR is introduced. TrustR performs the best on reducing route discovery number, which is benefited from the built-in deceptive routing message detector.

III. RESULT AND ANALYSIS

The following table summarizes efficient techniques to obtain the better network, parameters, and other factors. The different algorithms are working on same parameters at some cases. Each algorithm focuses on improving various kinds of requirements in the network. The differences are shown in Table 1.

Table.1 Different routing techniques/algorithms

S.N	Techniques & Algorithms	Parameter Analysis	Conclusion
1	Greedy forwarding technique	OPNET modeler environment. Battery capacity. X-MAC, energy	An energy-efficient protocol which extends the network lifetime. Suitable for time sensitive applications.

2	Greedy perimeter stateless routing (GPSR).Boundary stateroutin g (BSR).Bypassing void routing protocol based on virtualcoordinate mapping (BVR-VCM)	Networks size, propagationmodel, ratio range, bandwidth, MAC protocols. The radius of every void is 45m.	Reduce the average length of the routing paths, reduce transmission delay, higher message delivery ratio, less energy consumption, less control packet overhead.
3	Fair cooperative routing method,	Energy consumption rate, energy transmission rate.	Achieved fair lifetime improvement in heterogeneous overlapped sensor networks.
4	Levels Division Graph (LDG), Dynamic Source Routing (DSR).	PS, the probability of strong barrier formation, PW, the probability of weak barrier formation, P.	Number of sensor nodes to deploy to achieve a specified level of coverage, energy efficient and maintains critical QoS measures, such as timeliness and accuracy.
5	Bayes Node Energy and Polynomial Distribution (BNEPD) technique, Poly Distribute algorithm	Energy consumption energy drain rate, time complexity and communication overhead.	Demonstrate better performance of objects of similar event detection and minimal energy for sensed data being routed over a number of sensor nodes.
6	Dynamic routing structure , SEE-INASDR algorithm	Network size, Transmission range of node, Packet length, BS location, Initial energy, Radio amplifier energy	Improve the secure delivery rate , created a secure and energy efficient routing in WSNs, Network life time of the proposed algorithm is increased by 15 percentages.
7.	Energy-efficient sleep \scheduling algorithm, Geographic Greedy Routing (GGR), Distributed Energy Balanced Routing (DEBR)	Energy consumption model and transmission range of sensor nodes	The network lifetime and energy hole evolution process within an error rate smaller than 5%.

IV. ADVANTAGES

There are many advantages in these routing protocols while using wireless sensor network. Depending on the protocols and energy level that will get vary.

4.1Advantages

1) The biggest benefit of routing techniques is that user neither has to install hardware nor software to access the applications, to develop the application and to host the application over the internet facilities with wireless manner
2) The lifetime of the sensor network is enhanced by using the smart node distribution manner and the probability of routing is get improved.

3) During the communication the energy consumption is get reduced by finding the nearest node in the over all network structure.
4) Freshness of authendication response and communication keys. By using the path key we can protect the data by removing the encryption and decryption.
5) While working with the dynamic routing provides the better throughput and less administration maintenance compared to the static.

V. CONCLUSION

Routing is the one of the most important task in data transferring between the various packets. In these paper we have analyzed the various kinds of techniques/algorithms and parameters to obtain the better network implementation. The energy consumption during the data routing get reduced and availability, scalability get increased. The lifetime of the sensor network also get enhanced.

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