Novel Approach for Secure Routing Using Bayesian Approach Dependent Optimization

Navjot Sharma[1], Dr. Anand Sharma[2]
[1]*Research Scholar, Deptt. Of CSE, Assistant Professor, UCCA*
Guru Kashi University, Talwandi Sabo (Bathinda)

Abstract-The wireless base stations in wireless sensor networks cannot communicate with each other directly. They all are related to each other by bases stations. The WSNs are suffered from many disadvantages like congestion problems at that time when many users are communicating at same time. In this paper, node-to-node communications are proposed to remove the disadvantage of regular wireless sensor network. A secure routing protocol increase time delay because of encryption process. In this paper reduce overall time delay and network stability by improving the node routing process by Bayesian approach base optimization

Keywords- WSN,AKA,Encryption,secure

I. INTRODUCTION

The distinct advancement done in the field of wireless technology possibly developed the use of wireless sensor networks (WSN) consisting of small devices which are used for collecting the information with proper cooperation planning with each of its parts. These small type of devices are generally known as the nodes and it consists of memory used for storing the data, CPU for data processing, transceiver enabling the communication signals between the sender and the receiver, and the battery for energy fulfilling requirements. The sizing of each and every sensor node varies according to the applications in use. For example, in surveillance or military-based applications it might be assumed very small (microscopically) and the cost is dependent on its parameters such as processing speed, battery, and memory size. [1] Wireless Sensor Networks (WSN) is the application based networks which consist of a number of sensor nodes. It represents an arrangement of many sensor gadgets which speak with wireless networks with the assistance of restricted vitality expending steering conventions. WSN technology uses the following steps to keep them safe for its long usage.

- Scheduling the nodes state (receiving, idle or sleep, and transmitting).
- Changing the range of transmission between the sensing nodes used in the process.
- To reduce redundant or unwanted data.
- Use of efficient data collecting methods and the routing protocols.

Types of WSN

WSN technology is based on different types of sensors discussed below:

(a) Terrestrial WSNs: These type of WSNs consists of a large number (hundreds or thousands) of wireless sensor nodes and such nodes. Such types of nodes can be located in a structured or unstructured manner. In the case of unstructured mode, each of the sensor nodes gets distributed on a random basis but kept within the specified or targeted area. As the name represents these sensors are terrestrial in nature that means they are located above the ground and such networks are powered up by the use of solar cells. The energy conservation can be done by maximizing the delays and by the use of low duty cycle operations.

(b) Underground WSNs: The underground sensors are costlier than the terrestrial WSNs technology. The used equipmentis very costly and they need special maintenance. But these systems are used effectively in monitoring underground operational activities. The whole activity occurs underground but the information is passed to the station with the help of sink nodes that are present above the ground. The major issues of such type of networks include the battery recharging as the loss of signal basically occurs in underground processes due to high attenuation level.

(c) Underwater WSNs: It is composed of a vehicle and a sensor node placed under water. The vehicles are used to get the data from the sensor nodes. The big major challenges of this process are sensor failures and the long propagation delay processes. The battery life of such WSNs is also limited and is not rechargeable. Therefore, distinct techniques have been used for solving the issues related to this type of WSN.

(d) Multimedia WSNs: These type of sensors collects the data in the form of video, audio, and imaging. Here, the sensor nodes are linked to microphones and cameras which would monitor and track the different events connected and keep an eye over all the events. The nodes are linked to each other for the purpose of data retrieval, correlation, and compression with the help of a wireless connection. As the process of data transmission is done through audio and video. Therefore, such networks require high bandwidth and power consumption.

(e) Mobile WSNs: This process relies on using the sensor nodes moving from one place to another. They are interfaced very easily within the adopted environment. The basic advantage of mobile-based WSNs is that they help in providing superior channel capacity and enhanced and better coverage. These are more versatile than the other existing types used for WSN technology. [3]

WSN Encryption:

Security is the main concern of Wireless Sensor Networks. The efficiency of energy is the most important responsibility in Wireless Sensor Networks, encryption standards with small size keys should be chosen to reduce the complexity and consumption of the battery.[4]There are many algorithms for the security of WSN through which messages can be transferred confidentially. It can be achieved only by doing the encryption of the message.

Encryption is an effective way to secure data from the third party or from an intruder. If this security feature is applied on wireless sensor communication it will increase security but also increase overhead in the form of space and time delay.

II. LITERATURE REVIEW

Shelke, Maya, et al. [1] proposed a congestion-aware routing protocol in the wireless sensor network. It works on the opportunistic theory and selects the optimized route. For scheduling on the network, it uses the sleep mechanism. The proposed protocol reduced the congestion on the network and enhances the node's life and the entire network lifetime. It also reduced the partitioning of the network. It mainly used to provide the appropriate path on the wireless network to the nodes.

Hong, Chao, et al. [2] introduced a Forwarding Area Division and Selection routing protocol in the wireless sensor network. This protocol used to classify the collisions in two forms that are same slot collision and distinct slot collision. It reduces the probability of same slot collision and it balances the load by using dynamic load balancing approach. Forwarding area division method is applicable to nodes within the same area and selecting the sub area by reducing the number of candidates. This process reduced the same slot collision. Adaptive forwarding area selection is used to channelize the subarea dynamically. The simulation result of the proposed method reduced the packet delay, energy consumption.

Chincoli et al. [3] worked on the transmission power control in wireless sensor networks by using cognitive methods. In these protocols are divided into two types proactive and reactive. Cognitive protocols that are used this work are fuzzy logic, swarm intelligence and reinforcement learning. These protocols improve the energy level and quality of service management. This paper also gives information related to the benefits of these protocols.

Umar, Idris Abubakar, et al. [4] introduced the state free geographic forwarding protocol which worked on the concept of cross-layering and combines the task of routing and media access control layers which minimizes the energy consumption. MAC protocols are able to mitigate the hidden terminal problem using handshake mechanism. This mechanism reduced the end-to-end delay and energy consumption in the wireless networks. In this work, the author uses Directional Compact Geographic Forwarding approach to reduce the excessive overhead in the multi-hop network. The result of the paper shows that it reduced the message overhead, energy consumption, and end-to-end delay.

Shafieirad et al. [5] proposed an energy-aware opportunistic routing protocol for wireless sensor networks. This protocol analyzed the energy available on the sensor node, distance from the other node and the amount of data transmission between the nodes. This protocol does not require any prior information related to the network topology. The experiment also tested by using the numerical results and it clearly shows that it enhanced the data delivery ratio.

Oh, Hoon et al. [6] introduced a slotted sense MAC protocol for timely and reliable data transfer in the wireless sensor network. This protocol allocates the sharable slot to each tree which produces topology independent schedule and makes it highly responsive. This protocol provides reliable data transmission over the nodes. The sharable slot features the proposed method to improve its performance by enhancing the data delivery ratio.

Agrawal, Deepika, et al. [7] Fuzzy based unequal clustering algorithm is proposed by the author in this article to enhance the lifetime of the wireless sensor network. It balanced the energy consumption by making the unequal clusters. Cluster heads are selected by using the fuzzy logic. Density, energy and base station distance are the input variables of the network. Rank and competition radius are the outputs of the fuzzy system. The performance of the proposed algorithm is compared with existing protocols and found that the proposed algorithm performs better.

Kirubakaran et al. [8] IW- MAC (invite and wait) protocol is proposed to provide efficient wireless sensor networks. This protocol is used to provide the efficient use of battery power by sensor nodes. It transfers the minimum control packets and maximum data packet in the given time. The energy on the nodes is used to transfer the data and reduce the overhead of control packets and channel reservation. This approach is used to save energy during data transmission on the nodes.

Gowtham et al. [9] proposed congestion control and packet recovery in a cross-layer approach. It reduced the problem occurred by the traffic like congestion and contention on the data link layer and transport layer. This protocol recovers the missing packets by storing the copy of the data packets. To avoid the congestion on the network it assigns the priority to the nodes for transmitting data. On the basis of priority, the

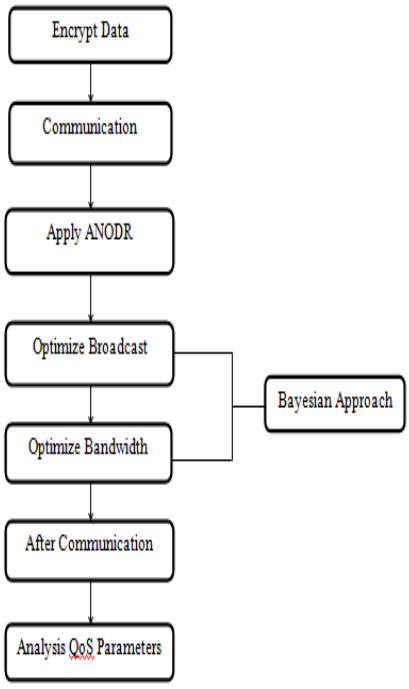
packets are transmitted to the next node. The packet which has the highest priority transmitted first and then next according to the assigned priority. The performance of the packet is tested on the simulator and gives effective results.

Swain et al. [10] work on the diagnosis of fault in the wireless network and proposed a protocol for it named as Heterogeneous Fault Diagnosis Protocol. This protocol consists of three phases that are clustering phase, fault detection phase, and fault classification phase. This method detects the faulty nodes and classification is done by using a probabilistic neural network protocol. The simulation result of the proposed method is tested on NS-2 simulator.

III. FLOWCHART

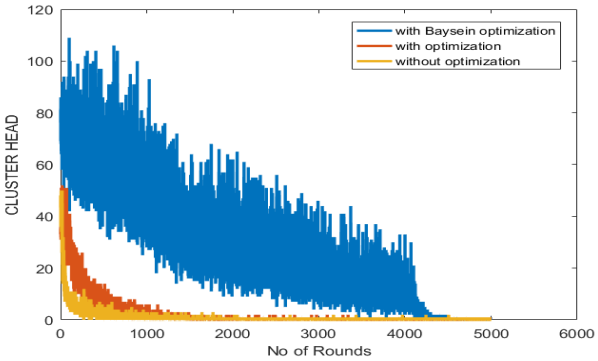
The flowchart of the proposed work is given below:

1. The first step is to Encrypt the data and then start communication.
2. After the communication is established, apply ANDOR.
3. Bayesian Approach is applied to optimize Broadcast and optimize Bandwidth.
4. After optimization, communication is established.
5. At last, analyze the QoS Parameters.



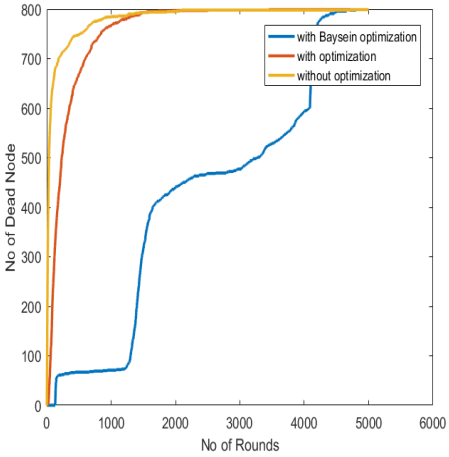
Flowchart 1: Optimize the routing by Bayesian approach

IV. RESULTS AND ANALYSIS



Graph 1: Number of cluster head formation by Bayesian and previous approaches.

Graph 1 represents the number of cluster head formation by Bayesian and previous approaches. The X-axis presents the number of rounds and Y-axis presents the Cluster Head. The number of rounds is inversely proportional to Cluster Head. When the Cluster Head Formation did without optimization then Cluster Head remains the same for a maximum number of rounds. The Cluster Head formation with optimization shows higher than without optimization and it also shows zero cluster head formation from 1000 number of rounds to 4000 number of rounds. In the last, Cluster Head formation by Bayesian optimization shows a wider range and the value of the cluster head decreases as the number of rounds is increasing.

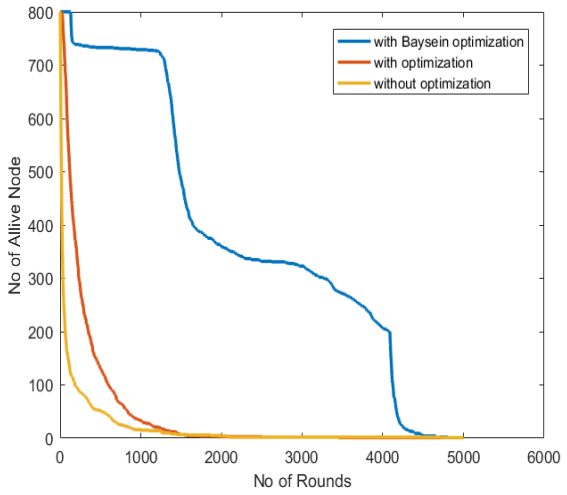


Graph 2: Number of Dead nodes formation by Bayesian and previous approaches

Graph 2 presents the number of dead nodes formation by Bayesian and previous approaches. The X-axis represents the Number of Rounds and Y-axis represents the Number of Dead nodes. The formation of dead nodes without optimization shows a sharp increase and remains the same from 1500 number of rounds till 5000 rounds. And the formation of dead

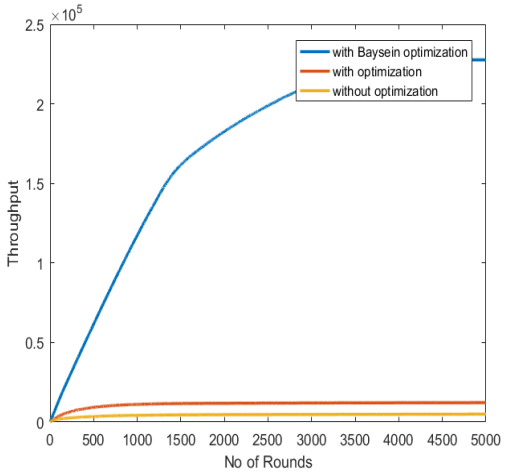
nodes with optimization shows increment at a slower rate than without optimization technique and the dead nodes remain the same from 1500 rounds to 5000 rounds. With the Bayesian optimization, the formation of dead nodes remains same for first 1000 number of rounds but after 1000 rounds number of dead nodes shows a sharp increase and from 2000 number of rounds, the formation of dead nodes are continuously increasing till 5000 number of rounds.

Graph 3 shows the number of alive nodes by Bayesian and previous approaches. The x-axis shows a number of rounds and the y-axisshow the number of Alive nodes. The number of Alive nodes is decreasing as the number of rounds are increasing. The number of alive nodes without optimization is zero for almost all rounds. But with optimization technique, the number of alive rounds is increasing but remains the same from 1500 rounds to 5000 rounds. At last, the number of alive nodes by a Bayesian approach is continuously decreasing and also remains constant in between.



Graph 3: Number of Alive nodes by Bayesian and previous approaches

Graph 4 shows the throughput by Bayesian approach and previous approaches. The X-axis shows Number of rounds and the y-axis shows Throughput. The throughput is continually increasing. Firstly without optimization, the throughput is very low and is similar for all number of rounds. The throughput with optimization is slightly higher than without optimization throughput. In the end, with Bayesian optimization, the throughput is much higher than previous approaches.



Graph 4: Throughput by Bayesian and previous approaches

V. CONCLUSION

Inwireless sensor routing and network stability the security of data is one more aspect. On this aspect researcher work on two parameters i.e., time and storage of encryption because these two parameters increase the overhead so it should be less. If these parameter increase, it also impact the stability of network. In this paper ,balance between AKA based encrypted data by optimization base process. For this process improve the network stability and analysis these stability parameters by deadnode,alivenode and throughput compare with bayesian and non bayesian optimization.

VI. REFERENCES

[1]. Shelke, Maya, Akshay Malhotra, and Parikshit N. Mahalle."Congestion-Aware Opportunistic Routing Protocol in Wireless Sensor Networks." *Smart Computing and Informatics*. Springer, Singapore, 2018.63-72.

[2]. Hong, Chao, et al. "FADS: Circular/Spherical Sector based Forwarding Area Division and Adaptive Forwarding Area Selection routing protocol in WSNs." *Ad Hoc Networks* 70 (2018): 121-134.

[3]. Shafieirad, Hossein, Raviraj S. Adve, and ShahramShahbazPanahi. "Max-SNR Opportunistic Routing for Large-Scale Energy Harvesting Sensor Networks." *IEEE Transactions on Green Communications and Networking*(2018).

[4]. Chincoli, Michele, and Antonio Liotta. "Transmission power control in WSNs: from deterministic to cognitive methods." *Integration, Interconnection, and Interoperability of IoTSystems*.Springer, Cham, 2018.39-57.

[5]. Umar, Idris Abubakar, et al. "Towards overhead mitigation in state-free geographic forwarding protocols for wireless sensor networks." *Wireless Networks* (2018): 1-14.

[6]. Oh, Hoon, and Chi Trung Ngo. "A Slotted Sense Multiple Access Protocol for Timely and Reliable Data Transmission in Dynamic Wireless Sensor Networks." *IEEE Sensors Journal*(2018).

[7]. Agrawal, Deepika, and SudhakarPandey. "FUCA: Fuzzy- based unequal clustering algorithm to prolong the lifetime of wireless sensor networks." *International Journal of Communication Systems* 31.2 (2018).

[8]. Kirubakaran, M. K., and N. Sankarram. "IW-MAC: a invite and wait MAC protocol for power efficient wireless sensor networks." *Journal of Ambient Intelligence and Humanized Computing* (2018): 1-12.

[9]. Gowtham, M. S., and KamalrajSubramaniam. "Congestion control and packet recovery for cross layer approach in MANET." *Cluster Computing* (2018): 1-8.

[10]. Swain, Rakesh Ranjan, Pabitra Mohan Khilar, and Sourav Kumar Bhoi. "Heterogeneous fault diagnosis for wireless sensor networks." *Ad Hoc Networks* 69 (2018): 15-37.