International Journal For Technological Research In Engineering
Volume 9, Issue 10, June-2022 *ISSN (Online): 2347 - 4718*

REVIEW ON CONCEPT AND SECURITY OF WSN

Raja Manu[1], Ramesh Kumar[2]
[1]M.Tech Scholar, [2]Assistant Professor
Department of Computer Science and Engineering
K.K. University Nalanda (Bihar)

Abstract: ***Wireless sensor networks provide all the information you need without wires, so the system can be monitored and environmental changes can be detected. Wireless Sensor Networks, which are self-configured and take no infrastructure whatsoever, gather data from their location to be examined and analyzed. The networks can collect a number of factors, like temperature, sound, vibration, pressure and so on. These papers review the concept of the Wireless Sensor Networks and also provide the glimpse over the concept of security in wireless sensor networks.***

Keywords: Wireless Sensor Networks, Nodes, Hub

1. INTRODUCTION

Wireless Sensor Networks are networks that can transmit data or information to a sink, which is where the information is often observed and analyzed. These networks are sometimes self-configured and infrastructure-less. [1]

A base station or sink is basically an interface between the user and the network. It converts information from the (wireless) sensor network by injecting queries and gathering results from the sink. [1]

Sensory nodes can communicate wirelessly by using radio signals. The sensory nodes are equipped with sensors which monitor the environment, as well as radio transceivers, computing devices, and power components.
Wireless networks are limited by many factors. They have scarce resources, as well as limited processing speed, storage capacity, and communication bandwidth. It is the responsibility of these nodes to organize an appropriate networking infrastructure, which often uses multi-hop transmission in doing so. [1]

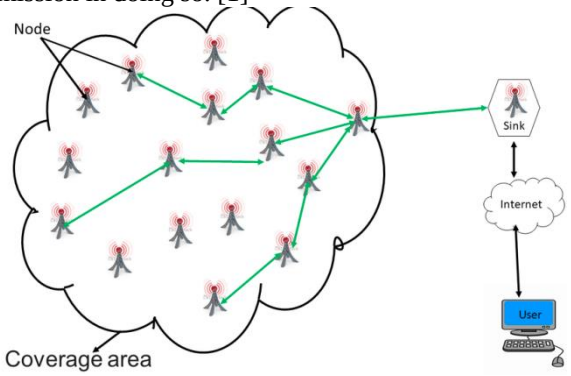


Fig 1. Wireless Sensor Networks

There are sensors that are collecting data, and they will respond with the appropriate instructions. There are two types of sensor nodes, continuous and event-driven. To determine location and positioning, GPS or Global Positioning System can be used. Sensors and actuators are often used in tandem with one another to detect new conditions. These networks are called Wireless Sensor Networks or Actuator Networks. [2]

Types of WSN

The five types of WSNs are based on their environment are:

- **Terrestrial WSN:** A different type of wireless sensor network is a terrestrial WSN. These networks are designed to interact with base stations in an efficient manner. Terrestrial wireless sensor networks are comprised of a large number of wireless nodes, and can be structured or unstructured. When a structured terrestrial WSN is used, nodes are deployed in the shape of the desired pattern and follow the planned pattern. Unstructured wireless sensor networks distribute nodes randomly within the given area. Nevertheless, both types of networks work by conserving energy with lower duty cycle operations, optimizing routing patterns, and delaying minimal data. [2]

- **Underground WSN:** Underground wireless sensor networks are more expensive than terrestrial wireless sensor networks, because they need additional nodes that can recharge the devices. Underground wireless sensor networks employ limited battery power and are hard to recharge. Underground sensor networks are not as cost effective as terrestrial WSNs, and deployments require more planning. UWSNs, or underground wireless sensor networks, have to be concealed and underground for observation, and must be able to communicate over a long distance. [3]

- **Underwater WSN:** Underwater Wireless Sensor Networks collect data from sensor nodes and vehicles. These networks can be found in oceans, lakes, rivers, and more. It's challenging to network underwater because communication can be hindered by a long propagation delay and bandwidth failure. WSNs are equipped with limited batteries with no ability to recharge. The difficulty of conserving recording energy is due to the need for underwater communication techniques. [3]

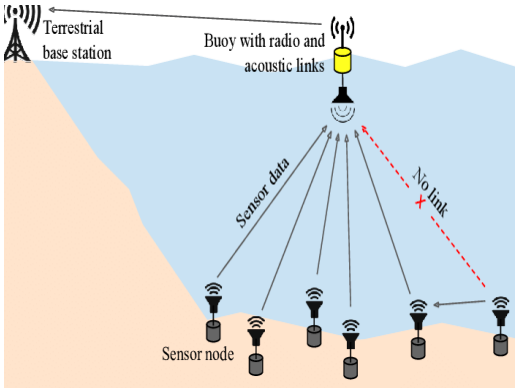
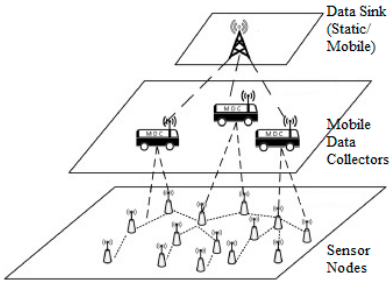


Fig 2. Underwater WSN

- **Multimedia WSN:** Sensor nodes in a multimedia wireless sensor network capture data like images, videos, and audio. They enable tracking and monitoring of events in multimedia. Multimedia WSNs share sensory data with one another, over Wi-Fi. One issue with multimedia WSN is high bandwidth consumption. [4]

- **Mobile WSN:** Mobile wireless sensor networks include the ability to create nodes that are mobile and can interact with their environment. These sensor networks can also compute and communicate. Mobile wireless sensor networks have improved coverage and channel capacity, among other benefits. [4]



Mobile WSN Architecture

Fig 3. Mobile WSN

Applications of WSN

WSN have many applications and they can be applied in various fields, we have highlighted some of them,

- Devices that use WSNs might be important for military operations and may be used in surveillance, investigation, control, communications, computing and much more. [5]

- In the application of monitoring, sensors are placed over an area in which some displays are observed. When the sensors notice an event such as temperature, pressure, or sound, these occurrences can be communicated to a base station which then takes appropriate action.

- Quickly detect the likelihood of traffic conditions using instant statistics on traffic and alert drivers about any future issues. [5]

- Use in medical applications include: diagnostics, management, integrated patient monitoring and management, tele-monitoring of human physiological information, medical practitioners or patients inside the medical facility. [5]

- Broadly speaking, WSNs have a variety of environmental applications. These include sensing oceans, seas, and soil. They can also detect forest fires and be used to monitor greenhouse gases.

- WSNs can be employed for monitoring the movement of diverse structural projects. For example, buildings and flyovers, bridges, roads, embankments and tunnels can be monitored remotely to reduce expenses from physical site visitations. [6]

- One of the primary ways autonomous networks are implemented is for automated maintenance, to reduce costs and provide surprises innovations. Industrial installers often find that conventional wired sensor networks become difficult to set up as the installation progresses.

- WSNs can create assistance for farmers, ranging from maintaining wires in difficult environments to I-devices for more effective irrigation. [6]

Fig 4. Applications of WSN

Limitations of WSN

- Problems with hardware also come into play, such as energy and limited space. Hardware constraints are used in discussing artificial intelligence as a limiting factor of current technology. [7]

- In a WSN, three communication methods are used; direct, clustering-based, and multi-hops. Direct communication consists of sending data to a managing node where it is processed with backend data centers. Clustering communications are made up of mutually independent clusters where the head nodes collect local information to process. Multi-hops uses neighboring nodes as relay points because sensor range is limited and each message can reach its destination by taking an indirect path.

- Scalability is a problem as the number of sensor nodes increases. Networking should still work no matter how

many sensor nodes are placed, without impacting bandwidth.

- Many exceptions have been addressed in sensor networks, such as sensors crashing. The strategies of fault tolerance can be used to keep the network going.
- Power saving: when there are sensors monitoring an environment of interest, the life span can be extended if there is a power saving mechanism. One-way sensors could be saving power is by transmitting less data.
- The materials to produce a sensor network are not as expensive as one might expect, and the applications for these networks vary from data processing, to weather forecasting.
- In a clustered Wireless Sensor Network (WSN), sensor nodes are organized into many clusters, with cluster controllers collecting sense data from other sensor nodes in the managed cluster. One benefit of managing WSNs this way is that mobility is not as important. [7]

WSN Security

With no central authority, there are security threats in a WSN. One such is when a malicious node imitates one of the network's nodes and tricks other nodes into incorrect data. Wireless sensor networks are extensively used in many applications to provide real-time readings and information. However, due to their limited resources, they face new challenges like centralized management and device heterogeneity. Communications in sensor networks for healthcare are mostly wireless. With this, it can result in various security threats that can pose serious problems to the individual using wireless devices. [8]

In most WSNs, there is a challenge with limited resources and high security parameters. One example of these security parameters is authentication with nodes, along with data confidentiality, anti-compromise and resilience against network analysis. In order to determine which nodes are trustworthy, the deployment sensors must be authenticated by the manager node or cluster head. Unauthenticated nodes can be isolated from WSNs during the authentication procedure. [8]

Sensors transmit important packets, which must be protected by encryption to ensure that information is not intercepted, modified and analyzed. If a packet is intercepted, an eavesdropper can modify and analyze the contents to find valuable data in a network. In wireless sensor networks, malicious attacks are a major concern. The network of nodes is distributed in space and without any central authority controlling them. This is particularly true for Wireless Sensor Networks. If the packets transmitted between devices and the manager node are intercepted and modified, valuable information could be discovered by eavesdroppers. [9]

CONCLUSION

These networks have potential applications in industrial, transportation or buildings areas as they can offer significant benefits such as improved reliability and energy performance optimization. Wireless Sensor Networks offer many types of applications for a comfortable and cost-effective intelligent life. Using wireless networks, we can monitor air, noise, and health care.

REFERENCES

[1] L. Chan K. G. Chavez H. Rudolph and A. Hourani "Hierarchical routing protocols for wireless sensor network: A compressive survey" Wireless Networks vol. 26 no. 5 pp. 3291-3314 2020.

[2] D. Lin Q. Wang W. Min J. Xu and Z. Zhang "A Survey on Energy-Efficient Strategies in Static Wireless Sensor Networks" ACM Transactions on Sensor Networks (TOSN) vol. 17 no. 1 pp. 1-48 2020.

[3] Nabil Sabor Shigenobu Sasaki Mohammed Abo-Zahhad and Sabah M. Ahmed "A Comprehensive Survey on Hierarchical-Based Routing Protocols for Mobile Wireless Sensor Networks: Review Taxonomy and Future Directions" Wireless Communications and Mobile Computing vol. 2017.

[4] Liu Xuxun "Atypical hierarchical routing protocols for wireless sensor networks: A review" IEEE Sensors Journal vol. 15 no. 10 pp. 5372-5383 2015.

[5] Carolina Del-Valle-Soto Carlos Mex-Perera Aldo Orozco-Lugo Mauricio Lara Giselle M. Galván-Tejada and Oscar Olmedo "On the MAC/Network/Energy performance evaluation of wireless sensor networks: contrasting MPH AODV DSR and ZTR routing protocols" Sensors vol. 14 no. 12 pp. 22811-22847 2014.

[6] Carolina Del-Valle-Soto Carlos Mex-Perera Aldo Orozco-Lugo Giselle M. Galvan-Tejada Oscar Olmedo and Mauricio Lara "An efficient multi-parent hierarchical routing protocol for WSNs" Wireless Telecommunications Symposium (WTS) 2014 pp. 1-8 2014.

[7] M. Mishra and S. Reddy "IoT-based implementation of classroom response system for deaf and mute using MQTT protocol" International Journal of Mobile Network Design and Innovation vol. 9 no. 2 pp. 57 2019.

[8] P. Praveen Kumar M. Krishna and M. Ramprakash "Design and Implementation of Smart Home using Cisco Packet Tracer Simulator 7.2" International Journal of Innovative Technology and Exploring Engineering vol. 8 no. 11 pp. 107-111 2019

[9] R. Nayak et al. "Structuring and Design of Home Automation System using IOT" International Journal of Recent Trends in Engineering and Research vol. 4 no. 5 pp. 200-206 2018.

[10] K. Math and D. Mathpathi "Voice Recognition Wireless Home Automation System Based on IOT" International Journal of Trend in Scientific Research and Development vol. -2 no. -5 pp. 261-264 2018..

