WSN: Privacy And Security Of Health Monitoring System

Nafiza
Asst. Prof.
Siddhartha Institute of Technology and Sciences
Narapally, Hyderabad, Telangana, India

Nalla Ajay Kumar
Asso. Prof.
Department of CSE
Siddhartha Institute of Technology and Sciences
Narapally, Hyderabad, Telangana, India

Abstract - **The Wireless Sensor Network (WSN) has exploited a wide range of medical applications. The expansion of WSN in recent decades has improved general life features, and its broad range of capabilities is being used in the medical field. It is primarily used to analyze human physiological activities such as heart rate, blood pressure, sugar and glucose levels on a regular basis. Wearable and implanted sensors are the two types of sensors, with wearable sensors being used on the human body surface or in close proximity for action. Other types of implanted medical devices include those that are inserted into the human body to assess various needs. On the health monitoring system, existing systems achieve periodic examination of patient behaviors without the need for a doctor through smart work. With hundreds or thousands of sensing nodes, wireless sensor technology is well-structured. These sensing nodes are primarily in charge of capturing and sensing data. The gathered patient physiological data, as well as other necessary data, was then transferred across the connected nodes. In today's world, handling sensitive data while ensuring its security and privacy is a difficult task. The research community uses some security and privacy strategies to do this. Several monitoring systems are examined in this study, all of which are ideal for monitoring various physiological indicators from the patient's body. In a typical healthcare monitoring system, nodes embedded in the patient's body capture signals from wireless sensors and transmit them to the base station. These sensing behaviours sent periodic updates to the doctor via the app on the patient's heart rate, blood pressure, and other vital signs. It will efficiently resolve concerns of communication delay between the doctor and the patient in the future. Overall, it will function well and will be considered more advantageous in the medical industry.**

keywords - WSN, the health monitoring system, heart rate, blood pressure, sensing nodes.

1. INTRODUCTION

Several wireless technologies, such as WBAN, WPAN, and WWSN, are used in medical applications. Wireless Body Area Network (WBAN) is one of the most extensively utilized technologies for detecting patient physiological signals. WBAN continuously monitors several activities such as blood pressure, heart rate, glucose levels, and movement, among others. In the medical field, there are two types of wireless sensor networks: wearable and implanted. Wearable Wireless Sensor Networks are discussed in this survey (WWSN). The performance of wireless sensor networks in a healthcare or hospital context is investigated. It is used in this field in a secure manner, including analysis based on packet loss, access delay, packet segmentation, and so on. The patient's regular activities, such as EEG, ECG, and GSR, are tracked using a Wireless Personal Area Network (WPAN). All of the data from the various sensors talks with the personal server during the study process. In hospitals and at home, there are various applications for monitoring sick patients' body position measurement. The Body-area networks capture all of the information regarding an individual patient's health, energy expenditure, and fitness. Cross-layer analysis is more essential in the context of wireless communications. There are three fundamental issues with the usual tiered approach: In the traditional layered approach, sharing of different information within the different layers is not possible. It leads to incomplete sharing of information on each layer.

The traditional layered approach does not guarantee network optimization. The traditional layered approach is incapable of adapting to changes in the environment. Interference among different users, fading, access conflicts, and changes in the environment are all factors in WSNs. Traditional layered approach wired networks are not suitable for wireless networks.

2. RESEARCH MOTIVATION

Technology advancements and improvements have had a significant impact on the healthcare industry's need for smart devices, which is continually increasing. Patients are increasingly using healthcare equipment at home these days. Sensors are found in the majority of healthcare devices. They are generally transducers with thermal, optical, chemical, electrical, and other signal detection capabilities [1]. The goal of this study is to improve health monitoring systems based on Internet of Things sensors. These devices receive information from WSNs and efficiently process context-sensitive data that is important to patients.

3. LITERATURE SURVEY

We have covered many technologies that would be used in the proposed research in this survey section. In the next subsections, other works based on this research will be discussed. One of the primary issues in wireless sensor networks is data distribution to several nodes [3-7]. Task scheduling, assigning, and data sensing are the most important tasks in WSN processing. OS and middleware architectures play a crucial role in data delivery in WSNs. Wireless Sensor Networks (WSNs) have been increasingly popular in health-care monitoring systems in recent years. In several types of study, the sensor, emergency message sending, and health state decision-making were all handled totally by the distant server. Managing and transmitting large amounts of data requires greater communication resources. As a result, the distant server's performance suffers, as does the delay in decision and notification times. WBSN was proposed by Ahmed Harbouche and others in their study. The WBSN is a particularly constructed wireless network that allows communication to flow between sensor nodes. These are sensor nodes that are attached to the human body and monitor crucial signals, parameters, and the surroundings. The design and implementation of WBSN systems in the field of health monitoring has piqued the interest of researchers. The high expense of health care aided this design and paved the door for the creation of small health monitoring gadgets.

D Mahesh Kumar created a unique prototype for WSN health care systems in a residential setting. It's a smart gateway integration idea based on a platform for connectivity and service administration. This design established a link between WS and public-access networks. Even with low-power and low-cost embedded systems, the combination of lightweight database, smart gateway system, and onboard data decision system allows for excellent patient health state decisions. It also defines communication protocols between the WSN, gateway, and distant servers. Ethernet, WI-FI, and GSM/GPRS connection modules were also added to achieve precise report and information notifications to careers. In-home ubiquitous networks provide a constant report on medical monitoring, medical data access, memory enhancement, and emergency communication to bridge communication between residents and their careers [8, 9]. It is feasible to discover emergency situations and diseases in patients through continuous monitoring. Furthermore, based on the environment, it permits the provision of a wide range of healthcare treatments in the areas of cognitive and physical disability [10]. There are many advantages for parents in providing high-quality care for their babies and little children. A global collaboration of computer, networking, and medical field researchers is trying to develop a broad vision of smart healthcare.

4. Healthcare Monitoring System Working Principle

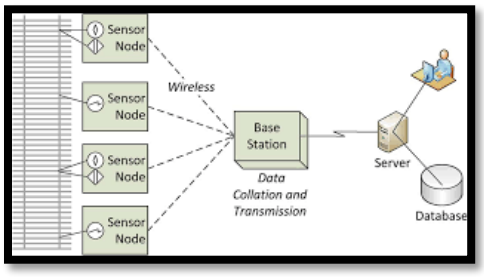

Fig-1 General architecture Health monitoring system in WSN

The base station in the design of the WSN Health Monitoring System contains one or more components such as computational, energy, and communication resources. These are in charge of data communication between sensor nodes and end users, as well as data WSN forwarding to a server. A wireless network (WSN) is a network of geographically distributed autonomous devices that is primarily used to monitor physical or environmental factors [11-21]. By providing a connectivity to the wired world and distributed nodes, this WSN system acts as a gateway. The wireless protocol you choose is determined on your needs. 2.4 GHz radios based on IEEE 802.15.4 or IEEE 802.11 standards, as well as

proprietary radios operating at 900 MHz, are available wireless protocols.

The major components in the typical sensor network are;

Sensor nodes: The sensor nodes represent the network's soul. The primary function of these sensor nodes is to collect and route the data they acquire.

Sensor field: It's a location where the nodes will be placed.

Base Station: The base station is the network's command and control center. The data is extracted and distributed throughout the network. It is a gateway, a storage location, a powerful data processing component, and an access point where a human can interact for the other network. A base station, which can be a laptop or a workstation, is where data is streamed over various communication modes such as the Internet, wireless channels, satellite, and so on.

User: The user is the person who makes use of the wireless sensor network's data or information. By using this information, the user can complete a task or make a judgement.

Wearable Wireless Sensor Networks (WSN) and their performance in the healthcare system are the focus of this survey. The Body Sensor Network (BSN) systems architecture in providing healthcare services is depicted in Figure 3. Medical data access, medical monitoring, and communication between the healthcare provider and the doctor are all services it serves. These signals were transmitted to the doctor via SMS or GPRS in emergency cases. Wearable or implantable body sensor networks in humans carry out continuous health monitoring and improve emergency condition detection in patients. Furthermore, this system allows for a variety of appropriate methods for gathering and monitoring physiological information. These technologies increase the patient's quality of life without interfering with their daily routine.

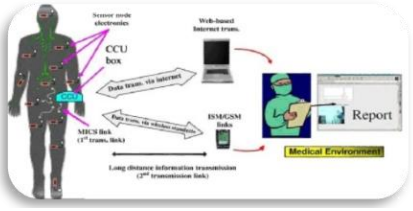

Fig-3 Functional diagram health care monitoring system in WSN

5. CONCLUSION

The current method keeps track of a patient's vital signs in real time. The sensors must be connected to the PCs for this system to work, and the patient must be able to get out of bed. There is no requirement for a link between equipment and sensors in the design of wireless devices and wireless networks. It allows the patient to move around, but only within the monitoring range. Because data cannot be collected while the device is out of range. Take, for example, a program that monitors and controls a pregnant lady. In general, a pregnant woman's blood pressure is comparable to that of a healthy individual. However, blood pressure must be monitored during pregnancy, especially for preeclampsia. Women should have their blood pressure checked frequently, and if it is too high, they should be hospitalized. In the current system, sensors linked to the patient's body detect physiological signals and transfer them to a base station, where they are stored and analyzed. An alarm via short message service (SMS) is also supplied in emergency situations for immediate responses and rescues.

REFERENCE

[1]. V. Stantchev, A. Barnawi, S. Ghulam, J. Schubert, and G. Tamm, "Smart items, fog, and cloud computing as enablers of servitization in healthcare," Sensors & Transducers, vol. 185, no. 2, pp. 121–128, 2015. View at Google Scholar

[2] Institute of Medicine (US) Committee on Data Standards for Patient Safety, Key Capabilities of an Electronic Health Record System: Letter Report, National Academies Press, 2003.

[3] Amudhavel, J., Sruthy, G., Padmashree, D., Pazhani Raja, N., SaleemBasha, M.S., Bhuvaneswari, B., "A comprehensive analysis on multi-agent decision-making systems", (2016) Indian Journal of Science and Technology, 9 (11)

[4] Amudhavel, J., Vigneshwaran, R., Janakiram, A., Jarina, S., Prem Kumar, K., Anantharaj, B., Sathian, D., “An empirical analysis on Quality of Service(QoS) in cloud computing”, (2016) Indian Journal of Science and Technology, 9 (22)

[5] Amudhavel, J., Dhavachelvan, P., Baskaran, R., “Leaf Cutter communication strategy, skills and attributes - a novel Bio-inspired intelligent communication for computing research”, (2016) Indian Journal of Science and Technology, 9 (11)

[6] Karthikeyan, P., Sathian, D., Amudhavel, J., Raghav, R.S., Abraham, A., Dhavachelvan, P., "A comprehensive survey on variants and its extensions of BIG DATA in a

cloud environment", (2015) ACM International Conference Proceeding Series, 06-07-March-2015
[7] Thilagavathi, N., Saravanan, D., Kumarakrishnan, S., Punniakodi, S., Amudhavel, J., Prabu, U., "A survey of reversible watermarking techniques, application, and attacks", (2015) ACM International Conference Proceeding Series, 06-07-March-2015 International Journal of Pure and Applied Mathematics Special Issue 491
[8] H.S. Ng, M.L. Sim, C.M. Tan, C.C. Wong, Wireless technologies for telemedicine, BT Technology Journal, Vol. 24, No.2,pp.130–137, 2006.
[9] S. Meyer, A. Rakotonirainy, A survey of research on context-aware homes, in Australasian Information Security Workshop Conference on ACSW Frontiers, Darlinghurst, pp. 159–168, 2003.
[10] C. Orwat, A. Graefe, T. Faulwasser, Towards pervasive computing in health care – a literature review, BMC Medical Informatics, and Decision Making, vol.8, no.1,pp.1-26. 2008.
[11] Padmapriya, V., Amudhavel, J., Gowri, V., Lakshmipriya, K., Vinothini, S., PremKumar, K., "Demystifying challenges, opportunities and issues of Big data frameworks", (2015) ACM International Conference Proceeding Series, 06-07- March-2015
[12] Amudhavel, J., Kodeeswari, C., Jarina, S., Jaiganesh, S., Bhuvaneswari, B., "Mathematical modeling on avoidance-to-acceptance transition in leaf-cutting ant colonies", (2016) Indian Journal of Science and Technology, 9 (11)
[13] Karthikeyan, P., Deepika, P., Amudhavel, J., Saranya, M., Infanta, E., Nandhini, C., "Impact on self-organization in Mobile AdHoc Networks: An comprehensive review", (2015) ACM International Conference Proceeding Series, 06-07-March-2015
[14] Jaiganesh, S., Jarina, S., Amudhavel, J., Premkumar, K., Sampathkumar, S., Vengattaraman, T., "Performance analysis of collision avoidance frame works in VANETS", (2016) Indian Journal of Science and Technology, 9 (11)
[15] Amudhavel, J., Prabhu, U., Inbavalli, P.,Moganarangan, N., Ravishankar, V., Baskaran, R., Dhavachelvan, P., "Survey and Analysis of Web Service Composition Strategies: A State of Art Performance Study", (2016) Indian Journal of Science and Technology, 9 (11)
[16] Amudhavel, J., Kumar, K.P., Jayachandrameena, C., Abinaya, Shanmugapriya, Jaiganesh, S., Kumar, S.S., Vengattaraman, T., "An robust recursive ant colony optimization strategy in VANET for accident avoidance (RACOVANET)", (2015) IEEE International Conference on Circuit, Power and Computing Technologies, ICCPCT 2015
[17] Amudhavel, J., Sathian, D., Raghav, R.S., Pasupathi, L., Baskaran, R., Dhavachelvan, P., "A fault tolerant distributed self organization in Peer to Peer (P2P) using Krill Herd optimization", (2015) ACM International Conference Proceeding Series, 06-07-March-2015
[18] Padmapriya, V., Bakkiya, K., Amudhavel, J., Sujitha, B., Thamizhselvi, M., Premkumar, K., "A scalable service oriented consistency model for cloud environment (SSOCM)", (2015) ACM International Conference Proceeding Series, 06-07- March-2015
[19] Amudhavel, J., Padmapriya, V., Gowri, V., Lakshmipriya, K., PremKumar, K., Thiyagarajan, B., "Perspectives, motivations, and implications of big data analytics", (2015) ACM International Conference Proceeding Series, 06-07-March-2015
[20] Amudhavel, J., Prabu, U., Dhavachelvan, P., Moganarangan, N., Ravishankar, V., Baskaran, R., "Non-homogeneous hidden Markov model approach for load balancing in web server farms (NH2M2-WSF)", (2015) Global Conference on Communication Technologies, GCCT 2015
[21] Ganesan, M., PremKumar, A., KumaraKrishnan, S., Lalitha, E., Manjula, B., Amudhavel, J., "A novel based algorithm for the prediction of abnormal heart rate using Bayesian algorithm in the wireless sensor network", (2015) ACM International Conference Proceeding Series, 06-07-March-2015