Special Issue on Proceedings of International Conference on Materials Manufacturing and Nanotechnology, June 2021. International Journal of Aquatic Science, Vol 12, Issue 03, 2021

# CCU: A NON-VULNERABLE IOT BASED MODERN WELL BEING HEED SYSTEM USING BODY SENSOR NETWORK

V.Satheeswaran, Shiny Jasmine, Prajith Prakash Nair, S.Raja, S. Mohan
Assistant Professor, Department of Electronics and Communication Engineering,
Nehru Institute of Technology, Coimbatore 641 105
satheesw@gmail.com

## ABSTRACT

Advances in information and communication technologies have led to the emergence of Internet of Things (IoT). In the modern health care environment, the usage of IoT technologies brings convenience of physicians and patients since they are applied to various medical areas (such as real-time monitoring, patient information management, and healthcare management). The body sensor network (BSN) technology is one of the core technologies of IoT developments in healthcare system, where a patient can be monitored using a collection of tiny-powered and lightweight wireless sensor nodes. However, development of this new technology in healthcare applications without considering security makes patient privacy vulnerable. In this article, at first we highlight the major security requirements in BSN based modern health-care system. Subsequently, we propose a secure IoT based healthcare system using BSN, called BSN-Care, which can efficiently accomplish those requirements.

## INTRODUCTION

A significant proportion of the human population suffers from various chronic ailments. Under the existing healthcare systems, for example, the fatality rate in the US from heart failures itself is more than 42%, many of which are due to the delays incurred in initiating medical intervention. This paper introduces MobiCare – a wide-area mobile patient monitoring system that enables continuous and timely monitoring of patients thereby enhancing quality of care for patients and potentially saving many lives. MobiCare consists of three important building blocks (Figure 1): a body sensor network (BSN) consisting of wearable sensors and actuators that are inter-connected using the wireless medium; a BSN Manager (also called the MobiCare client device) that connects the BSN to an 'always-on communication wide-area interface, e.g.,GPRS/UMTS cellular link; and backend infrastructure support (servers) at health care providers that provide necessary healthcare services to patients. The main goal in MobiCare is to define a programmable remote patient monitoring infrastructure that exploits there cent advances in wireless cellular and clinical sensor systems. By leverage these advances, MobiCare can offer potential health benefits: (1) continuous monitoring for chronically-ill patients, (2) better quality care and feedback for patients, (3) increased medical capacity and (4) reduced medical costs for patient care.

**Secure IoT-Based Healthcare System Using BSN:** Body Sensor Network (BSN) allows the integration of intelligent, miniaturized low-power sensor nodes in, on or around human body to monitor body functions and the surrounding environment. It has great potential to revolutionize the future of healthcare technology and attained a number of researchers both from the academia and industry in the past few years. Generally, BSN consists of in-body and on-body sensor networks. An in-body sensor

Special Issue on Proceedings of International Conference on Materials Manufacturing and Nanotechnology, June 2021. International Journal of Aquatic Science, Vol 12, Issue 03, 2021

network allows communication between invasive/implanted devices and base station.

On the other hand, an on-body sensor network allows communication between non-invasive/wearable devices and a coordinator. Now, our BSN-Care (shown in Fig. 1) is a BSN architecture composed of wearable and implantable sensors. Each sensor node is integrated with bio-sensors such as Electrocardiogram (ECG), Electromyography (EMG), Electroencephalography (EEG), Blood Pressure (BP), etc. These sensors collect the physiological parameters and forward them to a coordinator called Local Processing Unit (LPU), which can be a portable device such as PDA, smart-phone etc. The LPU works as a router between the BSN nodes and the central server called BSN-Care server, using the wireless communication mediums such as mobile networks 3G/CDMA/GPRS. Besides, when the LPU detects any abnormalities then it provides immediate alert to the person that wearing the bio-sensors. For example, in general BP less than or equal to 120 is normal, when the BP of the person reaches say 125, the LPU will provide a gentle alert to the person through the LPU devices (e.g. beep tone in a mobile phone).

## LITERATURE SURVEY

This paper introduces MobiCare – a novel service architecture that enables a wide range of health-related services for efficient and mobile patient care. These services include: (1) health- related services in medical devices and sensors to remotely install, self-activate, reconfigure or even self-repair with new health ser- vices and applications, (2) secure and reliable dynamic software upgrade or update services applied to the native code of the clinical device, and, (3) remote registration and reconfiguration of body sensors as well as remote health-data services such as patient health report downloads and diagnosis data uploads with provider servers. Collectively these services address a range of patient medical monitoring needs by accelerating deployment of new health-related services, thus reducing medical costs and im- proving the quality of patient care. We are currently implementing a proof-of-concept prototype. Early experiences with MobiCare do show that it has the potential to become a feasible and a useful infrastructure paradigm for the next generation healthcare. We are hopeful that our system will facilitate the prioritization of delegating medical attention. Our system should also benefit the organization and resources management of a simple triage. Our vision is that such a wireless health monitoring system will make a more sufficient emergency response to save more lives. Index Terms- Health monitoring system, Emergency (4). Healthcare is becoming increasingly pervasive. Improvements in sensor and mobile communication technologies allow for the constant monitoring of patients and their environment. Infrastructure supporting care services must enable such data to flow to the relevant parties as appropriate to the circumstances. This paper describes our initial work on a policy driven, component-based middleware, illustrating how it manages information flows (through reconfiguration) to account for the dynamic nature of healthcare provisioning (5). Fast information retrieval is pivot of medical breakthrough to provide quality medical services. There were a number of attempts to develop clinical information system (CIS) which is reliable, affordable and accessible over the entire hospital and beyond. Today's home healthcare progression is becoming a predominant form of healthcare delivery. Although there have been many recent advances in biomedical sensors, low-power radio communication and embedded

Special Issue on Proceedings of International Conference on Materials Manufacturing and Nanotechnology, June 2021. International Journal of Aquatic Science, Vol 12, Issue 03, 2021

computation, there does not yet exist a flexible, robust communication infrastructure to integrate these devices into an emergency care setting. An efficient wireless communication substrate for medical devices that addresses ad hoc or fixed network formation, naming and discovery, security and authentication, as well as filtration and aggregation of vital sign data need to be studied. The potential applications will save lives, create valuable data for medical research, and cut the cost of medical services. In this paper, we focus on home healthcare via wireless sensor network (WSN) platform. WSN composed of a large number of sensor nodes and multi-hop networking capability that are densely deployed for a wide variety of applicants such as smart buildings, interactive user interfaces, and environment control and highly suitable for monitoring in military and biomedical applications. We describe our experiences in developing and implement both hardware and software platform for medical sensor network, provides protocol for device discovery and multi-hop routing, as well as a simple query interface that is tailored for medical monitoring (6).

## EXISTING SYSTEM

There many systems are remedial measure in the world which is used to identify the condition of the patients by the different wireless networks. One of the methods of the transfer of the patient's data by the use of Wireless Medical Interface Using ZigBee and Bluetooth Technology.

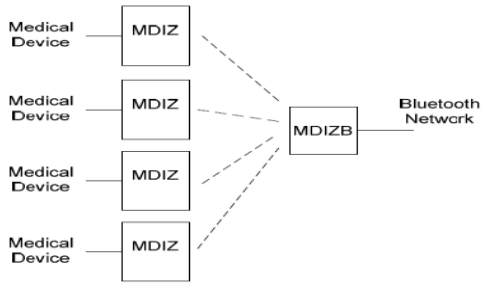


Fig 1: Configuration of wireless interface

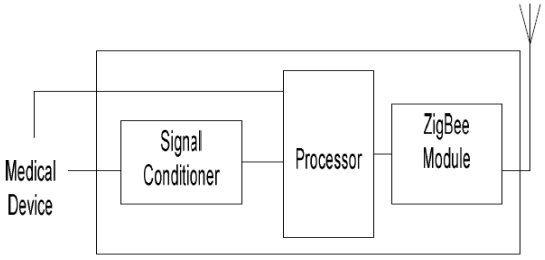


Fig 2: MDIZ block diagram

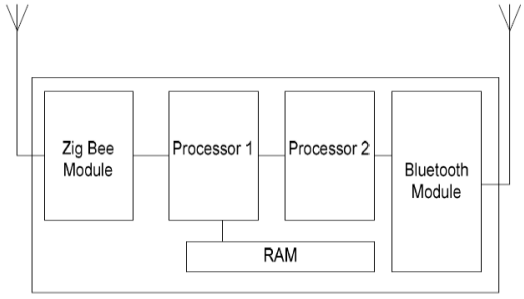


Fig 3: MDIZB block diagram

| Start Byte | Status | Device ID | Length of Frame | Data | Checksum | End Byte |
|---|---|---|---|---|---|---|

Fig 4: MDIZB data frame

## PROPOSED SYSTEM

The system is designed in order to overcome the drawbacks of the existing system by providing the security of the data which is transferred.

Special Issue on Proceedings of International Conference on Materials Manufacturing and Nanotechnology, June 2021. International Journal of Aquatic Science, Vol 12, Issue 03, 2021

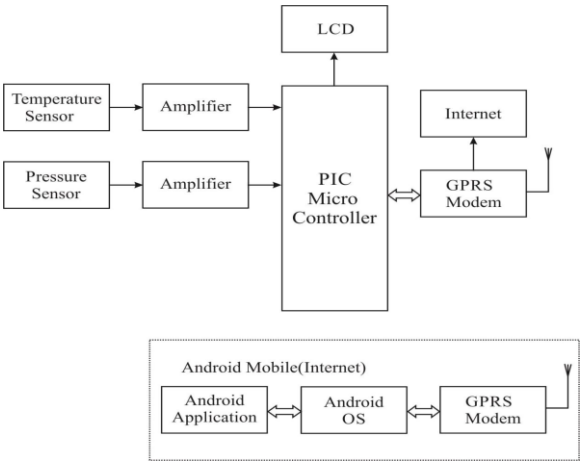


Fig 7: Block diagram of proposed system

**Pressure Sensor:** A pressure sensor measures pressure, typically of gases or liquids. Pressure is an expression of the force required to stop a fluid from expanding, and is usually stated in terms of force per unit area. A pressure sensor usually acts as a transducer; it generates a signal as a function of the pressure imposed. For the purposes of this article, such a signal is electrical.

**LCD:** Liquid Crystal Display screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

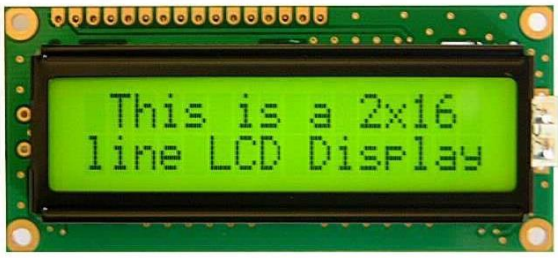


Fig 5: LCD

**PIC (16F877):** Various microcontrollers offer different kinds of memories. EEPROM, EPROM, FLASH etc. are some of the memories of which FLASH is the most recently developed. Technology that is used in pic16F877 is flash technology, so that data is retained even when the power is switched off. Easy Programming and Erasing are other features of PIC 16F877.

## RESULTS AND DISCUSSION

There are two important parameters to transfer data from medical devices; they are signal strength and data error. Good antenna signal strength guarantees the power is enough to transmit data within certain distance and environment condition. Data error test was performed to measure how much error data found when data are being transferred. In medical communication, error data may produces wrong diagnose or delay since it needs additional time to correct the error. All tests were performed indoor because basically the devices will be used commonly in indoor area.

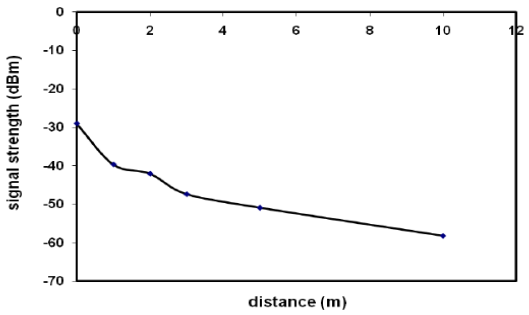


Fig 6: Signal strength of ZigBee module

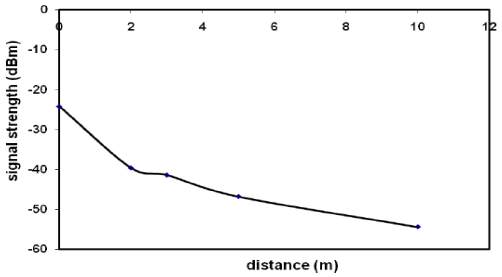


Fig 7: Signal strength of Bluetooth module

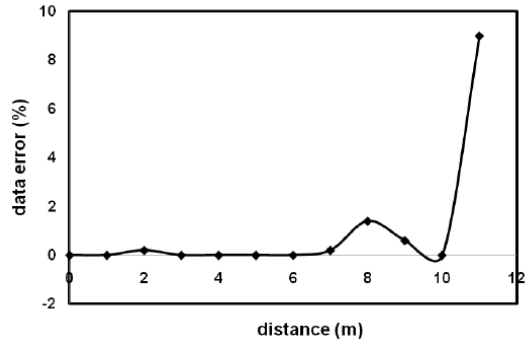


Fig 8: Data error as function of distance

## CONCLUSION AND FUTURE WORK

Initially Zigbee and Bluetooth were used to send messages but the range was too short. In order to overcome that we have used GPRS .We also found that most of the popular BSN based research projects acknowledge the issue of the security, but they failed to embed strong security services that could be preserve patient privacy. The purpose of this project is to resolve several security issues existing in BSN based heed system and also to generate reasonable computational overhead. We compare our proposed CCU care with the state of BSN based heed system. We analyzed especially on the security front and security requirements for the CCU. One of the most security requirements in IOT based heed system using CCU which can effectively deal with the impersonating attacks. Finally, we proposed non-Vulnerable IOT based Well Being Heed system using CCU

## REFERENCES

[1] P. Gope, T.Hwang "BSN-Care: A Secure IOT- Based Modern Health care system using Body Sensor Network" IEEE Sensors Journal Volume 16, 2016.

[2] T. Hwang, P. Gope "IAR-CTR and IAR-CFB: Integrity Aware Real-time Based Counter and Cipher Feedback Modes." volume 15.1, 2015.

[3] T. Hwang, P. Gope." Provably Secure Mutual Authentication and Key Exchange Scheme for Expeditious Mobile Communication Through Synchronously One- Time Secrets. Volume14, 2014.

[4] P. Kumar, H. Lee " Security Issues in Health Care Application using Wireless Medical Sensor Networks." volume 12.1,2012.

[5 J. Ko, J.H. Lim, Y. Chen, R. Musaloiu-E " Median: Medical Emergency Detection in Sensor Networks." volume 10, 2010.

[6] S. Pai, M. Maingast, T.Roosta " Confidentiality in Sensor Networks: Transactional Information." volume 8, 2008.

[7] A. Wood, G. Virone, T. Doan "ALARM-NET: Wireless Sensor Network for Assisted – Living and Residential Monitoring" volume 6,2006.

[8] R.Weinstein "RFID: A technical overview and its application to the enterprise," IEEE IT prof, Volume 7, 2005.