

Highly Secured IoT Based Health Care System for Elderly People using Body Sensor Network

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ABSTRACT: It is very important to monitor various medical parameters and post operational data. To access the patient's medical parameters in local and remote area, healthcare communication using Internet of Things (IoT) method is adapted. The main objective of this project is to transmitting the patient's health monitoring parameters through wireless communication. These input data are uploaded in cloud server and transmitted to the computer and mobile for family and doctor's reference. 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, the development of this new technology in healthcare applications without considering security makes patient privacy vulnerable. In this paper, at first, we highlight the major security requirements in BSN-based modern healthcare system. Subsequently, we propose a secure IoT-based healthcare system using BSN, called BSN-Care, which can efficiently accomplish those requirements.

KEYWORDS: Internet of Things (IOT), Security, Raspberry Pi, BSN, data privacy, data integrity, Authentication.

I. INTRODUCTION

The body sensor network (BSN) technology [5] is one of the most imperative technologies used in IoT-based modern healthcare system. It is basically a collection of low-power and lightweight wireless sensor nodes that are used to monitor the human body functions and surrounding environment. Since BSN nodes are used to collect sensitive (life-critical) information and may operate in hostile environments, accordingly, they require strict security mechanisms to prevent malicious interaction with the system. The healthcare remote monitoring systems have become a key contributor to the improvement of the elderly people' quality of life. The market sector of healthcare remote monitoring systems has increased significantly due to several reasons. The number of elderly people is increasing over the time where today in developed countries it is quite normal that elderly people usually live independently in their own homes. Furthermore, Internet of things (IoT) makes these healthcare remote monitoring systems technically feasible (IoT as the concept of a monitor able and modifiable world in which sensors and actuators over living and non-living objects) and the even decreasing cost of sensors makes it economically feasible. Due to the penetration of smart mobile technology, it is also expected that population is already prepared to accept this kind of solutions collecting in real time people's private and sensitive data such as temperature, blood glucose, heartbeat, pulse oximetry sensor to name a few. For instance, healthcare personal analyzers such as smart beds automatically inform who are occupying them and even more, they are able to inform about different patients' physiological levels, making real smart home medication dispensers to, for instance, automatically alert when medication is not taken. Several healthcare remote monitoring systems using different technology for monitoring and/or tracking patients and/or biomedical equipment within Hospitals and at their homes. Unfortunately, as far as we know, most of these solutions are not flexible at the moment of adding new sensors during runtime. Neither it allows normal users to create ad-hoc alerts immediately with the new sensors added. This project propose an IoT-aware architecture for healthcare remote monitoring systems for patients at

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home (suffering chronic diseases and or disabilities), which allows during runtime adding new sensors that become immediately available in order users may create/edit alerts' rules using also these new data.

II. RELATED WORK

S.no	Title	They are proposed	Getting Things
1.	IoT based Smart HealthCare Kit	Rule's & Accessible authentication are differentiated in this system.	Rule's & authentication are combined in the separate module.
2.	THE HEALTHCARE INTERNET OF THINGS	Event related work is done in this system. Event's doing changes in home environment.	System work based on the events changed in home
3.	Health Monitoring and Management Using Internet-of-Things (IoT) Sensing with Cloud-based Processing: Opportunities and Challenges	The information security requirements that are common over several sectors, and in particular, ones that impact critical societal services, namely, the energy, water, and health management systems.	Getting the critical infrastructure for improve the things in maintain the security level.
4.	Smart Under-Five Health Care System	A simplified sequence diagram documents this primary protection process, using rolling code encryption of the transmitted data. The security method was demonstrated successfully using an IP enabled universal industrial controller.	IP encrypting method for web security concept
5.	Exploiting the FIWARE Cloud Platform to Develop a Remote Patient Monitoring System	Manage and control the whole system, Security at the server, security in smart homes. Things may be real or virtual, moving or steady but things will be active participants. Things will communicate with each other, called as things-to-things communication. Things will also able to communicate or interact with human then it is called as things-to-human communication	Things to Things communication is implemented form this concept.
6.	Challenges in Wearable Devices based Pervasive Wellbeing Monitoring	The heterogeneity technologies prevents smart objects to natively interoperate for adapting the environment to users' needs. These services control the environment in accordance with user-defined rules and the users' location, calculated by exploiting an indoor localization mechanism.	Heterogeneity technology is improved to prevent the interoperated devices.
7.	A Comprehensive Review on Usage of Internet of Things (IoT) in Healthcare System	Current IoTs is achieved using physical platforms that lack intelligence on decision making. A proactive architecture that deploys Event Condition-Action(ECA) method is proposed to resolve the management of	ECA rules proposed for IoTs interoperability in smart homes is implemented

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		heterogeneous IoTs in smart homes. The proactive architecture, developed with a core repository stores persistent data of IoTs schema, proved to be an ideal solution in solving interoperability in smart homes.	
8.	IReHMo: An Efficient IoT-Based Remote Health Monitoring System for Smart Regions	device-level protections be augmented with network-level security solutions that can monitor network activity to detect suspicious behavior.	Device level security concepts are considered.
9.	RFID Technology for IoT-Based Personal Healthcare in Smart Spaces	Many available options are described up to the application level with some examples of RFID systems able to collect and process multichannel data about the human behavior in compliance with the power exposure and sanitary regulations. Open challenges and possible new research trends are finally discussed.	Challenges related to the research trends are implemented
10.	Framework for Dependable and Pervasive eHealth Services Ulrico	This paper begin with general information security background of IoT and continue on with information security related challenges that IoT will encountered. Also point out research directions that could be the future work for the solutions to the security challenges that IoT encounters.	Improve the security challenges encountered in future.

III. EXISTING SYSTEM APPROACH

In the traditional approach the healthcare professionals play the major role. They need to visit the patient's ward for necessary diagnosis and advising. There are two basic problems associated with this approach. Firstly, the healthcare professionals must be present on site of the patient all the time and secondly, the patient remains admitted in a hospital, bedside biomedical instruments, for a period of time.

Disadvantage:

1. In order to solve these two problems, the patients are given knowledge and information about disease diagnosis and prevention.
2. Secondly, a reliable and readily available patient monitoring system (PMS) is required.

IV. PROPOSED SYSTEM APPROACH

Here, researcher designed health monitoring system using Raspberry pi microcontroller with Wireless Body Area Sensor Network (WBASN) . In this work, the sensors are used here Temperature sensor, Blood pressure sensor, Heart beat sensor. These sensors are placed on human body which are helps to monitor the health condition without disturbing the daily routine of the patients and these health related parameters are then communicated to physicians server using long range wireless technology.

Advantage

1. Time related event setting can be achieved
2. Authentication level setting can be achieved

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3. System is globally accessed
4. Improve the speed due to fast respond
- 5 .Emergency is detected quickly monitor.
6. No need of manual updating of data.

V. PROPOSED ARCHITECTURE

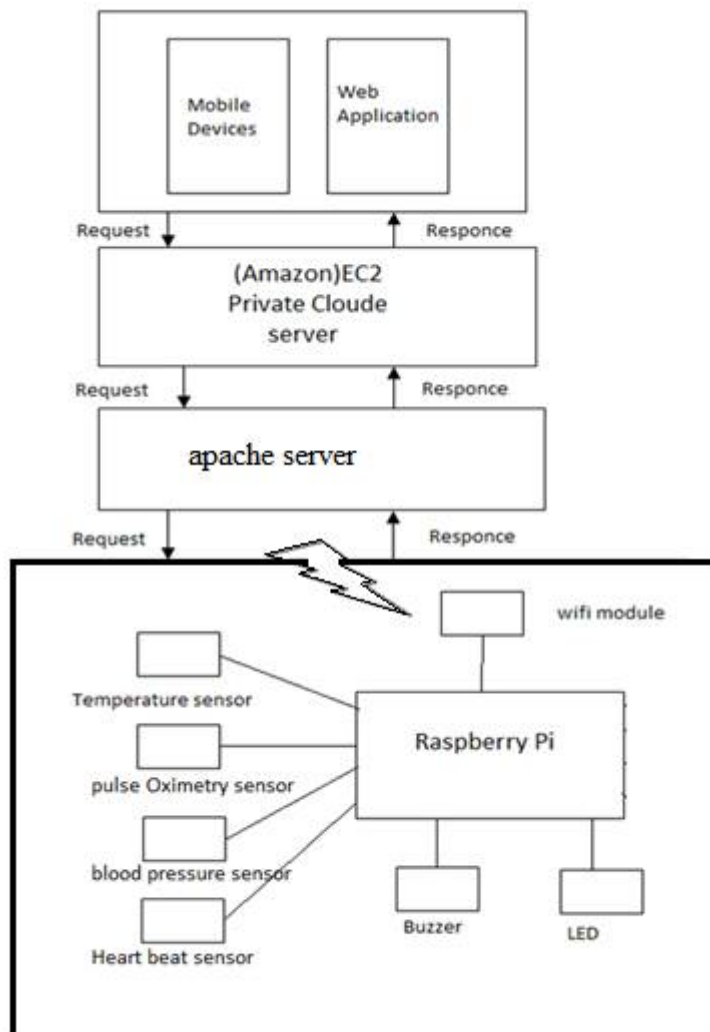


Fig.1. Proposed System Architecture

In Existed model an Ethernet based system that let users monitor real time switching information of the electrical devices and controlling them through an android app as well as monitoring the security of their homes in case of unwanted entry or fire. Our model uses temperature sensor and to check the temperature level of human body. Pulse Oximetry sensor is used to measure the oxygen saturation of arterial blood in a subject by utilizing a sensor attached typically to a finger, toe, or ear to determine the percentage of oxyhemoglobin in blood pulsating through a network of capillaries. Blood pressure sensor is used to measure the blood pressure of human body, Heart beat sensor is used to calculate the heart beats per second. buzzer & LED will indicate any changes in body to intimate the nearest person.

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This devices threshold level is adjusted through an android based mobile app as well as the web application. The system is connected to this application using internet connectivity for communication. The model has an option of controlling devices by either sending tap-to-toggle system and allows the permission level setting for security, making the system user friendly and easy to manage. It is Raspberry Pi certificated and designed to be hardware, software, and pin compatible with large range of Raspberry Pi shields. The app is android & web based which is connected to the internet thorough either Wi-Fi. It connects to the putty based server which is connected to cloud server over the internet and lets the users to monitor with the help of an internal sensor and toggles the threshold level by tap-to-touch & setting the functionality. The alert is sent real time to the user app also indicated by buzzer & LED.

VI. MODULES

A. RASPBERRY PI3 B

Everyone knows and loves Raspberry Pi, but what if it could be faster, say 6x faster. The Raspberry Pi 3 is here to provide you with the same Pi as before but now with double the ram and a much faster processor. The credit-card sized computer is capable of many of the things that your desktop PC does, like spreadsheets, word-processing and playing high-definition video and games. It can run several flavors of Linux (and even Windows 10 free-of-charge) and is being used to teach kids all over the world how to program... Oh yeah, and it still does all that for under \$50. The secret sauce that makes this computer so small and powerful is the Broadcom BCM2836, an ARMv11 Quad Core Processor System-on-Chip, running at 1Ghz, and a Videocore 4 GPU. The GPU provides Open GL ES 2.0, hardware-accelerated OpenVG, and 1080p30 H.264 high-profile decode and is capable of 1Gpixel/s, 1.5Gtexel/s or 24 GFLOPs of general purpose compute. What's that all mean? It means that if you plug the Raspberry Pi 2 into your HDTV, you could watch BluRay quality video, using H.264 at 40MBits/s. The biggest change that has been enacted with the Raspberry Pi 3 is an upgrade to the main processor and an increase of ram from 512MB to 1GB. The RPi2 still utilizes a microSD card to hold your system volume meaning most Linux distributions for the Pi 2 will happily live on a 4GB microSD card but larger cards are supported.

B. WIFI MODULE

Wi-Fi is defined as an abbreviation for wireless fidelity, *meaning* you can access or connect to a network using radio waves, without needing to use wires. An example of *Wi-Fi* is when you go to Starbucks and can join on their network to get on the Internet without having to connect your computer to any wires. *WiFi* allows computers, PDAs and other devices to connect to a broadband connection in a wireless mode. The 802.11 standard defines the wireless communication operating via electromagnetic waves.

C. TEMPERATURE SENSOR

The temperature sensors of ifm electronic are based on a PT100 or PT1000 resistor. The measured temperature value corresponds to a change in resistance and is converted into an electrical analogue signal. A microprocessor controls the evaluation of the electrical signal. The current system temperature is indicated via the LED display directly on the evaluation unit. The microprocessor and the display make process adjustment much easier. The user can set the values for the switch points, hysteresis and measuring range by means of programming buttons even without the system temperature being applied. This facilitates installation and set-up.

D. PULSE OXIMETER

A device that measures the oxygen saturation of arterial blood in a subject by utilizing a sensor attached typically to a finger, toe, or ear to determine the percentage of oxyhemoglobin in blood pulsating through a network of capillaries. Pulse oximetry is a noninvasive method for monitoring a person's oxygen saturation (SO₂). Its reading of SpO₂ (peripheral oxygen saturation) is not always identical to the reading of SaO₂ (arterial oxygen saturation) from arterial blood gas analysis, but the two are correlated enough within an acceptable deviation such that the safe, convenient, noninvasive, inexpensive pulse oximetry method is valuable for measuring oxygen saturation in clinical use. In its most common (transmissive) application mode, a sensor device is placed on a thin part of the patient's body, usually a fingertip or earlobe, or in the case of an infant, across a foot. The device passes two wavelengths of light through the body part to a photo detector. It measures the changing absorbance at each of

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the wavelengths, allowing it to determine the absorbances due to the pulsing arterial blood alone, excluding venous blood, skin, bone, muscle, fat, and (in most cases) nail polish.

E. BLOOD PRESSURE SENSOR

Blood pressure (BP) is the pressure exerted by circulating blood upon the walls of blood vessels. When used without further specification, "blood pressure" usually refers to the arterial pressure in the systemic circulation. Blood pressure is usually expressed in terms of the systolic (maximum) pressure over diastolic (minimum) pressure and is measured in millimeters of mercury (mm Hg). It is one of the vital signs along with respiratory rate, heart rate, oxygen saturation, and body temperature. Normal resting systolic (diastolic) blood pressure in an adult is approximately 120 mm Hg (80 mm Hg), abbreviated "120/80 mm Hg". Blood pressure varies depending on situation, activity, and disease states. It is regulated by the nervous and endocrine systems. Blood pressure that is low due to a disease state is called hypotension, and pressure that is consistently high is hypertension. Both have many causes which can range from mild to severe. Both may be of sudden onset or of long duration. Long term hypertension is a risk factor for many diseases, including heart disease, stroke and kidney failure. Long term hypertension is more common than long term hypotension in Western countries. Long term hypertension often goes undetected because of infrequent monitoring and the absence of symptoms. A heart rate sensor A heart rate monitor is a personal monitoring device that allows one to measure one's heart rate in real time or record the heart rate for later study. It is largely used by performers of various types of physical exercise.

F. BUZZER

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

VII. CONCLUSION

Internet of Things has many applications in different areas. IoT has been already designed for Body wireless sensor network (BWSN). It has been developed for health monitoring. This system presents the architecture of IoT and architecture of Remote health monitoring using IoT. There are some problems found in IoT and existing health monitoring. New technologies could help to minimize them by achieving the better quality as well as web based security concept. This system presents the problems and challenges that could come. New technologies and methodologies which are already used to improve applications of IoT have been discussed in this project. Raspberry Pi kit, Wi-Fi modules, temperature, blood pressure, pulse oximeter, heart beat rate sensors are currently in used for IoT.

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