We-Care: An IoT Based System Using ARM7Processor

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Abstract-In a world with accelerated population, there is an unassailable interest of creating solutions for the living assistant of elderly people. The Internet of Things is becoming an interesting conversation both at workplace and outside it and thus help in developing modern health care system for aging people. We-Care Healthcare system can benefit medical users by providing high-quality pervasive healthcare monitoring, the growth of this system depends on how we fully understand and manage the challenges, especially on during a medical emergency. In this paper, we propose a new secure and privacy-preserving opportunistic computing framework, called SPOC, to address this challenge. With the help of our proposed SPOC framework, each medical user who is in emergency can achieve the user-centric privacy access control to allow only those qualified helpers to participate in the opportunistic computing to assist in processing his great PHI data.

Index Terms-ARM7 Processor, Body Sensor Network, GSM Transmission, Bluetooth Module.

I. INTRODUCTION

The world is experiencing a unique technology transformation, evolving from isolated systems to ubiquitous Internet-enabled ‘things’ capable of producing and exchanging massive amounts of valuable data. This paradigm commonly referred as Internet of Things (IoT), is a new realism that is uplifting our everyday life. In the IoT era, day-to-day object are becoming smarter, and start to play a crucial role in surrounding infrastructure [1]. A significant domain where IoT promises to drive significant changes and cause a massive impact is in health care systems. Using real-time information from in-home sensors, the solution notifies family members of unforeseen changes in routines that may indicate an emergency [2]. The use of Information and Communication Technologies in healthcare scenarios have proven several benefits of continuously monitoring health, and the IoT pattern is enabling a more modified [3], preemptive and collective form of care, where patients are monitoring and managing their own health, and the responsibility for health care is shared between patients and the medical staff. The main goal of We-Care Health System is to provide a tool for safeguarding the health of their loved ones [4]. Tele monitoring systems face the problem of distributing medicine to the present growing population with chronic conditions while at the same time covering the extents of quality of care and new paradigms such as empowerment can be supported [5]. By periodically collecting patient’s health data and transferring them to specialists located in remote sites, patient’s health status regulation and response facility are possible. This type of system guarantees patient control while reducing costs [6]. So, to avoid hospital overflows we proposed architecture based on the mixture of ontology’s, rules, web services, and the autonomic
computing paradigm to manage data in home-based telemonitoring situations [7]. This proposed ontology-based solution outlines a flexible and scalable architecture in order to address trials presented in home-based telemonitoring scenarios and thus provide a means to integrate, unify, and transfer data supportive to both medical and technical managing tasks [8].

To circumvent the outcomes of high blood pressure i.e., damage to your arteries, especially those in the kidneys and eyes, We-Care provide warning services. Some of the visible parameters of temperature and blood pressure in most cases include migraine, anxiety, chest pain, vision changes, dizziness, nausea, etc. [9].

II. LITERATURE SURVEY

In this paper, we first detect some unique design requirements in the aspects of security and privacy preservation for communications between different devices in vehicular ad hoc networks. We then propose a secure and privacy-preserving protocol based on group signature and identity (ID)-based signature techniques[10]. We demonstrate that the proposed protocol cannot only guarantee the requirements of security and privacy but can also provide the desired traceability of each vehicle in the case where the ID of the sender must be revealed by the authority for any clash event [11]. It also comprises of several methods that can be used to monitor patients effectively and enhance the functionality of telemedicine systems and discuss how recent secure strategies can impede the outbreaks faced by wireless communications in healthcare systems and improve the security of mobile healthcare [12].

Previous investigator focuses on patient-centric skeleton and a set of mechanisms for data access control to PHIs stored in semi trusted servers. To achieve fine-grained and scalable data access control for PHIs, we leverage attribute-based encryption (ABE) techniques to encrypt each patient’s PHI file [13]. Unlike from previous works in secure data outsourcing, we focus on the multiple data owner scenario, and divide the users in the PHI system into multiple security domains that greatly reduces the key management complication for owners and users [14].

III. PROPOSED SYSTEM

A. System Layout

Proposed System allow data integration and management in an ontology-driven telemonitoring solution implemented in home-grown scenarios [15]. This is an innovative architecture that facilitates the integration of several management services at home sites using the same software engine. The proposed architecture includes three layers: the theoretical layer (the ontology) the communication and data layer and the emergency alert layer. Theoretical layer includes both the ontology and the definition of rules[16]. In particular, rules are used in combination with the ontology to provide personalized services. The second layer is based on Web Service (WS) technologies [17]. WSs have been successfully used in network management and in other works to exchange data modelled by ontology. Emergency alert layer is based on patient’s health data[18]. We-Care system software stack is shown in Figure 1.
Fig 1: We-Care system software stack

B. System Architecture

The overall architecture of the We-Care system is shown below. The architecture compromises of two sides i.e., Patient Side and Server Side. On the Patient side as shown in fig 2, Users are equipped with sensors. Through sensors, temperature and pressure readings are detected and captured in Smartphone via Bluetooth. The readings are then updated to server through Smartphone.

Fig 2: Patients Side Architecture

The Server Side (as shown in fig 3) deals with patient registration and updating data to server. The patient can get registered by filling in the details such as username, password, Email Id etc. Once registered the patient can monitor himself/herself. The BSN values after getting detected are monitored and analyzed. The result is either sent as update to server or sent to designated helper, if BSN values exceed its maximum value.

Fig 3 Server Side Architecture

C. We-Care Kit

We-Care Kit is shown in fig 4. It comprises of three modules: ARM7 Processor, Bluetooth Module and GSM Module.

Fig 4: We-Care Kit

D. Hardware Components

i) ARM7 Processor

ARM is a family of instruction set architectures for computer processors based on a reduced instruction set computing (RISC) architecture developed by
British company ARM Holdings. Below figure 5 shown ARM7 processor
A RISC-based computer design method means ARM processors require expressively fewer transistors than typical processors in normal computers. This approach decreases costs, heat, and power use. These are necessary traits for light, portable, battery-powered devices—including smartphones, laptops, tablet and notepad computers, and other systems. A simpler design enables more efficient multi-core CPUs and higher core counts at lower cost, offering higher processing power and enhanced energy efficiency for servers and supercomputers.

Fig 5: ARM7 Processor

✓ LPC2148:
LPC2148 is the commonly used IC from ARM-7 family. It is manufactured by Philips and it is pre-loaded with many integral peripherals making it more efficient and a consistent option for the beginners as well as high end application designer. Below fig 6 common LPC214x:

Fig6: LPC214x

1. Features of LPC214x
One or two (LPC2141/2 vs. LPC2144/6/8) 10-bit A/D converters offer a total of 6/14 analog inputs, with alteration times as low as 2.44 us per channel. Single 10-bit D/A converter offers variable analog output.
8 to 40 kB of on-chip static RAM and 32 to 512 kB of on-chip flash program memory.128-bit wide interface/accelerator allows high speed 60 MHz operation.
2. LPC2148 need minimum below listed hardware to work accurately.
   a) Power Supply
   b) Crystal Oscillator
   c) Reset Circuit
   d) RTC crystal oscillator (This is not necessary if you are not using RTC. However, this is considered as necessary requirement)
   e) UART (Universal Asynchronous Receiver Transmitter)

   a) Power Supply
LPC2148 works on 3.3 V power supply. LM 117 can be used for producing 3.3 V supply. However, basic peripherals like LCD, ULN 2003 (Motor Driver IC) etc. works on 5V. So, AC mains supply is converted into 5V and after that LM 117 is used to convert 5V into 3.3V.

   b) Crystal Oscillator
Oscillations (i.e., the heartbeat) are provided by means of a crystal and are essential for the system to work.

   c) Reset Circuit
Reset button is important in a system to avoid programming pitfalls and sometimes to automatically bring back the system to the initialization mode.

   d) RTC crystal oscillator
RTC stands for Real Time Clock. It offers clock for RTC operation.

   e) UART
LPC 2148 has built-in ISP which means we can program it in the system via serial communication on COM0. It also has COM1 for serial communication. MAX 232/233 IC must be used for voltage logic conversion

   ii) GSM Module
GSM Module as shown in fig 7 is used for sending SMSs and making calls using a SIM card. It is essentially a GSM Modem (like SIM 800) connected to a PCB with distinct types of output taken from the board viz. TTL Output (for Arduino, 8051 and other microcontrollers) and RS232 Output to interface directly with a PC. The board also has pins to take +5V or additional values of power and ground connections. High-end modules also have web surfing and email proficiencies. It consists of 4 connections: Vcc, Gnd and Rx and Tx for receiving and transmitting amid the module and a microcontroller. The SMS being sent will hold the address of the patient along with the last recorded signal values.

Fig 7: GSM Module

iii) Temperature Sensor(LM35)
It is a precision IC temperature sensor with its output relative to the temperature (in °C). The sensor circuitry is sealed and therefore it is not exposed to oxidation and other processes. With LM35, temperature can be measured more precisely than with a thermistor. It also holds low self-heating and does not cause more than 0.1°C temperature rise in still air. The operating temperature range is from -55°C to 150°C. The output voltage fluctuates by 10mV in response to every °C rise/fall in ambient temperature, i.e., its scale factor is 0.01V/°C. Below figure 8 show the pins of LM35.

Fig 8: LM35

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Function</th>
<th>Name</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Supply voltage; 5V (+35V to -2V)</td>
<td>Vcc</td>
</tr>
<tr>
<td>2</td>
<td>Output voltage (+6V to -1V)</td>
<td>Output</td>
</tr>
<tr>
<td>3</td>
<td>Ground (0V)</td>
<td>Ground</td>
</tr>
</tbody>
</table>

iv) Bluetooth Module
This module is used for sending data to smartphone via Bluetooth (fig 9).

Pairing of Bluetooth and smartphone:
- Search for new Bluetooth device from your mobile.
- You will find Bluetooth device with “Serial Adapter” name.
- Click on connect/pair device option; default pin for Serial Adapter is 1234.

v) Pressure Sensor
Pressure Sensor is a device that senses pressure and alters it into an electric signal where the amount depends upon the pressure applied. 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. Pressure sensors are used to control and monitor in thousands of days to day applications. Pressure sensors can also be used to indirectly measure other variables such as fluid/gas flow, speed, level, and altitude. Below fig 10 show a common pressure look like.

![Pressure Sensor](image)

**Fig 10: Pressure Sensor**

**IV. CONCLUSION AND FUTURE WORK**

This paper is designed to monitor and accumulate vital data on elderly people and to detect falls, as well as the absence of vital signs, triggering alerts in case of emergency conditions [19]. Stored data can later be used for analysis, which may benefit medical staff to trace the progress of their patients. It also exploits how to use opportunistic computing to attain high reliability of PHI process and transmission in emergency while reducing the privacy disclosure during the opportunistic computing [20]. Detailed security analysis shows that the proposed framework can accomplish the efficient user-centric privacy access control [21]. In addition, through wide-ranging performance evaluation, we have also established that the proposed framework can balance the high-intensive PHI process and transmission and minimizing the PHI privacy disclosure in emergency. Work in the near future will focus on the addition of new sensors in order to assemble data from other vital parameters such as the heart rate, blood sugar. This will be mostly helpful to determine the progress of patient’s medical condition as well as to find patterns that may indicates the growth of some disease [22].

**REFERENCES**


