Design and Development of Mobile Phone Based Healthcare System for Emergency Situation

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***Abstract*— With the wide unfold use of smart phones and the advances in wireless body sensor networks, mobile Healthcare, provides the environment for better health monitoring. This project proposes the mobile health care system for emergency situation. In this, smart phone resources are collected to process the health information of the patient located in the remote place with provision of privacy preserving. In order to provide individual health information and high reliability of health information process and transmission in Mobile Healthcare emergency, an efficient user-centric privacy access control in this framework is introduced, that is based on an attribute-based access control and a new privacy-preserving scalar product computation technique, and allows a medical user to decide who can participate in the opportunistic computing to assist in processing his individual health information data. With security analysis the proposed framework can efficiently achieve user-centric privacy access management in Mobile Healthcare emergency.**

***Keywords*— Body Sensor Network, Personal Health Information, Trusted Authority, Privacy Preserving Opportunistic Computing.**

I. INTRODUCTION

Rapid use of mobile technology has given rise to mobile healthcare. With mobile healthcare system monitoring patients is not restricted to homes or hospitals. Instead Medical users are monitored each and every moment with the wearable sensor body sensor networks and smart phones. In this Mobile Healthcare system the medical user's health information is gathered by the body sensor networks and transferred to the smart phones via Bluetooth. This in turn is transmitted to remote healthcare center via 3G networks. With this information provided by the medical user, the medical professionals assist them and save users lives. The Mobile Healthcare system benefits the aged people, who need to be monitored every now and then. The health information provided by the medical user should be reported to the health care centers within a fraction of time so as to have normal remote monitoring. In case of an emergency like heart attack, the person's health information such as heart rate, blood pressure, temperature needs to be updated within a short time before the dispatch of ambulance and medical professionals arrive. Advances in 3G and 4G have a huge impact on our day to day life. The use of smart phones and tablets has transformed communication, commerce, and entertainment, among other fields. Mobile technology is helping with chronic disease management, authorizing elderly and expectant mothers, reminding people to take medication at the proper time, extending service to underserved areas, and improving health outcomes and medical system efficiency. Here in this project we develop a application which helps hospital to monitor their patients remotely and provide necessary suggestions or possible treatment over recent technology i.e. ANDROID. In this paper, we propose a new secure and privacy preserving opportunistic computing framework. With the proposed this framework, each medical user in emergency can achieve the user-centric privacy access control to allow only those qualified helpers to participate in the opportunistic computing to balance the high-reliability of personal health information process and minimizing personal health information privacy disclosure in Mobile Healthcare emergency.

II. LITERATURE REVIEW

The pervasive healthcare applications [1] include pervasive health monitoring, intelligent emergency management system, pervasive healthcare data access, and ubiquitous mobile telemedicine. One major application in pervasive healthcare, termed comprehensive health monitoring is presented in significant details using wireless networking solutions of wireless LANs, adhoc wireless network and cellular/GSM/3G infrastructure oriented networks. Enabling secure service discovery in mobile healthcare enterprise networks [2] proposes a semantic-based secure discovery framework for mobile healthcare enterprise networks that exploits semantic metadata (profiles and policies) to allow flexible and secure service search/retrieval. As a key feature, our approach integrates access control functionalities within the discovery framework to provide users with filtered views on available services based on service access requirements and user security credentials. A Medical Implant Communication Service Band Wireless Body Sensor network [3], this paper presents a MICS (medical implant communication service) based body sensor network design and implementation for patient physiological data collection for health monitoring purposes. The MICS band offers the advantage of miniaturized electronic devices that can either be used as an implanted node or as an external node. In this work, a prototype sensor network is implemented by incorporating temperature and pulse rate sensors on nodes. Each developed sensor node has the capability of physiological data acquisition and local processing. The sensor node can also transmit data over the air to a remote central control unit (CCU) for further processing and storage. The developed system offers medical staff to obtain patient's physiological data on demand basis via the Internet. The wireless body area network [4] has emerged as a new technology for e-healthcare that allows the data of a patient's vital body parameters and movements to be collected by small wearable or implantable sensors and communicated using short-range wireless communication techniques. In this article we look into two important data security issues: secure and dependable

distributed data storage, and fine-grained distributed data access control for sensitive and private patient medical data. We discuss various practical issues that need to be taken into account while fulfilling the security and privacy requirements. Relevant solutions in sensor networks and WBANs are surveyed, and their applicability is analysed. The following papers describes implementation of security mechanism for mobile healthcare system [5] [6] and [7]. "Opportunistic Computing for Wireless Sensor Networks," Wireless sensor networks are moving from academia to real world scenarios. This will involve, in the near future, the design and production of hardware platforms characterized by low-cost and small form factor. As a consequence, the amount of resources available on a single node, i.e. computing power, storage, and energy, will be even more constrained than today. The proposed solution is based on the idea of partitioning the application code into a number of opportunistically cooperating modules. Each node contributes to the execution of the original application by running a subset of the application tasks and providing service to the neighbouring nodes [8]. "Findu: Privacy-Preserving Personal Profile Matching in Mobile Social Networks" [9] proposes the first privacy-preserving personal profile matching schemes for mobile social networks. In Findu, an initiating user can find from a group of users the one whose profile best matches with his/her, to limit the risk of privacy exposure, only necessary and minimal information about the private attributes of the participating users is exchanged. Several increasing levels of user privacy are defined, with decreasing amounts of exchanged profile information. Leveraging secure multi-party computation (SMC) techniques, we propose novel protocols that realize two of the user privacy levels, which can also be personalized by the users. We provide thorough security analysis and performance evaluation on our schemes, and show their advantages in both security and efficiency over state-of-the-art schemes.

III. PROPOSED WORK

Mobile Healthcare system framework aims at design and development of portable primarily based Healthcare system. We also provide the security and privacy issues, and develop a user-centric privacy access control of opportunistic computing in Mobile Healthcare emergency situation. This project mainly consists of 2 modules i.e. one module will be integrated in patient android mobile, which is associated with many sensors like heartbeat measurement and sugar level management. This module frequently activates sensors via android mobile and measures various parameters of individual patient such as blood sugar level, body temperature, heartbeat, blood pressure and sends these details to hospital server, where the second module gets installed. This module receives data and suggests patients accordingly over text or voice call via mobile. And in case of emergency it activates ambulance call to its nearest hospital. Thus, using android platform we increase the hospital service level being provided to patients. The below fig. 1 shows the mobile healthcare system.

Fig. 1 Mobile Healthcare system

IV. SYSTEM MODOLE

The preparation of an assembly of methods, procedures, or techniques united by regulated interaction to form an organized whole is termed as Systems design. It is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development. The design process translates the requirements into a representation of the software that can be assessed for quality before coding begins. Once the requirements have been collected and analysed, it is necessary to identify in detail how the system will be constructed to perform the necessary tasks. The system design transforms a logical representation of what a given system is required to be in to physical specification. Design starts with the system's requirement specifications and converts it into a physical reality during the development process. Various design features are followed to develop the system. The design specification describes the features of the system, the components or elements of the system and their visualization to end users.

Architecture diagram for mobile healthcare system gives the flow of communication between patients and the trusted authority as shown in fig 2. The following are the steps involved:

1. **Patient login:** Raw input data is read from the various body sensors networks present in the patient's android mobile and converted to fuzzy values. These values are then aggregated via Bluetooth. Body sensor measures various parameters like blood pressure, heartbeat, body temperature.

2. **Web Interface:** The data collected from the patients mobile are sent to the hospital server via 3G network. The information is read by the authorized professionals and provides necessary suggestion and prescriptions based on the patient's data.

3. **Patients Data:** Data collected by the various sensors are kept in the hospital database for trusted user and diagnose patient. The data is kept in two sections one is the normal readings and the other is critical readings.

4. **Service Provider:** The individual health information is processed in hospital server and related diagnoses are made by the particular medical professionals based on the readings. Services provided are in the form of text or voice. Patient's health information is stored in database and information is kept secure.

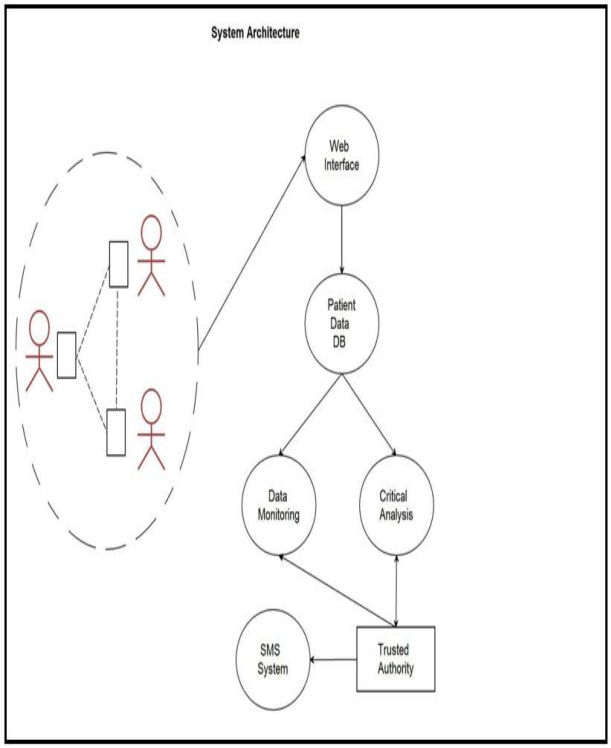

Fig. 2 System Architecture

Sequence diagram is a communication diagram that shows how processes operate with each other and in what order. It is a concept of a message sequence chart. Sequence diagram shows the time sequence object interaction. It shows the objects and classes involved in the process and the sequence of messages exchanged between the objects needed the carry out the functionality of the process. The following fig 3 shows the sequence diagram for our system. Initially android mobile collects the patient's data and that data is sent for encryption. Once the encryption is done, data is returned back to the patient's mobile. The patient can then send that information to the web server.

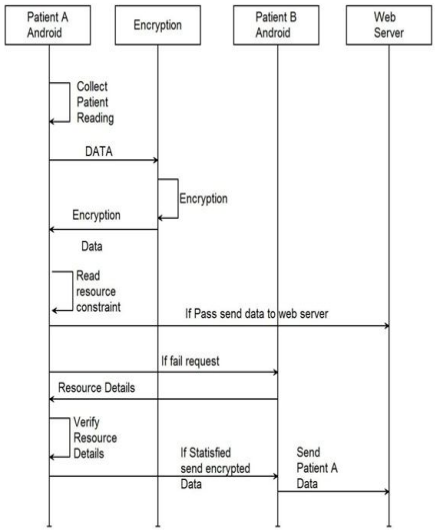

Fig. 3 Sequence Diagram for mobile healthcare

V. RESULT ANALSIS

After successful implementation, testing and deployment of the project the project's working in the user environment is recorded as the screen captures which gives the clear interpretation of results. The below screen shot gives the personal health information of the patient which includes pulse rate, blood sugar, temperature and blood pressure. Diagnoses are made based on these readings.

The deployed system consists of two main parts, J2EE and ANDROID part. The J2EE part has two separate login for admin and a trusted login. Admin is responsible for over-all management. Doctors and hospital officials can register through the trusted login. Admin will assign a key id and credentials for all the hospital officials been registered through the portal. The patients can register themselves through the android application been installed in there smart phone. The deployed system collects the various parameters of patients such as blood pressure, sugar level and heartbeat from the sensors that are integrated with the smart phone. These data are then forwarded to the server, where the data is been analysed and responds the patient status such as SERIOUS, NORMAL etc and also provides emergency service by forwarding the condition of patient to the concerned doctor or hospital official responsible for the patient. It also provides the provision for intimating the near-by ambulance in case of emergency. The objective of the system is to provide the emergency service for the patient in critical conditions by getting the various factors of patients through sensors deployed via smart-phone. The system is tested against various patients and doctors. The system

achieved an efficiency of delivering a message to doctor about patient details is quiet satisfactory.

Fig. 4 Screen Shot of Patients readings

These kinds of systems can be used by hospitals or government health sectors where they can monitor each individual patient condition periodically. The database of each patient is handled separately by the server, which then can allows the hospital officials to predict the condition of patient and then allows taking necessary precautions accordingly.

VI. CONCLUSION AND FUTURE WORK

In this paper, we have proposed a mobile phone based healthcare system to monitor the patients remotely and help them in case of emergency. Authorized users monitor patients continuously by reading the data of the patients every now and then. Patient locality and health details are only visible to authorized users. If the patient/client doesn't want to be monitored by the other person then they can disable the system. If the patient is in critical health condition or the patient feels abnormal then the authorized users can give them first aid by sending the SMS to nearby hospital to dispatch ambulance. In our future work, we intend to carry on real time implementation using sensors and smart phone-based testing to verify the effectiveness of the proposed framework. In addition, we will also exploit the security issues with internal attackers, where the internal attackers will not strictly follow the protocol.

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