Chapter 10
Advancements in Data Security and Privacy Techniques Used in IoT-Based Hospital Applications

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ABSTRACT

The risk of encountering new diseases is on the rise in medical centers globally. By employing advancements in medical sensors technology, new health monitoring programs are being developed for continuous monitoring of physiological parameters in patients. Since the stored medical data is personal health record of an individual, it requires delicate and secure handling. In wireless transmission networks, medical data is disposed of to avoid loss due to alteration, eavesdropping, etc. Hence, privacy and security of the medical data are the major considerations during wireless transfer through Medical Sensor Network of MSNs. This chapter delves upon understanding the working of a secure monitoring system wherein the data could be continuously observed with the support of MSNs. Process of sanctioning secure data to authorized users such as physician, clinician, or patient through the key provided to access the file are also explained. Comparative analysis of the encryption techniques such as paillier, RSA, and ELGamal has been included to make the reader aware in selecting a useful technique for a particular hospital application.

INTRODUCTION

A medical application necessitates treating patient care beyond the healthcare continuum. The healthcare continuum includes homecare, hospital, and long-term care facility. The medical devices which are connected through the Internet are referred as Internet of Things (IoT) applications. IoT applications have been widely investigated, forecasted for widespread future use even located on small scale. Any hospital that starts "smart beds" programme, can detect whether the hospital bed is occupied or not, analyses when the patient requires assistance to use the lavatory or move around and send desired information to the available nurse or nearest hospital staff for patient support (R. Babu, 2015). This smart bed has self-adjustable features, according to the appropriate patient load and nature of support required which can be provided without manual assistance. Some other areas where smart management is being used are home medication dispensers to automatically upload patient data to a cloud server when medication should be avoided or any other health symptoms which require immediate attention of the nursing staff or at home medical care personnel (Chouffani, 2016).

The definition of IoT given by IEEE is: "…a self-configured and adaptive system consisting of networks of sensors and smart objects whose purpose is to interconnect "all" things, including every day and industrial objects, in such a way as to make them intelligent, programmable and more capable of interacting with humans" (Internet of Things, 2018). The information provided by Gartner (Garthner, 2018) is that excluding cell phones, tablets, and computers, there are more than 8.5 billion devices connected through internet frequently which is a large number of devices connected online.

Nowadays, advancement in the proliferation and bioengineering of body sensor platforms has authorized the recognition of mobile health and pervasive systems. In this system, sensors are placed on the patient's body. These sensors record the data and send it to end user. Data transfer and collection must be private and secured because of using open network environment and mobile system considering patient safety aspects (Halperin, Heydt-Benjamin, Fu, Kohno, & Maisel, 2008) (Kumar & Lee., 2013). Some medical devices in present market are unguarded to attacks (Halperin, Heydt-Benjamin, Fu, Kohno, & Maisel, 2008) (Radclliffe., 2011). We contemplate a comprehensive system architecture where some

Figure 1. IoT healthcare network (IoThNet) issues
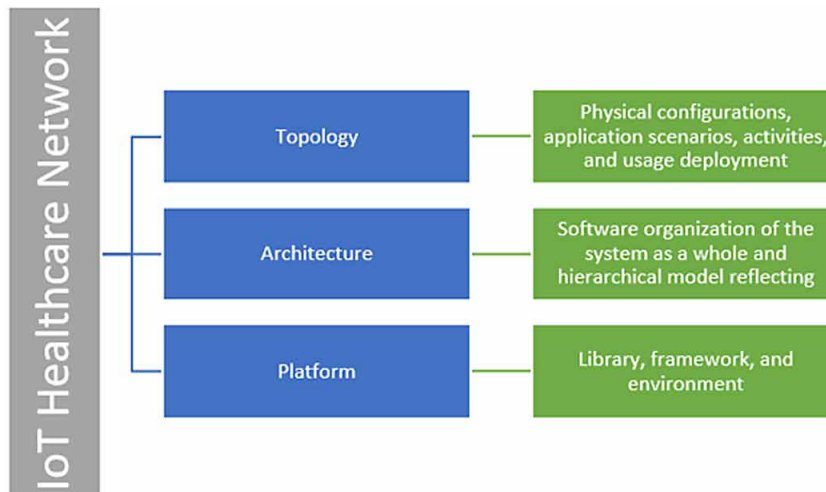
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