# Chapter 14
# A Trusted Ubiquitous Healthcare Monitoring System for Hospital Environment

**Durga Prasad**
*NMAM Institute of Technology, India*

**Niranjan N. Chiplunkar**
*NMAM Institute of Technology, India*

**K. Prabhakar Nayak**
*Manipal Institute of Technology, India*

## ABSTRACT

*Wireless Body Sensor Network with wearable and implantable body sensors have been grabbing lot of interests among the researchers and healthcare service providers. These sensors forward physiological data to the personnel at the hospital, doctor or caretaker anytime, anywhere; hence the name of the network is Ubiquitous health monitoring system. The technology has brought Internet of Things into this system making it to get connected to the cloud based internet. This has made the retrieval of information to the expert and thus improving the happiness of elderly people and patients suffering from chronic diseases. This paper focuses on creating an android based application for monitoring patients in hospital environment. The necessity of sharing hospital data to the experts around the globe has brought the necessity of trust in Health care systems. The data sharing in the IOT environment is secured. The environment is tested in real-time cloud environment. The proposed android application serves to be better architecture for hospital monitoring.*

## INTRODUCTION

Wireless Sensor Networks (WSN) are finding lot of scope in wide variety of applications but one of the prime fields where the crucial health related parameters are guided is Biomedical Engineering (Javaid,2012). So far, the technological advancements were not following the rapid growth of the need for

Health Monitoring Systems. However, in recent days, healthcare systems are attracting the researchers and service providers (Subhadeep, 2015). In recent days, heart related disorders have become most common amongst the people of all ages and many irregularities in the functioning of kidney, pancreas and diabetic related abnormalities which will lead to heart attacks. According to World Heart Federation report, 17.1 million lives are suffering from heart diseases such as stroke and cardiac arrest. About 82% of people who possess the above problems are in the developing country (www.world-heart-federation. org). The population of elderly people is rapidly growing needs a quality of life to be delivered with reducing the healthcare costs is an important issue in the field of healthcare. Wireless Body Sensor (or Area) Networks(WBSN/WBAN) system is found to be useful in post-operative wards for monitoring the health conditions of patients as well as in rehabilitation centres (Sana, 2009). Along with the quality of health of elderly people, chronically ill people, infants and small children are also benefitted (Hande, 2010).

In order to improvise the traditional models of telemonitoring, tele-medicine systems etc. are ubiquitous healthcare services are re-introduced in a different perspective introducing WBANs (Alexandros, 2010; Athanassios, 2012). Ubiquitous health monitoring system has enhanced its service to cloud based internet facility with the information available at anytime, anywhere. Body sensor nodes will forward the data after data acquisition and processing the sensed parameter. The type of topologies that are existing for these systems are star, mesh and peer to peer but the star topology is commonly preferred. It is a topology where the access point collects the data from various sensors. Various communication network technologies such as Bluetooth, ZigBee and IEEE 802.15.6 based are available. ZigBee is the most widely utilised standard in most of the commercial body sensors (Durga, 2013). But recent days Bluetooth low energy standard is arising to provide low power body centric applications. The new standard IEEE 802.15.6 is still in the infancy stage; performance evaluation has been carried out by researchers (Kyung, 2010; Byong Hoon, 2012).

The access point is an Internet of Things (IoT) based system where in the information received from various body sensors are uploaded to the internet Cloud (Debasis, 2011). Cloud computing paradigm provides the necessary technology for making this possible. Cloud based internet makes the retrieval of the data at any point of time.

## WBAN as Ubiquitous Health Monitoring System

Wireless Body Area Networks (WBAN) comprises of body sensor nodes positioned at certain area on the body, measuring specific parameters and forwards the information to a common hub called access point (Shah, 2013; Ian, 2013). There are basically two types of sensor network systems; one is wearable systems wherein the body sensor nodes are on or around the body of a person. Implantable sensors form the other type of classification wherein the nodes are implanted with the help of a small surgery. Hence, sensor based health monitoring systems may comprise of various types of miniature sized sensors, wearable or even implantable (Miaoxin, 2013).

Ubiquitous wearable health-monitoring system and biosensor industries have grabed sufficient concentration of researchers from the past decade. Researchers from the field of Computer, Information and networking, along with the professionals of medical fields are working together in order to execute the broad vision of smart healthcare possible into reality (Miaoxin, 2013).

Figure 1(a) and (b) shows an UHM system with the main components and various standards of UHM systems. Various blocks of the sensor nodes are powered up by a battery provided with the device. It is

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