

# A REVIEW PAPER ON 802.15.6 IEEE STANDARD

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### Abstract

In today's world, wireless communication is a must in everyday life. It is also a trending field of research for implementing innovative ideas. Such an innovation is the develop of Wireless Body Area Networks(WBAN) which is an extension of Wireless Sensor Networks(WSN). The technical term for WBAN in terms of IEEE standards is 802.15.6. The main area of work for this kind of networks is implementing them in the field of medicine for health care monitoring and reporting. Implementation of such techniques can decrease the medical response time and increase the mortality rate of the patients. There are numerous challenges which are to be dealt with when designing such applications. Existing articles and writings of various authors are described in this paper.

### I. Introduction

Wireless Sensor Networks (WSNs) is a rapid developing field in terms of medical research. They are used to monitor particular parameters in multiple applications like conditions monitoring, environment monitoring in mobile situations and smart homes. These divided sensors are distributed in identifying an area to screen field. WBAN is new growing sub-field of WSN. One of the main purpose of WBANs is remote health monitoring. Sensors are placed in different positions depending on the requirement to screen required data.

Using WBAN need for a patient to go to hospital decreases and the mortality rate also increases significantly. With the help of WBAN discovery, patients are kept at home for more time. Sensors continuously sense data and deliver to the remedial server. In WBANs, sensor cores are run with limited strength source. It is expected to employ the least energy for interacting knowledge from sensor cores to sink. One of the crucial difficulties in WBAN is to strengthen the batteries. A rich directing assembly is needed to overcome this issue of growing energy requirements. Various vitality skilled directing rules are

suggested in WSN discovery. There is a significant difference between WSN and WBAN in terms of deployment, data rate, latency, mobility. It is frustrating to port WSN steering organizations to WBAN. With the development of the network protocols, architecture and deployment methods there will be a significant improvement in the throughput and efficiency of WBAN. Both these sensors had the important information regarding the patient and needed the slightest contraction, consistent high grade, and sustained life this way; these sensors dependably send their data exclusively to sink. Various sensors take following their supervisor hub and transmit their data to sink for forwarder hub. It saves vitality of stations and system operates for more period.

A standard wireless radio transmission happens in 4 ways namely transmit, receive, idle, sleep. Depending on the requirement one of the four methods is used. For instance, if we need to transmit data only in times of an emergency the hub will be in either sleep or idle for the most of the time. If we need to transmit data continuously then the hub will be transmitting data for the most of the time. Notwithstanding low-control material outline, energy-rich remote structure requires low energy procedures all over the entire system assembly stack.

The best way to understand the working of Wireless Body Area Networks is shown in fig 1.1, this is a case of a patient who is wearing

a remote sensor which detects the required data and sends it to mobile phone or a PDA. Which in turn sends the data to the remedial server through internet. Depending on the device used and its purpose necessary actions are taken by remedial server such as informing the appropriate department in case of an emergency or recording the data for further use. A similar device which was used previously was "Life Alert Emergency Response System" where on a push of a button you can state your emergency and appropriate help will be there for the victim.

Wireless Body Area Networks need to differentiate between critical data and non critical data for transmission, So priority based network routing protocols must be implemented to achieve maximum efficiency. There must also be necessary error check protocols since the data might be sensitive and even a small error can cause a disaster. Transmission delay also plays a very important role since if there is delay in transmission of data which is critical. Another issue is failure of the node where we need a backup path for the data to be transmitted. For instance a pacemaker which transmits data to a remedial server, if there is an error or a transmission delay or a node failure it might cost the life of a person. Taking all these into consideration while designing a WBAN for medical purposes.

The basic architecture is divided into 3 tiers namely Intra-BAN, Inter-Ban, Beyond- BAN

respectively. Which deal with communication between the sensor, server, medical correspondence respectively.

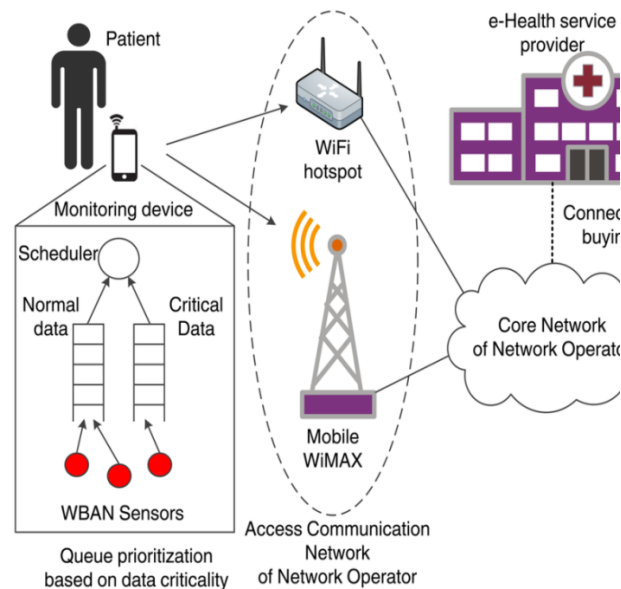


Figure 1.1 Three Tier Architecture of WBAN

## II.APPLICATIONS OF WBANS

WBAN has a wide variety of applications starting from virtual doctor to live remote monitoring of the patients vital signs. The main objective of WBAN is efficiency of the data transfer without loss of data. Some of its widely used applications include medical applications, assisted living, bio feedback.

### Medical Applications

One of the main goals of WBAN in the field of medicine is providing professional health care without going to hospital by means of cost effective, scalable, data-driven techniques. From the surveys provided by many organizations, there were 35 million people who are 65 years and above in 2000 but by

the year 2030 the number might go to 71 million people which means it is more than double. Which in turn means more medical attention is need for increasing the mortality rate. As of now some of the most common WBAN used include ECG(Electrocardiogram), EMG (Electromyography), EEG(Electroencephalography) which monitor data related to heart, muscle, brain respectively. There are certain constrains while implementing such technologies such as memory, energy, computation, communication capabilities. The most common way of attaching a sensor to a body is my external attachment in case of stress analysis for athletes or by internal fixtures such as pacemaker which transmits data to medical server in cases of emergency. The common way of transmitting data is sending the recoded or live feed from the wireless sensor to a mobile device such as a phone or PDA and sending the data to medical server through internet or cell transmission for appropriate action.

### Personal Health Monitoring

Personal healthcare monitoring is now possible using WBAN. Sensors are places on or inside human body to record and monitor personal health data which may include blood pressure, sugar levels, ECG,EMG, EEG which can be seen on your personal device and take necessary actions. Physical activities can also be monitored by using WBAN by checking the amount of calories burnt, this can be

implemented by placing a WBAN on the wrist of the subject to monitor is pulse and report it.

### **Smart Homes**

As people age the number of times they have to visit a hospital increases due to increase in the problems related to health due to age. By placing WBAN sensors we can monitor the changes in surroundings of the people in old age homes and retirement homes at affordable prices when compared to going to hospital which is costly and lengthy process. Using this method if there are any changes in parameters in environment they can be immediately reported to appropriate medical services for immediate action.

### **III. Literature Review**

Reza Khalilian et al.[2016] "An Effective Approach To Improve WBAN Security," This writing presents another approach which develops the defense issues of WBANs. This analysis intends to minimize the necessary memory handle parcels multifaceted environment, constraining cradle over the stream and restraining the current harm by employing high switching pace of data among hubs.

Anurag Tiwari et al.[2016] "Security plus Privacy in E-Healthcare monitoring by WBAN," are to a notable standard key for those individuals who are undergoing diseases like heart-related illnesses, reasonably extreme subjects, pregnant

woman, and so forward, they need constant attention. Since because of the network linked all of these practices, they demand higher security. Thus the writing presents a security and protection associated problems.

Muhammad Moid Sahndhu et al. [2015] "BEC: A safe routing protocol for equivalent energy using in Wireless Body Area Networks" WBANs are becoming evolving interest on record of their suitability for the wide type of remedial and non-remedial purposes. Use of WBAN in the field of medicine, requires more energy efficient devices, which means devices which last longer than the conventional devices. This writing suggests that the WBAN can transfer the data not only specifically to a particular PDA or mobile device they can send the data to sink using the nearest mobile device available in times of emergency or regular use. Using this technique studies have showed that there was a increase of 49% in device life time.

Ilkyu Ha [2015] "Advancements and Research Trends in Wireless Body Area Network for Healthcare: A Orderly Literature Review" Here writing stages that WBAN has environmental characteristics is not the equivalent as that of subsisting WSNs. The improvements that attached to existing WSNs is not attached to WBAN because distant sensors in the BAN are attached to multiple parts of the human build also it has a completely another system

conditions contrasted and endured separated sensor systems

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S. Yousaf [2014] "CEMob: Critical Data Transmission in Emergency with Mobility Support in WBANs" Here the article states, by using old ways such as ATTEMPT and REATTEMPT energy consumption is large which is bad for WBANs, so the proposed idea is transmitting the data only when certain conditions are met, else no transmission is done just monitoring is done. Which can help save a lot of energy in cells and increase the lifetime of the device there by decreasing the need to change or replace the battery.

Cheistian Henry Wijaya Oey [2013] "A Survey on Temperature-Aware Routing Protocols in Wireless Body Sensor Networks" this paper mainly focus on the effects of temperature on the body from the different devices placed on the body and the negative effects of the temperature changes on the body. Paper also proposes the necessary temperature aware routing protocols such as TARA (Thermal-Aware Routing Algorithm), LTR (Least Temperature Routing), ALTR (Adaptive Least Temperature Routing) for the efficient transmission of data without any loss

#### **IV. Challenges faced by WBAN in medical field:**

When developing or designing any device or an instrument related to human body using wireless networks there are a certain set of

conditions to be met by the design team, such as IEEE standards, ISO Standard, Bluetooth SIG and soon. Furthermore there various challenges which are to be resolved such as energy usage, memory, computation, communication capabilities, mobile communication, movement of body, heat and radiation emitted by antenna, size of device, working in immersible environments, etc.

**Energy Usage:** when developing such devices energy consumption plays a vital role. Devices must run for prolonged periods of time without replacing the battery. This can be achieved by implementing various protocols and implementing different strategies depending on the requirement.

**Size of Device:** When dealing with sensitive body areas the size of device is important since reducing the size of device can impact its computational power and many other vital factors.

**Memory:** The memory of the device has a main points. One being if the size of the memory is decreased it needs to transmit the data continuously. Another is, if the memory is increased the size of the device also increases accordingly.

**Communication Capabilities:** The data which is being transmitted or received must have 100% integrity. There must be no scope of data loss and no delay in transmission. If

any of these happen it might have an impact on the availability of medical services to a patient in critical condition.

**Movement of Body:** Devices placed on or inside body must be able to transmit the data without data loss irrespective of the position and movement of the body.

**Heat and Radiation Emitted by Antenna:** Studies have shown that a 0.1 degree change in temperature of the body has many effects (positive or negative) on the body. Since antennas and nodes tend to heat up when used there must be necessary precautions and required materials must be used.

**Working in Immersible environments:** Devices which are planted inside the body or in the blood stream must not be damaged or cause negative effects on the body. Suitable material must be chosen for the manufacture of such devices.

## V. Conclusion & Future Scope

This survey paper highlights the requirements and the necessary features related to design and implementation of the WBANs or 802.15.6 in terms of networking. The basic architecture of the WBAN is split into 3 tiers namely Intra-BAN communication (between body sensors and master node), Inter-BAN Communications (between master node and server), Beyond-BAN communication (between server and medical correspondent).

When looking at the future scope, we can increase the efficiency of data communication by implementing cloud platform in this architecture thereby creating a backup of data and resolving the issues related to memory and computation.

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