

Security and Privacy Related to Different Type of Wireless Sensors and Body: Overview

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Abstract - A Wireless Body Area network (WBANs) is an emerging paradigm that include several type of radio devices like medical sensor and high storage and energy like mobile and laptop. Generally, in WBAN, type of sensor sense data, which related to the physiological body and then these data change from analog to digital transformer. The digital transformer collected and will be check to how these data can be transform from high energy device like mobile to another mobile or platform. In this paper, we are talking about how data gather and available for different users in shared platform. Additionally, briefly talking about different paradigms in WBANs and related technology.

Key Words: Wireless Body Area Networks (WBAs), Body Area Networks (BANs), Sensor, energy, Wireless Sensor Networks (WSNs), Cloud Computing, Wireless technology, Security and privacy.

1. INTRODUCTION

A Wireless Body Area network is an emerging paradigm [1] that include several type of radio devices like medical sensor and high storage and energy like mobile and laptop [2, 3]. Generally, in WBAN, type of sensor sense data, which related to the physiological body and then these data change from analog to digital transformer. The digital transformer collected and will be check to how these data can be transform from high energy device like mobile to another mobile or platform [4, 5].

These data can be reserved over different platform such as mobiles, sensors, databases in home, universities, shops, hospitals, cloud etc. [6]. The data will be process on databases and record based on data quality and what is usability of these data. In high level, there are several platform that work is data on cloud [7]. Each of these platform processes with different unit based on their quality and usability. Security and privacy is another big issue that must be consider and tackle it by useful [8].

2. Background

In high level, there are several security and privacy model has been proposed and investigated in cryptography and classic

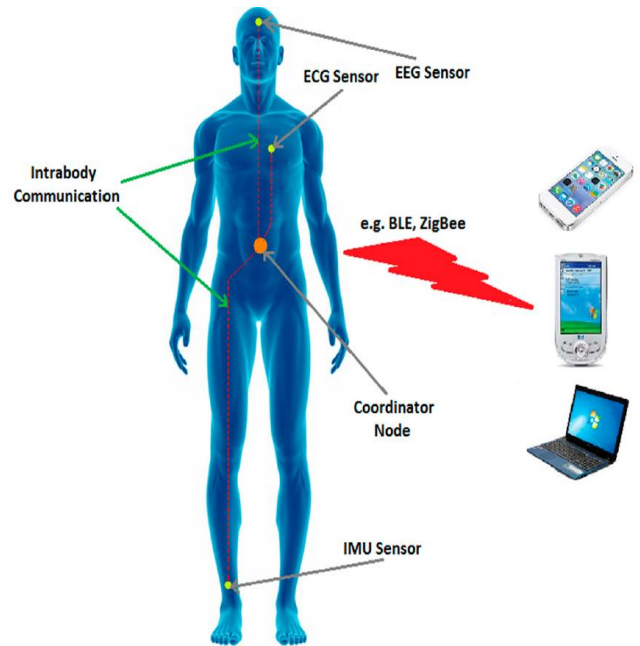


Figure 1: Body model

cryptography. There are several cryptography scheme such as public key generation, Diffie-hellman (DH) key exchange, ECDH and signature [9-12]. However, these techniques are very powerful to secure data over different platform, but there several issue using the techniques that we should think about them before deploy a model. Using a number of energy is one of big issue that is very important in these models as sensor need to live more than normal time and we could not change them on body [13-18]. A normal people need to pay lots of money for changing and new sensor and also they have to different surgery for this [19].

Storage is another big issue that must be consider before using these models. Usually, Cryptography model required a lot of storage as their size is very large. As a result, we have to propose light model with using 128-advance encryption and decryption model [20].

Classical model is very famous model where using to change the data in this system but the most issue is that there are not secure enough and can be modified and altered by different attacks. These attacks can be based on wireless radio like eavesdropping. By this attack, eavesdropper can listen the channel and inject a number of data into channel or modify it. This is very dangers as a number of sensor and mobile devices in WBAN and BAN using close range communication.

As a result, all of these devices can be in red situation where this can lead to another device and platform while data going from device to device figure 2.

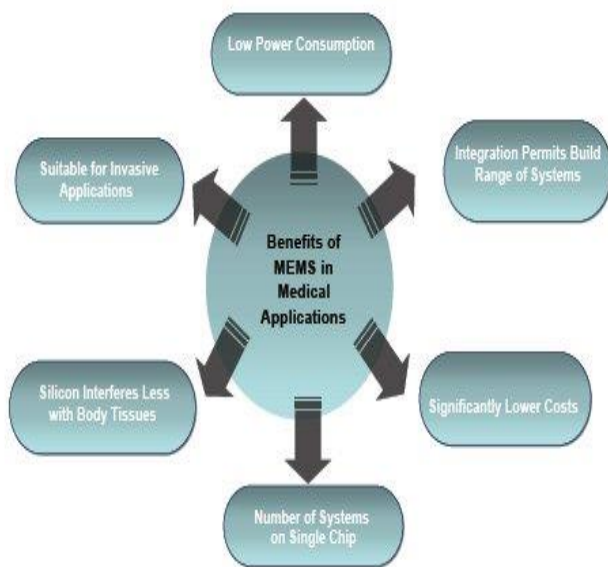


Figure 1: benefit of Medical Application

Productive attack such manufacture attack are also usual as BAS and related model using different type of devices [21]. These devices manufactured and product by different company. These companies using their security model to encrypt their data. We could not perform our security on some of these devices as they have unique security protocol such as password system. Additionally, some product can be modified but the problem is they will released our protocol to the company [22].

The biggest challenging is databases such as cloud. As we talked at the first of paper, there are a big number of databases over cloud computing where the data will be store and in high level, the data will be process to be available for different users. These users can be for different area as they are using current devices such as five generation mobile. These devices enable users to work easy, download, and upload data if they want.

The last issue is who want to use these data and how these data must be ready for them. There are several proposed model to how these data store on their databases and how these data must be encrypted over different databases. Also, it's important to know who want to use these data. As talked before, there are several databases model like iCloud but they have different wat to record data on their databases where make it very difficult for another databases [23]. In addition, they using different techniques to securer their domain, which must be, sink with another one in different time.

3. Wireless Body Area Network

As talked earlier, WBANs includes several type of radio devices like medical sensor and high storage and energy like mobile and laptop [24, 25]. The communication in in real area divided to different part as figured in 1. These communications are very important as different type of security and privacy apply on them. The model based on these is fully different and we have to be careful about what and how we are going to implement [26-28].

The communication in WBANs includes the data between devices attached on and also locate in body. This can be too many sensor (ECG, ECC, Brow, Blood, Temperature, etc.) Figure 2. As I talk before, these sensor using different technology and it very important how they are connect to another sensor. All of these sensor and related device here must be connect to another important hub [29]. The reason is to all of data absorb and send to last point. Please look at application in this part over the real scenarios figure 3.

The next one called far location of sensor like any big devices. These devices can be like many computer, many laptop, many mobiles like iPhone and Android and many devices that they can work for long time and has a big power to compute any type of data. The good think is that these devices working in order to collect data as they want and like and they can keep all of these data for ling time, as they would like. These is very good and enough to how run and process [30].

The biggest and hardest problem and issue is the other type of network. The issue is different type of devices such as any type of server in google, apple, companies, factories, education need to work and stores data [31].

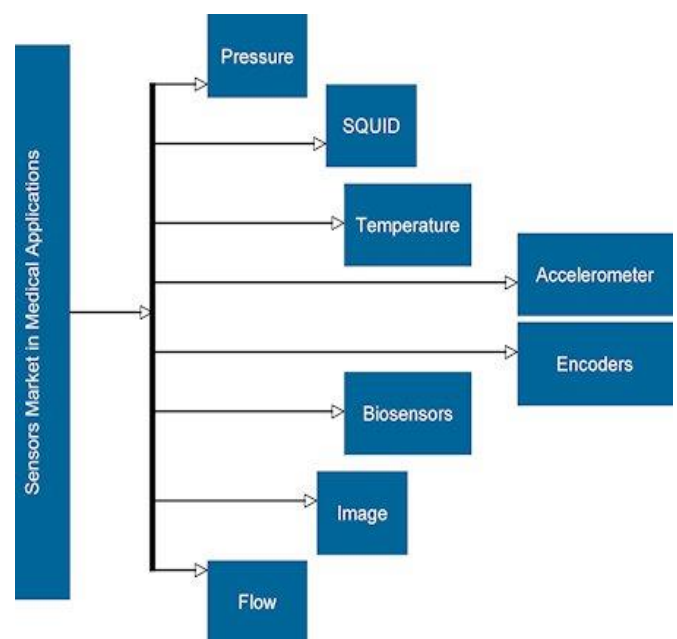


Figure 3: Type and located Sensor

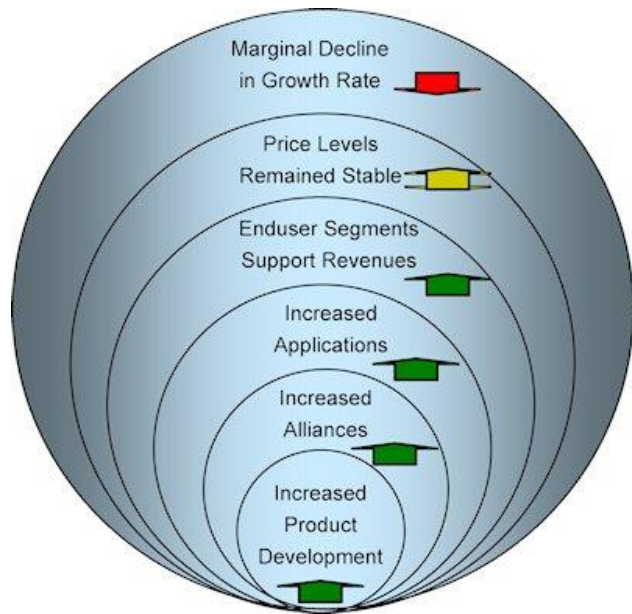


Figure 4: Medical Application places

The structure of WBANs network is in figure 4. Since 1950, there are many people proposed models to see how they can secure this part. Unfortunately, the issue is how they can control this big data and their devices and relevant communication [32]. As see in figure 4, the data collected from body and it is not easy to push them in different location [33].

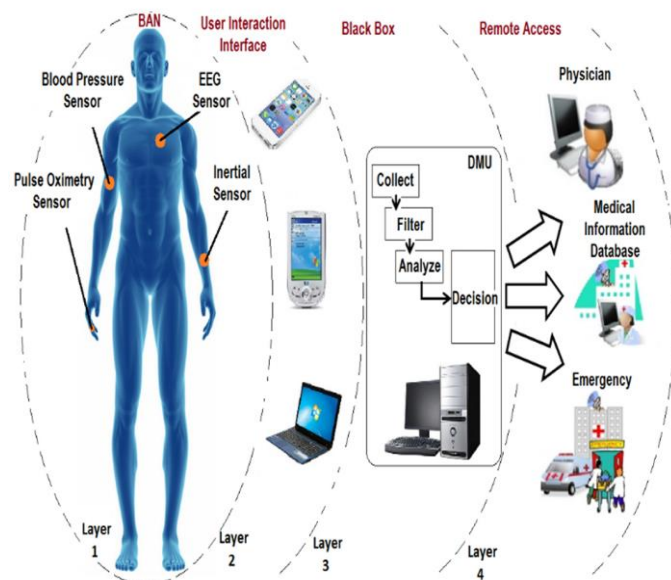


Figure 5: data link

Regard to all of data communication and technologies discussed above and mentioned, the communication and their frequency summaries in Table 1,2, 3,4 and 5.

Table 1: Summary of data Link

| Characteristic | RS-485 | CAN | Ethernet |
|-------------------------------|-------------|-------------|----------------------|
| Network Topology | Bus | Bus | Star |
| Theoretical Max Bandwidth | 35 Mbit/s | 1 Mbit/s | 10 Mbit/s–100 Mbit/s |
| Practical Bandwidth | 1 Mbit/s | 1 Mbit/s | 2 Mbit/s |
| Stack Size (Use of resources) | Light | Light Plus | Heavy |
| Management of Cabling | Complicated | Complicated | Straightforward |

Table 2: Summary of Communication

| Characteristic | ZIGBEE | Bluetooth Low Energy |
|---|---|--|
| Multiple Access Scheme | CSMA-CA, slotted CSMA-CA | FDMA, TDMA |
| Maximum Packet Size | 133 Bytes | 47 Bytes |
| Protocol Efficiency (ratio of payload to total packet length) | 102/133 = 0.76 (76 Percent Efficient) | 31/47 = 0.66 (66 Percent Efficient) |
| Error Control Method | ARQ, FEC | ARQ, FEC |
| CRC Length | 2 Bytes | 2 Bytes |
| Latency | <16 ms (beacon-centric network) | <3 ms |
| Identifiers | 16-bit short address 64-bit extended address | 48-bit public device address 48-bit random device address |

Table 3: Summary of topology

| Characteristic | ZIGBEE | Bluetooth Low Energy |
|-----------------------|---------------------------------|----------------------|
| Network Topology | P2P, Star, Cluster Tree, Mesh | P2P, Star |
| Single-hop/Multi-hop | Multi-hop | Single-hop |
| Nodes/ Active Slaves | >65,000 | Unlimited |
| Device Types | Coordinator, Router, End Device | Master, Slave |
| Networking Technology | PAN | PAN |

Table 4: Physical summary

| Characteristic | ZIGBEE | Bluetooth Low Energy |
|-----------------------------|--|---|
| Frequency Band | 2400, 868, 915 MHz | 2400 MHz |
| Bit Rate | 20 Kb/s (868 MHz), 40 Kb/s (915 MHz), 250 Kb/s (2400 MHz) | 1 Mb/s |
| Modulation Type | BPSK, O-QPSK | GFSK |
| Spread Spectrum Technology | DSSS | FHSS |
| Nominal TX Power | -32 dBm to 0 dBm | -20 dBm to 10 dBm |
| Receiver Sensitivity | -85 dBm | -70 dBm |
| Number of Physical Channels | 27 channels: 16 channels in the 2450 MHz, 10 channels in the 915 MHz, 1 channel in the 868 MHz | 40 channels in FDMA: 3 advertising channels, 37 data channels |
| Channel Bandwidth | 2 MHz (5 MHz wasteful spectrum) | 2 MHz (no wasteful spectrum) |

3. Discussion

Since 1998, there are several proposed model, technical report, and industry publication tried to address the issues related serous data between any type of domain such as university, industry, home, shopping mall, factories, companies, cities, country and even between countries. Unfortunately, these model are not enough practical and need to work more to cover what data going from point to point in different way.

3. CONCLUSIONS

A Wireless Body Area network (WBANs) is an emerging paradigm that include several type of radio devices like medical sensor and high storage and energy like mobile and laptop. Generally, in WBAN, type of sensor sense data, which related to the physiological body and then these data change from analog to digital transformer.

In this paper, we are talked about how data gather and available for different users in shared area such as home and university. Additionally, briefly talked about different paradigms in WBANs and related technology and how we can address the current issues. This paper can be used for future research in both industry and academic.

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