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BLOCKCHAIN BASED SOLDIER HEALTH MONITORING & TRACKING SYSTEM

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***Abstract*: - The paper reports an Internet of Thing (IoT) based health monitoring and tracking system for soldiers. The proposed system can be mounted on the soldier's body to track their health status and current location using GPS. This information will be transmitted to the control room through IoT. The proposed system comprises of tiny wearable physiological equipment's, sensors, transmission modules. Hence, with the use of the proposed equipment, it is possible to implement a low cost mechanism to protect the valuable human life on the battlefield.**

A network composed of lightweight devices such as IoT has problems due to limited resources such as lack of storage space and low computing performance. These issues pose significant challenges in the application of robust security technologies, which reduces network security performance. The blockchain with strong security is a suitable technology to solve IoT problems with weak security. As a result, various researches are being carried out to increase security, lightness, and efficiency of the IoT network by applying blockchain to IoT.

Keywords: - *Raspberry pi3 model B+, Pulse rate sensor, BMP sensor Web application.*

I INTRODUCTION

Indian armed forces are the third largest standing army in the world with 1,200,255 active troops and 990,960 reserve troops. The army suffers a lot due to the unavailability of information of injuries to its personnel which may increase the death/ permanent disability toll. It is observed that the causalities are caused due to injuries rather than the direct assaults in the battlefield. These numbers can be minimized if the real-time information is available at the control room about the health and location of the soldier. There are many issues regarding the safety of soldiers. Knowledge of current location of soldiers, inability of continuous communication with the control room during the operations, lack of immediate medical attention and operations under different geographical conditions are the few prominent safety issues.

In the last decades, technologies such as cable based system, RF transceiver, walkie-talkie, Zig Bee and GSM based tracking systems were most dominantly used methodologies for the tracking of soldiers life on the battlefield. However, all these technologies suffered from one or more reasons like high installation cost, loss of signal, high noise as well as the bulky nature. Hence, a portable, wireless low cost tracking system with high reliability is the need of hour for the protection of valuable life of the soldiers on the battlefields. Further, the said mechanism must also be real-time in nature so that the immediate and effective rescue operations can be initiated. The proposed system is based on IoT concept. The proposed system will be helpful in the real-time continuous monitoring of soldier's health parameters and location.

II LITERATURE REVIEW

1. Health Monitoring and Tracking of Soldier Using GPS,'

Many efforts were reported by different academicians and researchers to track the location of the soldiers' along with their health condition on the battlefield. PavanKumar*et.al.* reported a GPS based technology to monitor the soldier health parameters and location tracking using GPS. AT89C51 microcontroller was used to collect health parameters and then these parameters are transferred through GSM to the base unit.

2. Soldier Health and Position Tracking System

Soldier's tracking is done using GPS and GSM is used to provide wireless communication system. For monitoring the health parameters of soldier we are using bio medical sensors such as temperature sensor and heart beat sensor. An oxygen level sensor is used to monitor atmospheric oxygen so if there are any climatic changes the soldiers will be equipped accordingly.

3. IOT Based Soldier Navigation and Health Monitoring System

This system uses GPS module and wireless body area sensor network to record all parameters in real time and send it to the base station. The different types of sensors used in this

system are the humidity sensor, temperature sensor and pulse sensor which help in deciding the health status of that particular army official. This is a wearable technology which is the most important factor of this project.

4. GPS Based Soldier Tracking And Health Indication System

In this paper we focus on tracking the location of soldier from GPS, which is useful for control room station to know the exact location of soldier and accordingly they will guide them. Also High speed, short-range, soldier-to-soldier wireless communications to relay information on situational awareness, GPS navigation, Bio-medical sensors, Wireless communication.

5. Health monitoring and tracking system for soldiers using Internet of Things (IoT

The paper reports an Internet of Thing (IoT) based health monitoring and tracking system for soldiers. The proposed system can be mounted on the soldier's body to track their health status and current location using GPS. Hence, with the use of the proposed equipment, it is possible to implement a low cost mechanism to protect the valuable human life on the battlefield.

6. GPS and IoT Based Soldier Tracking & Health Indication System

Continuous Communication is Possible: Soldiers can communicate anywhere using RF,DS-SS,FH-SS which can help soldier to communicate among their squad members whenever in need.

• Less complex circuit and power consumption. Use of ARM processor and low power requiring peripherals reduce overall power usage of system. Modules used are smaller in size and also lightweight so that they can be carried around.

7. An IOT based patient monitoring system using Raspberry Pi

A *Raspberry Pi* based approach was proposed in to monitor the body temperature, respiration, movements and heartbeat of the patient. The collected information were then added to the cloud-based websites with the help of IoT.

8. Real time tracking and health monitoring of soldier using ZigBee technology

ZigBee and GSM wireless technology were used to send current update of patients to the doctor and then doctors can take immediate action against that patient. A wireless body area sensor networks (WBASNs) technology using ZigBee was reported in to continuously monitor the human health and its location.

9. Efficient key management scheme for health blockchain

The author of deals with the combination of health care IoT and blockchain used in the efficient key management. Due to its weak security, current health care IoT needs to be helped by external devices such as Smartphones. By using blockchain to enhance security, healthcare IoT has increased the reliability of the data it generates. In this paper, hospitals act as directors of blockchain and use two block chains, A chain and B chain. Chain A stores only verified data that has been consensus process to for validation between hospitals. Conversely, the chain B stores invalid data that has been omitted from validation, which is to be stored considering that the data generated by the sensor is personal information, even if it is invalid. The IoT sensors act as a minor in the blockchain system and serve to transfer data to the ledger node. Healthcare IoT devices have become highly secure devices with blockchain applied to simple sensor nodes, providing high scalability in the medical field. This demonstrated that IoT can be expanded to other tasks through the introduction of blockchain even in areas where IoT is currently applied.

III COMPONENTS

1. Pulse Sensor

Pulse Sensor is a well-designed plug-and-play heart-rate sensor. It can be used by students, artists, athletes, makers, and game & mobile developers who want to easily incorporate live heart rate data into their projects. The sensor clips onto a fingertip or earlobe and plugs right into circuit with some jumper cables. It also include open source monitoring app that graphs your pulse in real time.

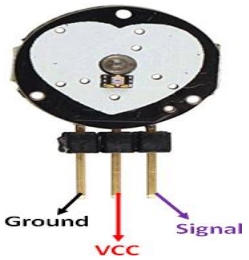

Figure 1: Pulse sensor

Pin Number	Pin Name	Wire Color	Description
1	Ground	Black	Connected to the ground of the system
2	VCC	Red	Connect to +5V or +3.3V supply voltage
3	Signal	Purple	Pulsating output signal.

Table 1: Pin description of pulse sensor

Features:

- Biometric Pulse Rate or Heart Rate detecting sensor
- Plug and Play type sensor
- Operating Voltage: +5V or +3.3V
- Current Consumption: 4mA
- Inbuilt Amplification and Noise cancellation circuit.
- Diameter: 0.625”
- Thickness: 0.125” Thick

Warning: This sensor is not medical or FDA approved. It is purely intended for hobby projects/demos and should not be use for health critical applications.

2. BMP Sensor

The BMP180 is the function compatible successor of the BMP085, a new generation of high precision digital pressure sensors for consumer applications. The ultra-low power, low voltage electronics of the BMP180 is optimized for use in mobile phones, PDAs, GPS navigation devices and outdoor equipment. With a low altitude noise of merely 0.25m at fast conversion time, the BMP180 offers superior performance.

The BMP180 is designed to be connected directly to a microcontroller of a mobile device via the I2Cbus. The pressure and temperature data has to be compensated by the calibration data of theE2PROM of the BMP180.The BMP180 consists of a piezo-resistive sensor, an analog to digital converter and a control unit with E2PROM and a serial I2C interface. The BMP180 delivers the uncompensated value of pressure and temperature. The E2PROM has stored 176 bit of individual calibration data. This is used to compensate offset, temperature dependence and other parameters of the sensor.

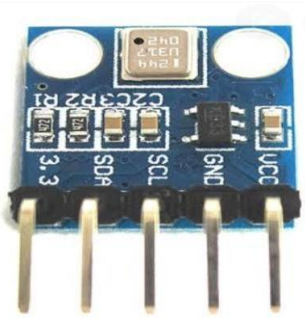

Figure2:BMP180 Sensor

3.Raspberry pi3 B+ model

Raspberry Pi is a credit card sized computer manufactured and designed in the United Kingdom by the Raspberry Pi foundation with the intention of teaching basic computer science to school students and every other person interested in computer hardware, programming and DIY-Do it Yourself project. The Raspberry Pi is manufactured in three board configurations through licensed manufacturing deals with Newark element14 (Premier Farnell), RS Components and Ego man. Raspberry Pi is a credit card sized computer manufactured and designed in the United Kingdom by the Raspberry Pi foundation with the intention of teaching basic computer science to school students and every other person interested in computer hardware, programming and DIY-Do it Yourself projects .

The Raspberry Pi is manufactured in three board configurations through licensed manufacturing deals with Newark element14 (Premier Farnell), RS Components and Ego man .These companies sell the Raspberry Pi online. Ego man produces a version for distribution solely in China and Taiwan, which can be distinguished from other Pi’s by their red coloring and lack of FCC/CE marks. The hardware is the same across all manufacturers .The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM cortex A53 processor, Video Core IV GPU and was originally shipped with 1GB of RAM, (Model B+).It does not include a built-in hard disk or solid-state drive, but it uses an SD card for booting and persistent storage, with the Model B+ using a MicroSD.

Figure 3: Raspberry pi3 B+ model

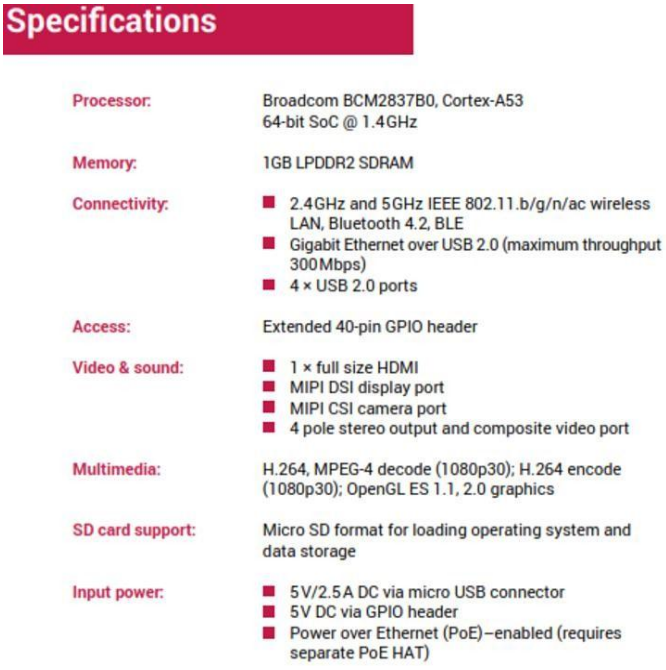

Figure 4: Specification of Raspberry pi3 B+ model

IV BLOCKCHAIN

WHAT IS BLOCKCHAIN?

• Blockchain Consensus Protocol guide. A blockchain is a decentralized peer-to-peer system with no central authority figure. While this creates a system that is devoid of corruption from a single source, it still creates a major problem. – How are any decisions made? – How does anything get done? – Think of a normal centralized organization

• All the decisions are taken by the leader or a board of decision makers. This isn't possible in a blockchain because a blockchain has no "leader". For the blockchain to make decisions, they need to come to a consensus using "consensus mechanisms".

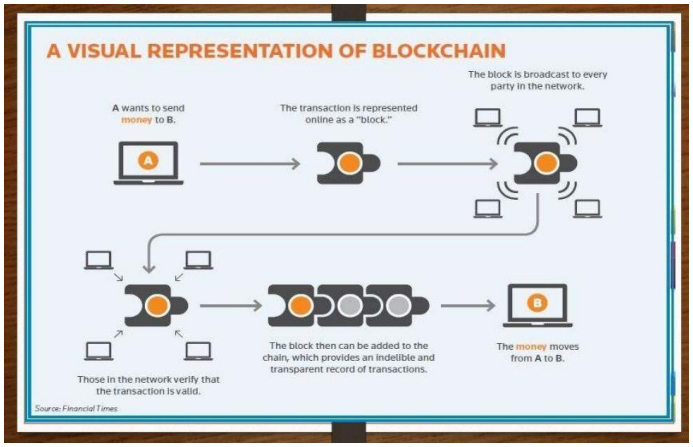

Figure 5: Visual representation of Blockchain

BLOCKCHAIN FEATURES:

- Distributed Ledger
- Decentralized
- Uses Cryptography and Hashing
- Append-only Transactions
- The Code already exists in Git-hub
- Immutable

CHARACTERISTICS OF THE BLOCKCHAIN:

The blockchain is a purely distributed peer-to-peer data stored with following properties:

- Immutable
- Append only
- Ordered
- Time Stamped
- Open and Transparent
- Secure

V WORKING OF THE SYSTEM

The soldier Health and Position Tracking System allows military to track the current GPS position of soldier and also checks the health status including temperature and heartbeats of soldier. The GPS modem sends the latitude and longitude position with link pattern with the help of that military can track the current position of the soldier. The system is very helpful for getting health status information of soldier and providing them instant help. The proposed system not only performs the task of health monitoring but also does the tracking of soldiers using IoT.

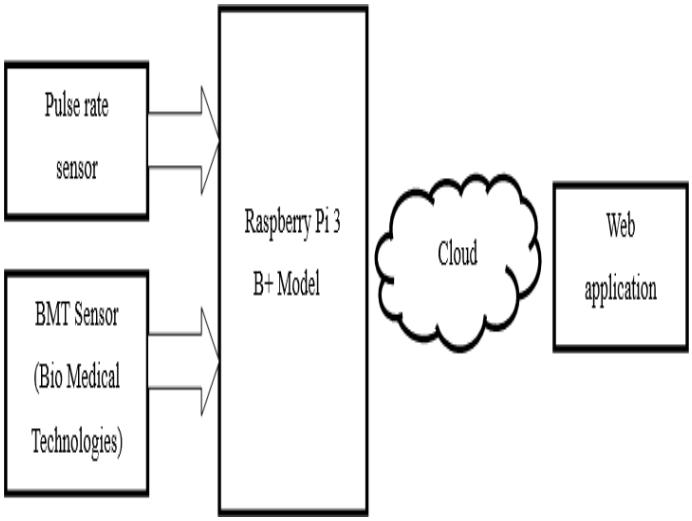

Figure 6: Block diagram working of system

The control room can acquire the details about the position and orientation of soldier from GPS. The base station can access the current status of the soldier using IOT as the different tracking parameters of the soldier get transmitted via Wi-Fi module. These information will be updated on the blockchain and can be extracted on the PC of control room, as and when extracted. These all soldiers information is secured by blockchain technology so no one can hack these information. Based on these information, the authorities can initiate immediate action by deploying a medical, rescue team or any backup force for their help. Using various biomedical sensors, health parameters of a soldier is observed along with its surrounding environment condition observed. The proposed system is divided into two unit i.e. Soldier unit and control room unit. Here in the system architecture diagram the soldier is enabled with IOT unit, it means that with biomedical sensors like body temperature sensor, heart beat sensor. These sensors will help to sense physical parameters & informs to Base Station through GSM. This unit is carry by the soldier. Wireless communication takes place through Wi-Fi Module which is placed on the soldier unit. Soldier control room is the base station from where the military personal officer tracks location of the soldier and monitor the health status continuously with the help of the stand alone application.

VI RESULT OF IMPLEMENTATION

This figure show the surveillance controller system implemented using Raspberry pi. Raspberry pi is powered by 5V adapter. The

desktop of Raspberry pi is accessed software which is installed on laptop.

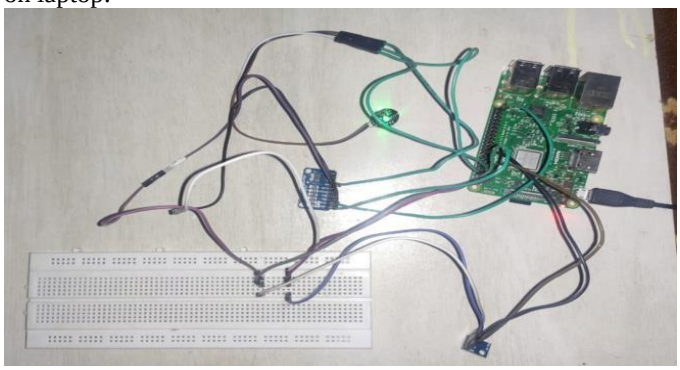

Figure 7: Surveillance controller system implemented using Raspberry pi

In this system soldiers seeks surveillance on cloud using Web application .The soldiers enter username and password login then his gets heart beats, body temperature, blood pressure, altitude & sea level pressure shows in figure 9.

Figure 8:Health monitoring using blockchain login

Figure 9: Example of deciding the health status

VII CONCLUSION

The paper reports an IoT based system for the health monitoring and tracking of the soldiers. Raspberry Pi 3+ is used which is a low cost solution for the possessing purpose. Biomedical sensors provides heartbeat, body temperature, and environmental parameters of every soldier to control room. This technology can be helpful to provide the accurate location of missing soldier in critical condition and overcome the drawback of soldiers missing in action. The addressing system is also helpful to improve the communication between soldier to soldier in emergency situation and provide proper navigation to control room. Thus we can conclude that this system will act as a lifeguard to the army personnel of all over the globe. In future, a portable handheld sensor device with more sensing options may be developed to aid the soldiers. A technical marvel made possible by software, hardware, strong cryptography, and the Internet Has made significant progress in only 100+ months Has significant strengths and a few limitations too Blockchain is starting to be widely used to automate trusted computing transactions and increase efficiencies in many industries.

REFERENCES

[1] P. Kumar, G. Rasika, V.Patil, and S. Bobade, "Health Monitoring and Tracking of Soldier Using GPS,'' International Journal of Research in Advent Technology, vol.2, no.4, pp. 291-294, Apr.2014.

[2].Soldier Health and Position Tracking System, Akshita V. Armarkar, Deepika J. Punekar , Mrunali V. Kapse, Sweta Kumari, Jayshree A. Shelk, International Journal of Engineering Science and Computing, March 2017

[3] IOT Based Soldier Navigation and Health Monitoring System, Krutika Patil, Omkar Kumbhar, Sakshi Basangar, Priyanka Bagul, International Journal of Electrical, Electronics and Computer Systems (IJEECS) ISSN (Online): 2347-2820, Volume -5, Issue-1, 2017

[4] Gps Based Soldier Tracking And Health Indication System, Shruti Nikam, Supriya Patil , Prajkta Powar , V.S.Bendre, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 2, Issue 3, March 2013

[5] Health monitoring and tracking system for soldiers using Internet of Things(IoT), Niket Patii ; Brijesh Iyer, 2017 International Conference on Computing, Communication and Automation (ICCCA), IEEE.

[6] GPS And IoT Based Soldier Tracking & Health Indication System, Jasvinder Singh Chhabra, Akshay Chhajed, Shamlee Pandita, Suchita Wagh, International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 04 Issue: 06 June-2017

[7]R. Kumar and M. Rajasekaran, "An IoT based patient monitoring system using raspberry Pi," International Conference on Computing Technologies and Intelligent Data Engineering, Kovilpatti-India, Jan. 2016, pp. 1-4.

[8] D. Kumar and S. Repal, “Real Time Tracking and Health Monitoring of Soldiers using ZigBee Technology: a Survey” International Journal of Innovative Research in Science, Engineering and Technology, vol. 4, no.7, pp. 5561-5574, Jul.2015.
[9] Zhao, Huawei, et al. "Efficient key management scheme for health blockchain." CAAI Transactions on Intelligence Technology 3.2 (2018): 114-11
[10]https://blockgeeks.com
[11]https://www.blockchain.com