Health Monitoring and Assistance for Elderly People

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Abstract – The premise of this research is to develop smart health care for elderly people who stay alone in the house. The proposal basically exploits the idea of "Internet of Things" and aims to use the existing technology. The work has been motivated by the fact that number of elderly people living alone has been increasing and their emergency situations are not been attended properly. So, the system that we create would attend to their emergency situations and would guide them to the first aid during their emergency without anyone's help. This system will also keep their health at check at regular basis in case of any abnormalities it would be intimated. We intend to achieve it.

Index Terms– Iot, RFIDTags, PulseOximetry, IoThNet, Network Security

1. INTRODUCTION

Internet of Things (IoT) is increasing far reaching fame among inquire about group in view of its capability to digitize genuine physical questions around us. IoT has risen because of present remote media transmission administrations and universal nearness of Internet. Remote sensor systems, RFID labels, actuators and different handheld astute gadgets, for example, cell phones, PDAs, Tabs and so forth are prompting the development of IoT. IoT appears to be engaging and its development is being acknowledged by research and ventures, because of its effect on our everyday life both underway and utilization forms. It has opened up wide range of inventive situations to enhance nature of human life. Sensor systems have effectively demonstrated their brilliance in making human life simple in routine assignments, for example, controlling water tanks, to spare power at open spots like exhibition halls, libraries and basic errands, for example, territory observing, controlling/helping mechanical procedures and so forth. Clever gadgets, for example, cell phones have been changed from inserted keypad based customary telephones to lightweight touch screen based gadgets. Uses of sensors in our everyday life are various which demonstrates their significance, be that as it may they are obliged because of restricted battery life which constrains their utilization. Radio Frequency Identification Tags (RFID) innovation gave substitute to sensors as these labels can be utilized to recognize , track and find any protest utilizing special Electronic item code (EPC) which is encoded in these labels. RFID label involves a little chip, a reception apparatus and a cover for exemplifying chip and receiving wire. Reception apparatus gets motion from RFID peruse gadget and transmits the label ID to it. These labels can be either dynamic or detached in light of energy source. Dynamic labels are related with a battery life and along these lines rely upon it for their lifetime, much the same as sensors. Be that as it may, latent labels obtain vitality from peruse gadget either through attractive acceptance or electromagnetic wave catch systems. Flag got by RFID receiving wire, creates a current in it through enlistment, which is additionally used by the radio wire to return the label ID to the per user. This method can cause transmit label Id to a radio scope of couple of kilometers. Along these lines RFID labels dispense with battery constraint of sensors, additionally being little in measure they can be installed in any genuine question for its observing. Therefore RFID labels are helping extraordinary arrangement to change over each genuine physical protest into computerized element. Such RFID detecting items will shape their RFID sensor systems with peruser gadgets as sinks of information produced. Development of these RFID sensor systems, in our everyday life will fill the hole in inescapability of Internet and will enable IoT to spread its foundations in our general public. 'Whenever, anyplace, any media' figuring has transformed into reality with each question inserted with either RFID tag or sensors, these when joined with officially existing remote correspondence innovations make everything digitized and on Internet. This gives road for vast scope of imaginative applications, for example, keen homes, Ehealthcare, activity observing and course administration, asset administration at retail locations, mechanized checkouts at strip malls, condition based maintenance of vehicles are a few conceivable outcomes. Uses of IoT has been partitioned into four classifications :

1.Transportation and coordinations domain.
2.Healthcare domain.
3.Smart condition (home, office, plant) domain.
4.Personal and social domain.

The present proposition centers around the heath care of elderly subject as their solid presence is given the slightest significance so in the accompanying area we will center around the best approach to actualize this thought with the current innovation.

Next segment gives a diagram of significant writing in this field. Segment 3 gives proposed system and segment 4 deals with Modular Description.. Segment 5 deals with various

modules in the project. Segment 6 deals with the various security issues that needs to be dealt. Finally, segment 6 concludes the paper.

2. RELATED WORK

This area investigates work effectively done in the field of IoT. Atzori et al. exhibited a study on Internet of Things featuring the most engaging purpose of IoT which is the coordination of a few innovations and correspondence arrangements. Their work underscored that any commitment towards headway of IoT must be a consequence of synergetic exercises in different fields, for example, media communications, informatics, gadgets and sociology. Coetzee and Eksteen have explained IoT area and stressed that different application spaces, for example, Green IT, vitality effectiveness and coordinations have just begun picking up profits by it. In view of vast capability of this area, IoT has snatched higher need on the examination motivation of the scholarly community, industry and governments, for example, IBM's Smarter Planet, Microsoft's Eye-on-Earth stage and HP's Earth activity, just to list a couple. European commission and Chinese Government is additionally trying endeavors toward this path. Be that as it may, progressions in IoT is likewise raising trust and security issues all the while. Institutionalized conventions and administration techniques are required for IoT to work at worldwide level. Overview on IoT displayed by Mckinsey Global Insitute featured that most IoT information being caught today isn't utilized at present. By and by the caught information is utilized just for peculiarity location and control, be that as it may it might be utilized for improvement and forecast which is of more significance. Further, they pointed that there is huge degree for IoT in creating economies, for example, India. The basic examination of accessible writing unmistakably mirrors that IoT is the request and solid prerequisite of creating nations and there is a colossal hole winning amongst hypothesis and practice. The proposition submitted intends to satisfy this hole in one of the areas i.e. social insurance. The following segment introduces the proposition of building up the home framework for the elderly individuals and anticipating life misfortune because of heart assault increment in BP.

3. SYSTEM OVERVIEW

The system will consist of 1) a wristwatch-like device that contains a heart rate sensor, an active RFID chip and antenna, LCD display, vibration motor, and battery 2) cell phone with an integrated active RFID reader 3) (optional) home PC with active RFID reader and an internet connection. Heart rate data for the outlined use cases requires a bandwidth of 256 bps, assuming a data size of 32 bytes and data sent once per second. The HP Memory Spot, a state of the art RFID chip, has a bandwidth of 10 Mbps [13]. Active RFID is a perfect wireless technology for this application due to its range and bandwidth. The user will wear the wristwatch and the cell phone and his or her heart rate will be logged in the phone's memory. Should his or her heart rate exceed or drop below a preprogrammed threshold the phone will automatically contact emergency services. Optionally, the user could leave the phone at home and heart rate would be logged to the RFID chip's memory for later download to a PC. At home the user would wear just the wristwatch and data would be sent to the PC.

Pulse (BP) is the weight applied by flowing blood upon the dividers of veins. At the point when utilized without promote particular, "circulatory strain" as a rule alludes to the blood vessel weight in the fundamental flow. Circulatory strain is normally communicated as far as the systolic (most extreme) weight over diastolic (least) weight and is estimated in millimeters of mercury (mm Hg). It is one of the imperative signs alongside respiratory rate, heart rate, oxygen immersion, what's more, body temperature. Typical resting systolic (diastolic) circulatory strain in a grown-up is around 120 mm Hg (80 mm Hg), truncated "120/80 mm Hg". Pulse shifts relying upon circumstance, movement, and malady states. It is directed by the anxious and endocrine frameworks. Circulatory strain that is low because of a malady state is called hypotension, and weight that is reliably high is hypertension. Both have numerous causes which can run from gentle to serious. Both might be of sudden beginning or of long length. Long haul hypertension is a hazard factor for some maladies, including coronary illness, stroke and kidney disappointment. Long haul hypertension is more typical than long haul hypotension in Western nations. Long haul hypertension regularly goes undetected in light of rare observing and the nonappearance of manifestations. Heart rate sensor A heart rate screen is an individual observing gadget that enables one to measure one's heart rate continuously or record the heart rate for later examination. It is to a great extent utilized by entertainers of different sorts of physical exercise.

4. MODULAR DESCRIPTION

Hardware:

The RFID technology to be used will be ISO 18000-7 active 433 MHz . The requirements that affected this choice are as follows: 1) 100+ foot range when user is at home and heart rate data must be transferred to a PC. 2) cell phone RFID reader will have to be small and low power but also be able to read from up to 48 inches away. 3) 1 MB memory. 433 MHz was chosen because it is part of the ISO 18000-7 standard. Power and size constraints of the cell phone based reader

dictated the need for active RFID. The use of a heart rate sensor in conjunction with the RFID chip also necessitated the use of active technology. To measure heart rate a pulse oximetry sensor will be used, specifically a BCI Micro Power Oximeter. This sensor was chosen for its low power – 22 mW. Pulse oximetry works by sensing the light, from an LED source, reflected from the bloodstream. Heartrate is determined from the pattern and amount of light reflected.The LCD display interface will display time and heart rate. Options to change sampling time (5s – 60s), set a target heart rate zone, and store data will be available. The vibration motor will serve as tactil feedback for those exercising who want or need to stay in a specific heart rate zone. Once the target heart rate zone is programmed, the motor will vibrate whenever the user falls below or rises above will have to be integrated with a cell phone. The reader and battery will have to have similar dimensions to the phone. The range requirement of the reader is 72 inches. Current Related RFID Technology RF Code makes the M220, a mobile active 433 MHz RFID reader with a battery life of approximately 8 hours. This device can be worn on a person's hip comfortably as it measures 4.37"x3"x1"and weighs only 5.2 ounces. A similar form factor and power consumption is desirable for the reader for the proposed system. This particular reader would not work for the proposed system since it uses a proprietary communication protocol and RF Code does not sell any tags with an integrated heart sensor.

Pulse Oximetry:

A gadget that measures the oxygen immersion of blood vessel blood in a subject by using a sensor connected commonly to a finger, toe, or ear to decide the level of oxyhemoglobin in blood throbbing through a system of vessels. Heartbeat oximetry is a noninvasive strategy for checking a man's oxygen immersion (SO2). Its perusing of SpO2 (fringe oxygen immersion) isn't generally indistinguishable to the perusing of SaO2 (blood vessel oxygen immersion) from blood vessel blood gas examination, yet the two are sufficiently related inside a satisfactory deviation with the end goal that the safe, advantageous, noninvasive, reasonable heartbeat oximetry strategy is important for estimating oxygen immersion in clinical utilize. In its most normal (trans missive) application mode, a sensor gadget is set on a thin piece of the patient's body, normally a fingertip or ear cartilage, or on account of a newborn child, over a foot. The gadget passes two wavelengths of light through the body part to a photograph indicator. It quantifies the changing absorbance at every one of the wavelengths, enabling it to decide the absorbances because of the beating blood vessel blood alone, barring venous blood, skin, bone, muscle, fat, and (by and large) nail clean.

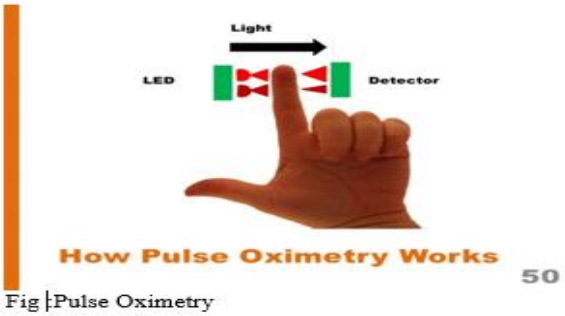

Fig | Pulse Oximetry

Security Alert Tracking:

Third Eye Inc. sells a Security Alert Tracking System that includes a wrist-based heart sensor and active RFID chip, anda reader connected to a PC. The application of this system is security for casinos and banks. The active RFID chip operates at 915 MHz and has a range of 100+ feet, and the sensor is a pulse oximetry. The wristwatch portion of this system is similar to the proposed systems, but the reader is not portable and the communication protocol is proprietary.

Pulse Monitoring

The topic of how the mix of a KIT circulatory strain (BP) meter and a NFC-empowered KIT cell phone turns out to be a piece of BP checking in view of the IoT is tended to in [13]. A spurring situation in which BP must be consistently controlled remotely is displayed by demonstrating the interchanges structure between a wellbeing post and the wellbeing focus in [14]. The subject of how the Withings BP gadget works relies upon the association with an Apple portable processing gadget is tended to in [15]. A gadget for BP information gathering and transmission over an IoT organize is proposed in [16]. This gadget is made out of a BP mechanical assembly body with a correspondence module. An area shrewd terminal for carry-on BP checking in view of the IoT is proposed in [17].

General Devices Available:

Numerous other versatile restorative gadgets are accessible however there is no express exhibit of the incorporation of those gadgets into IoT systems. That is, it is just a short time before these gadgets wind up installed with IoT capacities. Expanding quantities of restorative social insurance applications, gadgets, and cases have kept pace with the developing interest for IoT-based administrations over the world. Some human services regions whose reconciliation with the IoT seems approaching incorporate hemoglobin

recognition, top expiratory stream, strange cell development, malignancy treatment, eye issue, skin contamination, and remote surgery. Most gadgets today are compact demonstrative gadgets with regular availability.

Software :

The cell phone will need software to log the incoming heart rate data and to automatically contact emergency services if the user's heart rate drops below or exceeds a programmed threshold for a programmed time. It will also need an interface so the user or a physician can set the heart rate thresholds for automatic emergency contact. A middleware that handles contacting emergency services over a cellular network or WiFi, if available and if featured on the phone, is necessary. Embedded software is necessary on the RFID chip to sample the heart rate data and store it. Software is also necessary on the user's home PC, if he/she uses that optional part of the system. A middleware to handle automatic emergency contact, push heart rate data to a monitoring center, and facilitate secure patient data sharing between a hospitals, the doctor's office, and monitoring center, is needed.

Fig: Webpage that handles the data of the elders

Smart Watches :

- Edisse has a model wearable sensor for constant following, fall identification, and cautions. It fundamentally joins the GPS, versatile information, short informing administrations (SMSs), and an accelerometer to recognize abnormal developments, for example, a fall and after that reports them to an outsider, for example, grown-up kids.

- A group of researchers in Korea has introduced a sufficiently compact and subtle wearable BP sensor that can be used to deliver nonstop monitoring for a long period without disturbing the daily activity of the user.

- An iHealth Lab group has built up an arrangement of IoT social insurance gadgets including a remote BP wrist screen, a BP dock, a remote body examination scale, iHealth Lite, iHealth Edge, a remote heartbeat oximeter, iHealth Align, and a remote keen glucose-checking framework.

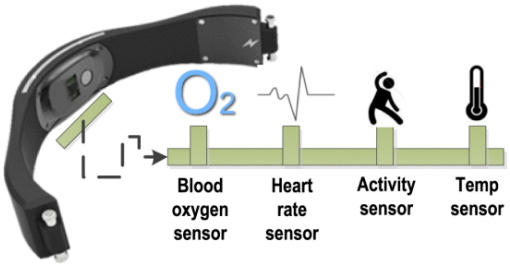

Fig: Positions of different sensors in angel.

5. MODULES

IoT Healthcare Networks:

The IoT human services organize or the IoT arrange for social insurance (from this point forward "the IoThNet") is one of the crucial components of the IoT in medicinal services. It bolsters access to the IoT spine, encourages the transmission and gathering of restorative information, and empowers the utilization of medicinal services customized interchanges. As appeared in Fig. 2, this segment talks about the IoThNet topology, design, and stage. Nonetheless, it ought to be said that the proposed models in and can be considered as a decent beginning stage for forming bits of knowledge into the IoT arrange.

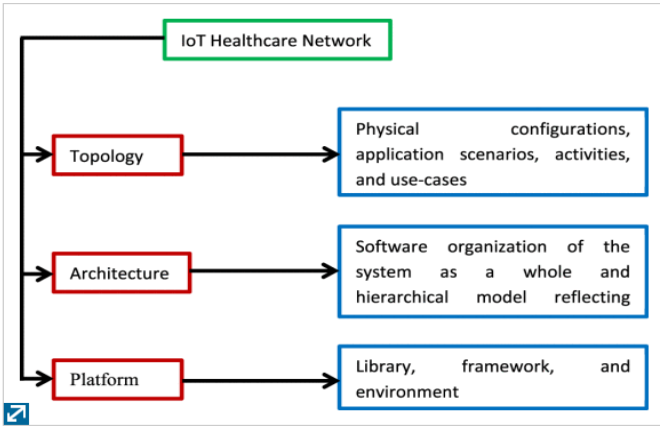

Fig: IoT healthcare network (IoThNet) issues.

The IoThNet Architecture:

The IoThNet engineering alludes to a framework for the detail of the IoThNet's physical components, their practical association, and its working standards and methods. To begin, the fundamental reference design in Fig. 6 is introduced for the telehealth and encompassing helped living frameworks

prescribed by Continua Health Alliance. The key issues have been recognized for this design : the interoperability of the IoT entryway and the remote neighborhood (WLAN)/remote individual region arrange (WPAN), mixed media spilling, and secure correspondences between IoT passages and guardians.

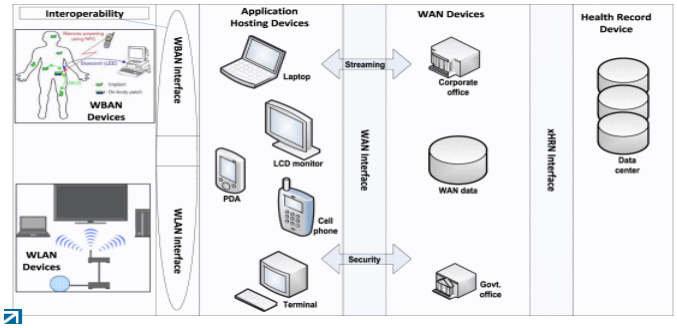

Fig: Continua Health Alliance's framework-based simplified reference architecture.

The IoThNet Platform

The IoThNet platform refers to both the network platform model and the computing platform. As shown in Fig. 10, a service platform framework focusing on residents' health information is presented in. This framework shows a systematic hierarchical model of how caregivers or agents can access various databases from the application layer with the help of a support layer. A similar concept of data center platforms as the middleware between smart objects and the business layer can be found in.

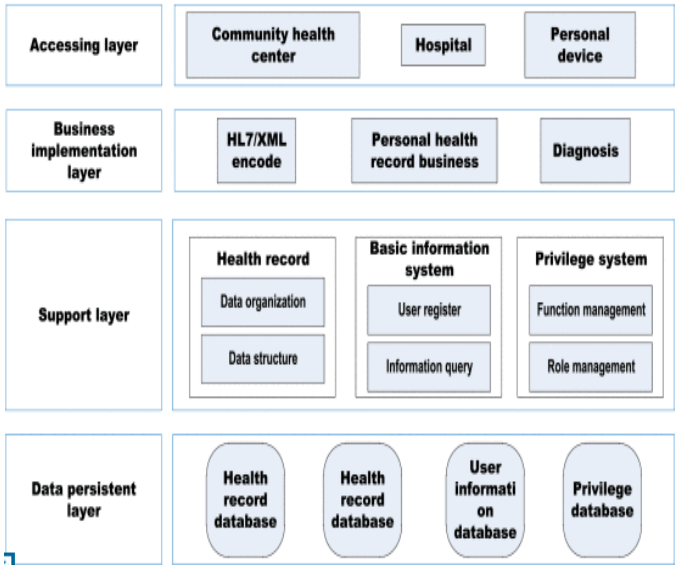

Fig: Continua Health Alliance's framework-based simplified reference architecture.

6. IoT HEALTHCARE SECURITY

The IoT is developing quickly. In the following quite a long while, the restorative part is required to witness the broad selection of the IoT and thrive through new eHealth IoT gadgets and applications. Human services gadgets and applications are relied upon to manage key private data, for example, individual social insurance information. Likewise, such savvy gadgets might be associated with worldwide data systems for their entrance whenever, anyplace. Accordingly, the IoT medicinal services space might be an objective of assailants. To encourage the full selection of the IoT in the social insurance space, it is basic to distinguish and investigate unmistakable highlights of IoT security and protection, including security necessities, vulnerabilities, danger models, and countermeasures, from the human services point of view (we can see that in the below given figure).

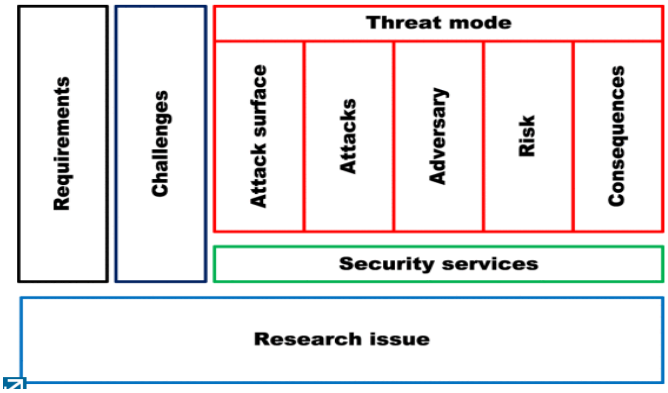

Fig: Security issues in IoT-based health care.

Security Requirements

To achieve secure services, there is a need to focus on the following security requirements.

1. Confidentiality
2. Integrity
3. Availability
4. Authentication
5. Resiliency
6. Fault Tolerance

There are various types of security challenges that needs to be faced while developing such model, we have come with an

System Protocol Stack Attack: each layer of the convention stack proposed by the IETF working gathering for the IoT arrange has distinctive kinds of vulnerabilities that a foe may endeavor to dispatch noxious exercises. To enhance the

execution of IoT human services systems as for security, life span, and network under changing ecological conditions, security ought to be guaranteed at each layer of the convention stack.

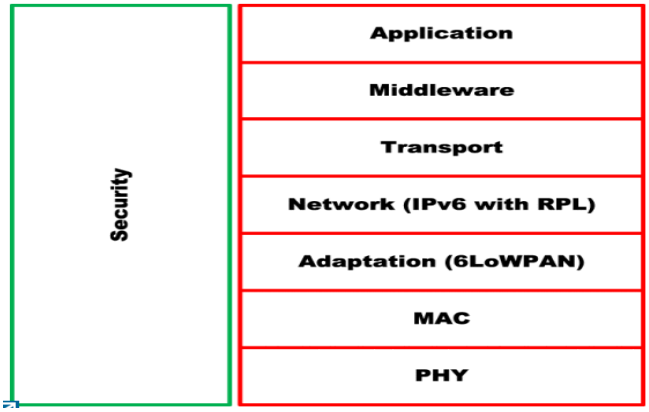

Fig: A layered networking model of secured IoT.

A Proposed Security Model:

IoT medicinal standards are not yet hearty but rather keep on developing. Along these lines, it is hard to distinguish and foresee every conceivable powerlessness, dangers, and assaults related with the IoT restorative space. Regardless, when security masters work to discover conditional security answers for evident and unsurprising issues, such security plans ought to have the ability to alleviate concealed or capricious issues that presently can't seem to develop. To accomplish this security objective, security administrations ought to be planned with dynamic properties. That is, they ought to be able to achieve choices on unnoticed issues in light of understanding and information. This intelligent security model is collaborative in nature and uses the most recent knowledge base.

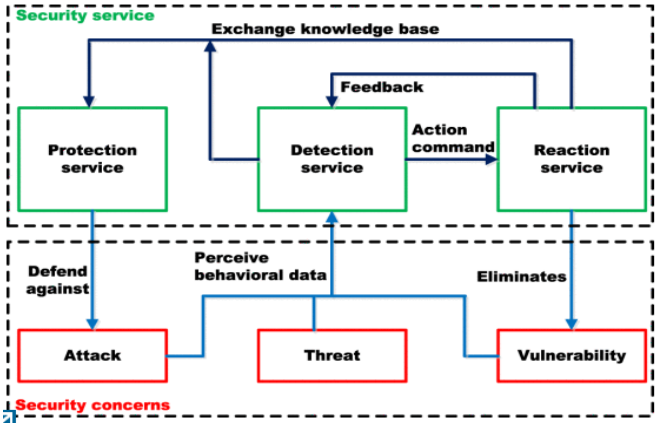

Fig: A layered model of security service.

7. CONCLUSION

Analysts over the world have begun to investigate different mechanical answers for upgrade social insurance arrangement in a way that supplements existing administrations by activating the capability of the IoT. This paper overviews differing parts of IoT-based social insurance innovations and presents different medicinal services arrange designs and stages that help access to the IoT spine and encourage restorative information transmission and gathering. Significant R&D endeavors have been made in IoT-driven social insurance administrations and applications. Likewise, the paper gives point by point examine exercises concerning how the IoT can address pediatric and elderly care, ceaseless infection supervision, private wellbeing, and wellness administration.

For more profound bits of knowledge into industry slants and empowering advances, the paper offers a wide view on how later and continuous advances in sensors, gadgets, web applications, and different advances have inspired reasonable social insurance contraptions and associated wellbeing administrations to vastly extend the capability of IoT-based medicinal services administrations for advance improvements.

REFERENCES

[1] Atzori, L., Iera, An., and Morabito, G. (2010). The web of things: A survey.Computer systems, 54(15), 2787-2805.
[2] Coetzee, L., and Eksteen, J. (2011, May). The Internet of Things-guarantee for what's to come? A presentation. In IST-Africa Conference Proceedings, 2011 (pp. 1-9). IEEE.
[3] Babar, S., Stango, A., Prasad, N., Sen, J., Prasad, R. (2011, February). Proposed installed security system for web of things (iot). In Wireless Communication, Vehicular Technology, Information Theory and Aerospace and Electronic Systems Technology (Wireless VITAE), 2011 second International Conference on (pp. 1-5). IEEE.
[4] Ukil, A., Sen, J., and Koilakonda, S. (2011, March). Implanted security for Internet of Things. In Emerging Trends and Applications in Computer Science (NCETACS), 2011 second National Conference on (pp. 1-6). IEEE.
[5] Weber, R. H. (2010). Web of Things– New security and protection challenges.Computer Law and Security Review, 26(1), 23-30.
[6] Jara, A. J., Zamora, M. An., and Skarmeta, A. F. (2011). A web of things - based individual gadget for diabetes treatment administration in surrounding helped living (AAL). Individual and Ubiquitous Computing, 15(4), 431-440.
[7] The Internet of Things: Mapping the Value Beyond the Hype, Executive Summary by Mckinsey Global Institute, June 2015. Accessible online at http://www.mckinsey.com/~/media/McKinsey/dotcom/Insights/Business%20Technology/Unlocking%20the%20potential%20of%20the%20Internet%20of%20Things/Unlocking_the_potential_of_the_Internet_of_Things_In_brief.ashx
[8] Subterranean insect, R. (2006). A prologue to RFID innovation. Inescapable Computing, IEEE, 5(1), 25-33, January-March,2006.
[9] Istepanian, R. S., Zitouni, K., Harry, D., Moutosammy, N., Sungoor, A., Tang, B., and Earle, K. A. (2009). Assessment of a cell phone

telemonitoring framework for glycaemic control in patients with diabetes. Diary of Telemedicine and Telecare, 15(3), 125-128
[10] Istepanian RSH, Jara A., Sungoor A, Philips N. (2010). Web of Things for M-wellbeing applications(IoMT). AMA-IEEE medicinal innovation meeting on singular social insurance, Washington.
[11] W. Wang, J. Li, L. Wang, W. Zhao, "The Internet of Things for resident health information service platform research", Proc. IET Int. Conf. Commun. Technol.Appl. (ICCTA), pp. 631-635, Oct. 201
[12] L. Yang, Y. Ge, W. Li, W. Rao, W. Shen, "A home mobile healthcare system for wheelchair users", Proc. IEEE
[13] A. Dohr, R. Modre-Opsrian, M. Drobics, D. Hayn, G. Schreier, "The Internet of Things for ambient assisted
[14] J. Puustjarvi, L. Puustjarvi, "Automating remote monitoring and information therapy: An opportunity to practice telemedicine in developing countries", Proc. IST-Africa Conf., pp. 1-9, May 2011
[15] L. M. R. Tarouco et al., "Internet of Things in healthcare: Interoperatibility and security issues", Proc. IEEE Int. Conf. Commun. (ICC), pp. 6121-6125, Jun. 2012.
[16] Z. Jian, W. Zhanli, M. Zhuang, "Temperature measurement system and method based on home gateway", Dec. 2012.
[17] L. In, "Patient body temperature monitoring system and device based on Internet of Things", Feb. 2014.

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