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IMPLEMENT OF SMART HEALTH CARE MONITORING SYSTEM USING MOBILE IOT AND CLOUD COMPUTING TECHNOLOGIES

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Received on 09-01-2017

Accepted on: 20-02-2017

Abstract

Recently, many research works were interested in combining cloud computing and IoT to design systems for smart health care. Many authors have highlighted the benefits of using cloud computing with IoT and proposed a cloud infrastructure to extend the limited resources of the sensors and to facilitate the management of the sensor-centric applications in many domains. However, about MCIoT convergence, there are fewer research works. One of the projects is about a developed platform based on MCIoT where sensors can interact with a mobile device which has access to the cloud via Internet using Bluetooth. Based on restful web services, the framework is feasible on resource constrained devices. Our work aims basically to come up with a general service architecture for smart healthcare monitoring application, that combines the features of mobile devices, sensors, and cloud computing to offer to the user the enhanced services that are accessible anywhere while guaranteeing scalability and security. Our general service architecture to build a network for health care applications that generated data is stored in the cloud our mobile application will show the accurate results on user dashboard of their smartphones.

Keywords: MCIoT, Cloud Computing, Sensors, Smart phone, Healthcare networks.

1. Introduction: Internet of thing is being popular now a day. It is being interconnected with many devices like physical devices and smart devices. The growth of the internet is going to change the world with the IoT devices which allows the innovative of a person ideas presenting to this world. The Internet of Things (IoT) is a structure which between relates the contraptions which figures and the machines. People that gives the unique identifiers and it has the limit of moving the data in a framework that does not obliges human to human and human to PC

collaboration. Kevin Ashton is a kindred advocate besides the official of Auto-ID Center at MIT and he at first decided the Internet of Things in a presentation in 1999. In spite of the way that the IoT was not showed in early years and the Internet of Things has been being created from various years. The main web are given an outline, a Coke machine at Carnegie Melon University in the 1980s. The product designer will take up with the machine. Since, the IOT has being huge from the guest remain with the commonplace development, for instance, Radio Frequency Identification (RFID), Wireless Sensor Network, Bluetooth. They are misusing the availability in Cloud Computing. The Cloud Computing giving us a Smart City with various machines. In 2015, the improvement in web of things had machine to machine classes. per Gartner Research: "4.9 billion related things being utilized as a part of 2015 ... and will accomplish 20.8 billion by 2020." In any cause the world doesn't extensions to the 50 billion devices by 2020. By then there will be different devices will be come to 2.5 billion devices that shows around 5% of all devices are related. The data will interface various contraptions which will generate 10 million terabytes for every month. Here after the 5% data which is related the things will create.

Distributed computing could be a general term for the conveyance of expedited administrations over the net. Distributed computing could be a style of computation that depends on sharing registering assets rather than having neighborhood servers or individual gadgets to handle applications. Distributed computing is analogous to matrix computation, a kind of registering wherever unused getting ready cycles of all PCs during a system area unit outfits to tackle problems overly serious for any stay solitary machine. In distributed computing, the word cloud (additionally declared as "the cloud") is employed as Associate in Nursing illustration for "the net," that the expression distributed computing signifies "a quite net based mostly computation," wherever distinctive administrations, as an example, servers, reposition Associate in Nursing applications area unit sent to an association's PCs and gadgets through the net. He quantifies for interfacing the PC systems and the item anticipated that would make conveyed processing work are not totally described at present time, leaving numerous associations to portray their own specific circulated figuring advancements. Appropriated processing structures offered by associations, like IBM's "Blue Cloud" progresses for example, rely on upon open benchmarks and open source programming which interface together PCs that are used to pass on Web 2.0 limits like mix or compact exchange. Cloud-based applications can be up and running in days or weeks, and they cost less. With a cloud application, you just open a program, sign in, change the application, and start using it. Associations are running an extensive variety of utilizations in the cloud, like customer relationship organization (CRM), HR, accounting, and significantly more. A

segment of the world's greatest associations moved their applications to the cloud with salesforce.com after altogether testing the security and steady nature of our structure. Dispersed processing and Web of Things (IoT), two out and out various headways, are both starting now a bit of our life. Their tremendous apportionment and use is required to addition propel, making them fundamental sections Without limits internet of Things (IoT) Cloud Advantage manages these repressions by giving a directed Stage as a company(PaaS) cloud-based giving that may assist you decide on essential business choices and systems by permitting you to interface your contraptions to the cloud, separate information from those devices systematically, and facilitate your information with monumental business applications and distinctive net organizations.

The versatile cloud is net primarily based data, applications and connected administrations need to through cell phones, good phones, and different convenient devices. Mobile distributed computing is separated from moveable process by and huge on the grounds that the gadgets run cloud-based net applications rather than native applications. purchasers subscribe cloud administrations and find to remotely place away applications and their connected data over the online. a transportable cloud approach empowers engineers to construct applications composed notably for versatile purchasers while not being certain by the versatile operating framework and therefore the registering or memory limit of the mobile phone.

Versatile distributed computing centered square measure by and huge gotten to by suggests that of a transportable program from a distant web server, commonly while not the need for introducing a client application on the beneficiary phone. As per the foremost recent investigation of analysis, the amount of versatile distributed computing supporters is relied upon to develop quickly within the following 5 years. Cloud-based versatile market can turn out yearly financial gain of \$9.5 billion in 2014 from \$400 million in 2009, at a traditional yearly increment of half a mile.

Shrewd Home minimizes client's mediation in observing home settings and controlling home machines. This paper displays a way to deal with the advancement of Practical Understanding Home applications by incorporating Web of Things (IoT) with Web administrations and Distributed computing. Moreover, by conveying a proposed composition. we will depict how the Versatile Distributed computing and the Web of Things cooperate. The Framework Model is delineated by outlining an administration design that meets the elements of IoT and MCC. This will convey our utilization case application called health care monitoring system, with point by point depictions of the usage. Finally, the conclusion and our future arrangement will be introduced.

2. Research Work: The approach for the most part spotlights on: (1) installing knowledge into sensors and actuators utilizing Arduino stage, (2) organizing shrewd things utilizing Zigbee innovation, (3) encouraging communications with things utilizing Cloud administrations, (4) enhancing information trade effectiveness utilizing JSON information design. Also, we execute three utilize cases to show the approach's plausibility and effectiveness, i.e., measuring home conditions, observing home machines, and controlling home get to. As of late, many research works were keen on consolidating Cloud Computing and IoT to outline frameworks for Smart City. The two universes of Cloud and IoT have seen an autonomous development. In any case, a few shared preferences getting from their joining have been distinguished in writing and are predicted later. From one viewpoint, IoT can profit by the basically boundless capacities and assets of Cloud to remunerate its innovative limitations (e.g., capacity, preparing, vitality). The Cloud can offer a viable answer for execute IoT benefit administration and synthesis and applications that adventure the things or the information delivered by them. Then again, the Cloud can profit by IoT by extending its extension to manage true things in a more circulated and element way, and for conveying new administrations in a substantial number of genuine situations. Not at all like the current arrangements that objective area applications when outlining their middleware, our proposed work points essentially to concoct a general administration design for smart City people's Health care monitoring applications, that joins the components of cell phones, sensors and Distributed computing keeping in mind the end goal to offer to the client the upgraded administrations that are open anyplace while ensuring adaptability and security. Our general administration design is outlined through a structure called health care monitoring system that will help to the public who lived in smart city to monitor their health data and those results are presented in their mobile phones.

3. Internet of Things and Mobile Cloud Computing

IoT incorporates a considerable measure of information sources. It conveys a ton of unstructured or semi-sorted out data of the three significant characteristics of the data: volume, speed, and arrangement. cloud affiliation gives an effective and scalable, for instance, taking after and administering anything at whatever point from wherever to use a custom passageway and certain applications. The joining with the Cloud handles by far most of these issues moreover giving additional segments, for instance, direct passage, accommodation, and diminished association costs

3.1. The Necessaries of the Integration

Scattered handling can profit by the Web of things, obviously, by extending its degree to administer things in this present reality more orbited and part course, and to give new associations on a clearing number of real conditions.

The equivalent properties of circled handling and Web of things is engaging a quick result of the different recommendations reported in making and connecting with Cloud-IoT point of view appeared in Table 1. On a very basic level, the Cloud goes about as focus layer between the things and the applications, where it covers all the adaptable quality and the functionalities basic to understand the last determined.

Table1. Shows Cloud-IoT

Internet of Things	Cloud Computing
real world	virtual resources
limited computational	Unlimited computational
limited storage	Unlimited storage
point of convergence	service delivery
big data source	means to manage big data

IoT gear handling assets are not permitted to handle information preparing. Gathered information are typically collected and transmitted to a more effective hub handling is possible, however not a proper adaptability difficulties to accomplish foundation.

Cloud and its on-request model of interminable limit permits proper substance, make the Web of things to manage remarkable request complex examination. Information driven basic leadership and expectation calculations would be conceivable with ease and would give expanding incomes and lessened dangers. One of the necessities of the Web of things is to make the IP get to gadgets impart through committed equipment, and bolster the correspondence can be extremely costly. Cloud association gives a successful and shoddy arrangement, for example, following and overseeing anything whenever from wherever to utilize a custom entry and implicit applications. The reconciliation with the Cloud tackles the greater part of these issues likewise giving extra elements, for example, straightforward entry, usability, and diminished arrangement costs.

3.2 The Applications of the Integration

The selection of Cloud in this situation prompts to the reflection of specialized points of interest, taking out the requirement for skill in, or control over, the innovation framework. What's more, it makes the usage of security (cloud) mixed media to defeat the issue, on the gadget running an expansive number of sight and sound and security calculation with constrained processing force and little batteries. Around there, the normal issues with the administration, innovation, wellbeing, and legitimate examination: interoperability, framework security, the gushing media nature of administration (QoS) and powerfully expanded capacity is generally viewed as a boundary.



Figure 3.1: Anatomy of Smart City Applications.

The appropriation of Cloud in this situation prompts to the deliberation of specialized subtle elements, disposing of the requirement for aptitude in, or control over, the innovation foundation. Moreover, it makes the usage of security (cloud) sight and sound wellbeing administrations, to beat the issue, on the gadget running countless and security calculation with restricted registering force and little batteries. Here, the basic issues with the administration, innovation, wellbeing, and lawful examination: interoperability, framework security, the spilling media nature of administration and powerfully expanded capacity is normally viewed as a boundary.

4. IoT and MCC Convergence

For this situation, the cell phone goes about as an administration supplier of sensor information opposite the Cloud. Numerous situations in view of e-wellbeing [5] for instance, depend on this design. Truth be told, in these designs, numerous sensors like those for temperature, hypertension, glucose, weight, and so forth give information to a patient, that are gathered by the cell phone permitting the specialist to get a thought on the patient wellbeing and to contribute in the patient demonstrative. For the most part, these sorts of sensors have insufficient assets to handle the detected information; and the information gathered by the cell phone can be put away in the Cloud for examination or factual purposes. The option design is to have more advanced sensors with asset capacities, for example, information detecting and information handling incorporating cryptographic estimations with a low-run data transmission association (WIFI, Bluetooth, ZigBee, NFC and M2MC).

Mulle2 and Arduino3 sensors are cases of these sorts of rich sensors. The cell phone stays critical regardless of the possibility that the cell phone and the sensor can speak with each other, regarding a machine-to-machine demonstrate. Since the cell phone, because of its expansive range transfer speed correspondence, permitting it the entrance to the Web, can interface with the Cloud. Utilizing the cell phone as a portal, the Cloud can either gather information from the sensors or send information to the sensors. If select any health care prototype to gather the medical data from peoples to do some analysis if any abnormal result is shown to inform to concerned doctor or smart phone will

suggest the required medicine and alarm them to the patent, for example, any health care monitoring device can generate data in continuously to building pieces to form our middleware.



Figure 4.2: IoT Health care product and prototype.

5. Proposed Model

Our proposed model main objective is to monitor patient health status in any ware and if any risk is occurred to provide concerned doctor or nurse instantly. our proposal described in below steps.

STEP 1: Interfacing every one of the sensors to the patient and exchanging that gathered information through ZigBee transmitter to the local medical attendant station.

STEP 2: When every one of the parameters is gotten by the PC-based application through ZigBee collector, parameters are redesigned into database.

STEP 3: Android application gets these parameters for each change and show on the mobile app.

The proposed framework incorporates few of the equipment and programming equipment. The essential equipment necessities are sensors, control supply, LPC2148 microcontroller, LCD, bell, ZigBee modules and programming as takes after Keil IDE, Flash Magic, Eclipse IDE.

5.1 Hardware Components

A DC control supply which keeps up the yield voltage consistent despite AC mains changes or load assortments is known as "Controlled D.C Power Supply" For case a 5V coordinated control supply unit.

ARM7 LPC2148 MICROCONTROLLER:

The LPC2148 microcontroller relies on upon a 16/32-bit ARM7TDMI-S CPU that join the microcontroller with 32 kb, 64 kb, 128 kb, 256 kb and 512 kb of blaze memory of fast. A128-bit wide memory interface and uncommon structures empower 32-bit code execution at the most outrageous clock rate.

LCD: The LCD is shown on level board it appears electronic visual presentation that utilizes the light adjust properties of fluid. Fluid gems don't emanate light particularly. LCDs are available to appear optional pictures or

settled pictures which can be appeared or concealed, for instance, words, digits, and 7-segment showing unit as in a digitalized clock. They use a similar basic development, except for that optional pictures are contained a considerable number of little pixels, while distinctive showcases have greater parts.

ZIGBEE: The ZigBee module is used to trade information from the patient fragment to the cloud storage. The ZigBee module is utilized to exchange data from the patient segment to the server area.

Temperature Sensor (LM35): The LM35 is precision fused circuit temperature sensors, whose yield voltage is directly in respect to the Celsius (Centigrade) temperature. The LM35 does not require any outer trimming to give ordinary rightness of $\pm 1/4^{\circ}\text{C}$ at room temperature and $\pm 3/4^{\circ}\text{C}$, over a full - 55 to $+150^{\circ}\text{C}$ temperature run. The LM35's low impedance, direct yield, and correct trademark arrangement make interfacing to readout or control equipment especially basic. It can be used with single power supplies, or with many supplies. As it draws only $60\ \mu\text{A}$ from its info supply, it has low self-warming, under 0.1°C in still air.

Heartbeat Sensor: The new frame uses the TCRT1000 intelligent optical sensor for photo plethysmography. The use of TCRT100 enhances the build system of the sensor part of the work as both the infrared light emitter diode and the identifier are sorted out one beside the other in a leaded package which would obstruct the encompassing light present around; else is influence the execution of the sensor. It delivers the advanced yield which is synchronous with the pulse. The yield pulse can be sustained to either an ADC channel or a propelled information stick of a microcontroller for further planning and recouping the heart rate in thumps every moment (BPM).

ECG Sensor: It is a solitary lead heart rate observing sensor. AD8232 is a planned front-end for bio-electrical indications of the heart letter. This is a key parameter observing sensor which senses all kind of use created by low power. Fundamentally it is an analogous front end heart rate checking framework.

6. Implementation:

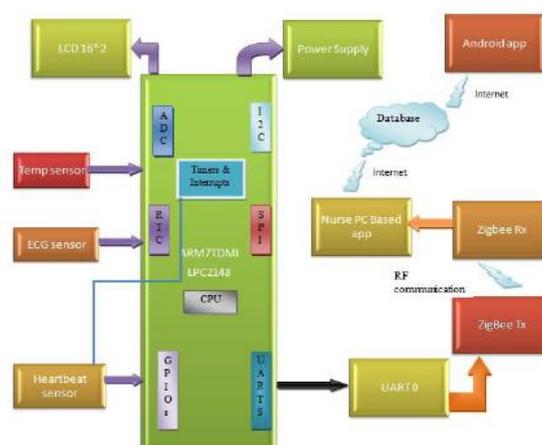


Figure 6.1. Experimental setup of proposed system.

6.1. Algorithm of our system Model

1. Temperature sensor, ECG sensor and pulse sensor are interfaced with the microcontroller. Since the temperature and ECG sensors create simple yield, the yield pins of these sensors are allocated to the ADC pins of the controller. What's more, these sensors needn't bother with any postponement to gauge the parameters of the patient, yet pulse sensor requires least of 15sec to quantify. Subsequently, clocks and hinders are presented in heartbeats sensor. When every one of the information is prepared microcontroller to read the information, handle it and send serially to thenext level. With the parameter of the patient, bed ID is additionally sent. So, that ZigBee can separate the information originating from various patients.
2. Prepared parameters are shown on the LCD and in addition given to the ZigBee transmitter through UART0.
3. The ZigBee gets the parameters from by the gadgets which are ON, the PC-based application isolates
4. the parameters originating from various patients and show on the table. This application utilized diverse ID to isolate the information. If the esteem goes past the limit esteem, it shows red shading demonstrating risk.
5. Once the information is placed in various table and showed it is upgraded into the database to the patient segment.
6. Android will screen constantly every one of the segments, any progressions will upgrade into the android application. On the off chance that any esteem goes past edge the specialist will get the popup message. On the off chance, that unnoticed call is to be created by the specialist.



Figure: 6.2 Proposed Model Prototype.



Figure 6.3: Zigbee receiver with cloud based application.



Figure 6.4: shows the patients parameters on LCD.



Figure 6.5. Cloud based monitoring GUI.

Android application is utilised to track singular patient wellbeing point of interest by specialist and technician. Once a Doctor/Technician login into the application, they can see a pie graph speaking to an aggregate number of specialist, expert and patient appear is the first window of the Fig.6.6. A Doctor/Technician can see rundown of their patient, specialist, and specialist in second window. Once a Doctor/Technician select a patient from the rundown, they can see persistent detail like patient name, temperature, heart beat and ECG in 3rd window. A specialist/Technician can offer call to Doctor or Technician by selecting them from the rundown.

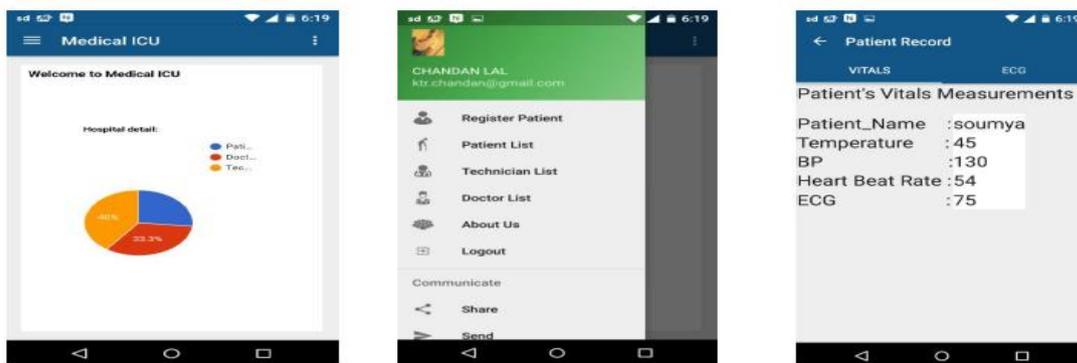


Figure .6.6. Android application for access patient or doctor.

7. Security Management Sub System

To ensure Keen City legitimately, various security issues must be confronted by outline/arrange; here, a portion of the issues that must consider in the plan stage are portrayed:

Security: If clients consider a framework as unreliable for his/her delicate data (protection), it won't have the capacity to set up itself effectively in the market. Critical social difficulties come from the need to adjust Keen City administrations to the qualities of each client. An administration has numerous setups alternatives, contingent upon client desires and inclinations; the learning of these inclinations ordinarily implies the achievement or disappointment of an administration.

In smart city pepos health management monitoring system frameworks from the security point of view is required, which incorporates: sensors, middleware, and mobile IoT cloud computing and alter safe shrewd frameworks or gadget structures (crypto and scratch administration for stages with constrained memory and calculation);transformative trust models (i.e., trust is not static but rather progressive, and related qualities can change quite a while) for adaptable and secure between framework connection; theoretical and far reaching security arrangement dialects; self-checking and self-ensuring frameworks, and also advancement of (formal) strategies for outlining security and protection into unpredictable and reliant frameworks; general string models that permit to consider various sub-frameworks.

Key administration: Key administration is important to give a dependable crypto security. Considering that the smart City will contain many gadgets, spread crosswise over several associations, the key administration frameworks utilized must be adaptable to phenomenal levels.

Further, key administration must offer solid security (validation and approval), inter organizational interoperability, and the most astounding conceivable levels of effectiveness to guarantee that pointless cost because of overhead, provisioning, and upkeep are minimized. It is likely that new key administration frameworks will be required. Condition of Workmanship is poor in this field.

7. Conclusion

Persistent parameters continuously in both the PC and android GUI. Android GUI is the discernible upgrade in this work. Contingent on the ZigBee module ability number of patients can be expanded, for demo reason we actualized two patients and can be expanded. It's one-time speculation framework yet a successful one. Android application and cloud technology empowers approved specialist to know the status of the patient at whatever time, any place over the world. In our approach, we investigated the specialized elements that are important to meet this joining and we exhibited the achievability of the administration engineering through mobile cloud IoT technology combined with the Android cell phone, while opening a capable entryway between the Cloud and Arduino stage.

8. Future Extension

The future work of this module is the plan the framework still more progressed. Improvement could gauge all a few more parameters of the patients furthermore expanding the many of patients for observing at the same time. Information transferring should be possible utilizing WIFI8266 module that may come about quicker transferring of information into the database furthermore upgrading the android application usefulness.

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