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Cloud Based Vital Health Stats Monitoring using IoT

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Abstract : *While there are lot of devices and applications available for monitoring the vital health statistics of human beings, there is still room for enhancement and improvement. This paper's intention is to address one of those perspectives. There are a lot of elderly people, whose children live abroad or at a long distance due to work and other priorities. Monitoring the health of the parents and having a keen eye on their health on a daily basis is a real challenge for the children living away from them. This challenge includes both communication regarding health and delay in regular vital checks. With this cloud based health monitoring, which employs Internet of Things (IoT) as a concept, the distance and the communication barrier can be overcome. This can enable people monitor their parents' health from a longer distance with consistency and reliability.*

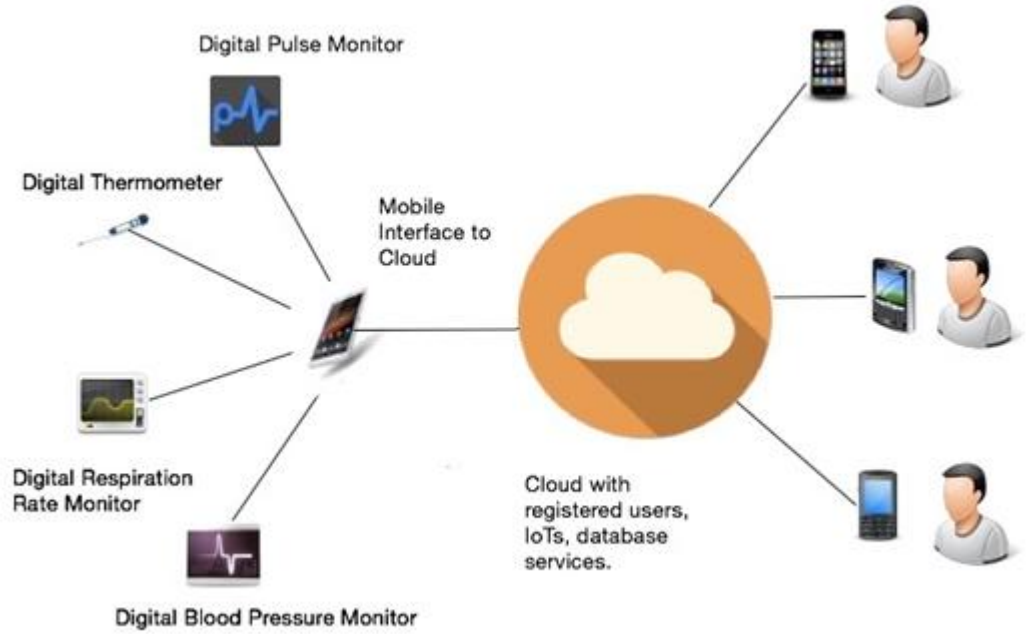
Keywords: *Cloud, SaaS, IoT – Internet of Things, PUT – Person Under Test, AWS- Amazon Web Services, Vitals, RDS - Relational Database Service, Monitor.*

I. Introduction

Cloud has changed the paradigm of computing, data manipulation and presentation. The efficiency of cloud combined with the evolution of Internet of Things, can help in resolving lot of problems faced in real life and to enhance the existing digital trends. This paper's objective is to consider one such scenario of implementation using IoT[1] as a concept with a cloud base, to provide efficient remote monitoring and reporting of vital health stats of a person.

Vitals are measurements of human body's basic functions. These include body temperature, pulse rate, respiration rate and blood pressure.

1.1 PICTORIAL REPRESENTATION



II. Internet of Things

Most of us think about being connected in terms of computers, tablets and smart phones. IoT describes a world where just about anything can be connected and communicate in an intelligent fashion. In other words, with the Internet of Things, the physical world is becoming one big information system. Based on this concept, we can visualize an intelligent connection among medical instruments used for monitoring health stats like blood pressure monitor, thermometer etc.

III. Cloud Computing – Software As A Service

Software as a Service [2] is considered as the most complete cloud computing model, under which platform and infrastructure are also provided as a service indirectly. SaaS provides software to the users in the cloud, allowing them to use it as an application. This paper discusses the implementation of one such software, which helps in aggregating and presenting the data collected from different digital instruments used for vital statistics check.

In addition to that, the SaaS model discussed in this paper also includes communication to a database to store, manipulate and retrieve the data collected. Since the data base implementation is outside the scope of this document and we have many robust cloud based databases available, this paper assumes the usage of Amazon RDS from the AWS infrastructure for this model.

IV. Data Flow and Functionality

The data flow and functionality of components across this proposed system can be separated into 4 modules for clarity in understanding.

1) IoT Interfacing
2) User Identification
3) Data Storage and Retrieval
4) Test Reminders

1) IoT Interfacing

The devices participating in the system like thermometer, pulse monitor, respiration rate monitor and blood pressure monitor, all have to be digital instruments and it is a prerequisite. These devices communicate to the cloud database via a smart phone to transmit their readings for a particular user. The information flows from the devices to the smart phone, gets aggregated there and then transmitted to the cloud database.

The communication between an IoT device and the smart phone is out of scope of this document. More over there are well established communication models based on blue tooth and wireless technologies for any device as an endpoint of a network. This paper assumes that one of those established technologies are implemented to transmit the readings from the instrument to the smart phone.

Every device registered with the cloud is assigned a unique device id. These device ids will be the column name in the cloud database table. Any information (the readings) transmitted by the devices to the cloud will be identified by the sender id and stored against the particular row in the table.

So, at any instance, a value transmitted by a blood pressure monitor will not be inserted into the pulse rate column. Mapping the sender id specific information to the column names, enables the user the take the readings without any particular order.

2) User Identification

A smart phone acts as the interface between the devices and the cloud. An interface of this kind is required for 3 reasons,

1. To reduce the complexity involved in connecting an IoT directly to the cloud. Having a smart phone in between the IoT and cloud can make things easier.
2. To enable multiple users use the same intermediate managing device and to facilitate segregation among data from different users.
3. A smart phone is a very common device nowadays and its less complex usability makes life easier for the user in this context.

Like the devices, every user should also be registered with the cloud. Every user is assigned a unique ID when he registers with the cloud. This id will serve as the primary key in the database. Before taking the measurements, the user logs in to the application (a software as a service mentioned in Section III of this document) running in the smart phone with the unique ID assigned to him. Only after the user logs in, the application initiates the daemons responsible for pairing with the measuring devices. Once the services are enabled, the user can initiate test session with the instruments.

The readings received from the devices for this session are mapped against the particular user id. The incoming readings arrive at the smart phone with the sender device id and the reading value as an ordered pair (IoT ID, Measurement Value). Ordered pairs from different devices are received in the smart phone one by one. This information is aggregated and then transmitted from the smart phone to the cloud DB as a triplet (User ID, IoT ID, and Measurement Value). With the help of this, the identification becomes easier, the first level being the user segregation and the second level being device specific info

3) Data Storage and Retrieval

As discussed, the smart phone serves as the interface between the measuring devices and the cloud. Data insertion to the cloud data base from the smart phone can be implemented using existing interfaces provided by the cloud infrastructure deployed. In this case, the stock interfaces present in the AWS cloud RDS can be used to insert the data to the cloud from the mobile application.

Similarly the other end point of this model, the monitors (person interested in monitoring the health stats of the PUTs) can also use the interfaces in cloud RDS to retrieve the data. Essentially, these smart phones used by the monitors will also be running the application and will be a member of the cloud. Only difference being, they will not be uploading test results to the system.

Apart from retrieval, the system will have options to automatically push daily test results of the PUTs to all registered monitors. In addition to this, aggregate data on weekly and monthly basis, providing average values for all readings in table as well as graphical format can also be supported, enabling an easy analysis of the recorded statistics.

4) Test Reminders

Any scheduled monitoring system is not complete without a reminder. A daemon running in the background (scheduler) will expect a test to be conducted at a pre-entered time on a regular basis. This daemon will be sending reminders to all the users in the cloud (both the person under test and the remote monitors) on the scheduled time. These schedules need to be fed to the SaaS at the time of PUT registration to the cloud.

The point behind sending reminders to all the users is, if a PUT decides to ignore the reminders and skip the regular check, the monitor could very well be aware of it, reach out to them and ask them to have the vitals checked. The reminder for a PUT on any particular day will stop only after all vital stats are uploaded to the cloud

V. Conclusion

This model when implemented according to the guidelines, can serve as an effective tool to monitor the health stats of a person from remote location. From sending reminders to aggregating the average data on a periodical basis, this can prove to be very efficient.

The system can be still more enhanced for including medications, other major tests done at a hospital like ECG, Echo on a bi-annual basis and adding a doctor to a family cloud making the monitoring process more effective. Technical implementation details of interfaces, procedures and libraries are not detailed in this paper, since the objective is to provide an overview of the system as a whole.

References

Websites:

[1] https://www.techopedia.com/definition/28247/internet-of-things-iot

Books:

[2] Dinakar Sitaram, Geetha Manjunath, Moving to the Cloud (Syngress, Elsevier 2011).