Personnel Health Care Applications based on Azure Cloud

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Abstract--- In recent days social insurance turns into a basic issue because of absence of accessibility of master specialists. So as to conquer this issue we are proposing an individual wellbeing Assistant framework which will be brought together with distributed computing. This paper Propose the iCare Personal Health Assistant from a specialized point of view and its advantages for clients. iCare individual wellbeing aide screens patient's wellbeing in an exceptionally suitable way and produces a notice when the patient's key parameters surpasses the ordinary esteem. The histological patient information will be exchanged to the Azure distributed storage that can be gotten to by master specialists and patients by means of iOS portable application. iOS 8 App which can read different wellbeing information parameters gave by iOS Health Kit Framework and an Azure Web application which all things considered stores every one of the information to perform straightforward investigation and give an account of wellbeing conditions for a particular time. The Azure Web application will be created utilizing ASP.NET and facilitated in Microsoft Azure Cloud. Sky blue Web administrations and Azure Mobile Services are utilized to send push warnings. Therefore, clients get the most recent wellbeing report alongside couple of suggestive activities to cure that wellbeing condition, assuming any, and this enables clients to modify their sustenance and exercises as needs be.

Keywords--- Healthkit API, Azure Cloud, iOS, Asp.Net, WSDL.

I. INTRODUCTION

Appropriated m-medicinal services distributed computing idea has developed as of late. we can state that it is a patient driven model as general control of patient's information is with the patient.[1] due to the high cost of building and keeping up server farms, outsider specialist organizations give social insurance administrations. Utilizing outsider specialist co-ops postures numerous security and protection dangers. In human services interpersonal organizations, individual wellbeing data is constantly shared among patients situated in separate social groups experiencing a similar sickness for common help, and crosswise over appropriated medicinal services suppliers outfitted with their own particular cloud servers for therapeutic counsel in disseminated m-human services distributed computing frameworks. [2].

II. TWO RECALCITRANT ISSUES REQUESTING PRESSING

Arrangements are patient's close to home wellbeing data that ought to be shared and which doctor their own wellbeing data ought to be imparted to. Lately, the appropriated m-medicinal services (portable social insurance) has developed as a worldview for trading wellbeing related patients information. It permits to make, oversee and control individual wellbeing information, which requires that capacity, recovery, and sharing of restorative data is more effective as in distributed computing. [3].

The world social insurance association characterizes versatile human services framework as a zone of rising patterns in momentum medicinal services applications that gives wellbeing data and administrations over portable innovations, for example, cell phones and individual computerized Assistants (PDAs) .Personal wellbeing data is constantly shared among patients experiencing a similar malady, amongst patients and doctors as proportional partners or even crosswise over circulated medicinal services suppliers for therapeutic interview.

This sort of individual wellbeing data sharing enables each teaming up medicinal services supplier to process it locally with higher proficiency and adaptability, incredibly improving treatment quality, altogether reducing intricacy at the patient side, and accordingly, turning into the preparatory segment of a conveyed m-human services system[4].

III. RELATED WORK

iCare is a personal health-care web application and mobile-based system which can read various health data parameters provided by iOS Health Kit Framework which is collected by the using various health devices and an Azure Web application which collectively stores all the data to perform simple analytics and prediction of health conditions for a foreseeable time. The objectives are prediction of health conditions well in advance with high level of accuracy, no scope limitations, easy combat actions which go on with daily life routines.

To understand the user's physical limits and plan actions accordingly, medical history based analysis is to be carried out by the system. Everything will be approved and certified by a nutritionist to ensure no harm is caused by usage of the system. iCare web application is developed using ASP.NET and hosted in Microsoft Azure cloud.A comparing engine will intelligently analyze the standard recommended data store and map it with the current health readings of the user, to predict deviations in health conditions.

Thus, the user can follow suggested actions to remedy the predicted health condition. It suits all age groups irrespective of their physical characteristics. The Proposed iCare healthcare system consists of two parts. First, Azure Mobile Services are used for connectivity to the iCare iOS App using predefined APIs. Azure Push notification service will be used for sending frequent health reports to the iOS App.

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The iOS app is developed using two languages i.e. Swift and Objective-C. The Health kit API is used to check the health data from Health kit store in iOS. The health data is categorized into five main health categories including nutrition, exercise, body vitals, body fitness, and sleep. These categories consist of many available health parameters, which can be utilized to keep track of health conditions with a high level of accuracy. After the data is imported, a copy of it will be sent to the Web app in Microsoft Azure Cloud for further processing and storage.

The storage of data does not violate health laws applicable to cloud storage as only the calculated inference data and the individual health score will be stored. The raw health data will never stored for any user. This type of processing can lead to dynamic health scores which can change rapidly over time, in days or in hours or even in minutes, as required by the user. The health data can also be used to suggest simple actions to bring the level of health impact to normal, if found to be very high or very low. The report is then generated with health parameters and its levels of impact on the overall health, which is then push notified to the iOS app. Thus, the user can get a timely notification of a snapshot of current health condition and plan his/her nutrition and activities for the day accordingly.

IV. EXISTING SYSTEMS

The existing health applications had a drawback of reading and storing health data for limited time period only. So there is no prediction based implementation had been done in existing system.[5] Hence data computational and comparative accuracy is very low. Peoples were not able to understand their health conditions from a snapshot of data, because of the above mention reason patient should consult a doctor to diagnose and analyze the causes of illness[6]. Also there is no nutritionist is approved standard charts to view and analyze live health conditions automatically. [7]Centralized health data stores are available which provide at a glance look at the present health condition but these are limited by scope.

V. LITERATURE SURVEY

A literature study was conducted and it is summarized in Table 4.1.

Table 1: Literature Review

S.No	Title / Publication	Data Sets / Techniques Adopted	Functions	Conclusions
1	A Mobile Health Monitoring System for the Elderly - *IEEE, National Science Forum, China – 2013*	Body Sensor Networks (BSNs) with short range communication with PDA.	Real-Time data collection. Automatic alerts to family and relatives.	Manual health readings must be taken and entered to system.
2	A Survey on Ambient Intelligence in HealthCare *Proceedings of the IEEE - 2012*	Body Area Networks (BANs) with hierarchal tiers of devices and sensors. Ambient Intelligence Systems (AmI) with behavioural pattern recognition and continuous monitoring.	Accurate readings of health parameters (crucial only). Critical dependencies of health parameters is uncovered.	No support for Smart-Wearable devices / Requires purchase of body sensors such as ECG etc.
3	A Cloud Computing Solution for sharing healthcare information - *Proceedings of the IEEE - 2012*	Google APP Engine(GAE) based desktop system connecting health centres and hospitals. Large scale binary file sharing is used to share larger media files like patient X-Ray images.	A comprehensive solution to share critical health data between hospitals and health centers, with allowable read access to patients.	Although read access is provided to patients, real-time data is not used to monitor past health situations,.
4	Mobile Healthcare Service System Using RFID - *Proceedings of the IEEE - 2004*	RFIDs hold a patient's disease information and smart generators scan the RFIDs. Infection control system in both hospital and local communities.	Very quick analysis and scanning of medical history. Prevention of diseases which are spreading too fast in a community can be controlled by analyzing large amounts of data.	Even though high-speed Wireless networks are used, data transfer speed cannot exceed 10MB/s.

VI. PROPOSED SYSTEM

The proposed framework centers around gathering of patient's fundamental wellbeing parameters, to create ready cautioning to medicinal services takers with the goal that prompt cure move can be made if there should be an occurrence of crises. The information is then put away in Cloud so information can be gotten to through web from anyplace whenever. Present day innovation is being moved to cloud based stage as it is most appropriate for long haul information stockpiling. The targets of iCare are expectation of wellbeing conditions well ahead of time with abnormal state of exactness, no extension confinements, simple battle activities which go ahead with day by day life schedules. iCare utilizes Webservices depiction dialects calls for questioning and putting away information between iOS application and Azure web application. Useful necessities are 128-piece Azure encryption and approval, secret key recuperation components, A Microsoft SQL for Azure database equipped for dealing with 1000 inquiries for each moment, access to Azure database by the web application day in and day out, straightforward information examination strategies, access to iOS application through WSDL calls, forecast reports and investigation comes about pushed to the gadget. Non-useful prerequisites for execution are: least framework necessities on Cloud CPU 0.5 GHZ or higher, memory of 0.5 GB or higher, 150MB of free storage room, 500,000 API calls like clockwork or higher. Few advantages that iCare has over other systems include:

- This will be the first cloud based system with a snapshot of all health parameters, not limited by scope
- Fits in your pocket, as an iOS app running in the background
- The iOS app will recover all the data stored in Health Kit momentarily and not just a few of them
- Since iOS and Health Kit is used, encryption will be strong and user information always stays private
- The power of Azure cloud means that the system can scale depending on the load and never crash.
- Data accuracy will be high (subject to smart device limitations) and all the parameters (not just limited to scope) Because every action predicted by the system verified with a nutritionist and it consist of only simple everyday activity and nutrition remedies.
- It suits all age groups irrespective of their physical differences, as all their physical data will be extracted from the users and then processed
- It allows adjusting the user's body limits to align actions accordingly.

VII. SYSTEM ARCHITECTURE

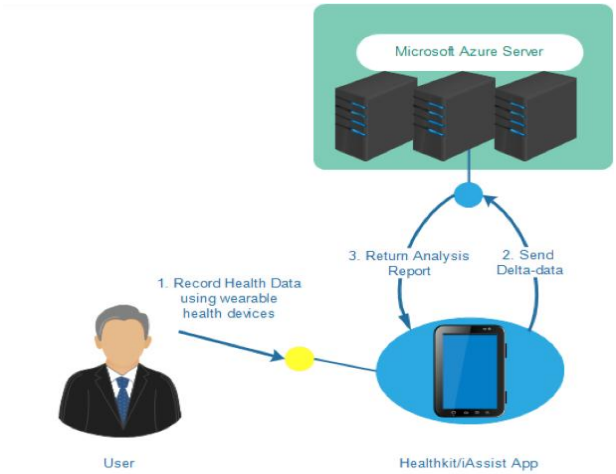

Figure 5.1. iCare Personal Health Assistant System Architecture

VIII. DETAILED DESIGN

Health kit Recovery Component

HealthkitRecovery of iCare iOS App allows usage of Apple's iOS Health kit APIs to automatically input health data in terms of various parameters stored in the Health kit app. User privacy to be high as only health parameters which are allowed by the user to be read can be accessed. However, crucial data required for the app to work will be flagged as mandatory. The raw health data to be stored temporarily in the main memory for further processing .

Input: Raw health data in parameters (with units) which are read by Health kit API

Output: Categorized health data in main memory, kept by iOS app

AzureCompute Component

AzureCompute will read the health data stored in main memory and compare it with the standard health norms (which are entered by the user during initial startup of app). This comparison allows the calculation of delta-data (the difference in readings either positive or negative) with respect to the actual health readings. This delta-data is uploaded to the remote Azure Server using Azure Mobile-Services API. Then its stored in the Microsoft SQL Server for Azure in the remote Azure server.

This component also provides login facility to the user via the app. Azure Authorization and Authentication mechanisms with 256-bit encryption using AES protocol (standard for any Azure Server) implemented here. After successful authorization, the delta-data is uploaded to the server. Logging in using Microsoft accounts and recovering passwords via e-mail also done here.

Input: Health data in

main memory, kept by iOS app,Output: Delta-data stored in SQL database in remote Azure Server

AzureAnalysis Component

AzureAnalysis of iCare ASP Web Application take as input, the delta-data stored in the SQL database along with standard normal health data by average (given by a physician) and analyses these data by comparing the health parameters with one another. Included are the mechanisms to analyze all health parameters instead of relying only on those necessary parameters to calculate health percentage (as a prediction report) for any kind of disease or regular checkups. The prediction report is used to determine the appropriate suggestive actions to be sent to the user on a timely basis. These suggestive actions (pre-entered into the app) are read appropriately by the Web app and passed on to the AzureResult component.

Input: Delta-data along with standard health average (given by a physician)

Output: Suggestive action

AzureResult Component

AzureResult will take as input, the suggestive actions passed by the Azure Analysis component and uses the WSDL based Azure mobile services API to push notify the iCare iOS app with the suggestive action. The suggestive actions are queued and sent through the network by the same API.

Input: Suggestive actions provided by AzureAnalysis

Output: Push notification with the suggestive action

AzureRecovery Component

AzureRecovery is designed as a manual way of getting a suggestive action based on a push notification. This also uses the Azure mobile services API to poll the server for any suggestive actions that are waiting to be sent to the iOS app, but not yet sent due to network outage. The user have to click a button to pull the suggestive action from the server to the app.

Input: suggestive actions queued to be sent by AzureResult

Output: Manually pulled suggestive action displayed in iOS app

IX. SYSTEM ANALYSIS & RESULTS

Requirement ID	Description	Priority
RR1	The System should allow the user to login using 128-bit Azure standard login	High
RR1a	Logging in using Microsoft ID is possible	Low
RR1b	Password Recovery is through E-Mail	Medium
RR2	With the click of a button, iOS app should recover all the data from Healthkit	High
RR2a	User privacy over types of health data is to be strictly given	High
RR2b	Mandatory types of data based on health problem is to be strictly imposed to the user	Medium
RR2c	Storing all the health data locally is prohibited	High
RR3	Uploading data to Azure database is done only on the delta-data calculated	High
RR3a	Delta-data is calculated based on the comparison between norms and the actual health readings over time	High
RR3b	Delta-data upload is through Azure Mobile Services only	Medium
RR3c	The Azure database should be capable of handling 1000 queries per minute or lower as dictated by network speed	Low
RR4	Analysis and prediction logic with suggestive actions is to be implemented in the Azure website	High
RR4a	Comparison of delta-data with historical data of the individual and the standard norms is to be used in prediction	Medium
RR4b	Prediction report generated with a time limit of expiry and accuracy limits	High
RR4c	Simple suggestive actions are chosen based on prediction report	High
RR4d	Data discrepancy problems to be avoided (harmlessness)	Medium
RR5	Medical history is mandatory to be entered by the user	High

X. CONCLUSION

This paper proposes an iCare Personal Health Assistant Systems in light of versatile distributed computing condition. This gives an abnormal state of reconciliation, interoperability, and sharing for medicinal services suppliers, patients and specialists. The cloud allows quick Internet access and sharing by verified clients.

A definitive objective of the proposed framework to present another age of HealthCare frameworks that give social insurance administrations of high caliber and ease to the patients utilizing a blend distributed computing and portable figuring innovations. The System to be produced comprises utilization of openly accessible structures and APIs (Application Programming Interfaces), in a natural way. The safe idea of battle steps adds to its uniqueness.

It will work as indicated by the client's body breaking points and pace and proceeded with use will just prompt higher exactness. Subsequently, it will be a genuine "Wellbeing in your Pocket" execution with numerous expanded applications. A portion of the arranged upgrades for this framework incorporate the forecast of looming wellbeing disappointments/sicknesses and battling with basic ordinary advances if wellbeing circumstance is consummately typical, recommendation of worldwide WHO suggested solid living activities according to the client's pace. Understanding the client's reaction times and adjusting activities and glitches in wellbeing conditions distinguished to be furnished well ahead of time alongside prescribed sound living straightforward activities to battle those breakdowns.

REFERENCES

1. Guohua Bai, G., & Malmqvist, G. (2007). Guide to Good Practice of EHealth Research Report. IANIS+GGP ehealth Group.
2. Martin, T., Jovanov, E., & Raskovic, D. (2000) Issues in wearable computing for medical monitoring applications: A case study of a wearable ECG monitoring device. Int. Symp. Wearable Computers ISWC 2000, Atlanta, GA. doi: 10.1007/s10916-010-9449-4
3. Pantelopoulos, A., Bourbakis, N. G. (2010). Prognosis - A Wearable Health-Monitoring System for People at Risk: Methodology and Modeling. IEEE Transactions on Information Technology in Biomedicine, 14(3), 613-621.
4. Milenkovic, A., Otto, C., & Jovanov, E. (2010). Wireless sensor network for personal health monitoring: Issues and an implementation. Computer Communications, 36(1), 93-101.
5. Gregoski, M. J., Mueller, M., Vertegel, A., Shaporev, A. , Jackson, B. B., Frenzel, R. M., ... Treiber, F. A. (2012) Development and validation of a smartphone heart rate acquisition application for health promotion and wellness telehealth applications. International Journal of Telemedicine and Applications, 2012 (1). doi: 10.1155/2012/696324
6. LeahC.Osterhaus,"Cloud Computing and Health Information". [Online]. Available: http://ir.uiowa.edu/ bsides /19/. [Accessed: 06-April-2012]
7. Y. Guo, Y. Hu, J. Afzal, and G. Bai, "Using P2P technology to achieve eHealth interoperability", in Service Systems and Service Management (ICSSSM), 2011 8th International Conference on, pp. 1 –5, 2011

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