

An Adaptive Technique in Electronic Health Record for Clinical Decision Making Based on Data Visualization

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ABSTRACT

Cloud computing is a collection of several computer resources that consists of both software and hardware. It is a type of service that is delivered over the internet and can be accessible from anywhere. [1] The data and services can be accessed through the internet. [4] These services are managed by the third-party over the internet. They eventually provide access to the servers and resources. Health records consist of patient's data regarding health. This data is usable by both the hospitals and patients. [6] [8] This can be eventually used to track the medical history of patients. Data Visualization is a graphical depiction of the data. It implicates producing images that advertise the link among the data that the users view. Hence, they are used for clinical decision making. In this paper we will be discussing how cloud can be used to maintain health records electronically.

KEYWORDS: Cloud Computing, Internet, Hospital, Electronic health record, Data Visualization

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I. INTRODUCTION

The world is becoming too enormous and all are utilizing innovation in their everyday life. In this way, even the innovation is developing and even the necessities of everybody are likewise developing. [9] Nearly everybody right now utilizing innovation for their day by day assignments. Web turns into a fundamental need and is vital and assumes a significant job in everyone's life just as in the organizations. All the end-gadgets are associated with web. This is the period of change. As the requests are developing higher, cloud comes into picture where it is an on-request administration, it is a mutual pool, it decreases the expense and aides away, organizing and offers different types of assistance.

As we know that every patient will have a patient history. The data of each patient is very important. Health Information must follow a standard format for Health Information exchange between different hospitals. [11] Different forms of Health Records will be created because there are different sources being used. Integration of these medical records will help in patient's Health Records to be in a sequential manner. The hospitals don't adopt to this because, they seem it is expensive. [5] Health Records must follow CDA defined by HL7 to ensure interoperability. Integrating the Health Records using an Open API service on Cloud which is free. Data Visualization gives Physicians the graph, which displays the disease/fever that are critical.

II. HEALTH RECORD

Health Record is the place it comprises of wellbeing information and other data identified with a patient's wellbeing. This can be utilized generally for electronic upkeep of clinical records of patients. They can be utilized by the two patients and clinics. [1] The doctors can use to follow the clinical history of a patient. The medical clinics can use to enter to follow a patient's information, for charging reason and some more. They are utilized to give precise data with respect to a specific patient. These are all around accessible. They are useful to settle on the clinical choices. There are a few important benefits that are listed below -

- For the best medical practices
- For chronological clinical history maintenance
- Centralization of information
- Information to be shared in a digital format
- For better decision making
- To remove the communication blockade

III. HEALTH LEVEL 7

HL 7 - It is the arrangement of global measures that is utilized for sending or sharing the clinical data and managerial information among the product applications that are profited by wellbeing cares. [6] These gauges for the most part focus on the application layer, that is the Application layer of the OSI model in systems administration.

It is for trading the data over the emergency clinics that are utilizing diverse programming, to re-establish electronic clinical data and to absorb the data.

CDA was created by Health Level 7 universal standard, which describe the structure of the wellbeing records for them to be shared and trade the data between the clinics and patients that are utilizing distinctive programming stages. They can contain pictures, writings which together structures an electronic wellbeing record.

IV. DATA VISUALIZATION

Data Visualization is a graphical depiction of the data. It implicates producing images that advertise the link among the data that the users view. [12] The relationship between them are gained using mapping among the graphic marks and the data rate in the formation of the visualization. Datum will change when there is a difference in graphic mark such as colour and size.

These use statistic graphics, information graphics and so on. Numerical data will be represented using dots, bars, lines to show the volume or portion message. This makes sure that the user has the evidence and reason about the data. You can use and understand data better. Usually they are used for data comparison and visualization also helps in understanding better. [2] Tables play a very important rule where they are used for looking up and measurement of data. There can be many charts that can help the users to show the patterns between many values or data.

V. PROBLEM IDENTIFICATION

Health Information data must be in a standard organization to trade the information between various clinics. There are various organizations of clinical reports that will be created in various emergency clinics all around the globe. It takes a long pace for assembling all the data since all are in various organizations. [8] It is a basic errand to assemble all the data. The clinical history of a patient is significant for the prosperity of an individual, so it is imperative to assemble all the data and set up in an equivalent arrangement, so all the medical clinics get the opportunity to get to the data. When the information is gathered to a unified framework, the information must be envisioned for better dynamic.

VI. PROJECT SCOPE AND OBJECTIVE

The health record project gives an assortment of the suggestion identified with grasping the electronic wellbeing data gauges in Electronic Health Information/Electronic Medical Information and other clinical records. [9] The principle extension is distinguishing the gauges and their motivation in clinical industry, the catching of information alongside the perspective on information, how they are spoken to, put away, shared, transmitted that will be through interoperability of the considerable number of records. This venture does exclude considering portions of creation and action of neighborhood, nearby or national systems, records, or storage facilities as they are overseen by appropriate regulative/administrative bodies.

The main objectives are as follows –

- Improving interoperability which makes sure that the content that are shared and exchanged may be of different formats, but they can still incorporate the

different formats of data, including the vocabulary and other standards.

- Implementing policies, best practices and frameworks.
- Adapting according to the standards and make sure they are not interdependent.
- Encouraging all the hospitals to adopt to modernization (digitalization)
- Making the data technically available according to the standards.
- Maintenance of the system in a timely manner.
- Implementation and maintenance cost must be low.

VII. PROPOSED SYSTEM

The proposal that we have for this project will have many components such as – Validation, Collocation, Parsing, Integration Interface, Hospital consisting of a database, along with the API, linked to the data visualization dashboard. Here, the patient details will be stored in a centralized database. They will be using an Application Programming Interface, so that the data generated from different platforms can interact and share information in a single format using the clinical document architecture. The data must pass through the integration interface, then the data will be parsed, then the data will be put together from different hospitals and will be verified with the architecture and verified across the standards that are required. Then the data all together will move up and down as shown in the architecture and then we can visualize the data by choosing the records, and variables, which is precisely helpful for decision making. The architecture is depicted below. The above architecture shows how the flow of the project goes. This also will have a visualization dashboard that can be used to visualize and get insights of every metrics.

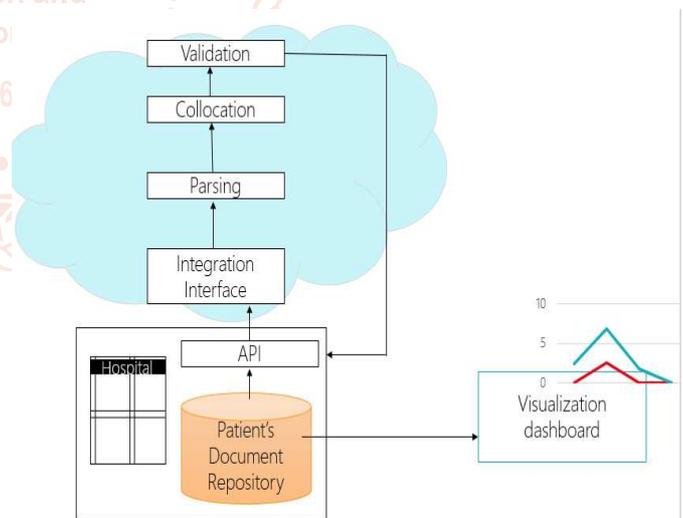


Figure1. Architecture of Electronic Health Information System

The above architecture shows how the flow of the project goes. This also will have a visualization dashboard that can be used to visualize and get insights of every metrics.

VIII. IMPLEMENTATION

The project implementation has main modules that must be implemented accordingly. First the doctor must login with the credentials and then enter the patient details and why they came for the appointment. The doctor can view the information later when they with the code that will be sent to the registered email address for security purposes. The patient can also look for his/her details when required same

as the doctor with the security code sent to their email address. When the patient visits a new hospital also can enter the details of the patient that can be integrated and stored online. This can be accessed from anywhere over the internet. The encrypted data will look like the image below.

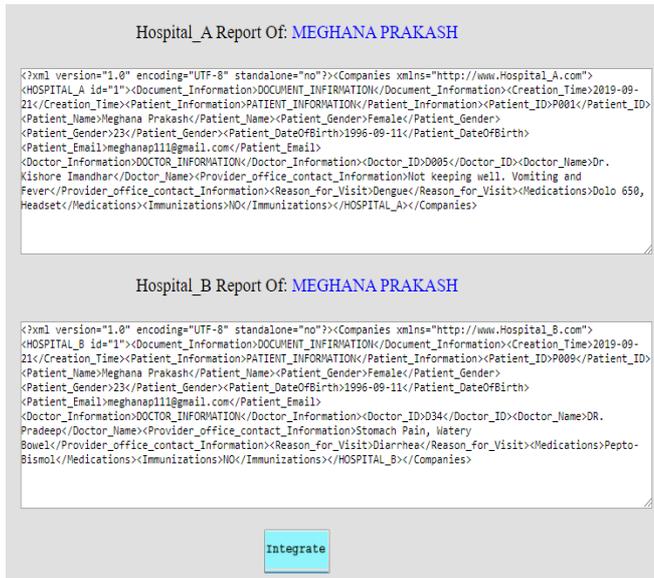


Figure2. XML format of CDA generated

The key that will be generated when the patient or the doctor wanted to view the information. The below figure shows the key generated.

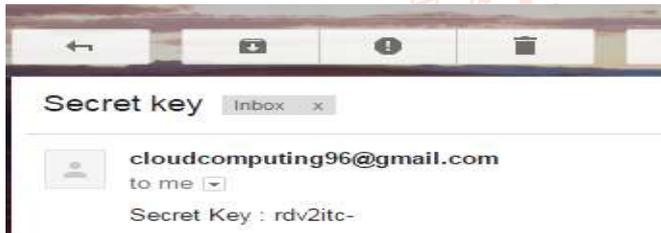


Figure3. Secret key sent to the registered email

The data that will be collected are will be stored in a place in XML format. The data can be merged in an excel and extract the data. In this we will use tableau tool which is free to visualize each and every field.

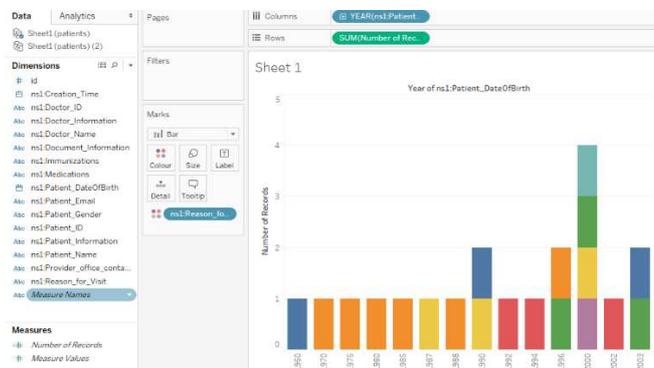


Figure 4. Data Visualization Dashboard

In this architecture we can see that we are using Elastic File System. This is mostly used with Linux. As we are using Linux Containers, we will be using them to store all the required files. This will be mounted to the instances. In case of failure we have EFS to EFS backup where that can data if it lost from one EFS will still be available in another EFS. This

improves Fault Tolerance levels and helps in Disaster Recovery.

IX. RESULT AND OBSERVATION

The implementation of the concept that we discussed re implemented successfully. The user-interface of the Electronic Health Information System has an interface where all have to insert the user id and password. They can access particular patient's data with the access code that will be generated randomly and sent to the mail id that was registered. The admin will click send for those who requested. Only when they give send, the access code will be sent, and the clinical history can be accessed in the XML format. The data that is integrated will help the physicians and the patients to get more insights about the clinical history.

X. CONCLUSION

The methodology utilized right now pertinent in embracing different models, as well, for example, the EHR Extract dependent on open EHR. In the event that a clinic sends the substance prime example, administrator model, and segment paradigm to the cloud server, at that point the server separates fundamental data from every original. Next, it creates an Extract control structure that fits with an assigned format and returns the structure to the mentioned clinic.

As the quantity of HIE dependent on CDA archives expands, interoperability is accomplished, however it additionally brings an issue where overseeing different CDA records per persistent gets badly arranged as the clinical data for every patient is dissipated in various reports. The CDA report joining administration from our cloud server satisfactorily addresses this issue by coordinating different CDA archives that have been created for singular patients. The clinical information for the patient being referred to is given to his/her primary care physician in sequential request per segment so it causes doctors to rehearse proof based medication. In the field of report-based wellbeing data trade, the IHE XDS profile is transcendent and our distributed computing framework can be promptly connected with the IHE XDS profile.

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