CDA Generation and Integration for Health Information Exchange Based on Cloud Computing System

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Abstract -- Successful arrangement of Electronic Health Record enhances tolerant wellbeing and nature of care, however it has the essential of interoperability between Health Information Exchange at various doctor's facilities. The Clinical Document Architecture (CDA) created by HL7 is a center report standard to guarantee such interoperability, and spread of this record organize is basic for interoperability. Lamentably, doctor's facilities are hesitant to embrace interoperable HIS because of its organization cost with the exception of in a modest bunch nations. An issue emerges not withstanding when more healing centers begin utilizing the CDA record organize on the grounds that the information scattered in various archives are difficult to oversee. Our CDA record blend structure organizes distinctive CDA chronicles per calm into a single CDA report and specialist and patients can scrutinize the clinical data in consecutive demand. It in like manner gives security by scrambling the patient information .Our arrangement of CDA archive age and mix depends on distributed computing and the administration is offered in open API. Engineers utilizing diverse stages in this manner can utilize our framework to improve interoperability.

Index Terms- Health information exchange, Electronic Health Record, HL7, CDA, cloud computing, software as a service

I. INTRODUCTION

Viable wellbeing data trade should be institutionalized for interoperable wellbeing data trade between healing facilities. Particularly, clinical record institutionalization lies at the center of ensuring interoperability. It takes increasing amount of time for the medical personnel as the amount of exchanged CDA document increases because more documents means that data are distributed in different documents. This fundamentally defers the medicinal work force is enabled to audit the patient's clinical history advantageously in sequential request per clinical segment and the subsequent care administration can be conveyed all the more viable.

Electronic Health Record (EHR) is longitudinal collection of electronic health information for and about persons, where health information is defines as information pertaining to the health of an individual or health care provided to an individual and it can support of efficient processes for health care delivery [1]. In order to ensure successful an operation of EHR, a Health Information Exchange (HIE) system need to be implemented [2]. However, most of the HIS in service have different characteristics and are mutually incompatible [3], [4]. Hence, effective health information exchange needs to be standardized for interoperable health information exchange between hospitals. Especially, clinical document standardization lies at the core of guaranteeing interoperability.

Health Level Seven has established CDA as a major standard for clinical documents [5]. CDA is a document markup standard that specifies the structure and semantics of 'clinical documents' for the purpose of exchange. The first version of CDA was developed in 2001 and Release 2 came out in 2005 [6]. Many projects adopting CDA have been successfully completed in many countries [7], [8], [9].

More HIE system has to support CDA to establish confidence in interoperable Health Information Exchange. Additionally, the structure of CDA is excessively mind boggling and the right CDA Document generation is troublesome without the great comprehension of the CDA standard and enough involvement with it. Also, the HIS development platforms for hospitals differ so greatly in such a way that generation of CDA documents in every hospital invariably requires a separate CDA generation system. In addition to that, hospitals refuses to adopt a new

system unless it is perfectly necessary for delivery of care. As a result, except for only few handful countries like New Zealand or Australia, the adoption rate of EHR is too low [10]. To promote EHR adoption among hospitals, the USA government had implemented an incentive program called the Meaningful Use Program [11].

In this paper we present (1) a CDA document generation system that generates CDA documents on different developing platforms and (2) a CDA document integration system that integrates multiple CDA documents scattered in different hospitals for each patient. The cloud CDA document benefit produces archives in the CDA arrange endorsed by the National Institute of Standards and Technology (NIST) [12].

II. MATERIALS AND METHODS

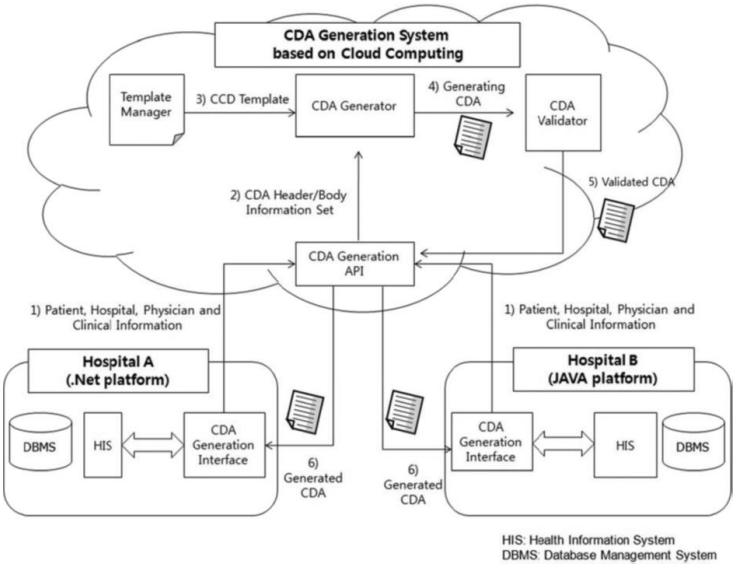
In this area, we display the vital procedures in detail for the outline, and clarify the execution of our CDA document and mix framework in view of distributed computing.

Construction of System Environment

In this we develop the construction of the System Environment to prove our proposed system model. In this module we develop Hospital, Doctor, Patient, Admin and Cloud modules. In Hospital, we create the user authorization with Login credentials. This module provides the option of upload the Patient details as XML file in the cloud with encrypted and also provides the option to check the status of the uploaded file with the XML format. In the Admin part, we provide the Admin Authorization with login credentials and view pending request of users and doctors. The admin only give approval to the request by sending secret key to user to access the file. In cloud login, view the patient details in the XML format which is acquired from CDA.

The CDA Document

In this we develop the CDA document. The HL7 Clinical Document Architecture Release 2 (CDA R2) was approved by American Nation Standards Institute. It is an XML-based document markup standard that specifies the structure and semantics of clinical documents, and its primary purpose is facilitating clinical document exchanges between heterogeneous software systems. The patient medical information is encrypted by using AES algorithm for providing security and preventing unauthorized access. A CDA document is divided into its header and body. The header has a clearly defined structure and it includes information about the patient, hospital, physician, etc. The body is more flexible than the header and contains various clinical data. Each piece of clinical data is allocated a section and given a code as defined in the Logical Observation Identifiers Names and Codes (LOINC). Distinctive subcategories are embedded in a CDA record contingent upon the motivation behind the archive, and we picked the Continuity of Care Document (CCD) on the grounds that it contains the wellbeing outline information for the patient.



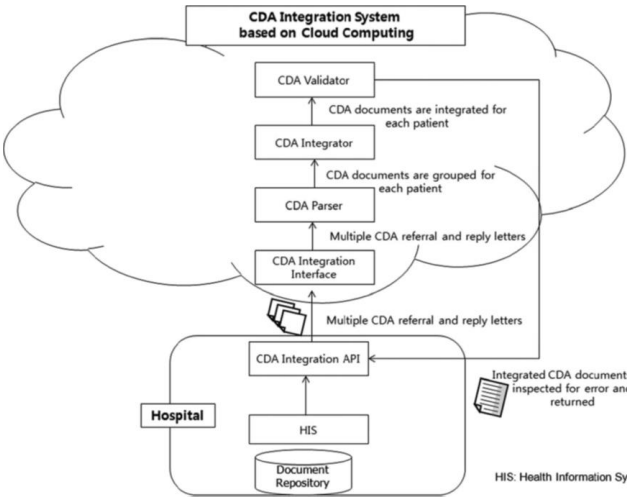
Construction of Cloud Computing Environment

In this we develop the cloud computing environment. We use Drive HQ cloud service provider to upload our files in the cloud. We develop construction of a cloud computing environment and how multiple CDA documents are integrated into one in our CDA document integration system. Layouts which produce a CDA utilize CCD part of solidified CDA which is discharged by ONC and made by HL7. In any case, a truly created CDA has a sort of CDA Referral and Reply Letters. The method of reasoning for CDA archive joining is as taken after. At the point when CDA-based HIE (Health Information Exchange) is

effectively utilized among doctor's facilities, the quantity of CDA reports relating to every patient increments in time. Physicians need to spend a significant portion of their time on reading these documents for making clinical decisions. At a doctor's facility, the CDA archives to be incorporated are prepared through our CDA Integration API. The CDA Integration Interface transfers each CDA record sent to the cloud to the CDA Parser, which changes over each information CDA archive to a XML protest and dissects the CDA header and gatherings them by every patient ID. The CDA document integrator integrates the provided multiple CDA documents into a single CDA document. In this procedure, the information in a similar segment in the archive body is blended.

Integration of CDA Document via our Cloud Server

We incorporated various CDA archives of patient referrals and answers by utilizing the API at our server. The use case scenario and patient data used for integration are shown. We adopted sample patient data provided by the US EHR Certification Program, Meaningful use. The data does not pertain to an actual person. It is anecdotal and accessible for free. This module is to indicate how a customer coordinating various CDA reports by utilizing our API. The sample many clinical documents are shown to be successfully integrated. For integrating CDA documents we are using Triple DES Algorithm.

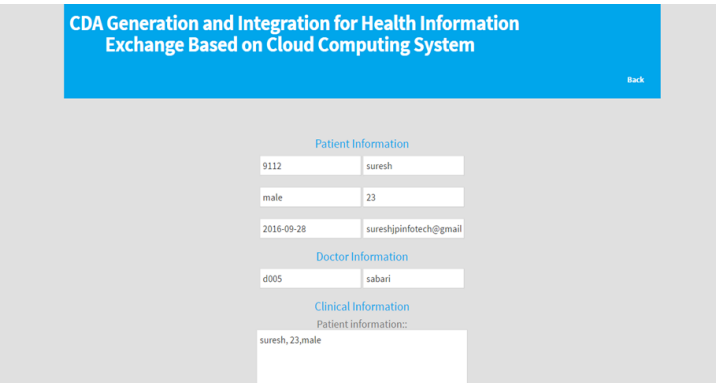


III. RESULT

Construction of a Cloud Computing Environment and Deployment of CDA Generation and Integration System Based on it

We choose Drive HQ cloud as the cloud platform for our CDA generation and integration system. Microsoft Windows Server 2008 base was selected as its operating system.

Java (JDK 1.6) was used for CDA document generation and integration system and Tomcat 6.0.26 was selected as the web server platform for service deployment. Hospitals conveniently generate and integrate CDA documents by exploiting the API offered by our system.



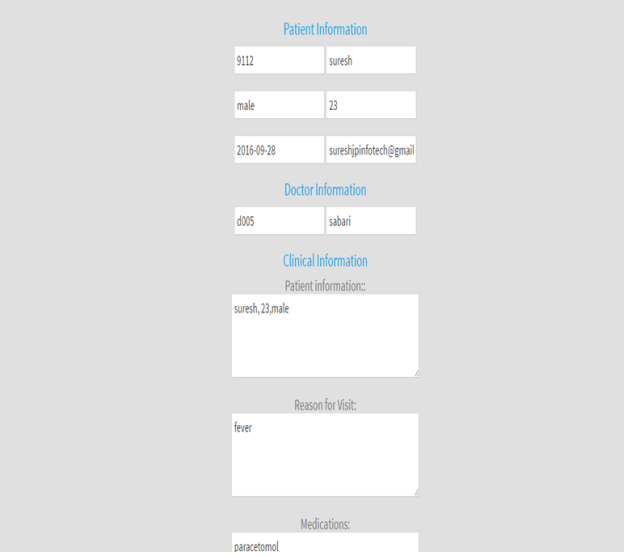
Generation of CDA Document on Different Developer Platforms through Cloud

To check whether the framework capacities as composed, we asked for CDA report age on numerous frameworks executed on various designer stages by means of our API. By clicking on upload CDA button then the patient medical information is encrypted and

converted into XML file by using AES algorithm. If the doctor requests the secret key for seeing the patient information then he receives the secret key then the XML file is decrypted by giving the secret key and the doctor can view the patient information.

Integration of CDA Document via our Cloud Server

We incorporate various CDA records of patient referrals and answers by utilizing the API at our server. The utilization case situation and patient information utilized for reconciliation are appeared. By utilizing Triple DES Algorithm the CDA records are coordinated and it swings to single CDA report for every patient.



IV. CONCLUSION AND FUTURE WORK

We build up a proficient method for producing the CDA design for the created and coordinated CDA Documents for the utilization of patients. Our cloud computing based CDA generation and integration system has a few pronounced advantages over other existing projects. CDA documents increases, interoperability is achieved. The CDA document integration service from our cloud server adequately addresses the issue of integrating CDA documents as they are scattered in different documents by integrating multiple CDA documents that have been generated for individual patient. First, Hospitals do not have to purchase propriety software to generate and integrate CDA documents and bear the cost as before. We develop a capable strategy for delivering the CDA plan for the made and facilitated CDA Documents for the use of patients. Regardless of the type of the platform, CDA documents can easily generated to support interoperability. The integration of multiple CDA documents into single CDA document helps the doctors to save their time in taking medical decisions at emergency times and deliver the correct health care as the medical records are in chronological order.

In our future work, we will explore the following points. First, we will make a concrete estimation of the reduction in cost when the EHR system becomes cloud-based. Establishing a reasonable fee system is an important issue for cloud computing. Security and Stability is the top priority for cloud computing resources as it is used by many users. Future work will endeavor to upgrade security while guaranteeing sensible nature of administration even with different clients signed on the framework in the meantime.

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