Design System For Exchanging The Patient Information On Cloud Computing System Using CDA Generation and Integration

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ABSTRACT

Successful deployment of Electronic Health Record helps improve patient safety and quality of care, but it has the prerequisite of interoperability between Health Information Exchange at different hospitals. The Clinical Document Architecture (CDA) developed by HL7 is a core document standard to ensure such interoperability, and propagation of this document format is critical for interoperability. Unfortunately, hospitals are reluctant to adopt interoperable HIS due to its deployment cost except for in a handful countries. A problem arises even when more hospitals start using the CDA document format because the data scattered in different documents are hard to manage. In this paper, we describe our CDA document generation and integration Open API service based on cloud computing, through which hospitals are enabled to conveniently generate CDA documents without having to purchase proprietary software. Our CDA document integration system integrates multiple CDA documents per patient into a single CDA document and physicians and patients can browse the clinical data in chronological order. Our system of CDA document generation and integration is based on cloud computing and the service is offered in Open API. Developers using different platforms thus can use our system to enhance interoperability.

1. INTRODUCTION

ELECTRONIC Health Record (EHR) is longitudinal collection of electronic health information for and about persons, where health information is dined 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 species the structure and semantics of clinical documents for the purpose of exchange. The rest 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 [2], [3], [4]. Active works are being done on improving semantic interoperability based on open EHR and CEN13606 [5]

2. RELATED WORK

Interoperability between hospitals not only helps improve patient safety and quality of care but also reduce time and resources spent on data format conversion [3]. Interoperability is treated more important as the number of hospitals participating in HIE increases. If one hospital does not support interoperability, the other hospitals are required to convert the data format of their clinical information to exchange data for HIE. When the number of hospitals that do not support interoperability, complexity for HIE inevitably increases in proportion. Unfortunately, hospitals are reluctant to adopt EHR systems that support interoperability, because changing an existing system adds cost for software and maintenance [4], [5]. The advantages of an API service as ours are at the amount of resources that hospitals need to allocate for interoperability is minimal [6]. Therefore, offering a system that supports interoperability with cloud computing is a good alternative for hospitals that have not yet adopted EHR because of cost issues.

3. PROBLEM STATEMENT

Design System for exchanging the patient information on cloud Computing system using CDA generation and integration. Successful deployment of Electronic Health Record helps improve patient safety and quality of care, but it has the prerequisite of interoperability between Health Information Exchange at different hospitals.

4. GOALS and OBJECTIVES

Goals:
Its eventual goal is to come up with a speciation of the system under study.
It explains what system models are and what kinds of system models exist.

Objectives:
1) To introduce software verification and validation and to discuss the distinction between them.
2) To describe the program inspection process and its role in V and V.
3) To explain static analysis as a verification technique.
4) To describe the Cleanroom software development Process.

5. SYSTEM ARCHITECTURE

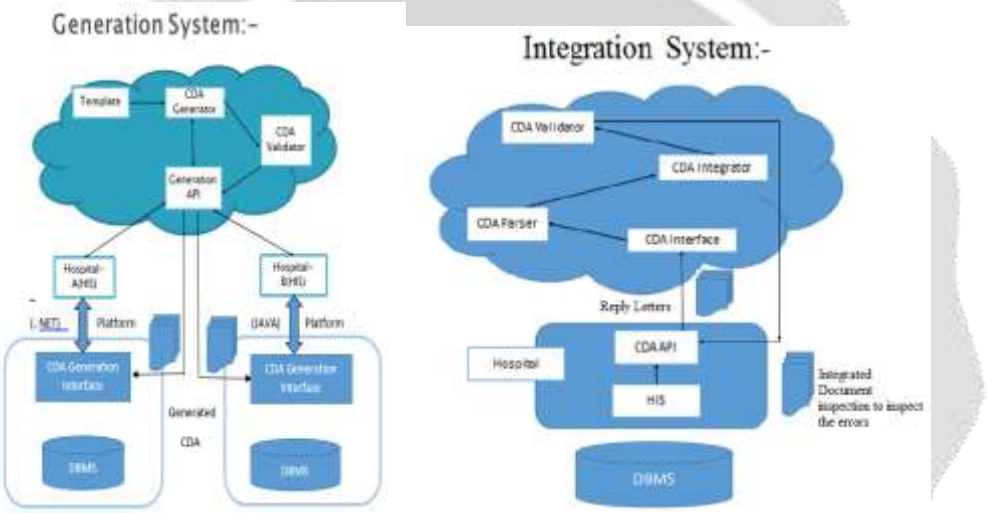

Fig -1: System Architecture

We chose Amazon Elastic Compute Cloud (EC2) as the cloud platform for our CDA generation and integration system. Microsoft Windows Server 2008 Base was selected as its operating system. We chose Singapore as the server location. 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. we developed the CDA document integration and integration system and deployed the system on the Amazon Cloud Server. Hospitals conveniently generate and integrate CDA documents by exploiting the API offered by our system.
Generation of CDA Documents on Different Developer Platforms through Cloud. To verify whether the system functions as designed, we requested CDA document generation on multiple systems implemented on different developer platforms via our API. For input data, we used the sample patient data offered by the US EHR Certication Program, Meaningful Use [2]. The data does not pertain to any actual person. It is functional, and available for public access. The use case scenario and data for CDA document generation the JAVA-based HIS (Health Information System) indicated in is a screenshot of our API when requesting a CDA document generation for a hypothetical hospital that uses Java as its developer platform. is a screenshot of using the API of our service to generate a CDA document by a hypothetical hospital that uses C as its platform. When the user clicks on the button Generate CDA, the data in each tab is rest transmitted to the CDA Generation API in the cloud server via CDA Generation Interface and a CDA document is generated. We varied the validity of our CDA documents with the CDA document validation tool provided by US NIST, which has the authority to certify CDA documents, to validate the CDA documents generated by using the API at our cloud server. The CDA documents generated by two clients developed with Java and C, respectively, passed the validity test. Integration of CDA Documents via Our Cloud Server. We integrated multiple CDA documents of patient referrals and replies by using 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 Certication Program, Meaningful Use. The data does not pertain to an actual person. It is coronal, and available for public access. of a client integrating multiple CDA documents by using our API. The three clinical documents are shown to be successfully integrated.

6.Following 'AES' algorithm steps of encryption for 128 bit block:

1. Derive the set of round key from the cipher key.
2. Initialize the state array with the block data(Plaintext).
3. Add the initial round key to the starting state array.
4. Perform 9 rounds of state manipulation.
5. Perform 10^{th} and final round of state manipulation.
6. Copy the final state array out as the encrypted data (Ciphertext).

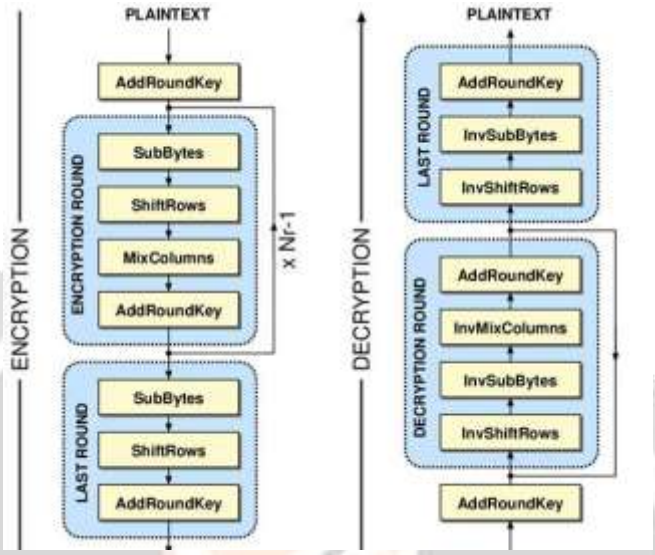

Fig -2: AES Algorithm

7.SOFTWARE TECHNIQES

1. Cloud Computing Platform.
2. My-SQL Server.
3. PHP.
4. Operating System Supported.

8.MATHEMATICAL MODEL

S=U, I, O, P
Where,
U = Set of users
Ui = {u1,u2,u3,... ... ...,un}
Where n>0
= ex. Primary user.

I = Set of Inputs
Ii = {i1, i2, i3,... ... ..., in}
Where n>0
= ex. Store data on cloud.

Output= {Access data from cloud}
P = Set of Processes
Pi = {p1,p2,p3,... ... ...,pn}
Where n>0

9. SYSTEM OVERVIEW

Fig -3: System Overview

Fig -4: System Overview

Fig -5: System Overview

10. CONCLUSION

Interoperability between hospitals not only helps improve patient safety and quality of care but also reduce time and resources spent on data format conversion. Interoperability is treated more important as the number of hospitals participating in HIE increases. If one hospital does not support interoperability, the other hospitals are required to convert the data format of their clinical information to exchange data for HIE. When the number of hospitals that do not support interoperability, complexity for HIE inevitably increases in proportion. Unfortunately, hospitals are reluctant to adopt EHR systems that support interoperability, because changing an existing system adds cost for software and maintenance. The advantages of an API service as ours are at the amount of resources that hospitals need to allocate for interoperability is minimal.

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