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A SURVEY PAPER ON HEALTH INFORMATION EXCHANGE BASED ON CLOUD COMPUTING SYSTEMFORCDA 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.

INTRODUCTION:

One of the key features of the cloud includes the flexibility, so we used the clouds for large data storage system. When a patient is recognize at a clinic, a CDA document recording the diagnosis is generated. The CDA document can be shared with other clinics if the patient agrees. The concept of family doctor does not exist in some countries; therefore it is common for a patient to visit a number of different clinics. The interchange of CDA document is triggered in the following cases: when a physician needs to study a patient's medical history; when referral and response letters are drafted for a patient cared by multiple clinics; when a patient is in urgent situation and the medical history needs to be reviewed. It takes get larger 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 significantly holds up the medical personnel in making decisions. Hence, when all of the CDA documents are integrated into a single document, the medical personnel is empowered to review the patient's clinical history conveniently in chronological order per clinical section and the follow-up care service can be delivered more effectively. Unfortunately for now, a solution that integrates multiple CDA documents into one does not exist yet to the best of our knowledge and there is a practical limitation for individual hospitals to develop and implement a CDA document integration technology.

EXISTING SYSTEM:

□□Effective health information exchange needs to be standardized for interoperable health information

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exchange between hospitals. Especially, clinical document standardization lies at the core of guaranteeing 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 significantly delays the medical personnel in making decisions. Hence, when all of the CDA documents are integrated into a single Page 633 document, the medical personnel is empowered to review the patient's clinical history conveniently in chronological order per clinical section and the follow-up care service can be delivered more effectively. Unfortunately for now, a solution that integrates multiple CDA documents into one does not exist yet to the best of our knowledge and there is a practical limitation for individual hospitals to develop and implement a CDA document integration technology.

DISADVANTAGES:

The HIS development platforms for hospitals vary so greatly that generation of CDA documents ineach hospital invariably requires a separate CDA generation system. Also, hospitals are very reluctant to adopt a new system unless it is absolutely necessary for provision of care. As a result, the adoption rate of EHR is very low except for in a few handful countries.

Unfortunately for now, a solution that integrates multiple CDA documents into one does not exist yet to the best of our knowledge and there is a practical limitation for individual hospitals to develop and implement a CDA document integration technology.

To establish confidence in HIE interoperability, more HIS's need to support CDA. However, thestructure of CDA is very complex and the production of correct CDA document is hard to achieve without deep understanding of the CDA standard and sufficient experience with it.

PROPOSED SYSTEM:

In this paper we present (1) a CDA document generation system that generates CDA documentson different developing platforms and (2) a CDA document integration system that integrates multiple CDA documents scattered in different hospitals for each patient.

CDA Generation API generates CDA documents on cloud.

CDA Generation Interface uses the API provided by the cloud and relays the input data and receives

CDA documents generated in the cloud.

Template Manager is responsible for managing the CDA documents generated in the cloud server.Our system uses CCD document templates.

CDA Generator collects patient data from hospitals and generates CDA documents in the template formats as suggested by the Template Manager.

CDA Validator inspects whether the generated CDA document complies with the CDA schemastandard.

ADVANTAGES OF PROPOSED SYSTEM:

Hospital systems can simply extend their existing system rather than completely replacing it with anew system. Second, it becomes unnecessary for hospitals to train their personnel to generate, integrate, and view standard-compliant CDA documents.

The cloud CDA generation service produces documents in the CDA format approved by the National Institute of Standards and Technology (NIST).

If this service is provided for free at low price to hospitals, existing EHR are more likely to consideradoption of CDA in their practices. Interoperability between hospitals not only helps improve patient safety and quality of care but also reduce time and resources spent on data format conversion.

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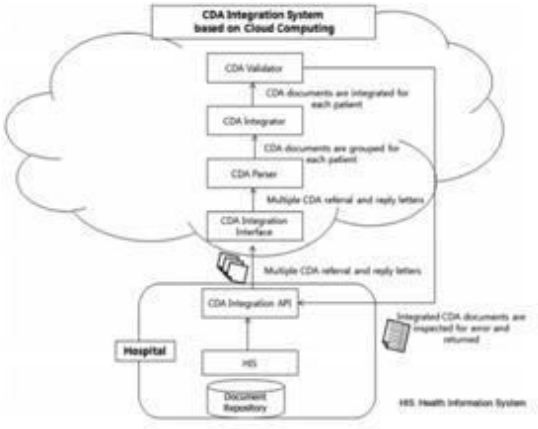
SYSTEM ARCHITECTURE:



MODULE DESCRIPTION

MODULES:

- Construction of System Environment
- The CDA Document
- Construction of a Cloud Computing Environment
- Integration of CDA Documents via Our CloudServer

MODULES DESCSRIPTION:

Construction of System Environment

In the first module we develop the Construction ofthe System Environment to prove our proposedsystem model. In this module we develop HospitalA, Hospital B, Doctor, Patient/User, Admin andCloud Modules.

In Hospital A, we create the User Authorizationwith Login Credentials. This module provides theoption of Upload the Patient details as XML Filein the Cloud with Encrypted and also provides theoption to check the status of the uploaded file withthe XML Format. The same is followed in theHospital B too.

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/doctor to access the file.

The CDA Document:

In this module we develop the CDA document.The HL7 Clinical Document Architecture Release2 (CDA R2) was approved by American NationStandards Institute. It is an XML-based documentmarkup standard that specifies the structure andsemantics of clinical documents, and its primarypurpose is facilitating clinical document exchangesbetween heterogeneous software systems.

A CDA document is divided into its header andbody. The header has a clearly defined structureand it includes information about the patient,hospital, physician, etc. The body is more flexiblethan the header and contains various clinical data.

Each piece of clinical data is allocated a sectionand given a code as defined in the LogicalObservation Identifiers Names and Codes(LOINC). Different subcategories are inserted in aCDA document depending on the purpose of thedocument, and we chose the Continuity of CareDocument (CCD) because it contains the healthsummary data for the patient and it is also widelyused for interoperability.

Construction of a Cloud Computing Environment:

In this module we develop the Cloud computingenvironment. We use DriveHQ Cloud Serviceprovider to upload our files in the Cloud.

In this module, we develop the construction of aCloud Computing Environment and how multipleCDA documents are integrated into one in ourCDA Document Integration System. The standardfor this is Korean Standard for CDA Referral andReply Letters (Preliminary Version). Templateswhich generate a CDA use CCD part ofConsolidated CDA which is released by ONC andmade by HL7. However, an actually generated CDA has a form of CDA Referral and Reply Letters.

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The rationale for CDA document integration is asfollowed. When CDA-based HIE (HealthInformation Exchange) is actively used amonghospitals, the number of CDA documentspertaining to each patient increases in time.Physicians need to spend a significant portion oftheir time on reading these documents for makingclinical decisions.

At a hospital, the CDA documents to be integratedare processed through our CDA Integration API.The CDA Integration Interface relays each CDAdocument sent to the cloud to the CDA Parser,which converts each input CDA document to anXML object and analyzes the CDA header andgroups them by each patient ID. The CDADocument Integrator integrates the providedmultiple CDA documents into a single CDAPage 635document. In this process, the data in the same section in the document body are merged.

Integration of CDA Documents via Our Cloud Server:

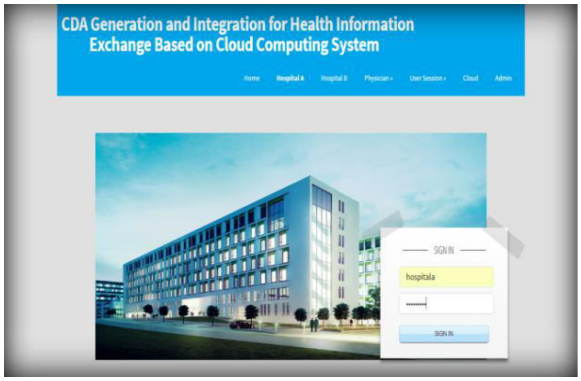
We integrated multiple CDA documents of patientreferrals and replies by using the API at our server.The use case scenario and patient data used forintegration are shown in this module.

We adopted sample patient data provided by theUS EHR Certification Program, Meaningful Use.The data does not pertain to an actual person. It isfictional, and available for public access. Thismodule is to show how a client integratingmultiple CDA documents by using our API. Thesample many clinical documents are shown to besuccessfully integrated.

SCREEN SHOTS:

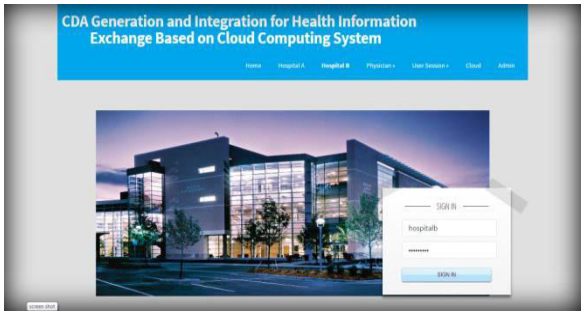
Home:

Hospital A Login:



Patiant Information:

Hospital B Login:



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View Reports:

Cloud Home:

CONCLUSION:

As the number of HIE based on CDA documents increases, interoperability is achieved, but it also brings a problem where managing various CDA documents per patient becomes inconvenient as theclinical information for each patient is scattered indifferent documents. The CDA document integrationservice from our cloud server adequately addresses thisissue by integrating multiple CDA documents thathave been generated for individual patients. Theclinical data for the patient in question is provided tohis/her doctor in chronological order per section sothat it helps physicians to practice evidence-basedmedicine. In the field of document-based healthinformation exchange, the IHE XDS profile ispredominant and our cloud computing system can bereadily linked with the IHE XDS profile. The approachemployed in this paper is applicable in adopting otherstandards, too, such as the EHR Extract based onopenEHR. If a hospital sends the content archetype,admin archetype, and demographic archetype to thecloud server, then the server extracts necessaryinformation from each archetype. Next, it generates anExtract containment structure that fits with adesignated template and returns the structure to therequested hospital.

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