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CDA GENRATION FOR HEALTH INFORMATION EXCHANGE USING ON CLOUD COMPUTING SYSTEM

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Abstract: Maintenance of Electronic Health Record helps improve patient safety and quality of care, but to do that we need the operation of interoperability between Health Information Exchange at different hospitals. The Clinical Document Architecture (CDA) established by HL7 is a core document standard to ensure such interoperability. Unfortunately, hospitals refuses to adopt interoperable HIS due to its deployment cost. More problemsarise when all hospitals start using the CDA document format because the data scattered in many documents are difficult to manage. In this paper, we describe our CDA document generation and integration which is an Open API service based on cloud computing, through which hospitals are enabled to conveniently generate CDA documents without having to purchase software. Our CDA document integration system integrates multiple CDA documents per patient into a single CDA 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 through Open API. Developers using different platforms thus can use our system to enhance interoperability

Keywords: Clinical Document Architecture (CDA), Health Level Seven (HL7), Electronic Health Record (EHR).

I. INTRODUCTION

The health information that consists health of the patient, health care provided to that patient as well as the reaction of the patient to the provided healthcare can be stored as electronic health information in the form of longitudinal collection, thus forming an Electronic Health Record (EHR) [1]. Therefore, the implementation of HIE system is made to ensure successful maintenance of EHR [2]. But there is also a problem of incompatibility between systems and also there are different characteristics involved in HIS [3], [4]. Thus,

there is a need to standardize the health information exchange between hospitals ensuring interoperability over health information. Therefore, the core of guaranteeing interoperability is to standardize the clinical document. The major standard for clinical documents is CDA which was established by Health Level Seven (HL7). CDA is the core document standard, an XML documentwhich holds the structure and semantics of clinical documents for health information exchange. The first version of CDA was released on 2001 and it's second version was released on 2005. Many

countries have done many successful projects adopting CDA [7], [8], [9]. To improve semantic interoperability, many active works are done based on open HER and CEN3606 [10], [11]

More HIE system has to support CDA to establish confidence in interoperable Health Information Exchange. Moreover, the structure of CDA is too complex and the correct CDA Document production is difficult without the good understanding of the CDA standard and enough experience 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 [12]. To promote EHR adoption among hospitals, the USA government had implemented an incentive program called the Meaningful Use Program [13]. A CDA document which has the record for the diagnosis is generated, when a patient is diagnosed at a clinic. This CDA document will be shared with other hospitals if the patient agrees. A person or an patient may shift his location from one place to another hence it is common for a that patient to visit a number of different hospitals for check-in or treatment. The exchange of CDA document is invoked in the following cases: when a medical personnel needs to study a patient's medical history; when referral and replyletters are drafted for a patient cared by multiple hospitals; when a patient is in emergency and the medical history needs to bereviewed.

It takes a huge amount of time for the medical personnel because the amount of exchanged CDA document increases because more documents means that data are distributed in different documents. This definitely delays the medical personnel in making decisions. Therefore, when all the CDA documents are integrated into a single document, themedical personnel is motivated to view the patient's medical historyconveniently in chronological order per clinical section and the corresponding care service can be provided more effectively. Sadly for now, a solution that integrates multiple CDA documents into one do 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 interface. The benefits of implementing this system are as follows. First, the system can be accessed through an Open API and developers can continue working on their developer platforms they are specialized for example Java, .NET, or C/C++. Hospital systems can simply extend their existing system instead of completely replacing it with a new system. Second, the hospitals do not have to train their personnel to generate, integrate, and view standard-compliant CDA documents. The cloud based CDA generation service produces documents in the CDA format approved by the National Institute of Standards and Technology (NIST) [14]. Third, as these services are provided free of cost at low price to hospitals,existing Electronic Health Record are more likely to consider adoption of CDA in their practices.

II. ELECTRONIC HEALTH RECORD WITHCDA

Electronic Health Record (EHR) is a collection of patient and population electronically is stored the health information through systematized in digital format. It is a digital version of a patient's paper chart . The records are shared through different healthcare settings. The

authorized providers can be created and managed of an EHR is that health information in a digital form at capable shared with other providers across more than one health careorganization. The HER has the capacityto generate a complete record of a clinical patient come across, as well as supporting other care related activities directly or indirectly via interface. The important note is, EHR is generated and maintained within an institution, like a hospital, integrated delivery network, clinic, or physician office. The patient receives those service from an auxiliary department are created as an electronicrecord.

III. CLINICAL DOCUMENT ARCHITECTURE

Clinical Document Architecture is in XML based format. It is classified from the HL7 RIM(Reference Information Model) and uses HL7 version 3 data types. The documents contain any relevant information to a healthcare provider or government entity and all information about a patient's medical history, such as allergies, medications, insurance information or lab results [14]. Each piece of clinical data is allocated a section and given a code as defined in the Logical Observation Identifiers Names and Codes (LOINC) [15]. For the integrated CDA document, we chose the Korean Standard for CDA Referral and Reply Letters format as the number of clinical documents generated when patients are referred and replies made, is large [16][17]. The CDA is divided into two categories such as Header and Body in Fig 1. In CDA Header that includes Patient ID, Birth Date, Gender, Given Name, and Family- Name. In CDA Body, the items are included as Problem, Medication, Laboratory, Immunization, and so on. Different subcategories areinserted in a CDA document depending on the purpose of the document, and

chose the Continuity of Care Document (CCD) [18] because it contains the health summary data for the patient and it is also widely used for interoperability.
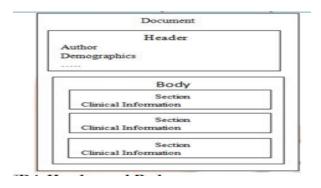

Fig.1. CDA Header and Body.

IV. CDA IN CLOUD COMPUTING

The information can exchange and use the information that has been exchanged between two or more systems or components through interoperability. The cloud computing services model refers the cloud SaaS where the software applications HIS are offered as services. A web services is any service that is available over the internet or intranet, uses standardized XML messaging system and is self describing, discoverable and not tied to any operating system or programming language [19]. So the focus on HL7 CDA (Clinical Document Architecture) and CCD (Continuity of Care Document). CDA is a document markup standard that defined with clear structure and semantics of clinical document for the purpose of data exchange and cloud be any of the following: discharge summary, referral, clinical summary, history/physical examination, diagnostic report, prescription, or public health report. In a private or public cloud, the medical data are stored with the condition for the public cloud to provide a strong security and all the departments of the hospital access this medical data of the patients. Cloud computing can help

patients to gain access to their medical history from anywhere in the world via the internet [20]. It defines the new style of computing where resources are dynamically scaled, virtualized and are provided as a service on the internet. Health care Information System recommends the technology for its benefits: flexible and quick access to information, features needed more and more in these times characterized on one side by budget cutting and on the other side by ageing societies.

V. CDA GENERATION AND INTEGRATION ON CLOUDCOMPUTING

CDA generation software is platform dependent and it is not centralized. So the process of CDA document an Open API is developed. The clinical information of patient, hospital, and physician are entered through CDA Generation interfaces and sent to the cloud server by CDA generationAPI. The data are relays in the CDA Header/Body. The Header and Body contains about the patient's, and clinical information. The CDA Generation API are packaged the data in the CDA Header Set and Body Set and relayed to CDA Generator. The Continuity of care document template is received by CDA Generated in the cloud. Result of the generated CDa document is inspected by Validator. Usually the patients are consults with multiple physicians in different hospitals. The CDA document scattered in different location. Physicians need to spend more time on reading these documents for making clinical decisions. So the multiple CDA documents are integrated into single document in CDA Integration system. Each CDA document sent to the cloud to the CDA parser, which converts each input CDA documents to an XML object and analyses the CDA header and groups them by each patient ID. The integrated CDA sent to validator, and the result is returned as string tothe hospital

that requested CDA document integration. Using the system on cloud, hospitals are enabled to conveniently generated CDA documents without having to purchase proprietary software. So all the CDA documents are integrated into a single document, the physician is empowered to review the patient's clinical history conveniently.
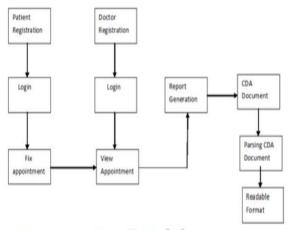
VI. IMPLEMENTATION

For health concepts representation, CDA uses HL7's Reference Information Model (RIM), which puts data in a clinical or administrative context and expresses how pieces of data are connected. The health information system can be generated as a CDA document through CDA Generation and Integration on cloud computing Open API. The world widely adopted HL7 CDA standards and is based on XML (Extensible Markup Language). Common for a patient to consult a number of different clinics.When a physician needs to study a patient's medical history which are cared for patient by multiple clinics. In this case, the generation of multiple CDA documents that integrates into single document in CDA Generation and Integration of Open API on cloud. The result of the CDA document is in XML based document. For the physician it should be as uncomfortable to read and understand and take time to get conclusion. So the health information of the CDA document that is converted to readable format through API. The steps should be following as: The health information that includes patient, Hospital, Physician, and Clinical Details care send to Generation and Integration of API through interfaces. The CDA Document produced after generate and integrate process. Output of the document can be validate and returned to parser. Using java API, the parsed documents send for conversion to receive the readable format.

Result can be send as a output to the recipient of the hospital. When the physicians need to make quick decision's the readable format can be as a flexible and efficient to their knowledge. Using API, CDA document can change to other format. The readable text format is comfortable to read for both physicians and patients. Users can be avoided unnecessary conversion for specified formats. They can download as a readable format directlyfrom the server (cloud). So this can be a best solution for XML based CDA file to convert to other format as shown in Fig 2. The defined structure of new architecture for CDA document to convert to other format is useful to the developer to give as a user friendly document that which had details of about the patient healthinformation.

Fig.2. Conversion process and flow.

VII. CONCLUSION

Interoperability not only helps to improve patient safety and quality of care but also reduce time and resources spent on data format conversion between hospitals . The CDA document format a clinical information standard hospitals, a large number of HIE projects that use the Clinical Document Architecture format have been undertaken in many countries .So the health information records are Generated and Integrated as a clinical document XML based

file format in chronological order on cloud. The hospitals are not ready to buy licensed software to generate and integrate CDA documents. Since the upgradation of the software and supporting software's are to be purchased in regular intervals. The service can applicable to various developer platforms because the CDA document generation and integration system is drive by open API. With cloud server the document can provide easy access with CDA. Increases of HIE based on the CDA documents, achieves its interoperability. But physicians get inconvenient to refer multiple documents. So multiple CDA documents are integrates into one through CDA Integration system. Final result of CDA Document is based on XML format. In the proposed system, the CDA XML based document converted to readable format using theAPI.

VIII. REFERENCE

[1]M. Eichelberg, T. Aden, J. Riesmeier, A. Dogac, and Laleci, "A sur- vey and analysis of electronic healthcare record standards," ACM Comput. Surv., vol. 37, no. 4, pp. 277–315,2005.

[2]R. H. Dolin, L. Alschuler, C. Beebe, P. V. Biron, S. L. Boyer, D. Essin, E. Kimber, T. Lincoln, and J. E. Mattison, "The HL7 Clin- ical Document Architecture," J. Am. Med. Inform. Assoc., vol. 8, pp. 552–569,2001.

[3]R. H. Dolin, L. Alschuler, S. Boyer, C. Beebe, F. M. Behlen, P. V. Biron, and A. Shabo, "The HL7 Clinical Document Architecture," J. Am. Med. Inform. Assoc., vol. 13, no. 1, pp. 30–39,2006.

[4]Kevin marks, Social Media Expert at Google, Kevin, Kelly2016.

[5]https://blog.interfaceware.com/clinical-documentarchitecture-cda-overview/

[6]K. Ashish, D. Doolan, D. Grandt, T. Scott, and D. W. Bates, "The use of health information technology in seven nations,"Int. J. Med. Informat., vol. 77, no. 12, pp. 848– 854,2008.

[7]KS X 7504 Korean Standard for CDA Referral Letters (PreliminaryVersion).

[8]KS X 7505 Korean Standard for CDA Reply Letters (PreliminaryVersion).

[9]J. D. D'Amore, D. F. Sittig, A. Wright, M. S. Iyengar, and R. B. Ness, "The promise of the CCD: Challenges and opportunity for quality improvement and population health," in Proc. AMIA Annu. Symp. Proc., pp. 285–294,2011.

[10]E. Cerami, Web Services Essentials. Third Indian Reprint, O'Reily Media, Inc., 2007.ISBN10:81-7366-339-4.

[11]OanaSorina LUPSE, Michaela VIDA and Lacramioara STOICU-TIVADAR University "Politechica" of Timisoara, Romania.

[12]J. Walker, E. Pan, D. Johnston, J. Adler-Milstein, D. W. Bates, and B. Middleton, "The value of health care information exchange and interoperability," in Proc. Health Aff., pp. 10–18,2005.

[13]Sung-Hyun Lee, Joon Hyun Song, and IlKon Kim MARCH/APRIL2016.

[14]https://blog.interfaceware.com/clinical-documentarchitecture-cda-overview/

[15]K. Ashish, D. Doolan, D. Grandt, T. Scott, and D. W. Bates, "The use of health information technology in seven nations,"Int. J. Med. Informat., vol. 77, no. 12, pp. 848– 854,2008.

[16]KS X 7504 Korean Standard for CDA Referral Letters (PreliminaryVersion).

[17]KS X 7505 Korean Standard for CDA Reply Letters (PreliminaryVersion).

[18]J. D. D'Amore, D. F. Sittig, A. Wright, M. S. Iyengar, and R. B. Ness, "The promise of the CCD: Challenges and opportunity for quality improvement and population health," in Proc. AMIA Annu. Symp. Proc., pp. 285–294,2011.

[19]E. Cerami, Web Services Essentials. Third Indian Reprint, O'Reily Media, Inc., 2007.ISBN10:81-7366-339-4.

[20]OanaSorina LUPSE, Michaela VIDA and Lacramioara STOICU-TIVADAR University "Politechica" of Timisoara, Romania.

[21]J. Walker, E. Pan, D. Johnston, J. Adler-Milstein, D. W. Bates, and B. Middleton, "The value of health care information exchange and interoperability," in Proc. Health Aff., pp. 10–18,2005.

[22]Sung-Hyun Lee, Joon Hyun Song, and IlKon Kim MARCH/APRIL2016.