A RELIABLE INTEGRATION ON DATA IN CLOUD USING CDA

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ABSTRACT
Organization for electronic Health record helps us to enhance persistent security and nature of care, yet it has interoperability as an earlier condition between Health data exchange at various healing facilities. To guarantee interoperability between the wellbeing data exchanges at various clinics the CDA built up a center document by utilizing HL7, where

as the center report engendering is basic for interoperability. A portion of the healing facilities are hesitant to embrace the interoperability due its sending cost. The healing centers began utilizing CDA arrange as alternate records are difficult to oversee. Considering the above issue we will portray the CDA document era and Integration Open API benefit in view of distributed computing. This helps the healing facilities to empower advantageously and create CDA record without having any issues in regards to programming.
Key words: On-demand self-service, Broad network access, Resource pooling..

INTRODUCTION
Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet). The name comes from the common use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams. Cloud computing entrusts remote services with a user's data, software and computation. Cloud computing consists of hardware and software resources made available on the Internet as managed third-party services. These services typically provide access to advanced software applications and high-end networks of server computers.

The goal of cloud computing is to apply Traditional supercomputing, or high-performance computing power, normally used by military and research facilities, to perform tens of trillions of computations per second, in consumer-oriented applications such as financial portfolios, to deliver personalized information, to provide data storage or to power large, immersive computer games.

The cloud computing uses networks of large groups of servers typically running low-cost consumer PC technology with specialized connections to spread data-processing chores across them. This shared IT infrastructure contains large pools of systems that are linked together. Often, virtualization techniques are used to maximize the power of cloud computing.

The salient characteristics of cloud computing based on the definitions provided by the National Institute of Standards and Terminology (NIST) are outlined below:

On-demand self-service: A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service's provider.

Broad network access: Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, laptops, and PDAs).

Resource pooling: The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location-independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level

of abstraction (e.g., country, state, or data center). Examples of resources include storage, processing, memory, network bandwidth, and virtual machines.
Rapid elasticity: Capabilities can be rapidly and elastically provisioned, in some cases automatically, to quickly scale out and rapidly released to quickly scale in. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be purchased in any quantity at any time.
Measured service: Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be managed, controlled, and reported providing transparency for both the provider and consumer of the utilized service.
Cloud Computing comprises three different service models, namely Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (Sass). The three service models or layer are completed by an end user layer that encapsulates the end user perspective on cloud services. The model is shown in figure below. If a cloud user accesses services on the infrastructure layer, for instance, she can run her own applications on the resources of a cloud infrastructure and remain responsible for the support, maintenance, and security of these applications herself.

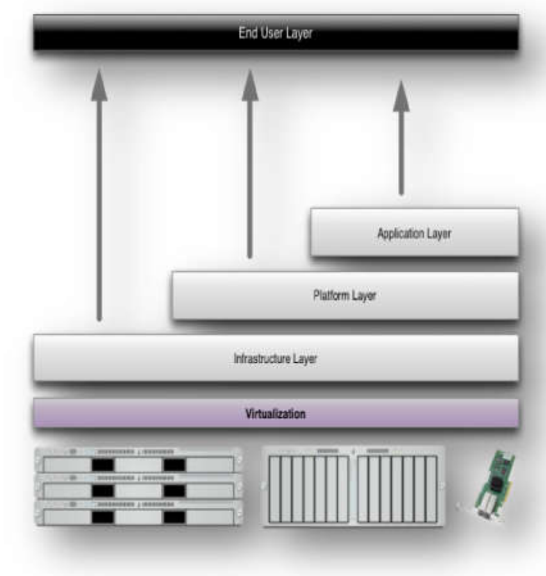

fig: **Structure of service models**

Achieve economies of scale – increase volume output or productivity with fewer people. Your cost per unit, project or product plummets. Reduce spending on technology infrastructure. Maintain easy access to your information with minimal upfront spending. Pay as you go (weekly, quarterly or yearly), based on demand. Globalize your workforce on the cheap. People worldwide can access the cloud, provided they have an Internet connection.
Streamline processes. Get more work done in less time with less people.
Reduce capital costs. There’s no need to spend big money on hardware, software or licensing fees.
Improve accessibility. You have access anytime, anywhere, making your life so much easier!
Monitor projects more effectively. Stay within budget and ahead of completion cycle times.
Less personnel training is needed. It takes fewer people to do more work on a cloud, with a minimal learning curve on hardware and software issues.
Minimize licensing new software. Stretch and grow without the need to buy expensive software licenses or programs.

Improve flexibility. You can change direction without serious “people” or “financial” issues at stake.
Price: Pay for only the resources used.
Security: Cloud instances are isolated in the network from other instances for improved security.
Performance: Instances can be added instantly for improved performance. Clients have access to the total resources of the Cloud’s core hardware.
Scalability: Auto-deploy cloud instances when needed.
Uptime: Uses multiple servers for maximum redundancies. In case of server failure, instances can be automatically created on another server.
Control: Able to login from any location. Server snapshot and a software library lets you deploy custom instances.
Traffic: Deals with spike in traffic with quick deployment of additional instances to handle the load.

II. PROBLEM STATEMENT

To implement Cloud based CDA (Clinical Document Architecture) generation and integration system in three different hospital instances. The motivation of this project is to implement electronic health record which helps us to enhance persistent security and nature of care, yet it has interoperability as an earlier condition between health data exchange at various healing facilities. The main objective of our project is to eliminate message variability that HL7 V2 is prone to and also provide Interoperability between hospitals not only helps improve patient safety and quality of care but also reduce time and resources spent on data format conversion.

III.LITERATURE REVIEW

INTEROPERABILITY OF PERSONAL HEALTH RECORDS

The establishment of the Meaningful Use criteria has created a critical need for robust interoperability of health records. A universal definition of a personal health record (PHR) has not been agreed upon. Standardized code sets have been built for specific entities, but integration between them has not been supported. The purpose of this research study was to explore the hindrance and promotion of interoperability standards in relationship to PHRs to describe interoperability progress in this area. The study was conducted following the basic principles of a systematic review, with 61 articles used in the study. Lagging interoperability has stemmed from slow adoption by patients, creation of disparate systems due to rapid development to meet requirements for the Meaningful Use stages, and rapid early development of PHRs prior to the mandate for integration among multiple systems. Findings of this study suggest that deadlines for implementation to capture Meaningful Use incentive payments are supporting the creation of PHR data silos, thereby hindering the goal of high-level interoperability. The study was conducted following the basic principles of a systematic review, with 61 articles used in the study. Lagging interoperability has stemmed from slow adoption by patients, creation of disparate systems due to rapid development to meet requirements for the Meaningful Use stages, and rapid early development of PHRs prior to the mandate for integration among multiple systems. Findings of this study suggest that deadlines for implementation to capture Meaningful Use incentive payments are supporting the creation of PHR data silos, thereby hindering the goal of high-level interoperability. Thirdly, we can protect the scheme from collusion attack, which means that revoked users cannot get the original data file even if they conspire with the un-trusted cloud. In our approach, by leveraging polynomial function, we can achieve a secure user revocation scheme. Finally, our scheme can achieve fine efficiency, which means previous users need not to update their private keys for the situation either a new user joins in the group or a user is revoked from the group.

APPLYING CLOUD COMPUTING MODEL IN PHR ARCHITECTURE

In recent years, some practical and commercial Personal Health Records and some related services such as Google Health [1] and Microsoft HealthVault [2] have been launched. On the other hand, Cloud Computing has matured more and become the major streams to realize a more effective operational environment. However so far, there have been few studies in regards to applying Cloud architecture in the PHR explicitly despite generating volume data. In this paper, we review our trial on the general architecture design by applying the Cloud components for supporting healthcare record areas and clarify the required conditions to realize it.

HEALTH INFORMATION PRIVACY, SECURITY, AND YOUR EHR.

If your patients lack trust in Electronic Health Records (EHRs) and Health Information Exchanges (HIEs), feeling that the confidentiality and accuracy of their electronic health information is at risk, they may not want to disclose health information to you. Withholding their health information could have life-threatening consequences. To reap the promise of digital health information to achieve better health outcomes, smarter spending, and healthier people, providers and individuals alike must trust that an individual's health information is private and secure.

Your practice, not your EHR developer, is responsible for taking the steps needed to protect the confidentiality, integrity, and availability of health information in your EHR system.

A SECURE ANTI-COLLUSION DATA SHARING SCHEME FOR DYNAMIC GROUPS IN THE CLOUD

Benefited from cloud computing, users can achieve an effective and economical approach for data sharing among group members in the cloud with the characters of low maintenance and little management cost. Meanwhile, we must provide security guarantees for the sharing data files since they are outsourced. Unfortunately, because of the frequent change of the membership, sharing data while providing privacy-preserving is still a challenging issue, especially for an untrusted cloud due to the collusion attack. Moreover, for existing schemes, the security of key distribution is based on the secure communication channel, however, to have such channel is a strong assumption and is difficult for practice. In this paper, we propose a secure data sharing scheme for dynamic members. Firstly, we propose a secure way for key distribution without any secure communication channels, and the users can securely obtain their private keys from group manager. Secondly, our scheme can achieve fine-grained access control, any user in the group can use the source in the cloud and revoked users cannot access the cloud again after they are revoked. Thirdly, we can protect the scheme from collusion attack, which means that revoked users cannot get the original data file even if they conspire with the untrusted cloud. In our approach, by leveraging polynomial function, we can achieve a secure user revocation scheme. Finally, our scheme can achieve fine efficiency, which means previous users need not to update their private keys for the situation either a new user joins in the group or a user is revoked from the group.

IV.SYSTEM ANALYSIS

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. 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 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.

The HIS development platforms for hospitals vary so greatly that generation of CDA documents in each 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.

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To establish confidence in HIE interoperability, more HIS's need to support CDA. However, the structure 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.

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.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 schema standard.

Hospital systems can simply extend their existing system rather than completely replacing it with a new 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 consider adoption of CDA in their practices.

V.IMPLEMENTATION

CDA Generation Interface

In this module we develop the Construction of the System Environment to prove our proposed system model. In this module we develop Hospital A, Hospital B, Doctor, Patient/User, Admin and Cloud Modules. In Hospital A, 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. The same is followed in the Hospital 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. In cloud Login, view the patient details in the XML format which is acquired from CDA.

CDA Generation API

In this module 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. 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). Different subcategories are inserted in a CDA document depending on the purpose of the document, and we chose the Continuity of Care Document (CCD) because it contains the health summary data for the patient and it is also widely used for interoperability.

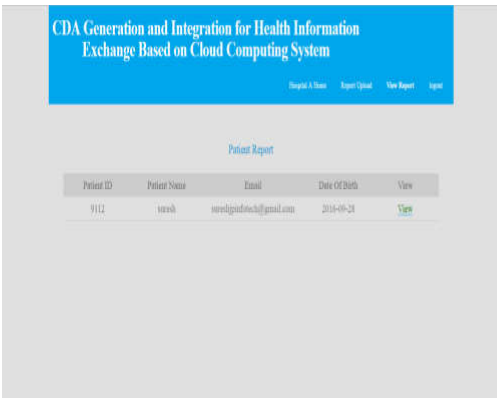
CDA Validator

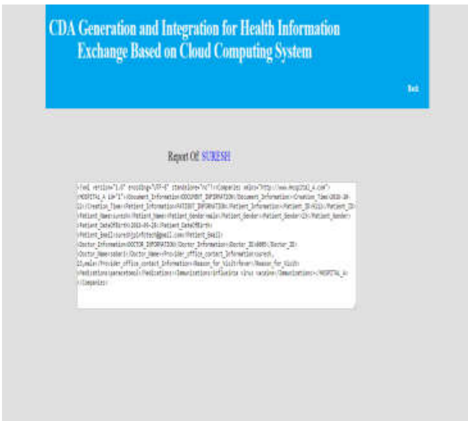
In this module we develop the Cloud computing environment. We use DriveHQ Cloud Service provider to upload our files in the Cloud. In this module, we develop the construction of a Cloud Computing Environment and how multiple CDA documents are integrated into one in our CDA Document Integration System. The standard for this is Korean Standard for CDA Referral and Reply Letters (Preliminary Version). Templates which generate a CDA use CCD part of Consolidated CDA which is released by ONC and made by HL7. However, an actually generated CDA has a form of CDA Referral and Reply Letters. The rationale for CDA document integration is as followed. When CDA-based HIE (Health Information Exchange) is actively used among hospitals, the number of CDA documents pertaining to each patient increases in time. Physicians need to spend a significant portion of their time on reading these documents for making clinical decisions. At a hospital, the CDA documents to be integrated are processed through our CDA Integration API. The CDA Integration Interface relays each CDA document sent to the cloud to the CDA Parser, which converts each input CDA document to an XML object and analyzes the CDA header and groups them by each patient ID. The CDA Document Integrator integrates the provided multiple CDA documents into a single CDA document. In this process, the data in the same section in the document body are merged

CDA Integration API

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 in this module.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 fictional, and available for public access. This module is to show how a client integrating multiple CDA documents by using our API. The sample many clinical documents are shown to be successfully integrated.

VI.EXPERIMENTAL RESULTS





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 the clinical information for each patient is scattered in different documents. The CDA document integration service from our cloud server adequately addresses this issue by integrating multiple CDA documents that have been generated for individual patients. The clinical data for the patient in question is provided to his/her doctor in chronological order per section so that it helps physicians to practice evidence-based medicine. In the field of document-based health information exchange, the IHE XDS profile is predominant and our cloud computing system can be readily linked with the IHE XDS profile.

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