

Design of Integrated Medical Information System Based on The Cloud

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Abstract

Today, the medical information system has evolved in the way of integrated healthcare IT information systems. Therefore, it is trying to build advanced U-Healthcare service. Though the U-Healthcare environments is exchanged the information between systems in many cases, however since the each system is different, the integration and exchange of data is difficult. To overcome this problem, in this paper it proposes that we suggests a possible DBaaS(DataBase as a Service) for the heterogeneous integration of medical information management and data exchange. First, the proposed system builds DBaaS cloud by integrating the meta-DB Schema level and DB Schema for each hospital. And, the mapping the schema data and the existing hospital information system is possible using the International Standard HL7. By applying the proposed method to the hospital system, it comes true the efficient exchange of information between the patients, doctors, staffs through the data mapping of the one to multi-system.

Keywords: heterogeneous integration, data mapping, DBaaS(DataBase as a Service), HL7

1. Introduction

With the development of IT technology in the medical field, the medical institutions are facing a new environment. U-health care has been a period due to the introduction of the smart care using a smart phone and mobile device.[1] Also it receives the health status of each species of medical sensors. Recently these sensors were fused the information processing and communications technology. So, it has evolved into a smart device to perform feedback to the process, transmission, the storing and recording of the information.[2] It is possible to easily check the health by using this. The U-Healthcare environment often needs to exchange medical data between different hospital systems.[3] The each hospitals stores and manages to the data, but the interaction of data is difficult because the EMR(Electronic Medical Record) of each hospital is different. In this issue, since it is difficult to manage of the integrated data, the HIE(health

information exchange) and inter-working is difficult.

Therefore, we propose a system that can be integrated with medical information by integrating the DBaaS cloud for enabling the exchange of data of each hospital system with the mobile environment. It comes true the efficient exchange of information between the patients, doctors, staffs through the data mapping of the one to multi-system. The structure of this paper is the related works in Chapter 2, the architecture and design of the proposed system Chapter 3, concludes in Chapter 4.

2. Related researchs

2.1 HL7(Health Level Seven)

HL7 is well-known standard protocol for data generated in hospital information systems. HL7 is providing the base that the medical information systems can be interacted with other medical information systems. HL7 is consisted of the elements of the patient information system, prescription management, views, remarks, result of remarks and readings and information management. It provides the format and transmission of data related to the patient instructions according to the fixed rules for that to create and transfer a message. Generally the biological information with a seven segments-message header, events, patient ID, PV, findings a doctor/readings and allergy information of the patient-transmits.[4] The message structure of HL7 shows such forms as Fig1.

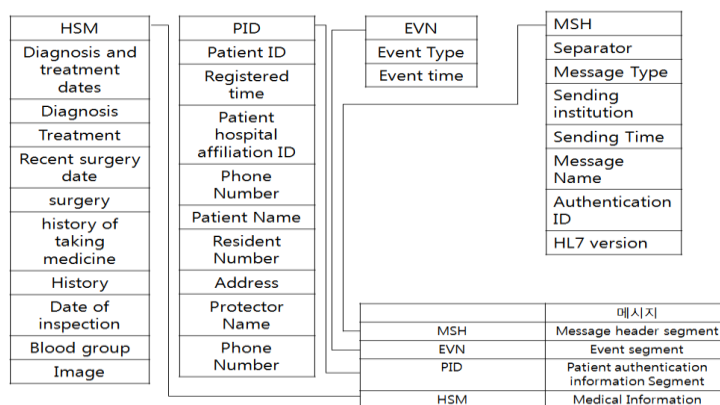


Figure 1. The message structure of HL7

2.2 DBaaS

Recently the database service has attracted considerable interest. While the demand for cloud services is increased, there is a need to predict that what kind of database should be configured and whether a certain service to the user. However, it not considered in detail. The method which can solve the problems is the DBaaS. DBaaS means a solution that is provided as a one-stop service of hardware installation, operation and monitoring through clouding the DB. This database can be used effectively in accordance with the state of the application. It provides the quickness and agility, DBaaS is possible to effectively use a database in accordance with the state of the application. The DBaaS is two forms of the integration at the Schema level and RAC integration at the database level. The integration at the schema level is difficult to implementation, but it can be used efficiently. Also the DBaaS is offered to the functions of the DB, and to provide a SQL interface features.[5]

3. The Proposed system

3.1. The Basic Architecture of The Proposed System

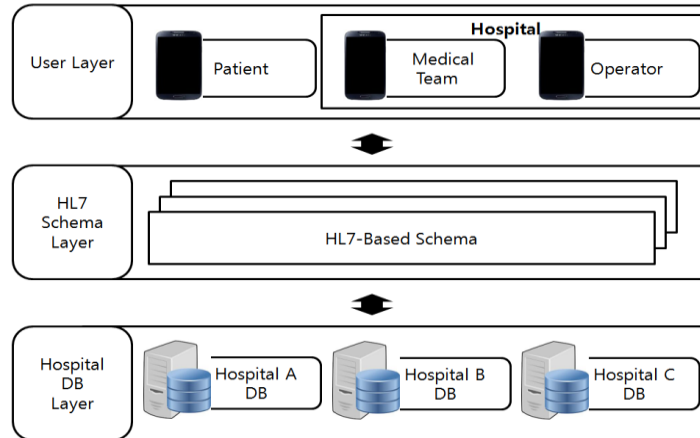


Figure 2. The Basic Architecture Diagram of The Proposed System

In this paper, the basic architecture of the proposed system is organized as Fig 2. Structures of the system is consisted of the user layer, HL7 Schema layer and the hospital DB layer. The users of the service exists in the user layer. The user divided the patient from the hospital with a medical team and the operator. HL7 schema layer is as an intermediary for data exchange of hospital DB layer and user layer is to be performed. The data can integrated and distributed based on the HL7. The hospital DB layer to store and manage to DB data that has been entered via the HL7 schema layer.

3.2 The Design of The Proposed system

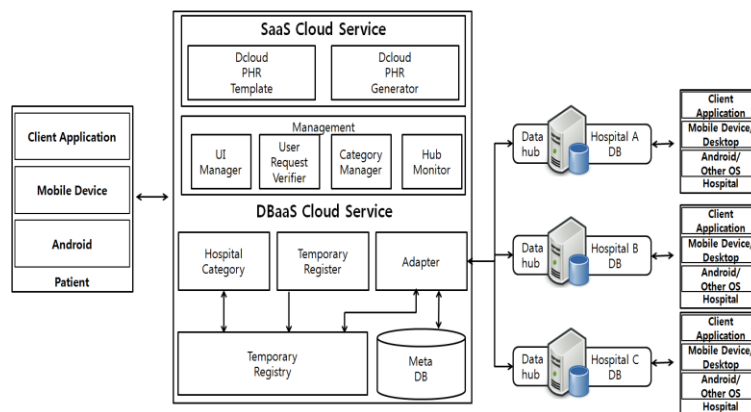


Figure 3. Design of the proposed system based on DBaaS

Fig. 3 was designed to integrate medical data DBaaS cloud-based, the construction is as follows.

● Patient

It has a sensor to measure the living body information based on the mobile device. To connect a cloud, it is provided with the services through the application.

●Cloud

For the service between the patient and the cloud, The SaaS(Software as a Service) serves to send the interface with the transmission method.

- DCloud PHR Template: It provides an interface to patient such as medical result and reservation scheme.
- DCloud PHR Generator: The patient send to the information about the interface through the DCloud PHR Template. Then it send the data with the Text format to the cloud. The cloud serve modifies the data in accordance with the HL7 Protocol format.

The role of the DBaaS is the data integration by mapping the HL7 Schema and Schema for each hospital.

- Hospital Category: This is a list of hospitals that are registered in the cloud, it have a hospital information-the name of each hospital, doctor name, location and other factors.
- Temporary Registry: To temporarily store data that has been entered using the DCloud PHR Generator.
- Temporary Register: To provide a service that Temporary Registry is to ensure that the temporary storage of data.
- Adapter: To perform the role to the data mapping of Meta DB Schema and Patient data of HL7 format that has entered through the Temporary Registry.
- Meta DB: The information of the Schema for each hospital and HL7 Schema is included.

●Management

To be efficient service to the users, it apply the user's request.

- UI Manager: And the user to provide an interface by DCloud PHR Template, I serve to select the interface in accordance with the needs of the user.
- User Request Verifier: It will serve to validate the needs of the user.
- Category Manager: To perform the role of monitoring and providing services for the hospital category.
- Hub Monitor: It will do the role of monitoring of hospital hub.

●Hospital

The mapped data through the Adapter is stored in each hospital DB through a Data Hub. And then, the hospital staff and doctors can see the information and reservation such as the patient's through each hospital DB.

3.3 Design of Interface

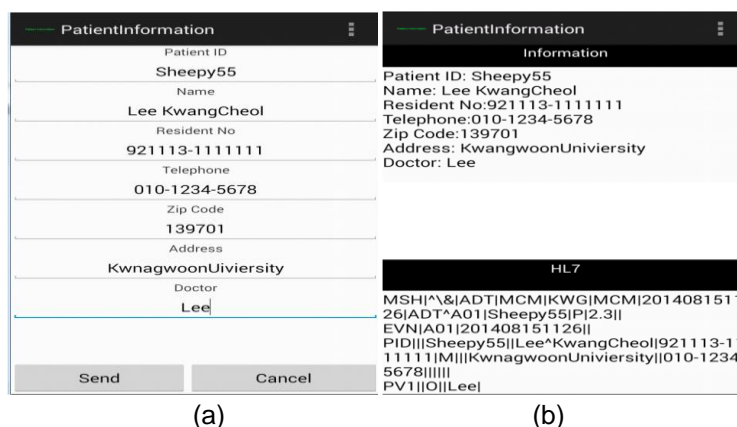


Figure 4. The Information Registration Form of Patient

Fig 4 represents a information registration form of the patient. Fig-3a write the personal information of the patient. the upper of Fig-3b is a Text format and the lower is the HL7 format. Fig-3b is shown in a format that is similar to the Fig 1. MSH is divided into the message header segment, Message type, sending institution, sending time, message name, authentication ID and HL7 version. EVN shows the time and type of event to the segment of the event. PID includes the patient affiliation, name, resident number, gender, telephone number and address.

5. Conclusion

Increasing the U-Healthcare market, it is required for data exchange and integration of the information. Because the current health care system is building a system on their own, the integration of medical information is difficult. For even more enhanced after incense U-Healthcare service, it should be reliable integrated medical information and the exchange of information. Therefore in this paper, we propose the DBaaS cloud service with the management and integration for heterogeneous health information and data exchange is possible. Each hospital system is maintained, for the integration, DBaaS environment was built through data mapping the hospital Schema and HL7 Schema. It comes true the efficient exchange of information between the patients, doctors, staffs through the data mapping of the one to multi-system.

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