

ABSTRACT

Recently, Information technology (IT) is used to adapt for exchanging electronic data among different educational systems. Educational data are coming from various types of software which generate their own data types have been widely used. Data exchange between different educational systems have to be done to improve interoperability between them. It improved ability for education information system to exchange information about students who move from one location or institution. This paper will propose data exchange platform for educational information system based on RESTFUL web service. Purposed data exchange platform for educational system is designed by using a cloud-based service platform.

INTRODUCTION

For the last years, Information technology (IT) is used to adapt for exchanging electronic data among different educational systems. IT facilitates exchanging data among different educational systems to make it easy, convenience and safety. Data exchange between different educational systems have to be done to improve interoperability between them. Due to the heterogeneity of platforms (i.e, operating system), different programming languages (i.e., Java, and Dot.Net) and different database management systems (DBMS) (i.e., SQL Server, MySQL, and Oracle) in each educational information systems makes a tough and time consumed way for exchanging data among different educational. Because of heterogeneous data on each educational information systems, the concept of centralized data exchange system may be used in the communication between different type and structure. It improved ability for education information system to exchange information about students who move from one location or institution to another and help Department of Education to access data and advanced reporting evaluate the effectiveness of the educational system. United States Software and Information Industry Association has proposed School Interoperability Framework (SIF) [1] in North America. And in China, the government also presents Education Management Information System Interoperability Framework (EMIF) [2]. However that Solution have some problem in interoperability communication.

THEORETICAL BASIS**Cloud computing**

Cloud computing is a collection of Information technology services that are provided to a customer over a network on a leased basis and with the ability to scale up or down their service requirements [3]. Cloud computing purpose internet-based technology which is stored in servers and provided as a service and on-demand to the clients. It sharing architecture of the IT trends, in which a third party provides highly scalable, reliable on demand software, hardware, and infrastructure services with agile management capabilities. The main characteristics of cloud computing is *managed metering, High scalability, agility, high availability and reliability, cost savings, multi-sharing, on-demand self-service, shared infrastructure, maintenance, scalability and resource pooling*. There are different types of cloud computing like *Public clouds, Private clouds, Hybrid clouds and Community cloud*. Three types are offered by cloud computing are Platform as a Service (PaaS), Software as a Service (SaaS) and Infrastructure as a Service (IaaS).

Web Service

Recently, web service plays a vital role to enable heterogeneous environments to exchange data between them in the form of XML and JSON. Simple Object Access Protocol (SOAP) is traditional web services which uses XML-RPC. Another implementation of services is REST was proposed by Fielding [4] in his doctoral dissertation as an architectural style for building large-scale distributed hypermedia systems. Data sets handled by client-server application logic are modeled as resources. REST key principles are fivefold (URI, response code, and query-methods GET, POST, PUT, and DELETE).

RELATED WORK

In practice, technology is used to adapt for exchanging electronic data between different educational systems to make it easy, convenience and safety. Chandio A.A [5] purposed Integration of Inter- Connectivity of Information System using Web Services. However, this study is applicable only for Inter- Connectivity between internal information system of educational system like library, student, and administration information management departments [6] [7]. United States Software and Information Industry Association has proposed School Interoperability Framework (SIF) [1] in North America. And in China, the government also presents Education Management Information System Interoperability Framework (EMIF) [2]. Both SIF and EMIF, in each educational system include special connection model for their databases of different educational system. However, both of them not efficient for transmitting large data between them.

Radwan et al. [8] proposed a Data Exchange system that used the cloud as central communicational intermediate service. Khoury et al. [9] proposed web service broker that exchange Medical Data between different Healthcare information systems. However, this study is applicable only for Healthcare information system. Dongdai Zhou [10] proposed a SOA-based interoperable model for educational information systems. However, this study is not securing the data that exchange among different educational institutions. This paper proposes architecture for exchanging data among different educational system.

Problem Definition

In real environment, education information system need to exchange data among them. it help educational system to exchange information about students who move from one location or institution to another. Due to the heterogeneity of platforms, different programming languages and different database management systems (DBMS) in each educational information systems makes a tough and time consumed way for exchanging data among different educational. However, exchanging data is difficulty because data is stored in different formats and systems. Data exchange between multiple educational institutions have to be done.

Problem solving approach

This paper will propose data exchange platform for educational information system based on RESTFUL web service. Purposed data exchange platform for educational system is designed by using a cloud-based service platform.

PROPOSED FRAMEWORK

The proposed of data exchange platform for educational information system is based on the above problem and literature survey. This section presents the framework architecture, the sematic interoperability, security and privacy, and the usage scenario of our proposed system.

Framework Architecture

The data exchange platform for educational information system is designed by using a cloud-based service platform. It uses concept of PaaS (Platform as a service) to provide a service for exchange and conversion of data into a pre-defined standard. Each educational system institutes must build its own RESTFUL web API service to exchange data with service broker.

Fig1. General architecture of purposed Architecture

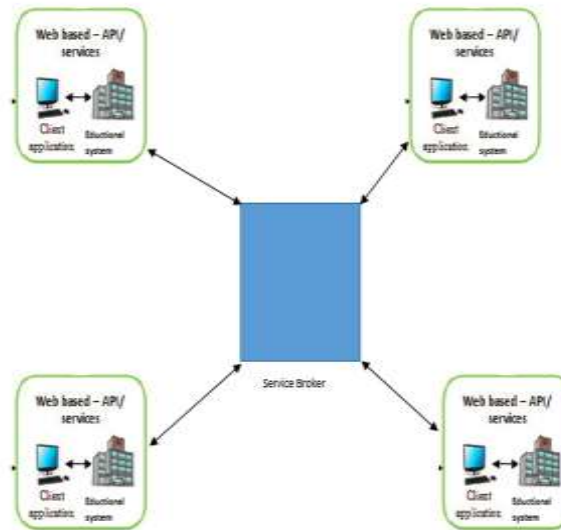
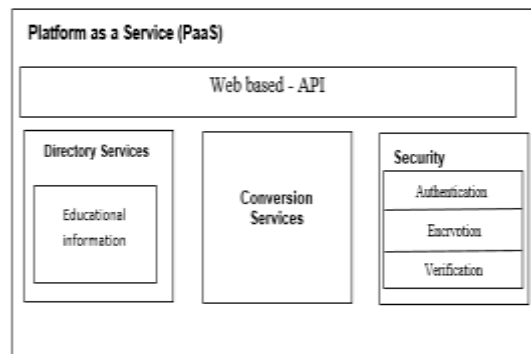


Fig2. Framework Architecture of Paas



PaaS Layer: It is based on data processing unit (cloud). When educational information application needs to access services, it must requests through web API. It is contains of

- 1) Information conversion services: It uses for translate educational system data into standard format (JSON), which is purposed in our purposed architecture.
- 2) Conversion service: It use for a central directory that keeps information of educational which is needed for exchange information data. it is consists of :
 - Educational information: such as educational id, educational name, IP address and public key.

Sematic interoperability

To exchange data from different educational system that is stored in different formats and systems, we provide data conversion services to translate them into the pre-defined standard format. Educational information system transform data into the standard form and receivers convert the standard form back to their own data format. Table I show purposed data standard format for send a query to other educational information system. The first column is the attribute. The second is the type of each attribute. The third column is the Null option. Lastly, it is a description of attributes.

Table I DATA STANDARD of Send Query

Attribute	Type	Null option	Description
Student ID	Integer	not null	ID student
Name	String	null	Name, middle name
Level	Integer	null	Student level ,level :1 ,2,3,4

Table II shows purposed data standard format for response educational data format.

Attribute	Type	Null option	Description
Student ID	Integer	Not null	ID student
Name	String	Not null	Name, middle name
Level	Integer	not null	Student level ,level :1 ,2,3,4
GPA	Integer	Null	Student GPA
Subject	JSON	Not null	{"information system": "70"," introduction to computer ": "80"," operation research ": "90",...}

If educational information system A wants to query Data from educational information system B will send our proposed data standard for sending query. For example if educational system A need to get transcript of student from educational system B so it send our proposed Data standard like below:

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{ "UUID": "1", "Student ID": "1001", "level": "4"
```

Educational system B will receive a request query and excused query and reply with proposed data standard format like below:

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{ "UUID": "1", "Student ID": "1001", "Prenome": "student", "Name": "Ali Yassin", "level": "1", "GPA": "3.5", "subject": { "Computer Science": "80%", "Information System": "70%", "Math1": "90%", "Data communication": "70%" } }
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Security and Privacy

The security and privacy of educational information data is the important issue for educational system. We proposed security and privacy for the system by following:

- Using user authentication for access system: Each educational information system need to register with system to acquire the account for logging to system.
- Creating a circle of trust: after each educational information system signup with system, it need to identify which register educational system can exchange data with it.
- PKI keys (Public Key Infrastructure) :
Each educational system need to create public and private key. Public key will be kept in the cloud system. When it has data transmission, public key will be provided to another user that wants to exchange data to encrypt data.
- Using file transfer protocol (FTP) to transfer data with secure socket layer.

Mechanism and Usage scenario

To communicate between client educational information application and cloud based platform (Pass). Each educational information system application use HTTP as a protocol to communicate by defining a request and response message. Each educational information application send request message to cloud platform, then it receive and process the request message.

Between clients of different educational information system, sending and receiving data directly in concept of peer-to-peer communication by using FTP (File Transfer protocol).

To use this system, it needs to be subscribed and set up by the following steps:

- Each educational information system signs up the system to acquire an account and then generate PKI keys.
- Create circle of trust to assign permission.

Fig3. Data exchange mechanism

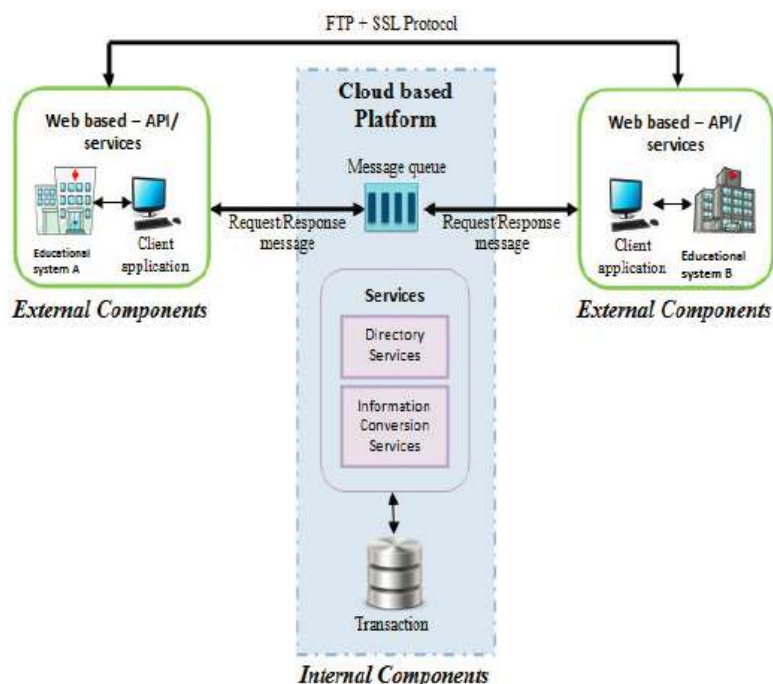
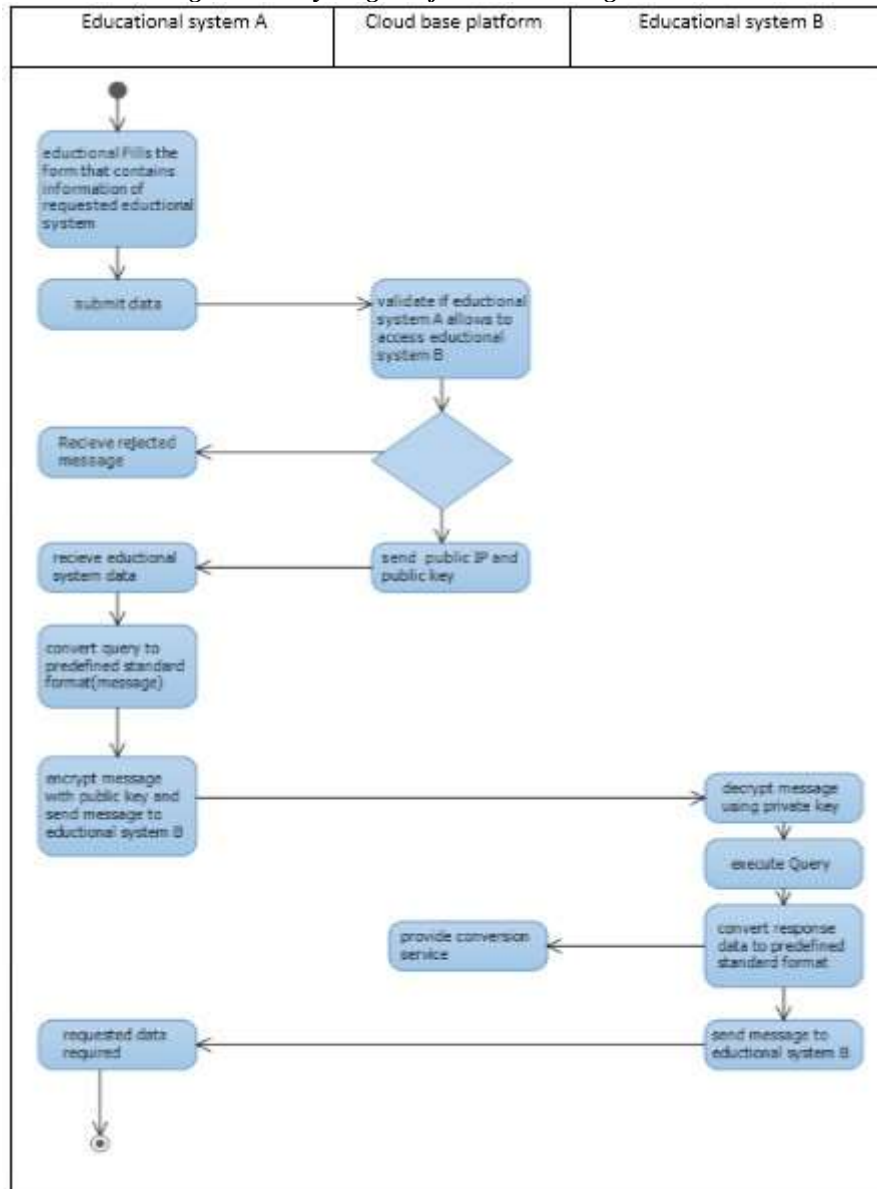


Fig. 4. Shows the scenario of data exchange. After log in to the application, educational system A fills the form that contains information of requested educational system and submit data. Cloud will validate if educational system A allows to access educational system B. if educational system A authorized to access educational system B, cloud will send public key and public IP to educational system A, otherwise will send rejected message to educational system A. Educational system A generate query by converting it to our purpose predefined standard format and encrypt message and send it to educational system B. Educational system B will receive and decrypt message using private key. Educational system B will execute query require and convert result to predefined format for response. Educational system A will receive requested data.

Fig. 4. Activity diagram for data exchange scenario



CONCLUSION

This paper will propose data exchange platform for educational information system based on RESTFUL web service. Purposed data exchange platform for educational system is designed by using a cloud-based service platform.

FUTURE WORK

In my future work, I will to purpose architecture model cross platform educational application protocol that constitutes a set of steps that facilitate the interaction among different educational systems. There will be a system federation for each educational system among different educational systems. We will purpose a structured data transmission among them which will be secure and it will be also cached data that transmitted so that it will improve the reliability, availability and scalability of our purpose architecture.

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