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Modeling Private Cloud Computing in Higher Education Environment

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Abstract- **The need of integrated data gathering in an institution often become a forgotten problem. In unifying data process, it always need a good corporate portal server to handle all the data. For that reason, there should be a specific information system that will hold whole data in the institution as an integrated data from every department and it also must handle all synchronization process. This sort of difficulty bring this research into cloud computing solution. The model of cloud application in this research merely take SaaS level from cloud computing concept. Using SOA as its base, this model tries to create architecture diagram which are currently being implemented as integrated data center in higher education environment at Ma Chung University. The cloud application which named as MacICE at present is being implemented and still under construction, thus this research is only an initial step from building a private cloud application in higher education environment.**

Keywords: **Cloud Computing, SOA, Higher Education**

I. INTRODUCTION

The need of integrated data gathering in an institution often become a forgotten problem. However, this requirement should be implemented carefully depending on the institution need. Especially in an higher education environment in Indonesia, which periodically doing accreditation process.

Whenever this process is being done, then it going to be a busy time for every person in university to gather and synchronize data for each departments which are involved. Thus, it really need a centralized and well organized data in order to create reliable output.

In unifying data process, it always need a good corporate portal server to handle all the data. Some great proprietary softwares has already provide that kind of features, yet, it will cost expensive price that not every university (especially in Indonesia) can afford to buy it. Also, accreditation process of university in Indonesia is not a common process. Since that it always need "special treatment" for the data in order to become a meaningful information for its form fillin process.

For that reason, there should be a specific information system that will hold whole data in the institution as an integrated data from every department and it also must handle all synchronization process. Other problem is that the system should have been done in very efficient way and being implemented as fast as it can. Remembering that most of data processing will be loaded from many sides of department, thus it ought to split the workload efficiently.

This sort of difficulty bring this research into cloud computing solution. Why it must be solved using cloud computing ? It merely come from cloud computing solution that bring virtualization and dynamic scalability on demand [1]. On the other hand, cloud computing also offers inexpensive computing infrastructure on demand, which could be accessed in a simple and pervasive way [2].

While the problem of accreditation process is not merely about data center, but it also about data synchronization. Thus, the implementation should be easy and interactive for the users. Since that not all users are having good capabilities in IT skill. All of these demands headed into cloud computing characteristics which are interactive in its type of application, easy to use and centralized [3].

In this research, cloud computing prototype only take the third layer or SaaS. This selected layers reasoned merely by the time limitation in implementation process which need fast ready-made application. The software that built is hosted in a local or intranet system in university, and it can be accessed through intranet and also internet.

The prototype which being built in this research currently implemented as software named as *MacICE* (Ma Chung Information and Curriculum Online). The software that built as web based application has already being tested as data bank for accreditation process.

II. THEORITICAL BACKGROUND

Cloud computing implementation commonly consumed via web browser as services to users. There

are three kind of layers of cloud computing which are [4,5] :

1. Infrastructure as Service (IaaS)
   Computing infrastructure, such as servers, storages and network delivered as cloud service typically through virtualization.
2. Platform as Service (PaaS)
   Platform that can be used to deploy applications provided by customers or partners
3. Software as Service (SaaS)
   Software deployed as hosted services and accessed over internet.

The term cloud has been used historically as a metaphor for the Internet. This usage was originally derived from its common depiction in network diagrams as an outline of a cloud, used to represent the transport of data across carrier backbones (which owned the cloud) to an endpoint location on the other side of the cloud [6].

However, cloud computing can be defined as a set of network enabled services, providing scalable, QoS guaranteed, normally personalized, inexpensive computing infrastructures on demand, which could be accessed in a simple and pervasive way [2].

On the other hand, cloud computing is still in its infancy. There is a hodge-podge of providers, both large and small, delivering a wide variety of cloud-based services [6]. Some companies like to do their own cloud computing environment or familiary named as private cloud computing. This solution will use private data center and tailor-made software which utilize Web Services and SOA in order to create their own cloud computing.

An SOA solution consists of a linked set of business services that realize an end-to-end business process. At a high level, SOA can be viewed as enabling improved management control, visibility, and metrics for business processes, allowing business process integration with a holistic view of business processes, creating a new capability to create composite solutions, exposing granular business activities as services, and allowing reuse of existing application assets [6].

SOA or service oriented architecture is a style of programming, an architectural approach in software development, where an application is organized in functional units of code with a given behavior called services. Services are a group of methods that share a common set of requirements and functional goals [7].

III. PROTOTYPE

The prototype of private cloud computing in this research take place at Ma Chung University. As stated before, that the need of this private cloud computing is making an integrated data center as well as collaborative process despite of running current system.

Thus, the cloud computing which are being built must exploit current system in Ma Chung University. Current running system are divided into two different web based application which are : an academic information system built based upon ASP .NET named as *MacSys* and a trusted local portal based upon Microsoft Sharepoint.

Both of the system has already been implemented in different web server, however, both of them still take place in local server environment. Thus, the upcoming cloud computing application can pull Web Services from those systems as SaaS.

The constraint from prototype is whether Web Services should have integrated data merely from basic data such as user profile or it should integrate any important data which will be included in forthcoming cloud application. This constraint came up exclusively since that both of current systems has already own their private user profile and also data that will be needed in cloud application.

Overcoming this problem, then cloud application must create an XML Web Service which will offer a service contract over authentication from both of current system. It also must have collaborative session with programmer from MacSys system in order to create an XML Web Service to pull over required data to cloud application as integrated link.

While Sharepoint as portal has already integrate itself automatically through Microsoft Office Sharepoint workspace, thus it will not be a hassle to integrate it in cloud application. However, it still need contract service that must be created through .NET Framework thus it can tweak required data seamlessly. Figure 2 explains this solution clearer :

IV. FUTURE WORKS

As a preeliminary result from whole software engineering in building cloud application, this model still need empirical evidence from current progress. Thus, while its implementation still need many adjustments from current model of this research, this model should be a great help in execution process.

Since that building XML Web Service in real application is not as easy as its model, this model should be breaking down into detail as use case model and also activity diagram. The breakdown process itself should consider real actor who really involved in cloud application, thus it can make precise Web Service in it.

However, the term of cloud computing should really integrate document integration in this implementation. It means that the upcoming application should really include application which can maintain data through web browser instead of desktop application. The term of "maintain" also must include office similar application, such as Microsoft Office Web Edition that will be integrated in cloud application. Thus, in future works of this cloud application will not merely integrating private data among university, but it will also contain collaborative features.

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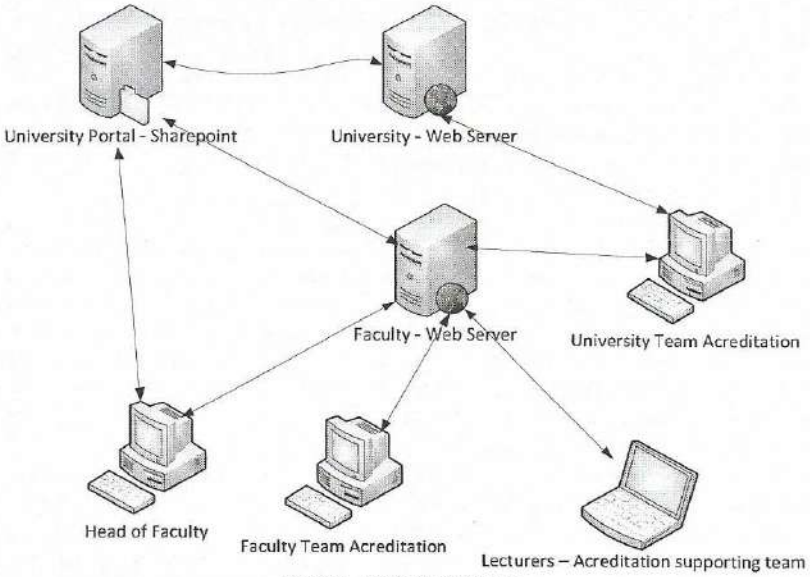

Figure 1. Architecture Diagram

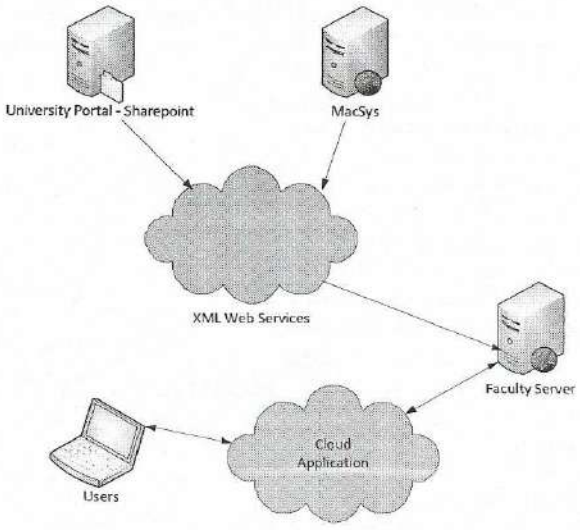

Figure 2. Cloud Application Model