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e-Learning Architecture Design using SOA Approach on SKB Gunungkidul Yogyakarta

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Abstract In e-Learning construction, there are many methods that can be used to build an e-Learning architecture, one of them is the Service Oriented Architecture (SOA). SOA is an approach that makes the application functions as services. It is packaged as a component that can be used repeatedly and is independent. The advantage of SOA is the ease to integrate several different systems. Application architecture that has been built is the integration of data, applications and technologies that form the basis for the development, management and information systems usage in order to comply with its mission in support of achieving the objectives of equality education package. Architectural design (architecture of data, permission and system) is done to support educational institutions in the strategy to improve the quality and equality of education planning application architecture to be implemented in the future research.

Key words: Architecture, SOA, e-Learning, future research, Indonesia

INTRODUCTION

The utilization of information technology, e-Learning, needs not only a teacher who is competent on using technology for making material teaching but also a design to apply an effective learning way. Asia has the world's highest regional growth rate for e-Learning of 17.3%.

On a learning designation, there are processes about design, develop and apply e-Learning content by utilizing available infrastructure and e-Learning application (Nurcahyono and Permanasari, 2015). e-Learning is used not only as a media to share info but also to develop world of learning so it can develop learning material freely. It enables the interaction between student to student or student to teacher. The aim of remote learning is to facilitate student on getting subject to learning sites Sanggar Kelompok Belajar (SKB).

Based on research in Gunungkidul learning site; topography condition is hilly. The research is supported by statement of relevant department head. He said that Gunungkidul region consists of hill and mountains. Furthermore, the transportation to rural area SKB Gunungkidul is very limited. The implementation of remote learning may support on line examination it does not require examinees coming to SKB because the examination can be done remote or online. Now a days, non-formal education on SKB Gunungkidul uses information system (http://skbgunungkidul.com) which every operational activity has been integrated well by computer-based system. However, the current system is not used optimally. There is a lack on network and functionality. The system needs improvement from staff's performance hence training and certification is needed for the officer to increase their skill to solve the mistake that may appear in the future.

SOA approach is chosen because it is an approach that makes application's functions as services. It is packaged as a component that can be used repeatedly. This thing is possible if there is any change or additional function of mobile-learning. The result of this research may help SKB to develop programs in line with its job and functions. According to Yuniati; mobile learning is able to make hand phone from only sms (short message) phone and internet becomes a complete study tool containing material, problems and try out. It is also equipped many features such search, jump to and back (Trends, 2014).

The research of implementation "Service Oriented Architecture Untuk Pengintegrasian Information System Perguruan Tinggi" that is done by Pungus (2008) reveals that SOA is a framework to integrate business process, support information technology infrastructure and standardize components of service which can be re-use and combine as business priority. SOA is loosely coupled (degree of dependence between low level

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components) highly interoperable (easy to operate) reusable (can be re used) and interoperability (able to communicate cross platform) (Pungus, 2008). Research to be done differently to what has been done by Brusilovsky (2004). On his study proposes an architecture for adaptive e-Learning based on distributed reusable intelligent learning activities that integrate the benefits provided by modern LMS and educational material repositories with the power of ITS and AH technologies. This architecture addresses both the component based development of adaptive systems and the teacher-level reusability. We have started by implementing the core functionality of the system within our local group by using some rather simple approaches to implement the required protocols (Brusilovsky, 2004).

On the research from Rahmi Nur Shofa and friends titled "Penerapan Service Oriented Architecture (SOA) Dalam Pembangunan Web based Learning" focuses on analysis and design it also implements the making of web based learning application by using SOA architecture. There is a conclusion that the application can help lecture process becomes better. This research explains that SOA is a concept of software development which use its partition system into several services which can be independent (Shofa and Kurnia, 2013). Another statement about service-based architectures, SOA take legacy application functionality and expose it to the internet in a reliable, highly available, scalable, flexible, manageable and secure manner, easy and reliable internet-based method to create and access learning (Jabr and Al-Omari, 2010).

MATERIALS AND METHODS

In this research, data processing is taken by comparing observation result and information checking from literature study, observation and interview. Afterwards, thus information is compared with data from chief of SKB Gunungkidul, officer, staff of youth and sport department and staff of PKBM which related to current system architecture.

SOA (Service Oriented Architecture): Service oriented architecture or SOA is defined as policies, practices, frameworks that enable application functionality is provided and consumed as a set of services on a unit that corresponds to the needs of customer service. Service can be used, published, discovered and abstracted using standard interfaces (Sprott and Wilkes, 2004). SOA describes the pattern that helps a client application to connect to a service. The pattern presents a mechanism that is used to describe a service, publish and find services and communicate with the service. Service implemented into the application form (Indraningrum, 2015). e-Learning can be expanded abilities into m-Learning by adding components to the software product layer and application layer. Data course/lecture can be used so it does not need to create m-Learning system separately from e-Learning. In the prototype, data can be transferred from server to mobile devices via wireless media in various formats such as XML and messaging.

To understand what makes e-Learning solutions effective, research has been done by Noesgaard and Orngreen (2015) analyzed factors promoting the effectiveness of e-Learning. These factors were categorized according to the context in which the e-Learning solution was used the artefact (the e-Learning solution itself) and the individuals that used the artefact. Subsequently, further categorization into key factors resulted in a model to guide e-Learning design (Noesgaard and Orngreen, 2015).

RESULTS AND DISCUSSION

Defining the architecture model aims to identify research process which need support from information systems and information technology so that the harmony between information technology and SKB's strategy can be managed well. The architecture is about: user architecture, data architecture, access right architecture and system architecture.

User architecture: User architecture designed to manage which users will be involved in the system. User is likely to use the system is divided into 4 groups, the first Admin both are prospective students the third the group that are directly related to teaching and learning activities (educators, learners and operator/SKB) four are users who will oversee ongoing education system consists of district education office, BTKP, PNFI and BPKB (Fig. 1).

Data architecture: Architectural design data starts by identifying all the entities of data to be generated, managed and used by all of the research process. Data entities are objects (people, places, concepts, objects or events) that have meaning (information) in the context of the research process in which the data can be stored. At this stage, it will be made a list of all the candidates of data entities based on the function of the main work processes and support functions research processes (research processes entities) that have been defined previously. Identification data entity is also concerned with catalogs of information resources that have been owned by SKB Gunungkidul (Table 1).

Data architecture aims to identified and define needs of e-Learning system toward data which support research process of the system. Defining the data or which is

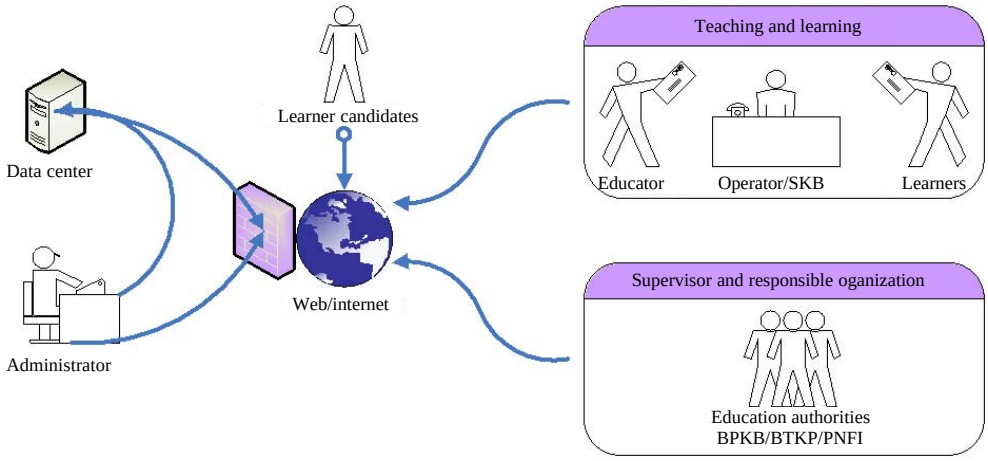

Fig. 1: The architecture model

Table 1: Data architecture model

Process entity	Data entity
New student registration	New student entity
	Registration entity
Academic operational	Curriculum entity
	Schedule entity
	Evaluation report entity
	Subject entity
	Operator entity
	Value entity
Program development and evaluation	Program planning entity
	Planning report entity program
	Planning staff entity
Management facilities and infrastructure	Facility and infrastructure entity
	Facility and infrastructure planning entity
	Facility and infrastructure report entity
SKB Gunungkidul management	Remote learning entity
	Remote learning report entity

needed by is a first stop from architecture designation because data quality is basic product from information system's function. Data architecture shows whole data entity that will be produced managed and used by all research process. Based on its previous business function and resource catalog (Fig. 2).

Permission architecture: Architecture permissions are useful to help clarify the activities that can be done by the user. Here is the detail of permission on the stakeholder:

- PNFI field (non-formal and formal education) of youth and sport department, require student's data, score and teaching progress in a whole province
- BTKP (technology, communication and education department) require curriculum, IT infrastructure, student and teacher's data
- BPKB (department of development and learning activities) require curriculum, student and teacher's data
- District/city education department require student's data, score and teaching progress in a whole district
- SKB (group learning sites) require student's data, score and teaching progress in SKB (Fig. 3)

System architecture: Architectural information allows organizations to understand the needs of the data from the subsystem when the subsystem development to maximize data sharing. Information system architecture can be defined by identifying information systems and sub-systems to be built. How can identify it using a diagram that shows relationships among data entities and processes.

Administrator: To avoid abuse of the system, need to add security on the database server. So, administrators do not just process data only. Examples recommended using Shadow software scanner database.

Operator and SKB Gunungkidul: In this case, the operator and SKB has the same authority which regulate the teaching and learning process from registration to the evaluation process which is then reported to the supervisor.

Teacher and student: It is expected to teacher and student can do teaching process by sharing information. It can be upload/download material, assignment, exam, latest event/latest activity and other through available feature. Especially utilizing the facility of learning resources/learning record.

Supervisor: Coordinating board is a stakeholder that supervise the activity in SKB.

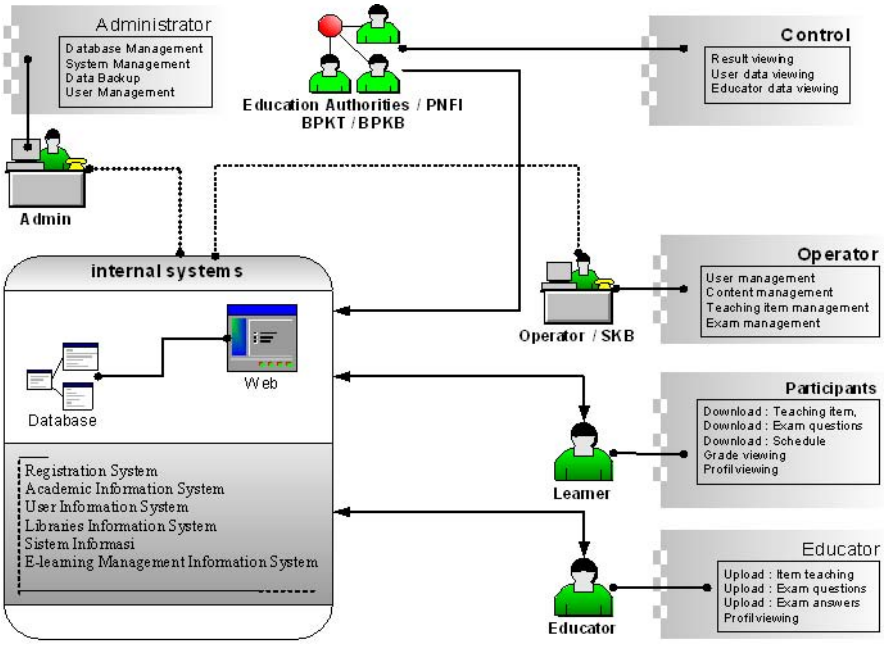

Fig. 2: Permissions architecture model

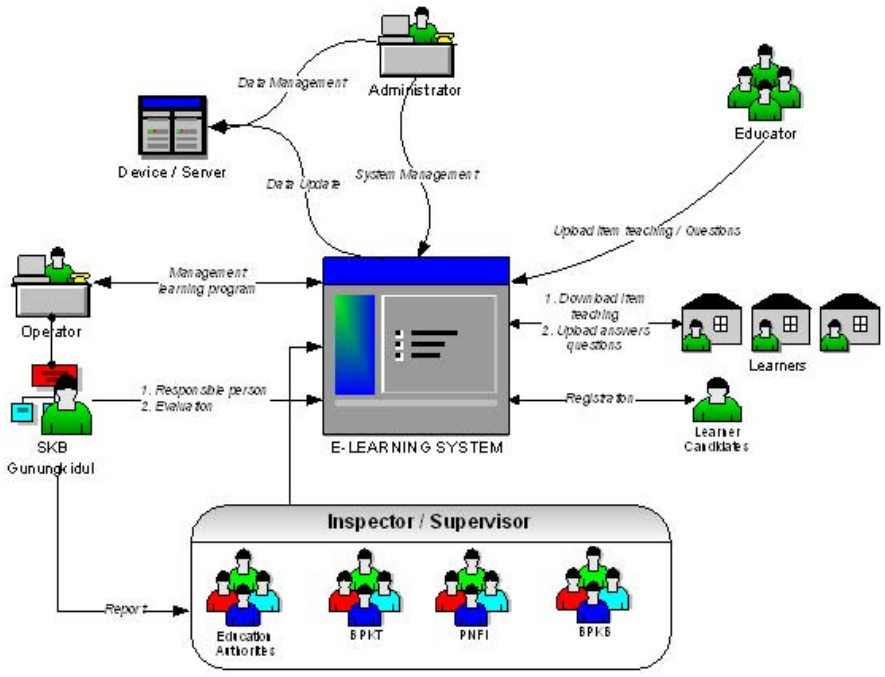

Fig. 3: Architecture system model

CONCLUSION

The conclusion of this research is a proposal architecture for education in SKB Gunungkidul by using SOA. Application architecture that has been built is an integration from data application and system architecture. Those things are the basic of development, management and usage of information system remote learning. To align with its missions: support the achievement of B and C package education goals. SOA approach results

integration between architecture which becomes proposal of application architecture. The designed architecture is suited with current problem on SKB. Main problem is the need of architecture for the remote learning (PJJ) building in Gunungkidul.

e-Learning can be done by adding its function into m-Learning. Adding the components without change other application's function. Learning data can be utilized so it doesn't need to make m-Learning system separately from e-Learning.

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