

A Survey on Service-Oriented Architecture for E-Learning System

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Abstract-E-learning refers to learning that is delivered or enabled via electronic technology. E learning is classified as synchronous or asynchronous. Service based technology in E- learning provides a common infrastructure to integrate heterogeneous software components, thus enhancing interoperability between different components. Service-oriented architecture for E-Learning provides adaptable, interactive, extensible, distributed, collaborative and intelligent E-Learning system to effectively realize the learning anytime and anywhere to instructors and learners. This paper presents a detailed analysis of well known architectures for service based E -learning system. The architectures that surveyed here gives users the ability to collect, analyze, distribute and use E-learning knowledge from multiple knowledge sources.

Keyword – E-learning, Service based E-learning, Service-oriented Architecture, web service.

I. INTRODUCTION

E-Learning is the teaching and learning activities that carry on through Internet. E-learning is defined as “the effective learning process created by combining digitally delivered content with support and services”.

E-learning is classified as synchronous or asynchronous. Both terms refer to “the extent to which a course is bound by place and/or time.” Synchronous simply means that two or more events occur at the same time, while Asynchronous means that two or more events don't occur at the same time.

A service is an entity that provides some Capability to its clients by exchanging messages.

Service-Oriented Architectures[10] for e-learning describe an architectural concept which defines the expression of processes and logic in e-learning system as individual services which in turn publish or expose facets of their functionality in a standardized way allowing other services to access and use their functionality in a flexible manner. E-Learning Services can represent and manage any functional aspect of an E-Learning scenario.

Available service based architectures provide adaptable, interactive, extensible, distributed, collaborative and intelligent E-Learning system to support instructional design, retrieve relevant learning materials, process and analyze data to enable

meaningful e-learning recommendations to be made to instructors and learners.

This paper presents a detailed analysis of well known architectures for service based e-learning system. The architectures that surveyed here gives users the ability to collect, analyze, distribute and use e-learning knowledge from multiple knowledge sources.

Section 2 presents the various architectures for service based e-learning system and then *section 3* concludes the work and future enhancement.

II. ARCHITECTURES FOR SERVICE BASED E-LEARNING SYSTEM

In this section we presented different service -based E-learning architecture. The architectures given here are classified into (1) Interoperable E-learning System; (2) Extensible E-learning System; (3) Distributed E-learning System; (4) Collaborative e-learning system; (5) Adaptive E-learning System; (6) dynamic E-learning system (7) Intelligent Agent Based E-Learning System

A. Interoperable E-learning system

Moon Ting Su et.al [8] developed an E-learning system that uses web service technologies. The objective of the proposed system was to provide interoperability between components written and running on different hardware. The architecture is based on the JISC e-Learning framework (ELF). Here a set of e-Learning web Services is constructed by choosing the required services the services include Assessment, Course Management, Grading, Marking, Metadata, Registration and Reporting web services. Metadata web service, Learning Object Metadata (LOM) is applied to capture the description of the learning objects. Marking web service, rubrics is used for assessment.

Angad Grewal et.al [1] presented a web service based e-learning lifecycle and its services. This Lifecycle defines all the functionality needed for the interactions between the service provider and the service requester, from the creation of a digital asset to the delivery of learning resources to the learner. Here the focus was given mainly in the transformation of digital assets into a learning object in an interoperable way by means of web service to enhance the learning process.

Giovanni Casella et.al [3] proposed web service based thin client architecture for e-learning system that uses Run Time Environment (RTE) in SCORM to trace learning process with a suitable middleware component. The main objective of this system is to reduce the workload on client side and to implement the communication schema based on HTML.

The Middleware consists of three components: Sequencer, Tracer, and Deliverer. The Sequencer proposes to the learner the suitable knowledge content to consume. The Tracer is used to trace the learning process by interacting with the Service Machine. Finally, the Deliverer component allows the instructional designer to deploy courses. The use of web service and middleware improves interoperability and the e-learning system can be extended with new features. The SCORM standard is used to support the student learning process.

Xiaofei Liu et.al [13] focused on how to integrate Web Services on the e-learning application domain. They used J2EE as technical infrastructure to build components and integrate with Web service.

The proposed system consists of functional architecture and service architecture. The functional architecture defines components that make up an e-learning system and the objects that must be moved among these components. The service architecture defines how different e-learning systems exchange messages through the interaction of Web service agents in each system.

Service Provider is the platform that hosts access to the service. Service Requestor is an application that initiates an interaction with a service. Discovery Agency is a searchable set of service descriptions where service providers publish their service descriptions.

They implemented the service model with Web Services technology to provide a standard means of communication among different Learning management systems.

B. Extensible E-learning system

Zhifen Cheng et.al [15] proposed a methodological framework for the development of e-Learning systems based on SOA and MDA. The platform consists of Activity Model, as a unit of work that needs to be executed. Workflow Designer is the design surface it allows for the graphical composition of workflows. Workflow Runtime executes the activities to make up a workflow. Rules Engine enables declarative, rule-based development for workflows. For the integration of various learning resources services, uses web services technology and .NET Framework 3.0. Standardized methodologies and platform independent languages have been used for developing extensible and adaptable e-learning system.

C. Distributed E-learning system

Hajar Kashfi [4] proposed a service based architecture for developing distributed e-learning system that used grid technology. The grid technology is suitable for developing distributed e-learning system because resources can be shared by direct access to computers, software data and other resources.

The proposed middleware is a multi-agent system, which represents grid core services for resource sharing and other basic services in e learning. In this architecture, the entire grid is divided into multiple administrative areas. In each area, a group of agents are responsible to serve some clients. For each area, there is one mediator server, that response to all requests of clients in that area. The most important agent is a mediator agent is responsible for coordination of other agents to provide e-learning and Grid core services.

The use of web service in grid system supports the dynamic discovery and composition of services in heterogeneous environments.

D. Collaborative E-learning system

Sandra Aguirre [11] proposed a federated service-oriented architecture for e-learning based on web service. The main objective of the proposed system was to provide a new service called "joint degrees service". Using this system two or more e-Learning systems can collaborate in the development of joint degrees by establishing collaboration agreements.

The architecture is made up of identity provider, a service broker and service providers (e-Learning systems). The identity provider is responsible for controlling identity and validity of users. The service broker is responsible for managing the federation of services and service providers are responsible for publishing and offering services that allow access to other e-Learning services.

E. Adaptive E-learning System

K.K.Thyagarajan and Ratnamanjari [5] addresses the problems of automatically selecting and integrating appropriate learning materials for a learner using web services based on the learners initial knowledge, goals, preferences etc. A system is described that provides learning content to multimedia industries and institutions those who are working in Adobe Flash. Instead of providing a learner with static data, the approach is based on fulfilling learning objectives based on a dynamic supply of services.

Athanasios D. Styliadis et.al [2] proposed a personalized e-learning system which is based on GIS case for distance learning. GIS e-learning initiatives that incorporate by default a number of sequencing spatial techniques (i.e. spatial objects selection and sequencing), will well benefit from a well defined personalized e-learning implementation with embedded spatial functionality.

Panagiotis Germanakos et.al [9] presents a semantic-based adaptation and personalization system, uses cognitive aspects as its core filtering element. Here the focus was mainly on the creation of a comprehensive user profiling that combines parameters that analyze the most intrinsic users' characteristics. Based on the user profile the content is adapted.

Vincenza Carchiolo et.al [12] proposed an architecture organized into four layers: a database layer to store, share and reuse courses and teaching materials, an adaptation layer which allow personalized courses generation, a presentation layer that arrange personalized courses into learning paths, and an interface layer to develop several learning interfaces. They used graph based model for personalizing the learning content.

F. Dynamic E-learning system

Zhengfang Xu et.al [14] proposed a Web services oriented framework that facilitates dynamic e-Learning systems by providing a comprehensive platform in which all the shareable learning components are published, described, located and invoked in a standardized way. The definition of standard interfaces between application and application is the key in Web services technology, which enhances the cross platform development in a lightweight communication protocol.

G. Intelligent Agent Based E-Learning System

Kai Wang et.al [6] proposed Web services-based framework that provide intelligence and adaptiveness to each individual learner for e-learning portal systems. This framework includes two parts: portal framework and Web services framework. Portal framework is comprised of presentation component, portal engine component and portlet container. Web services framework includes a service provider, a service broker, and a service requester. A Service provider delivers any learning information, material, or process as a self contained, self-describing modular service across different platforms (J2EE, dot net and others).

The main advantage of this framework is that Instructor/Learner will use this framework to their learning objects or services based on portal universally anywhere, any time with any device through common communication protocols. The interoperability and accessibility feature of the architecture enhance the future collaboration e-learning portal systems to communicate more efficiently and share data more easily.

MihaelaDinsoreanu and Ioan Salomie [7] analyzed the distance learning domain and investigated the possibility to implement some e-learning services using mobile agent technologies. They presented a model of the Student Assessment

Service (SAS) and an agent -based framework developed to be used for implementing specific applications. A specific Student Assessment application that relies on the framework was developed.

III CONCLUSION

Learning is an active process of constructing knowledge. This paper provided a survey on service based architecture for E-Learning system which include features like interoperable, distributed, adaptive dynamic, extensible, collaborative and intelligence, if the architecture includes semantic web technology and appropriate levels of security, the system will be more efficient.

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