A Supporting Architecture for Generic Service Integration in IMS Learning Design

Luis de la Fuente Valentin⋆, Yongwu Miao, Abelardo Pardo,
and Carlos Delgado Kloos

Department of Telematics Engineering, Carlos III University of Madrid, Spain
Educational Technology Expertise Center, Open University of The Netherlands
{lfuente,abel,cdk}@it.uc3m.es,
yongwo.miao@ou.nl
http://gradient.it.uc3m.es

Abstract. Learning Design offers the possibility of capturing the process, activities, user organization and resources used in a learning experience. But a wider set of scenarios appear when generic services are considered. Integrating such services in a Unit of Learning is difficult due to the lack of a defined bi-directional protocol for information exchange. In this paper the Generic Service Integration paradigm is presented. It extends the Learning Design specification to use generic services, first at the design stage of a Unit of Learning, and then at the deployment and run times. The framework allows for bi-directional exchange of information between a Unit of Learning and a service. The consequences of the approach are that services can be configured to suit the needs of activities in a learning environment, and a Unit of Learning may adapt its behavior based on the events that took place in any of the used services.

Keywords: service, integration, learning design, IMS LD, learning, course.

1 Introduction

In the evolution of e-learning technical standards, the release of the IMS Learning Design specification [1] (henceforth IMS LD, or simply LD) supposed a shift of focus from supporting content-centric learning to supporting activity-centric learning. Using IMS LD, multiple approaches to learning such as empirical, rationalist, pragmatic, cultural, historic, etc. can be formally modeled as a unit of learning (UoL) [2]. Once defined, a UoL can be instantiated and automatically executed at a run-time environment for scaffolding students to conduct online learning with the help of staff and other learners in a virtual learning context. A UoL prescribes how participants with various roles should individually or collaboratively perform activities in sequence or/and in parallel towards learning objectives within associated learning environments, where necessary learning objects and learning services are available [1].

⋆ Corresponding author.

In certain learning activities, especially those present in rationalist, pragmatic and cultural-historic approaches, learners interact with each other and with learning objects through the use of a variety of learning services. Without these services, activities cannot be properly supported by the environment and the number of possible pedagogical strategies is severely reduced.

The use of learning services is available through the use of the LD specification. Only four types of services are included: send mail, monitor, index search, and conference. To support a wider range of activities, the specification should allow the inclusion of more services. A generic approach that fits with the current specification is required to allow any service to be integrated in a UoL. This is the goal of the architecture presented in this document.

The architecture described in this document aims at minimally extending the current Learning Design specification such that UoLs may instantiate generic services by describing the required functionality. Furthermore, a communication protocol is presented to allow a bi-directional communication between a LD run-time environment and a remote service. Thus, services can be tailored to the specific needs of a learning environment, and the environment can adapt itself depending on the information reported by the service.

The paper is organized as follows. Section 2 presents the main initiatives that have considered the problem of service integration in a learning context. Section 3 includes a formal definition of the problem of generic service integration. A software prototype for testing purposes is outlined in Section 4. Finally, Section 5 is devoted to conclusions and future work.

2   Background

Interaction among services is a research topic that applies to numerous scenarios. In the context of a learning experience, the IMS Tools Interoperability Specification [3] focuses on facilitating integration of third party tools with learning management platforms. The concept of Personal Learning Environment (PLE) [4] also considers the idea of service orchestration in a learning environment.

None of these initiatives are implicitly related to IMS LD. Interaction with generic services will allow additional pedagogical models to be expressed with LD, increasing the current scope of the specification. This section analyzes how other initiatives explore the problem.

CopperCore is a learning design engine that allows its output to be formatted and presented to the user. The CopperCore Service Integration Layer (or simply CCSI) is an additional functionality conceived to be used in conjunction with the LD engine. This layer allows new services to be added and extend the Learning Design Framework. Services are added through Interoperable Segments (APIS) [5], whose adapter allow synchronization between services.

Using this approach, QTI assessments have been integrated within an UoL. Synchronization between QTI outcomes and LD properties is specified at IMS Interoperability Guidelines [3]. In a similar way, SCORM functionality [6] and Adaptive Game Services [7] have been integrated in a LD defined course.