Mediating Distribution Models and Access Control for the Exchange of Learning Objects

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Abstract- This paper presents a learning object broker that aims to mediate and control accesses to learning objects offered by the “Learning Resource Exchange”. This broker provides a unified view on access authorization to requestors and providers of learning objects.

I. INTRODUCTION

The Learning Resource Exchange (LRE) is a pan-European infrastructure for exchanging educational content. When it was officially launched in December 2008, it included 21 participating repositories offering more than 145,000 learning objects (LOs) covering virtually all curriculum subjects. These LOs were all “open”, meaning that they can be freely used by anyone, and, in some cases, can also be adapted and redistributed.

As new content providers start to express an interest in using the LRE to distribute commercial content, it will be necessary to allow them to protect these resources. For example, a content provider may want to request payment prior to any use of a LO, make sure that a LO is only used in a non-commercial context, or limit the type of use that is allowed. Actually, even for open educational content, some usage restrictions may apply (some rights reserved).

Initially, a Learning Object Broker (or broker) was developed to support two distribution models: Open educational content and institutional license (in which the provider grants access rights to a collection of LOs for a group of users) [2], [3]. As commercial content developers are joining the LRE, a key challenge consists of specifying a common service for content protection.

We propose a new broker that aims at mediating and controlling the access to the LOs offered by LRE members regardless of the variety of distribution models and technologies. This broker offers to LO requestors and providers a unified view on access authorization. The supported distribution models include, but are not limited to, open educational content, license-based access, and credit-based access. From a technical standpoint, requestors and providers communicate under the supervision of the broker that acts as a trusted third party.

II. LEARNING RESOURCE EXCHANGE OVERVIEW

The LRE is a service designed to unlock the educational content hidden in digital repositories across Europe and share it among all partners of the LRE and their users [1]. As suggested in Fig. 1, the LRE consists of an infrastructure that federates applications that provide LOs (e.g., learning object repositories) and offers a seamless access to these LOs to educational applications that consume them (e.g., educational portals, virtual learning environments).

III. LRE DISTRIBUTION MODELS

In a federation, there are 3 main categories of distribution models: open educational content, license-based access, and credit-based access. In this document, a provider is a LRE member who provides LOs. A requestor is a LRE member who wants to access LOs. Rights apply to these LOs. They can be seen as the result of a transaction between a requestor and a provider. “Access” could mean play, print, transfer, or any action that applies to a LO.

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1 The work presented in this paper is partially supported by the European Community eContentplus programme - project ASPECT: Adopting Standards and Specifications for Educational Content (Grant agreement number ECP-2007-EDU-417008). The authors are solely responsible for the content of this paper. It does not represent the opinion of the European Community and the European Community is not responsible for any use that might be made of information contained therein.
A. Open Educational Content

Open educational content is defined as learning content that resides in the public domain or is released under an intellectual property license that authorizes its free use. Although, the use of open educational content is free, some usage restrictions may apply. Open educational content is identified by the use of open license types such as Creative Commons\(^2\). The distribution of open content may thus require the acknowledgment of an applicable license prior to actual LO access.

B. License-based Access

The second popular distribution model is license-based access. In this model, buying a LO is similar to buying software. An individual user, a group of users, or all end users of a LRE member can access a LO or a group of LOs when the license is granted. A license agreement between a requestor and a provider must be obtained before the requestor sends an access request.

C. Credit-based Access

In this model, end-users “purchase” access to LOs by spending LRE credits. Basically, users have a certain amount of LRE credits that they may choose to spend to gain access to or use of LRE content. This situation is similar to that where an end-user would go to a shop to buy some goods with real money. A requestor presents money to a provider that checks that the amount is correct before providing the requested goods.

IV. LEARNING OBJECT BROKER

A key challenge the LRE has to face consists of specifying a common service for content protection that bridges different distribution models, different authorization services, and technical implementations. The proposed broker provides a unified way to mediate access control independently from actual distribution models.

As shown in Fig. 2, the broker relies on a LRE Registry Service (or registry) to collect information about available providers. It is the responsibility of individual providers to ensure that the registry contains the appropriate data. This includes the list of supported distribution models together with service endpoints where their local authorization service can be reached.

In the LRE, a transaction starts when a requestor contacts the broker to request access to a provider’s LO. The request specifies the LO identifier and the provider identifier, as well as a context that contains all the information needed by a provider to make an authorization decision. The broker checks the request validity, queries the registry to retrieve the endpoint corresponding to the requested provider’s distribution model, and forwards the request to that endpoint. Finally, the broker receives the result, in the form of a handle that is then returned to the requestor. The handle contains all the necessary information for the requestor to access the LO or to determine whether access to the LO is granted or not.

The context is different in each distribution model. It is transparent for open educational content, meaning that these LOs are freely accessible. In the case of the license-based access model, the LO context might be a pair that contains the user’s or the requestor’s identifier and an access code. It is also possible that the broker processes a very complex context to grant access to a requestor based on a license agreement. When a requestor wants to obtain access to a LO distributed via the credit-based access distribution model, the context can be a user identifier and the available number of credits. If needed, this simple concept can be extended to accommodate new distribution models.

A handle can also be either simple (e.g., a learning object URI) or complex (e.g., it can point to an encrypted LO and include a cryptographic key that allows the LO to be read). An optional expiration date provided by the authorization service is included in the LO handle, to support handle caching. Here also, the handle could be made as complex as required by the distribution model, by including, for example, cryptographic keys.

REFERENCES


\(^2\) http://creativecommons.org/