

## SUMMARY

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The objective of this thesis is a software architecture suggestion for the construction of a system which allows locating learning objects in a universal way so it will be possible to integrate them in learning or e-Learning system. At the present time the learning systems are reaching a great proliferation as it is demonstrated by the numbers that can be found in the published works about the subject. Nevertheless these systems develop at the same time that the standards to which they try to adapt.

The learning systems use learning objects (LO) as content base of their courses. These objects consist in repositories, which are digital stores of educative resources is a collection of resources (objects and/or units of learning) that is accessible through a communication network. The aim of a repository is to facilitate the reusability of those educative resources, making easier the access to them.

A learning object can be reused if it is made up in such a way that it is supported at least to some labelled standard associated to the contents that support.

In the present state of development, e-learning systems are already perfect tools but they are still based on a monolithic and strict architecture, and although they use Internet only do it as contents mass media without making use of their long possibilities. In these systems the stored contents in a repository (usually the owner) are integrated with the tools that help in teaching, and it is usually that they do not accede to external repositories of educational objects.

In summary, we are in the presence of a situation in which the platforms have greater sophistication than the contents, but in which the architecture also constitutes a serious brake to the evolution in development and accessibility terms.

It is needed, then, a really distributed architecture, in which each element constitutes assets able to interact with the others. This architecture will be sustained; as we will see, in the associated metadata to the educational objects that turn them in basic pieces of the system, and in protocols that will bring with them a modification of the present tools.

The proposed solution is the definition of a functional and architectonic frame for the adaptation of a system based on SOA and implemented through Web services (what provides a flexible integration mechanism of different applications and resources discovery in Internet) that assures the interoperability of different learning objects repositories and which assure their reusability.

In this Thesis, in the first place it is analyzed the present state of e-learning systems (also of learning based on the Web or Internet), their proposals, their advances and mainly their restrictions. Within this document it will be made a special emphasis in the repositories study that sustain them and the standards that point out how to construct them. From these studies we will indicate the present restrictions and we will define our proposals to solve them.

It is proposed a layers architecture of the system that includes a series of requirements that will have to be noticed like basic norms necessary to consider in every system based on this architecture. Also it is defined the needed components to assure the required functionality, as well as the information flow and the relations among them.

To validate the proposed Architecture it will be described a real prototype, which has been developed using the displayed techniques and which has been created from the proposed architectural principles.

This doctoral document ends with the presentation of conclusions and future works related to the treated subjects.

It has been also included a last point with the documentary sources (including Internet links) in which we have been inspired, without any intention of thoroughly in a referential frame subdue to intense and continuous changes.