

Transformation Services Laboratory on Open e-Learning Standards



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Overview of Presentation



- E-Learning (Concepts, Standards and Standardization Bodies)
- Overview of the Sharable Content Reference Model (SCORM)
- An architecture for integrating SCORM support into an LMS.
- A SCORM Sequencing Engine as a Service
- Federated search in Digital Libraries and Learning Object Repositories providing SCORM 2004

E-Learning



- "e-Learning" covers a wide set of applications and processes, such as web-based learning, computer-based learning, virtual classrooms, and digital collaboration.
- “Anytime, anyplace” learning
- Self-paced, Personalized
- Synchronous, Asynchronous
- Typically, delivered through a Learning Management System

Open E-Learning Standards



- **IEEE Learning Technology Standards Committee**
 - The IEEE Standard for ECMAScript Application Program Interface (API) for Content to Runtime Service Communication
 - IEEE Data Model for Content to Learning Management System Communication
 - The IEEE Standard for Learning Object Metadata (LOM)
- **Aviation Industry CBT Committee (AICC)**
 - The AICC CM1001 Guidelines for Interoperability
- **Instructional Management Systems (IMS) Global Learning Committee**
 - The IMS Content Packaging specification
 - The IMS Simple Sequencing specification
- **Advanced Distributed Learning (ADL)**
 - Sharable Content Reference Model (SCORM)

- **Types of e-Learning Standards:**
 - Content Packaging
 - Content -to- LMS communication
 - Content Description (Metadata)

SCORM (Sharable Content Reference Model)



- *“a reference model that integrates a set of inter-related technical standards, specifications, and guidelines designed to meet high-level requirements for learning content and systems”.*
- The high-level requirements, known as SCORM *“ilities”* or *“RAID”*, are:
 - **Reusability:** The ability to incorporate instructional components in multiple applications and contexts.
 - **Accessibility:** The ability to locate and access instructional components from one remote location and deliver them to many other locations.
 - **Interoperability:** The ability to take instructional components developed in one location with one set of tools or platforms and use them in another location with a different set of tools or platforms.
 - **Durability:** The ability to withstand technology evolution and changes without costly redesign, reconfiguration or recoding.

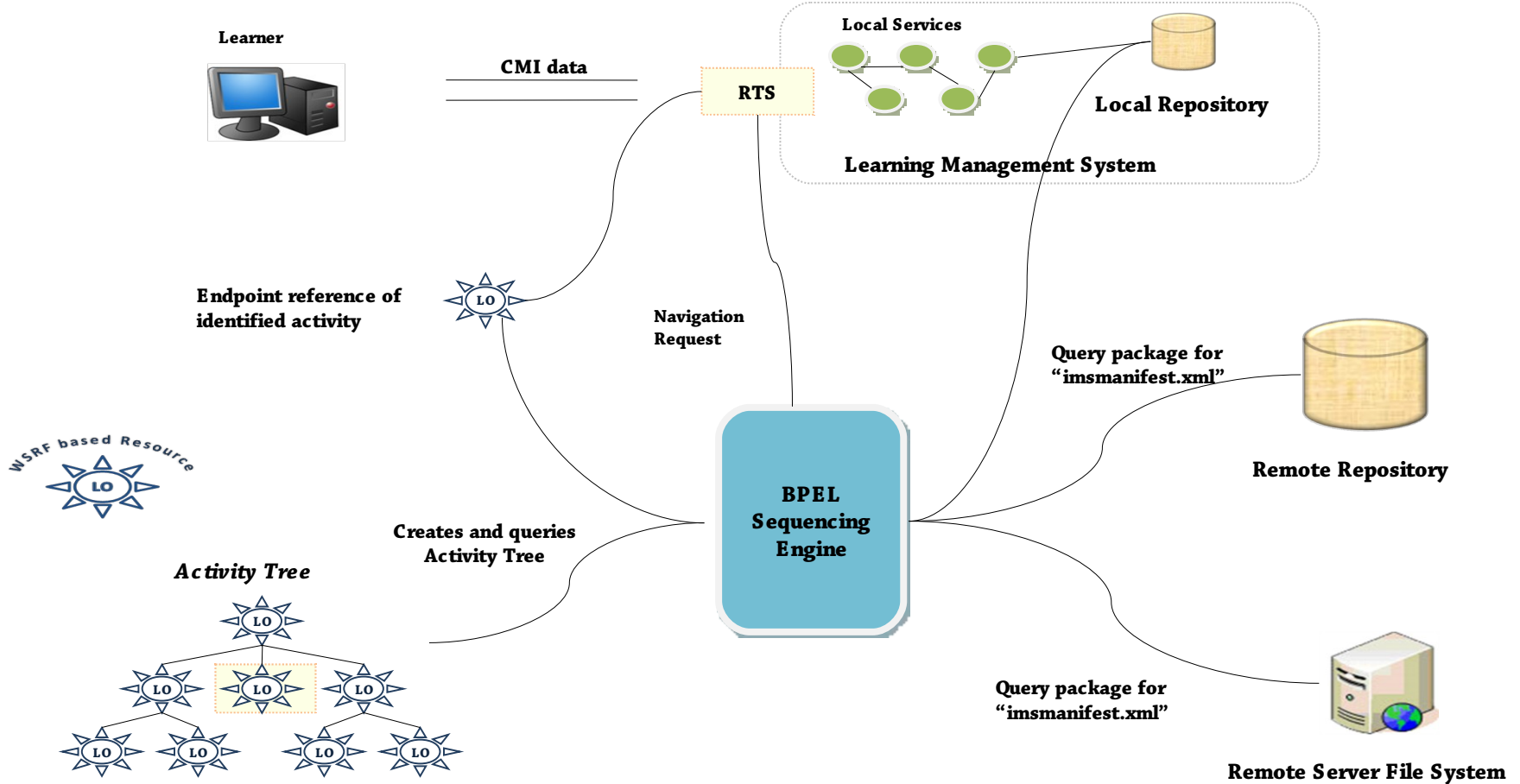
A SCORM conformant Sequencing Engine



- Design and implementing a SCORM conformant sequencing engine according to Service-oriented Architecture (SOA) principles
 - Representing characteristics and attributes of learning content through Web services
 - ✦ Use of WS-Resource Framework Specification
 - Implementing functionalities with Web services
 - Orchestrating services with WS-BPEL

A SCORM conformant Sequencing Engine

RTS = Run-Time Service of an LMS



A SCORM conformant Sequencing Engine



- **Advantages**

- Easily integrated to existing eLearning platforms
- Referencing and delivering content residing in remote repositories or platforms without the need to store the package in a local repository

- **Disadvantages**

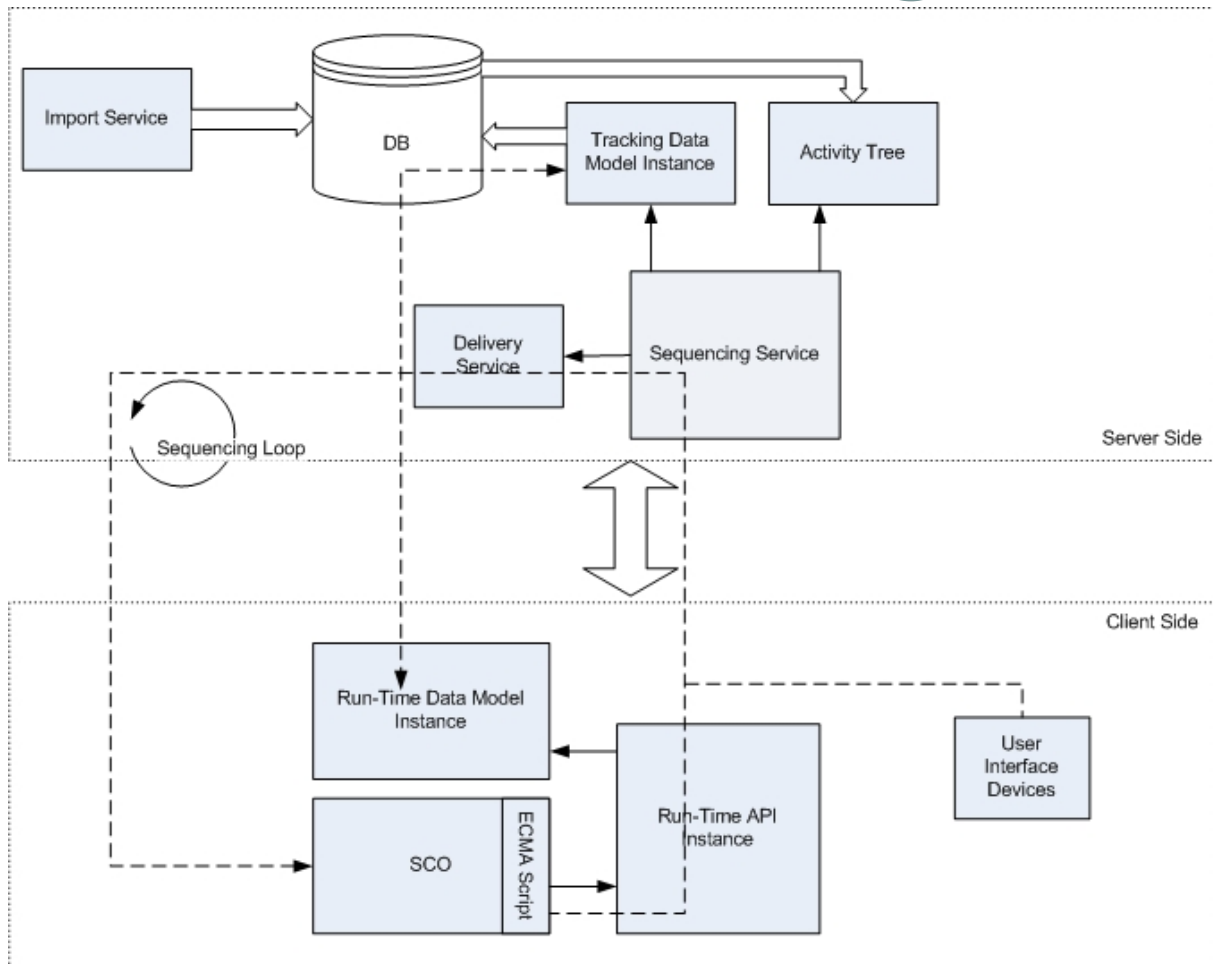
- Performance issues when dealing with large content objects and complex sequencing rules

An architecture for integrating SCORM into a LMS(1/3)



- **The proposed architecture deals with the following issues:**
 - The importing of any SCORM 2004 conformant content package.
 - The launching of content objects.
 - The runtime communication between content objects and the LMS.
 - The sequencing of learning activities according to the rules defined in the content package.
 - The tracking of learner progress.
 - The provision of an intelligent user interface.

An architecture for integrating SCORM into a LMS(2/3)



- Presumes a pre-existent learning management system that uses a relational database as its persistent data store.
- The LMS must provide a user and course management system for enrolling learners in courses and a Web-based course delivery system.
- *Open-source eFront lms* which is used in the course *CS-100 Introduction to Computer Science* offered by the Computer Science Department of the University of Crete

An architecture for integrating SCORM into a LMS(3/3)



The screenshot displays a web browser window with the URL `http://localhost/professorpage.php`. The page title is "efront | Greedy algorithms". The main content area shows "Activity 4" with the following text: "Learning Management System (LMS)", "Compliance Test", "Sequencing Test SCO", and a red status message: "Status: Test Completed." Below this, it notes "This test may take several minutes to complete." A sidebar on the left contains a search bar and a navigation menu for "Greedy algorithms" with items like "Main page", "Content", "Projects", "Tests", "Lesson rules", "Glossary", "Forum", "Surveys", "Files", and "Administration". A "Unit operations" panel at the bottom right lists "1. Print unit" and "2. Add comment".

Overlaid on the right side of the screenshot is a black box containing a navigation menu:

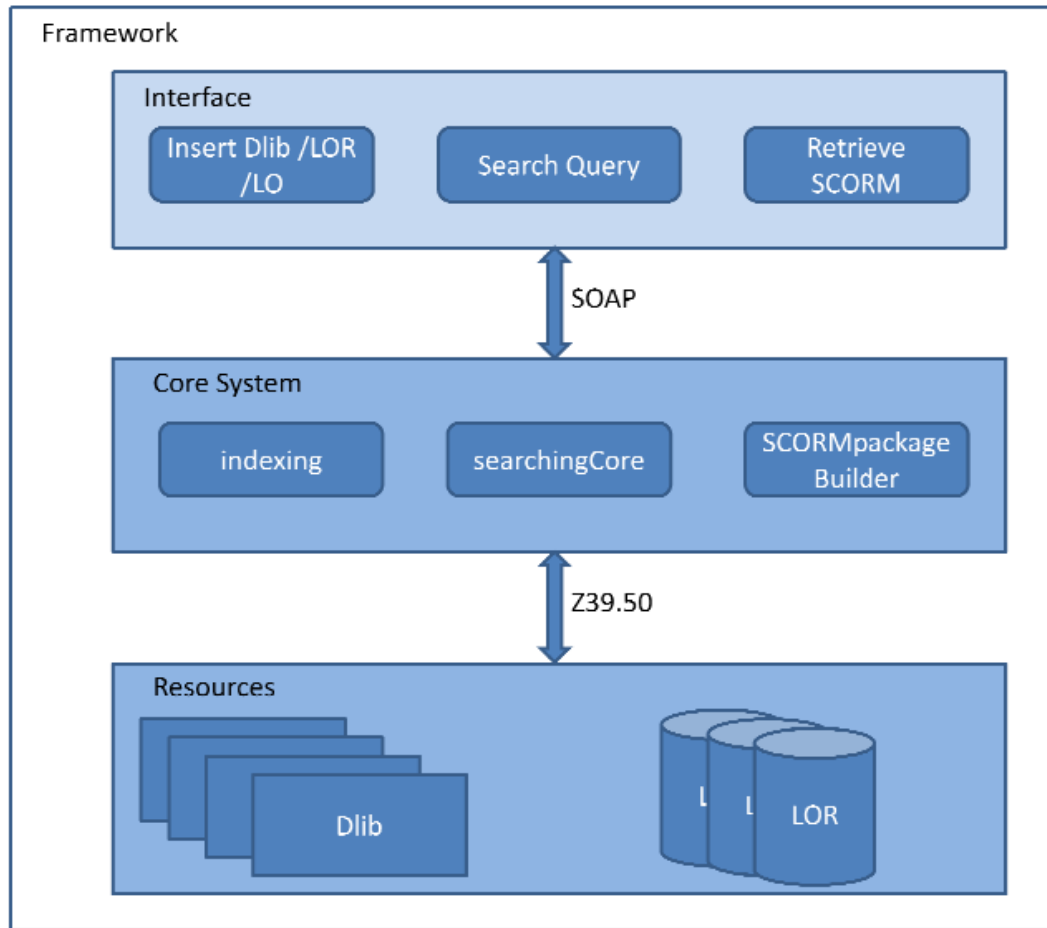
- Content Package 1
 - Activity 1
- Activity 2
 - Activity 3
 - Activity 4
 - Activity 5
 - Activity 6
- Content Package 2
- Content Package 3

Federated search in Digital Libraries and Learning Object Repositories providing SCORM 2004 (1/2)



- How to bridge the gap between Digital Libraries and eLearning
- Provide an effective proposal for addressing the interoperability problem between Digital Libraries and eLearning.

Federated search in Digital Libraries and Learning Object Repositories providing SCORM 2004(2/2)



Thank you!

Questions?

SCORM versions



- **SCORM 1.2**
 - Released in 2001
 - The first "real" release of SCORM
 - Content Packaging, Runtime Communication
 - Proved that content can be made interoperable.
 - Lacked a sequencing mechanism

- **SCORM 2004**
 - Sequencing and navigation (optional for content but mandatory for systems)
 - Improves significantly on SCORM 1.2, by eliminating even more ambiguities in the specification
 - Robust IEEE standards
 - Latest version SCORM 2004 4th Edition Version 1.1 released in August 2009