

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.

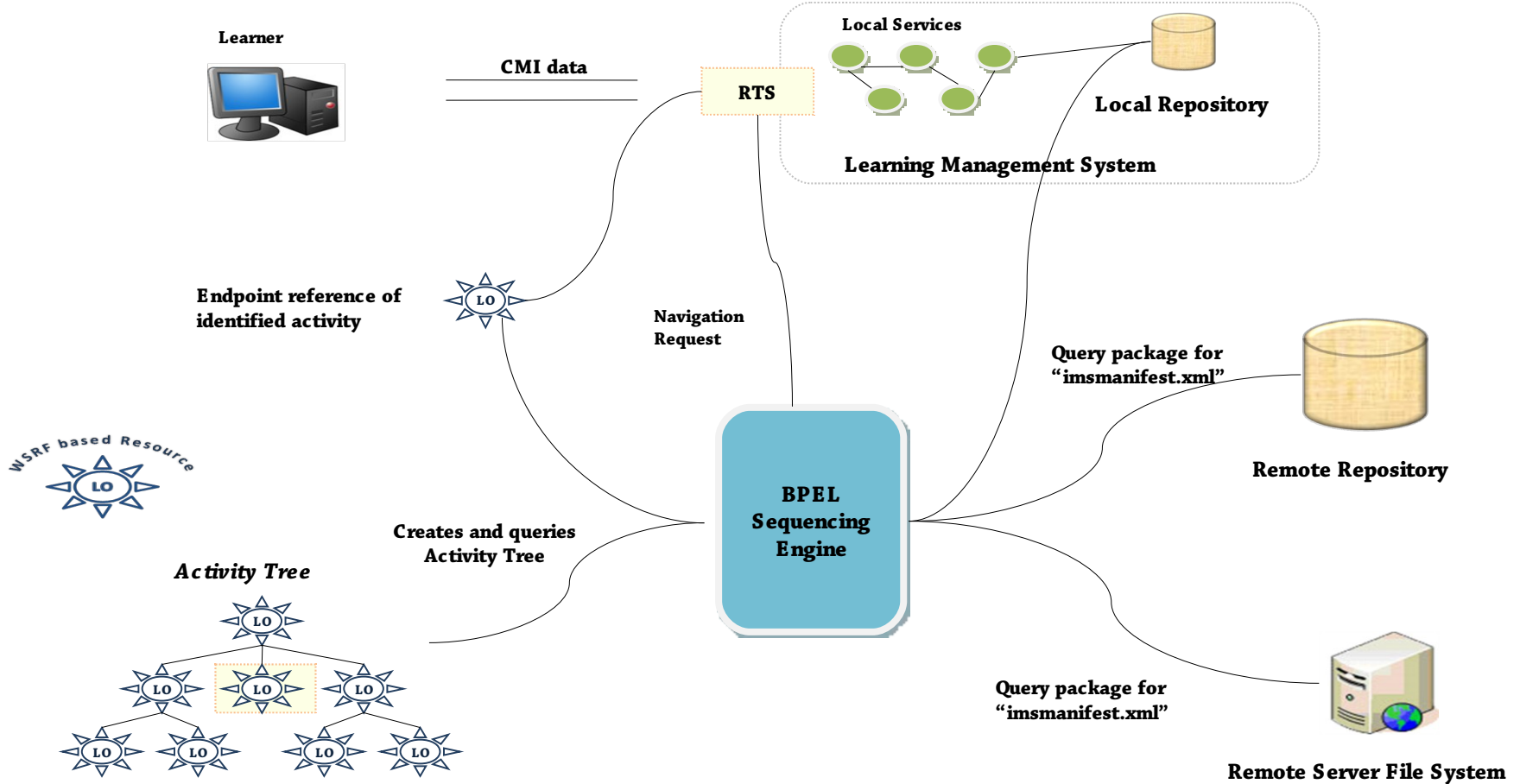
A SCORM conformant Sequencing Engine



- 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



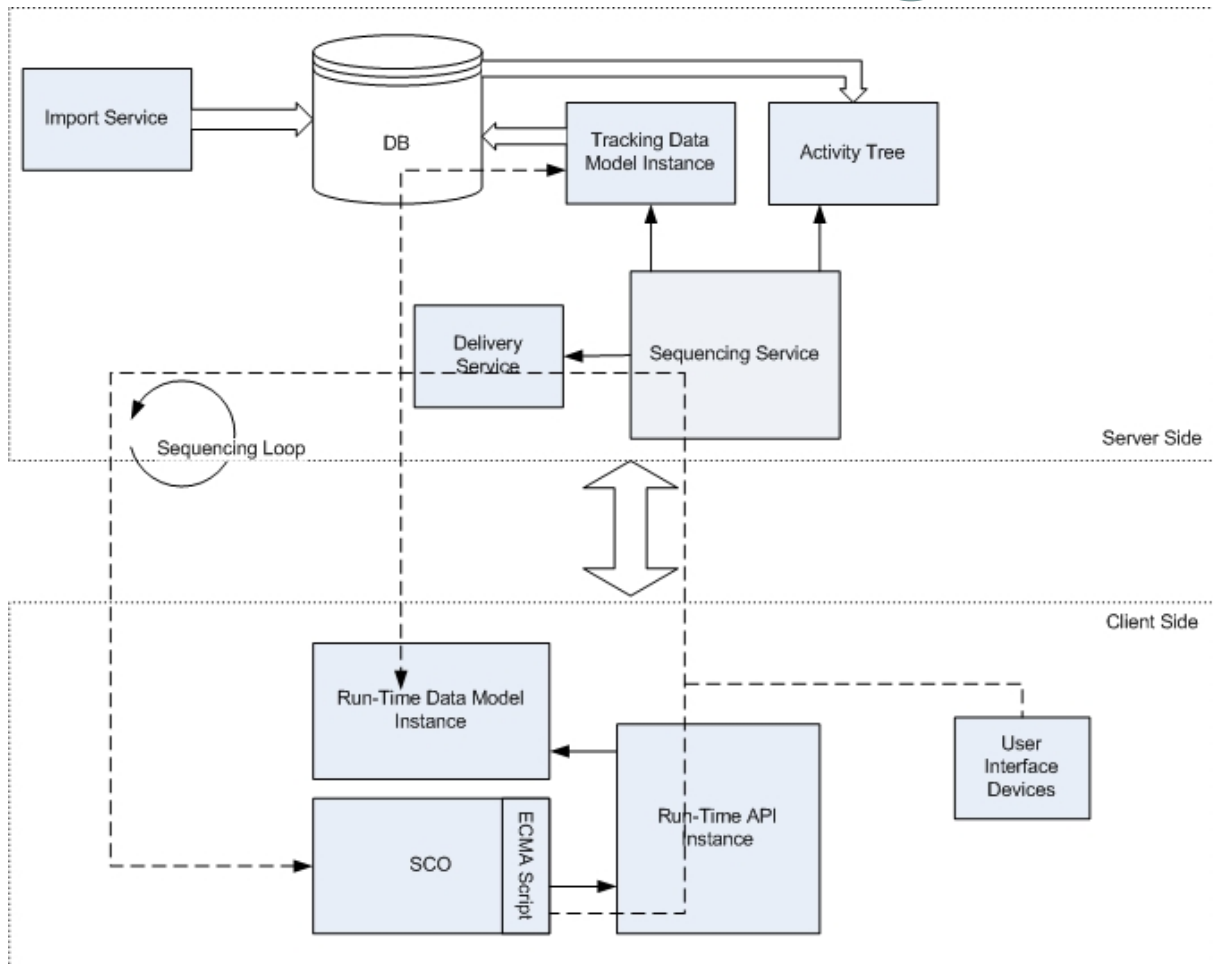
- **Advantages**
 - Easily integrated to existing eLearning platforms
 - Referencing and delivering content residing in remote repositories or platforms without the need to store the package in a local repository
- **Disadvantages**
 - Performance issues when dealing with large content objects and complex 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 bold red message: "Status: Test Completed." Below this, it says "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", "Administration", and "Change lesson". At the bottom left, there are sections for "Tools", "Chat", "Connected users (1)", and "Logout". A "Unit operations" panel at the bottom right lists "1. Print unit" and "2. Add comment". A floating navigation bar at the top right of the page contains icons for home, back, forward, and search. A large black overlay on the right side of the page contains a tree view of the course structure:

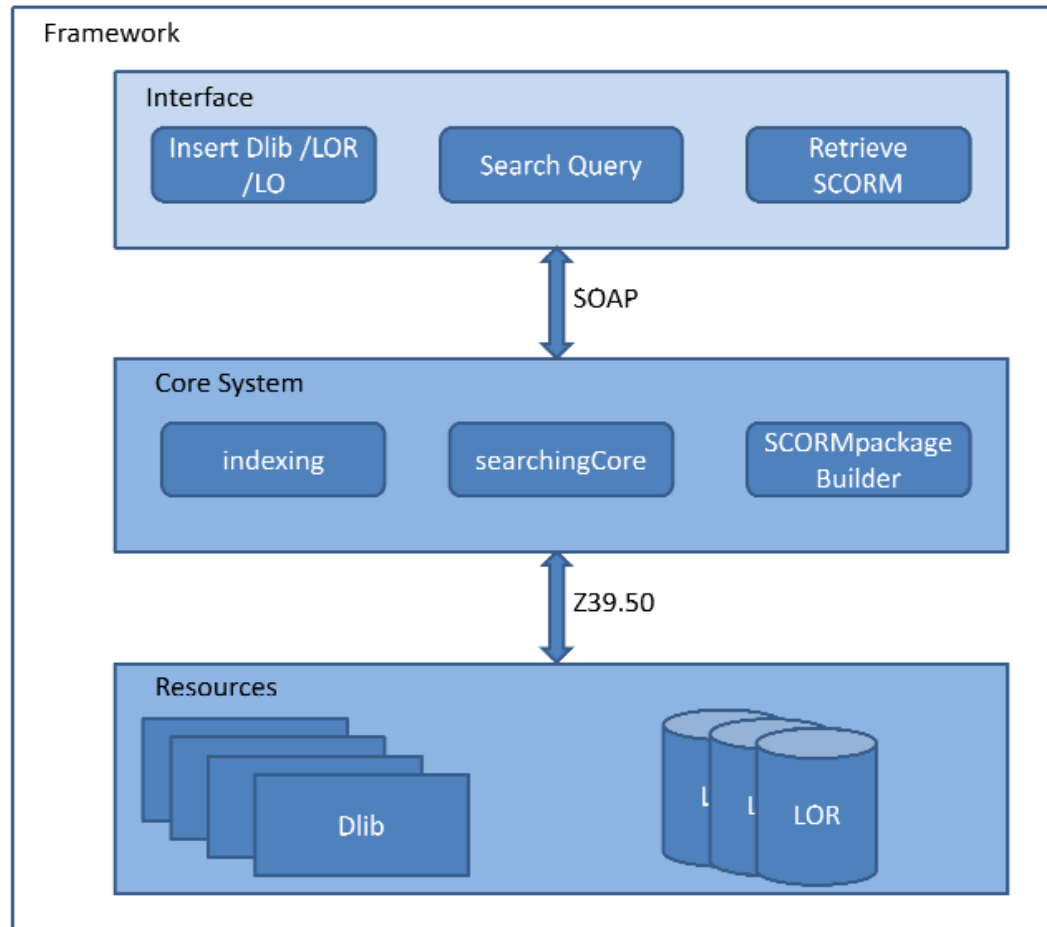
- Content Package 1
 - Activity 1
- Activity 2
 - Activity 3
 - Activity 4
 - Activity 5
 - Activity 6
- Content Package 2
- Content Package 3

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