Functionality Mashup Using
IMS Learning Tools Interoperability
Google 2008 Summer of Code

Update: Sakai and IMS are very pleased to have been selected for Google Summer of code 2008. We are now in the phase of the process where students and mentors interact and get to know each other better. Students applications are accepted by Google from March 24 - March 31. Students interested in working Sakai should read this entire page paying particular attention to the Ideas section below. If you have any questions, you should feel free to contact Dr. Chuck directly.

This Summer of Code 2008 ideas page centers around the notion of building open source reference implementations in a number of Learning Management Systems and environments for the IMS Learning Tool Interoperability specification which is under development.

IMS LTI has the potential to dramatically transform the use of technology in education. With IMS LTI, teachers and students will be able to use a wide variety of tools in their teaching and learning - not just the tools installed in their centrally installed learning management system. In addition, IMS LTI has the potential to put learners in charge of their own learning over their lifetime. The hope is to make the mash-up of teaching and learning tools as simple as placing the Google and YouTube videos on this page.

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Presentation: Breaking Down Barriers Between Learning Systems
http://www-personal.umich.edu/%7Ecsev/talks/2007/2007_12_14_ou_ti.pdf]
December 17, 2007, Open University, Milton Keynes UK
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About the Sponsors

This project is sponsored by the Sakai Foundation and the IMS Global Learning Consortium.

Sakai is an Open Source Collaboration and Learning Environment which is in Enterprise use at 200 Universities around the world with over a million users who use Sakai daily in their teaching and learning. The Sakai Foundation coordinates the activities of the Sakai open source community and provides shared resources to support the Sakai community activities.

IMS GLC is a global, nonprofit, member association that provides leadership in shaping and growing the learning and educational technology industries through collaborative support of standards, innovation, best practice and recognition of superior learning impact. IMS standards such as IMS Content Packaging, IMS Question and Test Interchange, IMS Common Cartridge, IMS Learning Design, and IMS Learning Tools Interoperability form the backbone of data and functionality interchange between learning management systems from multiple vendors.

The Sakai Foundation is the lead sponsor as Sakai has the open source infrastructure and processes needed to support this effort. The IMS Global Learning Consortium is providing access to the IMS LTI standards to this effort while the standards are in development.

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Web Sites:

Sakai Foundation: www.sakaiproject.org
Sakai Blog: www.planetsakai.org
Sakai Community: http://www.ohloh.net/projects/3551
Administrative Contact for Sakai: Michael Korkuska, Sakai Foundation
Executive Director

IMS Global Learning Consortium:  www.imsglobal.org
Administrative Contact for IMS: Rob Abel, IMS Chief Executive Officer
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Introduction

What is IMS Learning Tools Interoperability?

IMS LTI enables applications to be built which allow functionality mash-up where learning applications are integrated into a system as easily as an RSS feed. These applications can be used in a wide range of Learning Management Systems. IMS LTI is based on a set of simple standardized web services which exchange information between a learning management system and an externally hosted application so that externally hosted application can appear seamlessly in the learning management system?

What are the motivating use cases for IMS Learning Tool Interoperability?

There are three basic use cases for IMS tool Interoperability are: (1) bringing an externally hosted tool into a learning management system (functionality mash-up), (2) bringing externally hosted content from book publishers and open courseware repositories into a learning management system, and (3) pulling materials out from a learning management system to produce a personal portfolio or open educational repository.

How complex is LMS Learning Tool Interoperability?

IMS LTI is modeled very much on applications like iGoogle and Facebook. Information is exchanged using straightforward REST-style web services. The goal of LTI is to exchange learning-oriented data such as course information, user role in the course and other information unique to the teaching environment. Once a session is established and provisioned in the remote tool, the tool is launched in an iframe, popup window or though a proxy layer.

What is the Problem?

The first version of IMS Tools Interoperability (1.0) which was demonstrated in 2005 (above) was simply too limited in terms of features and too complex in its protocols to get any traction in the marketplace - people just invented their own local solution instead of using IMS TI 1.0. They got the features and ease of use they needed - but no interoperability.

IMS Learning Tools Interoperability (2.0) addresses both of these shortcomings and is simpler and more feature-rich at the same time through the use of REST with simple data models.

The basic problem which needs solving is getting IMS Learning Tool Interoperability 2.0 off the ground. The problem with interoperability is that someone needs to take the risk and do it first so others can modify their applications to be interoperable. While commercial Learning Management System vendors are generally supportive of standards supporting cross-system interoperability - the vendors usually take a "wait-and-see" approach when it comes to actually investing the necessary resources to get to a critical mass of interoperating applications.

This project intends to break that chicken-and-egg loop this Summer by quickly building a set of interoperating reference implementations of the IMS LTI specification in as many learning management systems as possible. By developing these reference applications and giving them away we hope to build a critical mass of interest that will allow the concept of learning functionality mash-up to take off.

About the Mentor

The lead mentor will be Dr. Charles Severance (www.dr-chuck.com).

Dr. Chuck was the chief architect of the Sakai Project (2003-2005) and the Executive Director of the Sakai Foundation (2006-2007). Dr. Chuck is now a Clinical Assistant Professor at the University of Michigan School of Information teaching courses on Java, Ruby on Rails, and Python.

Dr. Chuck has no teaching responsibility over the entire duration of the Google Summer of Code period (April 15 - September 2) so he can dedicate a good bit of time toward this effort. Dr. Chuck will be also working on these same projects along with the students who are selected to be part of the effort so there will be a high level of regular interaction.

Dr. Chuck is also a member of the IMS Technical Advisory board and part of the IMS LTI Working group and has developed the initial Sakai reference implementation for the IMS LTI standard.

The alternate mentor is Anthony Whyte of the Sakai Foundation - Anthony has participated in the IMS Learning Tools Interoperability working group and has developed the Sakai reference implementation for IMS Tools Interoperability version 1.0.

Note To Interested Students: Feel free to contact Dr. Chuck directly at csev@umich.edu directly if you have any questions or would like help in thinking about your application.

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Web References:

Java / Google Android Course: www.si543.com
Ruby on Rails Course: www.si539.com
Python Course: www.si182.com
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## Technical Overview of IMS Learning Tools Interoperability

IMS Learning Tool Interoperability defines two endpoints. The IMS LTI Producer is a tool or source of content to be pulled into the Learning Management System. This tool or content is consumed by the IMS Tool Interoperability Consumer - which is the Learning Management System, portal, PDA, or personal learning environment.

To relate this to iGoogle, the IMS LTI Producer is like the iGoogle gadget and the IMS LTI consumer is iGoogle itself.

There are two basic elements of the IMS LTI interaction: (1) Launch and provisioning and (2) Run-Time Services. This project will focus on the launch and provisioning aspects of IMS LTI - if the effort progresses well and there is interest we will begin to build reference implementations for some of the run-time services.

The above diagram shows a basic use case in a series of steps.

The very first step (0) is when the owner of the course places the IMS LTI Proxy tool in the course and installs the IMS LTI Descriptor. The IMS LTI Descriptor establishes the credentials and trust relationship between the LTI Consumer and LTI Producer. The step of installing the IMS LTI Descriptor is logically equivalent to copying a snippet of code from a YouTube page to add a reference to a video to your personal home page.
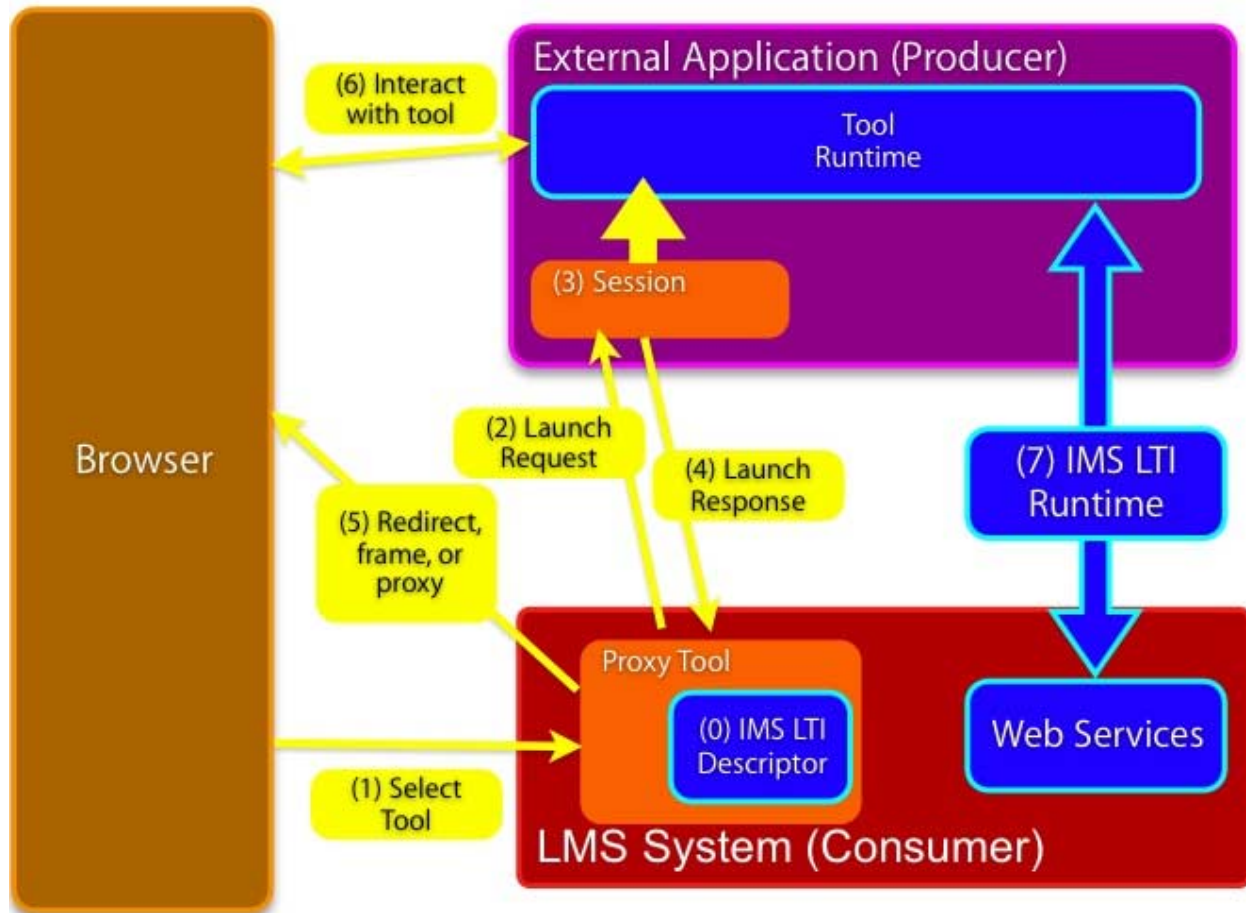
When someone selects the tool(1) the consumer sends a launch request (2) with the necessary provisioning information to the producer. When the producer receives the launch request, it is validated and then a session is established (3) for the user and the producer returns a launch response (4) giving details on how to access the markup of the external application. Based on the launch response, the browsers is either given the markup or directed to a URL which contains the markup (5). The user then interacts with the tool (6) either directly or through a proxy and the tool optionally makes use of the run-time services (7).

Using the above approach IMS Learning Tool Interoperability is 2.0 simple, flexible, and powerful.

Terms, Conditions, Copyright, Licensing, etc.

All of the code will be developed in the Sakai contributed source repository using SVN. All of the code will be copyright using the Apache 2 license.

Students will be asked to sign an Apache 2 style contribution agreement for both the Sakai Foundation and the IMS Global Learning Consortium which gives both organizations a copyright license to the code produced in these projects. Students should review the Apache 2 Contribution Agreement and Sakai Contribution Agreement below.

An important feature of these (very good) contribution agreements is that in both cases, students have the option of retaining ownership and copyright of their developed materials if they so choose. Students are simply giving Sakai and IMS a copyright license to their work. The following text is an important excerpt from both contribution agreements:

You hereby grant to the Foundation and to recipients of software distributed by the Foundation a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare derivative works of, publicly display, publicly perform, sublicense, and distribute Your Contributions and such derivative works.

This gives the student great flexibility going forward. They can continue to work in the open source environment under the signed contribution agreements or they can take a copy of their work and commercialize it if they prefer. Of course we prefer that work continue in the open source community - but we are also committed to avoiding any kind of "lock in". The open source traditions depend on truly voluntary participation.

Important: As participants in this effort you will be working with not-yet-published IMS standards material. When an IMS standard is complete and approved it is made available to the public. However while the standard is under development, access to the draft materials are limited to IMS Working Group members. The students participating in this project will have to agree to keep any under-development draft standards documents private. However the source code which is developed will be done in the open from the very beginning as we only need to protect the standards drafts from public distribution.

A benefit of working on these projects before the standards are produced is that these experiences can feed back into the standards development process and improve the resulting standard. Participants will have an opportunity to help improve the IMS Learning Tool Interoperability standard before it is completed.

If you have any questions on these terms and conditions please contact the mentors.

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Web References:

Sakai Contrib Project: http://www.ohloh.net/projects/4006
Apache Contribution Agreement: http://www.apache.org/licenses/icla.txt
Sakai Contribution Agreement: Word Document
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Some Basic Ideas for Projects

Note to Interested Students: A key is that the ideas are pretty wide ranging and that we can come up with a plan that makes good use of your skills and helps you develop new skills. Once you have looked at the ideas page - please feel free to contact Dr. Chuck directly at csev@umich.edu - a further dicussion can happen over E-Mail, IM, Skype, or phone to answer any questions you might have and help figure out a good set of activities for you to propose.

The basic ideas focus on building simple but fully functional IMS LTI Consumer applications in a wide variety of environments as well as developing simple reference implementation(s) of the IMS LTI Producer. Depending on the skills and number of the selected students we may actually do quite a number of these projects. Each of these projects will take from a few weeks to a month or so depending on the skill and the experience of the participants.

Many of these tasks consist of downloading the software, learning the pattern for developing an extension for the program and then producing an LTI extension compatible with the Learning Management System.

Build an IMS LTI Consumer for Moodle

Moodle is a very popular open source Learning Management System written in PHP. Moodle is widely used in K12 and higher education. We would hope to produce a contributed tool which implements LTI Consumer for the Moodle community. Language: PHP

http://www.moodle.org (Ohloh)

Build an IMS LTI Consumer for ATutor

ATutor is an open source Learning Management System developed by the University of Toronto. ATutor pays particular attention to learners with different capabilities and is designed with accessibility and adaptability in mind. Language: PHP

http://www.atutor.ca/ (Ohloh http://www.ohloh.net/projects/4204)

Build an IMS LTI Consumer for Elgg

Elgg is a flexible social networking system which provides organizations with their own locally controlled instance of many common web tools such as WIki, Blogs, social networks etc. Language: PHP

http://elgg.org/ (Ohloh http://www.ohloh.net/projects/4031)

Build an IMS LTI Consumer for the Chisimba Framework

Chisimba is a web 2. 0 application environment particularly focused on functionality mash-up. Chisimba is developed at the University of the Western Cape in South Africa and is a follow on to the KEWL Learning Management System. Language: PHP

http://avoir.uwc.ac.za/ (Ohloh http://www.ohloh.net/projects/5263)

Build an IMS LTI Consumer for Drupal

Drupal is a content management system that has support for social networking. Drupal is used in many situations where an organization wants a portal with social networking capabilities.

http://drupal.org/ (Ohloh www.ohloh.net/projects/3189)

Build a Ruby Reference Implementation of LTI Consumer

This will truly be simply a reference implementation of the LTI software. This is some very initial work with an intent to build simple reference implementations for all IMS Specifications. Ruby Toozday is not intended as production-ready software - it is only a technology demonstrator. Language: Ruby

http://www.rubytoozday.org/ (Ohloh http://www.ohloh.net/projects/9664)

Build a Ruby Reference Implementation of LTI Producer

One of the advantages of being only a demonstrator is that it is much easier to modify and experiment. Ruby Toozday already has simple support for IMS TI Producer but this needs to be improved. We can use this effort to experiment with adding and using some run-time capabilities to IMS LTI. Another key focus of this effort is to understand and document the unique architectural, performance, and data modeling aspects of building an application to be mashed up using IMS LTI. Language: Ruby

http://www.rubytoozday.org/ (Ohloh http://www.ohloh.net/projects/9664)

Build an IMS LTI Consumer for Google Android

Dr. Chuck taught a Java class in Fall 2007 which experimented with building simple Google Android applications (www.si543.com) - we could expand the sample applications produced by this course to be a simple IMS LTI Consumer. Language: Java

Ideas: Advanced

Build IMS LTI Producer for Sakai

This effort will add the necessary capabilities for Sakai to export individual Sakai tools and sites as IMS LTI Producer endpoints. This will be significant work because of the changes to internal Sakai structures to support the new course provisioning demands which Sakai must handle to support LTI producer. Language: Java

Build IMS LTI Producer for Moodle

This effort will add the necessary capabilities for Moodle to export individual Moodle tools and sites as IMS LTI Producer endpoints. This will be significant work because of the the new course provisioning demands which must be handled to support LTI producer. Language: PHP

Explore Proxied Access for IMS LTI

Currently the IMS LTI standard describes provisions for iframe, popup and proxied access to LTI tools. However there is no specifications far for *how* the proxy version of tools would be accomplished. This work would start with a survey of the variaous proxy approaches such as ad hoc HTML proxying, Web Services for Remote Portlets (WSRP), Facebook Markup Language, Google Widgets, and other approaches. Based on this survey we would build simple proof of concept code demonstrating feasibility of the selected approach(es). Language: Various

Summary

The ability to flexibly extend any learning management system using a web 2.0 approach has the potential to completely transform how we use technology to teach and learn. If a standard such as IMS Learning Tools Interoperability is broadly adopted - it will soon hardly matter what software your particular school is using as their Enterprise system for teaching and learning.

Teachers and students will pull in teaching and learning tools as easily as we use YouTube videos or RSS Feeds. Students will increasingly be given flexibility in how they organize and control their learning experiences and integrate learning across their lifetime. It would be very exciting to have the Google Summer of Code to help provide the resources to push this over the top and move us toward having a critical mass of interoperable teaching and learning software.

"I certainly don't see the VLE or LMS continuing in the form that they currently are, where you have a monolithic application with lots and lots of different tools presented to teachers and students. You very quickly come to the limits of any tool that you use. The answer is to abandon the tool you have been using and to swap in another tool. Now I can see a situation where you extend this from a single tool to all of the tools of an LMS. I can see a situation where the VLE or LMS actually shrinks to a container into which you plug these learning tools". (Dr. Aggie Booth, Leeds University, 2007)


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Dr. Charles Severance, University of Michigan
Michael Korkuska, Sakai Foundation Executive Director
Rob Abel, IMS Global Learning Consortium Chief Executive Officer

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