Question Interchange Standards and Learning Tools Interoperability

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CS6604 – Designing and Implementing Online Education Systems
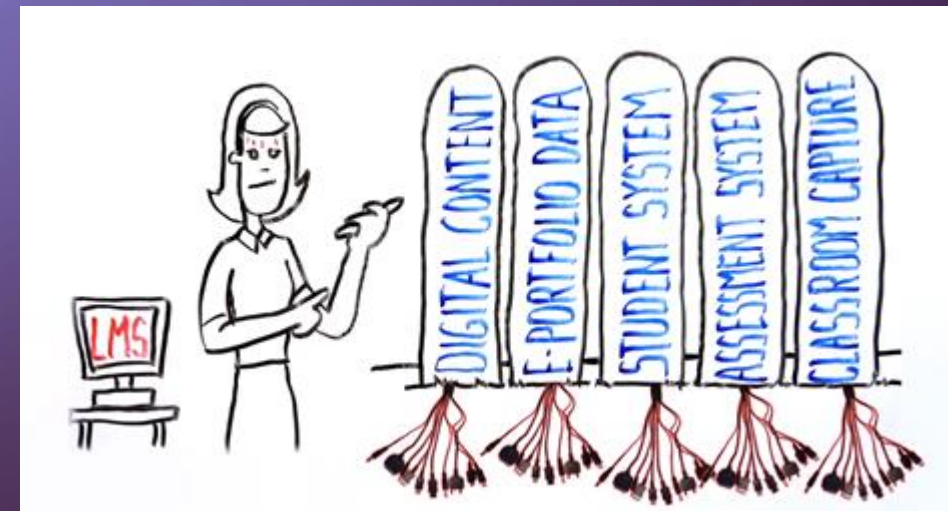
March 26, 2015 2:00PM at Randolph 110

Problem Introduction:

Course creation is generally quite hard, and involves choosing from many technologies which may not compatible with each other.

Digital content from content providers is not easily integrated into different LMS systems.

- Print → Digital Experience → Mobile Experience Transition
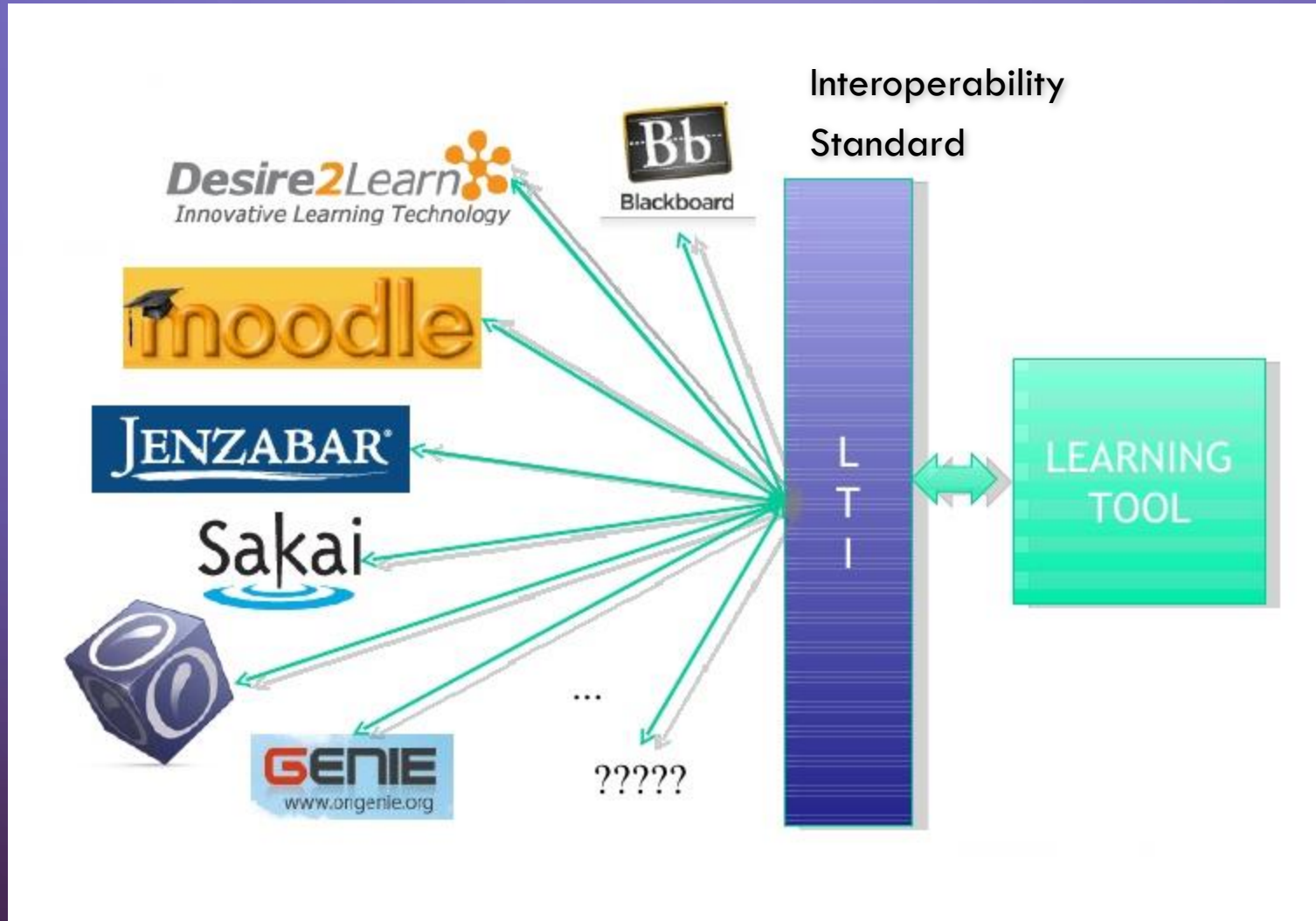
- LMS Adoption / Dropping

Problem Introduction:

- Digital Content
  - Many different content providers
  - Each has their own login system
  - Customizable?

- Student System
  - Student discussions / forums

- Assessment System
  - Student data analytics
    - Still possible?

- Classroom Capture
  - Seamless experience vs Context-switching ?

Problem Introduction:

Focus for this presentation:

- Letting course creators use **digital content / learning applications** from **various content providers** in their courses.

Table of Contents

- Problem Introduction

- Presentation Focus

- Table of Contents   ← You are currently here

- Review of Proposed Standards

- Learning Tools Interoperability

- Development and Integration Introduction

- Bringing It All Together
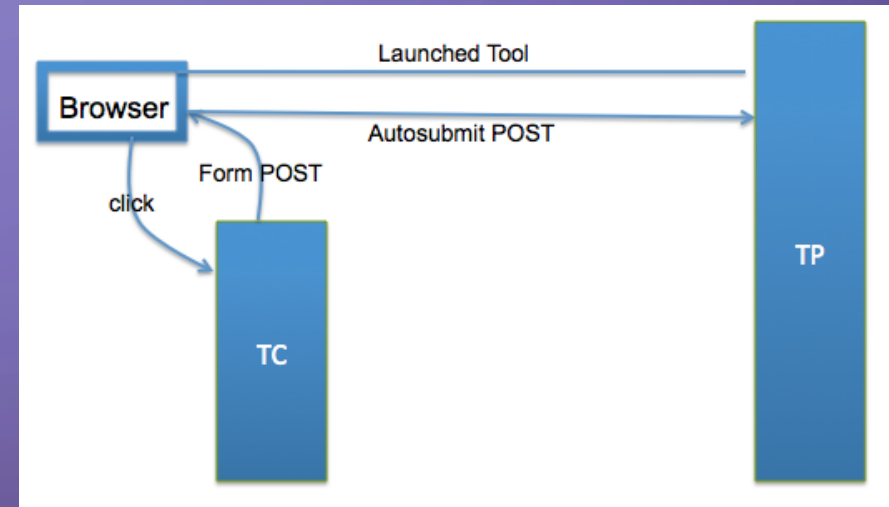
Proposed Standards

Basic LTI v1.0 Enabled LMS (IMS)

IMS GLOBAL Learning Consortium

IMS LTI 2.0

Wookie

Glue!

Review of Proposed Standards:

Hoyos, Wilson - Comparison of the Main Alternatives to the Integration of External Tools in Different Platforms
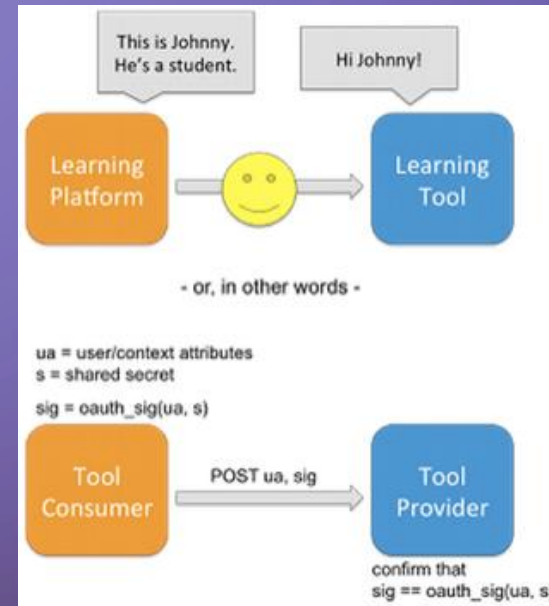
- Basic LTI (LTI 1.0)
  - Tool Consumer
  - Tool Provider
  - OAuth Protocol
  - Requires:
    - Launch URL
    - Consumer key
    - Consumer Secret
  - Does Not Have:
    - Single Sign-On
    - Pass back grades
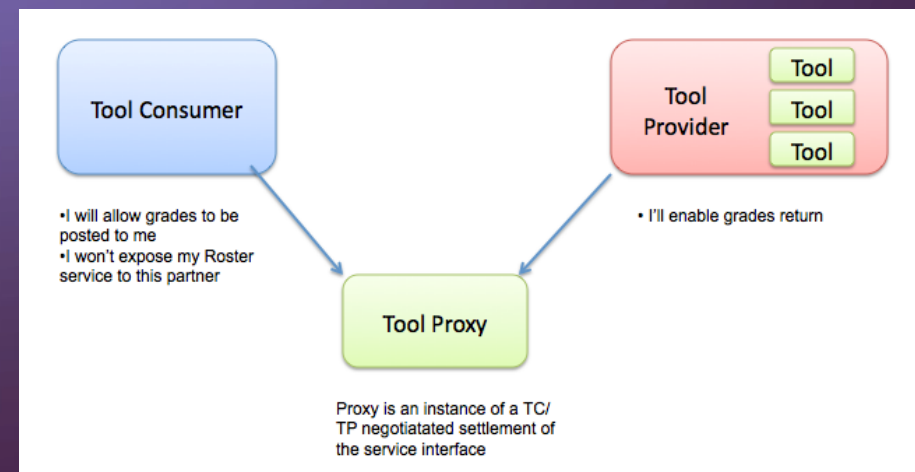
Review of Proposed Standards:

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Review of Proposed Standards:

Hoyos, Wilson - Comparison of the Main Alternatives to the Integration of External Tools in Different Platforms

- Full LTI (LTI 2.0)
  - Tool Consumer
  - Tool Provider
  - Requires
    - Tool Provider's public registration endpoint
    - Tool Consumer defines a key, Tool Provider defines the secret.
  - Tool Proxy
  - Single sign-on user-authentication
  - Pass back outcomes (grades) from the Tool Provider to the Tool Consumer.
  - Communication after launch
  - More complex
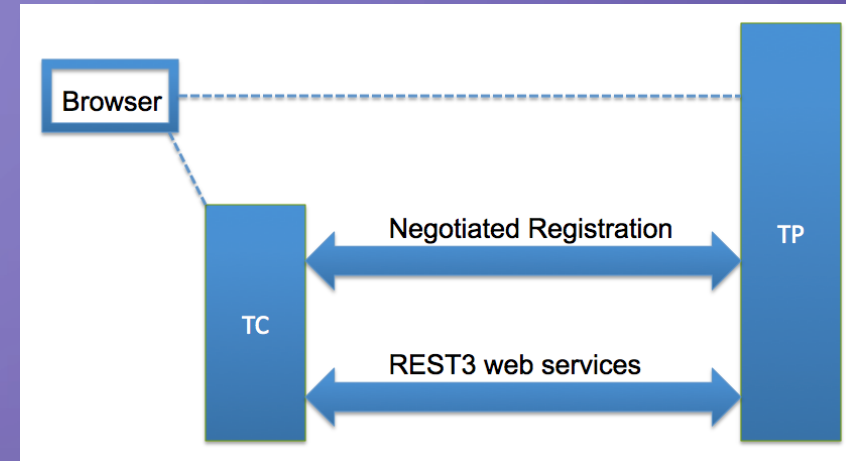
Negotiated Registration
- Tool Proxy (Interface Contract)
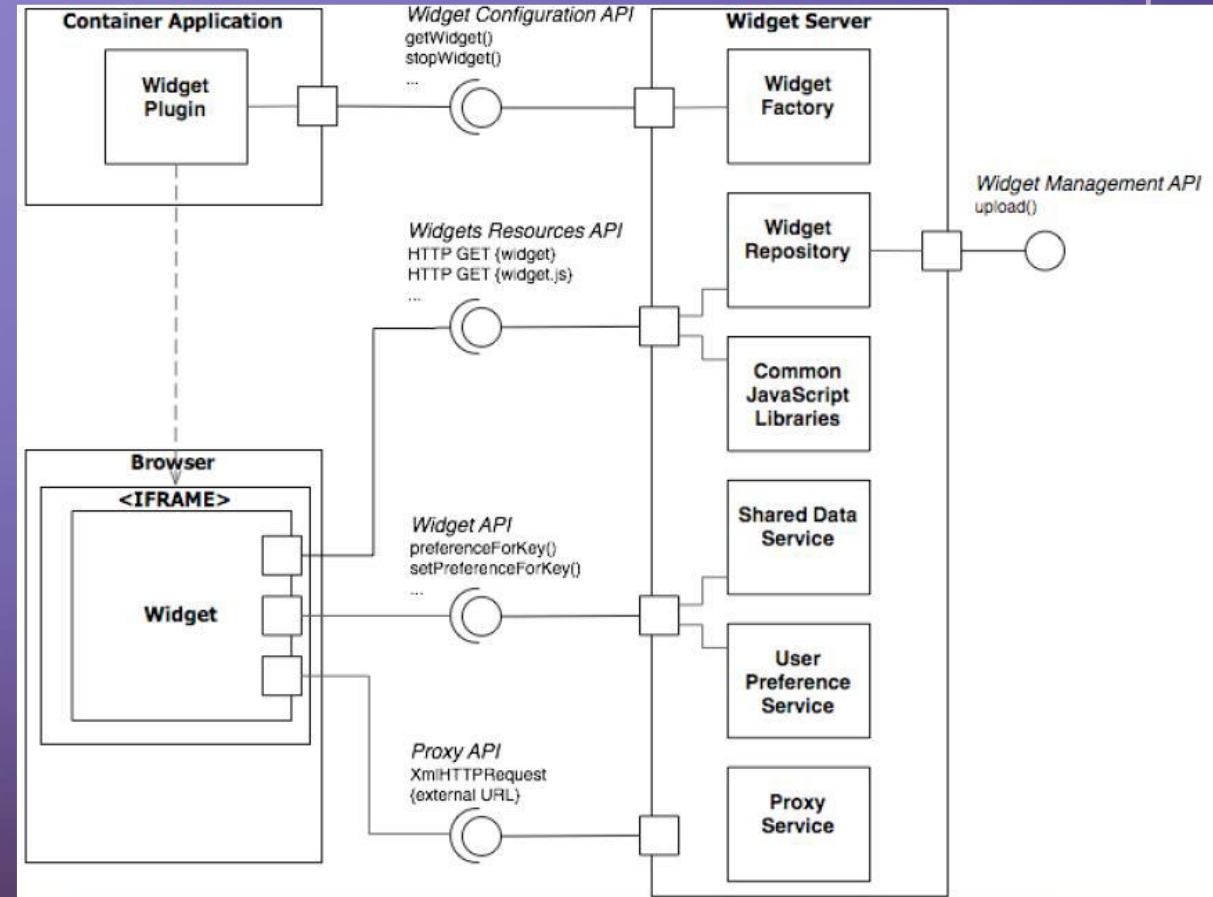
Review of Proposed Standards:

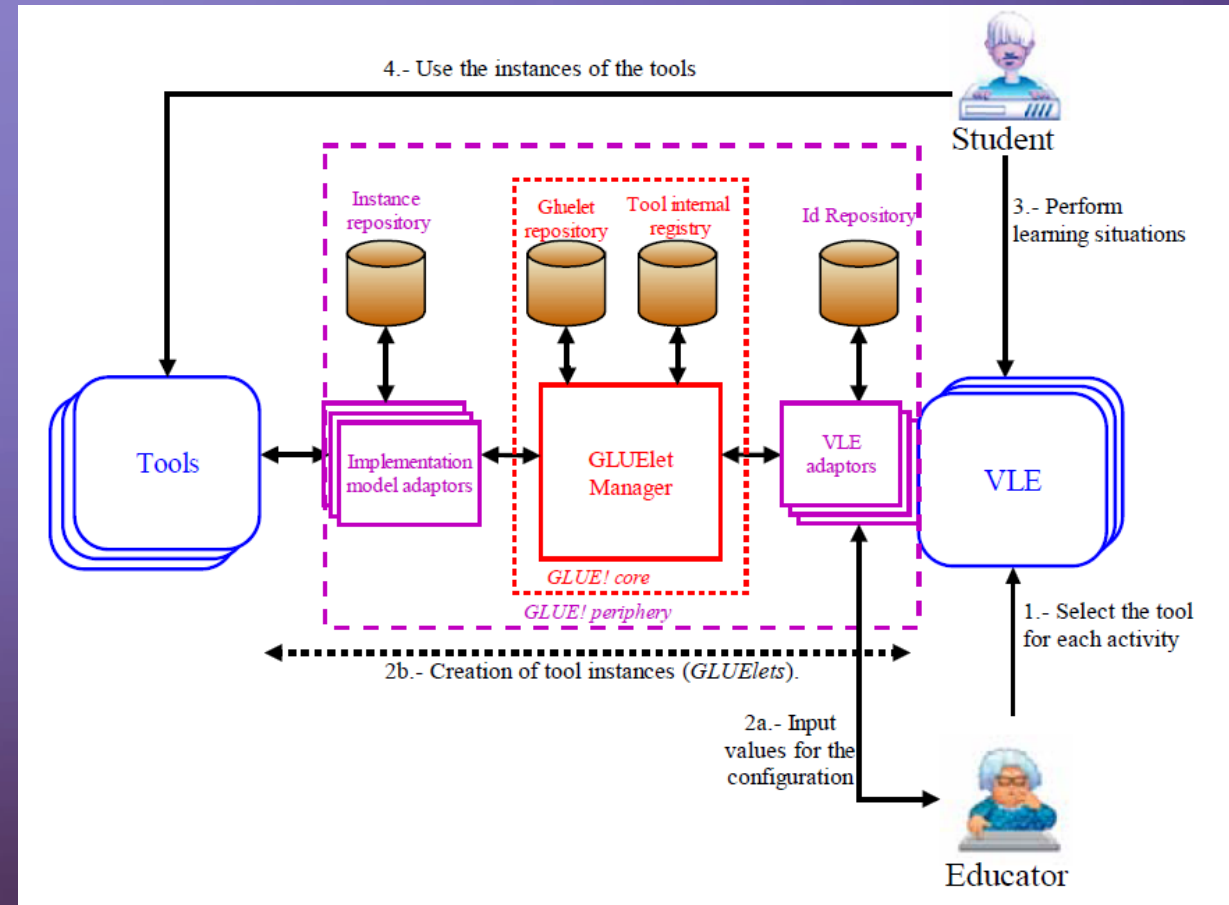Hoyos, Wilson - Comparison of the Main Alternatives to the Integration of External Tools in Different Platforms

- Full LTI (LTI 2.0)

    - Tool Services:

        - Tool Settings

            - Send outcomes back to Tool Consumer with richer palette of value types

            - Allow other learning metrics to be provided

        - Organizational Hierarchy

            - Structure of departments, courses, course sections

            - Enrollment lists

# Review of Proposed Standards:

Hoyos, Wilson - Comparison of the Main Alternatives to the Integration of External Tools in Different Platforms

- Apache Wookie

  - Widget server architecture

  - REST based contract

    - Widget instances

    - Storage of persistent information between instances

  - Native Widgets

  - Not specifically designed for integration of learning applications.

Review of Proposed Standards:

Hoyos, Wilson - Comparison of the Main Alternatives to the Integration of External Tools in Different Platforms

- GLUE! (Group Learning Uniform Environment)
  - REST based contract
  - Three main elements
    - VLE adaptors
    - GLUElet Manager
    - Implementation Model Adaptors
  - Relies on the development of the GLUE peripheral elements by third-parties

Review of Proposed Standards:

Hoyos, Wilson - Comparison of the Main Alternatives to the Integration of External Tools in Different Platforms

	LTI 1.0	LTI 2.0	Wookie	GLUE!
Must implement:	• Must implement a Tool Provider, integrate with Tool Consumer	• Must implement a Tool Provider, integrate with Tool Consumer	• Implement adaptors for Tool Consumer, but not Tool Provider.	• Must implement a Model Adaptor for each tool.
Amount of Communication after launch:	• None	• High Amount	• None	• None
Outcomes passed back:	• No	• Yes	• No	• No
Logging In:	• Multiple Logins	• Single sign-on	• Multiple Logins	• Multiple Logins
Community Support:	• High Community Support	• Low-Med Community Support	• Low Community Support?	• Low Community Support?

LTI Evolution

LTI 1.0
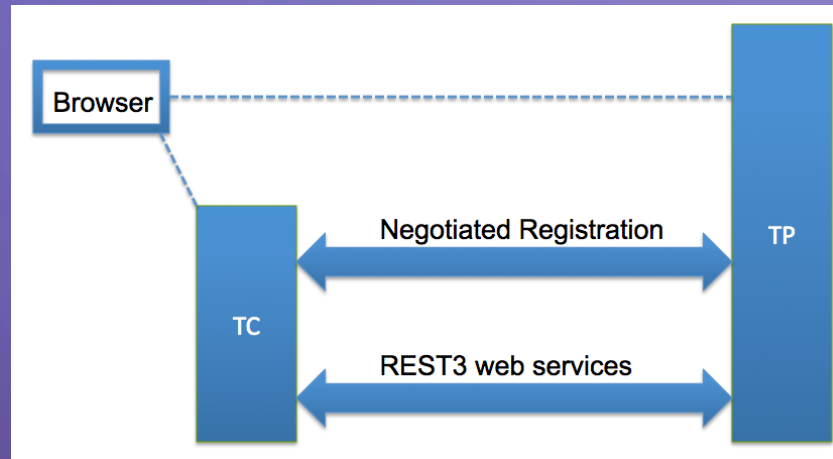
LTI 1.1
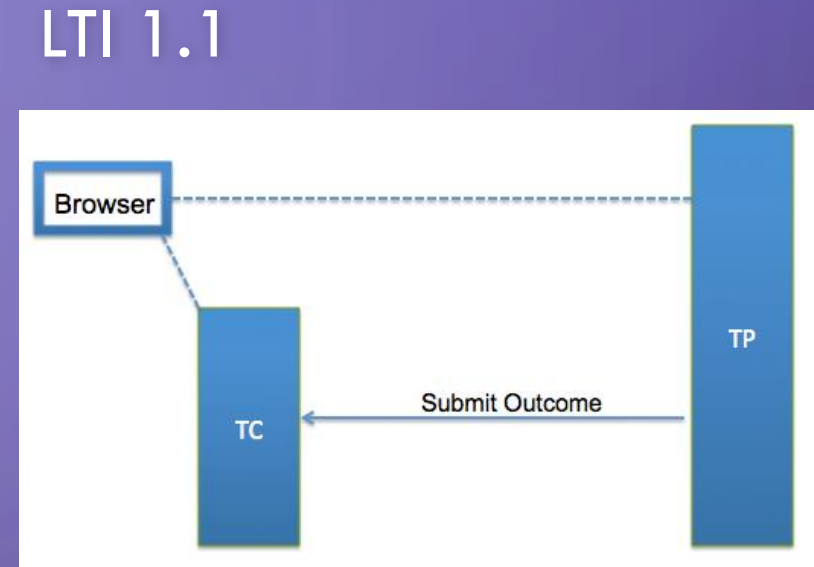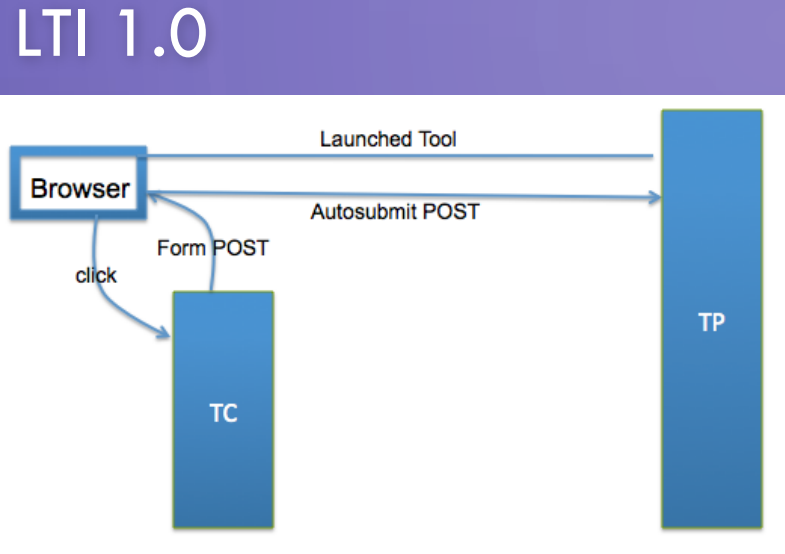
Architecture

Example:

Student reads her e-textbook within an LMS.

Student completes an assignment on a Tool Provider, and a grade is sent back to the Tool Consumer.
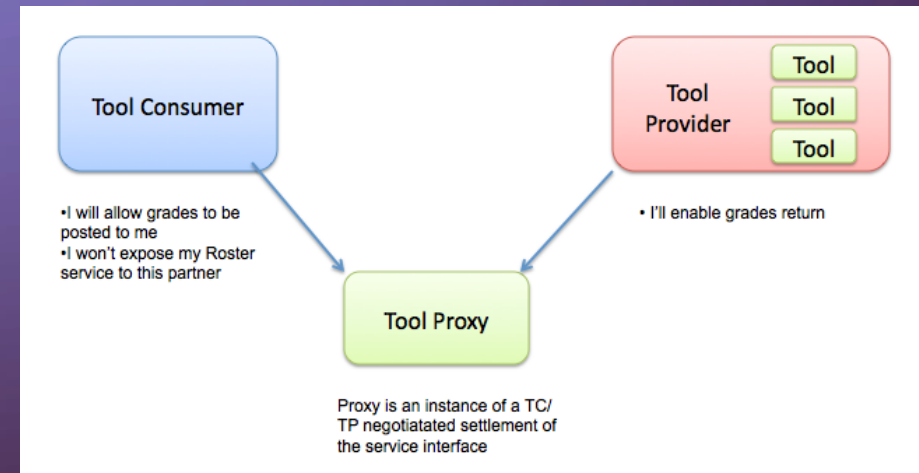
LTI Evolution

LTI 2.0

Architecture

Example: Student reads her e-textbook within an LMS.

- Automatic credential exchange and management

Additional Features

- Common Services
  - Tool Settings
  - Organization Hierarchy

Negotiated Registration
- Tool Proxy (Interface Contract)

LTI Data
Data provided by Tool Consumer to Tool Provider

- User's Information
  - First name, Last Name?
  - Role: learner, professor, administrator, guest
  - Image / Avatar – for profile picture
  - Email Address

- Other Users' Information
  - Enrollment List
  - Other students' names, roles, images, emails, grades

- Context
  - Course, student organization, club, study group, etc.
  - Resource_link_title
  - Context_title, Context_label

- Data for LMS Administrator or Course Professor (To Incorporate a Tool Provider into an LMS):
  - Resource URL
  - Consumer Key
  - Consumer Secret

- Behind the scenes data:
  - Resource_link_id
  - User_id
  - Context_id
  - Oath_consumer_key
  - Oauth_signature

Integration of the Tool Provider in the Tool Consumer

Ex: Moodle

- Required:
  - Launch URL
  - Consumer Key
  - Consumer Secret

LTI Launch Walkthrough
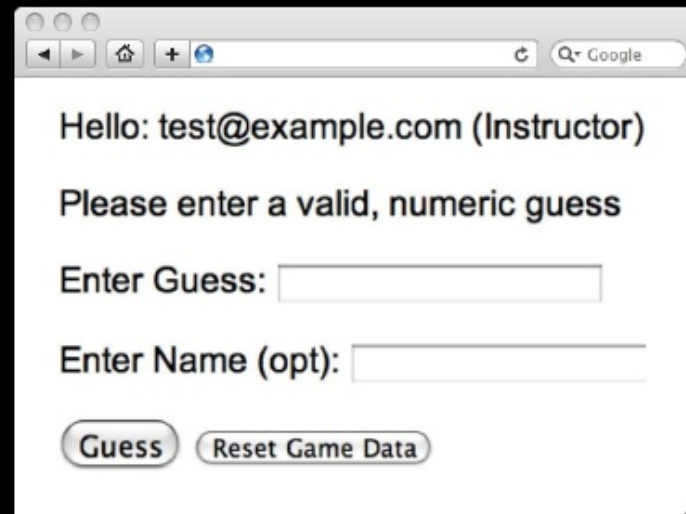
Integrated User Experience

Welcome
Local Resource
Local Resource
LTI Tool
Movie
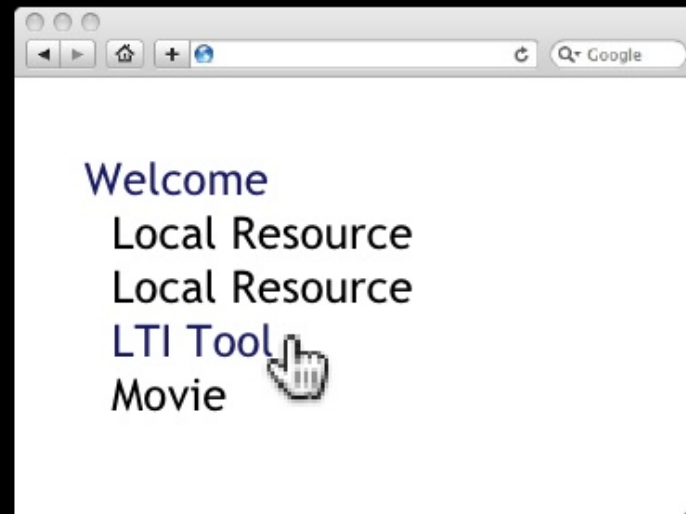
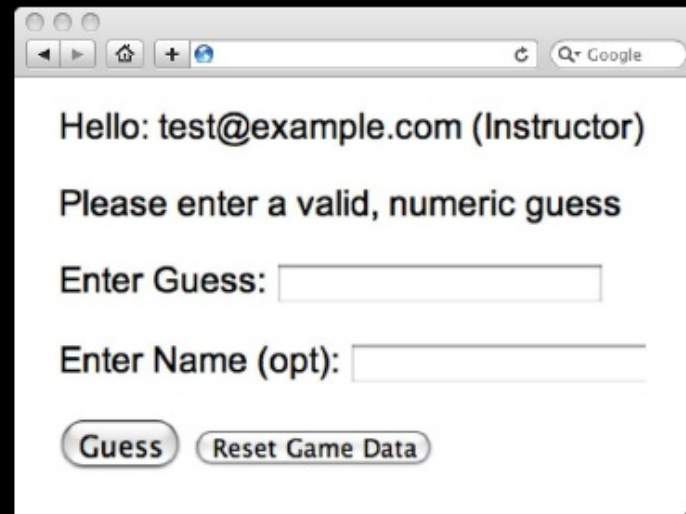© Copyright 2010 IMS Global Learning Consortium
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LTI Launch Walkthrough

LTI Launch Walkthrough

Again in slow motion...

Week 1
Local Resource
Local Resource
LTI Tool
Movie

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IMS

LMS (LTI Consumer)

LMS Looks up User and Course Information.

Information is signed using secret and OAuth

Form data sent to Browser

Tool (LTI Provider)

Severance, Charles http://www.slideshare.net/csev/ims-basic-lti-overview

LTI Launch Walkthrough

Form is immediately auto-submitted using JavaScript.

```
<form action="tool"/>
<input name="user_id"
    value="2348d8dd" />
<input name="oauth_token"

    value="abc.edu" />
</form>
```

LMS (LTI Consumer)

Tool (LTI Provider)

Tool looks up secret and validates signature.

Tool provisions user, course, and session.

Tool sends redirect

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IMS.

LTI Launch Walkthrough

LTI Launch Walkthrough

Severance, Charles http://www.slideshare.net/csev/ims-basic-lti-overview

LTI Launch Walkthrough

Basic LTI Sample Launch Data

lti_version=LTI-1p0
lti_message_type=basic-lti-launch-request
oauth_consumer_key=lmsng.school.edu
resource_link_id=120988f929-274612
user_id=292832126

roles=Instructor

lis_person_name_full=Charles R. Severance

lis_person_contact_email_primary = csev@umich.edu

context_id=456434513
context_title=SI301 – PHP
tool_consumer_instance_description=University of School

26

Severance, Charles http://www.slideshare.net/csev/ims-basic-lti-overview

LTI Catalog

http://developers.imsglobal.org/catalog.html

Learning Tools Interoperability Discussion

Sample Tool Consumer and Tool Provider Studio

- Sample Studio, running on Microsoft Azure Platform

  - LTI Consumer

    - http://consumer.azurewebsites.net/

  - LTI Provider

    - http://provider.azurewebsites.net/

  - Scenario: Create an account at the LTI Consumer site, enroll in a course, and try to submit a grade. Try a few of the assignments in the "Samples" course by Stuart Johnson.

LTI Components and OpenEdX

- LTI Components

    Open edX supports LTI 1.1 and LTI 2.0 is in development. It is the external standard and applicable to platforms such as Canvas.

    See the available apps at eduappcenter.com,

    an open LTI app collection:
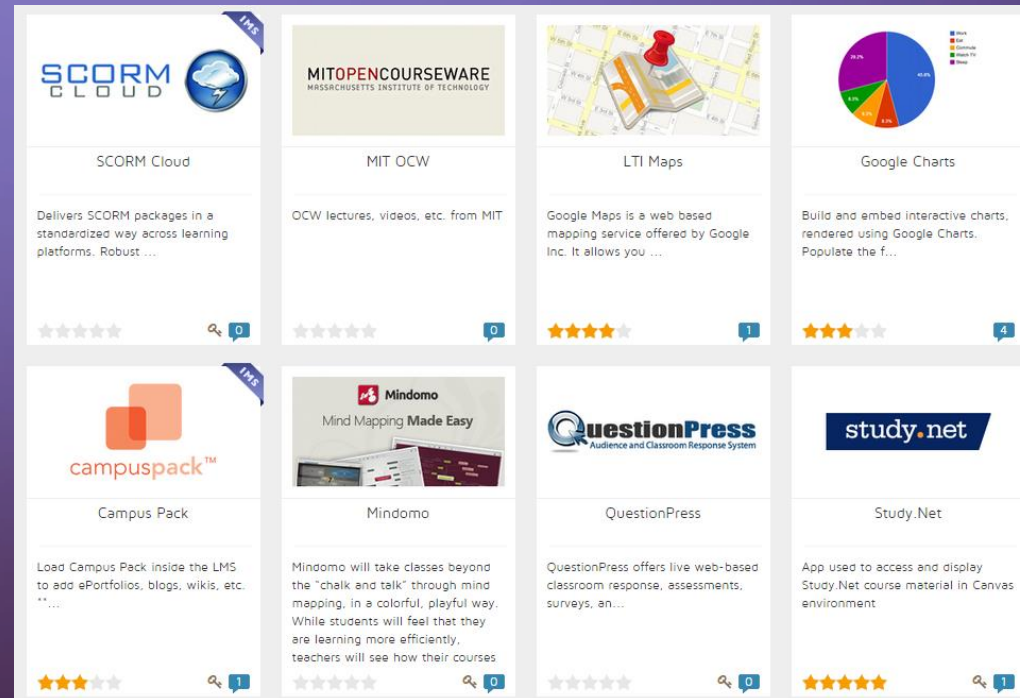
Development and Integration

- Developing a Tool Provider with LTI:

  - Tutorial: Using LTI in OpenEdX using Ruby:

    - http://reganmian.net/blog/2015/02/20/openedx-and-lti-pedagogical-scripts-and-sso/

  - LTI Tool Provider Minimal Example:

    - https://github.com/instructure/lti_tool_provider_example

  - LTI Tool Consumer Example:

    - https://github.com/instructure/lti_tool_consumer_example

  - Example Application which uses LTI for OpenEdX:

    - https://github.com/houshuang/inquirymooc

  - Create a simple tool provider with LTI 1.0 and PHP:

    - http://developers.imsglobal.org/phpcode.html

Development and Integration

- Libraries to Get You Started:

  - Ruby Library to help implement IMS LTI tool consumers and providers:
    - https://github.com/instructure/ims-lti

  - Python LTI Implementation
    - https://github.com/mitodl/pylti
  - MIT LTI Python Flask Example:
    - https://github.com/mitodl/mit_lti_flask_sample

Development and Integration

- Connecting your Tool Provider to your Tool Consumer:
  - Adding an external learning application (Tool Provider) to an OpenEdX course:
    - http://edx-partner-course-staff.readthedocs.org/en/latest/exercises_tools/lti_component.html
  - Adding an LTI Tool Provider in Moodle
    - http://www.somerandomthoughts.com/blog/2011/11/28/moodle-2-supports-connecting-to-ims-lti-tools/
  - Adding an LTI Tool Provider to Canvas, Moodle, Blackboard, Sakai, Desire2Learn
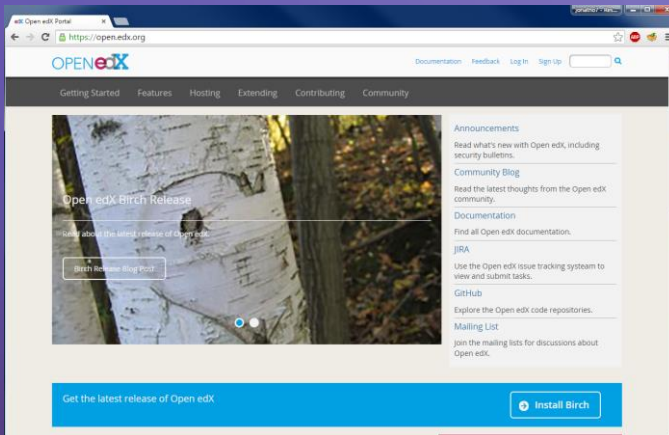   - http://www.edu-apps.org/tutorials.html

Bringing It All Together

Tool Consumers(OpenEdX, Moodle, Scholar), LTI, Tool Providers (OpenDSA, Snap), Project Architecture

Professor edits JSON File:

```
{
"pre_text": "This problem asks ..."
"snap_instance_url": "http://..."
"snap_instance_params": {width, height, etc.}
"post_text":"When finished"
}
```

Tool Consumer: OpenEdX

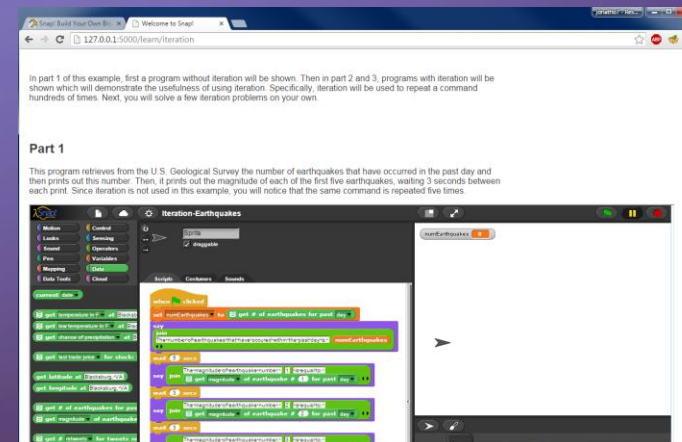ua=user/context attributes

s=shared secret, sig=oauth_sig(ua, s)

launch URL (with specific parameters) is generated

Confirm sig == oauth_sig(ua,s)

Snap Instance

Grade

Tool Provider: Snap

Setup:

Launch URL,

consumer key,

consumer secret

Elements:

Submission buttons

Grading components

Any Questions??

References

- IMS – The basic overview on how LTI works - http://developers.imsglobal.org/tutorials.html

- Alario-Hoyos, Wilson - Comparison of the Main Alternatives to the Integration of External Tools in Different Platforms, School of Telecommunication Engineering, University of Valladolid, Institute for Educational Cybernetics, University of Bolton

- Severance, Charles – IMS Basic Learning Tools Interoperability, http://www.slideshare.net/csev/ims-basic-lti-overview