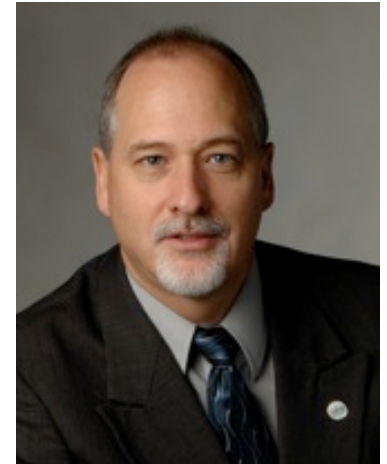




Building Tools in PHP using IMS Basic LTI



Charles Severance, Ph.D.
Affiliate Coordinator
IMS Global Learning Consortium (IMS GLC)

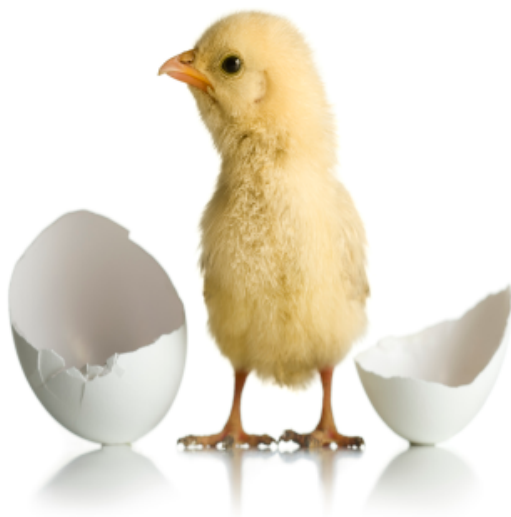
<http://www.imsglobal.org/>
<http://www.dr-chuck.com/>





IMS: Digital Learning Standards

Free the content



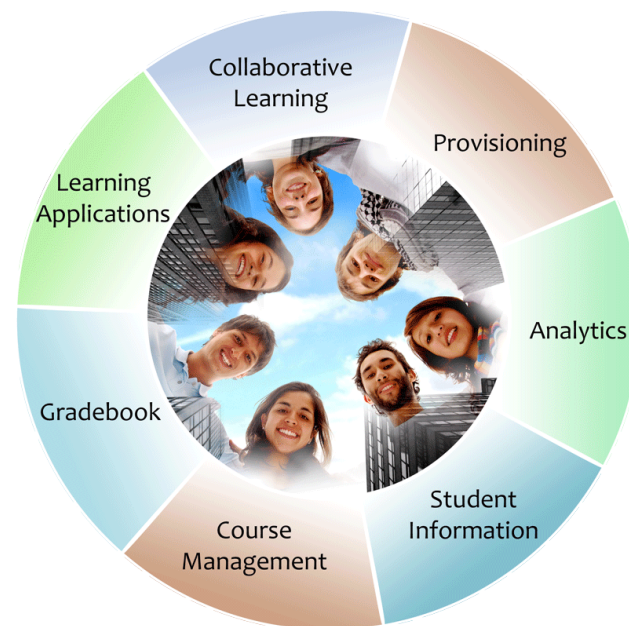
IMS Common Cartridge

Seamlessly connect to learning



IMS Learning Tools Interoperability (LTI)

The information architecture for learning



IMS Learning Information Services (LIS)



Blackboard



...



B
A
S
I
C

L
T
I



PHP
Java
App Engine
Wookiee...



My Home Email Locker Schedule Chat Content Welcome, Chuck Nov 26, 2009

Desire2Learn Dr. Chuck's Desire2Learn Course

Course Home Content Discussions Dropbox Self Assessments Quizzes Classlist Grades Links Glossary Surveys Edit Course Logout

Wookiee Wisdom of Crowds

Hi there Matt

Hi Chuck - This seems to work!

Apache Wookiee widgets are pretty cool

I agree

Hello: Chuck Instructor (Instructor) from S1300 via basiclti

Please enter a valid, numeric guess

Enter Guess:

Enter Name (opt):

Guess Reset Game Data

Sakai

My Workspace Wookiee Fun

Home Site Info Basic LTI Help

Users present: Charles Severance

IMS Basic Learning Tool Interoperability

Hi Scott - this is Wookiee running inside of Sakai using the Basic LTI Tool.

My Places Home Help Logout

WebCT The University of Testing

My Institution Courses Content Collection System Admin Scholar

Build Teach Student View PowerLink demonstrations - BasicLTI

Course Tools Course Content

Instructor Tools Manage Course Grade Book Grading Forms Group Manager Tracking Selective Release

Charles Severance (Admin) Hi there Scott - this would be WebCT Vista

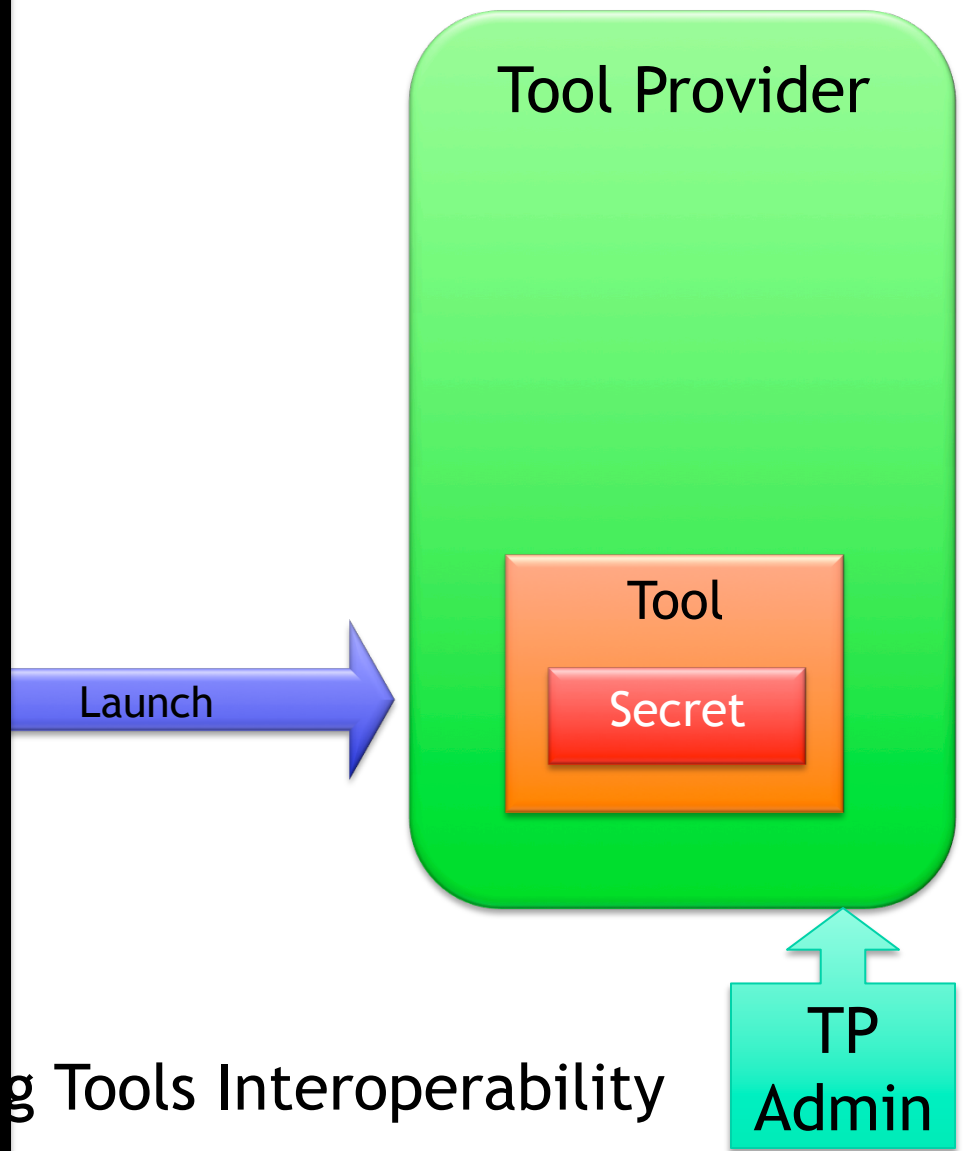
My Places Home Help Logout

WebCT The University of Testing

My Institution Courses Content Collection System Admin Scholar

Charles Severance (Admin) Hi there Scott

Apache Wookiee



g Tools Interoperability



How to Write a Basic LTI Tool in PHP



Test Harness

- We provide a test LMS and test Tool.
- No membership is required

<http://www.imsglobal.org/developers/BLTI/lms.php>

<http://www.imsglobal.org/developers/BLTI/tool.php>



IMS BasicLTI PHP Consumer



This is a very simple reference implementation of the LMS side (i.e. consumer) for IMS BasicLTI.

[Toggle Resource and Launch Data](#)

Recompute Launch Data

URL plus Secret

(To set a value to 'empty' - set it to a blank)

BasicLTI Resource

Launch URL:

Key:

Secret:

Launch Data

resource_link_id:

resource_link_title:

resource_link_description:

user_id:

roles:

lis_person_name_full:

lis_person_contact_email_primary:

lis_person_sourcedid:

<http://www.imsglobal.org/developers/BLTI/lms.php>



Press to Launch [toggle debug data](#)



IMS GLOBAL LEARNING CONSORTIUM

STANDARDS THAT ENABLE THE
DEVELOPMENT AND ADOPTION OF INNOVATIVE TECHNOLOGIES
TO IMPROVE AND TRANSFORM EDUCATION WORLDWIDE



IMS BasicLTI PHP Provider

This is a very simple Basic LTI Tool. If the message is a Basic LTI Launch, it checks the signature and if the signature is OK, it establishes context. All secrets are "secret".

Context Information:

```
isInstructor() = true
getUserKey() = 12345:292832126
getUserEmail() = user@school.edu
getUserShortName() = user@school.edu
getUserName() = Jane Q. Public
getUserImage() = http://www.gravatar.com/avatar.php?gravatar_id=447512ec60136862fa6f52382f0ffc23&size=40
getResourceKey() = 12345:120988f929-274612
getResourceTitle() = Weekly Blog
getCourseName() = SI182
getCourseKey() = 12345:456434513
getConsumerKey() = 12345
```

<http://www.imsglobal.org/developers/BLTI/tool.php>



Source Code - Download

- Simple Sample Application - Classified Ads
 - Classified Ad Software
 - Key / Secret administration
 - Basic LTI Utility Code
 - Testing harness (simple BLTI Consumer)
 - <http://www.dr-chuck.com/ims/php-simple/dist.zip>




Tool Installation and URLs

- LMS Tester
 - [install-dir/lms.php](#)
- Installation instructions
 - [install-dir/adlist/index.htm](#)
- Administration functions
 - [install-dir/adlist/admin.php](#)
- Launch URL
 - [install-dir/adlist/ads.php](#)



A Sample Tool - Classified Ads

My Home | Email | Locker | Schedule | Chat | Content | **Ad List** Welcome, Chuck Mar 29, 2010

Desire2Learn Dr. Chuck's Desire2Learn Course 

Course Home Content Discussions Dropbox Self Assessments Quizzes Classlist Grades Links Glossary Surveys Edit Course Logout

Title (Create New Ad)	Date	Action
Honda Shadow 600 VLX - Factory Footpegs - \$95.00	2010-03-29 13:15:24	edit delete
1983 Honda 450 - New Lower Price \$1200	2010-03-29 13:12:12	edit delete



A Sample Tool - Classified Ads

My Home Email Locker Schedule Chat Content Welcome, Chuck Mar 29, 2010



Dr. Chuck's Desire2Learn Course



Course Home Content Discussions Dropbox Self Assessments Quizzes Classlist Grades Links Glossary

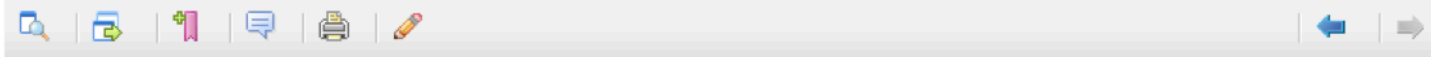
Surveys Edit Course Logout

Content Map

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 - ii. [Wisdom of Crowds](#)
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 - v. [Documentation \(DRAFT\)](#)
 - vi. [Wookie Poll](#)
 - vii. [Vview](#)
 - viii. [Wordpress](#)
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 - x. [Ad List](#)

Ad List [Back to Table of Contents](#)

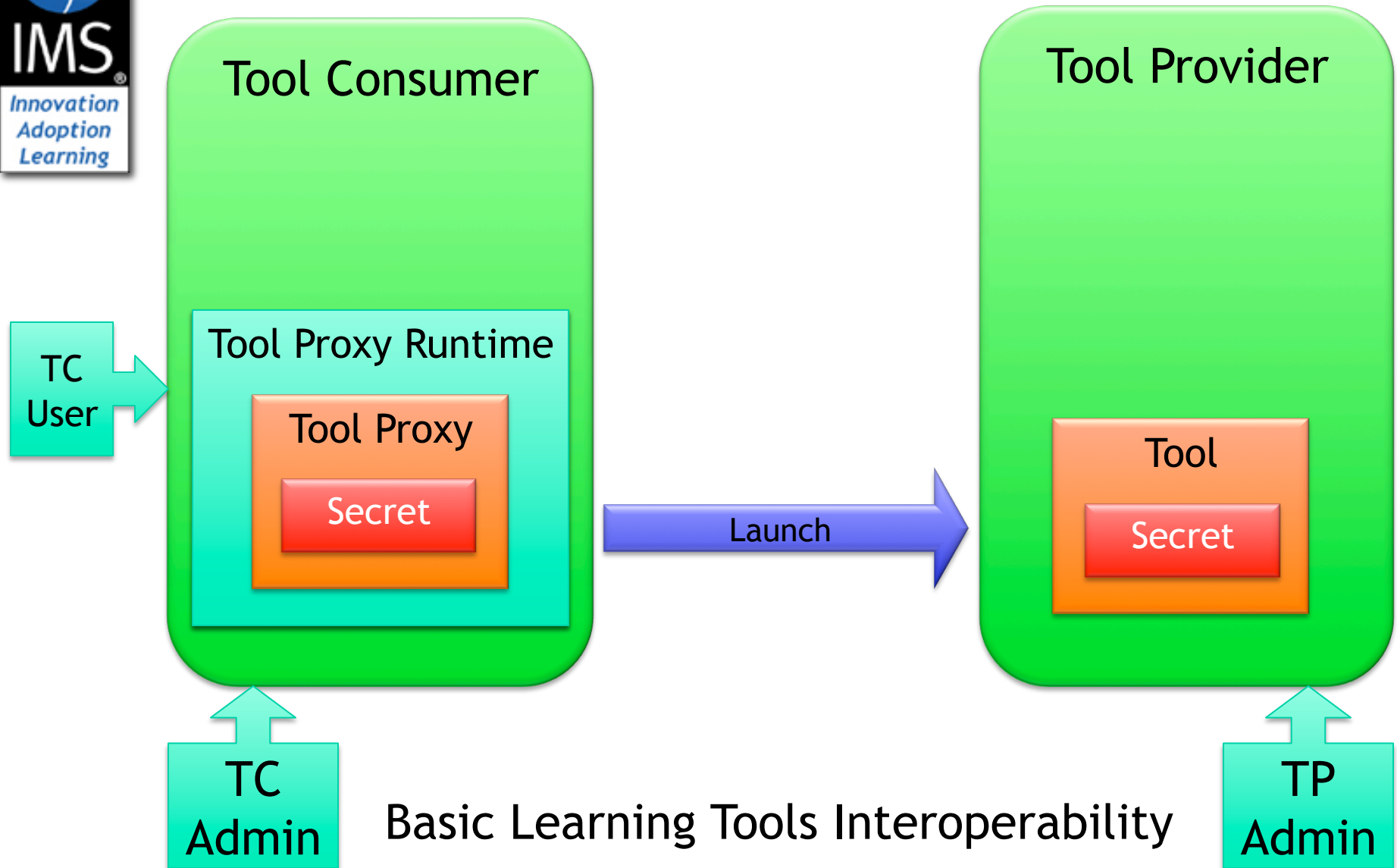


Title (Create New Ad)	Date	Action
Honda Shadow 600 VLX - Factory Footpegs - \$95.00	2010-03-29 13:15:24	edit delete
1983 Honda 450 - New Lower Price \$1200	2010-03-29 13:12:12	edit delete



Outline

- Secret Management
- Solving Multi-Tenancy
- Handling the Basic LTI Launch and Context
- Patterns for Simple Authorization



Administration Screen

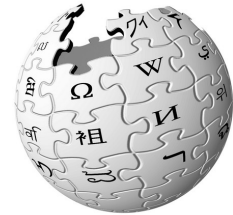
IMS Basic LTI Consumer Administration

Name	oauth_consumer_key	Secret	Action
Washtenaw College	www.wcc.edu	28sduf89dujc8fd8	edit delete
Rich Enbody	9876543	9sd8ufdvc98dfu	edit delete
Chuck	12345	secret	edit delete
Administrator	admin	secret	edit delete
The Edinburgh Uni	ed.ac.uk	9779765	edit delete
School University	lmsng.school.edu	secret	edit delete

[Add Consumer](#)



Multi-Tenancy



Multitenancy refers to a principle in software architecture where a single instance of the software runs on a server, serving multiple client organizations (tenants). **Multitenancy** is contrasted with a multi-instance architecture where separate software instances (or hardware systems) are set up for different client organizations. With a **multitenant** architecture, a software application is designed to virtually partition its data and configuration so that each client organization works with a customized/isolated virtual application instance.

<http://en.wikipedia.org/wiki/Multitenancy>



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

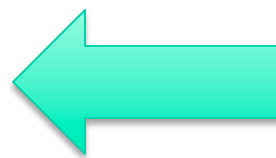
lis_person_name_full=Charles R. Severance

lis_person_contact_email_primary = csev@umich.edu

context_id=456434513

context_title=SI301 - PHP

tool_consumer_instance_description=University of School



Administration Screen

IMS Basic LTI Consumer Administration

Name	oauth_consumer_key	Secret	Action
Washtenaw College	www.wcc.edu	28sduf89dujc8fd8	edit delete
Rich Enbody	9876543	9sd8ufdvc98dfu	edit delete
Chuck	12345	secret	edit delete
Administrator	admin	secret	edit delete
The Edinburgh Uni	ed.ac.uk	9779765	edit delete
School University	lmsng.school.edu	secret	edit delete

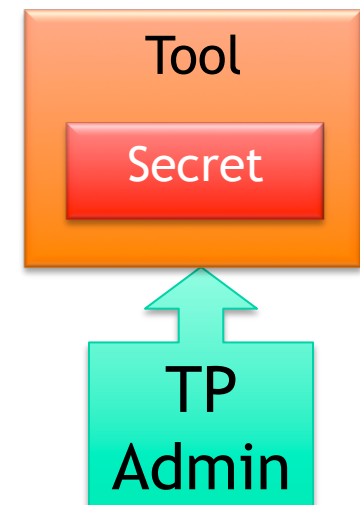
[Add Consumer](#)



Multi-Tenancy Data Model

```
create table blti_keys (  
  id          MEDIUMINT NOT NULL AUTO_INCREMENT,  
  oauth_consumer_key  CHAR(255) NOT NULL,  
  secret      CHAR(255) NULL,  
  name        CHAR(255) NULL,  
  context_id  CHAR(255) NULL,  
  created_at  DATETIME NOT NULL,  
  updated_at  DATETIME NOT NULL,  
  PRIMARY KEY (id)  
);
```

`context_id` is used to optionally override
`context_id` from launches



Advertisement Data Model

Content Map

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 - ii. [Wisdom of Crowds](#)
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 - v. [Documentation \(DRAFT\)](#)
 - vi. [Wookie Poll](#)
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 - viii. [Wordpress](#)
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Edit Classified Ad

Title

Honda Shadow 600 VLX - Factory Footpegs - \$95.00

Description

These are the factory footpegs. I replaced floorboards.

Submit Query Cancel

Content Map

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 - iii. [Wookie](#)
 - iv. [Sakai Wiki](#)
 - v. [Documentation \(DRAFT\)](#)
 - vi. [Wookie Poll](#)
 - vii. [Vview](#)
 - viii. [Wordpress](#)
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Title (Create New Ad)	Date	Action
Honda Shadow 600 VLX - Factory Footpegs - \$95.00	2010-03-29 13:15:24	edit delete
1983 Honda 450 - New Lower Price \$1200	2010-03-29 13:12:12	edit delete



Multi-Tenancy Data Model

```
create table ads (  
  id          MEDIUMINT NOT NULL AUTO_INCREMENT,  
  course_key  CHAR(255) NOT NULL,  
  user_key    CHAR(255) NULL,  
  user_name   CHAR(255) NULL,  
  title       CHAR(255) NULL,  
  description  TEXT(2048) NULL,  
  created_at  DATETIME NOT NULL,  
  updated_at  DATETIME NOT NULL,  
  PRIMARY KEY (id)  
);
```

Apologies to "3NF"



Multi-Tenancy Data

```
mysql> select id, left(course_key,25),left(user_key,25),left(title,20) from ads;
```

id	left(course_key,25)	left(user_key,25)	left(title,20)
6	12345:456434513	12345:292832126	A Totally Sweet Titl
7	12345:456434513	12345:292832126	Another Awesome Titl
8	lmsng.school.edu:45643451	lmsng.school.edu:29283212	A TITLE
9	lmsng.school.edu:7601b0ed	lmsng.school.edu:f315ea76	Honda 450 - 1983 - E
10	lmsng.school.edu:7601b0ed	lmsng.school.edu:f315ea76	Slightly Used App En
11	lmsng.school.edu:7601b0ed	lmsng.school.edu:f315ea76	Free Metal File Cabi
12	ed.ac.uk:lti_demo	ed.ac.uk:URN:X-WEBCT-b98f	Mountain Bike - New
13	ed.ac.uk:lti_demo	ed.ac.uk:URN:X-WEBCT-b98f	Two Premiere Tickets
14	ed.ac.uk:lti_demo	ed.ac.uk:URN:X-WEBCT-b98f	Monthly Bus Pass to

We must namespace the primary keys (user_id, context_id) with the oauth_consumer_key to isolate courses and users



Handling the Basic LTI Launch

- A utility library is provided that intercepts and processes launches

```
require_once '../ims-blti/blti.php';
require_once("db.php");
$context = new BLTI(array('table' => 'blti_keys'));
if ( $context->complete ) exit();
if ( ! $context->valid ) {
    print "Could not establish context: ".$context->message."\n";
    exit();
}
```

ads.php



Handling the Basic LTI Launch

- The "context" is either taken from the launch or restored from the PHP session - like a filter

```
require_once '../ims-blti/blti.php';
require_once("db.php");
$context = new BLTI(array('table' => 'blti_keys'));
if ( $context->complete ) exit();
if ( ! $context->valid ) {
    print "Could not establish context: ".$context->message."\n";
    exit();
}
```

ads.php



The Context

- The context contains information from the launch
 - Resource information
 - User Information
 - Course (aka context) information
 - Organizational Information
 - Launch Authentication Information



The Context - Supplied Methods

```
$context->getCourseKey() = 12345:456434513  
$context->getCourseName() = SI182  
$context->getResourceKey() = 12345:9fbbe1230  
$context->getResourceTitle() = Week 1 Blog  
$context->getUserKey() = 12345:292832126  
$context->isInstructor() = true/false  
$context->getUserEmail() = jane@school.edu  
$context->getUserShortName() = jane@school.edu  
$context->getUserName() = Jane Q. Public  
$context->getUserImage() = http://www.gravatar...  
$context->getConsumerKey() = 12345
```



Simple Authorization

- With the data model, we need to know who can edit which ads in our table

```
mysql> select id, left(course_key,25),left(user_key,25),left(title,20) from ads;
```

id	left(course_key,25)	left(user_key,25)	left(title,20)
6	12345:456434513	12345:292832126	A Totally Sweet Titl
7	12345:456434513	12345:292832126	Another Awesome Titl
8	lmsng.school.edu:45643451	lmsng.school.edu:29283212	A TITLE
9	lmsng.school.edu:7601b0ed	lmsng.school.edu:f315ea76	Honda 450 - 1983 - E
10	lmsng.school.edu:7601b0ed	lmsng.school.edu:f315ea76	Slightly Used App En
11	lmsng.school.edu:7601b0ed	lmsng.school.edu:f315ea76	Free Metal File Cabi
12	ed.ac.uk:lti_demo	ed.ac.uk:URN:X-WEBCT-b98f	Mountain Bike - New
13	ed.ac.uk:lti_demo	ed.ac.uk:URN:X-WEBCT-b98f	Two Premiere Tickets
14	ed.ac.uk:lti_demo	ed.ac.uk:URN:X-WEBCT-b98f	Monthly Bus Pass to



Instructor:

```
SELECT * FROM ads WHERE id='7' AND  
course_key='12345:456434513'
```

Student:

```
SELECT * FROM ads WHERE id='7' AND  
course_key='12345:456434513' AND  
user_key = '12345:292832126'
```

```
mysql> select id, left(course_key,25),left(user_key,25),left(title,20) from ads;
```

id	left(course_key,25)	left(user_key,25)	left(title,20)
6	12345:456434513	12345:292832126	A Totally Sweet Titl
7	12345:456434513	12345:292832126	Another Awesome Titl
8	lmsng.school.edu:45643451	lmsng.school.edu:29283212	A TITLE
9	lmsng.school.edu:7601b0ed	lmsng.school.edu:f315ea76	Honda 450 - 1983 - E
10	lmsng.school.edu:7601b0ed	lmsng.school.edu:f315ea76	Slightly Used App En
11	lmsng.school.edu:7601b0ed	lmsng.school.edu:f315ea76	Free Metal File Cabi
12	ed.ac.uk:lti_demo	ed.ac.uk:URN:X-WEBCT-b98f	Mountain Bike - New
13	ed.ac.uk:lti_demo	ed.ac.uk:URN:X-WEBCT-b98f	Two Premiere Tickets
14	ed.ac.uk:lti_demo	ed.ac.uk:URN:X-WEBCT-b98f	Monthly Bus Pass to



Show/Hide Buttons

My Home Email Locker Schedule Chat Content Welcome, Chuck Mar 29, 2010



Dr. Chuck's Desire2Learn Course



Course Home Content Discussions Dropbox Self Assessments Quizzes Classlist Grades Links Glossary

Surveys Edit Course Logout

Content Map

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Title (Create New Ad)	Date	Action
Honda Shadow 600 VLX - Factory Footpegs - \$95.00	2010-03-29 13:15:24	edit delete
1983 Honda 450 - New Lower Price \$1200	2010-03-29 13:12:12	edit delete



Showing Buttons For Edit/ Delete

```
<?php
if ( $context->isInstructor() ||
    $row['user_key'] == $context->getUserKey() ) { ?>
    <a href="<self?>?action=edit&id=<row[id]?>">edit<a>
    <a href="<self?>?action=delete&id=<row[id]?>">delete<a>
<?php
    }?>
```

ads.php



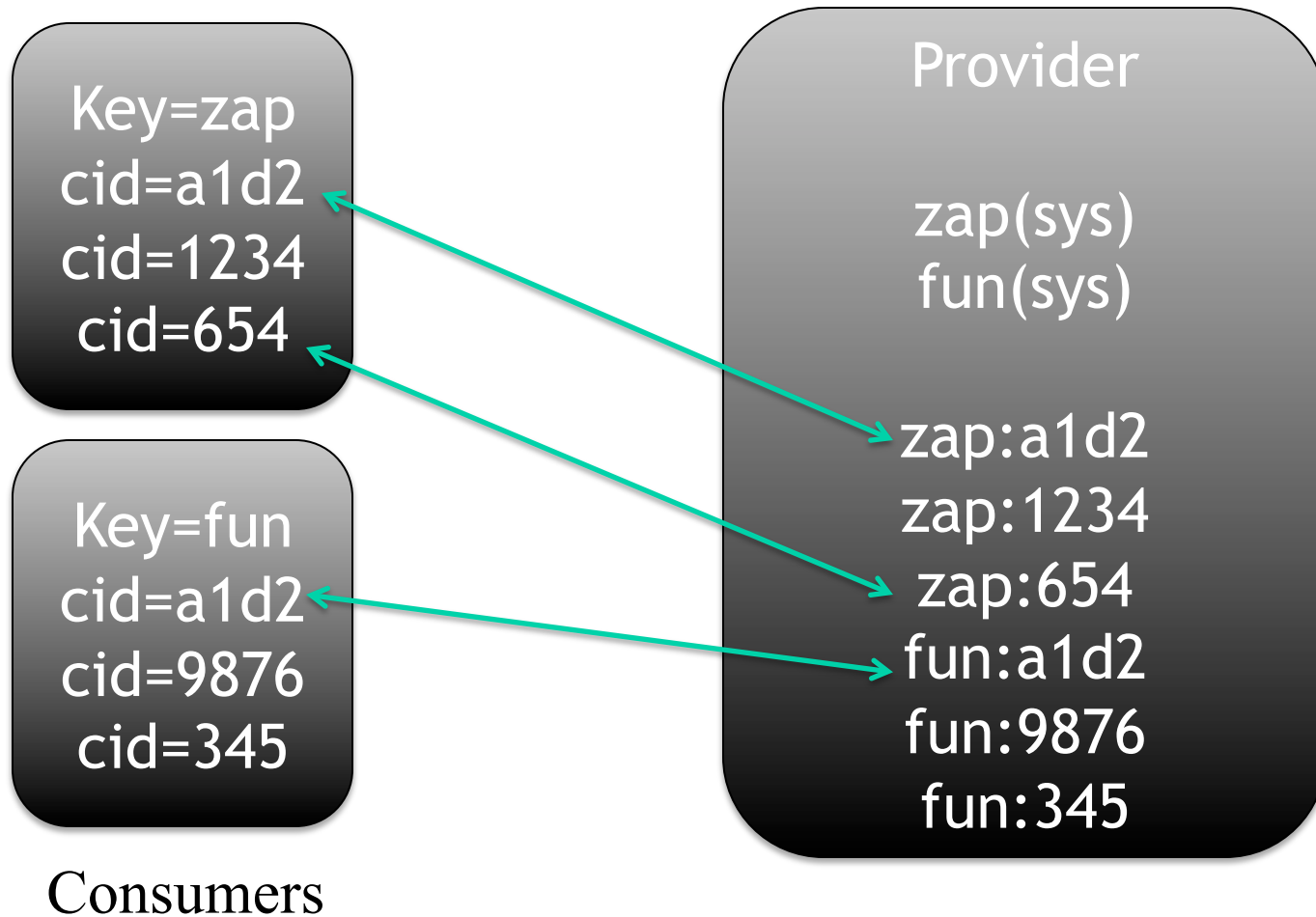
Advanced Topic: System and Course-Mapped Keys



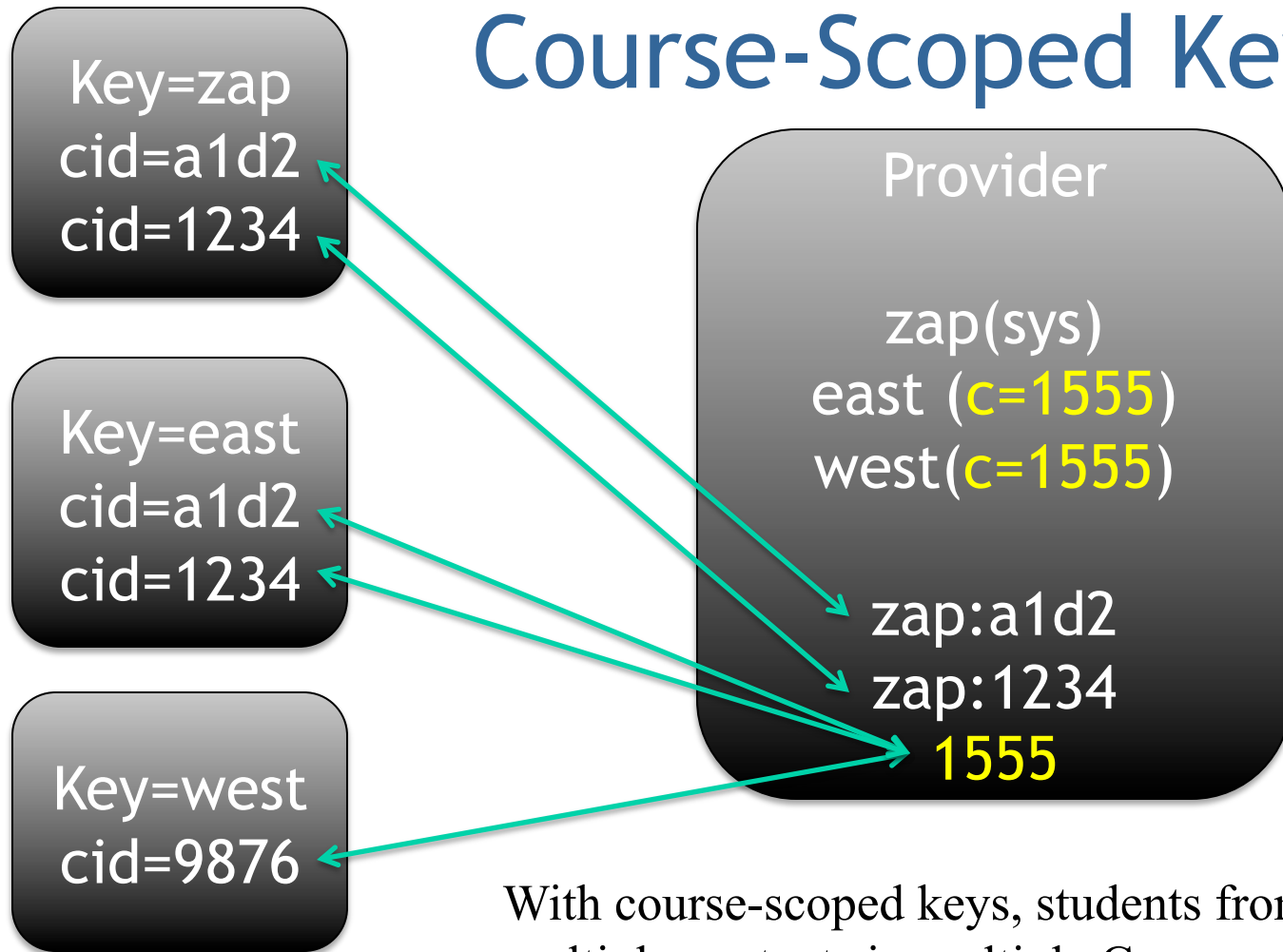
Use cases

- System-scoped key - The Consumer sends us a context_id for each course which allows many different courses to use our tool independently - this is a typical approach
- Course-mapped key - in this case, you ignore the consumer-provided context_id and specify the context_id inside of your (Provider) system

System-Scoped



Course-Scoped Keys



Consumers

With course-scoped keys, students from multiple contexts in multiple Consumers can meet and collaborate in the Provider.

Data Model Changes

```
create table blti_keys (  
  id          MEDIUMINT NOT NULL AUTO_INCREMENT,  
  oauth_consumer_key  CHAR(255) NOT NULL,  
  secret      CHAR(255) NULL,  
  name        CHAR(255) NULL,  
  context_id  CHAR(255) NULL,  
  created_at  DATETIME NOT NULL,  
  updated_at  DATETIME NOT NULL,  
  PRIMARY KEY (id)  
);
```



`context_id` is used to optionally override `context_id` from launches



Course-Scoped Keys

- In the sample application, each key as a `context_id` field - if it is null, the key is a system-scoped key.

```
mysql> select id,oauth_consumer_key,secret,context_id from blti_keys;
+----+-----+-----+-----+
| id | oauth_consumer_key | secret | context_id |
+----+-----+-----+-----+
| 4  | 12345              | secret | NULL       |
| 5  | bob.smith.lcc.edu  | secret | 999999    |
+----+-----+-----+-----+
```



Basic LTI Sample Launch Data

lti_version=LTI-1p0

lti_message_type=basic-lti-launch-request

oauth_consumer_key=bob.smith.lcc.edu

resource_link_id=120988f929-274612

user_id=292832126

roles=Instructor

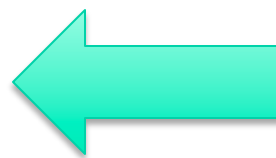
lis_person_name_full=Charles R. Severance

lis_person_contact_email_primary = csev@umich.edu

context_id=4598634513

context_title=SI301 - PHP

tool_consumer_instance_description=University of School





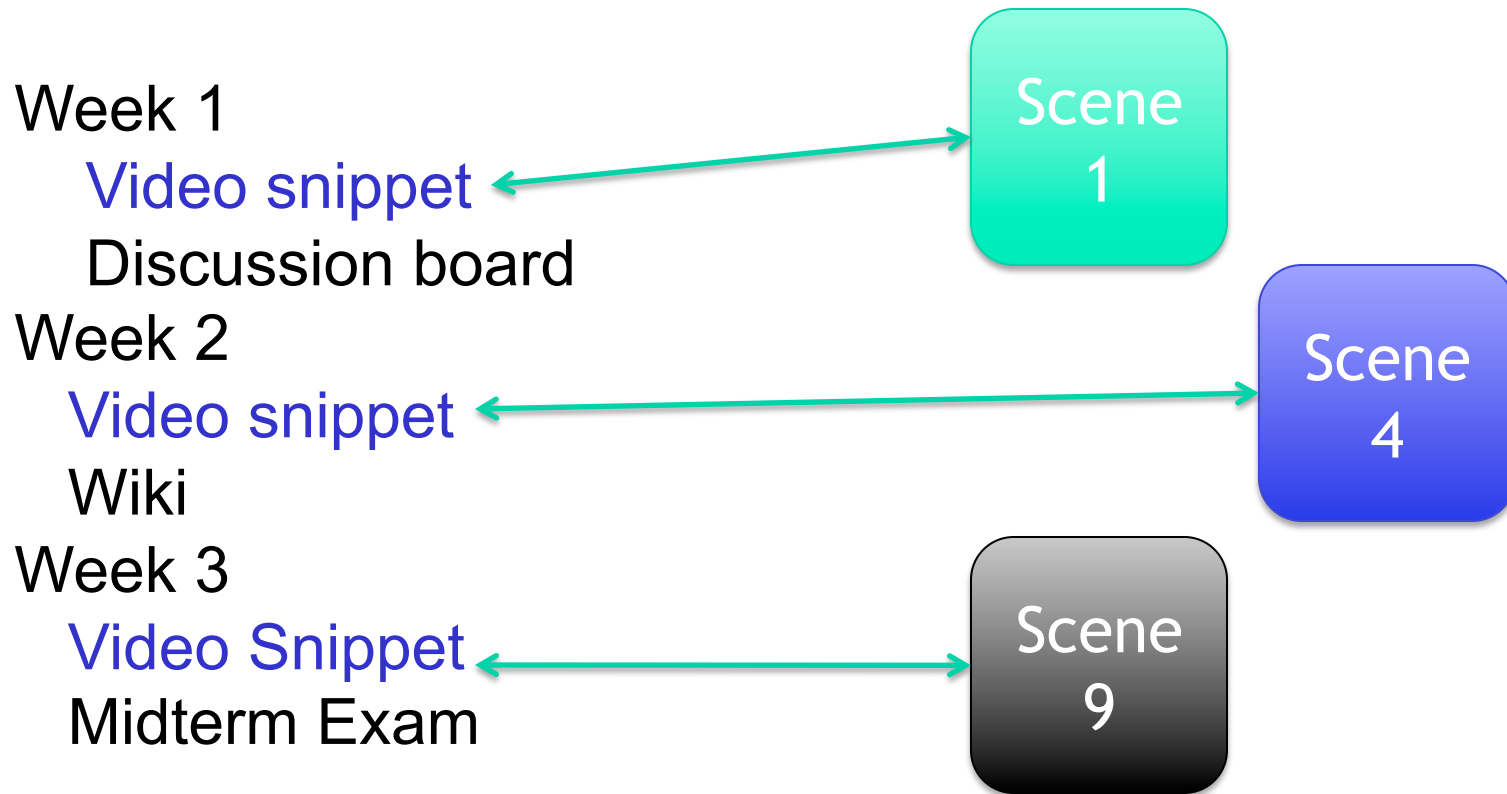
Configuration using resource_link_id



Use Case: Picking a Video

- If our Tool Provider is video archive and the purpose of each "placement" in a course is to play a particular video using BLTI to gain access to the video
- Problem: How to place BLTI resource links several places in the course map but refer to different videos in each placement?

Goal State





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





Understanding resource_link_id

Key=987 cid=a1b2

Week 1

Video snippet rlid=9c45

Discussion board

Week 2

Video snippet rlid=23b5

Wiki

Week 3

Video Snippet rlid=1725

Midterm Exam

The resource_link_id is unique for each placement of Basic LTI in a course. When each of the resources is launched you get key, cid, and rlid. Resource_link_id is required on all launches.



Using resource_link_id

Key=**987** cid=a1b2

Week 1

Video snippet **rlid=9c45**

Discussion board

You need a table in your application which maps from a **consumer_key:resource_link_id** (i.e. **987:9c45**) to some local resource identified within your application. Until the Instructor selects a resource within your tool, it is "unconfigured"

Understanding resource_link_id

Key=987 cid=a1b2

Week 1

Video snippet `rlid=9c45`

Discussion board

Not
Config

Pick
Video 

Scene
1

Scene
1 

Learner

Instructor

Learner

Instructor

Not configured

987:9c45 = matrix_scene_01



Primary Key for resource_link_id

- While the **resource_link_id** is a "GUID" and should be unique across consumers, it is safer to treat the tuple (oauth_consumer_key, context_id, resource_link_id) as the primary key for a resource



Redirect and Multiple Instances

- Once you have stored or retrieved the mapping between the LMS **resource_link_id** and your own internal resource id, you should redirect the browser to a URL that includes your internal resource id as a parameter or in the path
- You should not depend on session for either the **resource_link_id** or your own internal resource id to deal with the cases of multiple launches embedded in a single page, or launches running simultaneously in multiple browser windows at the same time.



Custom Field .vs. Resource Link

- In a Common Cartridge, Basic LTI Resource Links have a custom field which *could* be used for this purpose ... But ...
- The custom fields UI varies from LMS to LMS and may not even be available to the Instructor
- Using **resource_link_id** keeps the configuration UX in the Provider and keeps from needing per-LMS documentation
- A good practice is to use **custom_fields** in cartridges and if no custom field is present fall back to **resource_link_id** provisioning



Advanced Topics

- Adding Basic LTI To and Existing Application



Source Code - Download

- Simple Sample Application - Classified Ads
 - <http://www.dr-chuck.com/ims/php-simple/dist.zip>
 - Classified Ad Software (adlist/ads.php)
 - Key / Secret administration (adlist/admin.php)
 - Basic LTI Utility Code (ims-blti/blti.php)
 - Testing harness (simple BLTI Consumer) (lms.php)
 - Uses MySQL (adlist/setup.sql and adlist/db.php)



IMS Alliance Membership

- Attend IMS Quarterly Meetings
- Attend related Working Group Meetings
- Technical support for implementers of IMS Specifications
- Certification Program

<http://www.imsglobal.org/cc/jointhealliance.cfm>



Questions

- IMS - www.imsglobal.org
- cseverance@imsglobal.org



*Seamlessly
connect
to learning*



IMS Learning Tools
Interoperability (LTI)