Breaking Down Barriers Between Learning Systems

Charles Severance
University of Michigan
School of Information
Presented to: Open University
Milton Keynes, UK
December 14, 2007
Outline

• Setting the stage
• Standards
• UM SiteMaker and IMS TI
• Campus Project - Catelonia
• What I would like to see happen
• What I am planning on doing myself
Idea Fragments..

- During the last three years...
- I focused on building a product and community
- I was exposed to many ways different ways of approaching teaching and learning which I often ignored because I did not have time to think
- Now that I am just a teacher, I am taking time to explore those various ideas and try to make sense of them
True change in T & L happens in ways we cannot anticipate. CLE/LMS’s can take completely new forms and directions...

Sakai

Frozen - Many different “imperfect” CLEs and LMSs

Boiling Point

Liquid - We can tend toward common CLEs, and/or portability makes the choice of CLE irrelevant

Gas - Innovation can spread to cover the space of T & L practices

Time / “Heat” / Money / Energy Applied ---

December 2004 - Phoenix Arizona
Chuck’s Hierarchy of T & L Needs

Version ???
Version 3.0
Version 2.0
Version 1.0

The Future
Content Management
Assessment and Gradebook
Chat Room and Threaded Discussion
Syllabus on an Web site and an E-Mail List

We must learn to walk before we fly. And we must start at the bottom and work upwards…

December 2004 - Phoenix Arizona
Market circa 2004

• People purchased commercial LMS systems or wrote their own
Market circa 2007

- Some organizations choose to adopt an open source LMS
- The market is still divided into stovepipes
- Consolidation has happened - reducing market diversity - both for commercial and open source
To Do List (2007)

- Real Data Portability
- Real Application Portability
To Do List...

- Transform Teaching and Learning
- Life Long Teaching and Learning
- Personalize Teaching and Learning
- Open Educational Resources
- Learning contexts around OER’s
“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”. (Booth, 2007)
Functionality Mashup
Future - Learning

Flikr, Google, YouTube, Merlot, delio.us
Standards to break down stovepipes
Background in Standards

- Open Software Foundation (OSF) (1989-90)
- UNIX International (1990)
- IEEE POSIX
  - Vice Chair POSIX (1992-1996)
- IEEE Standards Advisory Board
- IMS
  - Technical Board coChair 2005-2007
  - IMS Tool Interoperability WG - 2005 - 2007
  - IMS Common Cartridge WG - 2006
- JSR-286 (Portlet V2.0) (2006-2007)
Conflict and Consensus: The Role of Standards

Charles Severance, Michigan State University

As an organization "in the hands of the players," we get to see the cards held in the hands of the players. Every organization, especially a standards organization, is subject to the interests of its stakeholders. One organization, the World Wide Web Consortium (W3C), takes a broad view of the Internet. W3C members include companies, researchers, and individual developers.

The FAST handout

FAST, or Fair, Accurate, and Sustainable Technology, is a handout that was distributed at the conference. It provides a framework for evaluating and comparing technologies. The FAST handout includes a checklist of criteria that can be used to assess the strengths and weaknesses of different technologies. It also provides tips for selecting the right technology for a particular application.

IEEE 754: An Interview with William Kahan

William Kahan is a computer scientist and mathematician who is known for his work in computer arithmetic. He has made significant contributions to the development of the IEEE 754 standard for floating-point arithmetic. In this interview, he discusses his work on the standard and its impact on the field of computer science.

The beginning

William Kahan: When I first started working on the IEEE 754 standard in 1979, it was just a small project. The goal was to create a standard for floating-point arithmetic that would be widely accepted and used.

The end

William Kahan: Looking back on the IEEE 754 standard, I think it has been a great success. It has been used in a wide range of applications, from scientific computing to financial transactions.
Grab the Chance to Work on the Leading Edge

Charles Severance, Michigan State University

The possibilities for career growth through involvement in standards are endless.

With the information I learned at each meeting, I was able to come back to my job and improve my development and production. I put these ideas into practice in my job, and the results were positive. I think the opportunity to participate in standards is an excellent way to share emerging technologies. When I attend IEE meetings, I always get a great deal of information outside the meetings about industry and home events.

Editor: Charles Severance, Michigan State University

To find out more:
To find out more about how to get involved, visit the OSI Web site at www.osi.org. The OSI Home page provides information about how to join OSI, how to participate in OSI, and links to more information.

OSI Retrospective and Prospect

Jerry Foley, Eopsis Corporation

Charles Severance, Michigan State University

As a recent IEEE meeting, I walked up to a conversation about OSI networking with Jerry Foley. As we talked, I realized that we should make some time to have lunch to talk openly about the myths and realities regarding the OSI OSI networking efforts and how they relate to TCP/IP networking. As the technology evolved over the last 1970s and 1980s, both TCP/IP and OSI were working under the auspices of the International Standards Organization (ISO). These organizations were to standardize networking and distributed systems.

As OSI gained momentum, it became clear that OSI networking would be based on the higher-level OSI models and protocols. OSI was never developed as a simple networking protocol, but was developed as an integral part of distributed systems toolkit. OSI was never developed as a protocol, but as a framework for networking and distributed systems.

Why did OSI gain such strong support?

The IEEE networking technology was being developed by companies that had a vested interest in OSI. A company like IBM was using OSI as a standard for their networking technology, and many companies were working on OSI technology. OSI was never developed as a simple networking protocol, but as a framework for networking and distributed systems.

What happened to OSI networking?

As OSI was never developed as a simple networking protocol, it was never developed as a protocol. OSI was never developed as a protocol, but as a framework for networking and distributed systems. OSI was never developed as a protocol, but as a framework for networking and distributed systems.

Enough time passed to talk openly about the myths and realities regarding the OSI OSI networking efforts and how they relate to TCP/IP.

As OSI gained momentum, it became clear that OSI networking would be based on the higher-level OSI models and protocols. OSI was never developed as a simple networking protocol, but was developed as an integral part of distributed systems toolkit. OSI was never developed as a protocol, but as a framework for networking and distributed systems.

How did the OSI function in TCP/IP at the beginning?

As OSI was never developed as a simple networking protocol, it was never developed as a protocol. OSI was never developed as a protocol, but as a framework for networking and distributed systems. OSI was never developed as a protocol, but as a framework for networking and distributed systems.

The OSI networking technology was being developed by companies that had a vested interest in OSI. A company like IBM was using OSI as a standard for their networking technology, and many companies were working on OSI technology. OSI was never developed as a simple networking protocol, but as a framework for networking and distributed systems.

What happened to OSI networking?

As OSI was never developed as a simple networking protocol, it was never developed as a protocol. OSI was never developed as a protocol, but as a framework for networking and distributed systems. OSI was never developed as a protocol, but as a framework for networking and distributed systems.

Enough time passed to talk openly about the myths and realities regarding the OSI OSI networking efforts and how they relate to TCP/IP.

As OSI gained momentum, it became clear that OSI networking would be based on the higher-level OSI models and protocols. OSI was never developed as a simple networking protocol, but was developed as an integral part of distributed systems toolkit. OSI was never developed as a protocol, but as a framework for networking and distributed systems.

How did the OSI function in TCP/IP at the beginning?

As OSI was never developed as a simple networking protocol, it was never developed as a protocol. OSI was never developed as a protocol, but as a framework for networking and distributed systems. OSI was never developed as a protocol, but as a framework for networking and distributed systems.

The OSI networking technology was being developed by companies that had a vested interest in OSI. A company like IBM was using OSI as a standard for their networking technology, and many companies were working on OSI technology. OSI was never developed as a simple networking protocol, but as a framework for networking and distributed systems.

What happened to OSI networking?

As OSI was never developed as a simple networking protocol, it was never developed as a protocol. OSI was never developed as a protocol, but as a framework for networking and distributed systems. OSI was never developed as a protocol, but as a framework for networking and distributed systems.

Enough time passed to talk openly about the myths and realities regarding the OSI OSI networking efforts and how they relate to TCP/IP.

As OSI gained momentum, it became clear that OSI networking would be based on the higher-level OSI models and protocols. OSI was never developed as a simple networking protocol, but was developed as an integral part of distributed systems toolkit. OSI was never developed as a protocol, but as a framework for networking and distributed systems.

How did the OSI function in TCP/IP at the beginning?

As OSI was never developed as a simple networking protocol, it was never developed as a protocol. OSI was never developed as a protocol, but as a framework for networking and distributed systems. OSI was never developed as a protocol, but as a framework for networking and distributed systems.
Two standards...

- IMS Common Cartridge - Data Mashup
- Many data formats
- IMS Tool Interoperability - Functionality Mashup
- Provisioning and run-time for tools
- Much more work is needed on both
Standards lesson

• If a standard is not suitable for the task at hand - fix it - don’t ignore it

• I learn this the hard way over and over
Functionality Mashup Technical Needs

Aggregating System

- Discovery
- Preferences
- Identity
- Context
- Roles/Attrib
- Markup
- Storage
- Services

Provisioning
Placement
Run-time

Tool / Capability / Code
How IMS Tool Interoperability 1.0 Works

1. Sakai
2. Sakai IMS Proxy
3. Session And Services Bootstrap
4. Launch
5. Sakai APIs
6. IMS TI Outcome Request
7. Outcome

External Tool

Application Code

Samigo, ConceptTutor, Etc

Sakai

Blackboard

WebCT

Angel
OXIDATIVE PHOSPHORYLATION

The enzymatic phosphorylation of ADP to ATP coupled to electron transfer from a substrate to molecular oxygen. Oxidative phosphorylation has the following attributes:

- occurs in the mitochondrion (and some other compartments)
- electrons are passed down the electron-transfer chain
- protons that become available at the electron-transfer chain move protons to the intermembrane space
- phosphorylation of ADP is coupled to re-entry of protons into the matrix through the enzyme ATP synthase
Sakai can consume IMS TI tools *and* produce / export its tools over IMS Tool Interoperability.

A Sakai calendar can be shown in a portal using this approach.
OXIDATIVE PHOSPHORYLATION

The enzymatic phosphorylation of ATP to ADP coupled to electron transfer from a substrate to molecular oxygen. Oxidative phosphorylation has the following attributes:

- Occurs in the mitochondrion (and some other compartments)
- Electrons are passed down the electron-transfer chain
- Protons leak from the mitochondrial matrix to the intermembrane space
- Oxidation of NADH is coupled to re-entry of protons into the matrix through the enzyme ATP synthase

Close Window
IMS TI - 2.5 Years After Sheffield 2005

- Still demoware
- Chicken-and-egg problem
  - With no consumers - there is no motivation to build producers
  - With no producers there is no reason to deliver consumers
  - No purchasers require the spec
- No Shipping product in any LMS - not even Sakai
- IMS TI 1.0 uses SOAP - Pretty much Java Only
- Sakai community uses Sakai-Only LinkTool because it is simple, easy, and REST and a good PHP example comes with it
Looking Forward IMS Tool Interoperability

• IMS Tool Interoperability 1.0 Extensions based on use
  ▪ REST and SOAP-Lite Bindings
  ▪ Security Function and Configuration Extensions
  ▪ Outcome Request schema - IMS TI 1.1
• IMS Learning Tool Interoperability 2.0
  ▪ Builds on IMS TI 1.0
  ▪ Improves the integration into LMS systems
  ▪ Defines extension points within LMS systems such as “Add New Resource”
  ▪ Modeled on Blackboard Building Blocks
  ▪ Led by: Bruno van Haetsdale of Wimba and Chris Moffat of Microsoft
About SiteMaker

- A simple user configured site builder
- Data Tables - User defined Schema - kind of a database backed flexible spreadsheet with simple AuthZ
- Very popular amongst its devotees
- Built at University of Michigan
  Jonathan Maybaum
SiteMaker Detail

- Open Source - Written in Apple WOA
- Maintained by Global Village - leading WOA experts - provide hosting and service
UM.SiteMaker

- From 2004-2007 SiteMaker and Sakai competed for attention and funds at UM
- UM.SiteMaker used in Sakai using SSO integration and CSS sharing
- Powers-that-be said to bring the products together - work jointly
SiteMaker

• I did not want to rewrite WOA code in Sakai - five years of development
• I want SiteMaker to work in places like Bb and Moodle - not just Sakai
• I chose to use IMS TI
• Integration mimics YouTube - “paste in this link”
### Configure Remote Participation

- **Enable Remote Participation:** [ ]
- **Remote Participation Password:** ********
- **Select style:** Remote Participation – Horizontal Navigation
- **Use this URL in Remote System:**
  - [http://sitemaker.umich.edu/remoteParticipation/sakai.conf.demo&style=remote-horizontal-nav](http://sitemaker.umich.edu/remoteParticipation/sakai.conf.demo&style=remote-horizontal-nav)

### Customize SiteMaker Integration

- **Tool Title:** Cancer Stem Cells
- **SiteMaker URL:** [http://sitemaker.umich.edu/remoteParticipation/sakai.conf.demo&style=remote-horizontal-nav](http://sitemaker.umich.edu/remoteParticipation/sakai.conf.demo&style=remote-horizontal-nav)
- **SiteMaker Password:** ********

### ctools.umich.edu

**Home**

<table>
<thead>
<tr>
<th>Title</th>
<th>Identification of Pancreatic Cancer Stem Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>File</td>
<td>Filename: cancer_res-6701030-37_2007...pdf (MIME Type: application/pdf; Size: 564.0 Kb)</td>
</tr>
<tr>
<td>Comments</td>
<td>Supports the concept...</td>
</tr>
<tr>
<td>Date Modified</td>
<td>15 Nov 2007 10:38 AM</td>
</tr>
<tr>
<td>Created By</td>
<td>maybaum</td>
</tr>
</tbody>
</table>
University Campus
Under Construction

3.4.5 OCT’07 CAMPUS.CAT
Barcelona Active/Active 162-164, BCN
CONSTRUCTION UNDER UC
Campus Project

- Service Oriented Architecture
- A new way to build portable tools
- Deployable in Sakai *or* Moodle
- OKI as Middleware
- Includes cross-deployment and configurations
- Proxy Tool Pattern
- Strong funding by Catalan Government
- www.campusproject.org
Initial Campus OKI OSIDs for New Tools

- Authentication
- Authorization
- Configuration
- Locale
- Logging
- Identifier
- Messaging

This set is a good choice because it keeps the project scope feasible. And these OSIDs are used by nearly every learning application ever built.
Campus Architecture

```
Java/PHP Application   Java/PHP Application
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OSID Interface</td>
<td>OSID Interface</td>
</tr>
<tr>
<td>OSID Implementation</td>
<td>OSID Implementation</td>
</tr>
<tr>
<td>Proxy Web Service</td>
<td>Proxy Web Service</td>
</tr>
<tr>
<td>Web Services</td>
<td>Web Services</td>
</tr>
<tr>
<td>OSID Implementation</td>
<td>OSID Implementation</td>
</tr>
<tr>
<td>OSID Interface</td>
<td>OSID Interface</td>
</tr>
<tr>
<td>Moodle Gateway</td>
<td>Sakai Gateway</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Moodle Platform</td>
<td>Sakai Platform</td>
</tr>
</tbody>
</table>
```
Important Details

How are tools provisioned?

The model for the new tool is solid. Much work is yet to be done.

Why not simply have each LMS implement the “on-the-wire” web services directly?
Adding IMS Tool Interoperability to Campus

Java / PHP Application

Session

OSID Context

Tool Runtime

OSID Implementations

Launch Request

Moodle / Sakai Gateway

Proxy Tool

IMSI TI Descriptor

Provisioning Run-Tme

OKI BUS

Web Services
Adding IMS Tool Interoperability to Campus

The primary value in using IMS Tool Interoperability as part of the Campus Architecture is to provide a standards-based protocol to exchange configuration information between the LMS and the Tool and establish the OSID Context.

For Campus, this OSID context can also contain information which properly configures the OKI bus so that applications can access other OKI services in the LMS.
Sharing Tool Context

We can support multiple LMS systems and tools that federate identity by including an appropriate bus end point in each launch request.

Trust is granted when two LMS placements share the IMS TI Descriptor.
Next Week - Spain

- I have been talking all along
- I have a feeling that I mis-understand aspects of the UOC model
- Some of the early sample code was weak
- Next week I hope to talk in more detail with the UOC team
Toozday - Personal Learning Environment

My personal playground to easily explore the un-explored use cases of the past three years...
Toozday

- Written in Ruby / Rails
- Running example in my complex Web Sites course
  - CSS
  - Ajax
  - Service-Oriented-Architecture (Ruby OSIDs)
  - Data Modeling
Toozday Goals

• IMS Tool Interoperability throughout
• Not to be an Enterprise LMS
• Personal content and collaboration system
• The place individuals produce and consume stuff
• Reference Implementations for IMS Specifications
Need to Explore Provisioning...
Toozday Technical Goals

- Understand provisioning for Functionality Mashup
- Showcase for IMS TI
- Content centric - JSR-170 in Ruby
- Build Ruby OSIDs
- “Peer-to-Peer” - synchronization model
- Works off line - on workstation
Toozday Use Cases

- Life Long Teaching and Learning
- Personalize Teaching and Learning
- Portfolio - Artifact-oriented - long term
- Open Educational Resources
- Organic / adhoc learning
- Produce / Consume / Annotate learning artifacts
Toozday Realities

• This is way too hard - Rails makes it easier
• Will need a few “throw away versions”
• Resources - Chuck spare time plus a few graduate students
• It is a continuous research experiment
What I would like to see and/or help make happen...
Sakai

- Needs to move to Core plus modules
- High quality core - usability, performance, etc.
- Easy to pull down and assemble modules
- Needs to become content-centered
- Core needs to be platform for innovation
OU UK

- Get involved in IMS Tool Interoperability
- Research and build the Moodle TI Producer
- Get involved in Sakai - focus on JSR-170 and make sure the OU 170 and Sakai 170 are well aligned going forward - share experience - coordinate efforts
OUC

- Work on building a new way of building fresh tools in Java
- Work on OKI OSIDs in Java - get suitable out of band agreements in place
- Figure out the on-the-wire web services
- Adopt IMS Tool Interoperability for Provisioning OKI OSIDs for the new tools
My tentative plans...
January 08

- Sakai Tool Interoperability in trunk
- Maximized tool view - frameset
- IMS Tool Interoperability Portlet will use new frameset mode - advantage over linktool

- Customers
  - SiteMaker
  - McGraw-Hill
January 08 (hope)

- IMS TI Portlet in Production at Michigan - used in my course to access bits of Toozday
- Toozday - IMSTI Producer and Consumer
Winter Semester 08

- Teaching Python - www.si182.com
- Teaching Ruby on Rails - www.si543.com
- Approach: Open Courseware Live!
Teaching Approach

- Build in Open Course Ware from the beginning - three sites

- Course Site - SI539 - Winter 2008

- Project Site - SI539

- Open Course Site - www.si539.com - www.rubylearn.com - move toward Toozday
Welcome to Teaching Programming with Ruby and Rails

This is a very much under construction web site being initially built by Dr. Charles Severance to collect resources to help in teaching Ruby and Rails to beginning programming students.

The first course I am developing is SI539 - Design of Complex Web Sites being taught Fall 2007 at the University of Michigan. I am using this site to make my materials publically available under the Creative Commons Attribution 2.5.

Textbook

I have adopted and recommend that you adopt the book Building
www.rubylearn.com
Personal Learning Environment

SI539 Community

SI539 Winter 2008

SI539 Fall 2007
May 08

- SiteMaker’s next release supports IMS TI Producer - Sakai Integration complete
- IMS Tool Interoperability Consumers
  - Blackboard
  - Microsoft Share Point
  - Moodle
- Merge linktool, iframe tool, and IMS TI tool
Summer 2008

- I have an open schedule from April 15 - September 6
- Will play with Toozday
- May raise some funds to invest in TI
Summary

• A lot of fragmentary ideas here

• Core concept - Functionality mashup and tool interoperability is a chicken-and-egg problem

• I now have time to come at it from a lot of directions to see which will prove fruitful

• These are conversation starters...