

The Coming Functionality Mashup

Dr. Charles Severance
Sakai Foundation
University of Michigan

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



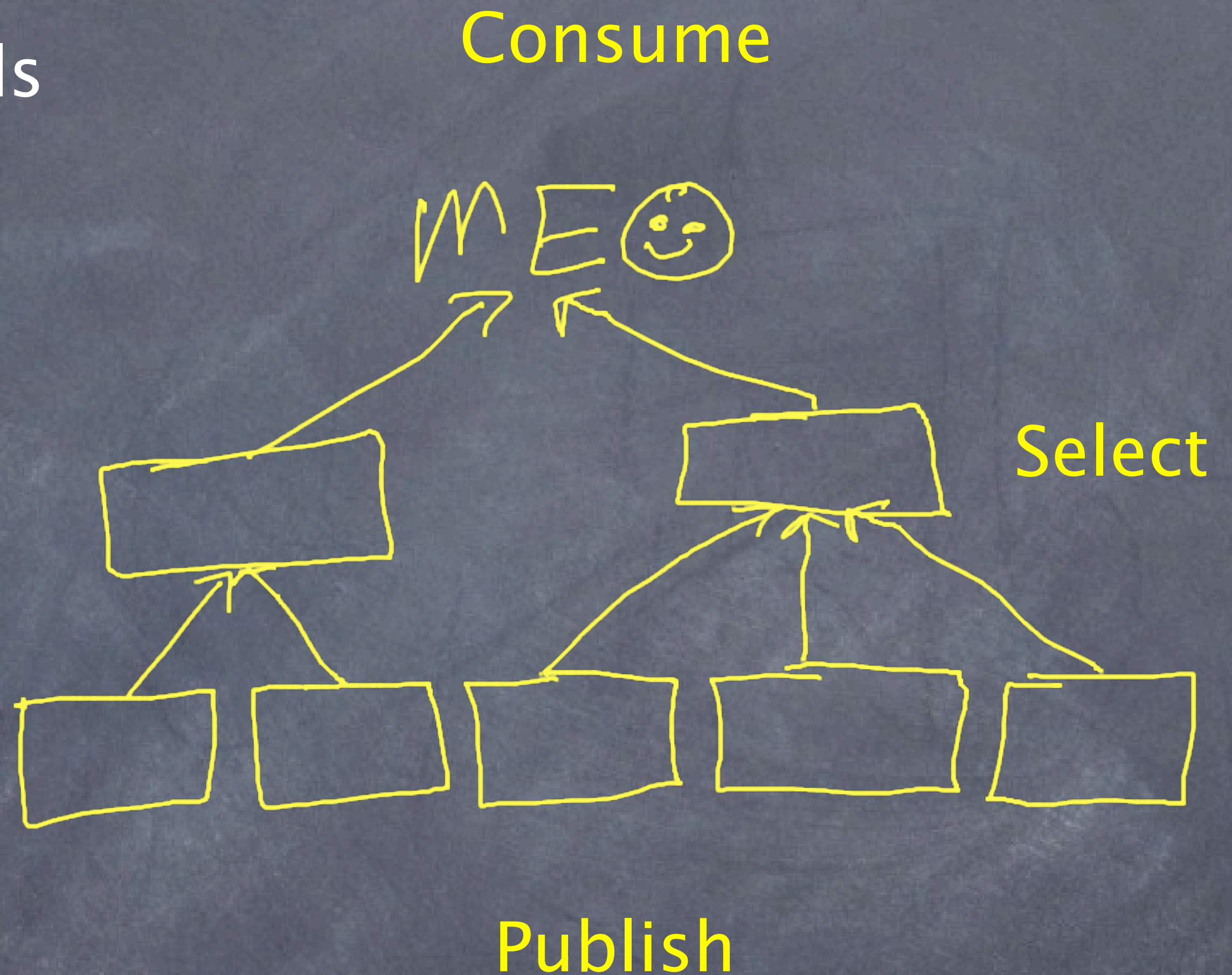
Outline

- Content mashup
- Functionality mashup
- Cloud services
- Scalable Software Architecture
- Standards and Technology for Functionality Mashup
- Functionality Mashup in a Learning Context
- Sakai Research Edition

Content Mashup

Content Mashup

- Read only – public materials
- Publish / subscribe
- Push content
- A highly personalized “newspaper replacement”





Dr. Chuck's Web Log

MAY 2007

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	
6	7	8	9	10	11	12
13	14	15	16	17	18	19
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May 14, 2007

Hockey Outcome

If you watch my photo blog - you already know that my team won the Hockey championship and my Thesis advisor did not win the championship.

[A picture of me with the trophy](#)

My finger was fine - it twinged a bit from time to time but it seldom really hurt. Back to the cast so it can heal for the next few months. The next key will be motorcycling - broken finger will put that on hold for 4-6 weeks - Damn!

We won the game 4-2. Rich got his team's first goal which tied the score. Our team was very balanced in scoring with Ray, John, Tom, and Scott each scoring - I got an assist on the fourth goal. I had three outstanding chances to score a goal. Each time I would miss the bench would laugh and suggest that it was my hand that screwed up - but of course I screw up often enough with a good hand - so that is not a good excuse.

RSS

RSS

RSS

planet sakai

May 23, 2007

Dutch Sakai

Sakai 2.4.0 is available

Today, May 22, the latest version of Sakai has become available. There is lots of new stuff in this release, that has been thoroughly tested by the community, as always. There is a new and significantly improved Chat tool, but also some completely new tools are now in the core release: Mailtool, Page Order Helper (in Site info), Polls and User Membership. Furthermore there is new functionality

by Wytze Koopal at May 23, 2007 12:33 AM

May 22, 2007

Matthew Buckett

Upgrading Sakai to 2.4

Ok, I've just upgraded our test sakai instance to the just released 2.4.0. Here are the notes of how I did it, this isn't a recommended pattern:

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Last updated: May 23, 2007 11:00 AM
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Content Mashup

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 - Mac OS Forge
 - TeraGrid Whiteboard **1**
 - Ian Foster

- Socioeconomic - 17 news items
 - Paging Mr. Keynes**
Calculated Risk 5/8/07 12:00 AM by Tanta
 - Supernova News**
The Street Light 5/8/07 12:00 AM by Kash
 - Time for the Credit Card?**
The Street Light 5/8/07 12:00 AM by Kash
 - DrumBeat: May 8, 2007**
The Oil Drum 5/8/07 5:57 AM by Leanan in (drumbeat
 - Is Deficit Spending Ethically Deficient?**
Economist xchg 5/8/07 8:15 AM by Economist.com | M
 - Yahoo! Should Buy Dow Jones**
The Big Picture 5/8/07 8:30 AM by ritholtz in (Media)
 - Eco Worrier Hosts Carnival of the Green**
Treehugger 5/8/07 8:50 AM in (
 - What's Al Gore Have in Common With the Ku Kl**
Freakonomics Blog 5/8/07 8:55 AM by Stephen J. Du
 - University Successfully Leading Neighborhood P**
Planetizen - Urban Planning and Development Network
 - Seattle Greendrinks: New Community-Building**
Treehugger 5/8/07 9:01 AM in (events, events, "green
 - The Contrarian's Guide to Used Car Buying**
The Truth About Cars 5/8/07 9:12 AM by Matthew Dar
 - Seattle Plans Clamp Down On Free Parking**
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 - This Blog Apparently Not Worthless After All**
Freakonomics Blog 5/8/07 10:21 AM by Stephen J. Du
 - Air Travel Treehugger Style?**
Treehugger 5/8/07 10:24 AM in ("Travel & Nature", "A
 - The Parable of the Donkey and the Japanese eW**
Treehugger 5/8/07 10:30 AM in (electronics, eWaste, J
 - Most Huggable: Organic Tequila, 8-Speeds of E**
Treehugger 5/8/07 10:32 AM in ("best of hugg.com", "
 - Debt financed death-dealing**
Economist xchg 5/8/07 10:43 AM by Economist.com |

- News Items
- TidBITS: ...
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Sakai RSS Feed

feed://192.168.1.103:8080/portal/atom/ Google

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Sakai RSS Feed

2 Total

Gateway Today, 01:41 PM

Server Status, Sakai Administrator, Feb 19, 2007 1:41 pm [Read more...](#)

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This is an Announcement, Sakai Administrator, Feb 19, 2007 1:31 pm [Read more...](#)

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Actions:

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Topic, Sakai Administrator, Feb 19, 2007 1:33 pm [Read more...](#)

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Yo Fellows, Sakai Administrator, Feb 19, 2007 1:31 pm [Read more...](#)



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Local Gas Prices

Gas Prices For 48842 :

Station/Brand	Address	Unleaded	Plus	Premium	Dies
KROGER KROGER FUEL #6884 Q	921 W HOLMES RD LANSING, MI 48910	\$2.989	N/A	N/A	
SUNOCO WASHINGTON AVE TOTAL	1600 S WASHINGTON AVE LANSING, MI 48910	\$3.109	\$3.219	N/A	

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Weather

Holt, MI
 72°F
 Clear
 Wind: SW at 10 mph
 Humidity: 43%

Today	Wed	Thu
78° 45°	58° 41°	60° 38°

Yahoo! Finance: GOOG News

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Symbol	Price	Value	Earned	
GOOG	\$461.78	\$6927	\$12	[?]

Functionality Mashup



Sakai Community May 2007

Map Mashup

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Proprietary Glue

Mapquest

MIT Simile: Timeline Mashup

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Sakai User's Meeting IMS Alt-I-Lab Meeting on usability and
Seth Theriault produces the NCESS eCollaboration Portals and portlets v
University of JA-SIG Meeting OS VLE Next Generation Universitat de
CLLAP: Open Source In TeraGrid 2006 Sakai Site Visit
JISC/CNI Meeting

JISC/CNI Meeting
York, UK ([URL](#))
Thu, 06 Jul 2006 04:00:00 GMT
Fri, 07 Jul 2006 04:00:00 GMT

May 28 Jun 4 Jun 11 Jun 18 Jun 25 Jul 23

Timeline © SIMILE

May Jun Jul Aug Sep

Depending on browser you may or may not be able to drag the timeline around Google-style. The way to navigate that works on all browsers is to double click on some area of the timeline and that will become the new center. If dragging seems not to work (Safari for example) simply double-click and be patient.

Reference: [The Very Cool MIT Simile Timeline Project](#)

Simile

dr-chuck.com



Proprietary Glue

Simile Project



Simile Timeline Mashup Code

```
<script src=  
"http://simile.mit.edu/timeline/api/timeline-api.js"  
type="text/javascript">  
</script>  
<script>  
  var tl;  
  function onLoad() {  
  
var eventSource = new Timeline.DefaultEventSource();  
var bandInfos = [  
  Timeline.createBandInfo({  
    eventSource: eventSource,  
    date: "Jun 28 2006 00:00:00 GMT",  
    width: "80%",  
    intervalUnit: Timeline.DateTime.WEEK,  
    intervalPixels: 100  
  }),  
  Timeline.createBandInfo({  
    eventSource: eventSource,  
showEventText: false,  
trackHeight: 0.5,  
trackGap: 0.2,  
date: "Jun 28 2006 00:00:00 GMT",  
width: "20%",  
intervalUnit: Timeline.DateTime.MONTH,  
intervalPixels: 200  
  })  
bandInfos[1].syncWith = 0;  
bandInfos[1].highlight = true;  
  
  tl = Timeline.create(document.getElementById("my-  
timeline"), bandInfos);  
  Timeline.loadXML("events.php", function(xml, url)  
{ eventSource.loadXML(xml, url); });  
  }  
  var resizeTimerID = null;  
  function onResize() {  
    if (resizeTimerID == null) {  
      resizeTimerID = window.setTimeout(function  
  
0 {  
      resizeTimerID = null;  
      tl.layout();  
    }, 500);  
  }  
}  
</script>
```

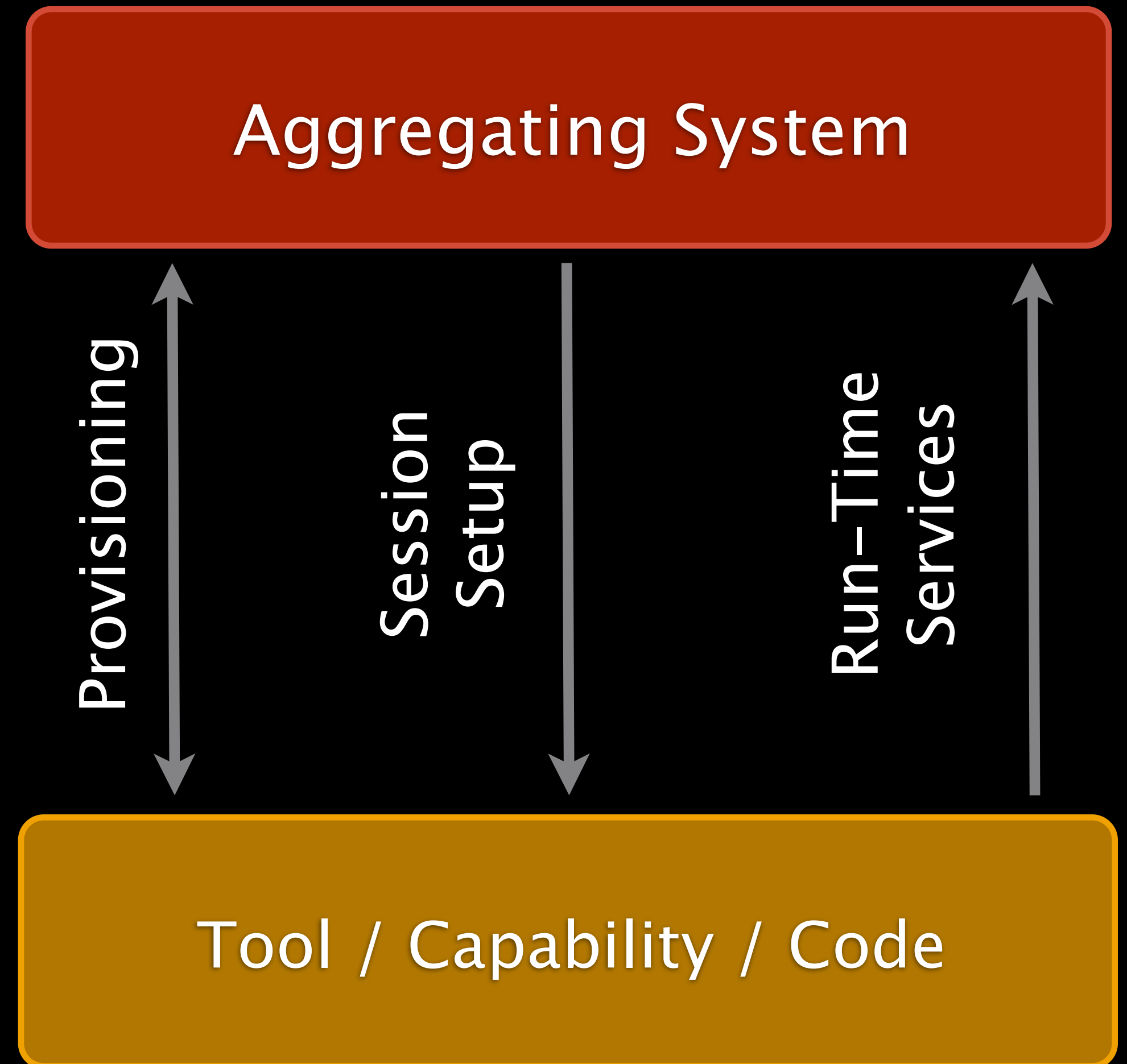
MashUp: Google Analytics

```
<script src="http://www.google-analytics.com/urchin.js"
  type="text/javascript">
</script>
<script type="text/javascript">
_uacct = "UA-423997-1";
urchinTracker();
</script>
```



Beyond Anonymous Functionality Mashup

- Think “portal”, “Eclipse”, even “Windows”
- There are no rich standards in this area so everyone invents their own
- Sakai is an example of a one off functionality mashup with identity and authorization used to select and assemble tools together flexibly to produce an application



Physics Computational Portal (ANU)

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Calendar

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May, 2007

< Today >

Sun	Mon	Tue	Wed	Thu	Fri	Sat
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2

Recent Announcements

There are currently no announcements at this location.

Recent Chat Messages

Finer-Grained Functionality Mashup

- It is about sharing sub-tool functionality across tools – Rectangles within rectangles
- In Sakai, we have several names for this
 - Helper tools
 - Tool components
 - Widgets
- uPortal calls them “servant channels”
- So far – much work yet to do for this to be a general solution which can be done at “arm’s length”
 - Mellon-funded FLUID Project – U. Toronto
 - Reasonable Server Faces – Cambridge University

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Dr. Chuck

Schedule

New Event

To add a schedule item, complete the form and choose 'Save Event' at the bottom.
Required items marked with *

Event

* Title

* Date

* Start Time EDT

Duration Hours Minutes

End Time EDT

Message

This is a meeting.

Just an idea...

Location: SI 210 Resources

| |

- [Title](#)
- [SI 210 Resources](#)
- [chuck-analytics.jpg](#)
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-

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To add a schedule item, complete the form and choose 'Save Event' at the bottom.
Required items marked with *

Event

* Title

* Date

* Start Time EDT

Duration Hours Minutes

End Time EDT

Message

This is a meeting.

Just an idea...

Location: /afs/umich.edu/user/c/s/csev/eecs280/chap1/ [Change](#)

<input checked="" type="checkbox"/>	Type	Title ^	Size
<input type="checkbox"/>		a.out	544.7 KB
<input type="checkbox"/>		disp-1-8.c	0.6 KB
<input type="checkbox"/>		disp-1-8.s	2.9 KB
<input type="checkbox"/>		hello	544.6 KB
<input type="checkbox"/>		hello.c	< .1 KB
<input type="checkbox"/>		hello.o	1.1 KB
<input type="checkbox"/>		hello.s	0.3 KB
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<input type="checkbox"/>		zzz	2 KB

Charles Severance - Google Scholar

http://scholar.google.com/scholar?q=Charles+Severance&hl=en&lr= Google

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Return to Sakai

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- [C Severance](#)
- [K Dowd](#)
- [M Loukides](#)
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[BOOK] High Performance Computing - group of 2 »
 K Dowd, C Severance, M Loukides - 1998 - O'Reilly & Associates, Inc. Sebastopol, CA, USA
 Cited by 167 - [Related Articles](#) - [Web Search](#) - [Import into Sakai](#) - [Library Search](#)

[Distributed Hybrid Earthquake Engineering Experiments: Experiences with a Grid Shaking Grid ... - group of 27 »](#)

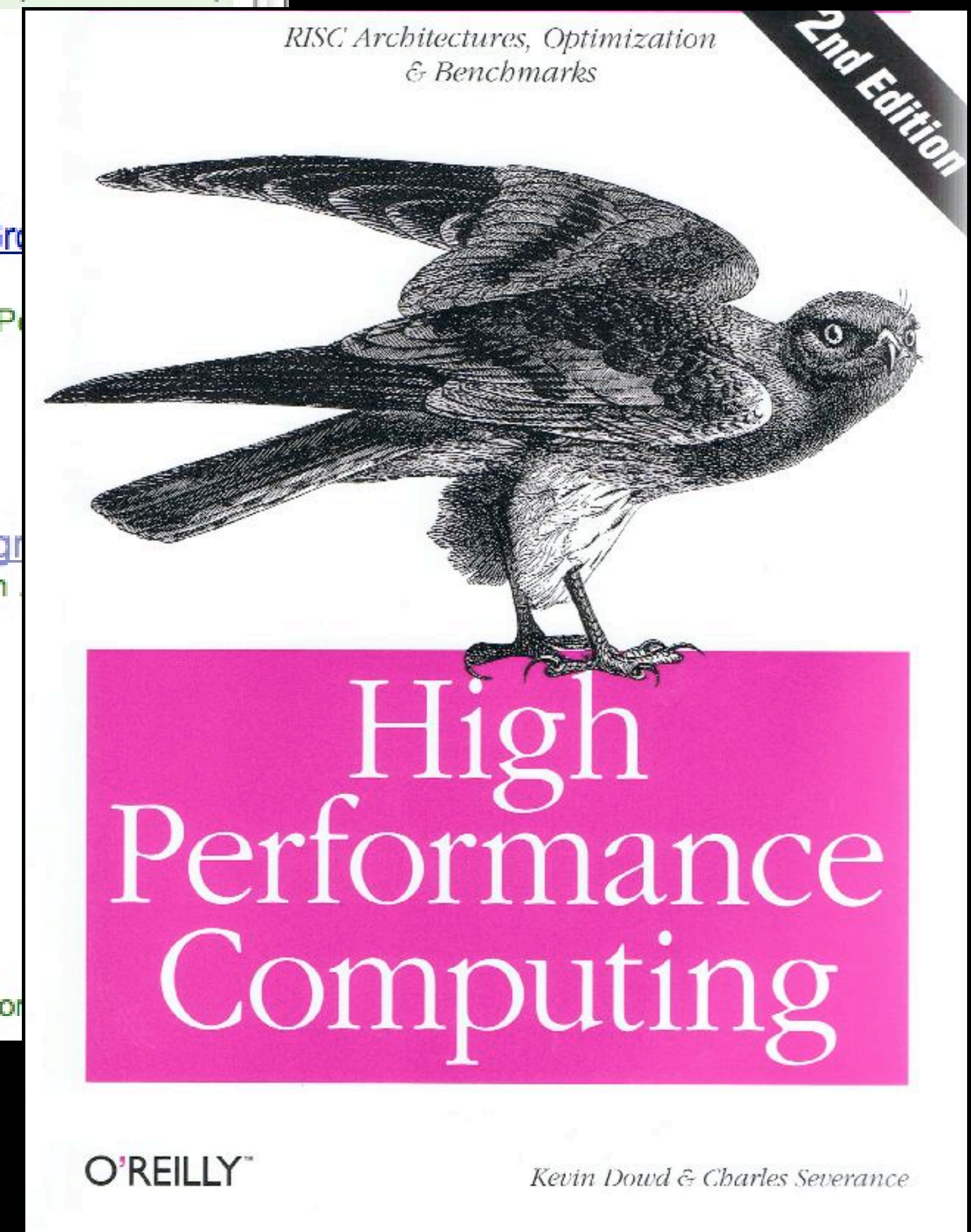
... , K Ricker, I Foster, P Hubbard, C Severance - 13th IEEE International Symposium on High Performance Computing, 2004 - doi.ieeecomputersociety.org
 1 USC Information Sciences Institute, University of Southern California, Los Angeles, CA 2 Department of Civil and Environmental Engineering, UIUC, ...
 Cited by 26 - [Related Articles](#) - [Web Search](#) - [Import into Sakai](#)

[Distributed linear hashing and parallel projection in main memory databases - group of 3 »](#)
 C Severance, S Pramanik, P Wolberg - Proceedings of the sixteenth international conference on Database and Information Systems, 2005 - acm.org

ABSTRACT This paper extends the concepts of the distributed linear hashed main memory file system with the objective of supporting higher level parallel ...
 Cited by 21 - [Related Articles](#) - [View as HTML](#) - [Web Search](#) - [Import into Sakai](#)

[CITATION] Grid portals: A scientist's access point for grid services (draft 1)
 ... B Plale, G von Laszewski, C Severance, J Hardin, J ... - Global Grid Forum, 2003
 Cited by 10 - [Related Articles](#) - [Web Search](#) - [Import into Sakai](#)

[p p. 10-12, 16 Storage Technology Takes Center Stage - group of 3 »](#)
 ... , PM Marden, EV Munson, C Severance, DJ Reifer, B ... - Computer, 1999 - csdl.computer.org
 Standards, Free, Requires Subscription, Purchase, pp. 126-127 IEEE



Cloud Services

Free world-wide services that provide us amazing capabilities that are generally far better than services provided by our employers – or services you can purchase on the open market.

Cloud Services

- The market is building services that are better, cheaper, and faster to support research than we are
- Yahoo, Google Video, Google Mail, YouTube, MySpace, and Microsoft Live
- I use these services rather than my campus–provided services
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Dr. Chuck Films Sakai

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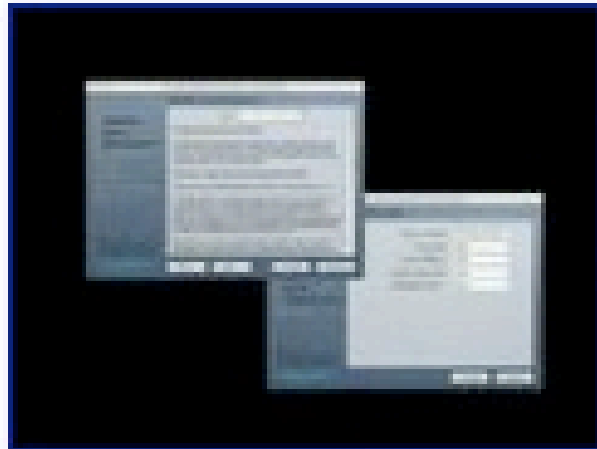
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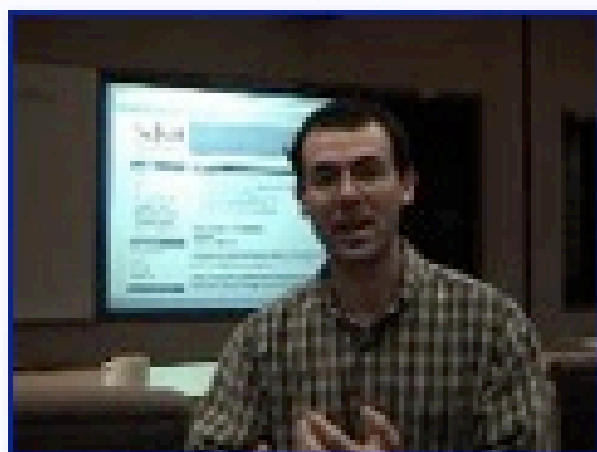


[Sakai Overview](#)

csev - 11 min - Sep 2, 2006

... and portfolios, how the **Sakai** community works, how **Sakai** works to improve interoperability through standards, and some technical detail about **Sakai**.

http://www.youtube.com/watch?v=_SkGi_tKBL4



[Sakai Developer Profile: Steven Githens](#)

Dr. Chuck Films - 4 min - Aug 18, 2005

Dr. Chuck interviews Steven Githens at the Ann Arbor **Sakai** Developers meeting and asked him about web services, user interfaces, and the future of **Sakai**.

<http://video.google.com/videoplay?docid=4668952922063159561>

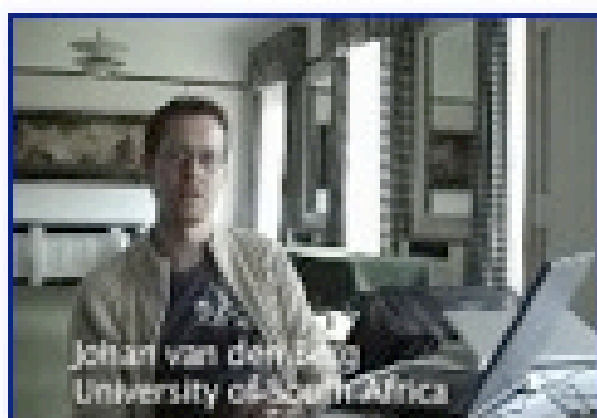


[Sakai Video Report: European Sakai Days, Lubeck Germany](#)

Dr. Chuck Films - 6 min - Sep 27, 2006

... and runs the **Sakai** system at oncampus and with Prof. **Dr.-Ing.** Rolf Granow who talks about the Baltic Sea Virtual Campus and why oncampus choose **Sakai**. ...

<http://video.google.com/videoplay?docid=-7598816498369623566>



[Sakai Developers @ Cambridge University](#)

Dr. Chuck Films - 4 min - Sep 26, 2005

The **Sakai** developers met in Cambridge, UK with representatives from several universities.

There was discussion around production issues, and the upcoming ...

<http://video.google.com/videoplay?docid=8704496191347105466>

Sakai Video Report: Andrew Booth - Bodington Project
Produced: February 14, 2007

Aggie Booth has been the leader for design and development of the Bodington LMS at Leeds University. We talk with Aggie about the history of Bodington, a demonstration of Bodington features including Shiboeth/Guan Xi integration. We also talk about future trends in LMS system architecture.
Flash Video: 9 minutes
www.bodington.org

You can also view the [Jon Maber](#) interview about Bodington. Jon was the lead developer of Bodington.

View other Dr. Chuck videos on [Google Video](#) | [Quicktime \(1440\)](#) | [YouTube](#)
www.dr-chuck.com Complete Media Index



Channel: Dr-Chuck's Media Library

- [Sakai Video Report: Andrew Booth - Bodington Project](#) Aggie Booth has been the leader for design and development of the Bodington LMS at Leeds University. We talk with Aggie about the history of Bodington, a demonstration of Bodington features including Shiboeth/Guan Xi integration. We also talk about future trends in LMS system architecture.
- [Understanding the Posix Open System Reference Model](#) This video introduces the IEEE POSIX 1003.0 (ISO/IEC TR 14252) Open System Reference Model. This is a model designed to help identify issues in Application Portability and System Interoperability. Produced: August 20, 1990
- [Mandy Birthday Project - Remix](#) A spoof of Blair With Project - based on Mandy's Birthday party in 1999. Makes good use of the Sony camcorder's night vision mode. The alien is an action figure and the spacecraft is an Apple Airport. Originally filmed: December 1999
- [A Visit to C.H.U.M. Therapeutic Riding](#) This is a video which features a number of C.H.U.M. Parents and riders talking about the importance of Chum Therapy to them and their families. Bonnie Depue explains about the program, its volunteers, and the Growing Together 4H club sponsored by the program.
- [Sakai Video Report: Open Source Portfolio 2.4](#) The Open Source Portfolio stakeholders had a meeting November 13 and 14, 2006 in Phoenix, Arizona to evolve OSP and come up with the objectives for the Sakai 2.4 releases. Community members from all over the

planet sakai

May 23, 2007

Dutch Sakai

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by Wytze Koopal at May 23, 2007 12:33 AM

May 22, 2007

Matthew Buckett

Upgrading Sakai to 2.4

Ok, I've just upgraded our test sakai instance to the just released 2.4.0. Here are the notes of how I did it, this isn't a recommended pattern:

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All time views: 4

Dr. Chuck Films
8 min 19 sec - Feb 14, 2007
www.bodington.org
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Aggie Booth has been the leader for design and development of the Bodington LMS at Leeds University. We talk with Aggie about the history of Bodington, a demonstration of Bodington features including Shiboeth/Guan Xi integration. We also talk about future trends in LMS system architecture.

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The Mandy Birthday Project

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Rating: 1.25
Views: 439
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See All Results

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Tags: Comedy Horror

YouTube

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Sakai Video Report: Andrew Booth - Bodington Project

Added: May 20, 2007
From: csev
Provided By: csev

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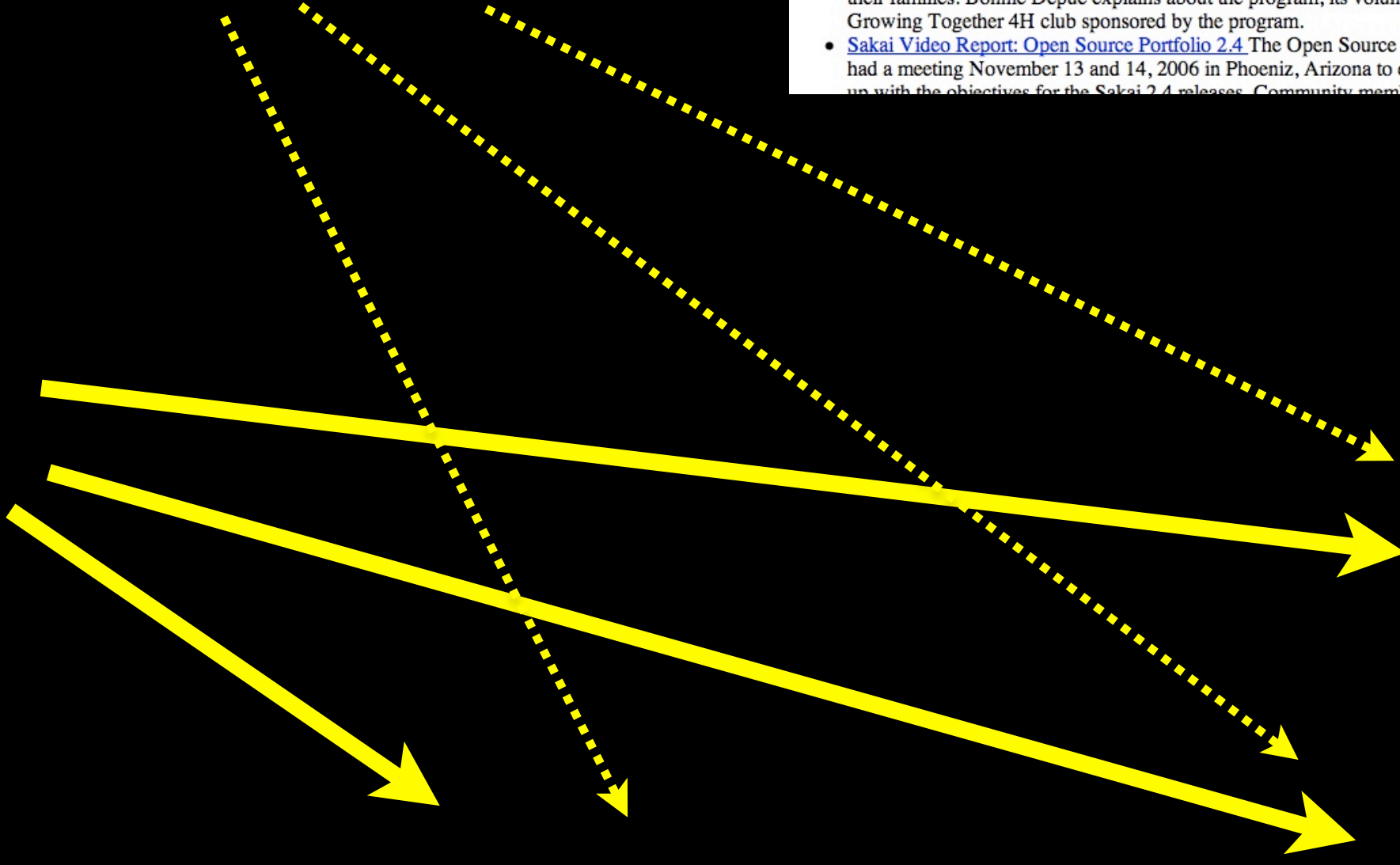
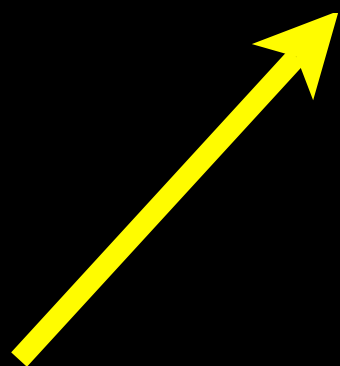
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Sakai Approach to Cloud Services

- Try to “keep up” with the innovation pace and use them as an indication of the requirements and use cases and usability.
- Build similar (likely simpler) interfaces that we maintain control over
- Integrate with and take advantage of those services
 - RSS Feed to Google Home Page
 - Proxy for Google Groups or Yahoo Groups or deli.cio.us
 - Publish to YouTube or Google Video
 - Make our data searchable by search engines and mark our data semantically to improve search results
- Outsource the hard bits like media conversion and high-end streaming to these services. Focus on keeping our archival copy with proper metadata.

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Dr. Chuck

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OOPZ

The screenshot shows a Flickr profile page for a user named 'dr-chuck'. At the top, it says 'Signed in as dr-chuck' with a notification icon for '(1 new)'. The navigation bar includes 'Home', 'You', 'Organize', 'Contacts', 'Groups', and 'Explore'. A search bar is present with the text 'Search your photos'. The main heading is 'Your photos' with a subtext '200 photos / 5,522 views' and a 'View as slideshow' link. Below this is a red notification banner: 'PLEASE READ THIS IMPORTANT SECURITY NOTICE.' followed by a 'DISMISS X' button. A larger grey notification box follows with the heading 'Hey dr-chuck! About your photos...'. The text inside reads: 'You've run into one of [the limits of a free account](#). Your free account will only display the most recent 200 photos you've uploaded. All of your photos beyond 200 will remain hidden from view until you either delete newer photos, or [upgrade to a Pro account](#). None of your photos have been deleted, and if you upgrade, they'll all come back unharmed.' Below the notification, there are three items: a photo of 'Stuart Dunn' at a presentation, a 'Multimedia message' showing a church, and a text message from 'dr-chuck' that says: 'Hi dr-chuck. Did you know you can [change the layout](#) of your photos page? Fun! If you like, you can arrange your photos into what we call a Set. When you're done, that Set will show up here. To get started, open up [Organizr](#). Go for it!' There is also a 'NEW Did you know you' notification at the bottom.

The navigation menu is displayed on a grey background. It features two blue cube icons with question marks. Below them are four buttons: 'Video Index', 'Slide Index', 'Thumbnails', and 'Problems'. Below the buttons, there is text: 'You may have to press [play](#) to start the lecture.' and 'This lecture was produced by [Sync-O-Matic 2000](#).' At the bottom of the menu, there is a copyright notice: 'Copyright 1994, 1997 Charles Severance' and a small number '1'.

Technical Aspects of TCP/IP Networking

Charles Severance

Copyright 1994, 1997 Charles Severance

First Back Next Slide Video

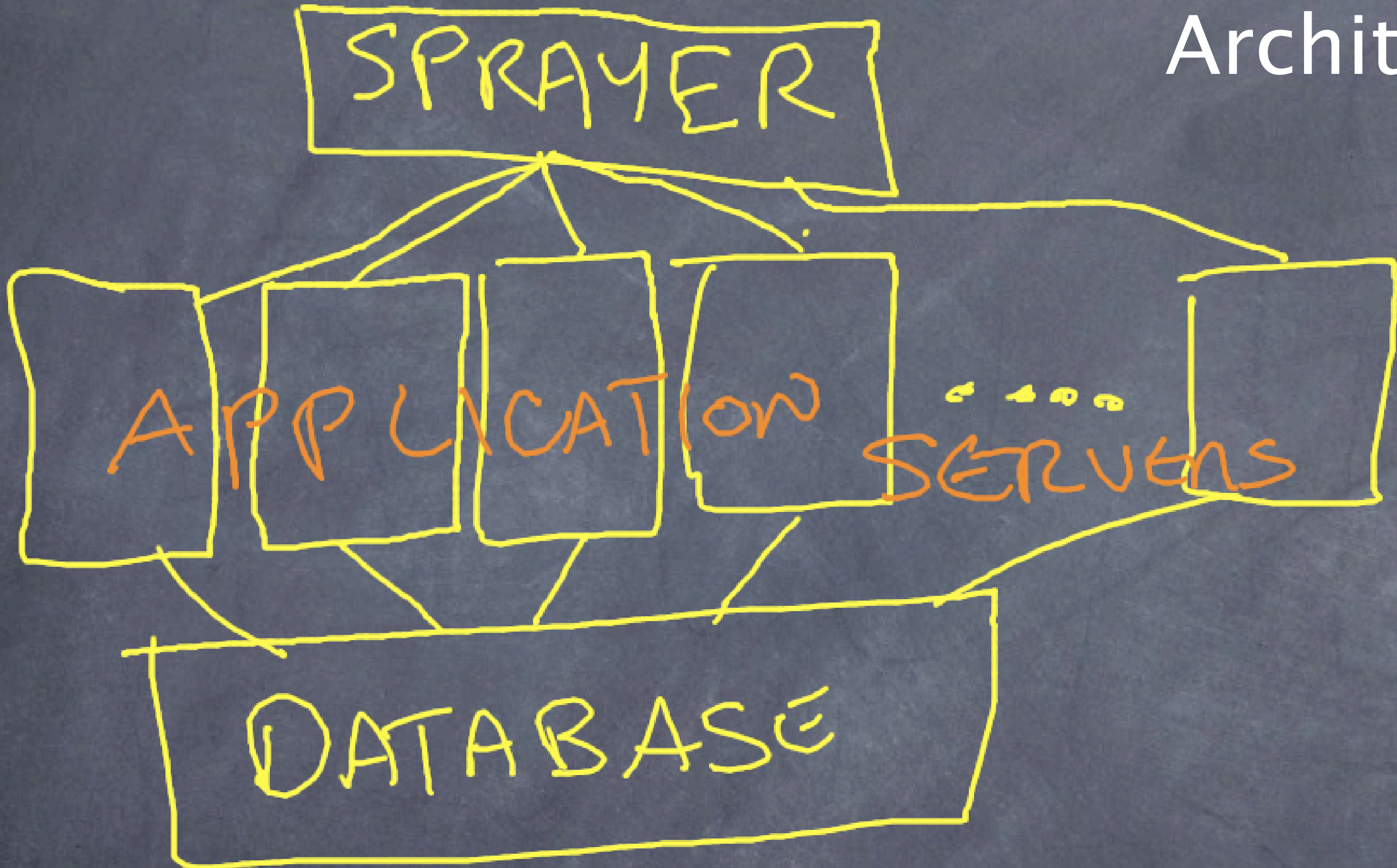
My Use of Cloud Services

- Campus is not keeping up in many areas
 - Rich streaming servers with media conversion
 - Map servers that cover the world
 - Cross-institutional community systems
- Things I cannot outsource to cloud services
 - E-Mail that I “own”, is private, and archivable by me
 - Mailing lists that I own and are archived in a way that I can get 100% of the data
 - Large amounts of backed-up storage that have URLs – with flexible permissions
 - The real artifacts – the genuine article – the original

Evolving Scalable Software Architecture for Cloud Services

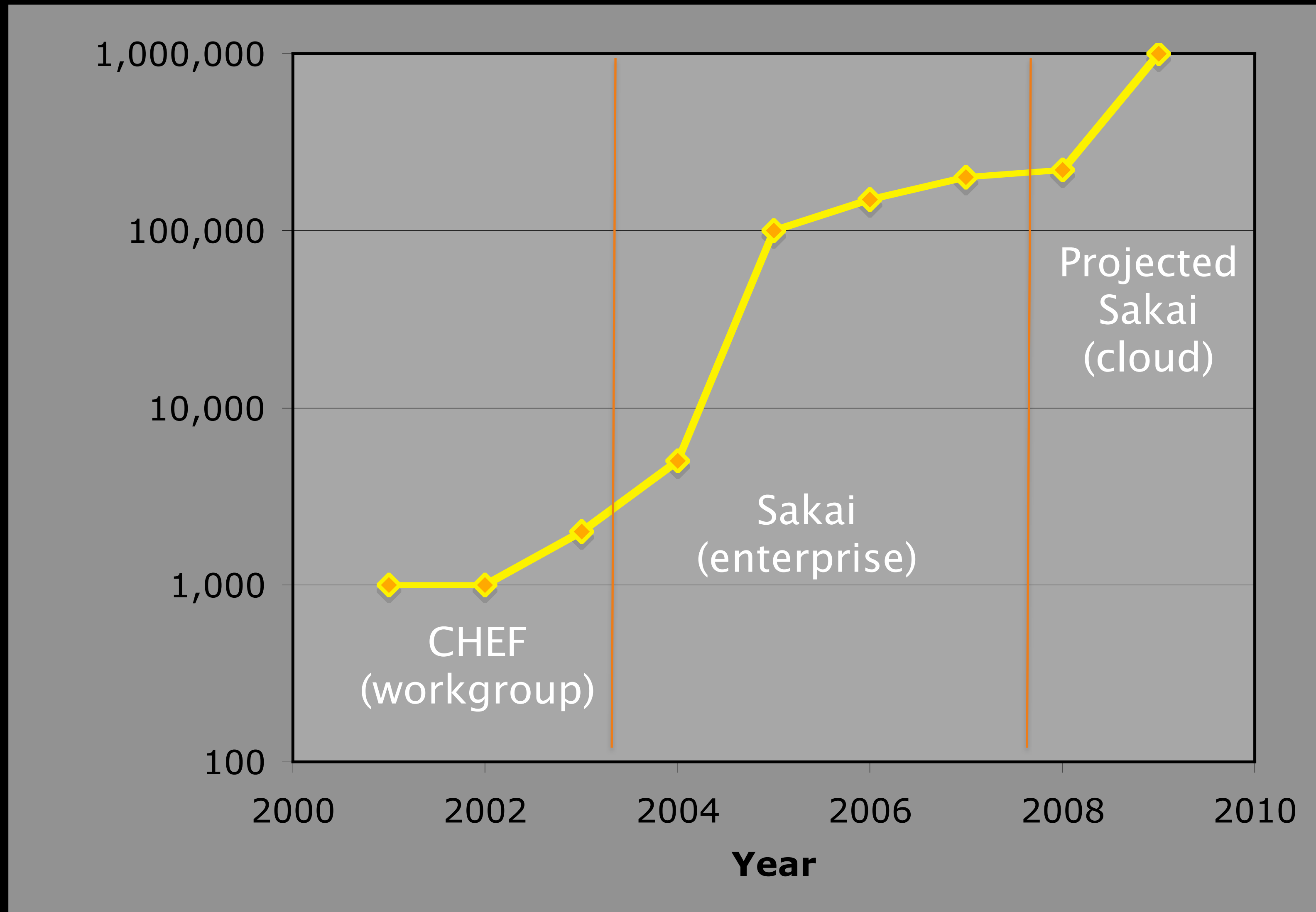
Open source applications such as Sakai need to begin to think about scaling beyond the “Enterprise” and to the level where millions of users can be supported.

Enterprise Architecture

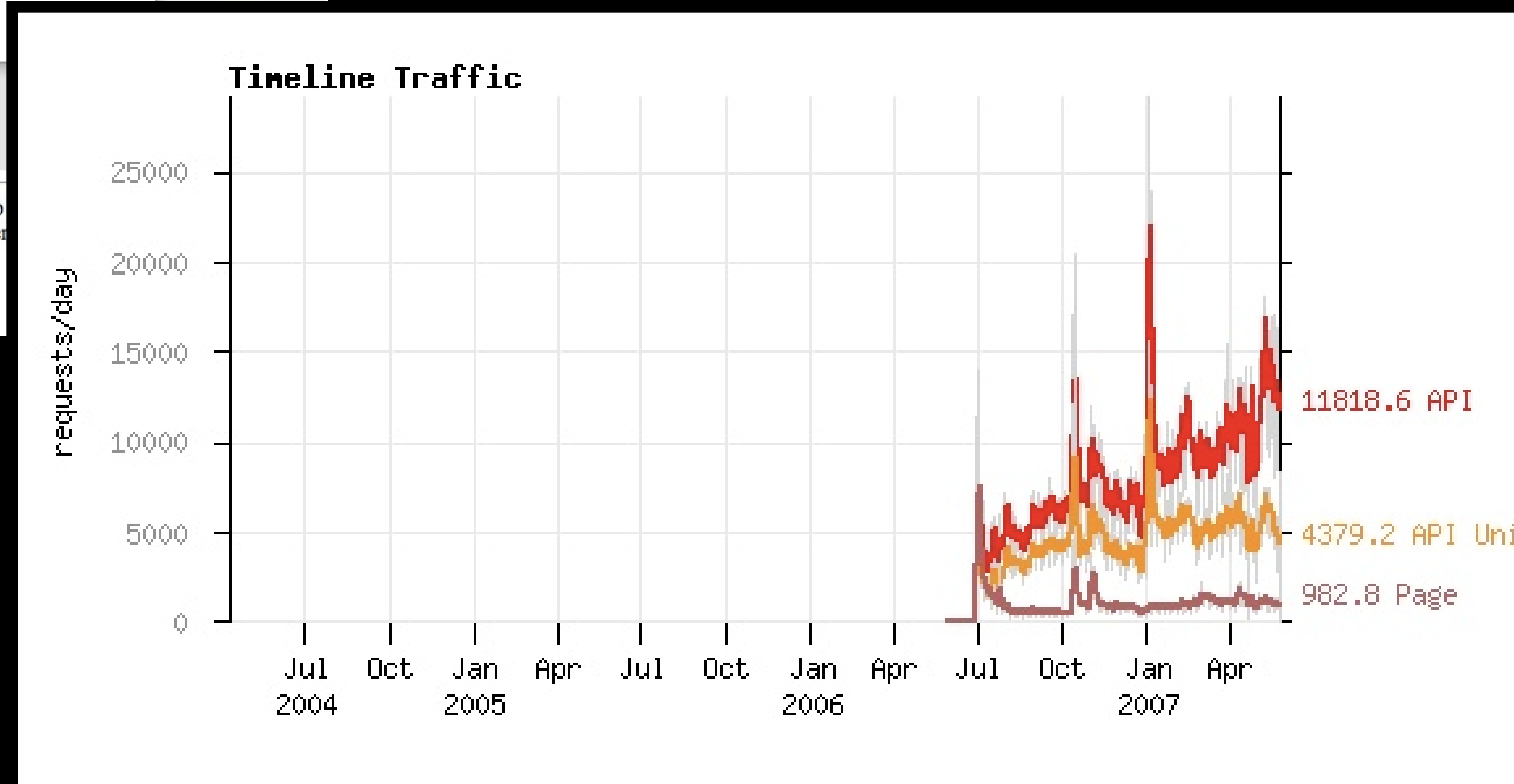
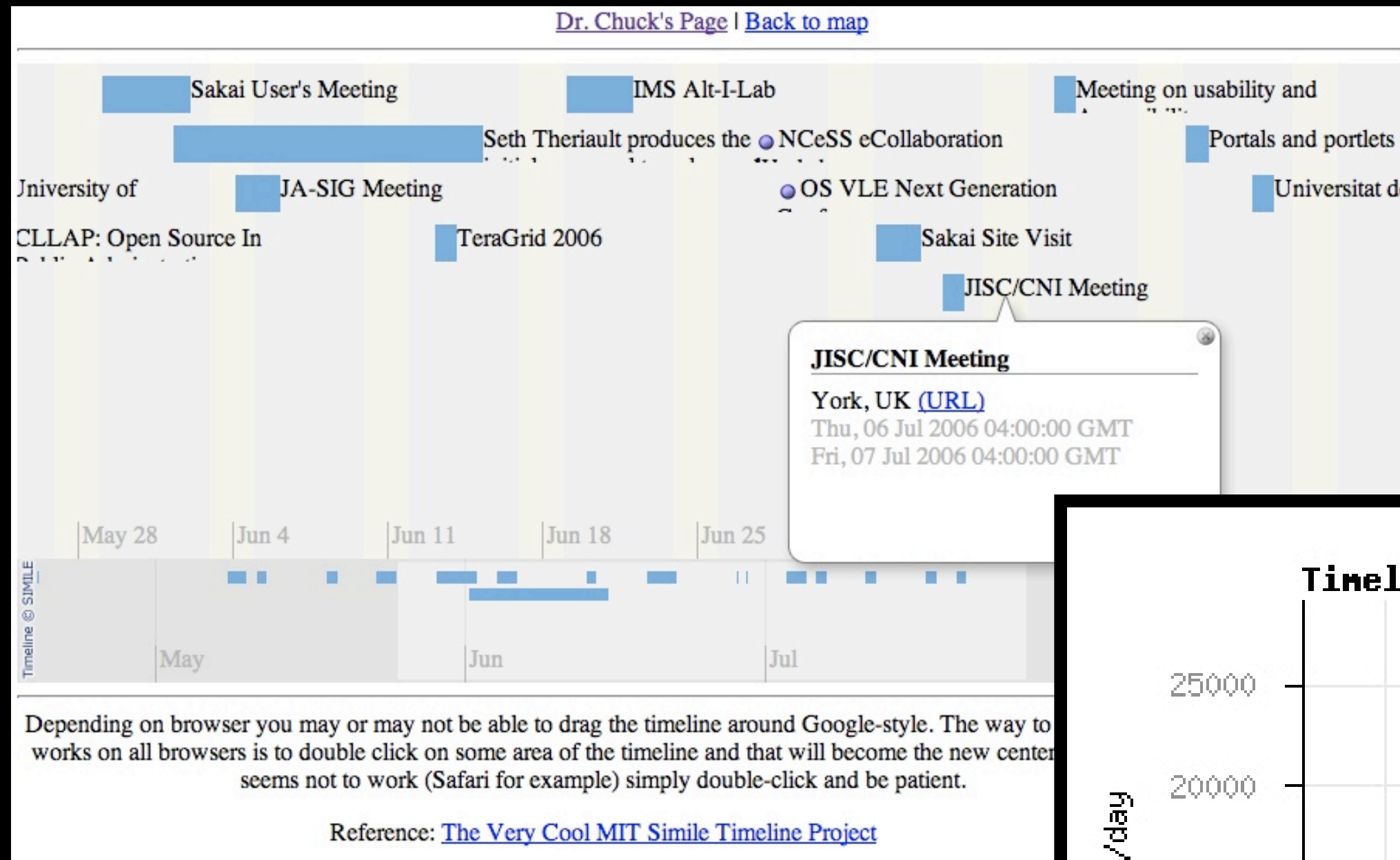


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Maximum Users Supported by Sakai



MIT Simile: Functionality Mashup Traffic





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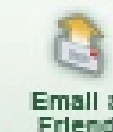
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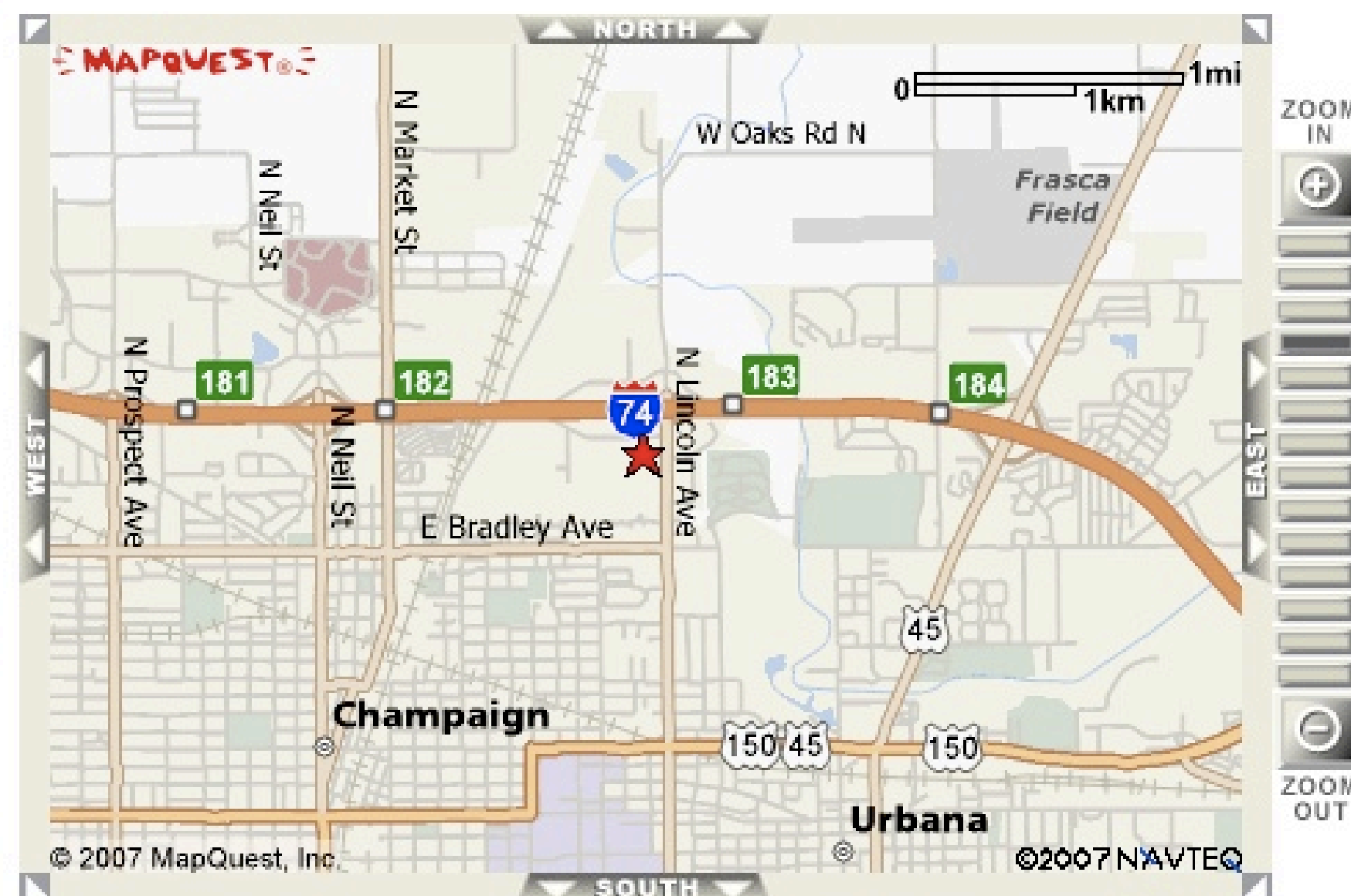
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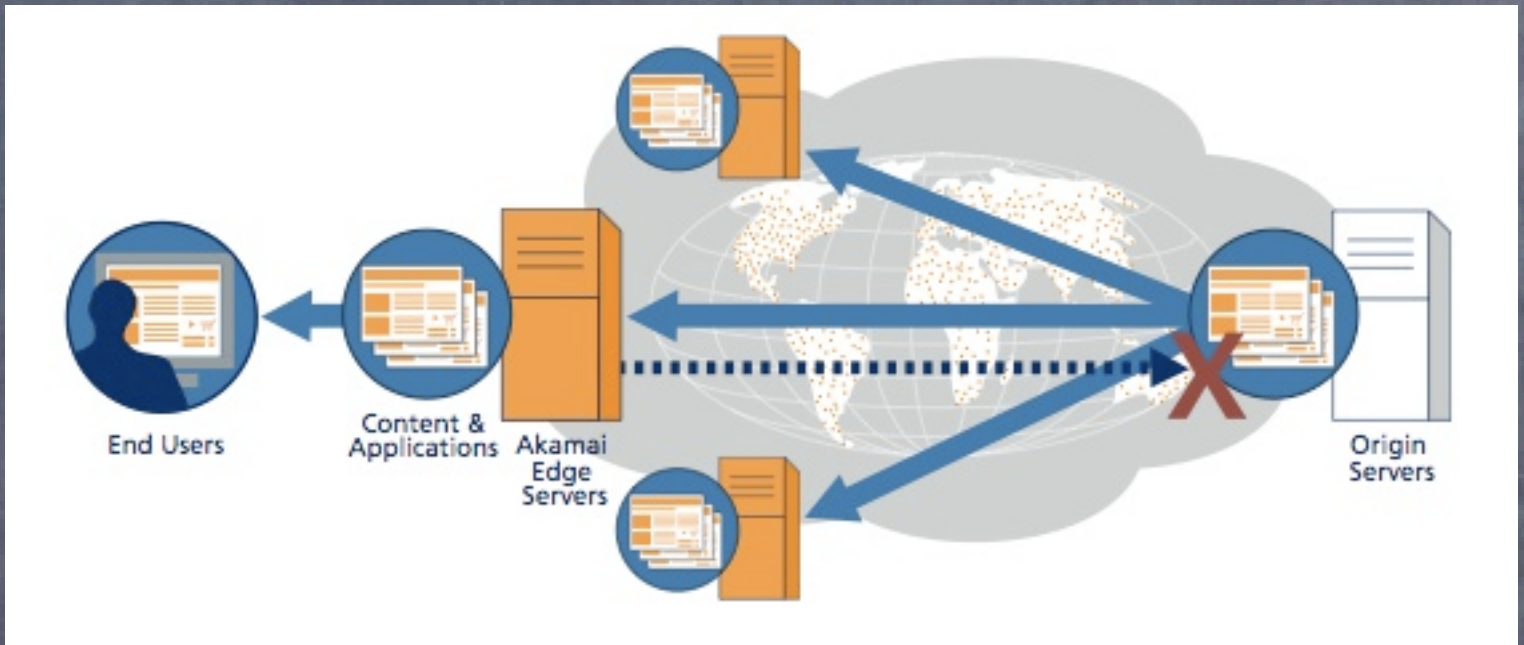
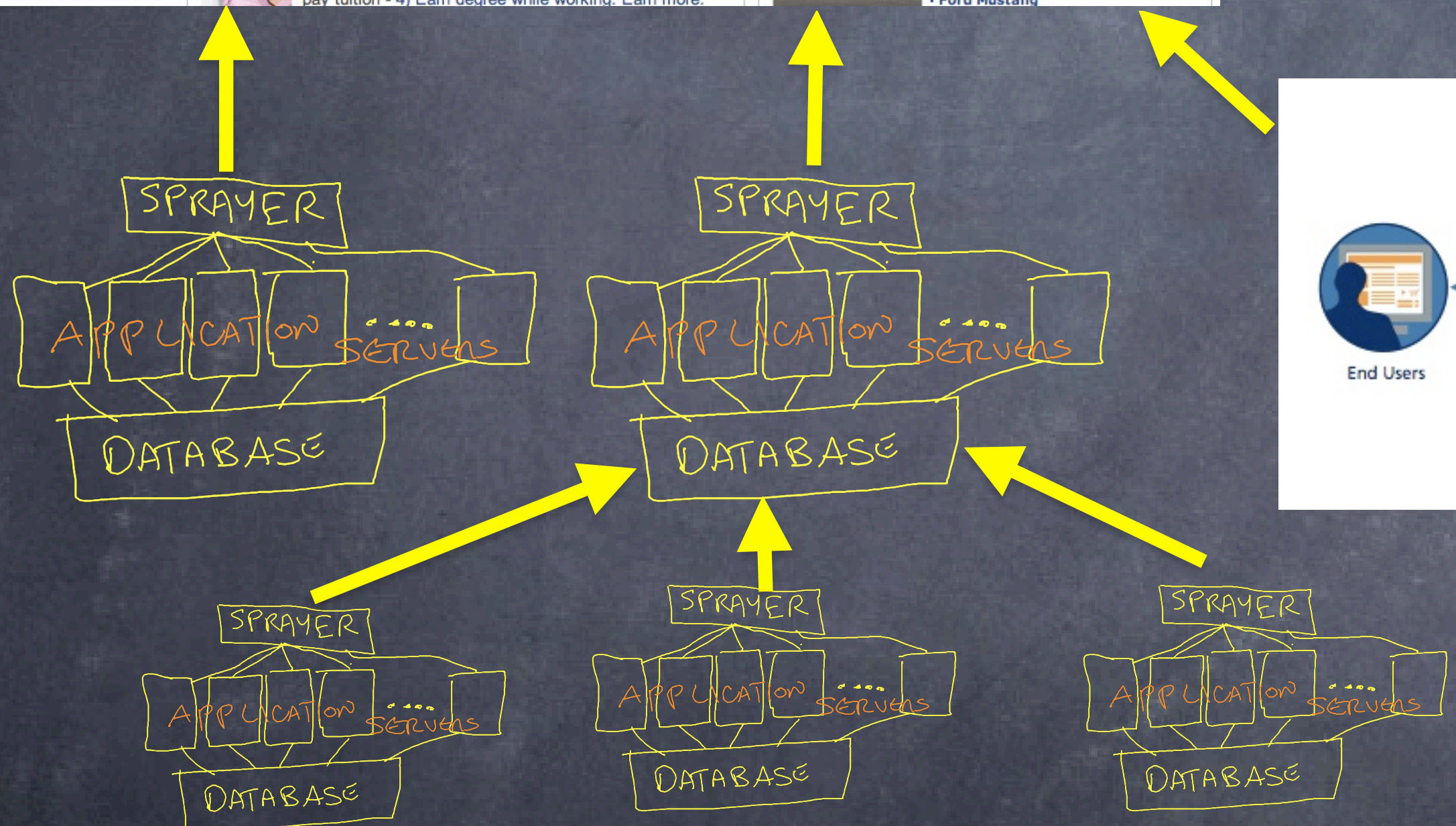
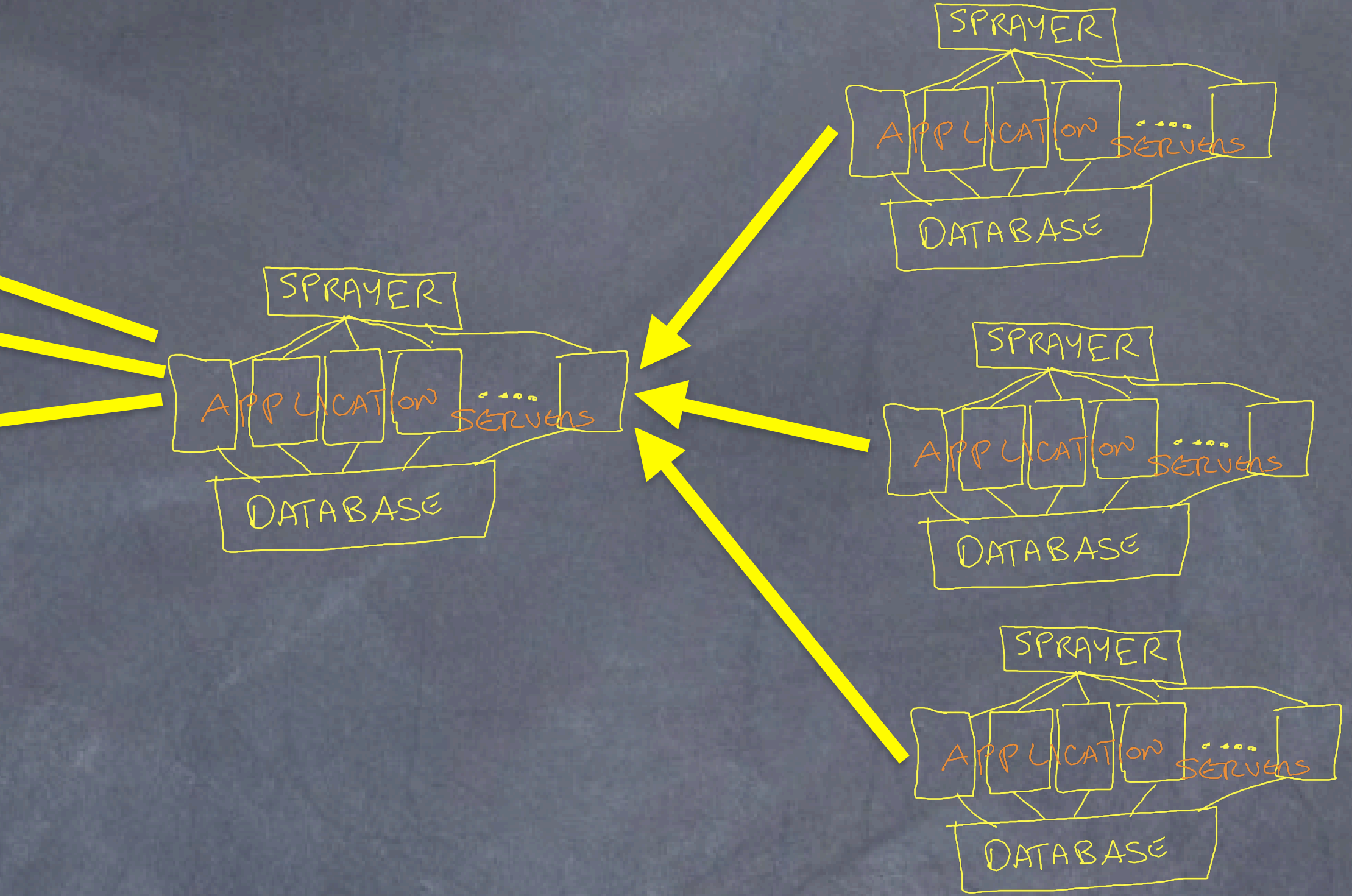
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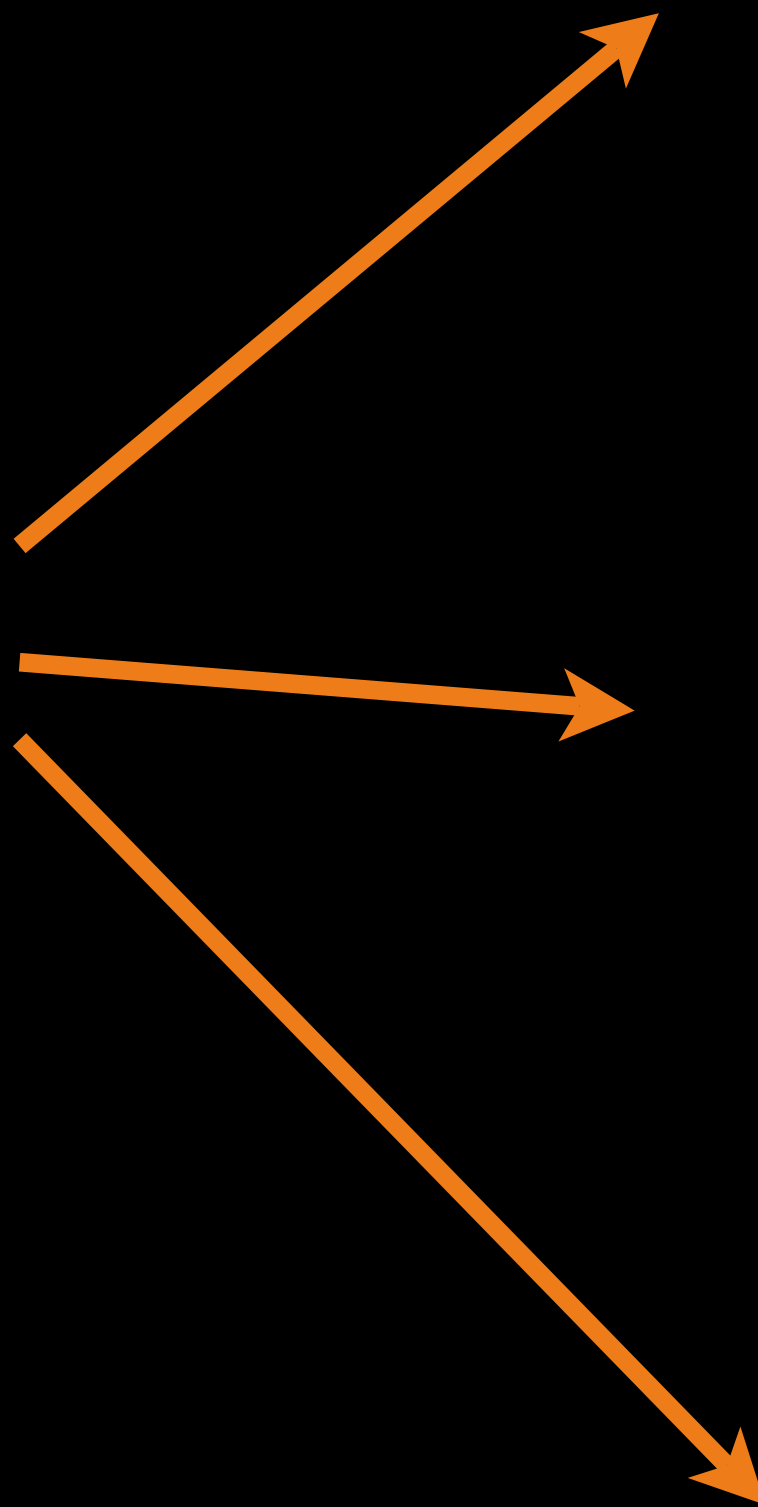




Cloud Architecture

Approaching Functionality Mashup Standards and Technologies

Standards are critical to making functionality mashup something we can commonly use to assemble applications.



?

Functionality Mashup

What is the standards equivalent of "RSS" for functionality mashup?

Background in Standards

- Open Software Foundation (OSF) (1989–90)
- UNIX International (1990)
- IEEE POSIX
 - IEEE P1003.0 / ISO BS ISO/IEC TR 14252 (1990–1997) – Guide to an Open System Environment Reference Model
 - Vice Chair POSIX (1992–1996)
- IEEE Standards Advisory Board
- IEEE Computer Magazine – Column Editor 1994–1998
- IEEE LTSC – (2001 – 2002)
- 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

Sometime in the future we will all look back at January 1998 and laugh about the current conflicts in the technology industry. A hindsight perspective inevitably generates a few chuckles, but it also allows us to recognize that conflict is essential to innovation. Conflict energizes the entire process. If there were no conflict (over market shares, protocols, pricing structures, formats, programming languages, platforms, or standards) innovation would almost certainly stagnate.

While conflict ensures that technology will continue to change and grow stronger, it also ensures a certain forced honesty. As one organization "invades" the turf of another—especially when it comes to standards activities—we get to see the cards held in the hands of the players. It usually takes a few years, however, before we're able to smile at all the poker faces.

THE PAST

While we certainly need to practice laughing about these conflicts, we must

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As one organization "invades" the turf of another, we get to see the cards held in the hands of the players.

try to remember how serious these conflicts seemed during their time. One of the most serious technology wars began with IBM mainframes reigning supreme over all challengers. In the mid-to-late 80s, Unix systems powered by fast RISC processors began to invade the IBM glass houses. Innovative risk-taking organizations tentatively deployed Unix.

Like all great conflicts, there were a great many fans cheering or booing as each skirmish was played out. And within the Unix field itself there were many battles. Versions of AT&T Unix and BSD Unix waged war for shares of the marketplace. Instead of continuing the battles head to head—a course of action that could have crippled all par-

ties involved—the vendors eventually decided to work together, forming the Open Software Foundation (OSF). While nearly all of the Unix vendors joined OSF, not everyone wanted to join. Those abstaining from OSF formed Unix International.

Instead of reducing the intensity of the battles, however, formalizing the conflicts served to increase it. Instead of small wars between individual companies, there were now two Unix superpowers. The fight for the control of the operating system of the future was on. The major battle of the Unix wars—I call it Unix War I—was the Motif versus Open Look conflict, a multiyear conflict about the shape of some buttons and whether or not the outlines of windows should have a 3D look.

Don't laugh. This was really serious business and kept many software developers on the sidelines for several years, waiting for one or the other of the technologies to win.

At the time, the two combatants were so engrossed in launching press releases at each other that they failed to notice that Microsoft was developing a graphical interface and application suite that ran on the lowly Intel processors. Instead of focusing on the deployment of a low-cost PC-based desktop with good applications, the Unix vendors waged war over the \$40,000 workstation market that was about to become much less significant. By the time they stopped fighting and began to work together, the battle for the desktop operating system was over without a single shot being fired.

Interestingly, though, by the end of the warfare both sides adopted the best features from each other. Standards organizations like IEEE Posix and X/Open continuously produced standards that broadened the "least common denominator" between different Unix versions.

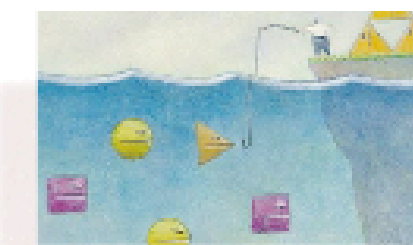
Because of cross-pollination—due to competition and intense standards development—Unix emerged as the most completely specified multivendor computing environment ever produced. The Unix-based standards have had some impact on all remaining viable operating systems, including MVS, VMS, Unix, and NT.

IEEE 754: An Interview with William Kahan

If you were a programmer using floating-point computations in the 1960s and 1970s, you had to cope with a wide variety of configurations, with each computer supporting a different range and accuracy for floating-point numbers. While most of these differences were merely annoying, some were very serious. One computer, for example, might have values that behaved as non-zero for additions but behaved as zero for division. Sometimes a programmer had to multiply all values by 1.0 or execute a statement such as $X = (X + X) - X$ to make a program work reliably. These factors made it extremely difficult to write portable and reliable numerical computations.

In 1976, Intel began to plan for a floating-point coprocessor for the Intel 8086/8 and i432 microprocessors. John Palmer convinced Intel that they needed to develop a thorough standard to specify the arithmetic operations for their coprocessor so that all Intel processors would produce the same results. Because William Kahan had extensive experience with the IBM, Cray, and Control Data Corp. (CDC) floating point, he was one of the few who understood the challenges of writing accurate numerical code. In 1976, Kahan's influence on floating-point processing escalated when Intel

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I think that it is nice to have at least one example—and the floating-point standard is one—where sleaze did not triumph.

hired him as a consultant to help design the arithmetic for the 8087 processor.

As a result, he had a hand in the birth of the IEEE 754 specification for floating-point computations.

—Charles Severance

THE BEGINNING

Charles Severance: When Intel hired you as a consultant in 1976, what did they want you to do?

William Kahan: The folks at Intel decided that they wanted really good arithmetic. The DEC VAX was really not that bad, so my reasoning went: Why not copy the VAX? Intel wanted the best arithmetic, so Palmer and I got together to think about what the best arithmetic should be. One of the things Palmer told me was that Intel anticipated selling these coprocessors in very large numbers. The best arithmetic was what was best for a large market, which subsequently started to frighten Silicon Valley because of

rumors that Intel was building floating point on a single chip, the i8087. And when they heard rumors of what was going to be on that chip, they were aghast.

CS: Out of this thinking grew IEEE 754?

WK: People have said from time to time (as a joke) that the other Silicon Valley companies got worried and joined the IEEE 754 working group. I realized at this first meeting that the members of the committee were very serious. CDC didn't bother to attend that meeting in November 1977 because it was a microprocessor committee—they had no idea that microprocessors would mean anything at all. Cray felt the same way. IBM was only there in an observer capacity—they knew microprocessors were coming but they couldn't say much.

CS: What were the meetings like?

WK: One of my friends said that attending one of these meetings was like a visit to the Grand Canyon: just awesome. In the usual standards meeting everybody wants to grandfather in his own product. I think that it is nice to have at least one example—and the floating-point standard is one—where sleaze did not triumph. Cray, CDC, and IBM could have weighed in, if they wanted to, and destroyed the whole thing. But CDC and Cray must have thought, "Microprocessors. Why worry?"

CS: What happened next?

WK: After the first meeting, I went back to Intel and asked to participate in the standards effort. Then Jerome Kuanan, Harold Stone, and I prepared a draft document of the Intel specification in the format of an IEEE standard and brought it back to an IEEE 754 meeting.

CS: Were there any complications?

WK: I got Palmer's verbal permission to disclose the specifications for the non-transcendental functions on the chip, but not the specifications for the architecture. I could describe the precision, exponent ranges, special values, and storage formats. I could also disclose some of the reasoning behind the decisions. We didn't say a word about the i8087's transcendental functions—I had to bite my tongue. [Commonly used transcendental functions include sine, cosine, loga-

Grab the Chance to Work on the Leading Edge

Charles Severance, Michigan State University

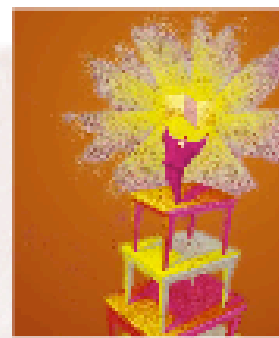
Each year I make a point to impress on my students the importance of standards to their career. I really want to cultivate in these young engineers a strong desire to participate in standards, because I myself have benefited so much from the experience.

Through my standards work, I have had a chance to travel and meet some of the sharpest engineers in the world. So I tell my students that by far the most important reason for an engineer to participate in standards is personal growth. The opportunities for networking and learning are endless.

The classic reason to attend standards meetings is to represent your organization when its technology is directly involved. But standards-setting is not simply about winning battles; it is about building consensus. To thrive in this environment, an engineer must be able to argue for a position on the basis of technical merit alone.

Even if your organization is not involved in the standards at hand, attending and participating in standards meetings is an excellent way to track emerging technologies. When I attended Posix meetings, I would spend a great deal of time outside the meetings talking about technology and future trends.

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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 with new perspectives on the technical problems I was facing. At times, my staff thought I had a crystal ball on the future, though I always told them I was just a lucky guesser.

Another benefit of participation in standards is achieving a more global perspective. Engineers from all over the world participate in standards-setting. Joining others in the work of forging an international consensus is an excellent way to develop a global awareness. And there may even be a chance to travel internationally.

To be frank, the cost of standards attendance is significant. Michigan State University spent about \$8,000 a year so that I could attend Posix. But the value to my career at MSU has been immeasurable. Without ever having to change jobs, I've been able to maintain career growth.

TO FIND OUT MORE

To find out more about how to get involved, start at the IEEE Web site, <http://www.standards.ieee.org>. Or explore the American National Standards Institute (<http://www.ansi.org>), the Internet Engineering Task Force (<http://www.ietf.org>), and the International Standards Organization (<http://www.iso.org>) sites.

Note that Web pages devoted to a working group are designed for use by the working group, not necessarily for the casual surfer. Poke around for the meeting announcements. If you have a question, don't hesitate to send an e-mail to the chair. Chairs are always glad to have new people attending the meetings. Some larger groups—IEEE 802 and IETF, for example—even offer orientation sessions.

TIPS FOR SUCCESS

Standards meetings are not like conferences. Unless you get involved, you won't learn and you won't meet or interact with anyone. Unless you have some role and some work to do, the meetings will become extremely boring. Here are a few tips to build your interest.

First, volunteer to take notes or minutes. The secretary role is my favorite. You don't have to fully understand what's going on, and taking minutes forces you to learn at least some of the material.

Volunteer to review material, such as draft documents. Even if you are starting out, your input is valuable to these groups. These draft documents are supposed to be written so that an engineer in the field can understand them. If you can't understand them, there is a good chance the material is not written well.

Finally, acquire some understanding in the topic area before you go to the meeting. Don't expect to be offered a tutorial. Conversations at standards meetings are narrowly defined and very deep.

Standards groups often find themselves working close to the edge of known technology. To arrive there, you need to have a strong focus. If the first group you attend is not working on something that interests you, move on.

But if you are willing to get involved, the networking, learning, and mentoring opportunities are endless. And the travel is not bad either. ♦

OSI Retrospect and Prospect

Jerry Foley, Epcom Corporation
Charles Severance, Michigan State University

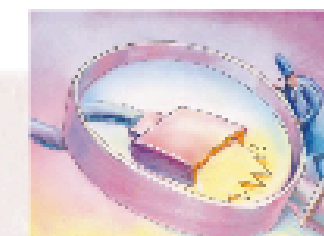
At a recent IEEE meeting, I struck up a conversation about OSI networking with Jerry Foley. As we talked, it occurred to me that enough time may have passed to talk openly about the myths and reality regarding the ISO OSI networking efforts and how they relate to TCP/IP networking as the two technologies evolved over the late 1970s and 1980s. In late 1976, working within the ANSI Information Systems infrastructure, Foley was authorized to write a study on "standards for distributed information systems." From this study ANSI's Open Systems Interconnect standards committee evolved, and for the next 16 years Foley served on the committee, about 12 of them as chair. Foley was a US delegate to ISO OSI committees and he represented the US State Department to the CCITT work on ISO. He also served as liaison to the Manufacturing Automation Task Force, which implemented OSI, and managed MAP implementations in General Motors plants.

—Charles Severance

How much effort went into developing OSI?

The US OSI committee involved more than 140 people. We met at least six times a year, one to two weeks at a time,

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

and we continued the work in our home offices and labs. The first ISO OSI meeting brought about 40 people to Washington, D.C.; we all fit in one room. Later, meetings were held concurrently in Vienna, Paris, and London to accommodate all the delegates. Representatives of 17 countries eventually made up ISO OSI. Delegates came from industry, government agencies, universities, and consultants under contract to governments. One or more ISO OSI technical groups would be meeting somewhere in the world on more than 40 out of the 52 weeks of the year, frequently with overlapping meetings.

Were OSI committee members aware of ARPANet, SNA, DECNet, and others?

Yes, many US OSI people were also developers of these systems, users, or had continuing liaisons with the respective organizations. They ensured the OSI groups' awareness of these other network technologies.

How did the OSI folks view TCP/IP at the beginning?

We saw a fundamental difference in scope. To us, OSI was an international system of standards to provide complete support for cooperating, interconnected computer systems. TCP/IP was viewed as a data-communications networking system. OSI was predicated on attaining error-free performance using an international mix of underlying transmission services—including some of very low quality. TCP/IP was perceived to be based on the higher quality US transmission capabilities. Most important, TCP/IP was viewed as a US Defense Department system that would therefore not be acceptable in international work.

Why did OSI gain such strong support?

The then-new information systems networking technology was being developed as proprietary systems and so was not interoperable. Coincidentally, there was a demand for standards to facilitate cooperating processes independent of platforms. Large users and computer manufacturers supported the demand with resources. Initially, it was the US, the UK, and European countries that supplied enough highly qualified technical people to give OSI momentum. Participation then snowballed because no company or country that wanted a major role in information processing could stay away.

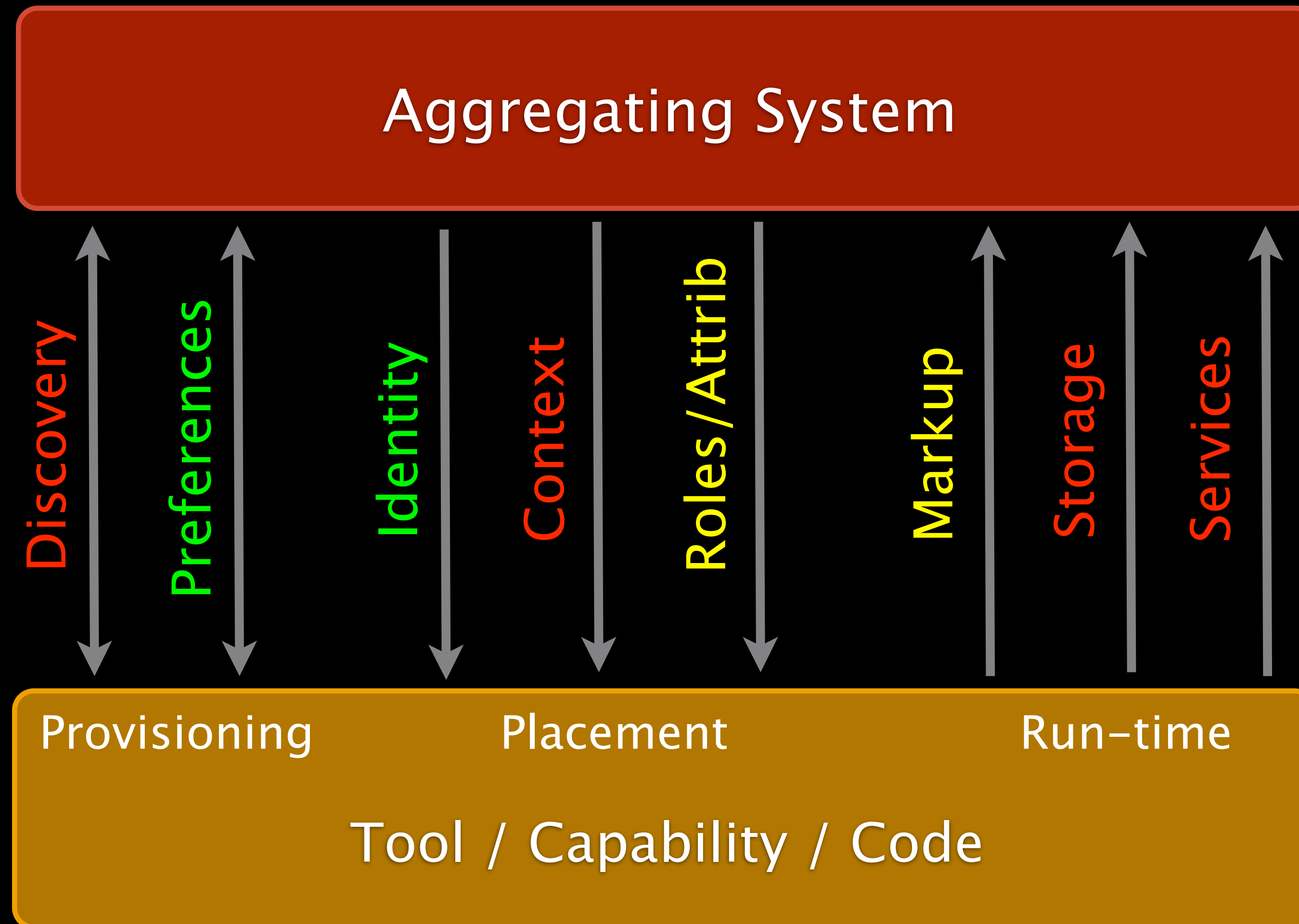
What were the barriers to acceptance?

OSI penetrated too deeply in too many vendors' proprietary interests. This kept the vendors from giving their full support to OSI in the area of delivering OSI to customers on their systems.

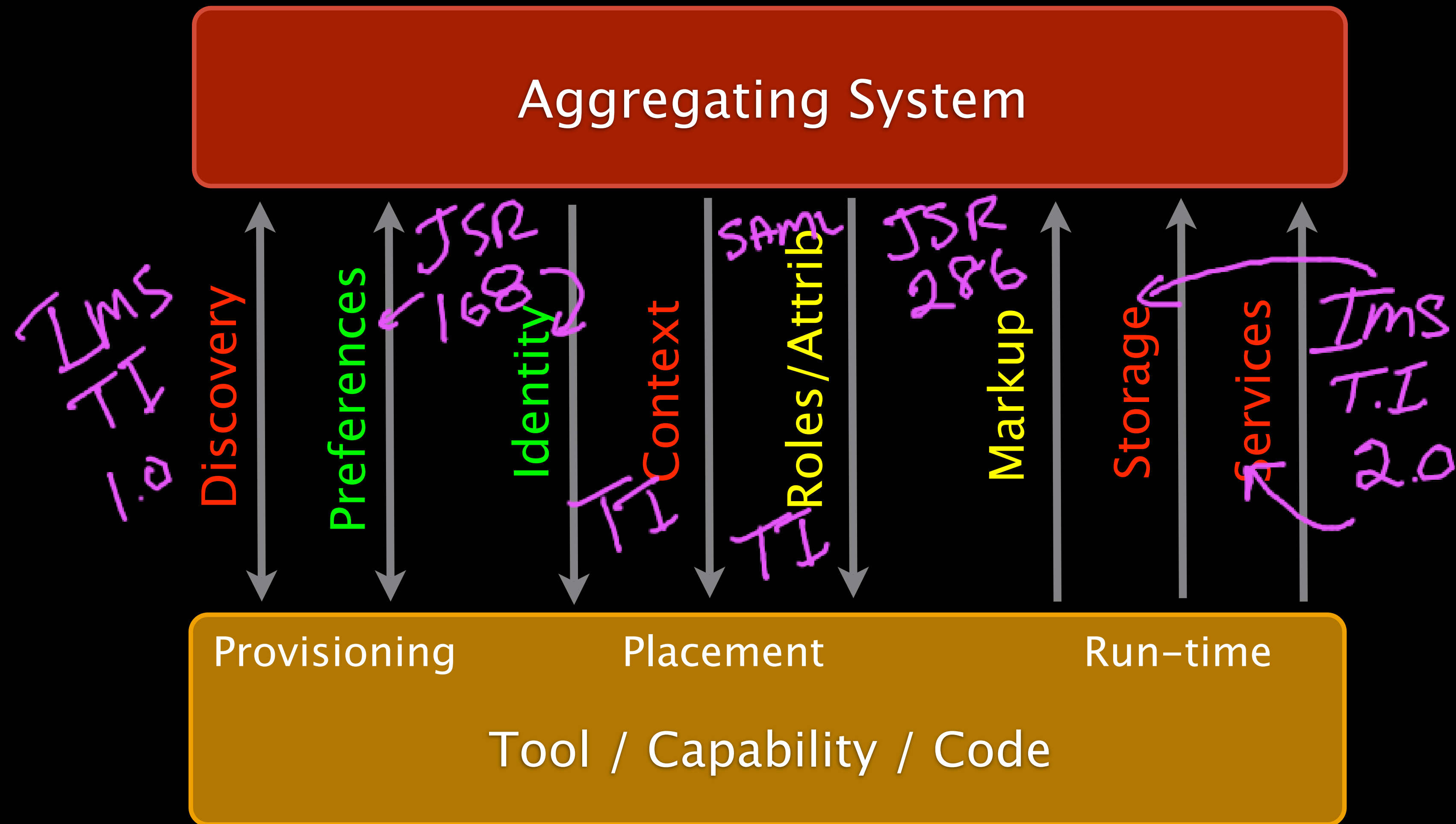
While many people think that OSI was too late, this is overemphasized as a barrier. In 1984, full OSI implementations were networked in a demonstration by the multivendor MAP consortium. At that time, the Internet had not yet become the de facto worldwide network.

However, this does not mean that the ANSI and ISO administrative structures were particularly quick, either. These groups were organized to produce blue-ribbon standards. Their operating procedures required multiple approval cycles, and most committee communications and balloting had to be done by reg-

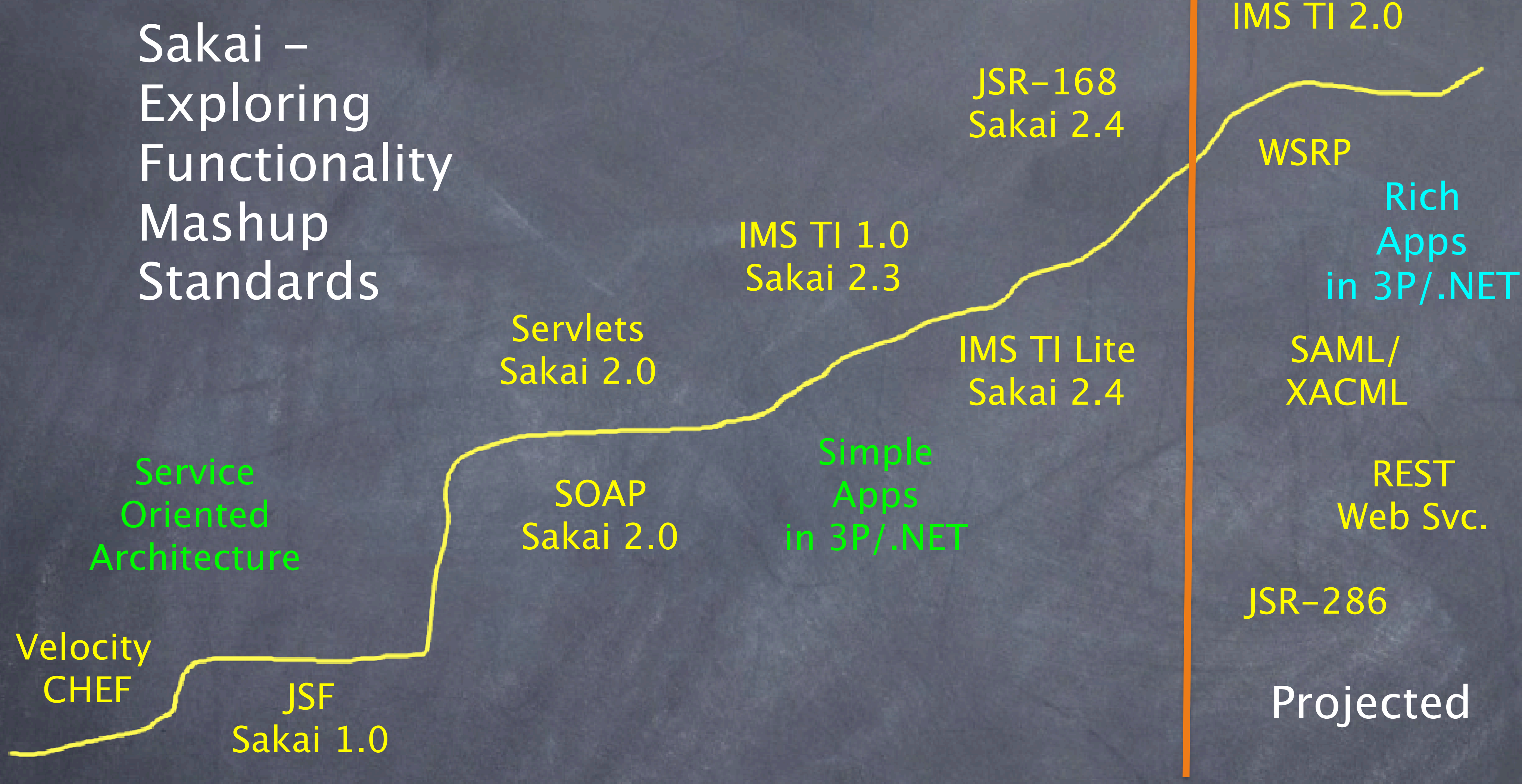
Functionality Mashup Technical Needs



Functionality Mashup Technical Needs



Sakai – Exploring Functionality Mashup Standards

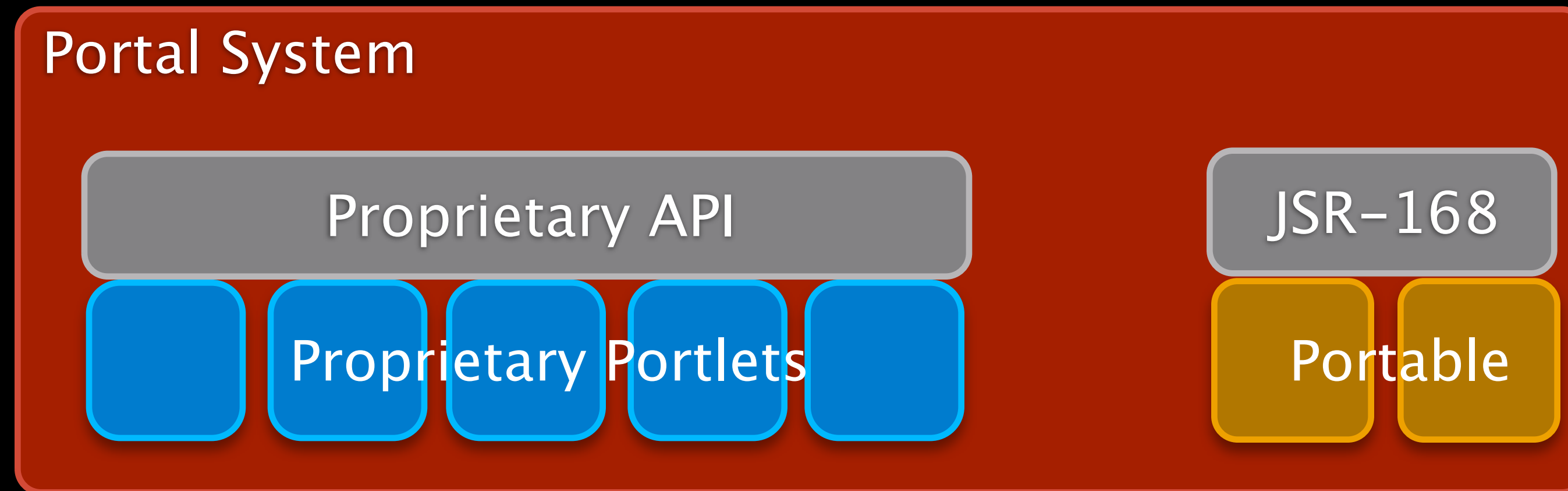


Time ->

Standards for Functionality Mashup

- The next several years are likely to see significant improvement in the standards around functionality mashup
 - JSR-286 – Portlet API Version 2.0
 - WSRP 2.0 – Web Services for remote Portals
 - IMS Learning Tool Interoperability 2.0
 - JSR-170 – Java Content Repository
- To make these standards truly useful – it will be necessary to have many eyes on the standards – and have many people trying to use the standards while they are still in development
- We also need to develop easy-to-use libraries in PHP, Perl, Python, etc to make innovation as approachable as possible.

Modern Portal “Architecture”



All portal containers provide their own APIs for things that are not provided for in the JSR-168 standards. Their own portlets make heavy use of these APIs and most developers just starting out simply write to the proprietary API because it is faster and more powerful. As a result, organizations quickly become locked into a single portal – and even worse – the portlets they produce only work in one portal.

JSR-168 – The Portlet API

- Strengths

- Compared to some frameworks, Portlets are like easy to write
- Good support for light-weight persistence in the form of properties
- Reasonable support for AUTHN, User Directory, and AUTHZ but lacking convention across vendors

- Weaknesses

- Not portable at a binary level
- HTML is not well-constrained – The only presentation standard for JSR-168 is a very weak CSS section
- No provision for any kind of service oriented architecture

- Conclusion: JSR-168 portlets are **great** for some things

When to use JSR-168 in Sakai?

- iFrame Portlet
- Web Clipping Portlet
- RSS Client
- WSRP Consumer
- A UI that calls backend web services for something like Fedora
- A simple Google Map Tool

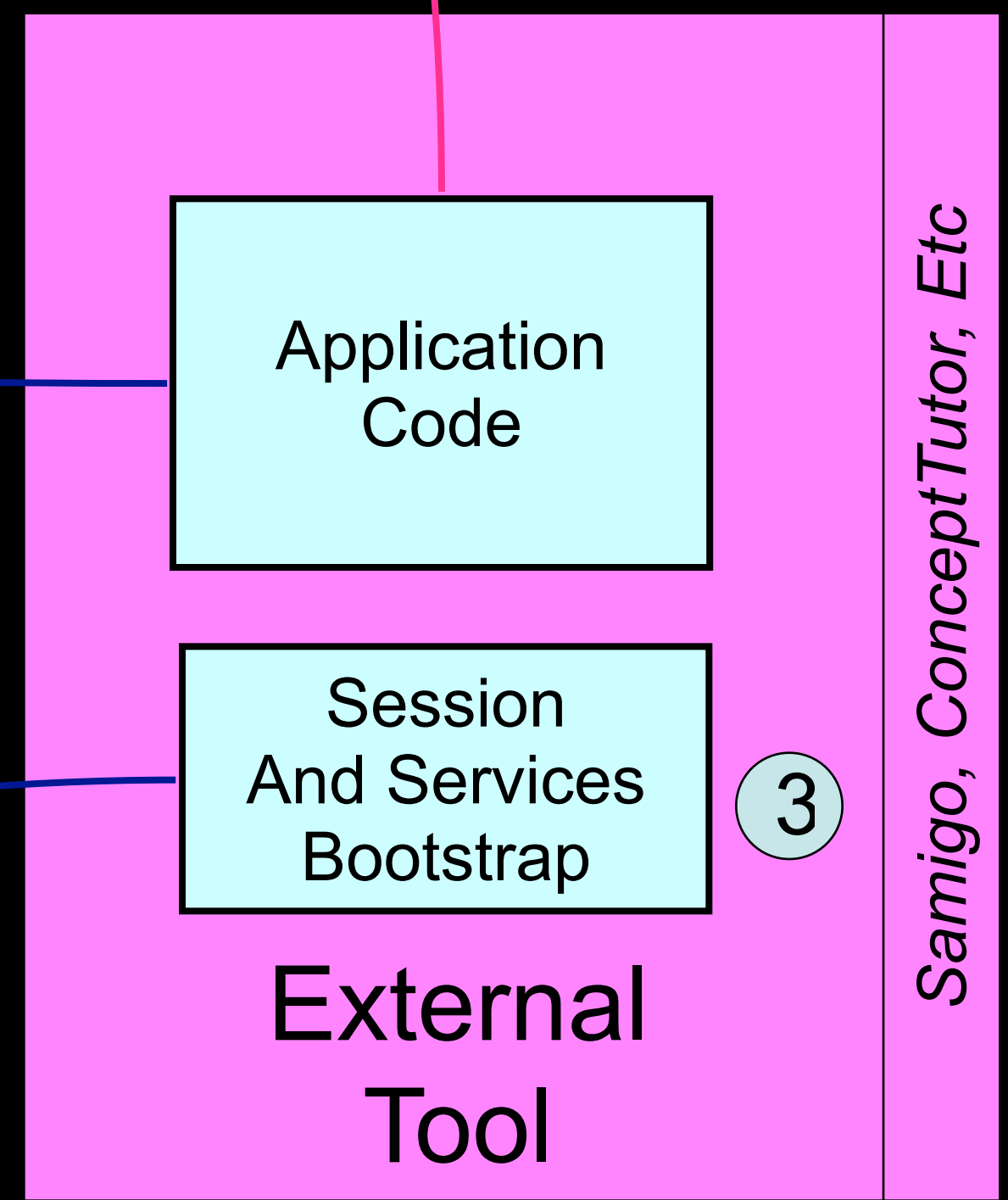
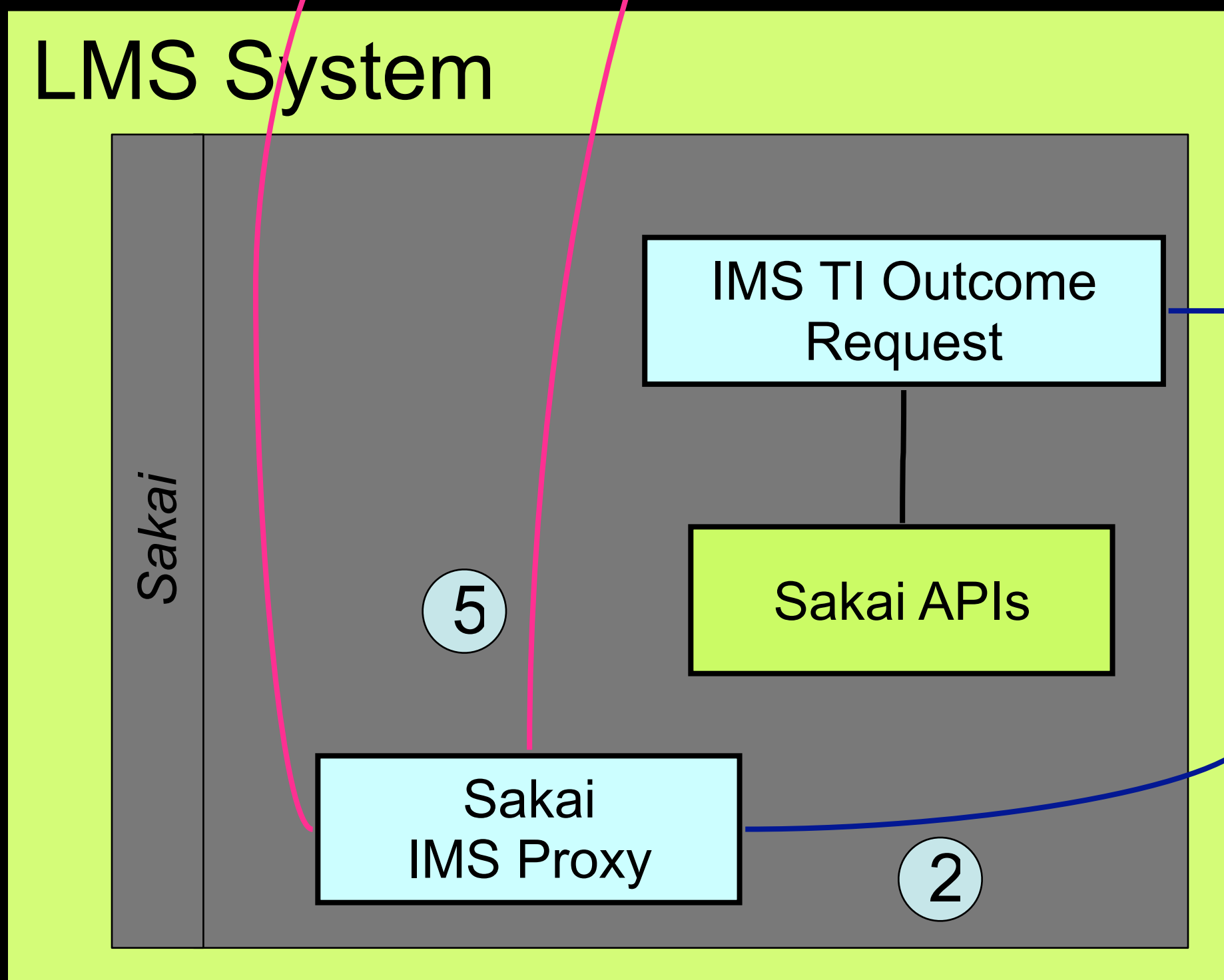
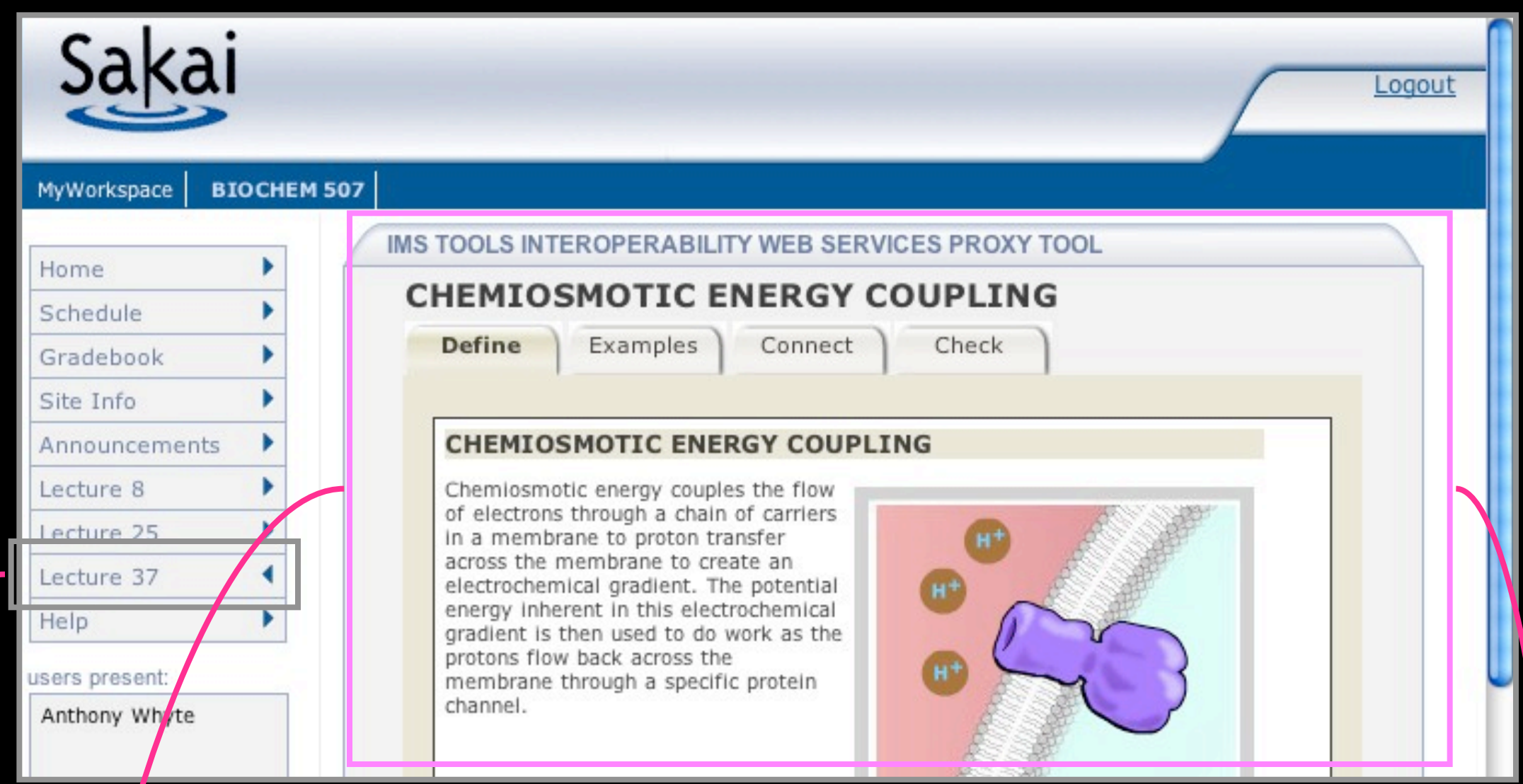
- Think of things that have persistence needs of 5-10K per placement – use properties for storage and edit mode for configuration.

IMS Tool Interoperability

- Focus is on making tools portable between systems (Sakai, WebCT, and Blackboard)
- Established to further the discussion with commercial and other CMS/CLE providers
- Can be done “organically” – Web 2.0 style
- IMS Tool Interoperability Version 1.0
 - Uses web services and IFRAMES
 - Roughly based on WebCT PowerLinks
 - Does not require tools to be written in Java
 - Currently in contrib space in Sakai
- IMS Tool Interoperability Version 2.0
 - Work is underway – significant increase in scope

How IMS Tool Interoperability Works

Sakai
Blackboard
WebCT
Angel



Outcome

Launch

Samigo, ConceptTutor, Etc

Pluto Portal

http://localhost:8090/pluto/portal//IMS%20Tool%20Interoperability/_pm0x3in

Sakai Collab Source Bugs Confluence Pluto S:8080 PDA uP3 Desiderata GVideo IMSTI DNS Devbox Gmail Band

APACHE PLUTO

Logout

Navigation:

IMS Tool Interoperability (JSR-168)

Add Merge Fields Permissions

Calendar by Week

View

Apr 15, 2007 - Apr 21, 2007 EDT

< Previous Week Today Next Week >

Printable Version

Earlier

	Sun 15	Mon 16	Tue 17	Wed 18	Thu 19	Fri 20	Sat 21
8 AM							
9 AM							
10 AM							
11 AM							
12 PM							
1 PM							
2 PM							

http://localhost:8080/portal/pda/b3ab...69-ed4a-4fbf-00be-b2caeb596370/target

http://localhost:8080/portal/pda/b3abd26c-23cl

Sakai Collab Source Bugs Confluence Pluto up3 S:8080 PDA uP3 Desiderata

Sites > IMS TI Testing > IMSTI (?)

Log Out

Tool List

OXIDATIVE PHOSPHORYLATION

Define Examples Connect Check

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:

mitochondrial oxidative phosphorylation

- occurs in the mitochondrion (and some other compartments)
- electrons are passed down the electron-transfer chain
- redox reactions of 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

Close Window

APACHE PLUTO JSR-168 Portlet

Sakai JSR-168 Portlet Sakai Tool

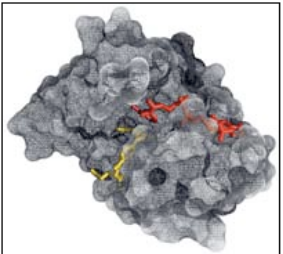
Sakai

Define Examples Connect Check

ACTIVE SITE

The region of an enzyme that binds a substrate molecule and catalyzes its transformation. Also known as the catalytic site. The image shows a net contour model of the enzyme dihydrofolate reductase with substrates NADP⁺ (red) and dihydrofolate (yellow) bound to the active site. An active site has the following attributes:

- a high degree of specificity for its substrate(s).
- weak interactions between substrate(s) and regions of the active site lower activation energy by holding the molecule in position for reaction.
- catalytic groups in the active site lower activation energy by activating the substrates for reaction.
- these enzyme-substrate interactions increase the rate of the reaction.



IMS Tool Interoperability (JSR-168)

Welcome to EndpointTool.php
This is the actual running tool.

```
SiteId= toolInstance.getContextProfile().getSourceId()
LaunchIdentifier= toolInstance.getLaunch().getLaunchIdentifier()
Role= admin
EID=
UserId=
FirstName=
LastName=
```



IMS TI
IMS TI
Lite

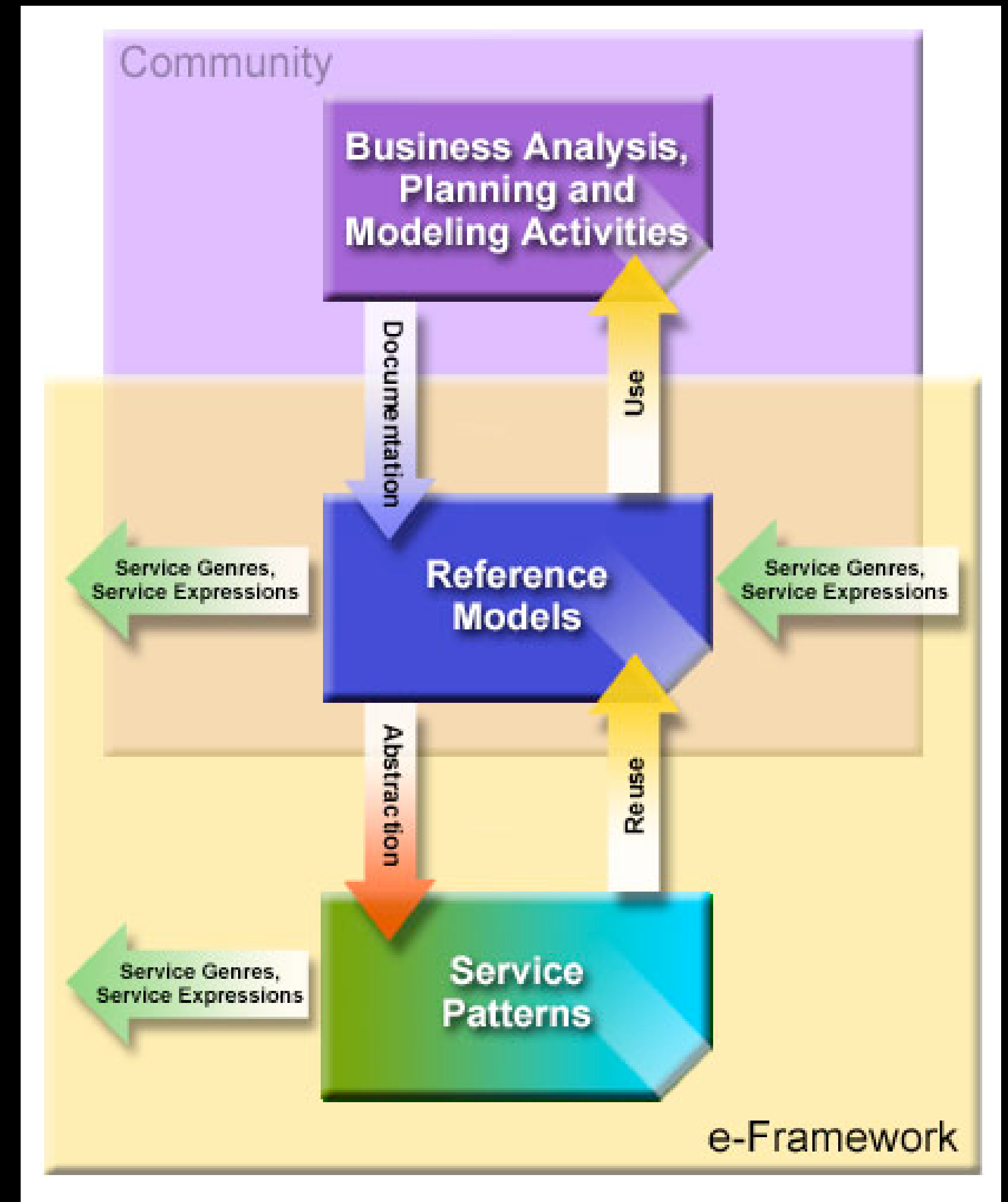
Cross-Application Identity in Sakai

- SAML profiles – Shibboleth and GuanXi
 - SAML = Security Assertion Markup Language
- Shibboleth – Oxford
 - Federated identity for large groups to use a Sakai server with support for distributed AUTHN/AUTHZ
- Guan Xi – University of the Highlands and Islands
 - Allows inclusion of Shib-enabled resources into a Sakai Collaborative Environment
 - Allows elements of Sakai to be used/included in another environment
- Work is in progress

JISC e-Framework

- Sakai is just *one* practical instance of an eFramework for one domain and one set of technologies. The eFramework is not about choosing a particular technology – but instead the eFramework is a context which helps guide, select, and architect architectures and technologies.
- By using the eFramework properly, applications, technologies and standards will evolve over time so as to meet the goals of the eFramework where applications can seamlessly exchange data and interoperate using open standards and interfaces.

www.e-framework.org



Functionality Mashup in a Learning Context



2. In epistolas canonicas

Search

[Options](#) [Advanced Search](#)

Thursday, 29 Mar 2007 You are logged in as: Anonymous Internet User

[Print Resource](#) [Logout](#)

[Store](#) [Layout](#) [Help](#)

Explicit explanatio uenerabilis
 pbr̄i sup̄ epl̄am s̄c̄i petri ap̄t̄i. u. Incipit eū
 expositio sup̄ epl̄am beati ioh̄is primam
V O D · F U I T · A B I N I T I O
 Q V O D A U D I V I M V S · Q U O D V I D I M V S O C U L I S
 Hanc epl̄am beatus ap̄t̄s ioh̄es de fidei & karitatis
 fectiōe con- scripta. laudans deuotionē eor̄ q̄ in unita-
 eccl̄ie p̄seuerabant. por- tate pacē
 sano dogmate turbaba- xp̄m au-
 10 maria n̄ fuisse c̄tendebat. ip̄s̄. ib̄
 q̄d̄e ex suis & ex ipsius d̄ni uerbis c̄substantialē patri filiū affirmat
 hic aut̄ q̄ ad̄no d̄dicit p̄p̄rijs sermonib; dep̄mens. & hereticor̄ stu-
 ciā ap̄lica auctoritate refellens. Unde mox in capite epl̄e diuinita-
 simul & humanitatē uerā eīdē d̄i & d̄ni nr̄i ih̄u xp̄i designat d̄c̄
 15 Q̄d fuit abinitio. q̄d̄ audiui. fuit enī abinitio filius d̄i. s̄. eundē fil-
 di in homine apparentē audier̄t & oculis uiderunt discip̄l̄i. Q̄d u-
 in eū angelo latius explicauit. Nā q̄d̄ hic ait q̄d̄ fuit abinitio. h̄c
 ē q̄d̄ in euāgelio d̄c̄. In principio erat uerbu. & uerbu erat apud

maxime



[Check Transcription](#)



2. In epistolas canonicas

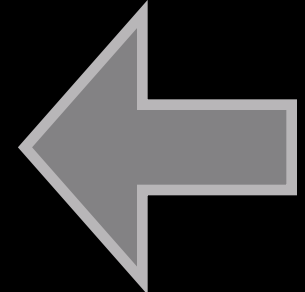
Thursday, 29 Mar 2007 You are logged in as: Anonymous Internet User

Options Advanced Search

Print Resource Logout

Bodington LMS

Enterprise Data

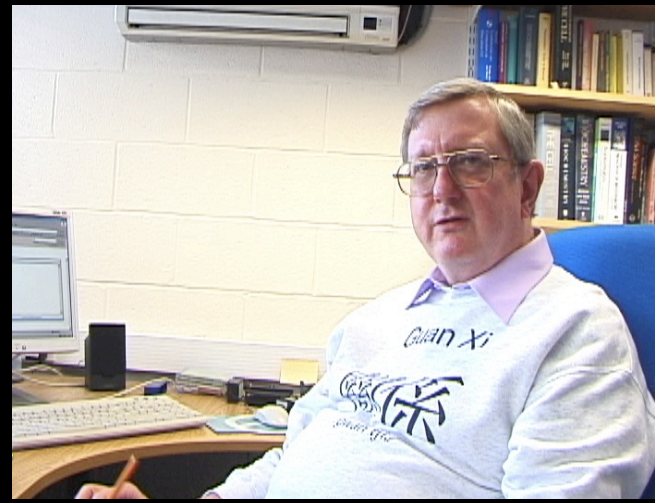


Identity
Roles
Storage

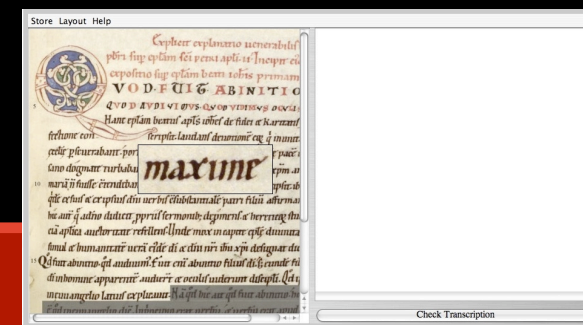
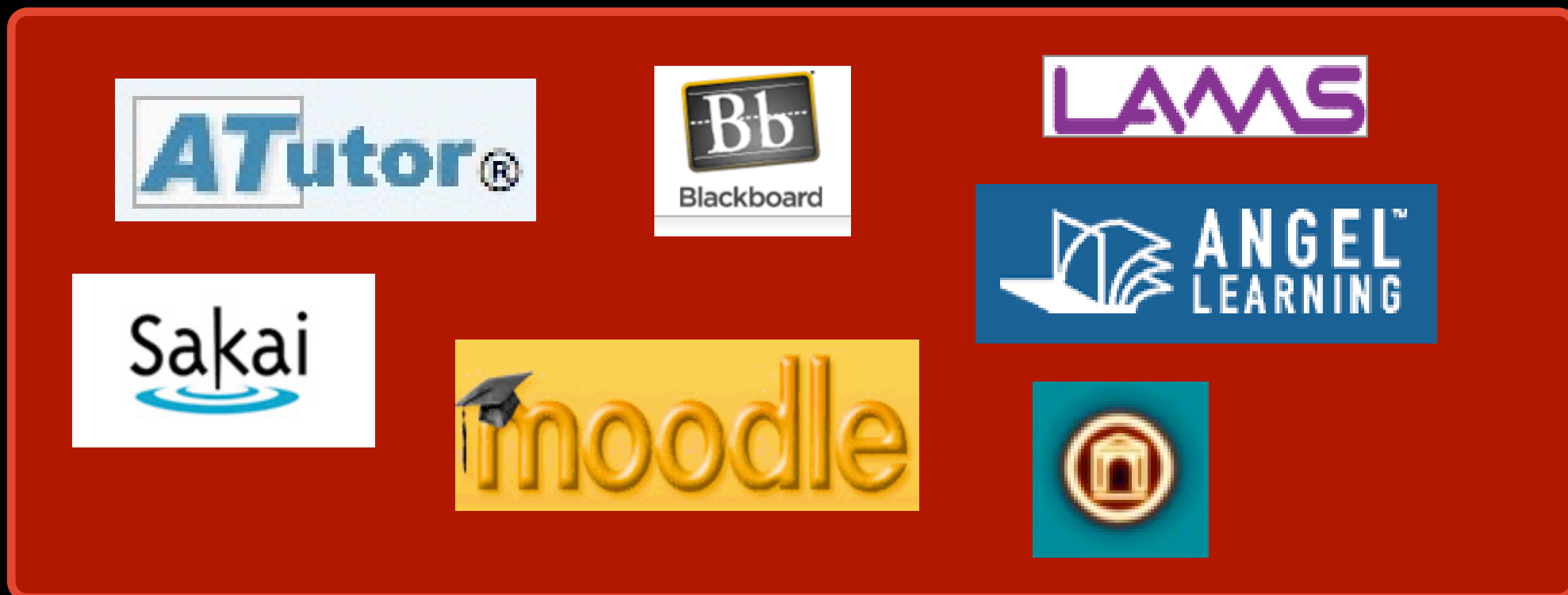
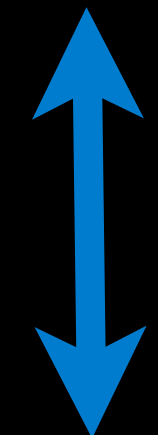
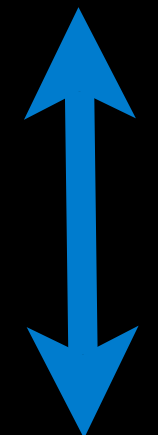
GuanXi
SAML
Waffle Bus

Store Layout Help

Check Transcription



Functionality Mashup Future – Learning



Flickr, Google, YouTube,
Merlot, delio.us

GuanXi Working in Sakai



To access the resource you requested, you must first login to your Identity Provider

<input type="text" value="uhistdnt1"/>	Username
<input type="password" value="*****"/>	Password
<input type="button" value="Login"/>	

Guanxi@UHI Millennium Institute

關係

Example Sakai Announcement Tool - Firefox

File Edit View History Bookmarks Tools Help

http://localhost:8080/weblearn/site/announcement/

Home Space for Matthew Buckett Example Sakai Announcement... Maven 1.x - Handling Dependencies [#SAK-6256] Control the 'Edit site ...

Example Sakai Announcement Tool Public: yes

Webmail | Help | TinyURL | Notify Me | Options | Advanced Search

12/01/2007 You are logged in as: System Administrator (Logout) MyWebLearn Signup

Add Merge Options Permissions

Announcements

View All

Viewing 1 - 1 of 1 items

show 10 items...

Subject	From	For	Date	Remove?
First Announcement Edit	System Administrator	site	Jan 12, 2007 3:38 pm	<input type="checkbox"/>

[Update](#) [Cancel](#)

Prototype of Sakai working in the Bodington Learning Management System

Done

Sakai Research Edition

Where I would like to go in the next few years..

Sakai Research Edition

- NSF Software Development for Cyber Infrastructure (SDCI) – NSF-07503 (applied for – not funded)
- Goals
 - Make Sakai more attractive and easier to use for Scientists on a daily basis – “Surprise and Delight”
 - Make archiving and retention of science activity robust and painless
 - Quick and easy deploy/config – working portal out of the box

<http://www-personal.umich.edu/~csev/papers/2007/>

Sakai Research Edition Deliverables

- RSS Feeds, Synoptic Information, and Event Notification
- Support for Functionality JSR-168, WSRP 1.0, WSRP 2.0, JSR-286
- Federate identity across multiple Instances of Sakai into a single view.
 - Support for Shibboleth/GuanXi built-in
 - Allow federation to happen after the fact
- Dramatically improve E-Mail support in Sakai – make E-Mail a general form of *interaction* with Sakai
- Widgets: Desktop/System Tray Sakai monitors, Apple Widget, PDA/iPhone version of Sakai
- Simple WorkGroup Content Publishing System in Sakai

Sakai Research Edition Deliverables..

- Publish Semantic data models for Sakai elements: Users, Groups, Resources, Files, Sites, Calendars, Announcements, Chats, Threaded Discussion, E-Mail Archive, Wiki, Blog
- Add RDF capabilities to Sakai
 - Able to write RDF-centric tools
 - Able to export Sakai information in RDF format
 - Re-Implement some Sakai services to be Tuple Native
- Use JSR-170 to store files, metadata and tuple-native data

Sakai RSS Feed

feed://192.168.1.103:8080/portal/atom/ Google

D Sakai Collab Bugs Confluence S:8080 PDA Portal Mambo Desiderata GVideo

Sakai RSS Feed

2 Total

Gateway Today, 01:41 PM

Server Status, Sakai Administrator, Feb 19, 2007 1:41 pm [Read more...](#)

PDA in Sakai Today, 01:31 PM

This is an Announcement, Sakai Administrator, Feb 19, 2007 1:31 pm [Read more...](#)

PDA in Sakai

feed://192.168.1.103:8080/portal/atom/snork/ Google

D Sakai Collab Bugs Confluence S:8080 PDA Portal Mambo Desiderata GVideo

PDA in Sakai

7 Total

Resources Today, 02:13 PM

[Read more...](#)

Schedule Today, 02:13 PM

[Read more...](#)

Wiki Today, 02:13 PM

[Read more...](#)

NumberGuess Today, 02:13 PM

[Read more...](#)

Discussion Today, 01:33 PM

Topic, Sakai Administrator, Feb 19, 2007 1:33 pm [Read more...](#)

Chat Room Today, 01:31 PM

Yo Fellows, Sakai Administrator, Feb 19, 2007 1:31 pm [Read more...](#)

Search Articles:

Article Length:

= =

Sort By:

[Date](#)

[Title](#)

[Source](#)

[New](#)

Recent Articles:

[All](#)

[Today](#)

[Yesterday](#)

[Last Seven Days](#)

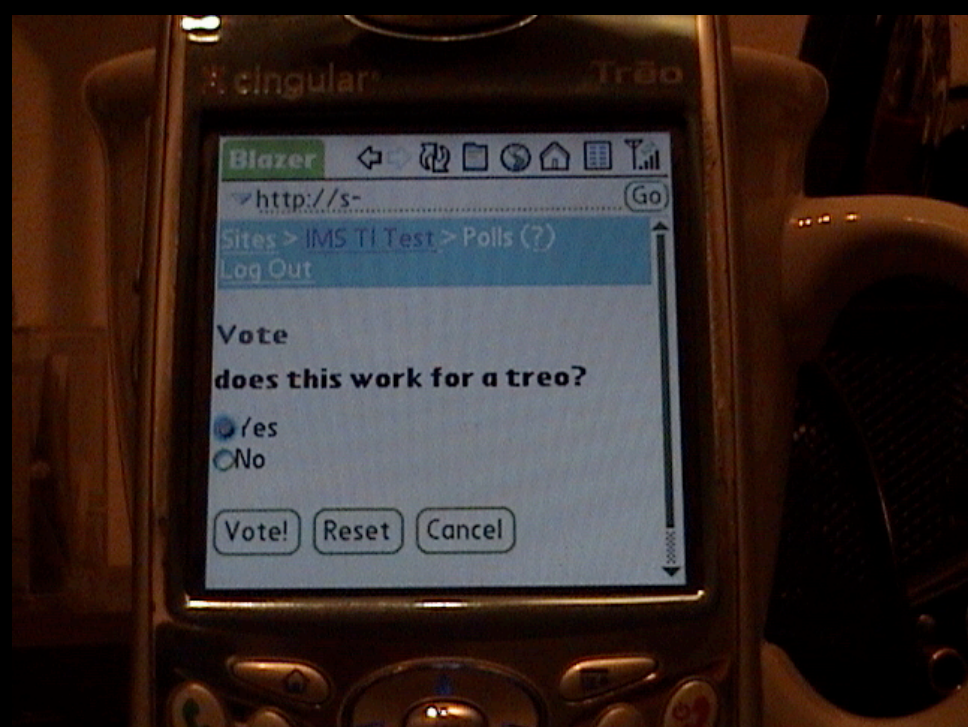
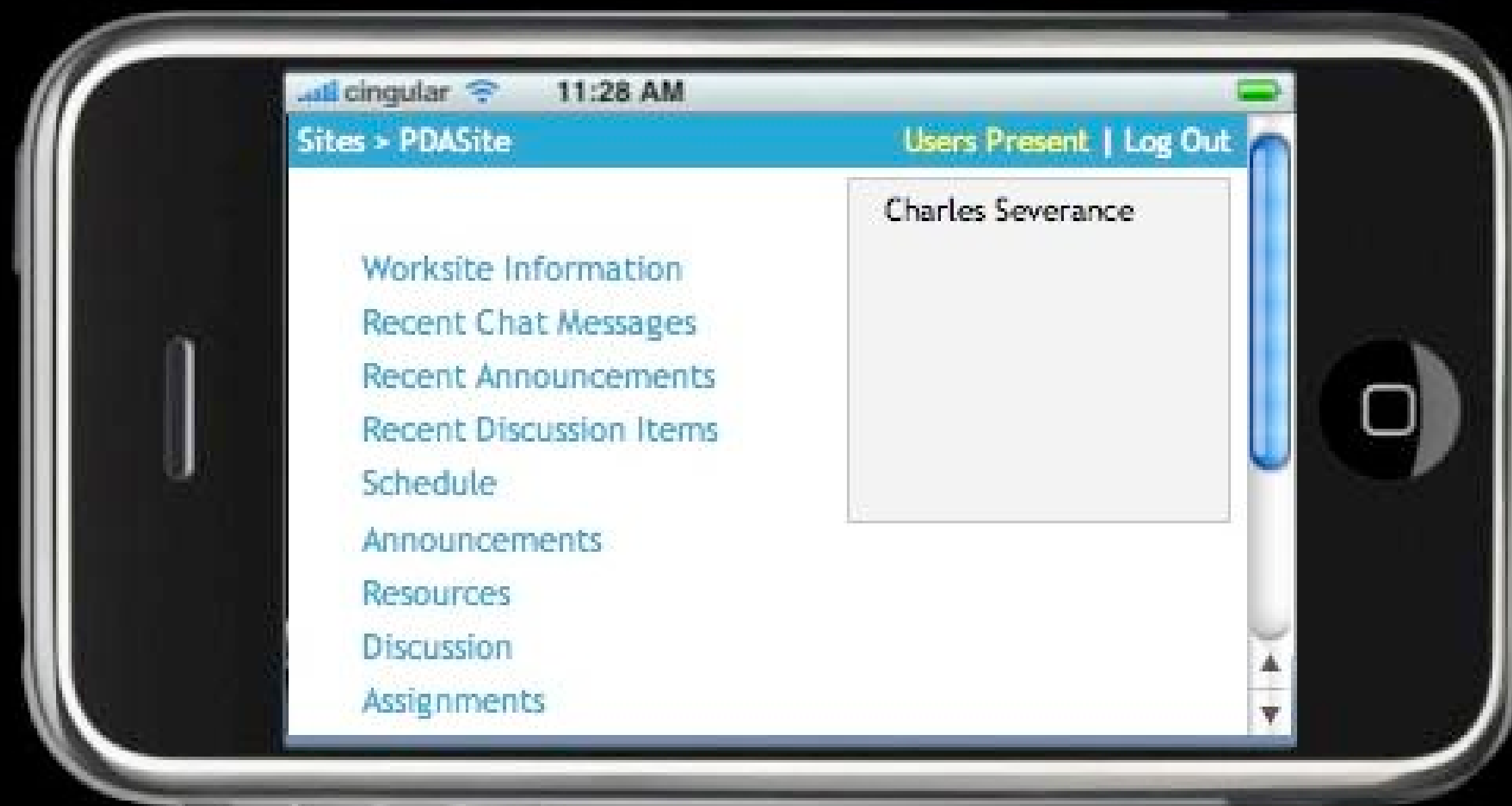
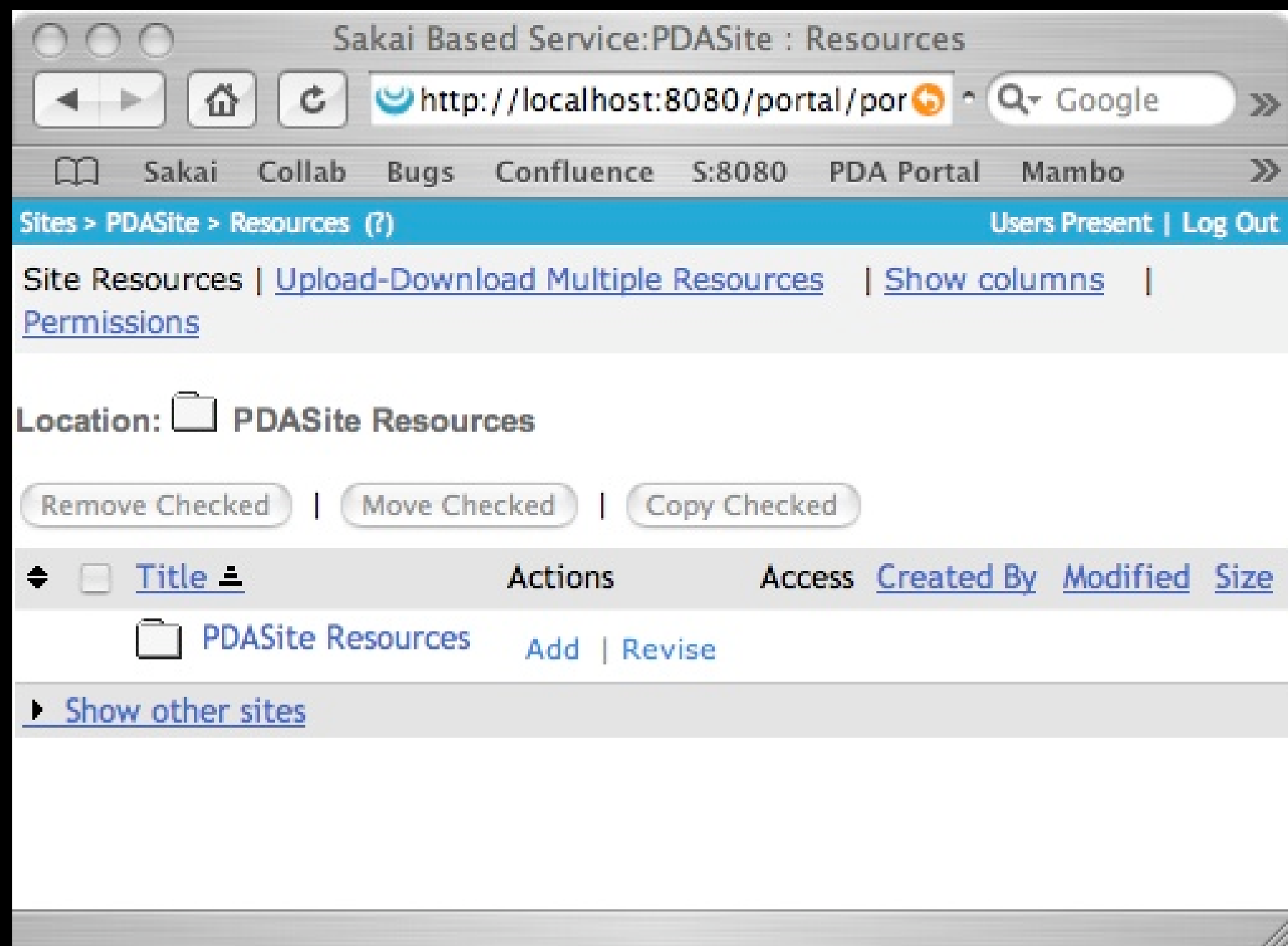
[This Month](#)

[Last Month](#)

Source:

PDA in Sakai

Actions:



Summary

The need for functionality mashup is becoming acute – teaching and learning is a great application to explore the problem space

Standards are emerging to enable functionality mashup – but much more work is required. Sakai is well-positioned to lead the way forward in evolving these standards.

For me, being at the nexus of teaching and research, with access to a bright student population provides the ideal environment to try to explore the next step in the evolution of cloud-scale mashed up open source software.

Thank you for your time...

- csev@umich.edu
- <http://www.dr-chuck.com>



Third International Conference
on e-Social Science
7-9 October 2007
Ann Arbor, MI 2007