

Sakai Technical ~~Futures~~ Musings

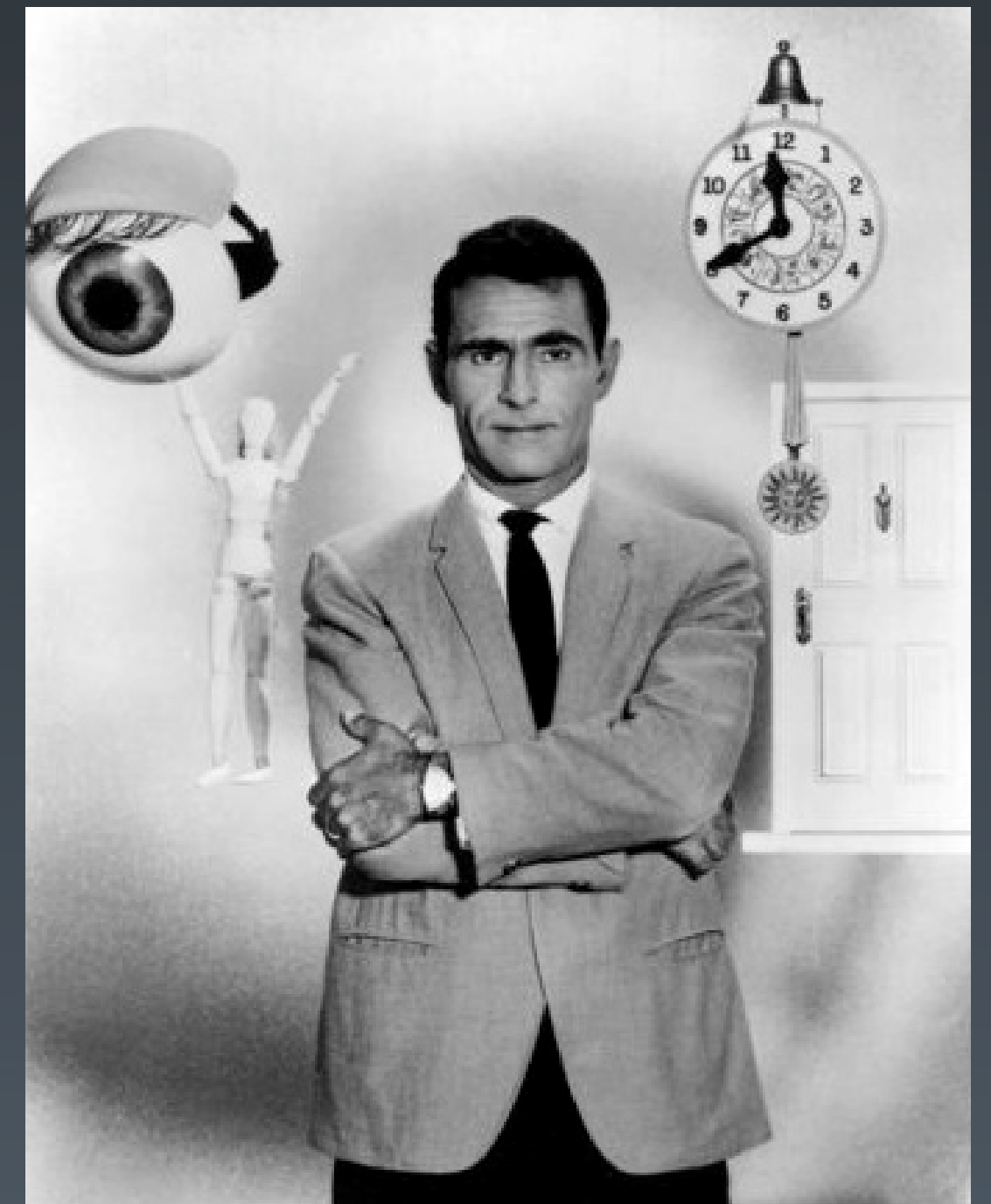
Dr. Charles Severance
Lame Duck Executive Director
Sakai Foundation

Clinical Assistant Professor
University of Michigan – School of Information

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

This is a presentation from a lame duck.

As such it is a rambling collection of ideas – not roadmaps or plans and certainly not commitments.



Outline

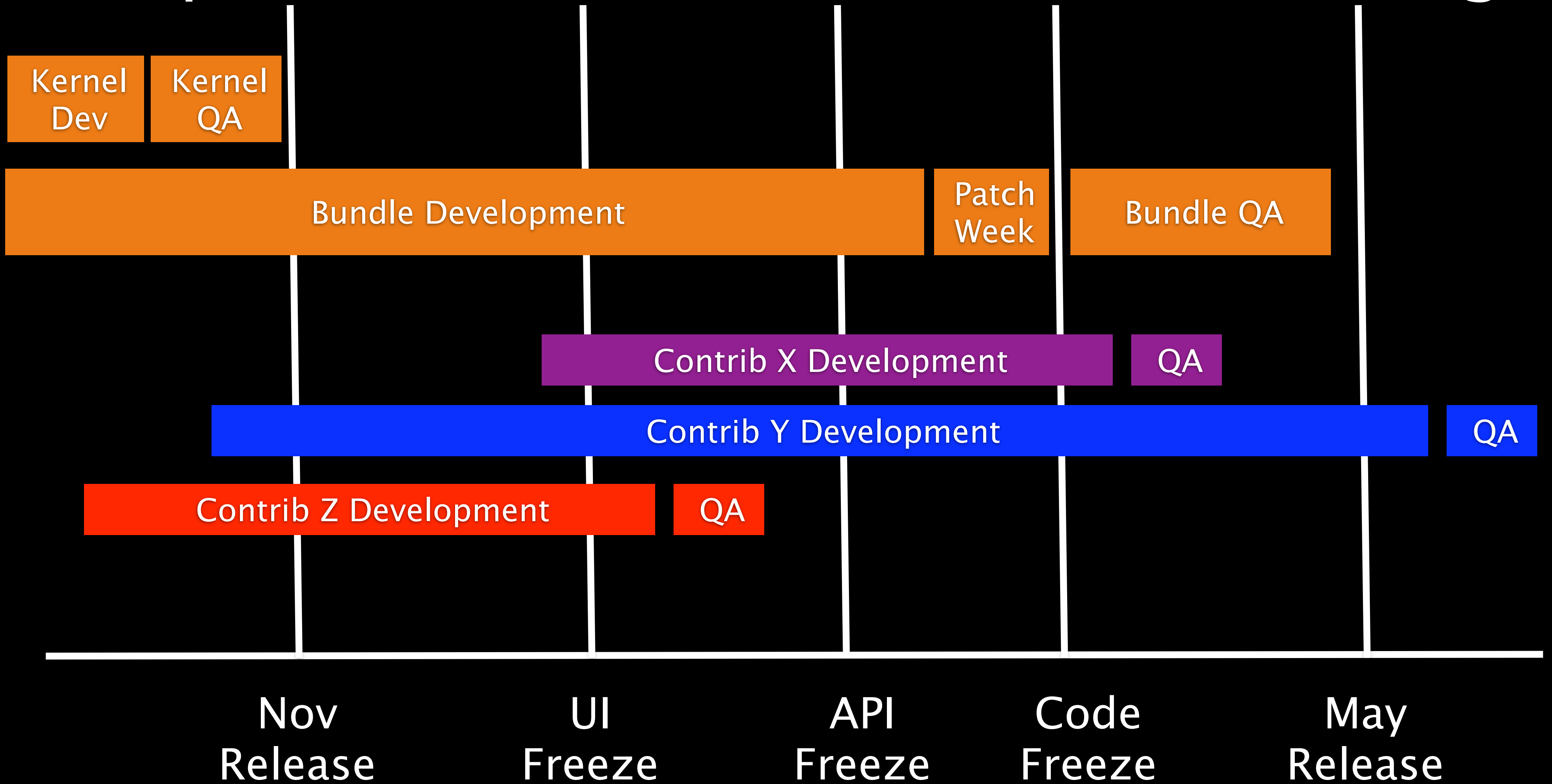
- Suggested Changes in Release Cycle
- Suggested Improvements for Development Processes
- Moving towards Tool Portability
- Moving towards Interoperability
- Things to Think About
- Chuck's New Job and Spare Time
- Sakai Research Edition

Suggested Changes in Release Cycle

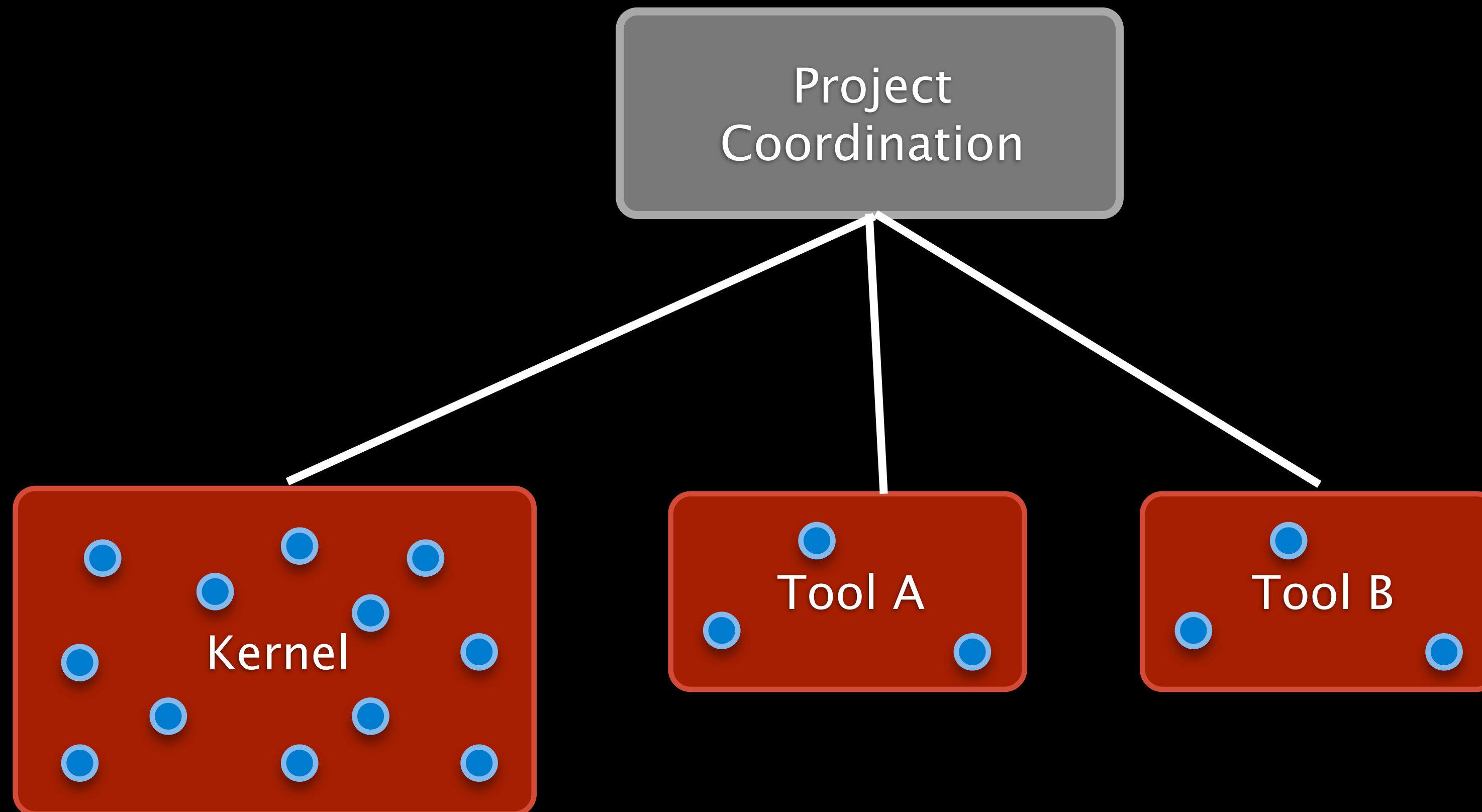
Release Cycle Change

- Sakai 2.5 code will be reorganized
 - Sakai Kernel – November 2007
 - Sakai Kernel+Bundle – May 2008
 - Tools and services need to be separated as they mature and become framework
- API's will **not** be re-done or renamed or moved (like in 2.2)
- Sakai Kernel
 - Similar in scope to “mini” / “cafe” / “training”
 - Will be very careful about dependencies
 - Ian Boston will take the lead on scoping and producing Kernel
- Sakai Kernel + Bundle
 - This will be similar in scope to 2.4
- Need some work on improving bundling and development environment

Proposed Kernel + Bundle Release Timing



Placement of Kernel Project



Kernel Leadership

- Effectively the establishment of the “kernel” produces an “kernel architecture group”
 - It **is not** special at some level – it is just another project
 - It is special because it affects Sakai broadly
 - Institutions will want to support staff to work in this project because of its impact
 - This project must operate more openly and more deliberately than other projects
 - It can meet more regularly than the Project Coordination Group
- This will become an efficient technical coordination point for cross-cutting issues as folks stay in the long term
- I would like to see Ian Boston of Cambridge chair this activity

Summary

- Kernel approach makes for a more solid product
- Kernel team will be a better structure for managing technical aspects of Sakai
- Reducing to one release will reduce community version skew and improve quality
- Skilled admins/developers can release more often than once per year and more flexibly with “post-” tags
- This should significantly increase product quality

Suggested Improvements for Development Processes

See Also

<http://bugs.sakaiproject.org/confluence/display/~ianebron/Strawman+Technical+Governance>

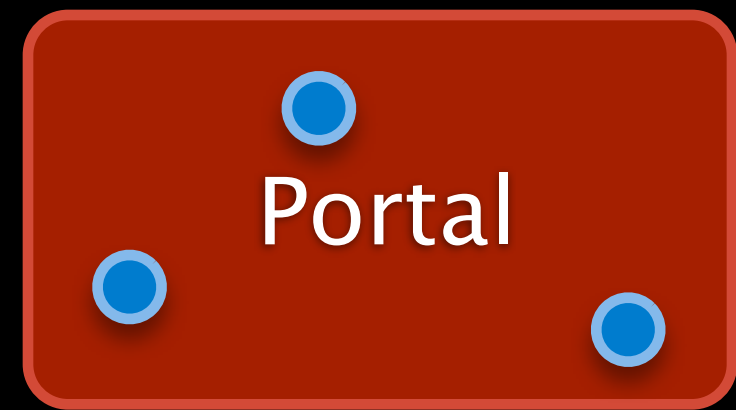
Improving Development Process

- 2.4 was too much at the last minute
- People are not announcing their work in advance
- Community awareness / review is happening after code is in trunk
- As we grow and are more and more large production efforts – we need better processes
- I see this as a better way for all of us – build a way for us to be more comfortable revealing plans earlier

Branch Approach

- We need to reduce risk/surprises in trunk and at code freeze
- Low Risk – just evolve trunk
- Moderate Risk – Branch and Merge (New)
- Project Team decides risk – with review and feedback from the Sakai Foundation Project Coordinator

Project Team Basics



- Each component of Sakai is maintained by a project team, developers, designers, etc.
- These are folks with long term commitment to the component
- They make final decisions about their component after considering community input
- The project team is listed in the Coordination page and is assigned incoming JIRAs (bugs/requests/requirements) by the Project Coordinator
- Project Teams adjust membership Apache-style
 - Portal: Ian Boston (lead), Chuck Severance, Glenn Golden
 - Resources: Jim Eng (lead), Harriett Truscott



Moderate Risk Changes: Branch and Merge

- ***** BEFORE YOU START *****
- Enter a JIRA to explain what is being done – optionally point to some other space to hold design materials
- Contact the PC – Update PC Report – Get a Branch – add README file to th branch
- Announce JIRA to dev list – community comment on JIRA
- Create branch with the name of the JIRA (SAK-10366)
- When branch is complete – announce to list – give time for folks to evaluate the change if they like
- Call for a vote on dev list as to whether branch is suitable

Voting Guidelines

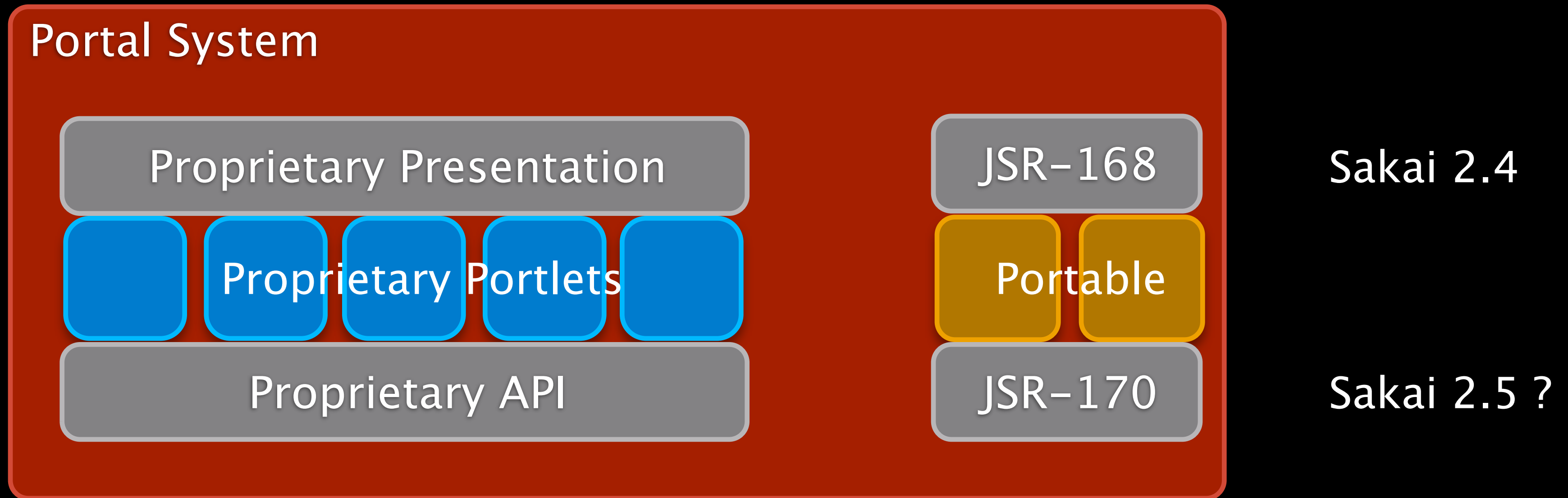
- Votes and JIRA commentary from outside project team are welcome and encouraged
- Votes outside the project team **are** advisory
- No votes must include a description of what it would take to convert the vote to yes – or they will be considered “unresponsive” and not counted

Summary

- Branch and merge greatly increases the notification and community involvement
- Mutual respect is needed
 - Project team must inform and involve the community in an open manner
 - Community must respect the fact that the Project team makes the final decisions on their projects
- We need to make sure trunk is solid and ready for freeze almost all the time.
- Teams can still whip up branches for experimental or temporary activity as needed without triggering the process
- This gives the PC far more material to work with and reduces all of our risk

Moving Towards Tool Portability

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 convenient. As a result, organizations quickly become locked into a single portal – and even worse – the portlets they produce only work in one portal.

Portal – Sakai 2.4.0

- JSR-168 Portlet Support using Pluto 1.1
 - uPortal 3.0 also use Pluto 1.1 – binary compatibility for portlets
- All markup moved to Velocity
- Workgroup Portal
- RSS / Atom / OPML
- PDA View
- Preferable stubs

Portal features currently in trunk

- Features

- Hierarchy – Site Attribute
- Single Tool View takes over the whole page
- Display icons for tools – Thanks Cambridge / NYU
- iFrame-free PDA View to support smaller/older PDAs
- Size/feature detection in PDA Portal – WURFL

- Back port should be done mid-July

- Sakai 2.3 (post-2.3 branch)
- Sakai 2.4 (post-2.4 branch)

UI Technology Path Forward

- In transition (same as we have been for 3 years)
 - JSF
 - RSF
 - FLUID
- Confusing Factors
 - Ajax
 - JSR-168
- FLUID is funded to find the path forward – please participate or at least monitor
 - <http://fluidproject.org/>

Complete Elimination of iFrames

- Not a trivial path – may need to pitch / rewrite portions of oldest tools
- Need to move toward JSR-168 by adaptor or rewrite or new tools
- Need to test the PDA portal with frames off
 - Test Tools
 - Test Browsers
- RSF supports both JSR-168 and Servlet

Use Cases for JSR-168 Support in Sakai

- Prepare a Pluto-style portlet war file and drop it into Sakai as a webapp – autoregister
- Users simply use Sakai's Site Info tool to place portlets like any other Sakai tool
- It will be possible to use any Sakai API within a JSR-168 Portlet
- Sakai will provide a JSR-168 compliant CSS classes so that portlets have the same look and feel as Sakai tools
- Allows the building of tools which are portable outside of Sakai

JSR-168

- 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

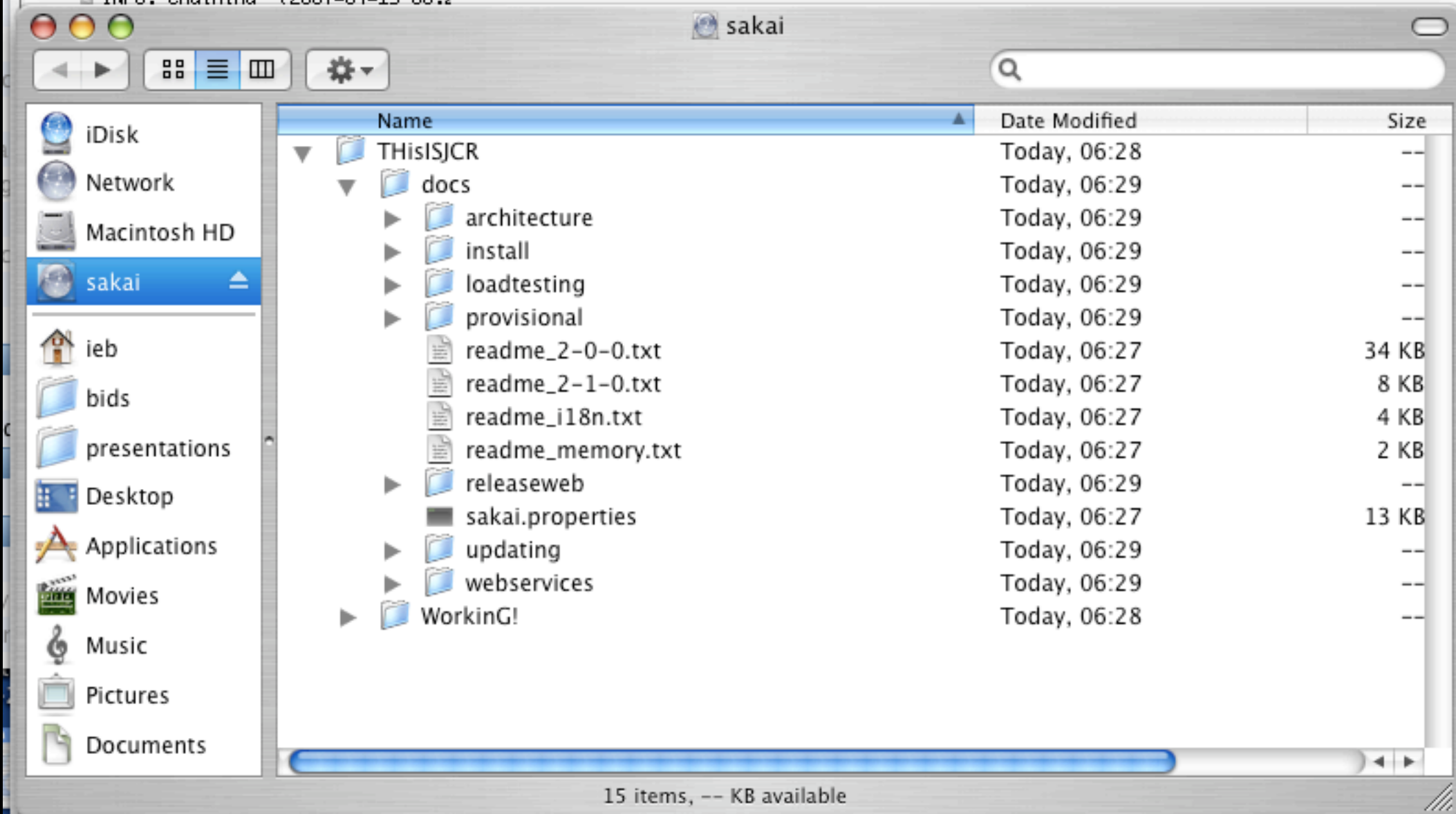
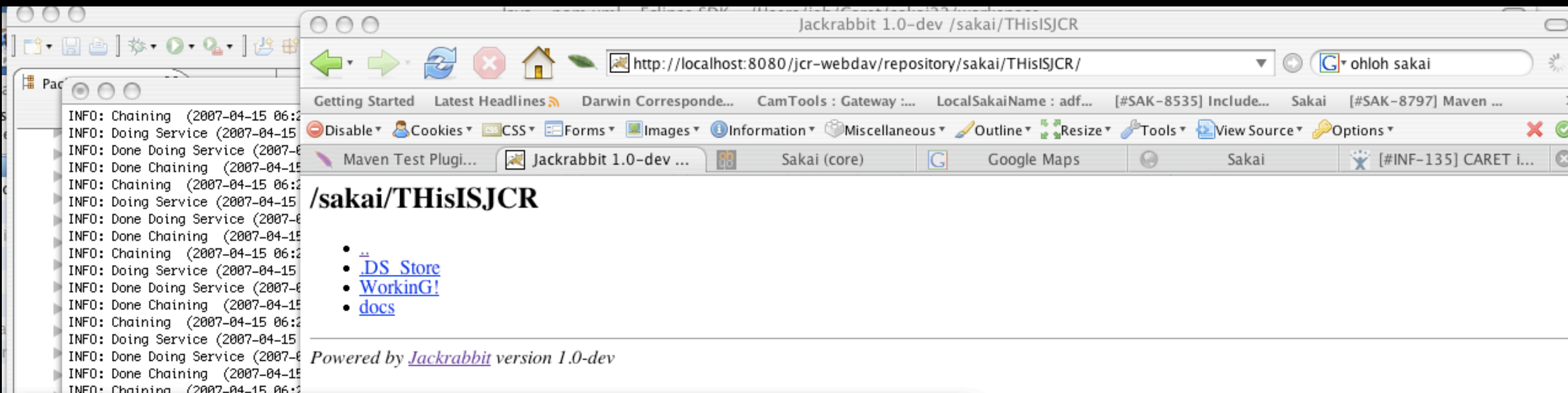
When to use JSR-168?

- iFrame Portlet
- Web Clipping Portlet
- RSS Client
- WSRP Consumer
- A UI that calls 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.

JSR-170 Java Content Repository

- Goal is to be able to store Sakai content in JSR-170
 - Improve Content Hosting
 - Improve DAV
- Files / Attachments / Metadata
- Also Application data – MailTool Experiment
- Ian Boston will hopefully join follow-on to JSR-170
- Working with Xythos
- Hopefully we will see solid JSR-170 support in 2.5 core release and then tools can begin to use it over time

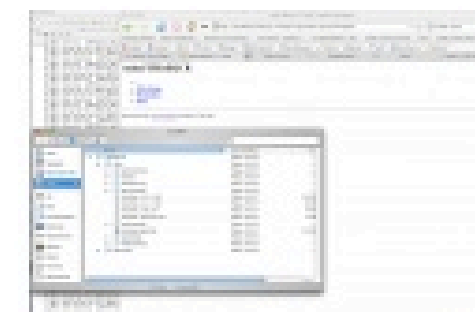


JCRService + WebDAV Working

I've now got the JCRService integrated into Sakai and working with Jackrabbits WebDAV library. The JCRService which exposes a the standard 170 API to Sakai is using a Jackrabbit implementation integrated into Sakai. The webDAV implementation uses Jackrabbits own webDAV libraries which have support for

- RFC 2518 (WebDAV - HTTP Extensions for Distributed Authoring)
- RFC 3253 (DeltaV - Versioning Extensions to WebDAV)
- RFC 3648 (Ordered Collections Protocol)
- RFC 3744 (Access Control Protocol)
- DAV Searching and Locating (DASL)

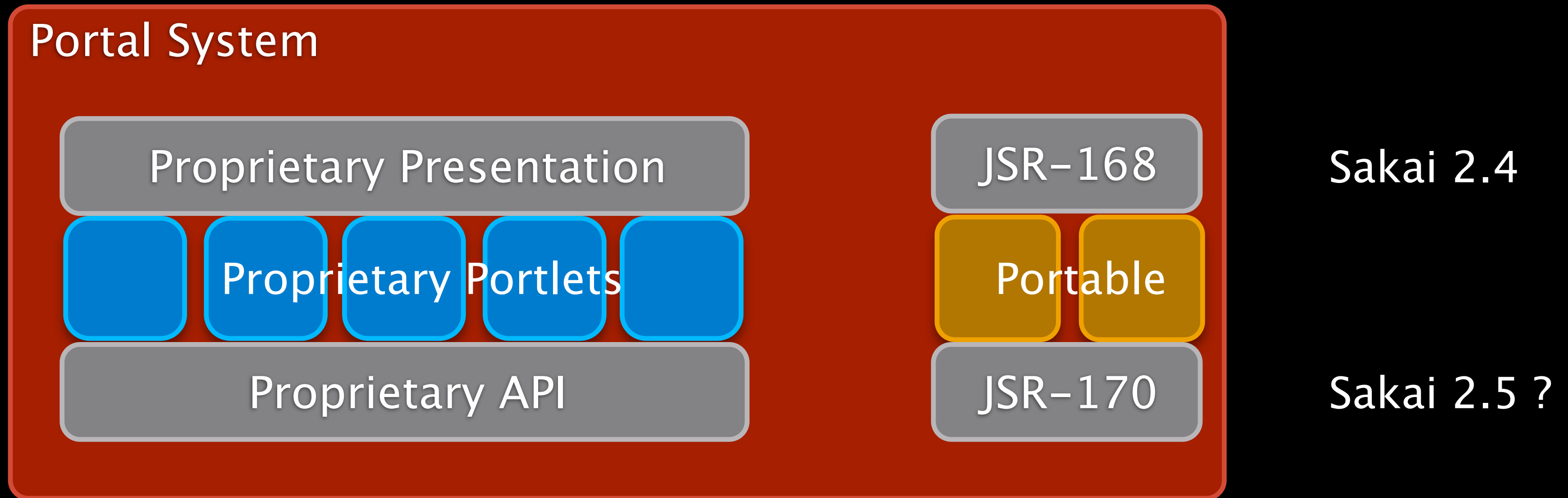
There is still some work to do in AccessManager to get all the fuctions mapped and setup some sort of default structure, but so far performance looks good, about 1000 items representing 20MB goes up in < 1Minute with some base level logging turned on. I expect this to drop a bit when the SakaiSecurity Service is fully integrated.



Looking Forward in Framework Standards

- JSR-286 (Portlet v2) is coming
- WSRP 2.0 is coming
- JSR-170 is an excellent compliment to JSR-168
- I would like to connect WSRP 1.0 to Pluto 1.1
- We need to develop conventions outside of the standards process for:
 - AUTHN
 - AUTHZ
 - Binary compatibility for war files
- Still need some agreement
 - Service Oriented Architecture Hooks – must be simple

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 convenient. As a result, organizations quickly become locked into a single portal – and even worse – the portlets they produce only work in one portal.

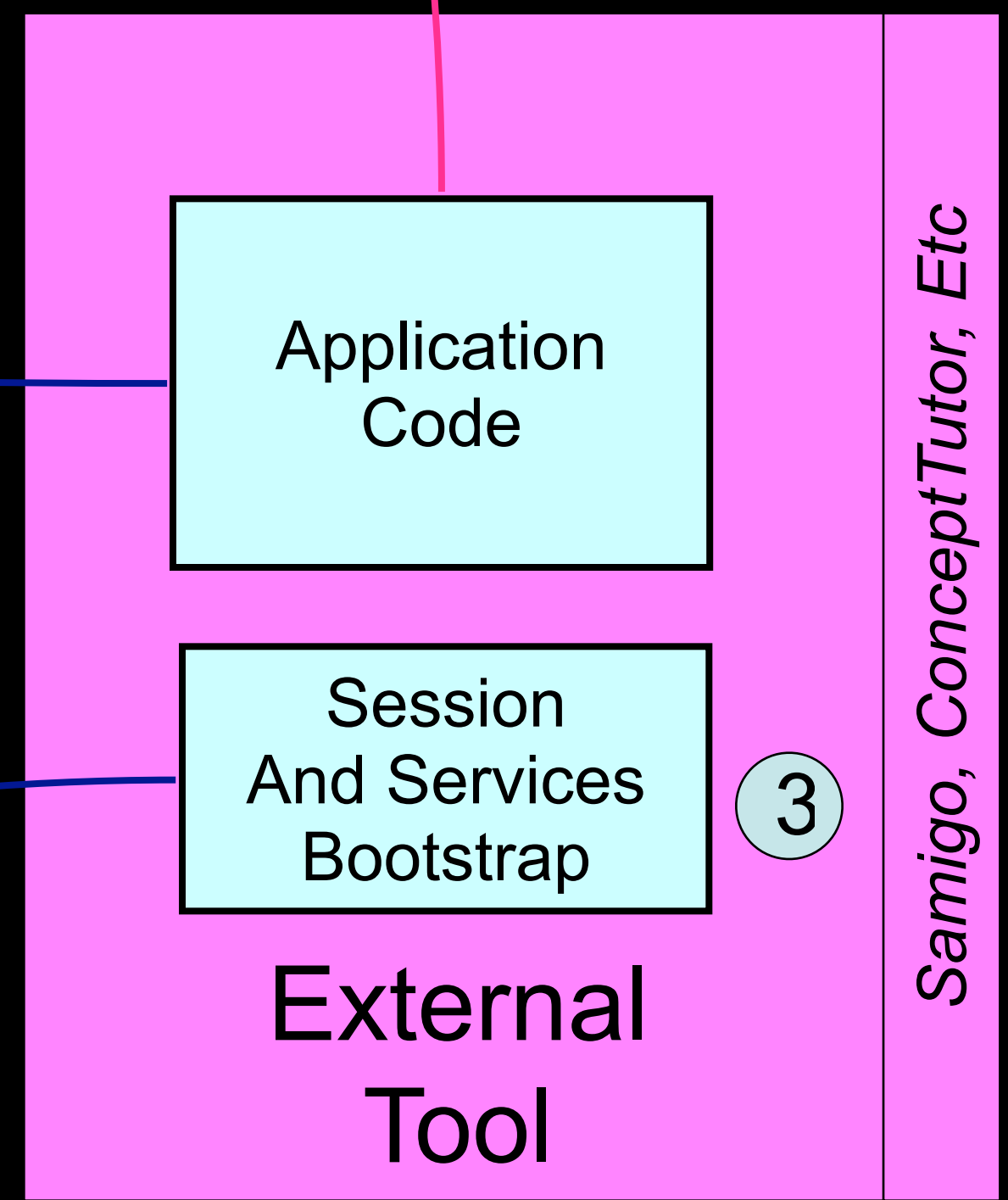
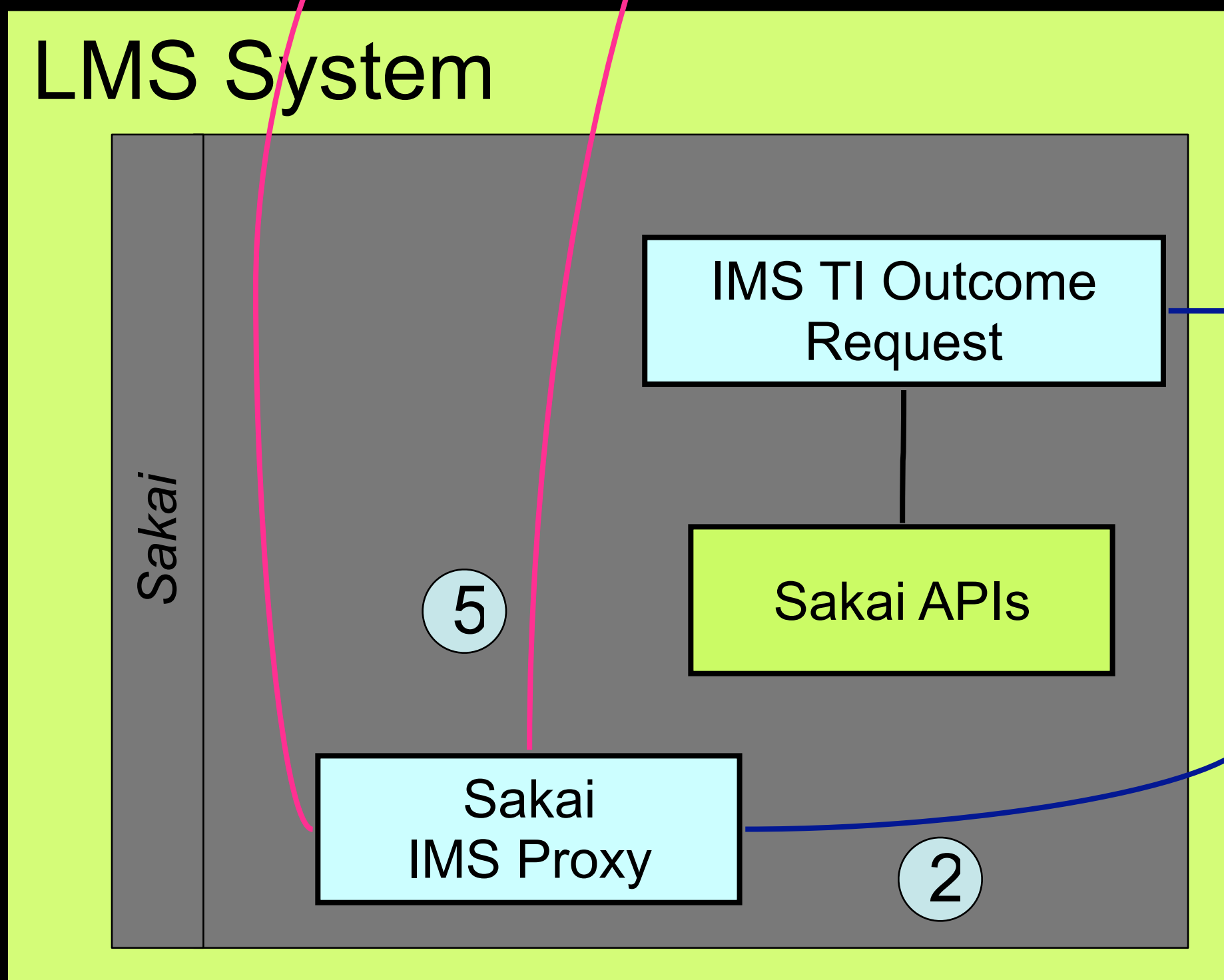
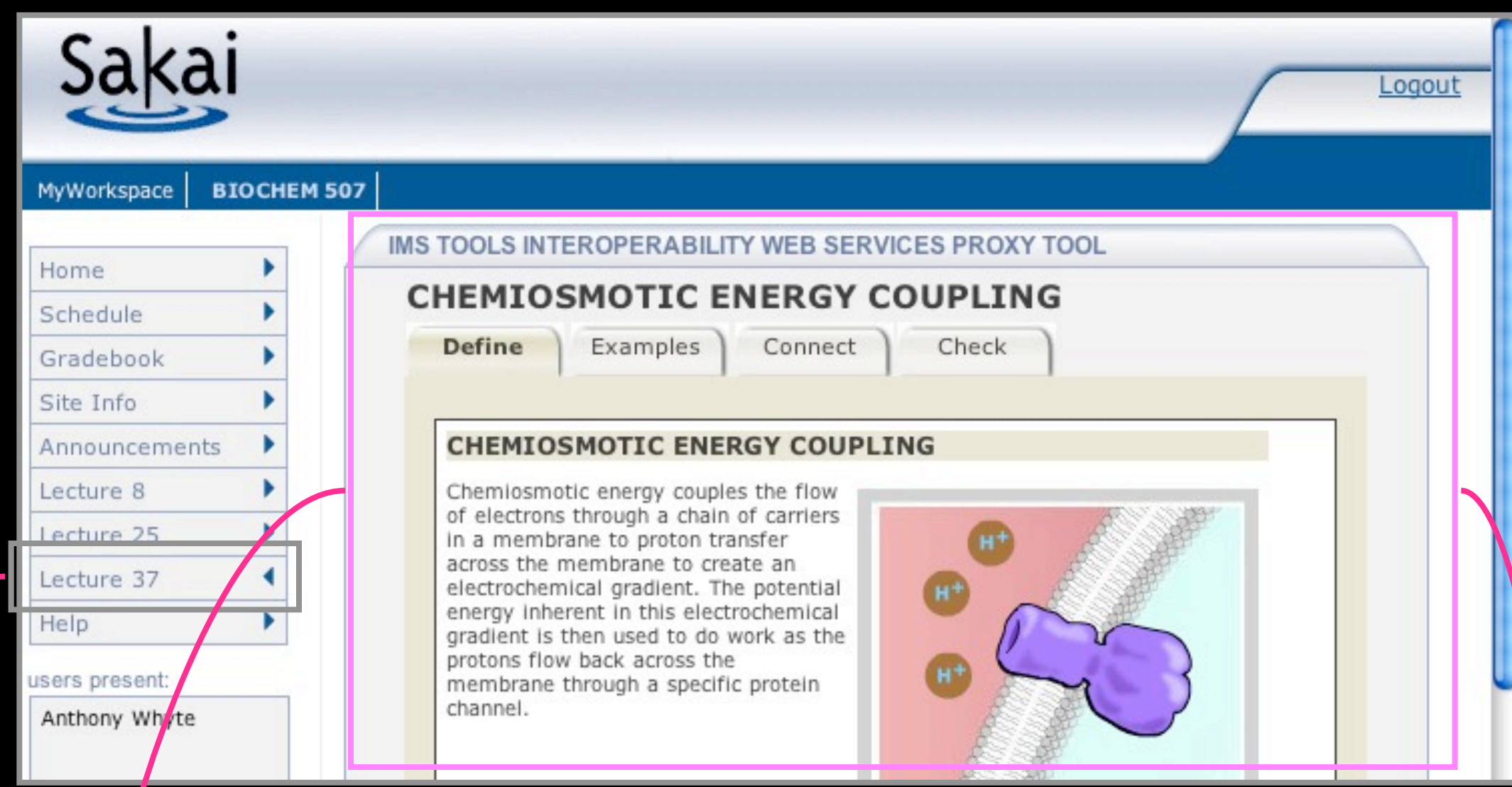
Moving Towards Interoperability

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

How IMS Tool Interoperability Works

Sakai
Blackboard
WebCT
Angel



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

[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

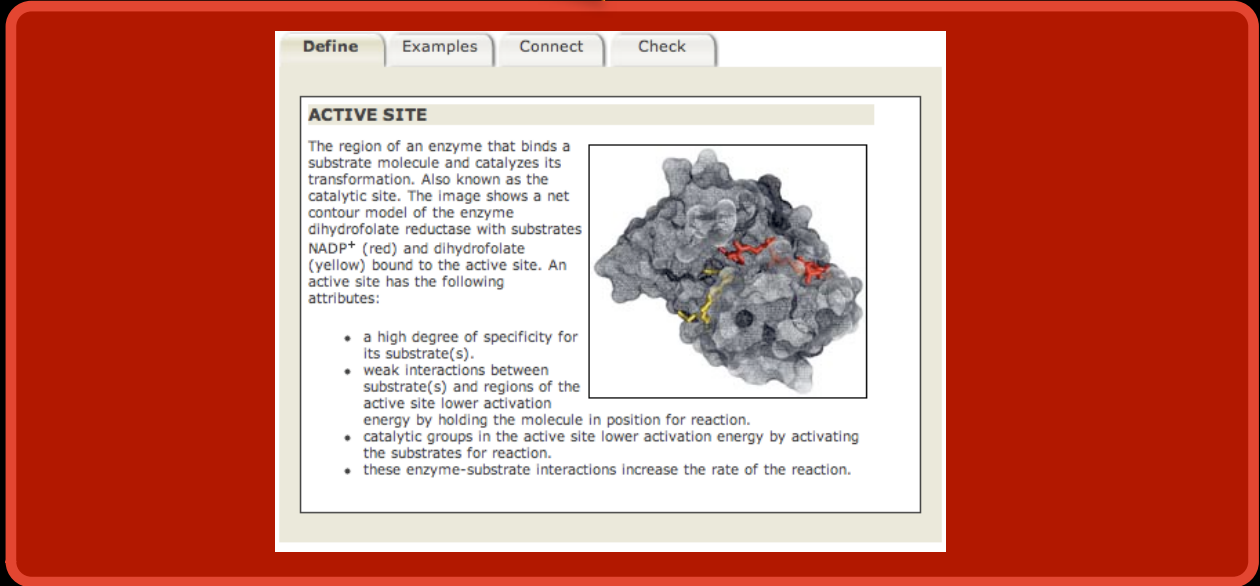
OXIDATIVE PHOSPHORYLATION

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



IMS TI
IMS TI
Lite

Tools Interoperability Version 2

- Focus on Run-time Environment
- Web services for
 - User and Course
 - Mail
 - Calendar
 - Assessment
 - Gradebook
 - File Manager
- Would like to borrow inspiration from WebCT PowerLinks
- I would like to make it **possible** to do TI without iframes using WSRP – hard task

IMS Common Cartridge

- Sakai has limited support – lacks resources
- Must evolve to be our only import/export format
 - We must improve our support for import and export at a low level
- Must iterate CC Specification as we gain experience

- Import Demos
 - Pearson
 - OU UK – Open Learn
 - Others

- Has not yet hit critical mass


[Logout](#)
[My Workspace](#) | [Test CC](#)

- [Home](#) ▶
- [Resources](#) ▶
- [Site Info](#) ▶
- [Help](#) ▶

users present:

Sakai Administrator

↑ RESOURCES ?

Location: Test CC Resources / Limits, Instantaneous Rate of Change, and the Derivative

 Remove Checked | Move Checked | Copy Checked

<input type="checkbox"/>	Title ▲	Actions	Created By	Modified	Size
<input type="checkbox"/>	Limits, Instantaneous Rate of Change, and the Derivative	Revise properties Add			
<input type="checkbox"/>	Chapter 2 Page 100	Revise properties Duplicate	Sakai Administrator	05/11/06	1 KB
<input type="checkbox"/>	Chapter 2 Page 80	Revise properties Duplicate	Sakai Administrator	05/11/06	1 KB
<input type="checkbox"/>	Chapter 2 Page 91	Revise properties Duplicate	Sakai Administrator	05/11/06	1 KB
<input type="checkbox"/>	Chapter 2 Page 95	Revise properties Duplicate	Sakai Administrator	05/11/06	1 KB

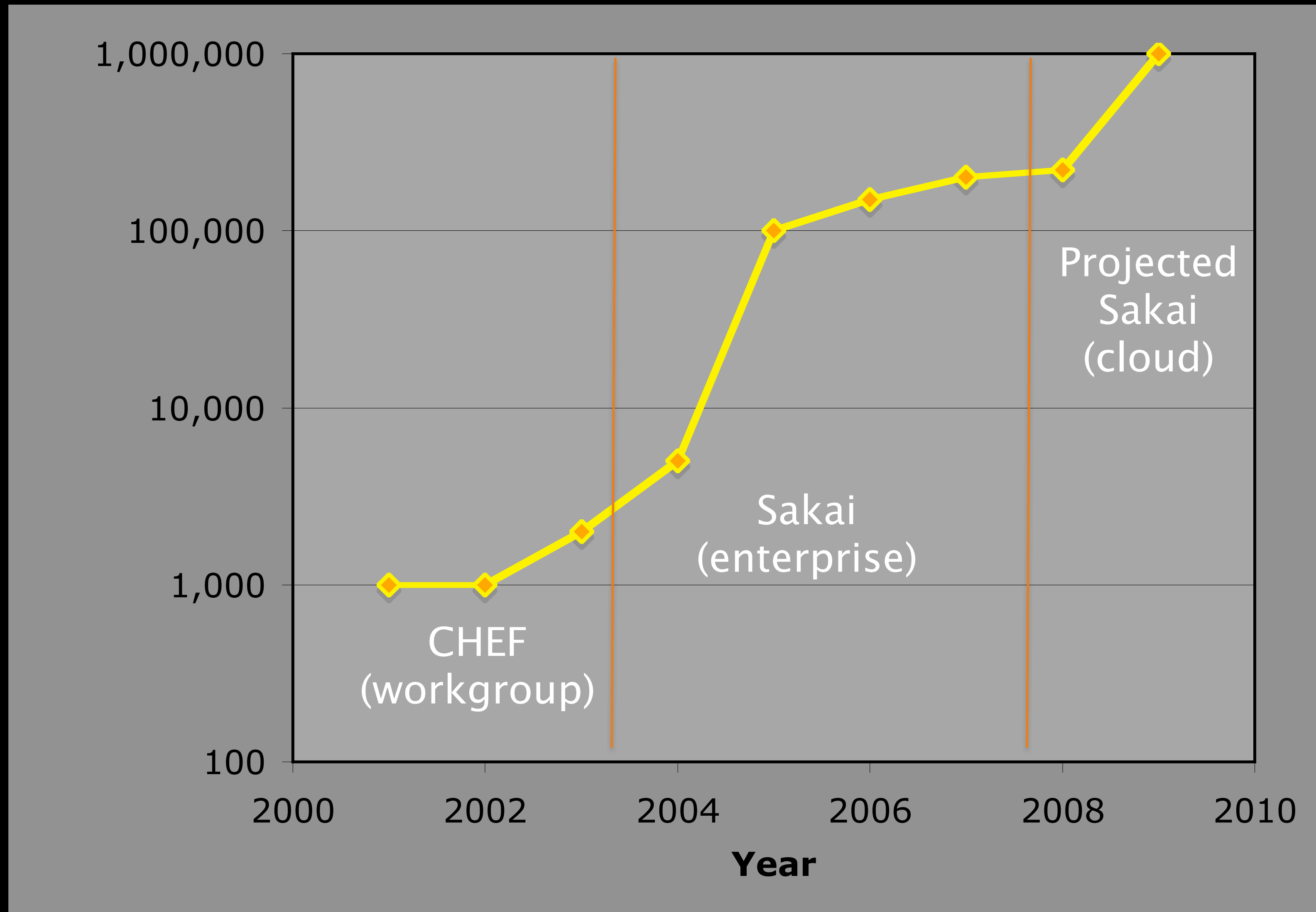
Powered by Sakai

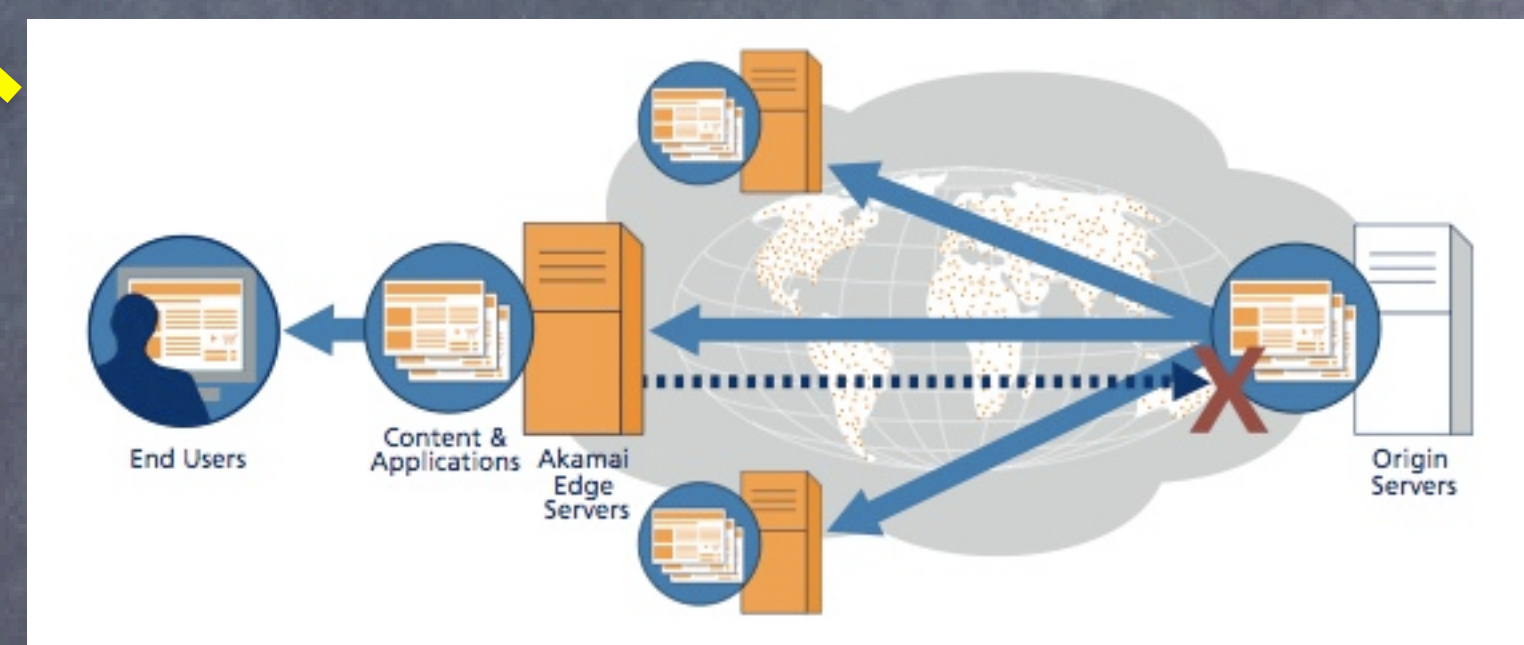
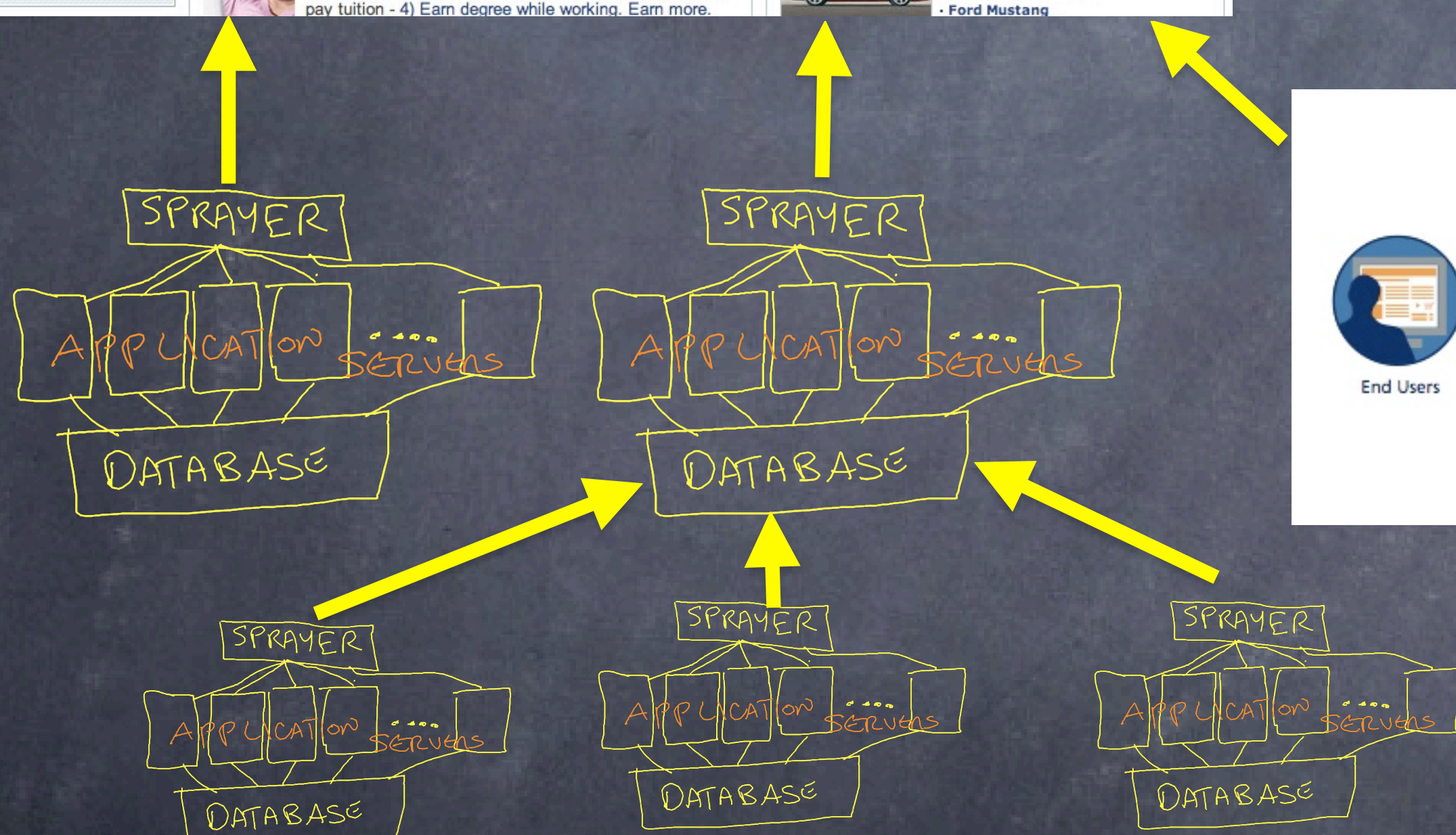
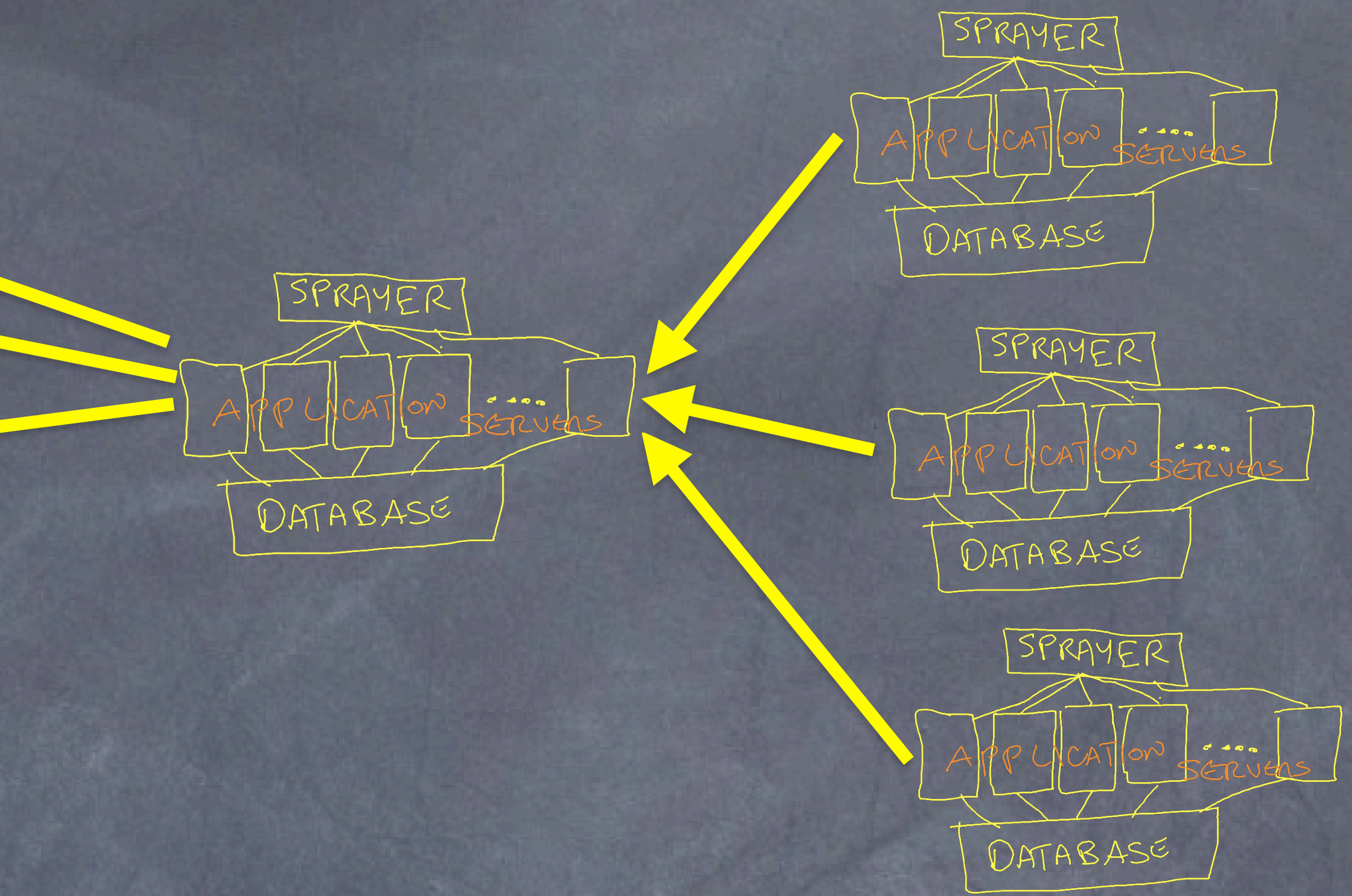
Things to Think About

Long Term

- Hyper-Scalability
- Federation
- Goal Aware Everywhere
- Functionality Mashup – Cloud Services
- UOC – OKIv3
- Facebook Platform

Maximum Users Supported by Sakai





Cloud
Architecture



www.holidayinn.com

Look again.
You're just a click away from a great stay

Reservations

Special Offers

Meetings and Groups

Games and More

Priority Club Rewards

Hello, CHARLES SEVERANCE

Account Log In

If this isn't you,
click here

Travel Profiles :

SEVERANCE (Leisure)

PRIORITYCLUB[®]
REWARDS

Check Availability

Check-In Date: Check-Out Date:

mm/dd/yyyy mm/dd/yyyy

Adults: Children: Rooms:

1 0 1

Group Code:

Rate Preference:

Best Available

Check Availability

More Choices

Exclusive Deals & Updates

SignUp Now!

Enter Email Address



BOOK WITH CONFIDENCE[®]

Lowest Internet Rate Guarantee

Reservation Desk >>> Select Hotel

Continue Reservation

Preference

Select
Hotel

Select
Room Rate

Guest
Information

Confirmation

Holiday Inn
CHAMPAIGN/URBANA

Book Online or Call
1 888 HOLIDAY (888 465 4329)

1001 KILLARNEY STREET
URBANA, IL 61801 UNITED STATES
Hotel Front Desk: 1-217-3287900 | Hotel Fax: 1-217-3287941



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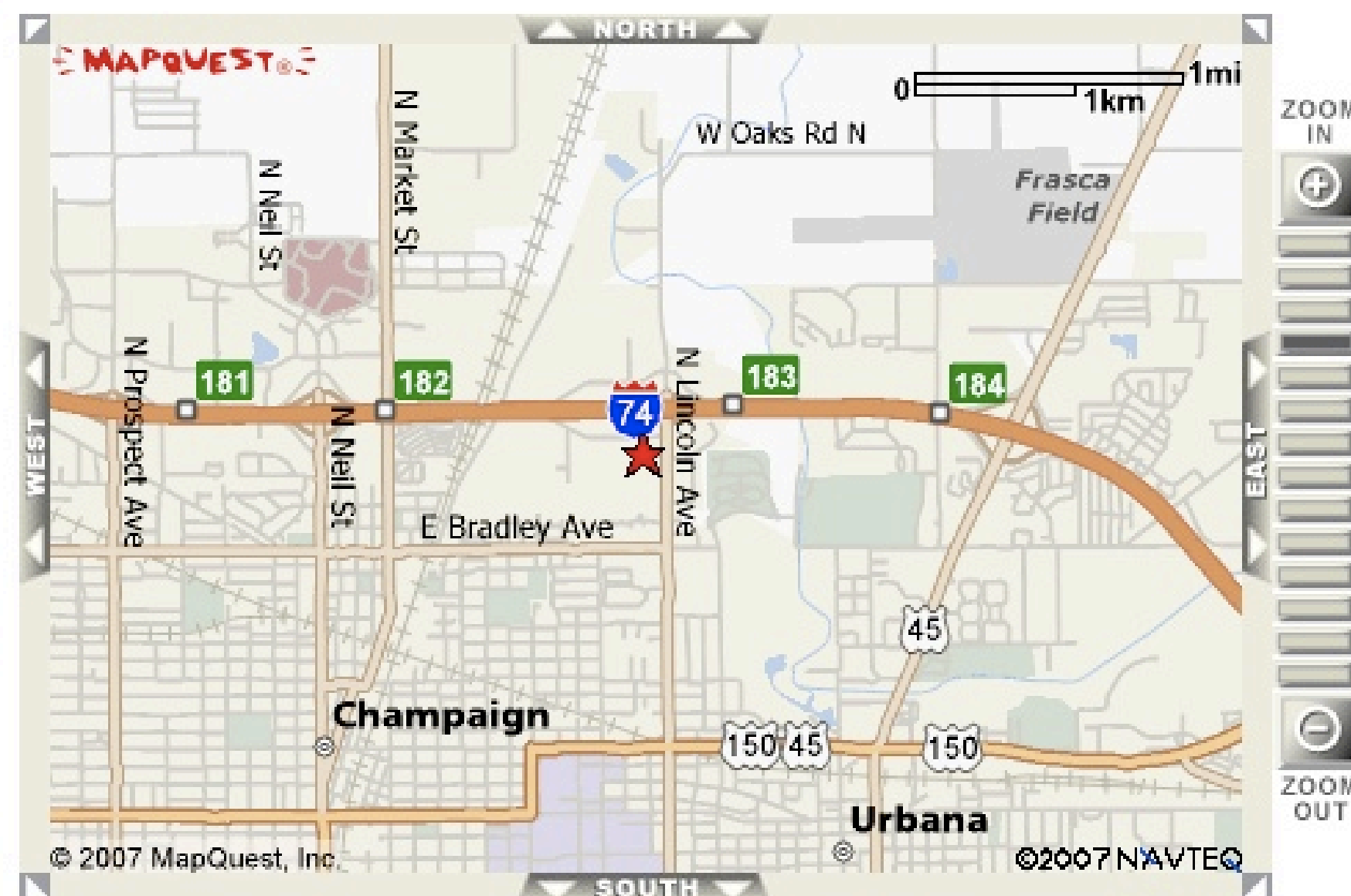


Hotel
Favorite

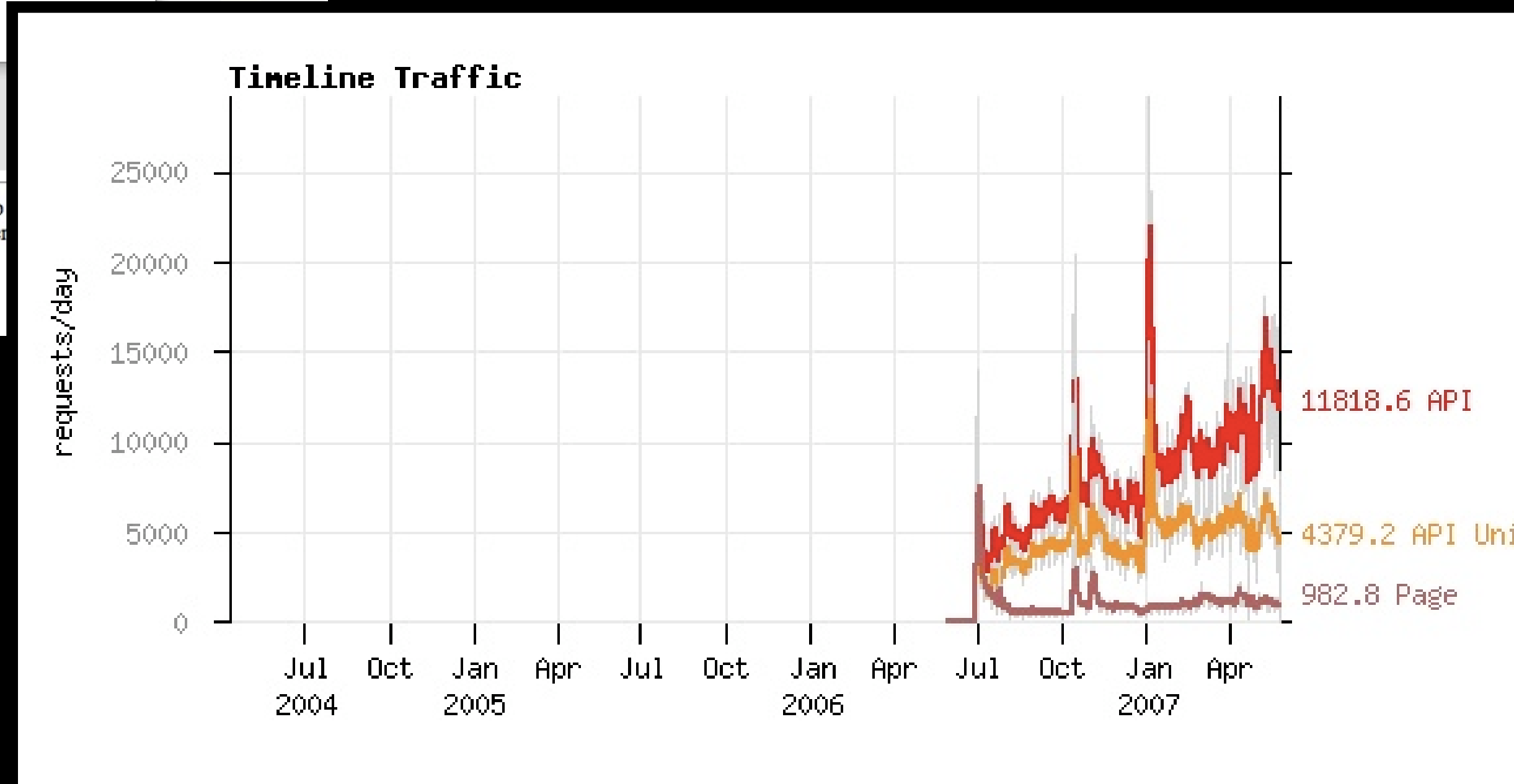
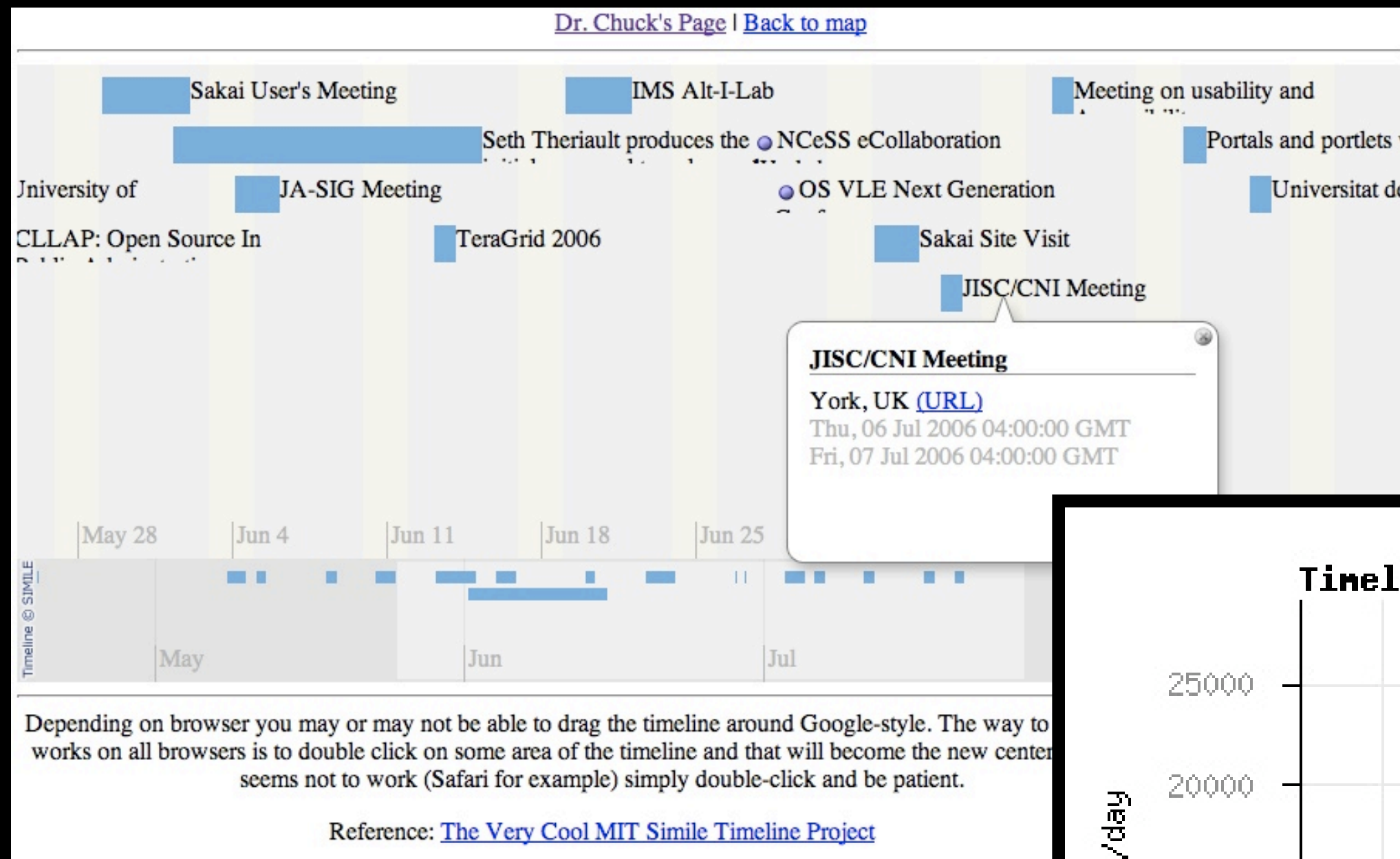


Contact
Us

Welcome | At a Glance | Amenities | Rooms | Dining | Event Facilities | Transportation | What's Nearby



MIT Simile: Functionality Mashup Traffic





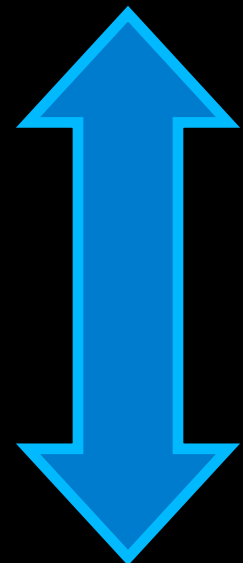
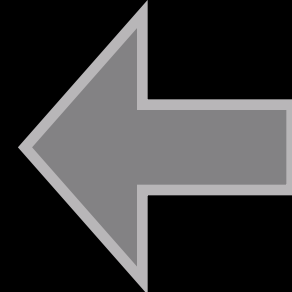
2. In epistolas canonicas

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

Search Options Advanced Search Print Resource Logout

Bodington LMS

Enterprise Data



Identity
Roles
Storage

GuanXi
SAML
Waffle Bus

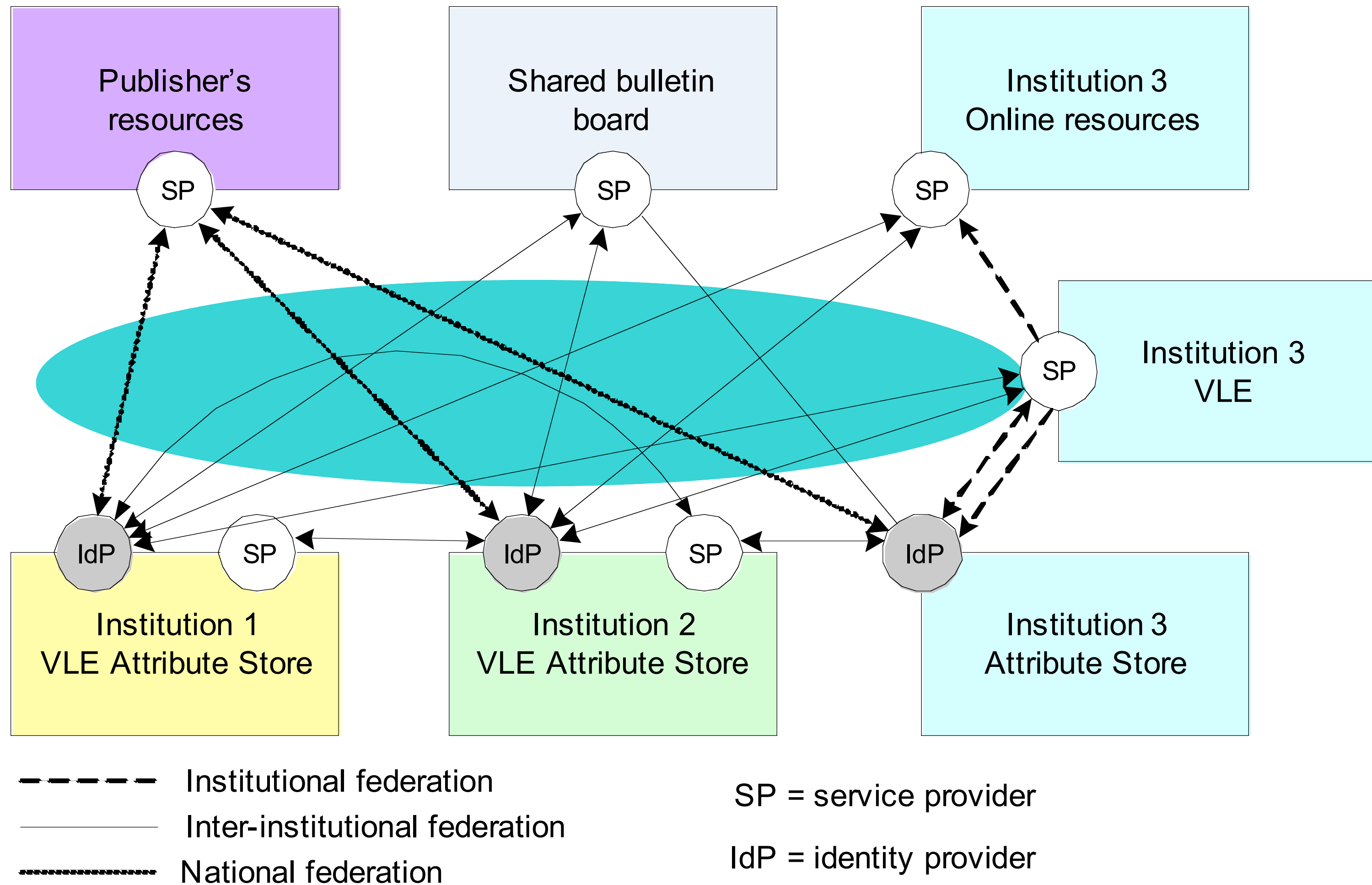
Store Layout Help

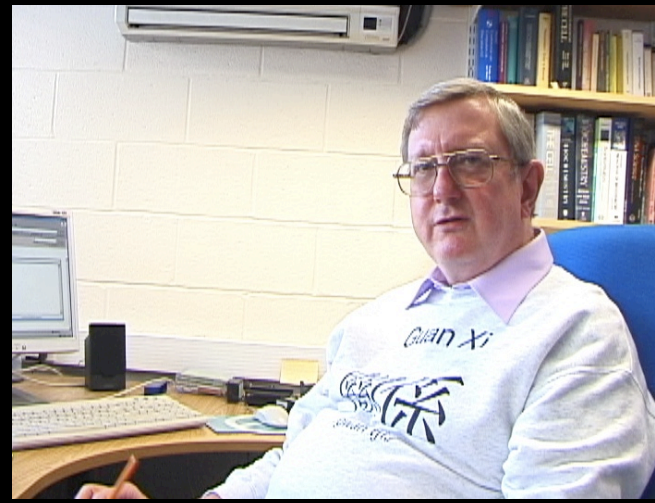
maxime

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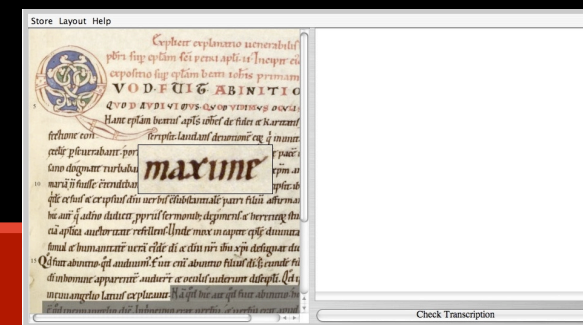
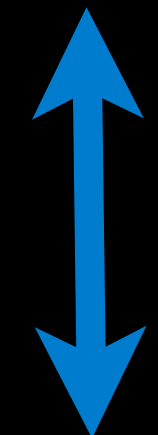
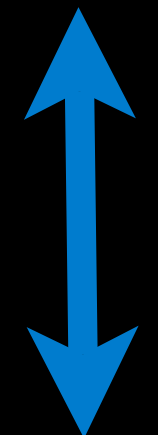
A WAFFLE

Wide Area Freely Federated Learning Environment,
JISC Middleware Conference 2005:
Mehan, Young and Booth.





Functionality Mashup Future – Learning



Flickr, Google, YouTube,
Merlot, delio.us

Physics Computational Portal (ANU)

[Home](#) [Queue Status](#) [Submit Job](#) [Resources](#) [ePrints](#) [Wiki](#) [Blogger](#) [Forums](#) [Help](#)

Calendar

[Options](#)

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

Th Federating portal using Sakai Web Services. Organic user-controlled federation – user-control over portal. Thing – far more sophisticated user preferences and user control over portal contents and look and feel.

Federated Identity in Sakai

- SAML profiles – Shibboleth and GuanXi
 - SAML = Security Assertion Markup Language
- Shibboleth – Oxford and Stockholm
 - 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

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"/>

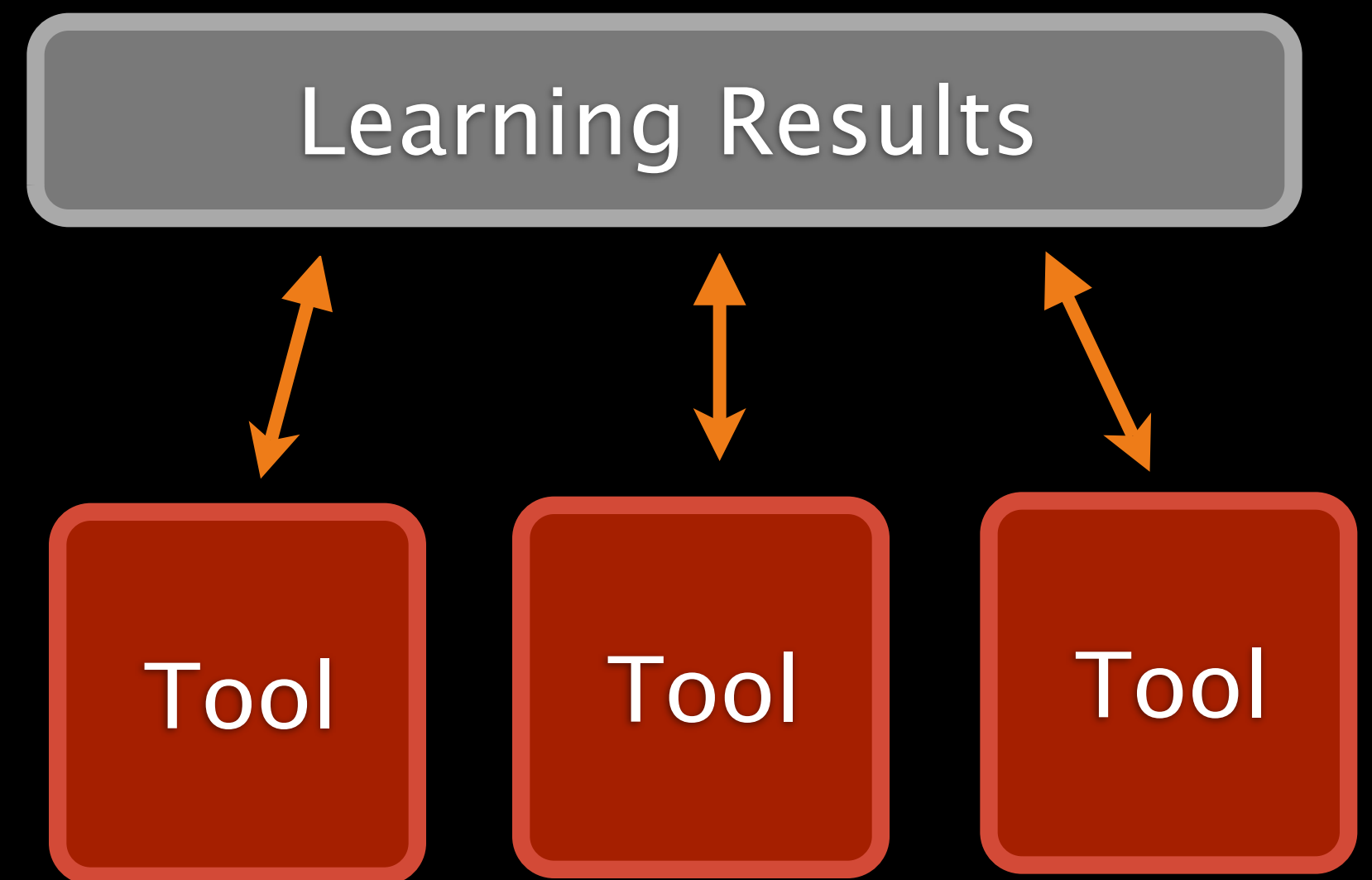
[Update](#) [Cancel](#)

Prototype of Sakai working in the Bodington Learning Management System

Done

“Goal-Aware” Everywhere

- Tracking learning across tools
 - Global results across life
 - Results within class
- Trigger remedial work
- Guide through learning sequences
- This is challenging
 - Need semantic information for each result to allow interchange
- “Does the current user need remedial information no single variable algebra?”

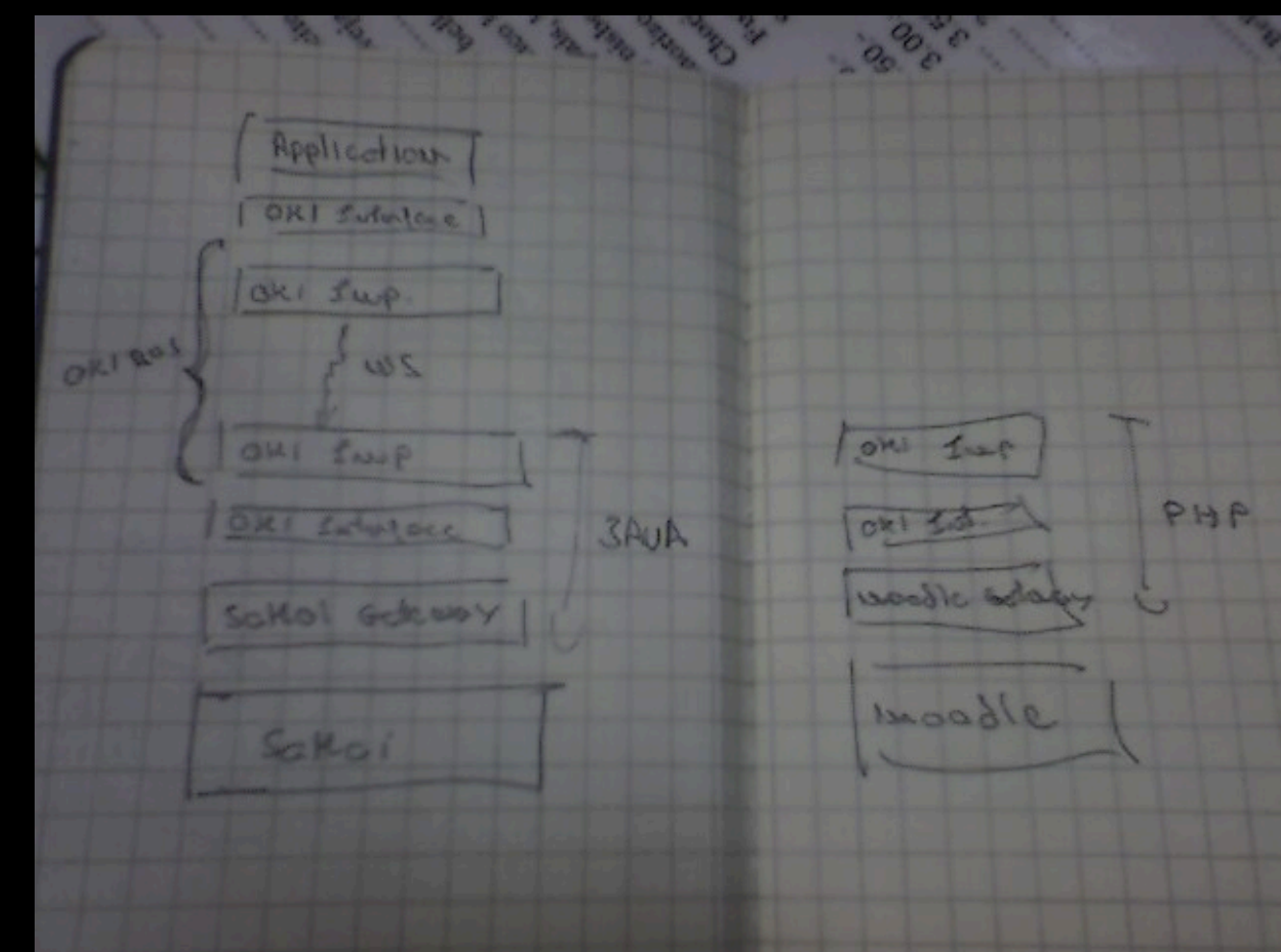
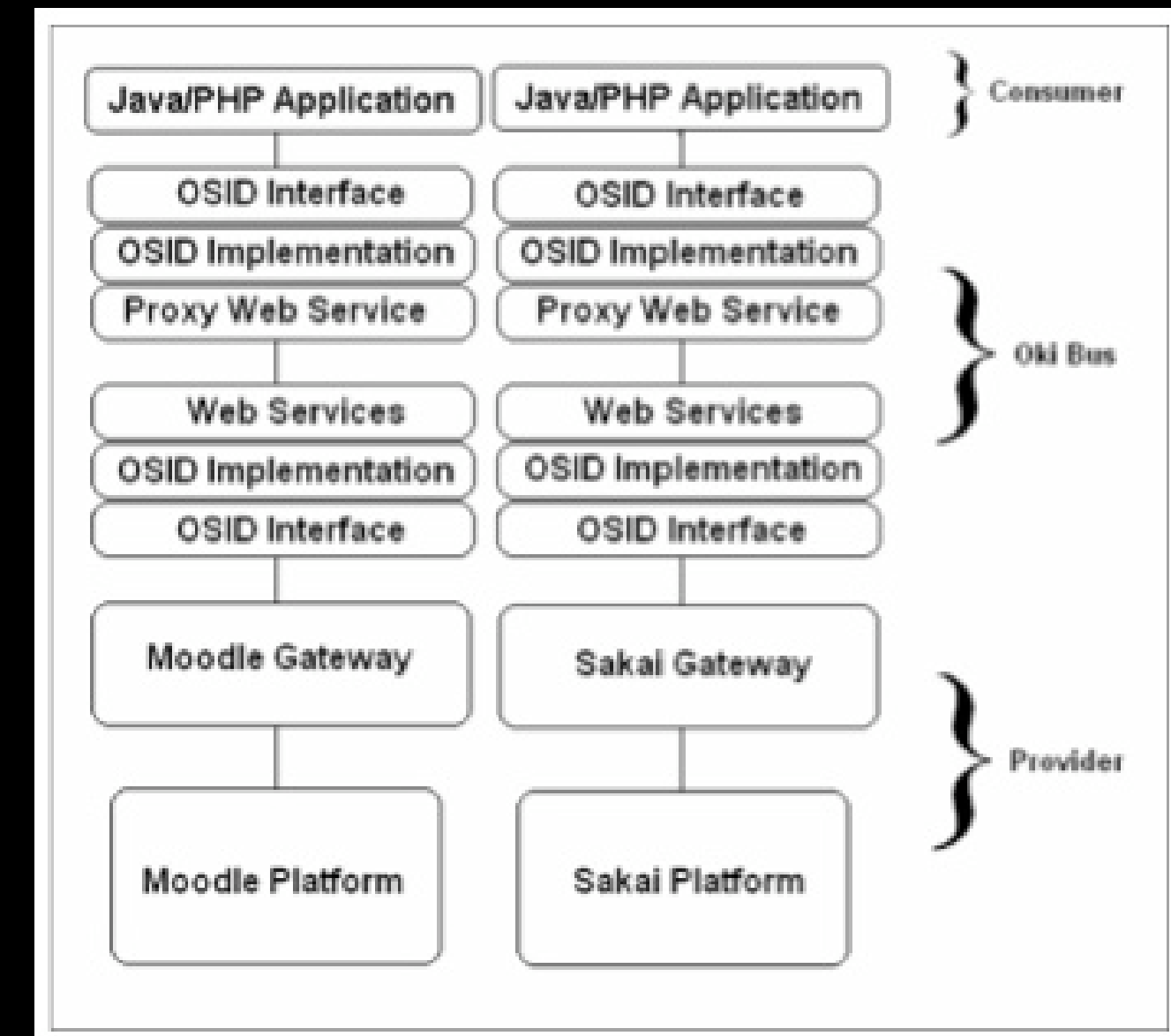


IMS: Personalized Learning Through Assessment and Sequencing

- Making it easier for developers of curriculum materials to map content and assessment items to organizational-specific learning outcomes, whether they be based on curriculum standards or talent management objectives
- Tying learning objectives and curriculum standards to content and assessment items
- Developing an easier to understand and implement approach to sequencing and/or learning application data exchange that will enable wider use of adaptive learning
- Linking measurable events and activities to instructor monitoring and sequencing to enhance learning outcomes and productivity
- Linking measurable events and activities to enterprise reporting to gauge achievement levels

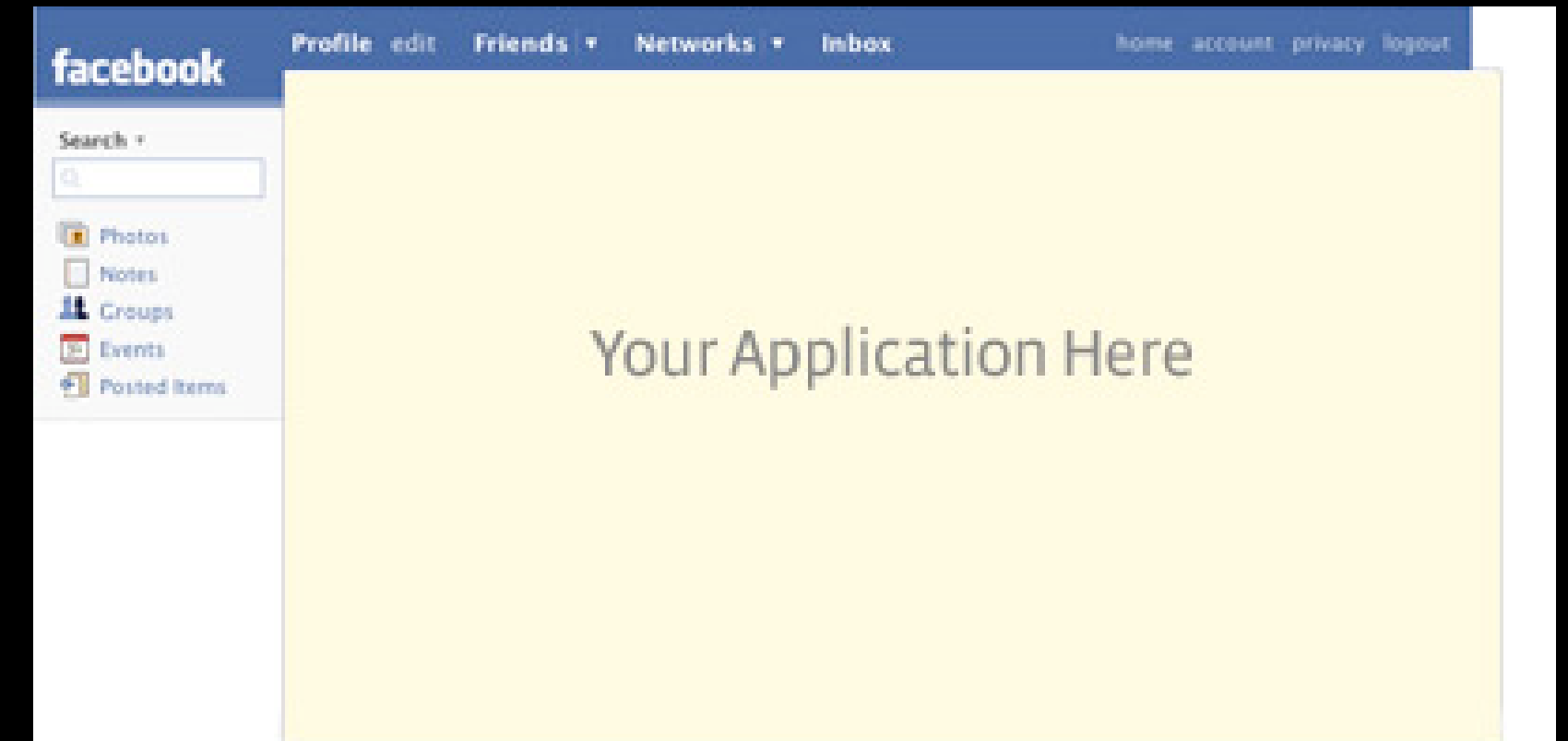
Open University of Catalonia

- Service Oriented Architecture
- Tool Pattern allows deployment in Sakai *or* Moodle
- OKI as UOC Developed Middleware
- Includes cross-deployment and configurations
- Proxy Tool Pattern
- Strong funding by Catalan Government
- www.campusproject.org



Facebook

- Facebook is becoming a personal portal
- REST – APIs
 - AuthN
 - Feed
 - Notifications
 - Profile
 - Events
 - Groups
- Pattern – you host an application and make it available to FB users





iPhone to Support Third-Party Web 2.0 Applications

Innovative New Way to Create Applications for iPhone

WWDC 2007, SAN FRANCISCO—June 11, 2007—Apple® today announced that its revolutionary iPhone™ will run applications created with Web 2.0 Internet standards when it begins shipping on June 29. Developers can create Web 2.0 applications which look and behave just like the applications built into iPhone, and which can seamlessly access iPhone's services, including making a phone call, sending an email and displaying a location in Google Maps. Third-party applications created using Web 2.0 standards can extend iPhone's capabilities without compromising its reliability or security.

"Developers and users alike are going to be very surprised and pleased at how great these applications look and work on iPhone," said Steve Jobs, Apple's CEO. "Our innovative approach, using Web 2.0-based standards, lets developers create amazing new applications while keeping the iPhone secure and reliable."

Web 2.0-based applications are being embraced by leading developers because they are far more interactive and responsive than traditional web applications, and can be easily distributed over the Internet and painlessly updated by simply changing the code on the developers' own servers. The modern web standards also provide secure data access and transactions, like those used with Amazon.com or online banking.

Apple ignited the personal computer revolution in the 1970s with the Apple II and reinvented the personal computer in the 1980s with the Macintosh. Today, Apple continues to lead the industry in innovation with its award-winning computers, OS X operating system and iLife and professional applications. Apple is also spearheading the digital media revolution with its iPod portable music and video players and iTunes online store, and will enter the mobile phone market this year with its revolutionary iPhone.

Increasing rate of UI change

- Increase separation between data, services and view

Chuck's New Job and Spare Time Pursuits

Chuck's Day Job

- Teaching
 - Masters Level – Java
 - Masters Level – Ruby on Rails
 - Undergraduate – Project Course
- Topics
 - Lecture Repository in Ruby using available in Sakai via IMS Tool Interoperability
 - Social Networking
 - Web 2.0
 - Guest Lecture help
- IMS Involvement Supported by UM
- Write Grants

Chuck's Background Thoughts

- Technical musings – Tough Challenges
 - Scalability
 - Service Oriented Architecture
 - Off-Line Sakai
- Pedagogic musings
 - Web 2.0 in teaching and learning
 - Personal Learning Environments
 - Research Collaboration
- Look at other software projects – survey the landscape

Fun Stuff

- Standard stuff for ex-Executive :)
- Consulting – Support my continued involvement in Sakai
 - Tactical stuff – writing providers and custom stuff for sites
 - Work with sites at the leading edge to explore new uses of Sakai
 - Training and speaking
- Write Portable Portlets
- Write Community Source book – capture what we have done and how it can be improved
- Sakai community involvement will be own-time activity likely focused on JSR-168, Portal, IMS Tool Interoperability

Sakai Research Edition

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

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...](#)

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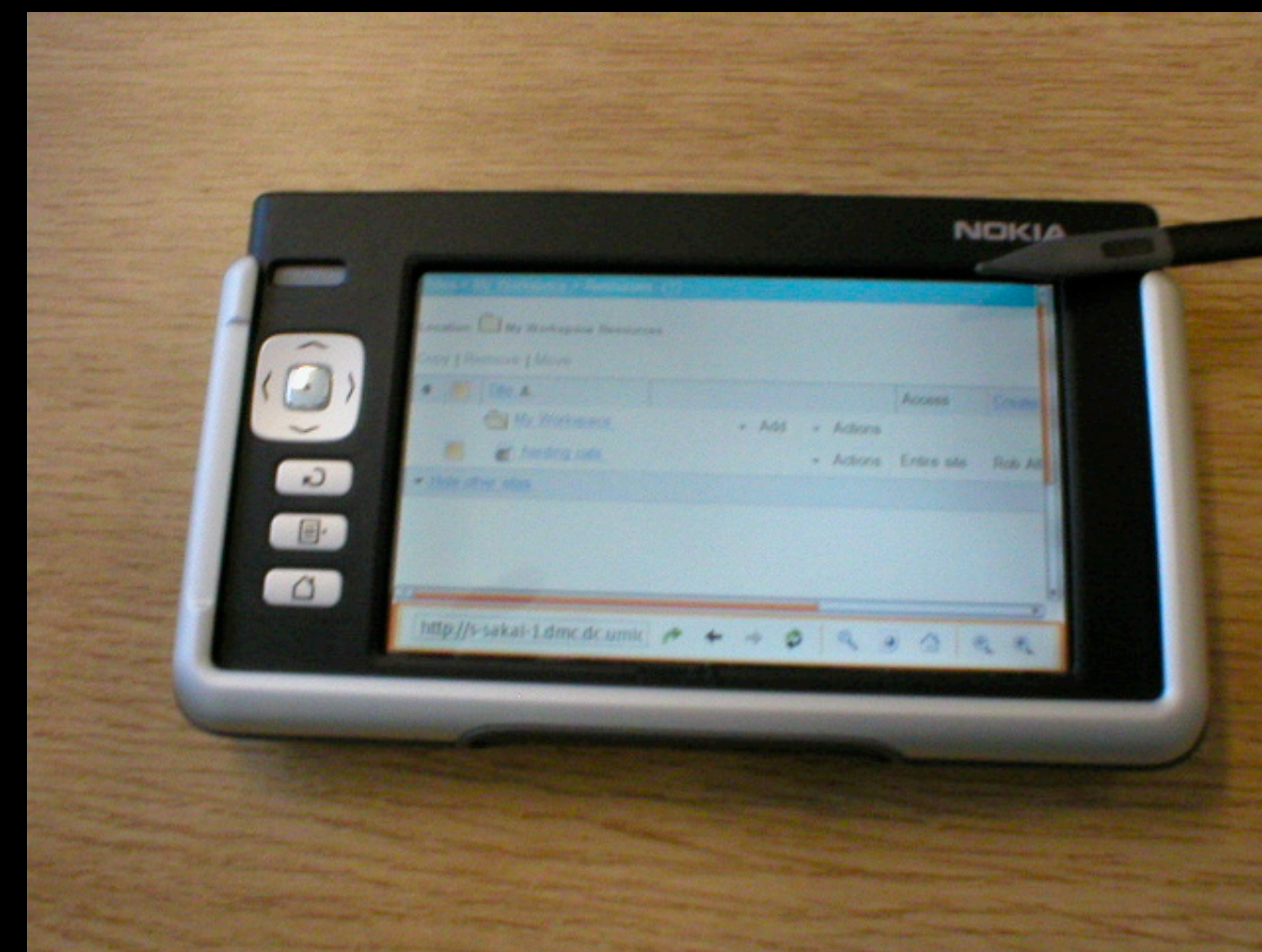
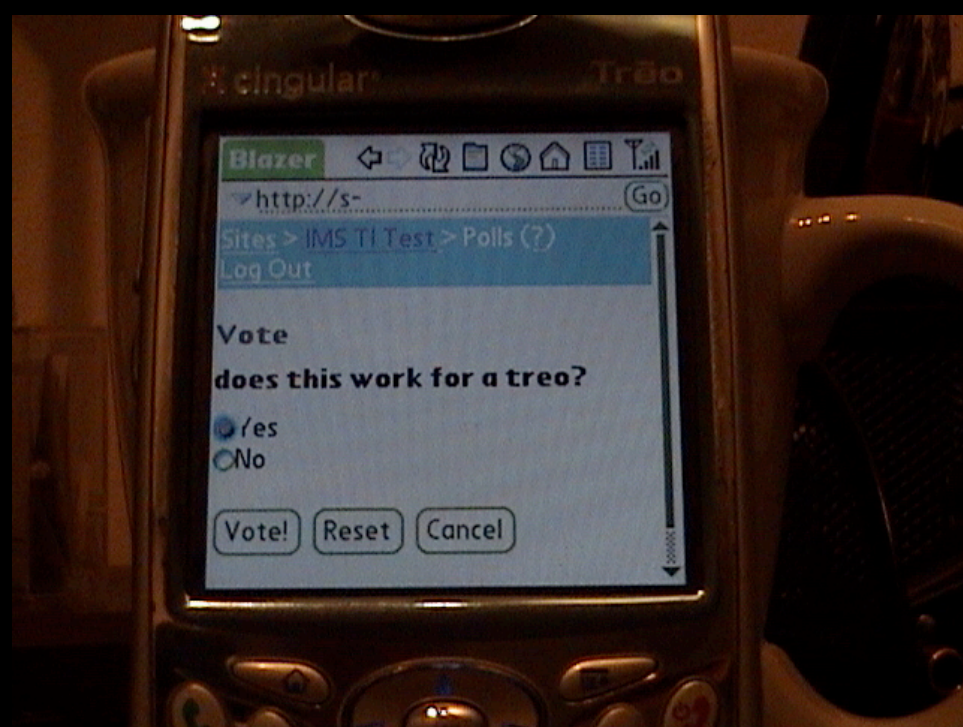
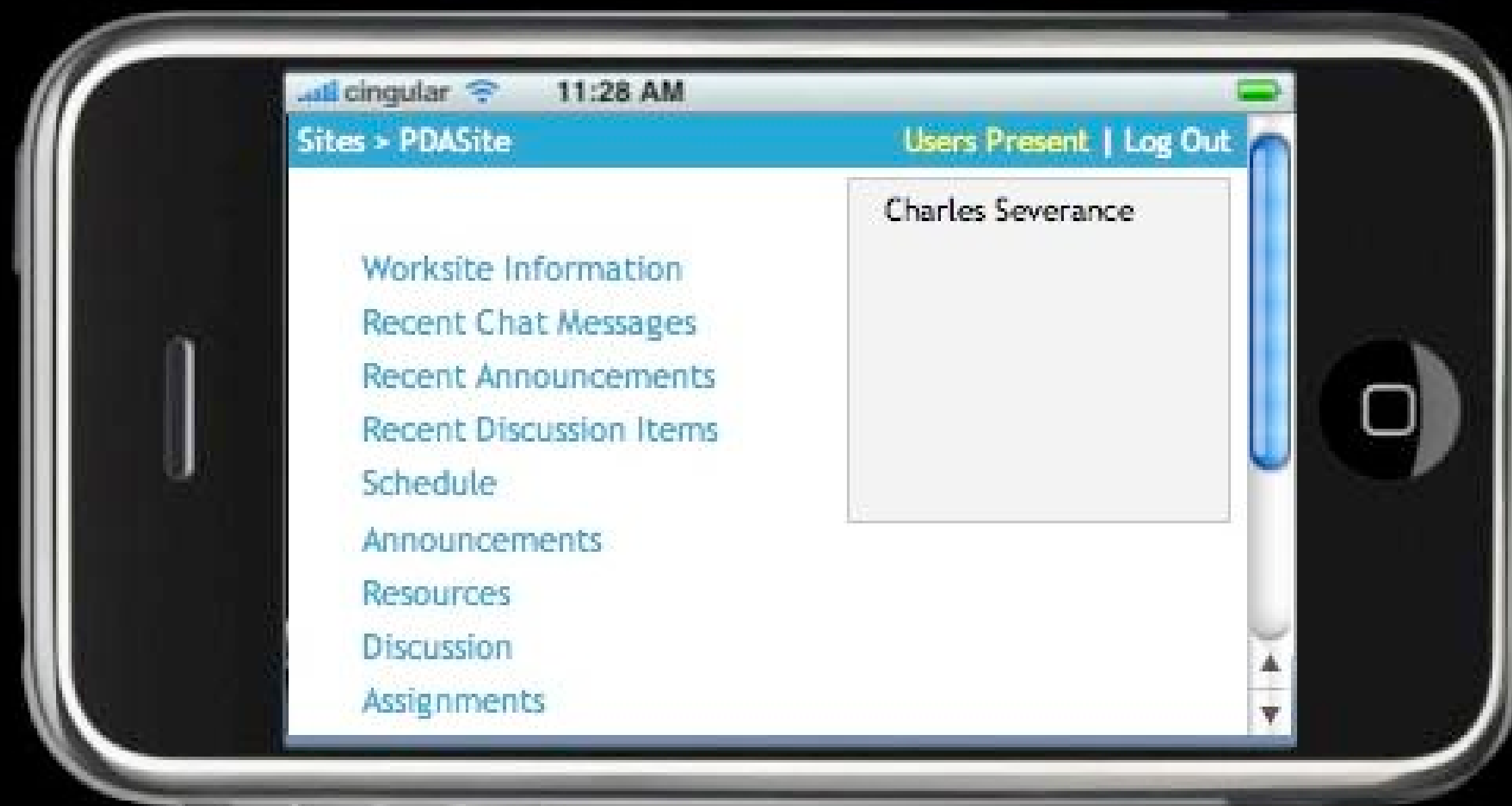
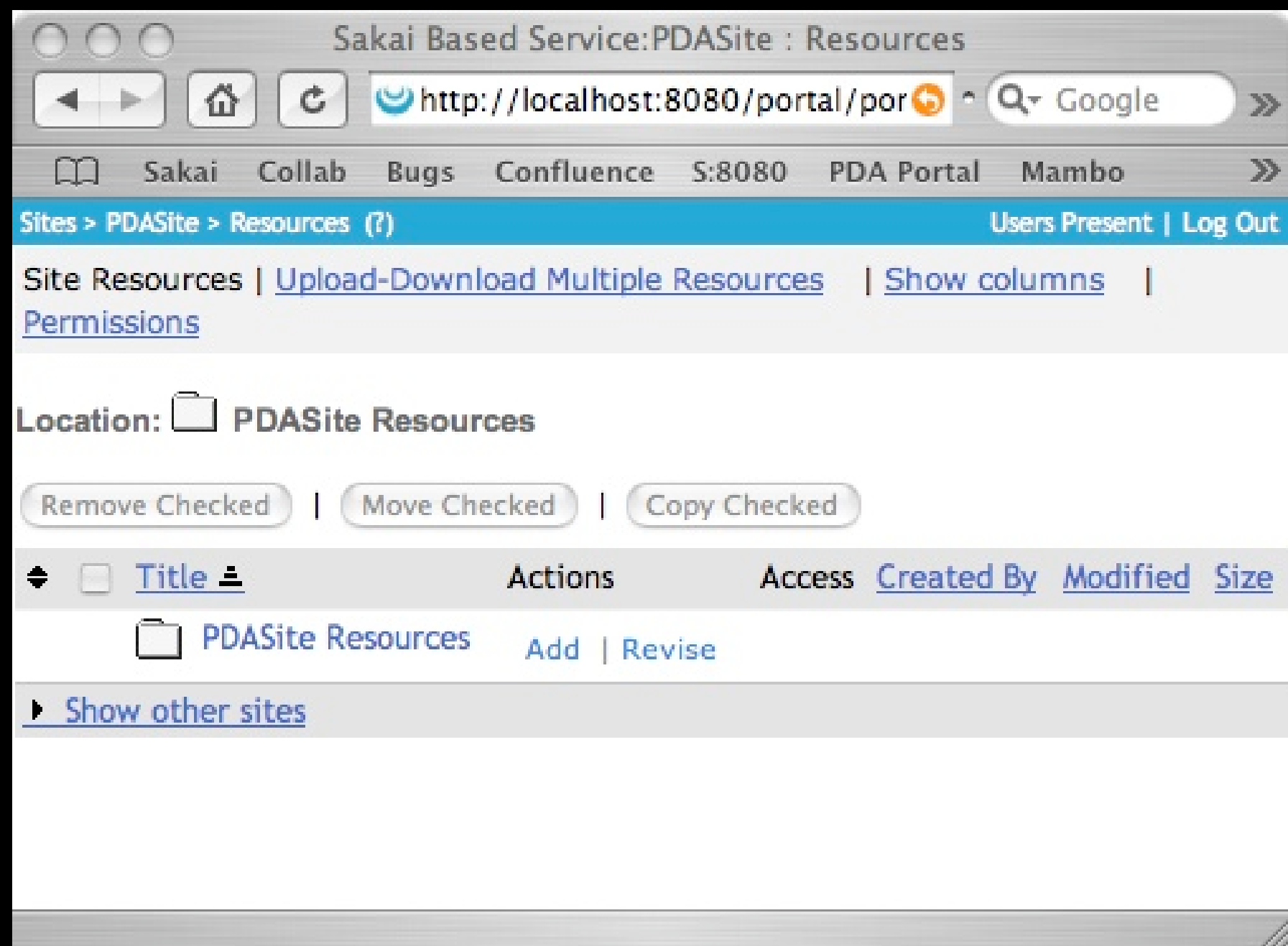
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- Yesterday
- Last Seven Days
- This Month
- Last Month

Source:

PDA in Sakai

Actions:



Questions

- Suggested Changes in Release Cycle
- Suggested Improvements for Development Processes
- Moving towards portability
- Moving towards interoperability
- Looking Ahead
- Chuck's New Job and Spare Time
- Sakai Research Edition

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