Sakai: eLearning and More

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Abstract

The Sakai project is an experiment in collaborative development, implementation, and productive use of eLearning software systems. The early experience has demonstrated that a rich-featured learning management system was developed by the Sakai Project and contributing Sakai partners. Building a sustaining community and demonstrating the eLearning systems can improve teaching, learning, and research has not yet been demonstrated, but appears likely.

Keywords: eLearning, open source, software

1 Motivation

The Sakai Project started January 2004 when four universities—the University of Michigan, Stanford University, Indiana University, and the Massachusetts Institute of Technology—began the development of a learning system to replace systems developed separately by each of the universities. The Andrew W. Mellon Foundation [4] supplemented local funding. The software development work was done by staff of the four universities.

Through the University of Delaware, the Mellon Foundation had funded the development of JA-SIG's uPortal as open source software; the Foundation and the universities agreed [7] the resulting Sakai software would be open source. Both the JA-SIG and Sakai licenses permit commercial firms to use the code in their software products and both have encouraged commercial participation. Two firms use the uPortal software in their proprietary products—SunGard SCT in their Luminus portal and Unicon, Inc. in their Academus portal. The Sakai project uses a Community Source license with similar provisions. The uPortal experience was adopted as a model for the larger Sakai project.

The proposing universities also asked that the uPortal project be funded to further integrate uPortal with Sakai, and later other portals, complying with the WSRP (Web Services Remote Portlet) specification. They also asked the MIT Open Knowledge Initiative (OKI) to continue development of the OKI Service Interface Definitions (OSIDs) though none have yet been implemented in the Sakai software.

Open source software is often credited with lower costs because there is no license fee. However, analysis of eLearning shows the long-term costs of maintaining learning materials in many different formats is both expensive for authors and publishers—which increases the cost of "textbooks"—and local software maintenance costs [1]. Similarly information technology budgets show the high cost of integrating systems by exchanging data using many different formats and architectures. The long-term costs of instructions may be reduced if "practical interoperability" can be achieved. Sakai's objective was not to save costs through open source licensing, but rather by strict compliance with open source standards and with cooperative development with other software developers.

The primary, and unspoken, motivation for Sakai is to achieve rich functionality that will support more effective pedagogies in all disciplines. Limited evidence [3] shows computer-based instruction can improve retention and completion and student satisfaction. However, often this has been achieved with specially developed learning materials or expensive licensed materials. Educational technologists working on the Sakai project and the Sakai partners generally agree that improved functionality will translate into more productive teaching, learning, and research. That is the motivation of those participating in Sakai.

2 Achieving "Practical Interoperability"

Sakai seeks "practical interoperability" through architecture of its product and compliance with open standards [2]. These include industry standards, such as OASIS, W3C, and ISO and similar standards-making bodies, standards and practices in education such as the Aviation Industry CBT Committee, SCORM, U.S. Postsecondary Electronic Standards Council (PESC) and IMS Global Learning, and research projects sponsored by the U.K. Joint Information Systems Committee (JISC) and SURF in the Netherlands.

2.1 Sakai Architecture

At the conceptual level, Sakai consists of two parts: The Sakai framework and "tools." The framework support the implementation of applications, called tools, by providing appropriate interfaces and services for the tools. The components are illustrated in Figure 1.

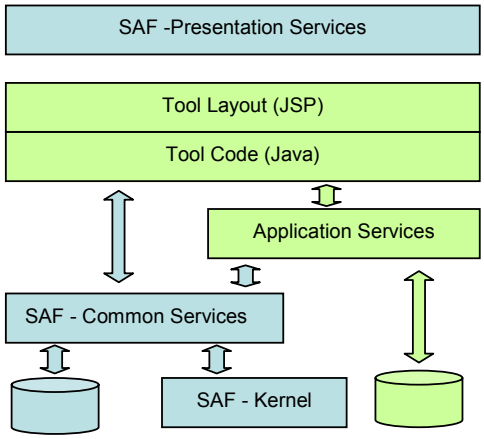

Figure 1 – Tools within Sakai

The framework provides presentation and common services; the tool may have application services separate from the Sakai Application Framework or use framework Common Services.

Although this diagram shows the use of Java, there is some research underway by Sakai partners to support other languages as well.

Some of the tools provided with Sakai 1.0 in April 2004 are listed in Table 1 [5]. Additional tools for Sakai 1.5 available March 2005 and Sakai 2.0 planned for June 2005 are listed in Table 2.

Announcements
Assignments
ChatRoom
Discussion
Threaded Discussion
Drop Box
Email Archive
Help
Message of the Day
News
Resources
Schedule
Site Browser
Web Content
WebDAV

Table 1 – Partial List of Sakai 1.0 Tools

Tool	Developer
Sakai assessment	Stanford and MIT
Syllabus	Indiana
Context Sensitive Help	Indiana
SCORM presentation	UC Davis
OSPI Portfolio	OSPI/rSmart
Melete lesson authoring	Foothill
Grade Book	UC Berkeley
Flow Talk	Cambridge
Blackboard Import	Texas

Table 2 – Additional Tools, Sakai 1.5 and 2.0

2.2 Implementing Standards

A number of specifications have come from standards-setting bodies. Choosing which specifications to implement and how is difficult. Sakai has followed these specification efforts closely and has asked those authoring the specifications to assist Sakai developers. This ensures consistency with the specification and the vision of those authoring the specifications. This is particularly important when specifications have several versions in a short period of time.

Sakai current supports the IMS Global Learning Consortium's Tool Portability Profile work group. If successful, this would ensure portability among learning systems. A demonstration of the exchange of Web Services messages between a grade book and learning management system is expected in July at Alti-Lab 2005. Sakai will continue to participate in further defining a specification or practice when a specification fails to provide "practical interoperability" and testing seeking to improve interoperability.

Sakai has developed a working relationship with the OASIS Web Services Remote Portlet Technical Committee, following the example of uPortal's relationship with the XLIFF language translation technical committee. This should ensure compliance with both current and proposed specifications and may reduce effort when work can be shared as planned for Apache Software Foundation's WSRP4J project. This code has been used and extended by the Sakai and uPortal developers and used by JISC in the CREE project at the University of Hull.

2.3 Determining Priorities

The Sakai Project development required a tradeoff between the immediate requirements to replace software at the University of Michigan (September 2004) and Indiana University (September 2005), and the section of features that

would also meet the needs of Stanford University and MIT, and satisfy MIT demanding architectural requirements, and time required to design and develop "best of breed" software.

Sakai has two communities. The Tools Team provided requirements, conceptual and functional designs, and priorities. The Tools Team also maintains the Sakai Style Guide. Development was done under the management of the Architecture Team. Because of the fixed dates for deployment, each of the releases included those features that were completed by the release date. The first release included legacy code that is being replaced by rewritten and refactored code in later Sakai releases.

Simultaneously with the development of the Sakai Collaborative Learning Environment, the University of California Berkeley was developing the grade book to be included in the Sakai 2.0 release. The assignment and assessment application, then called Samigo and now called simply Sakai assessment tool, was being further developed by Stanford and Indiana for release with Sakai 2.0. This work was done following advice of the Tools Team.

Much software development occurs external to the Sakai Project. The largest supplemental development effort has been Foothill College's Melete course authoring tool and Etudes NG (Next Generation)—an adaptation of Sakai for distance learning. This effort was not coordinated with the Tools Team because of the Team's commitment to a production release of the Sakai Collaborative Learning Environment. As shown in Figure 2, a growing number of tools is being developed by Sakai partners, generally basing their development on the emerging Sakai architecture.

The contribution of Foothill College is especially important; it provided sufficient functionality that the Sakai Collaborative Learning Environment, supplemented with Sakai assessment and the Foothill tools, has become a learning management system.

Because the Tools Team represents user needs, in the future the Tools Team should determine features of future releases. priorities for development for the core Sakai software product, and support partner projects that would benefit from the integration perspective the Tools Team provides.

3 Building the Community

Because learning, teaching, and research is the core business of tertiary education, the Sakai Community is important to mission of colleges and universities. More effective collaboration implies developing both the Sakai community and the larger community. This larger community includes the Sakai partners, the Sakai commercial affiliates—outreach to businesses that support these core functions, the firms and organizations that should be integrated into the learning systems, the library and publishing communities [6] that supply learning materials, other education open source software developments, and the larger open source communities.

3.1 Sakai Educational Partners Program

At the same time the Sakai Project began, the Hewlett Foundation provided funding to initiate the Sakai Educational Partners Program. This effort was to build a community that would implement the Sakai software and could contribute to further development. The Sakai Board asked that partners commit US$ 10,000 (US$ 5,000 for colleges and university with less than 5,000 students) for three years to support the community effort. The original plan expected 30 colleges and universities to join by December 2004, 70 by December 2005, and 100 by December 2006. In December 2004 56 colleges and universities were participating and 74 are now participating. Since the Sakai software is available at no cost to any potential user, this participation shows a commitment to the larger goals of Sakai, interest in participating in education and collaborative development of best practices and software, and perhaps altruism as well—the desire to make tertiary education better wherever possible sharing the benefits of their work with all.

The Partners Program maintains several channels of communications and provides limited technical support of the Sakai software. The program has supported some development as well. The Partners Program has held three conferences exchanging information on the project, building a context for eLearning, and planning further work. Based on discussions at the December 2004 conference in New Orleans, the partners have been developing an understanding of how to build and maintain an open source community. This is important to ensure the long-term support of the Sakai software, usually perceived as a software "product." The product is similar to, but should become more feature-rich than, current commercial learning management systems. Sakai's focus is much more narrow than commercial products—learning, teaching and research; commercial products tend to develop suites of somewhat related software omitting some of the features that few may find important for their method of teaching. Sakai expects to integrate with commercial products, especially administrative and library systems; for this reason there is an active Enterprise Integration Discussion Group. The Sakai Project is expected to transition into the Sakai Partners in January 2006, when their work is completed. All of the current core development universities expect to continue to contribute staff time to Sakai after the transition.

Unlike the more frequently cited open source projects such as Linux, the users of the Sakai software are faculty and their supporting education technologists. The difference between the user community and the development community is much larger than these other projects. CETIS' Bill Olivier has pointed out that any higher education application has these two communities. In December 2004 he suggested the uPortal project should begin to develop a "user" community (other than the developers) representing the interests of tertiary education. He observed the Sakai project and the Sakai partners may represent both of those communities, and may be important to the long-term development of the Sakai software.

The Sakai partners are developing software that extends the functionality of the Sakai software product. All seek to build "Sakai tools" and will be able to do so when the Sakai tool specification becomes more stable—following the release of Sakai 2.0—and with additional technical support. Each conference has held a Sakai Tool Development pre-conference workshop for these developers.

3.2 Sakai Commercial Affiliates

As a separate community, Sakai sought commercial firms that would use the Sakai software in or with their products—such as the OSPI portfolio "tool," provide technical support, especially implementation assistance, or become an application service provider. Six companies have been approved as Sakai Commercial Affiliates and will be reaching service level agreements. Others have asked to become a Sakai affiliate to generally support this open source community.

3.3 The International Community of Colleges and Universities

For several years U.K.'s Joint Information Systems Committee (JISC) and the Netherlands SURF organization have supported national and international standards development and implementations related to tertiary education. Sakai has followed their activities and projects, participates in their conferences, invites presentations on their work at the Sakai conferences, and attempts to integrate the Sakai software designs with existing standards and practices in the U.K. and Netherlands and, soon, the larger European Union. About one-third of the Sakai partners are Canadian, European, and Japanese universities.

The collaboration has shared JISC's experience using Web Services for integration of library, administration, and learning systems and SURF's integration of portals, especially uPortal, and other systems. The collaboration will be extended to the Japanese universities as well as the Ministry of Education has begun to support the implementation and development of open source software.

Sakai has also followed the work of JISC's OSS (Open Source Software) Watch project advising on the use of open source software.

4 Lessons Learned

The Sakai project, with less than 18 months experience, has demonstrated:

- Collaborative development of learning, teaching, and research software can produce richer functionality than any single college or university.
- There is a community—the Sakai partners—that is willing to support collaborative development, education and communication, and documentation even though the risks are not yet known.
- The Sakai open source learning systems may, in the future, reduce costs and improve productivity, though that has not yet been proven in practice.
- Cooperation with commercial firms has been productive, and expected to be more so. The Commercial Affiliates do not yet provide all of the services the Sakai community would like to have.

Sakai has made progress on defining and sustaining a community with common interests in tertiary education, though the emerging business model may not yet be sufficient to sustain the needed software development and support over the life of the software.

The effort so far has focused on the pedagogies found in research universities and the resulting software requirements. Supplemented by the Foothill College efforts and the emerging activities of other participating community colleges, the resulting software should serve eLearning from distance learning to supported classroom instruction.

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James Farmer is the Sakai Community Liaison. Ian Dolphin, University of Hull, is a member of the JA-SIG Board and the Sakai Board.

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