

Leading the Way on Standards-Based e-Learning

Beyond Compliance and Compatibility –
Building the Architecture to Support Future Standards

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Table of Contents

| | |
|-------------------------------------------------------|----------|
| OVERVIEW | 3 |
| TODAY'S STANDARDS LANDSCAPE | 3 |
| MORE DETAIL ON SOME IMPORTANT STANDARDS | 3 |
| IMS | 3 |
| ADL-SCORM | 3 |
| SNAPSHOT OF STANDARDS ORGANISATIONS | 4 |
| E-PORTFOLIOS, AUTHENTICATION AND ADDITIONAL | |
| IMPORTANT STANDARDS EFFORTS | 5 |
| BLACKBOARD: STANDARDS-BASED ENABLEMENT | |
| THROUGH BUILDING BLOCKS ARCHITECTURE | 5 |
| MAPPING A PATH: WHICH STANDARDS ARE IMPORTANT? | 6 |
| Content Import / Export / Reuse | 6 |
| Tool Interoperability to Support Multiple Pedagogies | 6 |
| Back Office Integration | 6 |
| Accessibility | 6 |
| STANDARDS INCORPORATED BY BLACKBOARD INC. | 7 |
| THE FUTURE | 8 |

OVERVIEW

The first generation of Course Management Systems (CMS) focused on ease of use and generic features such as grade books, quizzing tools and course calendars. Now that this first round of wide adoption has been achieved, faculty and instructors are finding that they require a second generation of tools and capabilities. They want discipline and pedagogy-specific tools and content which provide distinctive instructional experiences for students. This requires a second generation CMS platform that supports the integration of external tools and content while still providing a stable, robust, easy-to-use environment. In many ways, a CMS is becoming an operating system for education delivery.

As the next generation CMS begins, Blackboard believes it is critical to have individual specification compliance and compatibility, but, more importantly, for any CMS architecture to support current as well as future standards. This position paper explores the current standards landscape, Blackboard's strategy for successfully navigating the complicated standards environment and how the **Blackboard Building Blocks®** architecture can help you meet and keep ahead of the latest standards initiatives.

TODAY'S STANDARDS LANDSCAPE

As the e-Learning market has grown exponentially over the last five years, so have the number and types of organisations that focus on development and implementation of specifications and standards. Each year, dozens of new standards groups are created based on market, geography and topic. The "Snapshot" chart (see page 4) highlights just a few of these organisations and what they do.

MORE DETAIL ON SOME IMPORTANT STANDARDS

Of the standards and groups listed on page 4, a few stand-out for further detailed discussion: IMS, ADL-SCORM, and e-Portfolios.

IMS

The IMS organisation is the closest to an "umbrella group" for the variety of e-Learning standards organisations that exist or are currently forming. The IMS was born in 1997 as a project within the National Learning Infrastructure Initiative of EDUCAUSE. While IMS originally focused on standards for higher education, it now addresses requirements for a wide range of learning contexts, including K-12, higher education, corporate and government training. The IMS has, at one time or another, been composed of more than 30 working groups domestically and internationally, each working on different interoperable specifications.

Blackboard has a long history with IMS as the primary technical contractor to the IMS organisation under EDUCAUSE in 1997 and 1998. Blackboard co-founder and Chairman, Matthew Pittinsky, was part of the team that developed the original IMS vision, scope and requirements. Over the years Blackboard has collaborated with the IMS and its working groups to refine the standards and encourage adoption of them within the industry. In addition, Blackboard:

- Authored the original IMS Content & Packaging specification and coauthored the current IMS Content & Packaging specification with Microsoft;
- Developed the essential elements of the ADL SCORM run-time communication model in collaboration with Macromedia for the IMS; and
- Worked with PeopleSoft to co-author the IMS Enterprise specification, which is implemented in **Blackboard Learning System ML™** and **Blackboard Learning System™**-Release 6.

SNAPSHOT OF STANDARDS ORGANISATIONS

| Organisation | Geography | Primary Market | Function |
|------------------------|-----------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IMS | Worldwide | K-12, HE, Corp, Gov | The largest and most comprehensive standards group, the IMS is composed of over 30 working groups addressing interoperable specifications. |
| ADL-SCORM | Worldwide | K-12, HE, Corp, Gov | White House/USDOD project. Sharable Content Object Reference Model (SCORM) is Advanced Distributed Learning's (ADL's) most widely known initiative. Current releases include a model for packaging learning content, a run-time API communications model, and, in SCORM 1.3, content sequencing |
| AICC | Worldwide | Corp | Aviation Industry Computer-based-training Committee (AICC) defines airline standards for computer managed instruction (CMI) that have been adopted by the e-Learning industry and is the basis for the SCORM run-time communication model. |
| OKI and Sakai | Worldwide | HE | Open Knowledge Initiative (OKI) defines service-based component architecture and a set of service interface definitions and APIs to support interoperability. Sakai is a new project aimed at refactoring the OKI SIDs for a product. |
| SIF | US and UK | K-12 and Schools | Schools Interoperability Framework (SIF) is an open specification for interoperability among K-12 instructional and administrative software applications. |
| Shibboleth/Internet 2 | Worldwide | HE | Shibboleth is an open, standards based authentication integration solution allowing users to access controlled information securely without additional passwords. |
| IEEE | Worldwide | All | Institute of Electrical and Electronics Engineers (IEEE) working groups generally take IMS and other e-Learning specifications |
| JISC | UK | HE and FE | The Joint Information Systems Committee (JISC) supports further and higher education by providing strategic guidance, advice and opportunities to use Information and Communications Technology (ICT) to support teaching, learning, research and administration. JISC is funded by all the UK post-16 and higher education funding councils. |
| CETIS | UK | HE and FE | Centre for Educational Technology Interoperability Standards (CETIS) represents UK higher-education and further-education institutions on international learning technology standards initiatives. |
| BECTA | UK | All | British Educational Communications and Technology Agency (Becta) is the Government's lead agency for ICT in education. Working to support the development of ICT in education throughout the UK, Becta's unique contribution is to combine knowledge of the needs of education with an understanding of the power of technology. |
| JA-SIG uPortal | US and UK | HE | uPortal is a free, sharable portal under development by institutions of higher-education. |
| e-Portfolio Consortium | Worldwide | HE | The Electronic Portfolio Consortium, or ePortConsortium, is the collaboration of higher education and IT institutions working to define, design, and develop electronic portfolio software environment and management systems. |

ADL-SCORM

Another major standards organisation currently very visible is ADL-SCORM. ADL is a joint White House / U.S. Department of Defense (DOD) initiative. The role of the ADL is to document, validate, promote, and sometimes fund the creation of learning technology specifications and standards from other sources. The Sharable Content Object Reference Model (SCORM) is the ADL's most widely known initiative. SCORM is a reference model for standardising the reusability and interoperability of learning content.

The current release defines a model for packaging learning content (based on IMS Content & Packaging and IEEE LOM), and a run-time API for enabling communications between learning content and the system that delivers it (derived from the AICC course launch and statistics reporting model). The released SCORM 2004 specification includes content sequencing (based on the IMS Simple Sequencing specification).

SCORM represents a marriage of IMS, AICC and IEEE efforts, rather than a competing standards effort. SCORM has experienced wide and global adoption in government and industry. The education industry is now beginning to see SCORM as a model that integrates specifications from several areas into a cohesive set of specifications, despite the fact that SCORM does not address all the requirements of education.

E-PORTFOLIOS, AUTHENTICATION AND ADDITIONAL IMPORTANT STANDARDS EFFORTS

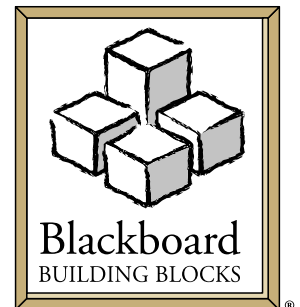
Other standards initiatives include the e-Portfolio Consortium and the IMS e-Portfolio Working Group that is developing specifications and standards around electronic portfolio interoperability and portability. In order to maximise portability, enterprise systems must be able to seamlessly exchange data in a secure manner. The Internet2 Middleware Working Group on Shibboleth has been working to test and refine the ability for learners and instructors to seamlessly move from one

learning platform to another across campuses and geographic boundaries without having to re-authenticate. In addition, Blackboard, Dartmouth College and Princeton University have recently embarked on a research project to show true interoperability with educationally funded and developed learning applications.

As the variety of specification organisations and their objectives indicate, there is not one cohesive standards body, but many specification groups worldwide with many disparate or overlapping aims. Navigating and supporting these varied organisations is becoming increasingly complex for vendors and end-users.

BLACKBOARD: STANDARDS-BASED ENABLEMENT THROUGH BUILDING BLOCKS ARCHITECTURE

Given the complicated standards specification environment and variety of groups to work with, as well as the varied needs of Blackboard's user-base, Blackboard focuses its efforts on making compliance with any standard possible. To do this, Blackboard has an architecture that allows for integration and interoperability: Blackboard Building Blocks. Blackboard Building Blocks is designed to provide users the extensibility needed to quickly implement support for new and changing interoperability specifications. Blackboard's open architecture means that clients do not have to wait for an update to a new product release to implement a standard. With the tools and power of Building Blocks, clients may implement customised interoperability technology at any time.



Many of the concepts enabled by Blackboard Building Blocks come from IMS and other standards groups, and our goal is for standards-based enablement as the industry reaches agreement on a comprehensive set of standards. Vendors who embed their specification support directly into the core of their product will always be well behind the latest version—placing interoperability in sight, but always just a bit out of reach. Blackboard Building Blocks allows Blackboard to not only provide support for the latest version and releases of specifications and standards, but also to support versions of specifica-

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tions still under development, without having to wait months or years for the completion of a product development cycle.

The Blackboard Building Blocks architecture supports integration of all types, including standards-based integration, industry leaders' proprietary interfaces, and customised integration to support local organisational needs and technology. Standards make interoperability easier and streamline efficiencies, and with Blackboard the benefits are accessible now. This is true, no matter what changes future standards bring.

MAPPING A PATH: WHICH STANDARDS ARE IMPORTANT?

The Blackboard Building Blocks architecture allows for the implementation of any standard, thus answering the question—which standards does Blackboard support? The real question becomes—which standards are important to you?

Based on client feedback, Blackboard realises that there are a few standards that will be important to a large constituent of its clients. For these clients Blackboard has invested its own development resources to create Building Blocks for key standards. Blackboard manages its various standards and specification development efforts across four key areas of interoperability: 1) content based standards; 2) tool interoperability; 3) enterprise integration of data, authentication and authorisation; and 4) usability. While many of the standards available today allow for some level of interoperability in the areas listed above, Blackboard envisions a day when all the specifications will allow the full interoperability and openness desired by faculty and students. Work is progressing towards that end goal, but is slow in some areas. Blackboard, however, is not waiting for the end goal—it is enabling interoperability today using Blackboard Building Blocks:

Content Import/Export/Reuse

The Content Player Building Block is a new Blackboard Building Block that supports the ADL SCORM 1.2 content, the IMS Content & Packaging 1.1.2 content and the United Kingdom's NLN content. All in a flexible architecture, the Content Player Building Block allows for additional content handlers to be installed and to play new content

types as new specifications or versions are released independent of the Blackboard Learning System core release dates. Blackboard courses have always and continue to be exportable and importable via the IMS Content & Packaging specification.

Tool Interoperability to Support Multiple Pedagogies

The Blackboard Building Blocks programme has established Blackboard as the leader in interoperability tools to support different pedagogies within Course Management Systems. Hundreds of commercial and academic developers are creating tools to integrate with Blackboard. These tools support a variety of different pedagogies and give instructors and learners the flexibility to choose which tool works best for them.

Back Office Integration

The Blackboard Learning System includes out of the box support for Enterprise interoperability—the ability to integrate Blackboard with student information systems, central authentication systems and library systems; and to share information about users, courses, enrollment records and grades. Blackboard's ability to support back office integration follows several standards, including the IMS Enterprise Specification, authentication integration with LDAP, Kerberos and DCE as well as Internet2 Shibboleth integration. The IMS Enterprise Specification allows for enterprise systems on campus to seamlessly interact with each other, for example allowing an SIS to send enrollment information to the Blackboard Learning System. Internet2 Shibboleth allows for not only single-sign on campus, but across campuses and the world as well, truly allowing for boundless learning. Blackboard Building Blocks has also allowed for the Enterprise interoperability of the JA-SIG uPortal to sit on top of and retrieve data from the Blackboard Learning System.

Accessibility

Blackboard has adopted the recommendations made in the IMS Accessibility guidelines, and has implemented support for accessibility standards as specified in Section 508 of the Federal Rehabilitation Act.

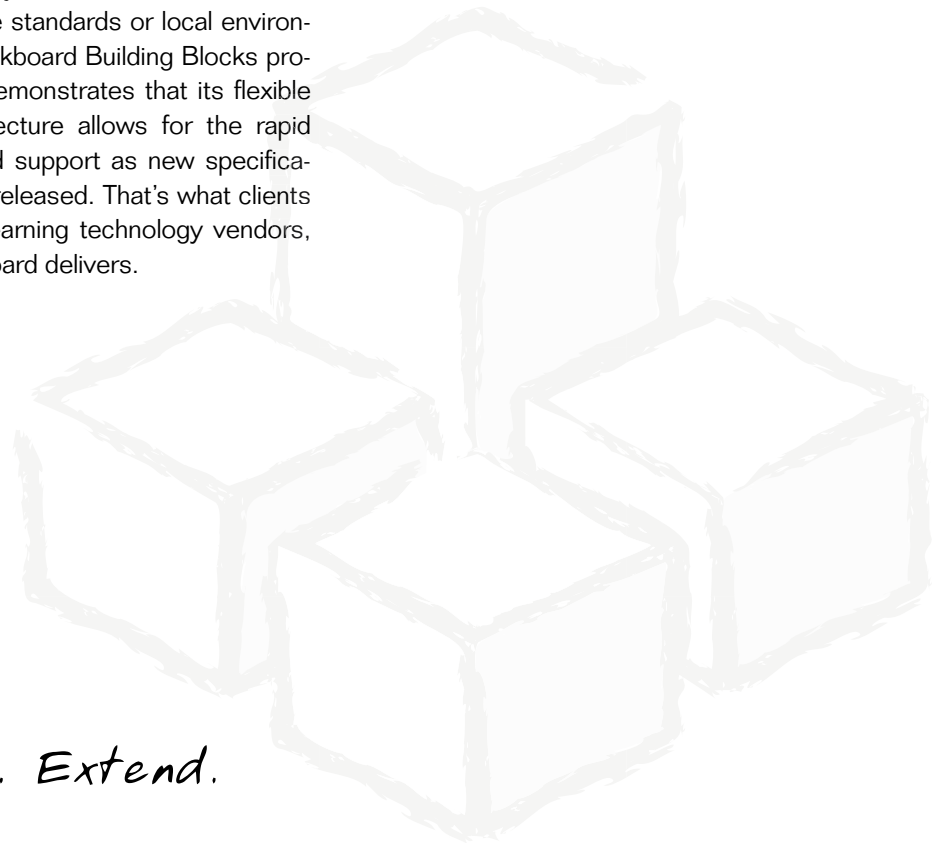
STANDARDS INCORPORATED BY BLACKBOARD INC.

| Industry Standards | Blackboard |
|---------------------------------------------------|----------------|
| Content Interoperability | |
| ADL/SCORM | X |
| IMS Content and Packaging | X |
| IMS Metadata | X |
| IMS Question and Test Interoperability | X |
| IMS e-Portfolio Specification | In Development |
| NLN | X |
| IMS Digital Repositories | In Development |
| IMS Learning Design | In Development |
| AICC | X |
| JA-SIG uPortal | X |
| Blackboard Building Blocks .NET APIs | X |
| Data Integration | |
| SIIA SIF (School Interoperability Framework, K12) | In Development |
| IMS Learner Information Package | In Development |
| IMS Enterprise | X |
| Authentication | |
| Shibboleth | X |
| A-Select (Netherlands authentication system) | X |
| Kerberos | X |
| LDAP | X |
| DCE | X |
| Accessibility | |
| Accessibility (508 Compliance) | X |

THE FUTURE

To be effective for its clients, a learning technology company such as Blackboard must track the activities of many different learning technology standards groups. It must also be willing to commit the resources needed to actively support the development of standards important to their market. Through membership and active participation in various standards bodies, Blackboard is helping to develop the full interoperability standards of tomorrow. Through Blackboard Building Blocks, Blackboard provides a flexible architecture that can take advantage of standards based-interoperability as it is today.

It is unlikely that the learning industry will coalesce around a single set of standards. By necessity, standards will vary based on different industries and regions, for both technical and social needs. Therefore, if you are a CMS user, you need a platform that supports the standards relevant to you, makes interoperability work in your environment, and can adapt to changes in the standards or local environment. Through the Blackboard Building Blocks programme, Blackboard demonstrates that its flexible and expandable architecture allows for the rapid adoption and continued support as new specifications and versions are released. That's what clients should demand from learning technology vendors, and that's what Blackboard delivers.



Innovate. Integrate. Extend.



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