

Blackboard Learning System[™] *(Release 6)*

Product Overview White Paper

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Document Purpose and Scope

This white paper provides an overview of the *Blackboard Learning System*™ (Release 6), and describes core functions as well as new features, functionality, architectural platform enhancements and overall system architecture. The *Blackboard Learning System* is a Web-based software system that offers industry leading course management, Building Blocks™ architecture for customization and interoperability, and a scalable, modular design that allows for integration with student information systems, authentication schema, and security protocols.

Introduction

Blackboard Inc. develops, licenses, and supports enterprise software applications for the global education market. Working in concert with more than 2,600 client-institutions and dozens of technology partners, Blackboard is committed to enabling client innovation and to enriching the educational experience through information technology. Blackboard's suite of enterprise applications includes the *Blackboard Learning System*, *Blackboard Community Portal System*™, and *Blackboard Transaction System*™. Through the use of Building Blocks technology, Blackboard's suite of applications has been architected and designed to deliver a flexible, customizable, and seamlessly integrated operating environment for e-Education.

Overview of the *Blackboard Learning System*

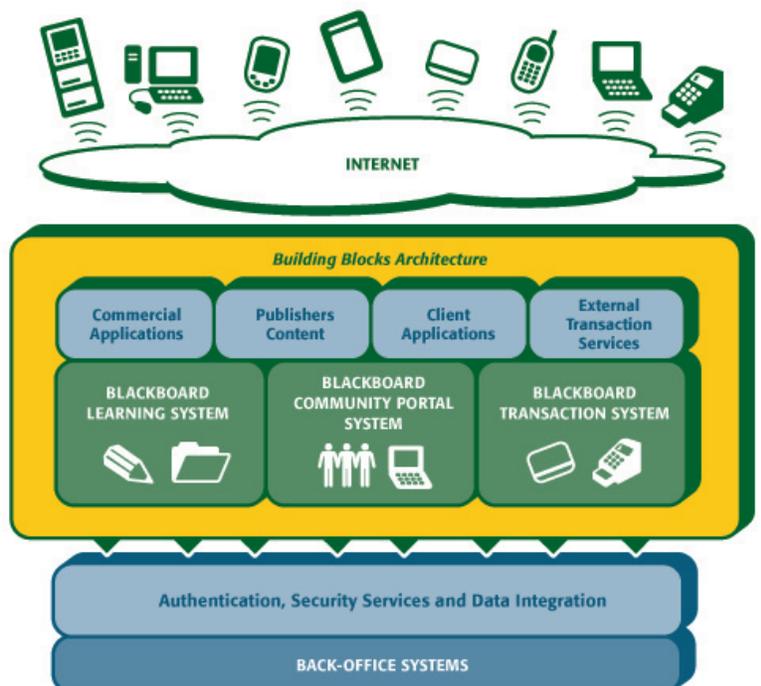
Information technology in education, once associated predominantly with providing administrative utilities, has become increasingly inseparable from an institution's core mission of teaching and learning. From the early adoption of course management tools in the late 1990s to today, education technology leaders have seen Web-based e-Education services take on an increasingly strategic position requiring enterprise-level thinking and planning.

The *Blackboard Learning System*, is the result of a multimillion dollar R&D effort and a third generation enterprise technology platform aimed at achieving the following client objectives:

- Measuring and improving student performance
- Increasing instructor productivity

- Enabling “Web-enhanced” classroom-based teaching and learning
- Delivering distance learning
- Supporting lifelong continuing education
- Blending the benefits of face-to-face and online learning through the use of hybrid courses
- Leveraging technology to enhance institutional competitiveness, applicant selectivity and retention
- Providing a platform framework that integrates course and learning management capabilities with an organization's student information, security, and authentication protocols
- Providing a framework for managing an institution's digital assets and content

BLACKBOARD PRODUCT ARCHITECTURE



Client-Driven Innovation—Powered by Blackboard

Blackboard's approach to product development is singularly focused on understanding and meeting client needs and requirements. *Blackboard Learning System* has evolved through hundreds of client-driven enhancement requests and includes more than 150 feature and platform innovations. Through extensive feedback from our client base of teachers, students, instructional technologists, our Product Advisory Board, and Beta testing partners, the *Blackboard Learning System* has been developed to focus on five core client success pillars, which reflect our clients' priorities for achieving success in their e-Education initiatives:

- *Ease of use and Simplicity*: to encourage adoption among novice and advanced users
- *Open Architecture*: to provide pedagogical and administrative flexibility
- *Enterprise Technology*: to enable a mission critical e-Education operating environment
- *Maximizing value and optimizing institutional investments*: to reduce administrative overhead and manage growth
- *Innovation*: to enable the adoption of new technologies in order to achieve strategic and pedagogical objectives

The *Blackboard Learning System*—Teaching and Learning Environment

Enabling institutions to use the Internet as a powerful tool for teaching and learning

Used daily by more than 2,000 institutions dedicated to teaching and learning, the *Blackboard Learning System* features an online environment designed to complement and supplement either traditional learning or distance learning. Through an intuitive interface, instructors can manage online environments for teaching and learning by using the following utilities:

- Content Management and Content Sharing
- Assessment Management
- Gradebook
- Collaboration and Communication
- Assignment and Portfolio Management

Summary of New Features within the Teaching and Learning Utilities of the *Blackboard Learning System*:

Content Management

- User-controlled, text-based naming and navigation for course content areas
- Ability to move and copy content items, folders, and learning units within course content areas and among distinct courses
- Seamless content linking within courses
- Ability to create and organize content and related assessments and communications in any content area
- Accepts SCORM-compliant Microsoft® LRN™ content in any area

Assessment Management

- Completely re-architected assessment engine
- Dynamic, rules-based assessment authoring with fewer clicks and more functionality
- More feedback and delivery options
- Full integration with content areas and gradebook
- Integrated math and science notation

Gradebook

- Ability to create and define custom symbol sets and letter grade values
- Enhanced grade display options (raw scores, percentages, letters, custom symbol sets)
- Custom gradebook category creation
- Ability to weight final percentages by category as well as by individual items
- Advanced sorting capability
- Ability to upload grades from spreadsheet applications and text files

In addition to offering instructors a feature-rich learning environment, Blackboard delivers pedagogical flexibility, complete control of the course design, and unmatched ease of use, as explored below.

Content Management and Content Sharing

Content management and content sharing in the *Blackboard Learning System* is curriculum-driven, designed to enhance student performance and provide instructors with complete pedagogical control within the course environment. The *Blackboard Learning System*, provides instructors with greater control over creating and managing course content, course navigation, and expanded course “real-estate.” Designed for advanced and novice users, instructors have complete flexibility to create course content, link assignments, and add tests, surveys, self-tests, and evaluations through the following capabilities:

Core Functionality:

- Create folder structures and learning units to organize content
- Post announcements, course materials, assignments, links, faculty and student profiles, and more to the course Web site

New Features in *Blackboard Learning System*, continued

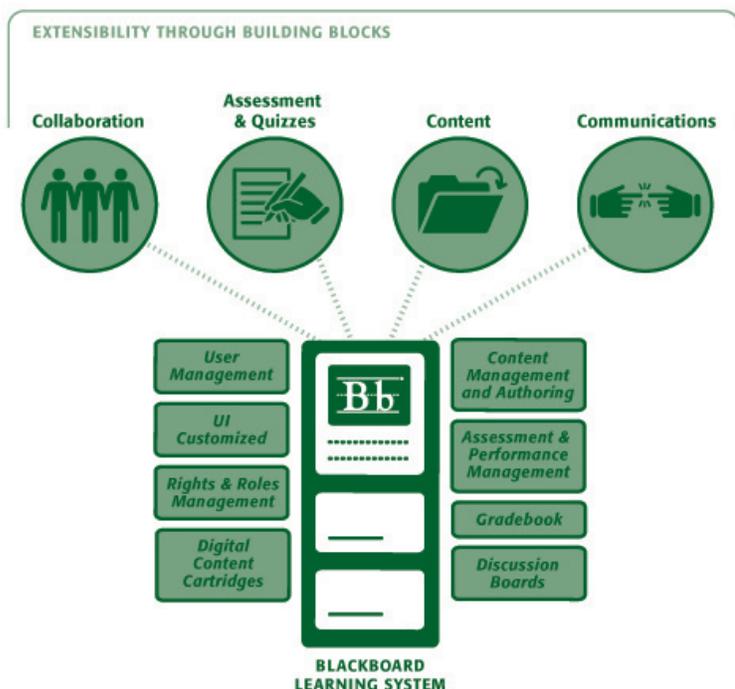
Collaboration

- Completely re-architected environment for online collaboration
- Free-form chat, chat lectures, question and answer chats, archives, white boarding, class tours, and group Web browsing

Assignment Management

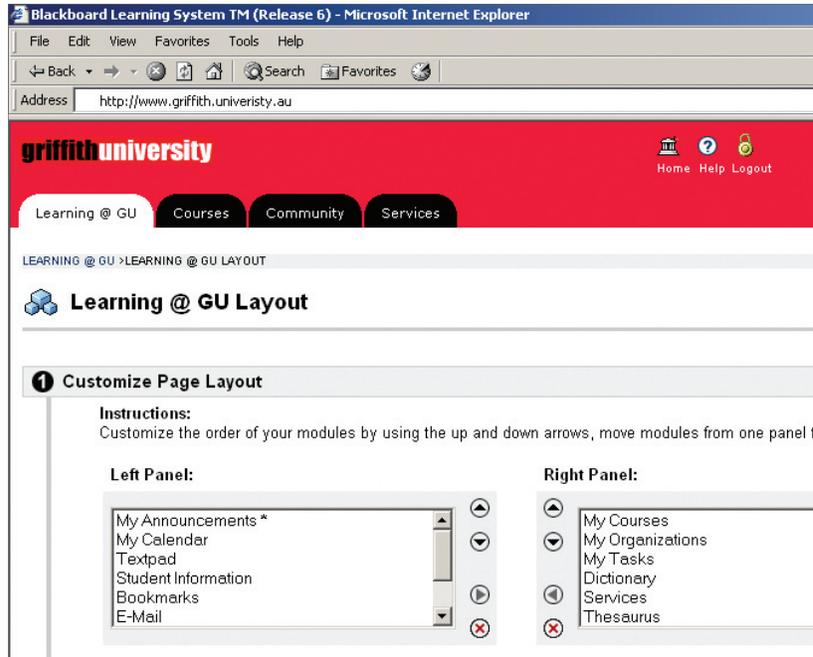
- Entirely new functionality allows for collection, storage, and organization of student assignments and teacher feedback
- Students submission of assignments directly to related course content area
- Teachers manage student files, “corrected” versions, rewrites, and feedback through gradebook
- Bulk assignment download and deletion

BLACKBOARD LEARNING SYSTEM



- Timed-release of materials (content, assessments, learning units) providing flexibility to present content according to curriculum-driven criteria, including sequential and date/ time-driven criteria
- Support for uploading and delivering multiple file and content formats, including:
 - Microsoft Office
 - Adobe Acrobat PDF
 - HTML
 - Digital images
 - Digital Audio files
 - Digital video files
 - Multimedia (e.g. Flash)
- Support for more than 1,300 publisher-created Course Cartridges, available in dozens of academic disciplines through the Blackboard Course Cartridge Catalog
- Download course content and customize publisher-created material to meet course-specific learning objectives

Text-based Navigation



New, in Release 6:

- Increased customization and labeling flexibility through text-based Course Menu, providing curriculum-driven course architecture—Collapsible Course Menu icon providing enhanced control and 30 percent more course “real-estate”
- Re-architected file management structure, allowing instructors to organize content by creating an unlimited set of content areas as well as the ability to name these areas according to instructor-determined criteria
- Section Management - Instructors teaching several courses can now copy and move content items, folders, and learning units among multiple sections of the same course
- Advanced content copying and content moving functionality
- Ability to group various types of course content (items, folders, external links, assignments, assessments, and links to related discussion board forums) into the same content folder
- Blend content and activities within a specified content area
- Internal linking from content areas to other content items, folders, or course tools
- SCORM and IMS-compliant Microsoft® LRN™ content can be added or linked to any course area

- Math and Science equation editor integrated in all content areas and assessments
- Leverage institutional investments in course content development through enhanced content copying among courses
- Option to license in conjunction with the *Blackboard Community Portal System*, content sharing for site-defined user groups

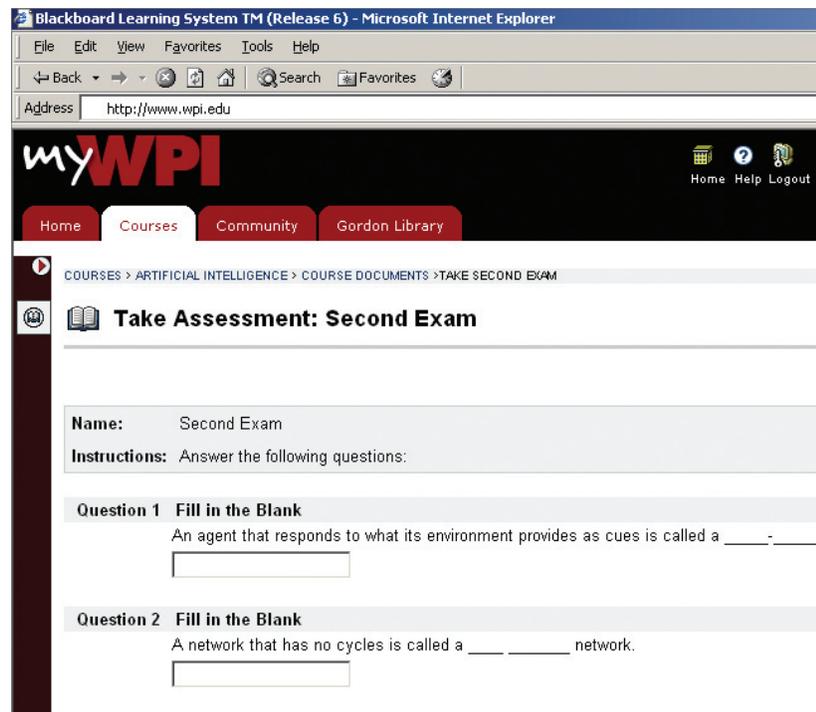
Assessment Manager

The Blackboard assessment manager allows instructors to raise student preparedness, measure progress against pre-set learning objectives or criteria, and collect student feedback. Featuring a completely re-architected assessment engine designed to improve assessment creation workflow, the *Blackboard Learning System* provides significant new functionality for online quizzes, self-tests, and surveys while at the same time maintaining a familiar, intuitive interface.

Core Functionality

- Develop assessments through intuitive, step-by-step workflow
- Administer multiple question formats, including multiple choice, multiple answer, true/false, matching, ordering, fill-in the blank and short answer/essay.

Assessment Manager



- Create question pools to store questions, import and export banks of questions, and randomize question delivery in assessments
- Build password-protected quizzes, timed assessments, and customized feedback for correct and incorrect answers
- Make assessments available to students within specified date and time ranges
- Generate statistics and item analysis reports for student answers to objective questions
- Include images, attached files/documents, and URLs into assessment questions and answer options

New, in Release 6:

- Offline authoring of questions in common spreadsheet applications for upload of question sets into assessments
- Provide customized feedback for correct answers and *each* incorrect answer
- Modify tests after they have been deployed
- Allows for make-up tests for select students
- Create scientific notation and mathematic equations within question text and answer items

Gradebook

- Generate default question type for streamlined question creation
- Deploy assessments within all content areas with increased flexibility
- Specify default point values for assessment questions

Gradebook and Assignment Management

Through usability testing and client feedback, *Blackboard Learning System* has been architected to make it easier to create, grade, and manage assignments and record individual student performance. Fewer clicks and a more intuitive workflow will increase instructor productivity—reducing the amount of time spent on organizing papers, sorting through floppy disks, or downloading files from disparate sources.

Core Functionality:

- Provides framework to manage total point values as well as grades earned on individual assignments and assessments
- Enables visibility into individual student responses on assessments and aggregate statistics of student responses to assessment question items
- Allows sorting Gradebook items by various criteria, including: default order, date added, name, or gradebook item category
- Calculates weighted percentages by instructor defined weighting value of gradebook items
- Utilizes symbols to quickly and easily represent status of assessment or final grade

New, in Release 6:

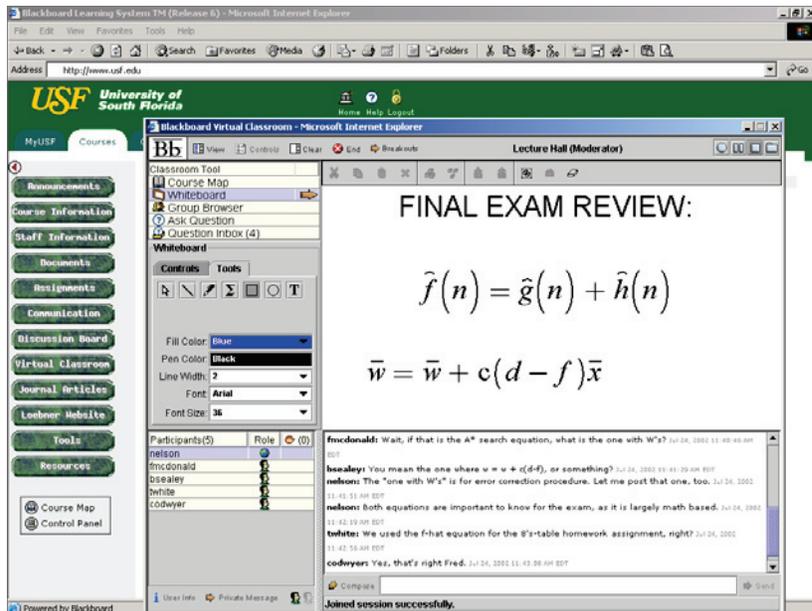
Gradebook

- Improved user interface requiring fewer clicks and less scrolling
- Supports custom definition of the value of letter grades and custom symbol sets (per test) within gradebook (e.g. 95 – 100 = A+)
- Upload and download grades directly to/from gradebook
- Calculates weighted percentages by individual gradebook items or by category
- Sort in a number of different ways, such as alphabetical by student last or first name, by grade, by assessment, or by student ID number

The screenshot shows the Blackboard Learning System interface for a gradebook. The browser title is "Blackboard Learning System TM (Release 6) - Microsoft Internet Explorer". The address bar shows "http://www.erau.edu". The page header includes the Embry-Riddle Aeronautical University logo and navigation links like "ERAU Online", "Courses", "Community", "Services", "Jack R. Hunt Library", and "Prescott Campus Library". The main content area is titled "View Spreadsheet" and contains a table of student grades. Above the table are controls for "Add Item", "Manage Items", "Gradebook Settings", "Weight Grades", "Download Grades", and "Upload Grades". Below the table are filters for "Sort Items by" (set to "Category") and "Filter Items by Category" (set to "All").

Student Name (Last, First)	HW1	HW2	HW3	HW4	HW5	Quiz	Mid-term	Final	Attendance	Participation	Journal	F
Berris, Megan	20	17	15	15	37	9	B	A	24	25	P	4
Black, Daniel	16	20	14	15	36	8	B+	A	23	22	P	4
Brady, Michael	17	17	14	11	34	9	B+	B+	20	21	P	4
Cannell, Jorge	20	19	12	15	39	8	B	B	21	20	F	4
Daniels, Betsy	18	17	15	14	37	8	A	B	19	21	P	4
Falls, Terrence	17	18	15	11	34	9	A+	B+	21	23	P	4
Jackson, Michelle	15	20	15	14	35	7	A	C+	20	22	P	4
Jenkins, Cory	14	17	9	14	33	8	B	D+	16	18	P	4
Johnson, Adam	19	18	15	15	37	9	B	A	23	18	P	4
Keamson, Julie	20	18	11	9	38	9	A	A	25	25	P	4
Lewis, Lori	18	17	14	15	35	8	A	A	24	23	P	4

Virtual Classroom



- Calculate and display letter grades, percentages, and raw scores at the same time
- Add and define custom gradebook categories

Assignment Management

- Collect and organize electronic assignments through gradebook (in addition to existing Digital Drop Box functionality)
- Submit assignments through corresponding course content area related to assignment, thereby linking lesson to student deliverables and results
- Return and comment on “corrected” files as well as store private notes related to student work in the gradebook
- Enhanced management and organization assignments through bulk download of all student work for one particular assignment, bulk download of all ungraded files, and bulk deletion of selected files

Collaboration

Blackboard’s virtual classroom and discussion board provides a rich, multi-functional environment for both synchronous and asynchronous communications. In release 6, the virtual classroom has been completely re-architected to provide a dynamic environment for interaction among all course participants, small groups, or on a one-to-one basis. The new virtual classroom provides free-form chat, chat lectures, question and answer chats, archives, white

boarding, class tours, and group Web browsing. The virtual classroom enables instructors to lead effective online discussions through the use of the online whiteboard and advanced group-management tools.

Core Functionality

- Monitor and lead chats and actively participate in discussions
- Archive discussion board threads for easy retrieval
- Sort archived discussions based on relevant criteria such as topic or date

New, in Release 6:

- Host multiple, simultaneous and concurrent synchronous sessions
- Facilitate small “break-out” synchronous discussions with either assigned or self-selected groups
- View and edit content online during a lecture chat, such as Microsoft® PowerPoint™ presentations
- Archive chat logs for future reference and grading
- Public and private messaging
- Provide class tours for introducing students to the course environment
- Online field-trips through the course Web site and external Web sites
- Complies with Section 508 accessibility regulations

Enterprise System Administration

System administrators and decision-makers at organizations running the *Blackboard Learning System* must continually plan for increasing usage, depth of usage, and load on their implementations. Enterprise administration in the *Blackboard Learning System* is designed to promote platform adoption and usage, and, through a robust environment for enterprise-wide system management, ensure that clients can successfully manage growth by reducing the administrative overhead required to successfully scale and manage a mission-critical Blackboard deployment. The *Blackboard Learning System* provides administrators with a flexible environment for system administration through the following enterprise functions and capabilities:

- Data management for student information, identity management, and authentication systems
- System management utilities

- Standards, policies, and management for online courses
- System configuration and design
- System-wide communications and calendaring

Data Management

Data management involves the transfer of user, course, enrollment, and staff data between an institution's information systems and the *Blackboard Learning System*. The goal of data integration is to maximize the value of your existing enterprise systems and avoiding the unnecessary and redundant creation, deletion, and management of courses, users, etc. Ultimately, Blackboard data management functionality serves to drive both depth and breadth of adoption. The tools associated with data management are:

- Batch upload tools available from the Web-based interface which allow administrators to load user, course, and enrollment information from a simple text file.
- The command-line Snapshot utility, based on IMS standards, which allows for synchronization between multiple external data sources (Student Records, Human Resource System, or Alumni System) and Blackboard. The Snapshot tool automatically handles disabling old data, inserting new data, and modifying existing data according to institution defined business rules. Data include users, courses, enrollment, faculty assignment, and course catalog data.
- Through Building Blocks Manager, real-time event-driven interfaces allow for custom data population and integration approaches.
- A separate Data Management utility which allows clients to report on and manage the lifecycle of data in aggregate, e.g. disabling all graduating student accounts, purging all data from the Fall term, or enabling the summer session.

Student Information Systems

Blackboard administrators may configure SIS system extensions according to either snapshot or event-driven criteria. With snapshot integration, administrators use a command line interface to update the Blackboard database with information contained in a flat file or XML file. The snapshot tool automatically synchronizes data and performs logic based on the desired criteria. The event-driven manager provides a collection of Java classes that programmers can use to insert, update, delete, or actively disable information based on an institution's unique configuration specifications.

“Wabash College is a relatively small school. We need to be able to combine our technology resources in a cost-effective manner that requires minimal maintenance. Our Blackboard Learning and Community Portal System™ seamlessly integrates with our Datatel Student Information System, LDAP Security, and our Windows 2000 Operating System. These powerful platforms work well together to provide user-friendly solutions for our campus.”

—Jason Boley

Database Administrator

Wabash College

By utilizing the Blackboard Building Blocks ManagerSM and system extensions, organizations may integrate the *Blackboard Learning System* with student information systems, which serves to reduce administrative overhead and automate many of the following functions:

- Creating users, courses
- Pre-populating course templates at the institution, department, section, or course level
- Managing add/drop periods from semester to semester
- Purging obsolete or redundant user and course data
- Providing consistency in course design within and across departments
- Addressing FERPA guidelines
- Enforcing consistency in authentication and access policies

New, in Release 6:

- SOAP-based Data Integration – All network-based data integration solutions that previously used database networking (JDBC) as the network transport layer now have the option of using XML over HTTP (SOAP) for improved Internet reliability.

Authentication

In addition to providing Building Blocks system extensions for leading information systems, the *Blackboard Learning System* provides pre-configured, customizable integration for leading identity management/authentication protocols. By integrating the Blackboard environment with a standard authentication protocol, administrators reduce help-desk requests for password information and significantly reduce overall help desk overhead.

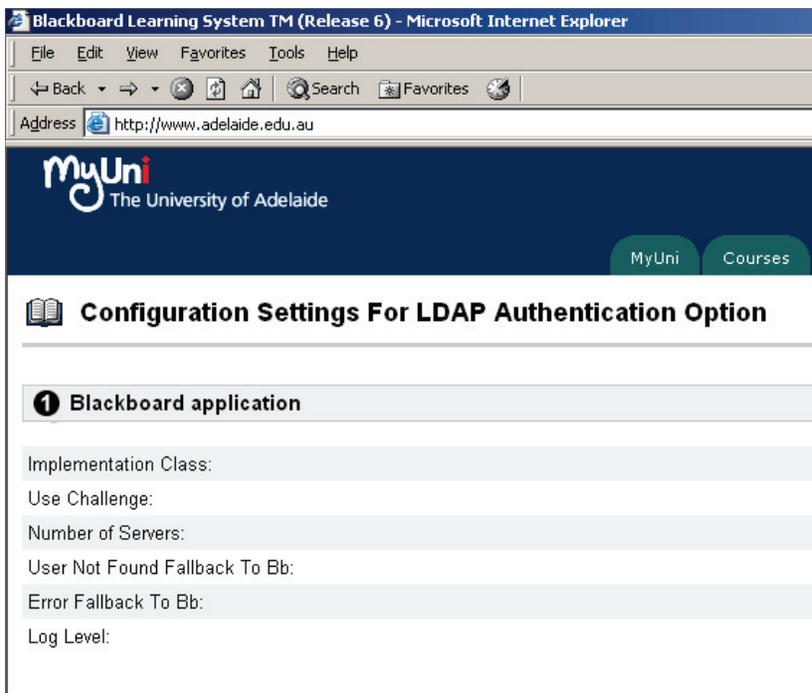
New in Release 6, the *Blackboard Learning System* provides pre-configured Building Blocks extensions for the following, industry standard protocols:

- Lightweight Directory Authentication protocol (LDAP 3.0)
- Microsoft Passport® for Windows
- Microsoft® IIS Delegation, including Microsoft Active Directory and NT Domain
- Apache® Delegation, including Kerberos and Unix password

System Management Utilities

Blackboard system management utilities provide administrators with a flexible and robust environment for effectively managing and generating system analytics and utilities through the following core functions:

LDAP Configuration



“Before we integrated our Blackboard Learning and Community Portal System™ with Data Warehouse, LDAP, and our Sun Solaris Operating System, we asked our faculty and staff for input on desired functionality. At the end of our first full year of integration, the number of faculty seeking assistance with help setting up courses or operating the system dropped dramatically, despite an increase in system usage. As a result, we dedicated our resources to enhancing the usefulness of the system for our faculty members.”

—Darrell Ward

*MicroLAN Analyst and Blackboard Accounts Manager,
Center for Teaching Technology
Ball State University*

- Application and system activity logging for optimization, monitoring, and diagnosis
- System reports to measure level and type of usage on the system
- Full system backup / restore processes
- Import/export utilities for saving course content in an IMS specified format for data backup and content sharing across servers

New, in Release 6:

- Web-based access to logs, log rotation, and log consolidation—to facilitate issue diagnosis and trouble shooting
- System reporting database and customizable reporting templates—through a secondary database, Blackboard system reports may be configured to provide customizable, detailed reports to measure system adoption, usage, depth of usage, capacity and activity planning, organizational usage and demographics, student usage and performance tracking
- Crystal Reports™ templates are provided for out-of-the-box reports that can then be modified and tailored for an institution’s needs
- Course archive and restore for incremental data protection

- Additional command-line utilities – allowing administrators to run offline, scheduled, or scripted commands; as well as new utilities for course copy, course import, course restore, course archive, and course export.

Standards, Policies and Management

Decision-making processes, standards, policies, procedures, and operational principles are critical to developing successful e-Education deployments. Blackboard’s powerful system administration environment can be configured and customized to provide consistent policies and workflow. Specific capabilities available for managing a tailored Blackboard environment include:

- Create, copy, update, and delete courses, instructors, and enrollments
- Define and manage the online catalog of courses
- Set defaults for course structure, navigation, and tool sets
- Set general course disk quotas and specific course quota overrides

New, in Release 6:

- Flexible rights and roles - ability to name course roles and redefine their privileges– e.g. call a “grader” a “mentor” and restrict their access to enroll students in the class.
- Set access policy for observers (parents, advisors, mentors, supervisors) and designate access parameters

System Configuration and Design

The *Blackboard Learning System* provides administrators with a broad range of functionality and options for how to present the system to users, the network, other IT systems on campus, and other enterprise systems critical to maintaining an integrated e-Education environment. Following are some of the core functions available to administrators:

- Customization of the Blackboard splash (gateway) page
- Customization of which tabs appear in Blackboard and the titles of the tabs
- Institutional branding, graphics and imagery
- Access parameters for guest access to the system, whether clients have an automated means of resetting forgotten passwords, and many other security-related settings
- Registration flexibility from self-registration by students to real-time creations from student information and records systems.

- Integration with network security schema

New in Release 6:

- SSL Choice – through the use of Secure Socket Layer (SSL) encryption technology
- Flexibility in the deployment and configuration of SSL to ensure optimal system performance
- Adaptable administrative menus – define which commands and actions appear on administrative menus
- User Profile Customization System—ability to specify on a field-by-field basis which items of user information will be displayed, parameters for when and how they can be updated by users, and what their titles are
- Implement site-specific multi-system data management strategies
- Context-Passing for Single Login – Anywhere an administrator places a URL

Flexible Configuration for SSL Choice

The screenshot shows a web browser window titled "Blackboard Learning System TM (Release 6) - Microsoft Internet Explorer". The address bar shows "http://www.uc.edu". The page header includes the University of Cincinnati logo and navigation links: "My UC", "Courses", "One Stop Student Services", "UC Libraries", and "System Admin". The main content area is titled "ADMINISTRATION PANEL > SSL CHOICE" and contains the following sections:

- SSL Choice**
- 1 Instructions**: Select the areas of the application that will require Secure Sockets Layer communication between the Blackboard server and the client. *Note: Changes to these settings may require restarting your webserver, and possible webserver configuration changes.*
- 2 Entire System**:
 - Disable SSL System-wide
 - Enable SSL System-wide
 - Enable SSL in select areas of the system (as indicated in subsequent sections)
- 3 System Specific Areas**:
 - Personal Information Areas
 - Admin Tab
- 4 Blackboard Tools**

System-wide Communications and calendaring

The Blackboard environment is a primary destination for thousands of students and instructors. Through numerous calendaring and communications utilities, administrators may develop aggregated, personalized, or delegated communications for each of the following functions:

- System calendar
- System announcements
- System-wide email

Blackboard Building Blocks™ Architecture

Stemming from a commitment to promote an open environment for platform customization, flexibility, and interoperability, Blackboard Building Blocks architecture provides clients with an e-Education platform that can be customized to meet unique pedagogical and administrative needs and requirements.

To support an institution's unique pedagogical objectives, Blackboard Building Blocks architecture allows administrators and end users to seamlessly integrate homegrown, open source, or commercially licensed applications and system services. In addition, Building blocks technology can be deployed to facilitate integration between the Blackboard system and an institutions student information systems, security, and authentication protocols. This supportable framework for platform customization not only provides flexibility and choice, but also maintains the integrity of Blackboard's core applications, ensuring seamless platform upgrades and cross-application compatibility.

At the heart of Building Blocks is the Building Blocks Manager™, which manages how Blackboard exchanges data and system services with third party technologies. The Building Blocks Manager enables integration through either embedded technology or customizable system extensions and is designed to provide integration with the following technologies:

“By integrating the Blackboard Learning System with the Bantu instant messenger, Embry Riddle will realize significant pedagogical and administrative advantages—maximizing the value of our Blackboard Enterprise Solution. Since a large segment of our student population is part-time and off-campus, many of them do not have consistent, reliable e-mail access. The IM feature allows them to communicate directly with professors or classmates, and provides access to sortable, archived communications. This enriches the teaching and learning environment and reduces the cumbersome burden on IT staff of creating and maintaining thousands of short-term e-mail accounts.”

—Ira Strauss

System Administrator

Embry-Riddle Aeronautical University

Student Information Systems:

The Building Blocks Manager contains a suite of advanced data population, integration, and management tools designed to interact with leading student information systems – including Datatel Colleague™, PeopleSoft SIS™, SCT Banner™, and SCT Plus™.

Network Infrastructure and Middleware

The Blackboard Learning System provides pre-configured Building Blocks system extensions for the following, industry standard network protocols:

- Lightweight Directory Authentication protocol (LDAP 3.0)
- Microsoft™ Passport® for Windows
- Microsoft® IIS Delegation, including Microsoft Active Directory and NT Domain)
- Apache® Delegation, including Kerberos and Unix password
- SSL Encryption technology

Specialized Applications

Through the Blackboard Building Blocks Program, clients may customize their end-user environment by integrating tools, content, and commercially licensed, open source, or homegrown interfaces and extensions. Among the many pedagogical and administrative benefits of Building Blocks Application infrastructure:

- Plan and develop freely distributed or commercially supported applications as extensions to the Blackboard platform
- Leverage the Blackboard Developers Network, providing access to documentation and a community of Blackboard Building Blocks developers
- Dynamically extend and enhance the Blackboard teaching and learning environment

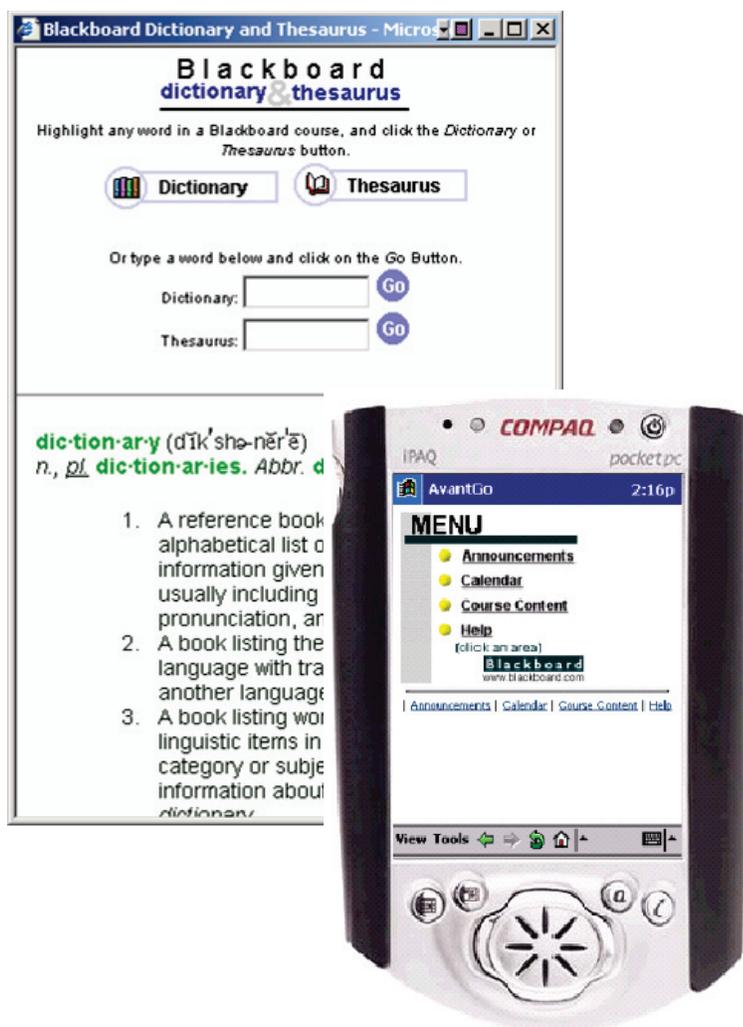
Following are some examples from more than two dozen currently available Building Blocks Application Extensions:

- Bantu Instant Messenger: This Web-based instant messenger allows students, instructors, and staff to communicate in real-time, and lets instructors extend their course Web site by creating self-selected or designated groups for online “office hours,” topical discussions, and moderated course discussion.
- ArcStream’s Blackboard to Go: Allows Blackboard users to synchronize announcements, calendar items, and course content (homework, books, assignments, syllabus, and more) onto their Palm OS™ or PocketPC™ based handheld devices.
- Dictionary and Thesaurus: A student extension that allows the user to highlight any word in a Blackboard course and lookup the dictionary or thesaurus entry for it.
- Harvest Road Learning Content Management System: Enables the collection, management and sharing of learning materials used in the delivery of online courses within K-12, Higher Education and Corporate organizations

System Architecture

The *Blackboard Learning System* has been architected to deliver a responsive, highly scalable system that allows for minimal downtime and, when necessary, speedy recoveries. Designed to support a wide range of configurations, ranging from a single server to a farm of application and

Building Blocks: Dictionary & Thesaurus



Building Blocks: Blackboard to Go

database servers, the *Blackboard Learning System* features a modular architecture that can meet a wide diversity of deployment and configuration parameters.

Tested and designed to support large scale implementations of tens of thousands of users, the *Blackboard Learning System* offers enterprise-critical technology, including application and database load balancing, fault-tolerant fail over, and dozens of additional architectural components designed to ensure system performance and uptime.

The following techniques can be used with *Blackboard Learning System* (Release 6) in order to optimize system performance and reliability:

- Increase individual server capacity

- Load balance (cluster) application servers for improved performance and reliability. They must share a network file storage area for content.
- Deploy the Virtual Classroom on a dedicated server
- Deploy statistics and system reporting database on dedicated disk system area/controller
- Provide a second database server for automatic fail over (Microsoft SQL Server only)
- Deploy virtual installations on dedicated server

New, in Release 6

Virtual Installations

Available as a licensing option for the *Blackboard Learning System*, Virtual Installations allow institutions to provide uniquely-branded and managed environments for multiple independent user populations on the same system hardware and 3rd party licenses. Through virtual installations, administrators can create distinct and customizable Blackboard environments for as many as a dozen entities, while reducing costs and administrative overhead by centralizing administrative and hardware costs in a clustered, centralized management environment. Each of the administrative capabilities described above, from creating users to setting disk quotas is fully independent for each virtual installation.

Commitment to Standards

Blackboard is a strong advocate for open industry standards in the areas of system interoperability through IMS, SIF, and OKI and content specifications such as IMS, AICC, SCORM and Microsoft's LRN as well as interoperating with JASIG, Oracle and Microsoft portal technologies. As a result of these initiatives, the *Blackboard Learning System* is a flexible and reliable platform for the development of content in multiple formats as well as digital content available via downloadable publisher Course Cartridges. All of Blackboard's content management and content development tools are IMS compliant, ensur-

ing seamless content portability within the Blackboard platform or externally to other IMS compliant e-Learning applications.

Conclusion

The evolution of the *Blackboard Learning System* to its newest version, Release 6, is the result of a continual effort to enhance and improve the possibilities that exist for e-Education. Blackboard is proud to offer the combination of proven solutions and new features and functions detailed above. Release 6 has been designed to address our clients' top priorities for achieving success in e-Education initiatives. This system will help you exceed your goals for teaching and learning through ease of use, open architecture, enterprise technology and the ability to maximize the value of your combined institutional investments.

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