# Blackboardlearn+

*Release 9.1 Service Pack 1 (SP1)*

*Release Notes*

*9.1.452.0*

## Blackboard

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# Contents

# About the Release Notes

The Release Notes provide System Administrators with information about the changes from the previous release to this Service Pack of Release 9.1. These changes have been categorized into three different types that are meant to assist you with planning your upgrade to this maintenance release. The highlights below are meant to be a quick reference of changes that we believe will impact most usage scenarios. You should always review the entire document and consider the impacts listed below to your specific usage patterns.

☑ **End User Impacts**: Items that fall into this category will generally be new features or enhancements that will improve the experience, but may require training.

- Service Pack 1 of Release 9.1 includes several client driven enhancements that are outlined in the New Features and Enhancements section.

- With every release, Resolved Issues may impact your end users and we hope this is a positive impact. You should review these for any you would like to highlight to your community.

- The *Blackboard Mobile Web Services Building Block* will allow users to interact with Blackboard using select mobile devices.

- We have provided a link to a regularly updated list of Known Issues specific to this release that provides a description and targeted path to resolution.

☑ **System Administration Impacts**: Items that fall into this category only impact the administration of the system.

- Support for Windows Server 2008 R2 was added. Firefox 3.0 was not tested in lieu of Certifying Firefox 3.6.

- There is a change to the installer/updater. Please read the details in the Installation and Upgrade Information section of this document.

- Guides Renamed – Please ensure you are looking for the newly renamed Installation, Performance, and Backup Guides.

  - The *Blackboard Learn Setup Guide* has been renamed the *Blackboard Learn Installation Guide*.

  - The *Optimizing Blackboard Learn Deployments Guide* has been renamed the *Blackboard Learn Performance Optimization Guide*.

  - The *Blackboard Learn Backup and Restore Guides* have been renamed *the Blackboard Learn Moving Blackboard Learn in a SQL Environment* and *Blackboard Learn Moving Blackboard Learn in an Oracle Environment*.

- With every release, the Release Notes include updates to the following information to help you prepare your systems for upgrade or tune them better.

    - [Performance and Scalability](#) – Details the latest analysis from our Performance Engineering team and how to tune an installation of this release.

    - [Supported Technologies](#) – Gives an overview of the changes to supported platform technologies and client technologies in this release.

    - [Installation and Upgrade Information](#) – Provides the supported upgrade paths to this release as well as where to go for more information.

☑ **Integration Impacts**: Items that fall into this category impact the APIs within the system that may require a review of building blocks, snapshot or other integrations.

- There are no known impacts to existing APIs.

- With the GA of Release 9.1, there were significant made changes to our CSS to improve Accessibility, readability, and support for new features.  These changes will have impacts to your customizations.  The impacts will vary widely from site to site.  Forthcoming documentation will help you resolve most issues.

If you are upgrading to Release 9.1 from Release 9.0, 8.0, 7.x, or CE 8, CE 4 or Vista, please go to the [Upgrade Center](#) for information targeted to your needs.

# New Features and Enhancements

The Release Notes provide a high level overview of the New Features and Enhancements.  For more detailed information, please refer to the "Understanding the Change" document available for each product available through the Behind the Blackboard.  These documents give users a comprehensive look at the features and functions of this release and how they compare to the user's current product release.

If you are new to Release 9.1, please work through the Upgrade Center.  We have provided a step by step planning guide to assist you through this process.

## Course Delivery Features

### Assessments

Creating and taking Tests have several enhancements to reduce errors and increase efficiency.

- Test-takers are reminded to submit answers before they are allowed to leave a test.

- Random Blocks and Question Sets are both available for instructors to add groups of questions to tests. Random Blocks pull questions into a test from a pool based on certain criteria. They are dynamic and reflect changes to the question pool. Question Sets are static and are made up of specific questions selected to be in the Question Set used in the Test.

- Question and response statistics are displayed for each question on the Assessments Attempts page. For K12 licensed clients, Standards that are aligned to test questions are viewable from this centralized location.

### Copying and Moving Items

Move and Copy are now two distinct options for content items. This allows items that cannot be copied such as Tests, Surveys, and Assignments to be moved to another location.

### Course Links

When Course Links are created, the link and the location are automatically populated, providing consistency across the link name and location.

### Discussion Board

The Discussion Board has two enhancements to streamline grading and create consistency across all collaborative tools.

- Instructors can clearly identify and grade users who are members of Groups participating in group discussions.

- Instructors can enter grades, comments, and feedback when viewing Discussions similar to the experience in Wikis Blogs, and Journals.

**Grade Center**

The Grade Center has been enhanced to improve grading efficiencies and reduce errors.

- Instructors are prompted to save or delete specific Grade Center columns when deleting a Group with gradable Blogs, Journals, Wikis, or Discussion Forums or Threads.

- Instructors navigating away and then back to the Grade Center in one login session are returned to the last scroll point they viewed or graded in the grid.

- Instructors can color code Grade Center cells that meet certain criteria such as grade threshold, exempted grade and so on. This new feature helps instructors spot trends and action areas in large Grade Centers.

**Learning Modules**

Items hidden in the table of contents in Learning Modules are made unavailable so they cannot be accessed directly. Additionally, Learning Modules have been enhanced so that when they are copied, links to any tests, assignments, or surveys, are created.

**Mashups**

Mashup links are now visible when the Text Editor is off.

**Standards and Alignments**

Standards that have been aligned to test questions can be viewed from the Test Statistics page, providing teachers with a centralized location to view question and response statistics as well as alignments.

**Text Editor**

The text editor allows users to select right-to-left or left-to-right language orientation of text.

# Community Engagement Features

**Modules**

Availability and role settings, as well as custom layouts for modules and tabs, are preserved upon upgrade. The following user defined settings are preserved:

- Tabs

- Tab Groups

- Modules

- Tab Modules – default layouts

- Tab Modules – user layouts

Administrators have the ability to fix modules to the top row of a page, ensuring high-priority modules will always appear in the desired location. Fixed modules cannot be moved or deleted by users, even on user-customizable tabs.

Administrators can control the availability of modules by date and time, allowing for time sensitive content to be scheduled for release, removing the need to set availability manually.

**My Organizations Module**

The My Organizations module now has all the same customization features as the My Courses module.

Users have the ability to re-order their courses or organizations in the My Courses and My Organizations modules, adding another level of personalization to the modules.

**Notifications**

Notifications are now processed in priority order.  For example, Due or Past Due notifications are sent before the thousands of "new content" notifications. The priority of a notification is determined internally based on factors such as due date and message type.

**RSS Support**

Blackboard Learn now supports updated RSS infrastructure including support for contemporary, as well as legacy syndication formats including RSS 1.0, RSS 2.0, Atom 0.3, and Atom 1.0.

**User Identification and Avatars**

When logged in, users now have a visual indicator that display's their name and avatar if avatar's are available in the system.

# Content Management Features

### Navigation and Shortcuts

The Shortcut View takes up less space vertically to reduce scrolling. A Bookmark link has been added for immediate access to bookmarks. Jump To... and Search Content have also been added to the left side for consistency and improved access.

Breadcrumb Navigation uses the separator between folders as an active button to open a drop-down menu. Items in the drop-down include all the folder's associated subfolders, making navigation in the folder hierarchy much faster. The Content Collection breadcrumb brings users to the "top" folder where they can select any of the content areas.

The current folder name is not displayed in the title with the content area name, and basic operations such as edit, set permissions, and bookmark can be performed from a contextual menu on the current folder.

### Sharing Content using Email

When emailing content to users has the To, CC, and BCC labels are now buttons that allow selecting individual users, courses or organizations, a group, or roles within the course or organization.

The system will now check that recipients have access to the emailed files or folders. Users will be warned if recipients do not have access to read the files. If recipients do not have access to read the files, the system can automatically set read permissions after confirmation with the user.

### WebDAV

Instructions for setting up and using WebDAV have been improved to be clearer and give specific operating system instructions where possible.

Automatic Web Folder opening has been restored for Windows Internet Explorer on Windows XP and Windows Vista with SSL (HTTPS). Users may have to re-authenticate in the Web Folder client. Users with Windows 7 cannot open Web Folders due to a Microsoft bug. Users that are not connecting with SSL have instructions provided in the user interface.

## Outcomes Assessment Features

### Batch Uploading

Course-to-program associations can be made using a batch file. Standards, objectives and goals can be aligned using a batch file.

Adding and modifying system data can be done with the same batch file operation.

### Curriculum Maps

Curriculum Maps are now easier to navigate and edit. A warning appears to users if they attempt to navigate away from an open curriculum map before saving their work. Curriculum Maps can now be moved and copied. Comments entered in Curriculum Map cells now appear in 360$_\circ$ Reports.

### Evaluation

The evaluation process is now much easier for users who rate artifacts and portfolios. The list of submissions now has contextual information about existing evaluations including how many evaluations there are, who last evaluated the submission, when it was last evaluated and on in progress evaluations. The Evaluate page includes the rubric directly on the page along with the artifacts being assessed.

### Improvement Project Templates and Modules

Improvement Project templates can be more fully customizable, putting all aspects under users' control.

Improvement Projects and Initiatives listed on Unit pages link to their respective project and initiative pages.

### Moving

Users can copy and move improvement initiatives to locations to which they have permission to do so.

## System Administration Features

### Building Blocks

Developers can improve Building Block performance and data persistence by adding requests for installing Building Block specific database objects to their Building Blocks. A tool which allows the System Administrator to approve or deny installation of Building Blocks which request creation of database objects is also provided.

Administrators experience improved dialog notification for Building Block management actions and retention of persisted data and location of upgraded Building Blocks.

### Improved Disk Storage Information

System Administrators are provided with an improved display of disk storage information.

### Search

Administrators can more easily find users and courses using two new search fields, Student ID and Data Source

## Blackboard Mobile™ Learn

### Blackboard Mobile Web Services Building Block™

This Building Block enables Blackboard Mobile™ Learn, a new mobile application from Blackboard.  Blackboard Mobile Learn takes interactive teaching and learning mobile, giving students and teachers access to their courses, content, and organizations on a variety of mobile devices, including Android™ and BlackBerry® phones and iPhone OS-powered devices. Blackboard Mobile Learn extends your existing Blackboard Learn implementation by making much of the core Learn content available in an engaging and intuitive way on mobile devices.

Blackboard Mobile Learn is available for North American Higher Education, Professional Education, and K-12, as well as most International institutions.

Blackboard has put together a No-Cost offering that allows eligible institutions to bring Blackboard Mobile Learn to a variety of mobile devices with no additional investment through a partnership with Sprint. With this No-Cost offering, North American Higher Education and some Professional Education institutions in the U.S. and Puerto Rico and the U.S. Virgin Islands can now bring Blackboard Mobile Learn to students and instructors on Sprint Android and BlackBerry mobile devices at no cost. Additionally, North American Higher Education and Professional Education clients can access Blackboard Mobile Learn at no cost via Wi-Fi on the Apple iPad, iPhone, and iPod touch. After installation, this Building Block is "Available" by default. For these eligible clients, the Building Block automatically registers with the Mobile Learn Central Service. This also enables the "Mobile Learning Update" portal module on the My Institution tab. The portal module provides users with instructions for downloading the native mobile learning applications for Sprint Android and BlackBerry devices, as well as Apple iPad, iPod touch, and iPhone devices over Wi -Fi.

For clients who are not eligible for the Sprint No-Cost option, the Building Block does not register and the portal module does not appear.

More information is available at http://www.blackboard.com/Mobile/Resources/FAQ.aspx.

# Resolved Issues

The list of issues resolved in Blackboard Learn Release 9.1 SP1 is available on the Resolved Issues Page of the Maintenance Center.

# Known Issues

The list of known issues in Blackboard Learn Release 9.1 is available on the [Known Issues Page](#) of the Maintenance Center.  The Known Issues page provides you a list of the issue ID, description, and resolution path.  This page is updated regularly with new client-reported issues.

In order to provide a timely release of Service Pack 1, we have deiced to release with a couple minor issues that are newly introduced.  The following issues are known to be new in 9.1 SP1 and all have been targeted for the very next Service Pack.

- **AS-146042** – The Clear button no longer appears while grading a thread.  This button no longer appears as a result of the changes made in SP1 surrounding Discussion Board grading.

- **AS-145950** – Even with full permissions, the user is not shown the Delete option in the context menu of a file in the Recycle Bin.  The Copy and Move buttons are also missing.

- **AS-145945** – An extra content folder is created when importing a course without any actual content.  This happens when importing a course exported with Content Area checked but without any content.

- **AS-145780** – If an instructor creates several individual Blog topics and deletes one.  Students may still see the deleted topic in the Grade Center.

- **AS-146047** – Running the LMSImport.sh script with `--conflict_prefix` causes some errors to be ignored.

# Performance and Scalability

Blackboard continuously invests in making Blackboard Learn more responsive and able to handle greater volumes of user traffic. This section describes the performance and scalability issues in this release of Blackboard Learn.

Performance issues occur when application responsiveness for a system not under load fails to meet user expectations. Scalability issues occur when application responsiveness or stability of a page request for a system under load fails to meet user expectations.

Issues are identified by clients through our traditional support channels and as a result of the performance and scalability exercises performed as part of all Service Pack releases.

## Performance Issues and Improvements

In general, Blackboard Learn Release 9.1 SP1 is more responsive and scalable than both Release 9.1 GA and Release 9.0 Service Pack 3 across all supported platform configurations. Blackboard completed more than 2000 hours of performance tests on Release 9.1, and this number continues to increase as Blackboard produces Service Packs against the Release 9.1 code line.

When comparing Release 9.1 SP1 against any previous release using regression performance settings, no degradation of performance was reported during performance tests or benchmarks. Performance improvements have been confirmed on both SQL Server and Oracle configurations.

### Performance Improvements

### Notifications

Enhancements were made so that notifications with higher priority will now be processed in the pipeline ahead of lower priority notifications, regardless of the time the notifications were created.

### Discussion Board

For Microsoft SQL Server only, we introduced the usage of included columns to the index of forum registry database table. By including these nonkey columns, we created a nonclustered index that contains all the columns referenced by the accessing queries. This contributes to systemic performance improvement by eliminating intermittent CPU spikes on the database server.

### Early Warning System

An under-performing query within the Early Warning System was re-factored to improve performance.  The underlying result improved the execution plan on both SQL Server and Oracle for efficiency and reduction of logical I/Os.

### Outcomes

Course navigation load query has been re-factored to comply with the SQL-92 standard. The new query performs far better than the previous version, dropping the execution time from over 1 minute down to less than 50 milliseconds against a large course application data set. The performance gain can be observed in creating tool links.

**Blank Registry Keys**

Unnecessary calls to the System Registry table resulted in returning 0 rows of data. This problem has been eliminated with this release.

# Recommended Deployment Approach

**64-Bit Deployments**

Release 9.1 is the first release to offer an entire application and database footprint using 64-bit addressable memory. To take advantage of more addressable memory, Blackboard strongly encourages clients to deploy using 64-bit operating systems (OSs) and sub-components (Java and SQL Server or Oracle). As part of the 64-bit deployment, Blackboard encourages clients to take advantage of larger Java Virtual Machines (JVMs) that range from 2GB to 16GB in size. The preferred size is 4GB, but performance testing has been conducted with acceptable performance as high as 16GB.

Customers should begin migrating from Tomcat clusters. Tomcat clustering was introduced for scalability purposes when the Blackboard Learn architecture was 32-bit and customers wanted the ability to increase their memory usage on a single server. With the option to virtualize on both 32-bit and 64-bit, Blackboard's benchmarking efforts have moved away from Tomcat cluster deployments. Customers can achieve similar performance in a virtual environment on the same physical server with multiple virtual instances as with a bare metal configuration with many Tomcat cluster instances. The difference in configurations is a smaller demand on the Apache or IIS web server fronting the Tomcat instance(s). The option to deploy a 64-bit JVM with larger heap sizes has suppressed the need for customers to run in a cluster option.

Blackboard recommends that customers consider a deployment approach consisting of larger 64-bit JVMs that are distributed across physical servers with the option to virtualize the hardware to take advantage of the CPU and Memory capacity of these systems.

**Database Availability Options**

Customers should also consider database availability options such as Microsoft SQL Server Active/Passive or Oracle RAC One Node, which is a single instance of Oracle RAC running within one node in a cluster. Additional nodes can be added within Oracle RAC to address scalability. In general, both offerings are more around high-availability and will have limited or no capability to improve performance.

**For More Information**

For more information about the SQL Server Failover capabilities of Blackboard Learn, contact Blackboard Consulting.

For information about running Blackboard Learn with RAC, see the *Blackboard Learn Server Administrator Guide* available on Behind the Blackboard.

For more information about deploying Blackboard Learn, see the *Blackboard Learn Hardware Sizing Guides* for Dell and Sun Deployments in the Upgrade Kit available on Behind the Blackboard.

# Recommended JVM Tuning Set

For every release, the Blackboard Performance Engineering team spends many hours studying the transactional and systemic performance of Blackboard Learn and whether particular tuning sets will have a positive or negative impact on performance or scalability.  This section provides the recommended Java Virtual Machine (JVM) tuning set as executed in the Blackboard Performance Engineering laboratory against Release 9.1.

JVM sizing varies from platform to platform. 32-bit Windows and Linux deployments are limited to JVM sizes no greater than 1.7GB of addressable memory. This consists of the main heap area (Old and New Space) plus the permanent space. 64-bit Windows, Linux, and Solaris configurations are not impeded by this limitation of addressable memory.

Blackboard recommends using the following tuning set for 1.4GB JVMs (32- bit) on Windows, Linux, and Solaris systems using Java 1.6. These recommended settings can be managed within the `bb-config.properties` file or `wrapper.conf` file:

```
-Xms1400m -Xmx1400m -XX:NewSize=350m -XX:MaxNewSize=350m
-XX:SurvivorRatio=4  -XX:+UseConcMarkSweepGC -XX:+UseParNewGC
-XX:+UseTLAB -XX:PermSize=256m -XX:ParallelCMSThreads=2
-XX:ParallelGCThreads=4 -XX:+PrintVMOptions -XX:+PrintGCDetails
-XX:+PrintGCTimeStamps -XX:+PrintGCTaskTimeStamps
-XX:+PrintCommandLineFlags -XX:+PrintGCApplicationStoppedTime
-XX:+PrintGCApplicationConcurrentTime
-Xloggc:<blackboard_directory>/logs/tomcat/gc.log
```

Clients who are unable to leverage more than 4GB of memory per OS can take advantage of 64-bit as long as their Intel or AMD CPU models support x64 on Windows or Linux. The Solaris CPU models should provide 64-bit support. In this scenario, customers unable to upgrade beyond 4GB can still take advantage of larger heap spaces.

When using a 2GB heap size, change the following parameter values in the recommended tuning set:

```
-Xms2048m -Xmx2048m -XX:NewSize=512m -XX:MaxNewSize=512m
```

For 64-bit JVMs on Windows, Red Hat Enterprise Linux and Solaris platforms, Blackboard recommends that 64-bit clients take advantage of large heap sizes, such as 4GB and 8GB. As noted above, Blackboard strongly encourages clients to leverage a 64-bit JVM for more addressable memory.

When using a 4GB heap size, change the following parameter values in the recommended tuning set:

```
-Xms4096m -Xmx4096m -XX:NewSize=1024m -XX:MaxNewSize=1024m
```

When using an 8GB heap size, change the following parameter values in the recommended tuning set:

```
-Xms8192m -Xmx8192m -XX:NewSize=4096m -XX:MaxNewSize=4096m
```

## Understanding the Settings

### Concurrent Mark Sweep Collector

With the certification of Java 6, Blackboard recommends using the Concurrent Mark Sweep Collector (`-XX:+UseConcMarkSweepGC`) instead of the Parallel Collector (`-XX:+UseParallelGC`).

### Local Allocation Buffer (TLAB)

The `-XX:+UseTLAB` parameter forces the JVM to use thread-local object allocation. A Thread Local Allocation Buffer (TLAB) is a region of Eden that is used for object allocation by a single thread, which is faster than performing an atomic operation on a top pointer shared across threads. Using a TLAB improves concurrency by reducing contention on the shared heap lock. Administrators can specify TLAB initial size and disable the resizing through the `-XX:TLABSize=<size in kb> -XX:-ResizeTLAB` parameter. The default setting of 256KB provides adequate performance. Blackboard's tests do not show increased performance when changing the TLAB size from the default value 256KB to 128KB or to 512KB. To discover which settings have a positive, negative, or neutral effect on performance, trace all TLAB operations, using the `-XX:+PrintTLAB` parameter.

### Survivor Spaces

The `-XX:SurvivorRatio` parameter controls the size of the two survivor spaces. If survivor spaces are too small, the JVM will copy collection overflows directly into the old generation. If survivor spaces are too large, they will be empty. At each garbage collection, the JVM determines the number of times that an object can be copied before it is tenured, which is called the tenure threshold (`-XX:MaxTenuringThreshold`). After experimenting with setting `-XX:SurvivorRatio` to 4, 8, 16, and 4096 with `-XX:MaxTenuringThreshold` set to 0, Blackboard's tests have found that customers who use our heap setting recommendations can improve Eden space memory management by changing the `-XX:SurvivorRatio` parameter to 4 or lower. Configurations that use JVM heap sizes larger than 8GB require different settings.

### New Space Region

Use the `-XX:NewSize` and `-XX:MaxNewSize` parameters instead of the previously recommended `-XX:NewRatio` parameter to determine the memory needs in the New Space region of the JVM. During performance tests, the `-XX:NewRatio` parameter did not size and resize the new generation space of the JVM correctly. Size the `-XX:NewSize` and `-XX:MaxNewSize` parameters to roughly 1/4 or 1/3 the size of the JVM.

# Supported Technologies

In every release, Blackboard devotes time and resources to make Blackboard Learn run on the latest operating systems, databases, and browsers available, with the goal of creating a system that is more manageable, more stable, and more user friendly.

This section highlights the major changes to the Supported Technologies and Browsers for this release. For the most up-to-date information, see Blackboard Learn Release 9.1 SP1 Supported Technologies and Browsers available on the Maintenance Center on Behind the Blackboard

The following sections highlight the new Platform and Client configurations tested for this release using the following support terms:

- **Certified**: Fully supported technology with highest level of testing before release.

- **Compatible**: Fully supported technology with minimal level of testing before release.

- **Unsupported**: Unsupported technology because it is either impossible or not tested.

## Platform Technologies

### 32-bit Server Configurations

| | Application Server/JDK 1.6 | SQL Server 2005 (32-bit) | SQL Server 2008 (32-bit) | Oracle 10gR2 (32-bit) |
|---|---|---|---|---|
| **Windows Server 2003 SP1 (32-bit)** | Compatible (32-bit JDK) | Compatible | Compatible | Unsupported |
| **Red Hat Enterprise Linux Server 4 (32-bit)** | Compatible (32-bit JDK) | Unsupported | Unsupported | Compatible |
| **Red Hat Enterprise Linux Server 5 (32-bit)** | Compatible (32-bit JDK) | Unsupported | Unsupported | Compatible |

## 64-bit Server Configurations

|  | Application Server/ JDK 1.6 | SQL Server 2005 (64-bit) | SQL Server 2008 (64-bit) | Oracle 10gR2 (64-bit) | Oracle 11gR1 (64-bit) |
|---|---|---|---|---|---|
| **Windows Server 2003 SP1 (64-bit)** | DATABASE ONLY | Compatible* | Compatible | Unsupported | Unsupported |
| **Windows Server 2008 (64-bit)** | **Certified** (64-bit JDK) | Unsupported | **Certified** | Unsupported | Unsupported |
| **Windows Server 2008 R2 (64-bit)** | Compatible (64-bit JDK) | Unsupported | Compatible | Unsupported | Unsupported |
| **Red Hat Enterprise Linux Server 4 (64-bit)** | Compatible (64-bit JDK) | Unsupported | Unsupported | Compatible | Unsupported |
| **Red Hat Enterprise Linux Server 5 (64-bit)** | **Certified** (64-bit JDK) | Unsupported | Unsupported | **Certified** | Compatible** |
| **Sun Solaris 10 (64-bit SPARC)** | **Certified** (64-bit JDK) | Unsupported | Unsupported | **Certified** | Compatible** |

\* Microsoft® SQL Server 2005 must be installed with SP3 or above.

\*\* Blackboard supports only build 11.1.0.7 of Oracle 11gR1.

## Windows Server 2008 R2

In Release 9.1 SP1 support for Windows Server 2008 R2 was added.  Only a limited amount of testing was done in this release; therefore it is listed as Compatible.  Additional testing is planned for future Service Packs.

## Windows Server 2008 IIS 7 Roles and Features Configuration

Windows Server 2008 uses IIS 7. Before installation of Blackboard Learn 9.1, IIS 7 needs to be configured with specific Role Services and other settings.

1.  Install the IIS 7 Role in Windows Server 2008 Server Manager and configure Role Services:
    A.  Click **Start** and select **Administrative Tools** then select **Server Manager**.
    B.  Click **Roles**, and under the **Roles Summary** heading, click **Add Roles**.
    C.  From the list of displayed roles, select **Web Server (IIS)**.
    D.  Click **Next**.

    At a minimum, the following five (5) role services must be installed in addition to the default role services:

    - Role Services > Web Server > Application Development > ISAPI Extensions
    - Role Services > Web Server > Application Development > ISAPI Filters
    - Role Services > Management Tools > IIS 6 Management Compatibility > IIS 6 Metabase Compatibility
    - Role Services > Management Tools > IIS 6 Management Compatibility > IIS 6 WMI Compatibility
    - Role Services > Management Tools > IIS 6 Management Compatibility > IIS 6 Scripting Tools

To enhance performance, troubleshooting, and offer additional web server configuration options, Blackboard recommends that the following role services also be installed:

- Role Services > Web Server > Common HTTP Features > all five (5) role services enabled
- Role Services > Web Server > Application Development > all seven (7) role services enabled
- Role Services > Web Server > Security > all eight (8) role services enabled
- Role Services > Management Tools > all three (3) role services enabled
- Management Tools > IIS 6 Management Capabilities > all four (4) role services enabled.

Of the role services listed in this step, the following are will be of the most interest:

- Role Services > Common HTTP Features > HTTP Redirection (to allow for HTTP redirection, in the event that the site is renamed)
- Role Services > Security > Windows Authentication (to allow for Active Directory integrated authentication)
- Role Services > Security > IP and Domain Restrictions (to allow for greater control of web server access)
- Role Services > Performance > Dynamic Content Compression (to allow for enhanced performance)

    E.   Select **Windows Process Activation Service (.NET Environment)**, and then click **Add Required Role services**.

2. Disable the Default Web Site:
   - A. Click **Start** select **Administrative Tools** then select **Server Manager**.
   - B. From the left menu, click the plus sign next to **Roles** to expand the tree.
   - C. Click the plus sign next to **Web Server IIS**, and then click **Internet Information Services (IIS) Manager**.
   - D. Under the **Connections** heading, click plus sign next to the **%HOSTNAME%**, and then click the plus sign next to **Sites**.
   - E. Right-click **Default Web Site** and from the drop-down menu select **Manage Web Site**, then select **Stop**.

3. Back up the current IIS 7 configuration and verify.
   - A. `%windir%\system32\inetsrv\appcmd.exe` add backup "Blackboard Pre-Change"
   - B. `%windir%\system32\inetsrv\appcmd.exe` list backup

4. Modify the IIS 7 configuration to permit double escaping within URLs (applies to all sites).
   - A. `%windir%\system32\inetsrv\appcmd set config /section:system.webServer/Security/requestFiltering -allowDoubleEscaping:True`

5. Modify the IIS 7 configuration to allow upload files greater than 20MB in size, specified in bytes (applies to all sites).
   - A. `%windir%\system32\inetsrv\appcmd set config -section:requestFiltering -requestLimits.maxAllowedContentLength:104857600`

6. Back up the current IIS 7 configuration and verify.
    A. `%windir%\system32\inetsrv\appcmd.exe` add backup "Blackboard Post-Change Backup"
    B. `%windir%\system32\inetsrv\appcmd.exe` list backup

7. Restart the IIS service.
    A. Click **Start** and select **Administrative Tools** then select **Server Manager**.
    B. From the left menu, click the plus sign next to **Configuration** and then click **Services**.
    C. From the list of services, right-click **World Wide Web Publishing Service** and select **Restart**.

### IIS Configuration Editing Notes

Blackboard recommends that you do not manually edit the `%windir%\system32\inetsrv\config\applicationHost.config` file to configure these options. This will result in errors that require a backup and restore of the last known good backup of the IIS 7 configuration that was managed by the IIS.

If you manually backed up the `applicationHost.config` file, restoring this manual backup and restarting IIS 7 will not fix errors generated by manually editing this file to configure IIS 7.

 By default, IIS 7 will check every two minutes for changes to the configuration files and will automatically create backups of them, maintaining a history of ten backups. Use the oldest of these backups to restore IIS 7 to a working state.

```
%windir%\system32\inetsrv\appcmd.exe list
backup%windir%\system32\inetsrv\appcmd.exe restore backup
"CFGHISTORY_0000000021"
```

Once the configuration has been restored and verified through web browser access, then use the appcmd utility to configure the necessary features of IIS 7 as described in the section above.

If this approach does not solve the problem with IIS 7 generating errors, remove and then reinstall the IIS 7 Role.

If you need to reinstall the IIS 7 Role, you can use the `%BLACKBOARD%\tools\admin\WebsiteReinstall.bat` command to re-establish the Blackboard Web site within IIS.Install the IIS 7 Role in Windows Server 2008 Server Manager and configure Role Services

### Non-English Operating Systems and Databases

Non-English operating systems and databases (such as a Chinese-language version of Oracle), are considered compatible with Blackboard Learn.  These systems have not undergone official Blackboard Product Development testing.

### Oracle RAC

Blackboard offers support for RAC with all versions of Oracle supported by Blackboard. For information about running Blackboard Learn with RAC, see the *Blackboard Learn Server Administrator Guide* available on [Behind the Blackboard](#).

### Oracle 11gR1 Query Error

Oracle 11gR1 contains a bug that displays the following error when attempting a complex query:

```
ORA-00600: internal error code, arguments: [kkocxj : pjpCtx], [], [],
  [], [], []
```

To prevent this error, before installation or afterward log on as a system user and run the command:

```
alter system set "_optimizer_push_pred_cost_based"=false scope = both;
```

### Hybrid Configurations

Red Hat/Solaris hybrid configurations have not been tested and are not supported.

### SSL Configuration

Blackboard strongly recommends running the Secure Sockets Layer (SSL) protocol to secure communication between a Blackboard Learn Web/App server and a client machine. If SSL is not used, authentication may be compromised. For more information, see the *Blackboard Learn Server Administration Guide*.

## Client Technologies

### Windows Client Configurations

|  | Internet Explorer 8 | Internet Explorer 7 | Firefox 3.6 | Firefox 3.5 |
|---|---|---|---|---|
| **Windows XP (32-bit)** | Compatible | Compatible | Compatible | Compatible |
| **Windows Vista (32-bit)** | **Certified** | Compatible | **Certified** | Compatible |
| **Windows 7 (32-bit)** | **Certified** | Unsupported | **Certified** | Compatible |
| **Windows Vista (64-bit)** | Compatible | Compatible | Compatible | Compatible |
| **Windows 7 (64-bit)** | **Certified** | Unsupported | **Certified** | Compatible |

### Mac OSX Client Configurations

|  | Safari 4.0 | Safari 3.2 | Firefox 3.6 | Firefox 3.5.x |
|---|---|---|---|---|
| **Mac OSX 10.5 "Leopard"** | Compatible | Compatible | Compatible | Compatible |
| **Mac OSX 10.6 "Snow Leopard"** | **Certified** | Unsupported | **Certified** | Compatible |

### Accessibility and JAWS

Blackboard strives to make all its products as accessible as possible. JAWS for Windows 9 and 10 were used during accessibility testing.

**JRE Support**

Blackboard Learn requires the latest version of Sun JRE 6. The JRE can be downloaded from http://java.sun.com/javase/downloads/index.jsp. Windows System Administrators who want to provide auto-download for users can find the .cab file link for the appropriate JRE at http://java.sun.com/javase/6/webnotes/install/jre/autodownload.html.

**No Longer Supported**

Firefox 3.0 was not tested with Service Pack 1 in accordance with our technology policy. Blackboard recommends that clients upgrade to the latest version of Firefox.

The following technologies are no longer supported:

- Internet Explorer 6

- Firefox 1.x and 2.0

- Safari 2.0

- Mac OSX 10.4 "Tiger"

- Java 5

# Virtualization

VMware® ESX Server 4 (Linux® and Windows®) is the only configuration Certified by Blackboard for Release 9.1.

Blackboard supports other virtualization solutions as long as Blackboard and the hypervisor support the guest operating system.

In addition to VMware, Blackboard has experience with Citrix XenServer 5.5, Solaris 10 Zones and Red Hat® Enterprise Linux® 4 & 5 Xen™.

# Installation and Upgrade Information

For information about fresh installations of Blackboard Learn 9.1 SP1, see the *Blackboard Learn Installation Guide* for Release 9.1.

For information about upgrading to Blackboard Learn Release 9.1 SP1, see the following sections and the *Upgrade Guide* for your current version.

## Direct Upgrade Paths

The following releases can be upgraded directly to Blackboard Learn 9.1 SP1.

- Blackboard Learn Release 9.1 General Availability (Build 9.1.407.2) and Hotfix 1 (Build 9.1.407.9)
- Blackboard Learn Release 9.0 Service Pack 3 (Build 9.0.539.0)
- Blackboard Academic Suite 8.0 Service Pack 6 (Build 8.0.475.0)

## Indirect Upgrade Paths

| Previous Version | Suggested Path |
|---|---|
| 9.0 GA, SP1, SP2 | 1. Upgrade to 9.0 SP3.<br>2. Upgrade to 9.1 SP1. |
| 8.0 GA, SP1, SP2, SP3, SP4, and SP5 | 1. Increment through the service packs to 8.0 SP6.<br>2. Upgrade to 9.1 SP1. |
| 7.3 SP2 | 1. Upgrade to 8.0 SP6.<br>2. Upgrade to 9.1 SP1. |
| 7.3 SP1 | 1. Upgrade to 7.3 SP2.<br>2. Upgrade to 8.0 SP6.<br>3. Upgrade to 9.1 SP1. |
| 7.3 GA | 1. Upgrade to 7.3 SP1.<br>2. Upgrade to 7.3 SP2.<br>3. Upgrade to 8.0 SP6.<br>4. Upgrade to 9.1 SP1. |
| 7.2 SP1 | 1. Upgrade to 7.3 SP2.<br>2. Upgrade to 8.0 SP6.<br>3. Upgrade to 9.1 SP1. |
| 7.2 GA | 1. Upgrade to 7.2 SP1.<br>2. Upgrade to 7.3 SP2.<br>3. Upgrade to 8.0 SP6.<br>4. Upgrade to 9.1 SP1. |

| Previous Version | Suggested Path |
|---|---|
| 7.1 SP2 or later | 1. Upgrade to 7.3 GA.<br>2. Upgrade to 7.3 SP1.<br>3. Upgrade to 7.3 SP2.<br>4. Upgrade to 8.0 SP6.<br>5. Upgrade to 9.1 SP1. |
| 7.1 GA and SP1 | 1. Upgrade to 7.1 SP2.<br>2. Upgrade to 7.3 GA.<br>3. Upgrade to 7.3 SP1.<br>4. Upgrade to 7.3 SP2.<br>5. Upgrade to 8.0 SP6.<br>6. Upgrade to 9.1 SP1. |
| 7.0.x | 1. Upgrade to 7.0 SP1.<br>2. Upgrade to 7.1 SP2.<br>3. Upgrade to 7.3 GA.<br>4. Upgrade to 7.3 SP1.<br>5. Upgrade to 7.3 SP2.<br>6. Upgrade to 8.0 SP6.<br>7. Upgrade to 9.1 SP1. |
| 6.3.x | 1. Upgrade to 6.3 SP2.<br>2. Upgrade to 7.0 SP1.<br>3. Upgrade to 7.1 SP2.<br>4. Upgrade to 7.3 GA.<br>5. Upgrade to 7.3 SP1.<br>6. Upgrade to 7.3 SP2.<br>7. Upgrade to 8.0 SP6.<br>8. Upgrade to 9.1 SP1. |

## Paths for Importing and Restoring Courses

The following table identifies the supported paths for importing or restoring a Course that was exported or archived from Blackboard Academic Suite. Certified paths are fully tested and supported by Blackboard. Compatible paths are not fully tested but should function correctly based on past performance.

**Note**    Paths for importing and restoring Courses are not backward compatible. Courses may be imported or restored to a newer version, but Courses from a newer version may not be imported or restored to an earlier version.

| Source | Support |
|--------|---------|
| Blackboard Learn Release 9.1 | Certified |
| Blackboard Learn Release 9.0 | Certified |
| Blackboard Academic Suite Release 8 | Certified |
| Blackboard Academic Suite Release 7 | Certified |
| Blackboard Academic Suite Release 6 | Certified |
| Blackboard ML | Certified |
| Blackboard 5.5* | Certified |
| Blackboard 5.0* | Compatible |
| CourseInfo 4 | Not Supported |

*Blackboard 5 and Blackboard 5.5 did not include an Archive and Restore function. Courses from these releases may be imported but Courses cannot be restored with user data and interactions intact.

## Upgrading Server Software

Server software must meet certain requirements before installing Blackboard Learn. The following items are important to keep in mind when setting up the server software:

- The database is run on a separate server when using two or more servers. Thus, appropriate client tools for the database must be installed on the Application server or servers when using a configuration with two or more servers.

- If running on Windows, when installing the Java SE Development Kit (JDK), make sure that both the JDK and the JRE components are installed to different locations. Also, ensure that there are no spaces in the path name to either the JDK or the JRE.

- If running on Windows, support for .NET APIs and .NET Building Blocks has been removed from Blackboard Learn in Release 9.1. If you are using .NET APIs and Building Blocks, they will not work in Release 9.1. Replace them with comparable Web Services and Java Building Block APIs. For more information about the available APIs, see the API documentation available on Behind the Blackboard.

- If running on Solaris, ensure that the Swap space for the operating system is 0.5 – 1.5 times the amount of physical RAM on the server. For more information, see http://www.sun.com/bigadmin/content/submitted/swap_space_impact.jsp.

## Upgrading the Operating System or Database

Before upgrading the operating system or database, back up the database and file system and test the restore process.

**Note**     Although non-English operating systems and databases (such as a Chinese-language version of Oracle®) are considered compatible with Blackboard Learn Release 9.1, these systems have not undergone official Blackboard Product Development testing.

## Upgrading to Blackboard Learn 9.1 SP1

### Upgrade Guides

Blackboard provides separate Upgrade Guides for each of the following products:

- Blackboard Learn Release 9.0

- Blackboard Academic Suite 8.0

- CE 4

- CE 8

- Vista 8

Each Upgrade Guide is available in the appropriate product's Upgrade Kit available on the Blackboard Upgrade Center or Behind the Blackboard.

### Provide New License

Contact Blackboard Client Operations to request a new license key file (`bb-license.xml`) for Blackboard Learn Release 9.1. Make sure to do so well in advance of the upgrade. It is important to obtain a new license file to ensure the upgrade includes new features and functions.

Save the new license file in the same directory as the updater. Be sure not to confuse the new license with the old license file.

During the upgrade, when the installation prompt presents the following options: Update, Provide new License file, Uninstall Blackboard Learn, and Uninstall appserver, select **Provide new License file**.

### Customizations Warning

Running the Updater on an existing system will reset many back-end and user interface customizations. Examples of affected back-end settings include:

- `JAVA_HOME` system environment variable

- SSL and custom authentication settings

- Settings in the `bb-config.properties`, `authentication.properties`, and `wrapper.conf` files

Examples of affected user interface settings include:

- Course Settings (which control the Course menu)

- Building Block availability

- Module and Tab availability, role settings, and custom layouts

Customizations will need to be reapplied after the upgrade. To make this process easier, create a detailed document outlining all existing customizations.

**Note** Any configuration files removed by the upgrade will be placed in the `<blackboard_directory>/backups/<upgrade_timestamp>` directory. Use these files as a guide when updating the new configuration files to reapply your previous customizations.

### Custom Themes Warning

Significant changes were made to the application markup and CSS in Release 9.1 to support new features and accessibility standards. These changes can cause customized themes and color palette changes created in earlier releases to malfunction as well as not apply styles to new features.

Comments have been added to the CSS files to make them easier to read and understand. These comments identify new elements and elements that are no longer used. Extraneous sectors have been removed.

### Load-Balanced Systems

The Updater must be run on each Application server and the Collaboration server on a load-balanced system. After running the Updater the first time, choose the Update an App Server for all other Application servers and the Collaboration server. This option will upgrade the application files without making any of the database changes.

### Language Pack Changes

To ensure consistency across releases, the Blackboard Learn Updater will compare the existing en_US language pack against the version that is being installed. The differences are noted and output in a file called bundle_diff.txt. This file is added to the blackboard/backups/<updater_time_stamp> directory. Use this file to review the text differences between releases and make upgrades to any custom Language Packs.

### Additional Screen in the updater for 9.1 SP1 and later

A new "Server Type" screen has been added to the Updater for better management of centralized services.  The options are **Production**, **Staging**, **Test**, and **Development**. Be sure to properly categorize each server when running the updater.  If the server already has a type specified, this screen will not display.

### Running the Updater on Windows

Follow these steps to run the Updater on Windows:

1. Make sure that the Java environment variable is properly set.

2. Click on the Updater file to launch it.

3. A welcome message will appear with a reminder to read the release notes and the installations instructions completely before updating. Click **Next** to continue.

4. The first updater page confirms the auto-detected install and content directories. Click **Next** to accept the defaults or enter new values and then click **Next**. Load-Balanced users should use the mapped UNC path.

5. The next prompt presents several options. The options are **Update**, **Provide new License file**, **Uninstall** Blackboard Learn, and **Uninstall Application Server**. Select the appropriate option and click **Next**. The **Update** option will use the license file already configured and **Provide new license file** will upgrade the system and apply the new license.

6. If the server does not already have a Server Type value, the new screen will display. Properly categorize the server and click **Next**.

7. A message will appear that displays the changes that will be made when the Updater is run. Click **Next** to start the upgrade. If the Updater was launched from the command line,

do not close the command line window or any of the other windows that pop-up during the upgrade.

**Running the Updater on UNIX (Red Hat and Solaris)**

Follow these steps to run the Updater on UNIX.

1.  Open a command-line prompt and navigate to the directory that holds the Updater.

2.  Run the following command to launch the Updater:

    $JAVA_HOME/bin/java -jar <updater_file>

    If Xwindows or a similar GUI is running and the DISPLAY variable is properly configured, the Updater will launch in GUI mode (remember that the following steps assume that the command line Updater is used)

    A welcome message will appear with a reminder to read the release notes and the installations instructions completely before updating. Hit ENTER to continue.

3.  Instructions will appear for navigating through the Updater prompts. The Updater, in most cases, will provide a default value in brackets. Hit ENTER to accept the default and continue or enter a different value. Hit ENTER to continue after entering a new value.

4.  The first Updater prompt asks for the directory where Blackboard will be found. Hit ENTER to accept the default or enter a new value and then hit ENTER. If The Blackboard Learn is not found in the directory provided, the Updater will attempt to install at the given location.

5.  The next prompt presents several options. The options are **"1 – Upgrade and Convert"** and **"2 – Upgrade App Server Only."** Type **1** and hit ENTER.

6.  If the server does not already have a Server Type value, the new screen will display. Properly categorize the server and hit ENTER.

7.  A message will appear that displays the changes that will be made when the Updater is run. Hit ENTER to start the upgrade.