

# Blackboardlearn<sup>+</sup>

*Release 9.1 Service Pack 4  
Release Notes*

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## 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. Always review the entire document and consider the impacts listed below to your specific usage patterns.

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.

- ☑ **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 4 of Release 9.1 includes enhancements that are outlined in the New Features and Enhancements section. Some highlights include:
    - Learning Tools Interoperability (LTI) provides institutions an easy and consistent way to integrate external learning tools and applications into Blackboard, allowing instructors to add third party tools into their courses without requiring learners to sign in to multiple tools.
    - Blackboard can import content that is formatted as 1.0 and 1.1 Common Cartridge packages as well as export Blackboard course content to Common Cartridge 1.0 and 1.1 packages.
  - With every release [Resolved Issues](#) may impact your end users. While we hope this is a positive impact, review the list for any changes you may want to communicate to your community.
  - 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.
    - Clients are cautioned to not use the Move Files Utility as described in this [KB article](#).
- ☑ **System Administration and Integration Impacts:** Items that fall into this category impact the administration of the system, including API integration. A review of Building Blocks, Snapshot or other integrations may be required.
  - With every release, the Release Notes include updates to the following information to help you prepare your system for the upgrade and make performance tuning adjustments.
    - [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 tips for running the updater.

# New Features and Enhancements

The Release Notes provide a high-level overview of the New Features and Enhancements from the previous service pack on Release 9.1. Release 9.1 Service Pack 4 contains some enhancements and changes in functionality for most users coming from Service Pack 3.

If you are new to Release 9.1, please refer to the “Understanding the Change” document, available for each product through [Behind the Blackboard](#), to get a comprehensive look at the features and functions of Release 9.1 and how they compare to the your current production version. Also please work through the [Upgrade Center](#) where we have provided a step by step planning guide to assist you through this process.

## System Administration

### Data Sources

System Administrators can navigate to **Administration Panel > System Reporting > Data Sources** to create new data sources and open existing data sources to view details about each type of record currently associated with that data source. Existing keys can also be modified or deleted. Records can be disabled and purged as well.

### Search and Select All

A large list of items, such as users or courses, is often returned from a search that uses the filter Not Blank or a generic character in the filter Contains. This list is displayed on multiple pages, the number of which is based on the setting of number of items to display on a page. Checking the top Status box selects all the items displayed on the page, but now gives you the additional option of selecting all items returned in the search. This option allows you to select the entire set so you do not have to go to each page and select all, or set the number of items displayed on the page to a very high number, causing performance problems.

### Support for Google Analytics™

Google Analytics™ is a free service offered by Google for mining web traffic data to a website or application. The process for setting up Google Analytics is the same for each Blackboard Learn code line including 9.0 SP5 and 9.1 SP4 and beyond.

1. Register with Google Analytics (<http://www.google.com/analytics/>).
  - a. Identify a test server outside your firewall and note its domain name.
  - b. Create a Google Analytics Account.
  - c. Register the domain name of your server through the Google Analytics setup pages.
  - d. Save the script provided by Google Analytics.
2. Open `<sharedDir>/web_analytics/googleAnalyticsSnippet.vm` (For example `c:/blackboard/content/web_analytics/googleAnalyticsSnippet.vm`), paste your script, and save the file.
3. You can restart Blackboard Learn Services for the changes to take effect immediately or wait until the .vm file cache is refreshed, once every 12 hours.

For information about Secure and Non-Secure sites, visit <http://www.google.com/support/analytics/bin/answer.py?hl=en&answer=55483>.

## Resource Governor

A new command line feature that allows certain performance intensive database operations to run at a lower priority so that they do not consume CPU resources is shipped with SP4. This feature, a resource governor, is turned off by default.

### To Activate

First contact Blackboard support. Next, navigate to the main configuration file: `/blackboard/config/bb-config.properties` and locate this property: `bbconfig.database.query.prioritization.enabled`, which is set to `False`. Follow the instructions from support to activate.

Once activated the resource governor is added to the Blackboard database. The resource governor regulates the CPU utilization of connections configured to run at a lower priority. Until activated, there is no impact on the system.

The resource governor is only installed on systems that use the following databases:

- Oracle 10 Enterprise Edition
- Oracle 11 Enterprise Edition
- SQL Server 2008 Enterprise Edition

It will **not** be installed for any other versions, and the low-priority connection feature will not take effect on those systems, even if enabled.

### To Disable

Set the `bbconfig.database.query.prioritization.enabled` property to `False`. The resource governor can also be turned off at the database level. This does not remove the resource governor from the database, but disables it. It can be enabled at any point.

### For Oracle:

1. Log on as the sys dba:  

```
sqlplus "/ sysdba"
```
2. Turn off the resource manager by setting it to an empty plan:  

```
alter system set resource_manager_plan = ''
```

### For SQL:

Bring up the SQL Server Manager.

- Navigate to **Management > Resource Governor**.
- Right click on **Resource Governor** and select **Properties**.
- Change **Classifier Function Name** to **None**.

 The 9.1 SP4 uninstaller does **not** remove the resource governors. This will be addressed in future service packs. Until it is, the follow artifacts will be left behind after the uninstaller executes.

### Oracle

- A resource plan, called **BB\_PLAN**
- Two consumer groups: **OLTP**, and **BATCH**
- The database's **RESOURCE\_MANAGER\_PLAN** will be set to **BB\_PLAN**

## SQL Server

- A workload group, called **groupLowPriority**
- A classifier function, called **get\_priority\_workgroup**
- The resource governor is updated to point to the **get\_priority\_workgroup** function

## To Delete

Delete the Resource Governor if you think it is causing issues on your system that disabling it will not address or if you uninstall your SP4 Learn environment and want to remove the resource governor as well.

## For Oracle:

1. Log on as the sys dba.  
`sqlplus "/ sysdba"`
2. Disable the BB\_PLAN resource plan.
3. Remove the plan and all its descendants by executing the following code:

```
alter system set resource_manager_plan = '';

exec dbms_resource_manager.create_pending_area();
exec dbms_resource_manager.delete_plan_cascade('Bb_plan');
exec dbms_resource_manager.validate_pending_area();
exec dbms_resource_manager.submit_pending_area();
```

## For SQL:

In a production environment, wait for all sessions that are using low-priority connections to complete or simply kill those sessions before attempting to uninstall the resource governor. Otherwise, the drop will fail.

1. Delete the low priority resource group.
2. Disable the resource classifier.
3. Delete the resource classifier function:

```
DROP WORKLOAD GROUP groupLowPriority;
GO

-- Update the Resource Governor in-memory configuration
ALTER RESOURCE GOVERNOR WITH (CLASSIFIER_FUNCTION=null);
GO
ALTER RESOURCE GOVERNOR RECONFIGURE;
GO

DROP FUNCTION dbo.get_priority_workgroup;
GO
```

## Global XSS Filtering

To prevent cross-site scripting (XSS) attacks, Blackboard Learn now can globally filter user HTML input. The filtering changes the greater-than sign, ">" to "&gt;" and the lesser-than sign, "<" to "&lt;". This applies to all data entered using HTML forms, such as submitting a Create Discussion Board Forum Message form. Global XSS filter is also applied to file uploads, and will be apparent when rendering the contents of a form submission back to the screen.

Global XSS filtering only occurs for un-trusted user roles such as students. Trusted users, such as course instructors are allowed to post data and will not have their HTML filtered.

Global filtering can be turned on and off for the entire server using the `bbconfig.global.xss.enable` property in `bb-config.properties`. This property is ON by default starting with 9.1 SP4. This property is OFF by default in 9.1 SP1 through 9.1 SP3.

Global filtering can also be turned on or off selectively by URL. When global xss filter is ON for the entire system (`bbconfig.global.xss.enable=true`), filtering can be turned off for specific URLs. This option could be used in the case of a Building Block that allows any user, with trusted role or not, to submit HTML content. To prevent the global xss filter from changing the HTML, the developer can modify the code to get the unfiltered data using the new APIs, or create an exception text file.

To create an exception file, add the URL prefixes, one per line, in a text file named in the `config/internal/bb-xss-global-filter-exceptions.txt`.

For building blocks, the BBUID is embedded in the URL (and is VI specific), so the placeholder `{bbuid}` can be used in the prefix. This will get replaced by the actual BBUID when URLs are being compared against the prefix.

For example `/webapps/bb-my-b2-{bbuid}` would get changed to `/webapps/bb-my-b2-BBLEARN`

## Course Delivery

### Support for Common Cartridge

Common Cartridge 1.0 and 1.1 are integrated into Blackboard Learn. Course content packages saved in this standard can be imported into Blackboard and course content created in Blackboard can be exported as Common Cartridge packages.

**Important Note:** Cartridges exported from Blackboard are automatically exported in Common Cartridge 1.0 unless the **Export as Common Cartridge 1.1** box is checked. In which case, the export is saved as Common Cartridge 1.1.

### Learning Tools Interoperability

The Basic Learning Tools Interoperability (LTI) is an IMS derivative of the full Learning Tools Interoperability specification that provides a simple integration for instructors to install external learning tools and applications anywhere within their courses. Users do not have to sign in to multiple tools. External content and tools are added to a course the same way a URL is added. The tool or content is launched by clicking the link.

Developers can add Basic Learning Tools Interoperability extensions to their Building Blocks, increasing their market value.

## Assessments

Feedback for each answer is now available for Multiple Answer questions.

## Course Files Issue Resolution Plan and Best Practices

**Service Pack 4** focused on resolving the most critical issues in the areas of Course Copy, Data Migration (Content Exchange), VTBE embedded image handling, and Guest Access.

As a reminder we recommend you discontinue use of the [Move Course Files Utility](#) until Service Pack 5.

**Service Pack 5**, scheduled for release in Q1 2011, will target additional fixes around course migration and Course Files tools but most importantly will provide a more stable Move Course Files Utility which will allow clients to move all course content from the legacy storage area into the Course Files directories and take full advantage of the Course Files functionality.

Please review the [Knowledge Base article](#) on Behind the Blackboard which consolidates all Course Files related issues and follow the [Maintenance Experience Blog](#) for updates on upcoming service packs.

Please keep in mind that as with any software release, while Blackboard will strive to maintain the above described dates, changes in release dates may occur for many reasons. Blackboard will keep you updated on progress regarding these Service Packs as information becomes available.

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## **Community Engagement**

### **Discovering Modules**

Users can locate modules to add to their My Institutional page more easily using categories and search. Modules can be categorized by the system administrator. Search is based on key words in the module title and description.

## **Blackboard Connect**

### **Country Codes Available**

Blackboard Learn and Connect are now integrated and support international phone codes. Integration automatically populates email addresses and phone numbers from Learn to Connect. A default country code can be used in the event that no code is provided from Blackboard Learn.

## **Outcomes Assessment**

### **Curriculum Maps**

The workflow for creating and building a Curriculum Map has been improved to reduce the number of clicks so that users go directly to the build tasks from the creation page.

### **Distribution Lists**

The workflow for creating a distribution list and adding criteria to it has been combined into one workflow.

## Known and Resolved Issues

The list of issues resolved in Blackboard Learn Release 9.1 SP4 is available on the [Resolved Issues Page](#) of the Maintenance Center.

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 a list of the issue ID, description, and resolution path. This page is updated regularly with new client-reported issues.

## 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

Release 9.1 Service Pack 4 no degradation was reported during any performance tests when comparing against any previous service pack using regression performance settings. Performance improvements have been confirmed on both Windows and Unix configurations.

#### Content System

When deleting a large number of items listed in the orphaned content report, a Request-URI Too Large error was encountered. This issue has been fixed and the error no longer occurs.

A query related to file permission was not being cached properly and therefore had a high execution count. This issue has been corrected.

A query related to the CMS workflow was found to be slow when adding a workflow module to the My Institution page. This was corrected by optimizing the query.

#### Course Content

There were full table scans occurring when switching between view modes for Content within a course. This occurred when toggling from Icon and Text view to either the Show Icons Only or the Show Text Only views. This issue has been fixed.

For Oracle, content areas with large number of items were impacting system performance due to excessive Oracle memory utilization. This issue has been corrected.

#### Discussion Board

Previously, when grading a user in a discussion forum, the request would take many seconds to load. The underlying query to perform this operation was executing an expensive full table scan on the MSG\_MAIN table. Customers with millions of rows on this table would experience unnecessary latency. This was addressed by modifying the query to force a nested loop.

#### Early Warning System

An inefficient query related to Early Warning System status update for Grade Center rules was identified. Previously, this query was performing a full table scan. This has been modified to narrow down the scope to improve performance.

## General System Performance

In some cases, Tomcat application threads would consume CPU cycles and block other threads. This was tracked down to the use of HashMap data structure in the NavigationCache used for accessing the course map and left navigation menu. The cache was re-factored to make use of a ConcurrentHashMap to eliminate resource contention.

The `bbconfig.database.instance.statementcache.size` property was not taking effect, so the application was not taking full advantage of using prepared and callable statements. This issue has now been corrected.

Sessions were not being cleaned up properly. This issue is now fixed to properly clean up invalid user sessions.

The database statistic gathering job was updated to gather updated database statistics.

CSS style selector matching process was identified as a cause of slow CSS evaluation in IE7. The relevant selectors causing this issue were identified and modified to correct this issue.

## Grade Center

The Needs Grading page was taking time to load when there were thousands of attempts in the page. This has been improved so it takes less time.

## Installer/Updater

The installer was inefficiently creating and removing indexes and duplicating the process which was increasing installer time. This issue has now been corrected to improve installer time.

A few updater queries were identified as taking too long during an upgrade test and were refactored to correct this issue.

## Modules

When loading the course module page, an inefficient query was identified that scanned all courses in the system multiple times to acquire data needed for presentation within the user's course module. This was addressed so that the query spans only those courses with which the user is associated.

Changing default layout header was not occurring in a timely manner. The code was refactored to improve this issue.

## Notifications

When copying courses, an inefficient notification query was identified to be causing database blocking and therefore overall system slowness. This query was improved to reduce the database blocking.

A complex query for What's New module was identified as consuming high CPU, physical and logical reads. The query was impacting overall system performance. The query was modified to greatly reduce the logical and physical reads.

## Outcomes

An inefficient query related to the `course_application` table was identified. The query was modified to improve the performance.

## Text Editor

Text editor was taking excessive time to load. The code has now been improved to load the Text Editor faster.

## User Search

Searching for users consumes significant CPU and Memory resources. The appropriate code was identified and corrected.

## 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 [Oracle RAC Support on UNIX](#) in [Blackboard Help for Administrators](#).

For more information about deploying Blackboard Learn, see [Hardware Sizing Information for Windows Dell Environments](#) or [Hardware Sizing Information for UNIX Sun Environments](#) in [Blackboard Help for Administrators](#).

## Recommended JVM Tuning Set

For every Service Pack 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 Service Pack 4. Customers are strongly encouraged to deploy their application environments in a 64-bit configuration using the recommended 4GB, 8GB, or larger tuning set.

Blackboard recommends using the following tuning set for 8GB JVMs (64-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:

```
-Xms8192m -Xmx8192m -XX:NewSize=2048m -XX:MaxNewSize=2048m
-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
```

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

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

Guidance for 32-bit configurations is also included below, however, to achieve the best performance and scalability, 32-bit environments are not recommended for use in production situations. 32-bit Windows and Red Hat Enterprise 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. For 32-bit configurations with a 1.4GB heap size, Blackboard recommends changing the following parameter values in the recommended tuning set:

```
-Xms1400m -Xmx1400m -XX:NewSize=350m -XX:MaxNewSize=350m
```

**TIP:** For performance reasons, Oracle Database Administrators should set `CURSOR_SHARING` to `EXACT` or `FORCE`, especially for clients on Oracle 10g and licensing Content Management.

## Understanding the Settings

Additional performance tuning may be required for certain configurations depending on how much memory is available and what other processes are running. Some of the parameters below can be changed to match your particular environment and improve overall performance.

### 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 SP4 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)	Oracle 11gR2 (64-bit)
Windows Server 2003 SP2 (64-bit)	DATABASE ONLY	Compatible	Compatible	Unsupported	Unsupported	Unsupported
Windows Server 2008 (64-bit)	<b>Certified</b> (64-bit JDK)	Unsupported	<b>Certified</b>	Unsupported	Unsupported	Unsupported
Windows Server 2008 R2 (64-bit)	<b>Certified</b> (64-bit JDK)	Unsupported	<b>Certified</b>	Unsupported	Unsupported	Unsupported
Red Hat Enterprise Linux Server 4 (64-bit)	Compatible (64-bit JDK)	Unsupported	Unsupported	Compatible	Unsupported	Unsupported
Red Hat Enterprise Linux Server 5 (64-bit)	<b>Certified</b> (64-bit JDK)	Unsupported	Unsupported	<b>Certified</b>	Compatible**	<b>Certified</b>
Sun Solaris 10 (64-bit SPARC)	<b>Certified</b> (64-bit JDK)	Unsupported	Unsupported	<b>Certified</b>	Compatible**	<b>Certified</b>

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

### Configuration Notes:

- Microsoft® SQL Server 2005 must be installed with SP3 or above.
- Microsoft SQL Server 2008 must be installed with SP1 or above.
- Windows Server 2003 should be installed with SP2 or above.

### Windows Server 2008 R2

Certified support for Windows Server 2008 R2 has been introduced with Release 9.1 SP3.

### Oracle 11gR2

Certified support for Oracle 11gR2 has been introduced with Release 9.1 SP3.

### 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.

### Oracle RAC

Blackboard offers support for RAC with all versions of Oracle supported by Blackboard. When using RAC with an OCI driver, a thin OCI driver must be used during upgrade. There is a known Java library issue when attempting to use a thick OCI driver. Using a thin OCI driver requires less configuration; however, in clustered environments a generic service name which corresponds to the whole cluster cannot be used and instead the specific SID must be used for each node. For information about running Blackboard Learn with RAC, see [Oracle RAC Support on UNIX in Blackboard Help for Administrators](#).

## Oracle 11gR2 Errors

Oracle 11gR2 contains two bugs that cause errors.

The first bug displays errors when importing content or restoring course packages. To prevent this error, as an Oracle user, run the following command:

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

The second bug returns an error that reads:

```
ORA-00918: COLUMN AMBIGUOUSLY DEFINED Bug 9219636: ORA-00918: COLUMN
AMBIGUOUSLY DEFINED IN 11.2.0.1
```

To prevent this error, apply the Oracle patch bundle 11.2.0.1 number 9259407.

### 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 [About SSL and SSL Choice](#) in [Blackboard Help for Administrators](#).

## 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)	<b>Certified</b>	Compatible	<b>Certified</b>	Compatible
Windows Vista (64-bit)	Compatible	Compatible	Compatible	Compatible
Windows 7 (32-bit)	<b>Certified</b>	Unsupported	<b>Certified</b>	Compatible
Windows 7 (64-bit)	Compatible	Unsupported	Compatible	Compatible

## Mac OSX Client Configurations

	Safari 5.0	Safari 4.0	Safari 3.2	Firefox 3.6	Firefox 3.5.x
Mac OSX 10.5 "Leopard"	Compatible	Compatible	Unsupported	Compatible	Compatible
Mac OSX 10.6 "Snow Leopard"	<b>Certified</b>	Compatible	Unsupported	<b>Certified</b>	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

The following technologies are not supported:

- Internet Explorer 6
- Firefox 1.x, 2.0, and 3.0
- Safari 2.0 and 3.x
- 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 SP4, see [Installing Blackboard Learn](#) in [Blackboard Help for Administrators](#).

For information about upgrading to Blackboard Learn Release 9.1 SP4, see the [Upgrade Center](#) or find the *Upgrade Kit* for your current version in the [Document Library](#).

## Direct Upgrade Paths

The following releases can be upgraded directly to Blackboard Learn 9.1.4 SP4.

- Blackboard Learn Release 9.1 Service Pack 3 (Build 9.1.30151.0)
- Blackboard Learn Release 9.0 Service Pack 5 (Build 9.0.613.0)

## Indirect Upgrade Paths

Previous Version	Suggested Path
9.1 GA, SP3	1. Upgrade to 9.1 SP4.
9.1 GA SP2	1. Increment through the service packs to 9.1 SP3. 2. Upgrade to 9.1 SP4.
9.1 GA, SP1	1. Increment through the service packs to 9.1 SP3. 2. Upgrade to 9.1 SP4.
9.0 GA, SP1, SP2, SP3, SP4	1. Increment through the service packs to 9.0 SP5. 2. Upgrade to 9.1 SP4.
8.0 GA, SP1, SP2, SP3, SP4, SP5, and SP6	1. Increment through the service packs to 8.0 SP7. 2. Upgrade to 9.0 SP5. 3. Upgrade to 9.1 SP4.
7.3 SP2	1. Upgrade to 8.0 SP7. 2. Upgrade to 9.0 SP5. 3. Upgrade to 9.1 SP4.
7.3 SP1	1. Upgrade to 7.3 SP2. 2. Upgrade to 8.0 SP7. 3. Upgrade to 9.0 SP5. 4. Upgrade to 9.1 SP4.
7.3 GA	1. Upgrade to 7.3 SP1. 2. Upgrade to 7.3 SP2. 3. Upgrade to 8.0 SP7. 4. Upgrade to 9.0 SP5. 5. Upgrade to 9.1 SP4.

Previous Version	Suggested Path
7.2 SP1	<ol style="list-style-type: none"> <li>1. Upgrade to 7.3 SP2.</li> <li>2. Upgrade to 8.0 SP7.</li> <li>3. Upgrade to 9.0 SP5.</li> <li>4. Upgrade to 9.1 SP4.</li> </ol>
7.2 GA	<ol style="list-style-type: none"> <li>1. Upgrade to 7.2 SP1.</li> <li>2. Upgrade to 7.3 SP2.</li> <li>3. Upgrade to 8.0 SP7.</li> <li>4. Upgrade to 9.0 SP5.</li> <li>5. Upgrade to 9.1 SP4.</li> </ol>
7.1 SP2 or later	<ol style="list-style-type: none"> <li>1. Upgrade to 7.3 GA.</li> <li>2. Upgrade to 7.3 SP1.</li> <li>3. Upgrade to 7.3 SP2.</li> <li>4. Upgrade to 8.0 SP7.</li> <li>5. Upgrade to 9.1 SP3.</li> </ol>
7.1 GA and SP1	<ol style="list-style-type: none"> <li>1. Upgrade to 7.1 SP2.</li> <li>2. Upgrade to 7.3 GA.</li> <li>3. Upgrade to 7.3 SP1.</li> <li>4. Upgrade to 7.3 SP2.</li> <li>5. Upgrade to 8.0 SP7.</li> <li>6. Upgrade to 9.0 SP5.</li> <li>7. Upgrade to 9.1 SP3.</li> </ol>
7.0.x	<ol style="list-style-type: none"> <li>1. Upgrade to 7.0 SP1.</li> <li>2. Upgrade to 7.1 SP2.</li> <li>3. Upgrade to 7.3 GA.</li> <li>4. Upgrade to 7.3 SP1.</li> <li>5. Upgrade to 7.3 SP2.</li> <li>6. Upgrade to 8.0 SP7.</li> <li>7. Upgrade to 9.0 SP5.</li> <li>8. Upgrade to 9.1 SP3.</li> </ol>
6.3.x	<ol style="list-style-type: none"> <li>1. Upgrade to 6.3 SP2.</li> <li>2. Upgrade to 7.0 SP1.</li> <li>3. Upgrade to 7.1 SP2.</li> <li>4. Upgrade to 7.3 GA.</li> <li>5. Upgrade to 7.3 SP1.</li> <li>6. Upgrade to 7.3 SP2.</li> <li>7. Upgrade to 8.0 SP7.</li> <li>8. Upgrade to 9.0 SP5.</li> <li>9. Upgrade to 9.1 SP3.</li> </ol>

## **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.

<b>Source</b>	<b>Support</b>
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 Vista and CE 8.0	Certified
Blackboard Campus Edition 4.1	Certified

\*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 <http://www.edugarage.com>.
- 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](http://www.sun.com/bigadmin/content/submitted/swap_space_impact.jsp).

## **Before Running the Updater**

### **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. Then install the IIS 7 Role in Windows Server 2008 Server Manager and configure Role Services.

## Upgrading to Blackboard Learn 9.1 SP4

### Upgrade Documentation

Blackboard provides Upgrade documentation for each of the following products in [Blackboard Help for Administrators](#):

- [Blackboard Learn Release 9.0](#)
- [Blackboard Academic Suite 8.0](#)
- [CE 4](#)
- [CE 8](#)
- [Vista 8](#)

### 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**.

### Warnings

Running the Updater on an existing system will reset many back-end and user interface customizations. Examples and warnings describing specific known issues are included here.

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 and other affected areas include:

- Course Settings (which control the Course menu)
- Building Block availability
- API hosts information
- 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.

### **Mashups and Firewall Warning**

Bidirectional communication to Web Services that control the APIs for Mashups is required for running Mashup searches. If you are running Blackboard from behind a firewall as a test server or for security reasons, you will need to open the firewall to use this feature. To open bidirectional communication to Mashup Web Services, you must configure your firewall to allow responses from the API hosts. Information from the hosts is available at these locations:

Flickr – <http://www.flickr.com/services/api/>

YouTube – <http://gdata.youtube.com>

SlideShare – <http://www.slideshare.net>

### **Acxiom Warning**

The IdentifyX Building Block is no longer bundled with Blackboard Learn. Clients who are upgrading from Blackboard Academic Suite 8.0 or Blackboard Learn 9.0 and then upgrade to Blackboard Learn SP4 must deactivate IdentifyX v1.1.3 prior to upgrading. After upgrading, download and install the newest version of IdentifyX, v1.1.6 available from [Blackboard Extensions](#). Clients that upgrade from a Learn 9.1 release are already using IdentifyX, v1.1.6.

### **New York Times Warning**

New York Times content modules will no longer be bundled with Blackboard Learn Community Engagement.

### **SafeAssign Warning**

Institutions choosing to archive courses from a legacy production installation and then restore the courses to a new 9.1 instance will lose some of the data associated with SafeAssign, specifically SafeAssignments in restored courses and the student submissions to those SafeAssignments will be inaccessible. In addition, this option could potentially create a privacy issue where some students would be able to see submissions that are not their own.

To avoid these issues, when SafeAssign is heavily used, Blackboard recommends that one of the other two upgrade paths is selected: In-Place Upgrade or Fresh Install – Data Migration.

If your institution chooses the archive/restore option, you will need to have the existing SafeAssign institution database copied from the previous installation to the new installation.

Please open a ticket with Client Support to request this copy after the new production installation is complete.

### **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 fail to 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 selectors have been removed.

### **Previous Content Management Clients Warning**

If your institution is planning to upgrade directly from Blackboard Learn 9.0 or earlier please be aware of possible complications with Content Management. Clients who have previously licensed the Content Management module, but no longer have such a license, may encounter problems when upgrading to Release 9.1. This occurs because of lingering schemas in the database that require a Content Management license. Because of these lingering schemas, the installer is unable to upgrade the database properly and will fail.

If your institution's database has lingering schemas from a previous Content Management license you must obtain the appropriate uninstaller script from Blackboard Client Support to remove these schemas before upgrading to 9.1.

### **Load-Balanced Systems Warning**

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 Warning**

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.

### **Wimba Pronto Basic No Longer Available**

Wimba Pronto Basic is no longer bundled with Blackboard Learn. Clients operating versions older than Service Pack 4 for Blackboard Learn, Release 9.1 may still discover the bundled Building Block on their system. However, support for the installation or operation for this tool will no longer be offered. Further inquiries about the use of Wimba Pronto should be directed to a representative from Blackboard Collaborate.

## **Running the Updater on Windows**

Follow these steps to run the Updater on Windows:

1. Make sure that the JAVA\_HOME system environment variable points to a full Java SDK, version 1.6.x. The path cannot contain spaces. For example: C:\JDK6.
2. Place the Updater file in the desired location, and then double-click the Updater file to launch the Updater.

A welcome message appears with a reminder to read the release notes and the installations instructions completely before updating.

3. Click **Next** to continue.
4. Confirm the installation and content directories for your environment, and then click **Next**. Load-balanced systems should use the correct UNC path for your content directory.

For those clients with Content Management and the /courses area turned off, a warning appears displaying a message that the /courses content area must be turned on to successfully upgrade. Although not recommended, the /courses area can be disabled again after upgrade, but it must remain on during upgrade.

5. At the next prompt, select **Provide new license file**, and then click **Next**.
6. If the server does not already have a **Server Type** value, the **Server Type** screen appears. Properly categorize the server and click **Next**.
7. When a message appears displaying the changes that will be made when the Updater runs, carefully verify the changes. You will not be able to undo the changes after you start the upgrade.
8. Click **Next** to start the upgrade.

**WARNING!** If you launched the Updater from the command line, do not close the command line window or any of the other windows that pop-up during the upgrade as this will cause the Upgrade to fail and may leave the database in an indeterminate state.

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

Follow these steps to run the Updater on UNIX.

1. Place the Updater file in the desired location.
2. Open a command-line prompt as the root user and navigate to the directory that holds the Updater.
3. Issue the following command to launch the Updater:

```
$JAVA_HOME/bin/java -jar <updater_file>
```

If using the X Windows System (X11) or a similar GUI solution and the DISPLAY variable is properly configured, the Updater will launch in GUI mode.

**Note:** The following steps assume that the command-line Updater is used.

4. A welcome message appears with a reminder to read the release notes and the installations instructions completely before updating.
5. Press ENTER to continue. Instructions appear for navigating through the Updater prompts. The Updater, in most cases, will provide a default value in brackets.
6. Press ENTER to accept the default and continue, or enter a different value. Press ENTER to continue after entering a new value.

The first Updater prompt asks for the directory where Blackboard will be found.

7. Press ENTER to accept the default, or enter a new value and then press ENTER. If Blackboard Learn is not found in the directory provided, the Updater attempts to install at the given location.
8. At the next prompt, type 1 for “1 - Upgrade and Convert” and press ENTER.

For those clients with Content Management and the `/courses` area turned off, a warning appears displaying a message that the `/courses` content area must be turned on to successfully upgrade. Although not recommended, the `/courses` area can be disabled again after upgrade, but it must remain on during upgrade.

9. If the server does not already have a Server Type value, the Server Type screen appears. Properly categorize the server and press ENTER.
10. When a message appears displaying the changes that will be made when the Updater runs, carefully verify the changes. You will not be able to undo the changes after you start the upgrade.
11. Press ENTER to start the upgrade.