



Blackboard Academic Suite™ Setup Guide for Sun® Solaris™ and Linux®

Release 6.1
Blackboard Learning System™
Blackboard Portal System™
Blackboard Learning System — Basic

Date Published: February 9, 2004
Date of Last Revision:

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About the *Blackboard Academic Suite* Setup Guide

Overview

The goal of the *Blackboard Academic Suite* Setup Guide is to provide institutions with all the information needed to make the *Blackboard Academic Suite*™ continuously available to users. Institutions have the choice of hosting their own installation or having their Blackboard installation hosted by Blackboard ASP Solutions.

Institutions that choose to have their installation hosted by Blackboard ASP Solutions will find the information in this Guide to be informative, but not necessary to making the *Blackboard Academic Suite* continuously available to users.

This guide will cover:

- Prerequisites for establishing a continuously available installation of *Blackboard Academic Suite*
- Installation of *Blackboard Learning System*, other licensed products, and supplemental components
- Maintenance and fine tuning of *Blackboard Learning System*
- *Blackboard Learning System* architecture and file structure
- Installation and configuration of Virtual Installations
- Utilities for administering the system

Note: This manual focuses almost entirely on the *Blackboard Learning System*. The *Blackboard Portal System* only requires additional licensing, not a separate installation process. The *Blackboard Portal System* may be installed at the same time as the *Blackboard Learning System* or the license can be obtained later. If a *Blackboard Portal System* license is obtained after installing the *Blackboard Learning System*, a simple [command line tool](#) will activate the *Blackboard Portal System*.

Manual Conventions

To make this manual easier to use a number of conventions appear throughout. These conventions are detailed in the table below.

| Symbol | Description |
|---------------------------|---|
| Bold type | A button or field name. |
| <code>Courier font</code> | Code samples, file names, and commands. |
| Steps | Tasks users should perform. |
| <i>Italics</i> | Italicized text is used for titles as well as to identify some variables. |

Note: Examples in this manual use `/usr/local/blackboard` as the *Blackboard Learning System* home directory.

Introduction to the **Blackboard Academic Suite**

Overview

The *Blackboard Academic Suite* is a robust platform for education that is licensed with several different options. The available products include:

- *Blackboard Learning System*: Includes the course management system and advanced integration and data management tools.
 - *Blackboard Learning System – Basic Edition*: Includes a course management system.
 - *Blackboard Portal System*: Includes a customizable portal.
-

Who uses the **Blackboard Academic Suite**?

Many different types of institutions use the *Blackboard Academic Suite*, including:

- Elementary and secondary schools
- Universities and colleges
- Vocational schools
- Corporations

Each institution customizes the content and appearance of the *Blackboard Academic Suite* to meet its goals.

Why do institutions choose *Blackboard Academic Suite*?

Institutions that use the *Blackboard Academic Suite* have access to the course management, integration, and portal features that are part of the platform. The features of the *Blackboard Academic Suite* can also be expanded using Blackboard System Extensions. Blackboard System Extensions allow institutions to install custom tools and features that they build themselves or that are built by vendors other than Blackboard.

In addition to the almost limitless number of tools and features available for the *Blackboard Academic Suite*, institutions can customize and brand the *Blackboard Academic Suite* according to the needs of specific groups of users. Also, multiple instances of Blackboard can be set up as Virtual Installations to address disparate units at the institution.

Blackboard Learning System – ML

The Blackboard Learning System is available in several different languages as *Blackboard Learning System – ML*. Please note that this is a separate product from the *Blackboard Learning System*. Language packs used to localize *Blackboard Learning System – ML* will not work with the *Blackboard Learning System*.

About Blackboard Inc.

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

Chapter 1—Before Installing the *Blackboard Learning System*

Overview

This chapter presents some topics that must be addressed before installing the *Blackboard Learning System* to ensure a successful installation and rollout. It includes information on technical and personnel considerations as well as some items to consider in the planning and preparation process.

In this chapter

Chapter 1—Before Installing the *Blackboard Learning System* includes the following topics.

| Topic | Description |
|--|---|
| Technical Requirements | This topic covers the technical requirements for installing the <i>Blackboard Learning System</i> . |
| Preferred Technical Skills | This topic offers suggestions on the skills needed to successfully install and maintain the <i>Blackboard Learning System</i> . |
| Planning and Preparation | This topic offers some issues to consider during the planning for the installation and rollout of the <i>Blackboard Learning System</i> . |
| Hardware Configurations | This topic covers the most common hardware configurations used with the <i>Blackboard Learning System</i> . |
| Install Small-Scale Oracle | This topic covers how to install the Small-Scale Oracle database provided with <i>Blackboard Learning System – Basic Edition</i> . |
| Configure Oracle | This topic offers some initial tips for configuring a full version of Oracle® for use with the <i>Blackboard Learning System</i> . |
| Create a UNIX User for the <i>Blackboard Learning System</i> | This topic covers the requirement for a UNIX user. |

Technical Requirements

Overview

The hardware and software requirements for the *Blackboard Learning System* are published as the *Blackboard Learning System* (Release 6) Minimum Hardware and Software Requirements. This chart is available on the Behind the Blackboard extranet.

To access Behind the Blackboard, login at <http://www.blackboard.com/products/services/support.htm>. After logging in, navigate to the Reference Center to view *Blackboard Learning System* documentation.

In addition to those requirements there are also a couple of software applications, available for free, that are required.

Java™ 2 Software Developer's Kit, Standard Edition

Note: For more information on Java technologies used with the *Blackboard Learning System*, please see Knowledge Base article **181-856**. This article also includes instructions for updating the Java 2 SDK.

The *Blackboard Learning System* (Release 6) requires the Java 2 SDK. The Java 2 SDK must be installed on the Web/application server. The *Blackboard Learning System* has been updated to work with the latest version of Java 2 SDK.

Release 6.1 of the Blackboard Learning System should be installed and run using Java™ 2 SDK, Standard Edition, v. 1.4.2.

Download and apply the latest version from <http://java.sun.com/j2se/1.4.2/>

Java 2 SDK must be installed on the application server and the path must be accessible by the *Blackboard Learning System*.

Sun updates the Java 2 SDK frequently. If the links above do not show the required version, then look in the archives section of the site for the correct version: <http://java.sun.com/products/archive/>.

GNUTar

With the Solaris® operating system, *Blackboard Learning System* requires GNUtar. Do not use the Tar that is supplied with Solaris. Red Hat Linux users may use the GNUtar supplied with the operating system.

Red Hat Linux 7.2 and Oracle 8.1.7

Oracle 8.1.7 requires glibc 2.1.3 to install correctly. RedHat® 7.2 ships with glibc 2.2. There are a few extra steps that must be completed prior to installing Oracle 8.1.7 successfully on Redhat 7.2.

Note: These steps are required when installing a full version of Oracle8i or when installing the Small-Scale Oracle included with *Blackboard Learning System – Basic Edition*.

- Step 1** Make sure to set environment variable
LD_ASSUME_KERNEL=2.2.5 before running
runInstaller for oracle.
- Step 2** Install the following compat libraries.
compat-egcs-6.2-1.1.2.14.i386.rpm
compat-glibc-6.2-2.1.3.2.i386.rpm
compat-libs-6.2-3.i386.rpm
compat-libstdc++6.2.2.9.0.16.i386.rpm
- Step 3** Then run:
./usr/i386-glibc21-linux/bin/i386-glibc21-
linux-env.sh

These libraries are available for free from several Web sites. The compat-libstdc++6.2.2.9.0.16.i386.rpm is also available on the Red Hat 7.2 installation disks.

Red Hat Linux Advanced Server 2.1 and Oracle 9i

To ensure that Oracle 9i will install correctly, please note the following:

- During the initial installation of Red Hat Linux Advanced Server, be sure to include the Developer's Tools.
- Verify that the following libraries are installed. If not, download the libraries and install. These libraries are available for free from a several Web sites.

```

cpp-2.96-108.1.i386.rpm(D1)
glibc-devel-2.2.4-26.i386.rpm (D2)
kernel-headers-2.4.9-e.3.i386.rpm(D1)
gcc-2.96-108.1.i386.rpm(D2)
binutils-2.11.90.0.8-12.i386.rpm(D2)

```

- Verify that a GUI is installed. This is necessary to run the Oracle installer.
- Ensure the temp directory has more than 400 MB of free space.
- Setup the following groups and users.

```
groupadd dba
groupadd oinstall
useradd -g oinstall -G dba oracle
passwd oracle
```

- Allocate the necessary Swap space.

```
dd if=/dev/zero of=tmpswap bs=1k count=900000
chmod 600 tmpswap
mkswap tmpswap
swapon tmpswap
```

- Configure shared memory.

```
echo `expr 1024 \* 1024 \* 1024` > /proc/sys/kernel/shmmax
cat /proc/sys/kernel/shmmax
```

- Setup the Oracle directories.

```
mkdir /usr/local/oracle
mkdir /usr/local/oracle/product\
mkdir /usr/local/oracle/product/9.2.0
chown -R oracle.oinstall /usr/local/oracle
mkdir /var/usr/local/oracle
chown oracle.dba /var/usr/local/oracle
chmod 755 /var/usr/local/oracle
```

- Setup the Oracle Environment

```
export ORACLE_BASE=/usr/local/oracle
export
ORACLE_HOME=/usr/local/oracle/product/9.2.0
export ORACLE_SID=test
export ORACLE_TERM=xterm
export NLS_LANG=AMERICAN;export
ORA_NLS33=$ORACLE_HOME/ocommon/nls/admin/data
LD_LIBRARY_PATH=$ORACLE_HOME/lib:/lib:/usr/lib
LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/usr/local/lib
export LD_LIBRARY_PATH
# Set shell search paths
export PATH=$PATH:$ORACLE_HOME/bin
# CLASSPATH:
CLASSPATH=$ORACLE_HOME/JRE:$ORACLE_HOME/jlib:$O
RACLE_HOME/rdbms/jlib
CLASSPATH=$CLASSPATH:$ORACLE_HOME/network/jlib
```

After completing this list, run the Oracle installer from the CD-ROM.

Preferred Technical Skills

Overview

Installing and supporting a *Blackboard Learning System* installation hosted at the institution requires some specific technical skills. It is important that human resources that understand the installation and support of enterprise software are available to install and maintain the *Blackboard Learning System*.

Before attempting to install *Blackboard Learning System*, please ensure that the appropriate skill sets are available to support the installation and maintenance of *Blackboard Learning System*.

Database Skills

The following database skills are recommended for installing and maintaining the *Blackboard Learning System*.

- Experience with Oracle databases
 - Accessing database and running SQL scripts
 - Online and offline database backup and restore
 - Adding database files to an existing database to increase its size
 - Monitor and reconfigure database parameters to meet growing demand
 - Tune the performance of the host machine and the database server
-

Network Skills

The following networking skills are recommended for installing and maintaining the *Blackboard Learning System*.

- Troubleshooting network bottlenecks
 - Experience with threading
 - Knowledge of authentication and experience with institutional authentication methods (LDAP, Active Directory®, or similar method)
 - Experience supporting 24/7 network environments with failover contingencies
 - Experience configuring load-balanced solutions
-

Operating System and Web/app server skills

The following operating system and Web/app server skills are recommended for installing and maintaining the *Blackboard Learning System*.

- Experience managing Apache® Web server
 - Experience with the operating system including file management and permissions
 - Experience in optimization and monitoring techniques
 - Comfortable with using a text editor to make changes to configuration files
 - Experience installing software
 - Knowledge of starting and stopping applications on the server to avoid damaging or corrupting the workstation or database
 - Knowledge of creating scheduled jobs to automate system processes such as backup and log file management
 - Install and troubleshoot operating systems
 - Understand how Web servers work and be comfortable starting and stopping the various servers and system processes
 - Knowledge of how to add hardware to the server
 - Perform tape backups and tape archive programs and understand how to use these backup tools to move files around the system and between machines.
 - Experience running a mission-critical application
 - Experience managing multiple points of integration
-

Developer skills

The following skills are recommended to create System Extensions or to use the Event-Driven API.

- Familiar with compiling software
- Relational database experience
- Java developer experience comparable to a mid- or senior-level programmer
- Experience programming Java Server pages
- Experience with JDBC 2.0
- Experience with Java 2
- Connection pooling
- Creating and testing JSPs
- Object-oriented programming
-

For assistance with integration, please contact Blackboard Technical Solutions. System Extension developers can find more information in the Blackboard Developer's Center through the Behind the Blackboard extranet service (<http://www.blackboard.com/dev/index.htm>).

Planning and Preparation

Overview

This topic covers some issues that may need to be addressed while planning and preparing for the *Blackboard Learning System*. Each school or institution that uses the *Blackboard Learning System* is unique and will require specific and detailed planning to implement the *Blackboard Learning System*. The information in this topic should not be used as a comprehensive guide but rather as a set of items that should be considered and adapted to each institution.

Develop a learning model

Before installing the *Blackboard Learning System* or making it available to users it is important to define how it will be used at the institution. Having a sound plan for how the *Blackboard Learning System* will be used helps ensure that configuration and security decisions are aligned with the goals of the institution. Some items to consider:

- Define a naming convention for courses and users on the system.
- Determine what information and areas of the system are accessible to each set of users (Instructors, Students, Guests, and so forth).
- Identify the other information systems will interact with the *Blackboard Learning System*. Define which system owns the data.
- Build a team to manage the system, support users, and develop tools and content.

These are just a few examples of the decisions that go into developing a learning model. Each institution will have a unique approach appropriate for its users.

Create a test environment

Creating a test environment is a critical step in the process. A test environment allows system and database administrators to tune the software for maximum performance based on the needs of the institution. Developers use the test environment to build System Extensions prior to rollout as well as developing tools for integrating with other information systems at the institution.

Finally, a test environment helps resolve potential issues with hardware or software before rolling out the *Blackboard Learning System* to users.

Establish a support infrastructure

Having qualified, trained staff to support users is important to operating smoothly with little interruptions to users. Define what level of support is required and when it should be available to users. Some institutions may require 24/7 support while others can operate with less. After training staff and defining support availability and expectations be sure to communicate this information to users.

Run a pilot program

After the software is installed, configured, and tested and the support staff is trained it is a good idea to launch a pilot program. A pilot program lets a few users on the system to work with the software in the context of the learning model. This is a good time to spot roadblocks or issues that may impact users when the software is rolled out. Also, the pilot program participants (especially the Instructors) can take a leadership role among their peers when the software is rolled out. These users can train other users on the software and help them successfully adopt the learning model.

Rollout

When the *Blackboard Learning System* is ready for users it is important to communicate key information to users. Make sure the user base has access to training sessions, support, and other resources to help them begin using the system.

Basic Hardware Configurations

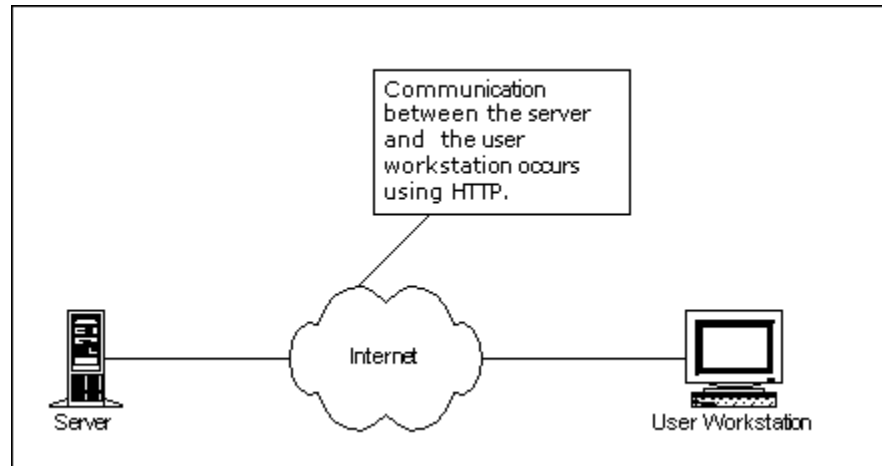
Overview

Most *Blackboard Learning System* installations are run on a one server or two-server configuration. Each of these hardware configurations is described in more detail in this topic. For more information on the separate application components please see [Chapter 3—Blackboard Learning System Application Architecture](#).

One server

When running the *Blackboard Learning System* on one server all components are run on the same machine. This is a good solution for small institutions that do not have a heavy load or content-rich courses.

A one-server configuration is a very simple design as shown in the diagram below.

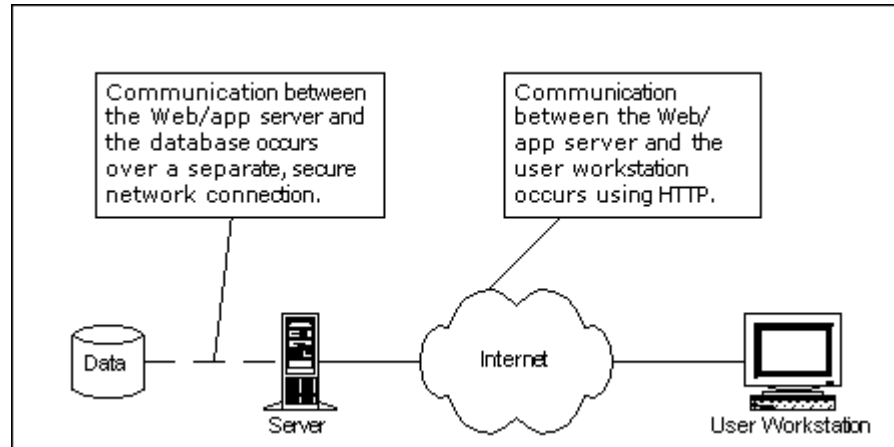


Note: *Blackboard Learning System – Basic Edition* can only be run on one server.

Two servers

One server acts as the Web/app server and the other server is a dedicated database server in a two-server configuration. Communication between the database server and the Web/app server should be done through a private network connection. This is a good solution for medium or large institutions that anticipate heavy load and content-rich courses.

A typical two-server hardware configuration is shown in the diagram below.



Advanced configurations

The *Blackboard Learning System* can be scaled both up and out to handle additional load. Scaling up is simply adding additional processors, memory, and disk space to existing servers. The *Blackboard Learning System* can also be scaled out with multiple Web/app servers. For detailed information on setting up a configuration with multiple Web/app servers please see [Chapter 7—Scaling with Multiple Web/app servers](#).

Blackboard now supports RAC with Oracle 9i. Please consult Oracle for information on configuring RAC. Once configured, the *Blackboard Learning System* on an Oracle 9i cluster.

Install Small-Scale Oracle

Overview

Blackboard Learning System – Basic Edition includes a version of Oracle designed to support the *Blackboard Learning System*. This version of Oracle is smaller than a full license and can only be used to support *Blackboard Learning System* – Basic Edition.

Note: These instructions are only intended for use with the Small-Scale Oracle provided by Blackboard. Use the instructions provided with the database management system for any other version of Oracle.

Set system parameters prior to installation (Solaris Only)

Solaris only:

Note: Red Hat Linux users should not change these parameters prior to installing Small-Scale Oracle!

Before installing Small-Scale Oracle, parameters in the `/etc/system` file must be set as shown below.

```
set shmsys:shminfo_shmmax=294967295
set shmsys:shminfo_shmmin=1
set shmsys:shminfo_shmmni=100
set shmsys:shminfo_shmseg=10
*
*max number of semaphore identifiers:
set semsys:seminfo_semmni=50
*
*max number of semaphores per identifier:
*semmsl=largest number of processes of all instances < 512
set semsys:seminfo_semmsl=200
*
*max number of semaphores: semmns=semmni*semmsl
*semmns>=sum of all processes of all instances
*semmns>=semmni*semmsl
set semsys:seminfo_semmns=10000
set semsys:seminfo_semopm=100
set semsys:seminfo_sevmx=32767
```

Installation

Follow the steps below to install the Small-Scale Oracle database software provided with the *Blackboard Learning System – Basic Edition*.

Note: These instructions assume that the path to the directory for Small-Scale Oracle is `/usr/local/oracle`. Do not install Small-Scale Oracle to `/usr/local/blackboard`!

Step 1 Verify that the server meets the hardware/software requirements for the Blackboard Learning System – Basic Edition. Be sure that the correct version of GNUTar is installed.

Step 2 Download the Small-Scale Oracle package or locate it on the *Blackboard Learning System* CD. The name of the package depends on the operating system.

Linux:

```
small_scale_oracle_linux.bin
```

Solaris:

```
small_scale_oracle_solaris.bin
```

Step 3 Create the `/usr/local/oracle` directory.

```
mkdir /usr/local/oracle
```

Step 4 Create an `$ORACLE_HOME` environment variable.

```
export ORACLE_HOME=/usr/local/oracle
```

Step 5 Create a dba group.

```
groupadd dba
```

Step 6 Create a dba user.

```
useradd -g dba -c "Oracle Software Owner" -d $ORACLE_HOME  
-m oracle
```

Step 7 Assign privileges to the `$ORACLE_HOME` directory for the dba user.

```
chown -R oracle:dba $ORACLE_HOME
```

Step 8 Move the installation package to the \$ORACLE_HOME directory. (The example below uses the appropriate package for Solaris. Modify the command for Linux accordingly.)

```
mv
/usr/local/oracle/small_scale_oracle_solaris.b
in $ORACLE_HOME
```

Step 9 Change directories to the \$ORACLE_HOME directory.

```
cd $ORACLE_HOME
```

Step 10 Make the .bin executable.

```
chmod +x small_scale_oracle_solaris.bin
```

Step 11 Run the installer.

```
./small_scale_oracle_solaris.bin
```

Note: When installing Small-Scale Oracle, do not use @ in any Oracle database user passwords. To be sure that Oracle database user passwords do not violate Oracle rules for passwords, use only letters, numbers, and the underscore. It is permissible to use @ in passwords for *Blackboard Learning System* user accounts.

Uninstall Small-Scale Oracle

Follow these steps to uninstall the Small-Scale Oracle provided with the *Blackboard Learning System – Basic Edition*.

Step 1 Login as root.

Step 2 Change to the following directory.

```
$ORACLE_HOME/admin/scripts
```

Step 3 Run the following command.

```
./uninstall_oracle_server.sh
```

Step 4 Change to the following directory.

```
/usr/local/oracle/ORACLE_HOME/uninstallSmallScaleOracle
```

Step 5 Run the following command.

```
java -cp uninstall_small_scale_oracle.jar run -console
```

Configure Oracle

Overview

The installer for *Blackboard Learning System* does not install Oracle. *Blackboard Learning System* – Basic Edition users should use the instructions in [Install Small-Scale Oracle](#) to install the database software prior to installing the *Blackboard Learning System*. Other users should follow the instructions from Oracle for installing the full version of Oracle.

After installing the full version of Oracle the database then requires some configuration before installing the *Blackboard Learning System*.

Note:

The Small-Scale Oracle installer configures these parameters. Small-Scale Oracle users can ignore the configuration setting instructions in this topic.

Prerequisites for Oracle

Before configuring Oracle:

- Oracle8 database software must be installed with Net8 and SQL*Plus.
 - An Oracle8 database must have been created. Blackboard recommends creating the database with 8K blocks (db_block_size = 8192).
 - The person configuring Oracle must know an Oracle DBA user ID and password.
 - There must be 500 MB of disk space available for tablespace files.
 - The person configuring Oracle must be able to use an editor like vi to edit files.
 - When installing Oracle, set the character set to 'US7ASCII'. This character set is required.
-

Initialization values for Oracle 8i

These instructions assume that the path to ORACLE_HOME is
/usr/local/oracle/ORACLE_HOME.

Please set the following Oracle initialization values in your
/usr/local/oracle/ORACLE_HOME/dbs/init<SID>.ora file:

```
compatible = 8.1.6           # or higher
db_block_buffers = 12800    # for 8K db_block_size, 25600 for
4K
dml_locks = 131000
job_queue_processes = 2    # MUST BE SET
log_buffer = 1048576
open_cursors = 200         # MUST BE SET
optimizer_mode = first_rows
optimizer_index_caching = 50
optimizer_index_cost_adj = 50
processes = 500
query_rewrite_enabled = TRUE
shared_pool_size = 67108864
sort_area_size = 1048576
sql92_security = TRUE
timed_statistics = TRUE
```

Initialization values for Oracle 9i

These instructions assume that the path to ORACLE_HOME is
/usr/local/oracle/ORACLE_HOME.

Please set the following Oracle initialization values in your
/usr/local/oracle/ORACLE_HOME/dbs/spfile<SID>.ora file:

Note: This is an example, settings such as domain name should be personalized to your institution.

```
background_dump_dest='/usr/local/oracle/admin/test/bdump'
compatible='9.2.0.0.0'
control_files='/usr/local/oracle/oradata/test/control01.ctl','/opt/oracle
/oradata/test/control02.ctl','/opt/oracle/oradata/test/control03.ctl'
core_dump_dest='/usr/local/oracle/admin/test/cdump'
db_block_size=8192
db_cache_size=33554432
db_domain='yourinstitution.com'
db_file_multiblock_read_count=16
db_name='test'
dispatchers='(PROTOCOL=TCP) (SERVICE=testXDB)'
fast_start_mttr_target=300
hash_join_enabled=TRUE
instance_name='test'
```

```
java_pool_size=83886080
job_queue_processes=10
large_pool_size=16777216
open_cursors=300
pga_aggregate_target=25165824
processes=150
query_rewrite_enabled='FALSE'
remote_login_passwordfile='EXCLUSIVE'
shared_pool_size=83886080
sort_area_size=524288
star_transformation_enabled='FALSE'
timed_statistics=TRUE
undo_management='AUTO'
undo_retention=10800
undo_tablespace='UNDOTBS1'
user_dump_dest='/usr/local/oracle/admin/test/udump'
```

Multi-threaded server

Blackboard has been developed and tested using the Oracle Dedicated Server configuration. Blackboard installations should not use the Oracle Multi-Thread Server (MTS) configuration, as it will cause errors under routine circumstances.

To deactivate MTS, comment out all parameters that start with MTS in the initialization file, found under ORACLE_HOME/dbs:

```
#mts_dispatchers = "(PROTOCOL=TCPS)
(PRE=oracle.aurora.server.SgiopServer)"
#mts_dispatchers = "(protocol=TCP) (DISP=1) (mul=OFF)
(pool=OFF)"
#mts_max_dispatchers = 5
#mts_servers = 1
#mts_max_servers = 20
```

Stop and re-start the database server to effect the change.

Helpful notes

- The Oracle database must be up and running along with the Net8 listener before any Blackboard installation can occur.
- There must be an `/usr/local/oracle/ORACLE_HOME/network/admin/tnsnames.ora` entry for the database that is being installed. This entry might look like the following for the database BB60 on the server myunivsrvr:

```
BB60 =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP)(Host = myunivsrvr)(Port
= 1521))
    (CONNECT_DATA = (SID = BB60))
  )
```

"Host = myunivsrvr" could also be "Host = <ip_address>".

- The Oracle database's SID_DESC must be listed in the `/usr/local/oracle/ORACLE_HOME/network/admin/listener.ora` file. For example:

```
SID_LIST_LISTENER =
(SID_LIST =
  (SID_DESC =
    (SID_NAME = PLSExtProc)
    (ORACLE_HOME = /usr/local/oracle/product/8.1.7)
    (PROGRAM = extproc)
  )
  (SID_DESC =
    (ORACLE_HOME = /usr/local/oracle/product/8.1.7)
    (SID_NAME = BB60)
  )
)
```

- Oracle's SQL*Plus must have been installed and accessible from the Solaris prompt as:

```
sqlplus system/<pw>@<SID_DESC> # SID_DESC is in
listener.ora
```

Create a UNIX User for the *Blackboard Learning System*

Overview

The *Blackboard Learning System* Installer requires a user with permissions on the directory where the *Blackboard Learning System* will be installed.

Create a UNIX User

The UNIX user must be created prior to installation with the following parameters.

- The user name must be `bbuser`.
 - `bbuser` must have full permissions on the directory where the *Blackboard Learning System* will be installed.
-

Chapter 2—Installation on One or Two Servers

Overview

The most common *Blackboard Learning System* installations run on one server or two servers. With a two server installation, the database is maintained on a separate server to better handle the load.

For information on installing the *Blackboard Learning System* on a multiple Web/app server, load-balanced configuration please see [Chapter 7—Scale with Multiple Web/app Servers](#).

In this chapter

Chapter 2—Installation on One or Two Servers includes the following topics.

| Topic | Description |
|--|---|
| Installation Process | This topic provides an overview of the installation. |
| Installation Checklist | This topic is a checklist of items that must be completed before beginning the installation. |
| Installation Worksheet | This topic is a worksheet that includes all the information required by the installer. |
| Step by Step Instructions | This topic goes through the installation step-by-step. |
| Installation Troubleshooting Tips | This topic covers some of the most common problems that may occur during the installation and provides solutions. |
| Uninstall the Blackboard Learning System | This topic covers how to uninstall the <i>Blackboard Learning System</i> . |

Installation Process

Overview

The most important part of the *Blackboard Learning System* installation process is the preparation. A properly configured and supported environment to host the *Blackboard Learning System* will help prevent future problems.

The *Blackboard Learning System* installer must be run on the Web/app server. Unlike previous versions of *Blackboard Learning System*, there is not a separate installation process for the database component or for the advanced integration tools. If installing *Blackboard Learning System* on two servers, simply run the installer once on the Web/app server to install the application, database, and advanced integration tools.

Process

The *Blackboard Learning System* installation process occurs in the following order:

- Step 1** Review the [Installation Checklist](#). Do not proceed until all items in the list are checked.
- Step 2** Complete the [Installation Worksheet](#). This worksheet includes space to record all the information that the *Blackboard Learning System* installer will require.
- Step 3** Follow the [Step-by-Step Instructions](#) to run the software installer.
- Step 4** Verify *Blackboard Learning System* installed correctly by logging in.
- Step 5** If *Blackboard Learning System* did not install correctly, troubleshoot the problem. Uninstall *Blackboard Learning System* and repeat the installation process if necessary.

Optional steps:

- Step 6** Install and configure any additional Virtual Installations.
- Step 7** Migrate data from a previous version of *Blackboard Learning System*.

Step 8 Integrate *Blackboard Learning System* with other information systems at the institution.

Note: For more information on migrating data from an earlier version of the software please see the *Blackboard Learning System Migration Manual*. For more information on integrating with other information systems please see the *Blackboard Learning System Advanced Integration and Data Management Manual*.

Installation Checklist

Overview

The installation checklist below and the installation worksheet that follows should be completed before installing *Blackboard Learning System*. Completing both the checklist and the worksheet prior to installation will help ensure a successful installation. Please note that if *Blackboard Learning System* will only be installed on one server, the machine must pass the checklist for both the Web/app server and the database server.

Blackboard basics

Review the following list to make sure that Blackboard has provided everything necessary to begin installation.

- A valid *Blackboard Learning System* license file is accessible from the Web/app server. The file must be accessible locally, not through the network.
 - The *Blackboard Learning System* installation package is available either on CD-ROM or from the Blackboard Download site.
 - The Administrator has contact information for Blackboard Technical Support and a login for the Behind the Blackboard extranet at <http://www.blackboard.com/products/services/support>.
 - The *Blackboard Learning System Operations Workbook* has been downloaded and begun. Download the Operations Workbook from the Reference Center section of Behind the Blackboard.
-

Web/app server checklist

Review the following list to make sure that the Web/app server is prepared for installation.

- The machine is connected to the network and powered on.
- The machine meets the minimum hardware requirements.

- ❑ A supported operating system is installed on the machine.
- ❑ The supported version of Java 2 SDK is installed on the machine.
- ❑ The machine is dedicated to *Blackboard Learning System* and has no unnecessary software installed.
- ❑ A bbuser account has been created.
- ❑ The Administrator has a plan for managing log files.
- ❑ The Administrator has a plan for backing up the application file system.
- ❑ The Domain Name Server (DNS) Server is set to correctly resolve the server name. Note that the server name should not contain underscore characters. Microsoft Internet Explorer 6 blocks cookies from machines with an underscore in the name as a security measure.
- ❑ The Oracle Client libraries are installed on the Web/app Server (if the database is running on a separate server).
- ❑ Oracle is defined in the path of the Web/application server.
- ❑ The bash shell is in use.
- ❑ Any firewalls are configured to allow access to the *Blackboard Learning System* ports. These ports are defined when the installer is run. It is not possible to use a firewall to redirect to a different port. The *Blackboard Learning System* must be available to users on the ports specified during the installation and not served through an alternate port. For more information on the ports used by the *Blackboard Learning System*, see the next topic, [Installation Worksheet](#).

- ❑ The server clock is synchronized with the other server or servers used in the *Blackboard Learning System* configuration. If the server clocks are not synchronized there may be differences between the displayed availability of time-sensitive content and the actual availability of time-sensitive content.
-

Database server checklist

Review the following to make sure that the database server is prepared for installation.

- ❑ The machine is connected to the network and powered on.
 - ❑ The machine meets the minimum hardware requirements.
 - ❑ A supported operating system is installed on the machine.
 - ❑ A supported version of Oracle is installed on the machine. (*Blackboard Learning System – Basic Edition* users should install the included Small-Scale Oracle. *Blackboard Learning System* and *Blackboard Learning and Community Portal Systems* users should install a supported, full version of Oracle obtained separately.)
 - ❑ The machine is dedicated to *Blackboard Learning System* and has no unnecessary software installed.
 - ❑ Oracle Listener and the Oracle database are running.
 - ❑ The database administrator has a plan for backing up the database and managing database log files.
 - ❑ The bash shell is in use.
-

Installation Worksheet for UNIX

Overview

The installation worksheet identifies all the information required by the *Blackboard Learning System* installer. Filling out the worksheet prior to installation will help the installation process run smoothly.

Using special characters

The following special characters should never be used in an attribute such as a User Name, password, database user, Course ID, and so forth.

%&# <> = +

These characters are only safe to use when adding content into a text box, such as adding the description for a course.

When creating attributes a good rule to follow is to only use alphanumeric characters, underscores, dots, and dashes (do not use spaces!).

Information required prior to running installer

The installer requires the following information.

License File:

The path to the *Blackboard Learning System* License File. If a *Blackboard Learning System* License File is not available, please contact Blackboard to request one. The license file determines which products and features are installed.

Note: The installation will fail if the license file is accessed through a network path. Make sure the license file is on the Web/app server before beginning the installation.

Setup Type: choose from one of the following options:

- New Install. Database on same server.** Select this option if installing *Blackboard Learning System*-Basic Edition or if installing another license on only one server. This Setup Type is appropriate only when the application and database will run on one server.

- New Install. Database on remote server.** Select this option if installing *Blackboard Learning System* or *Blackboard Learning and Community Portal System* on more than one server. This Setup Type is appropriate when the application and the database will be hosted on separate servers.
- Add application server to existing system.** Select this option if scaling *Blackboard Learning System* by adding an additional application server.

Administrator Name: _____

The name of the Administrator.

Administrator Email: _____

The email address of the Administrator.

Company: _____

The institution that will be using *Blackboard Learning System*.

State: _____

The state, province, or territory where the institution is located.

ZIP Code: _____

The ZIP Code where the institution is located.

Institution Type: choose from one of the following options

- K-12
- Higher Education
- Continuing Education
- Corporate
- Professional Association
- Hobby

Application Directory: _____

The path to a directory on the application server where the *Blackboard Learning System* will reside. Note that the installer will create a directory called blackboard within this directory.

JDK Directory: _____

The path to the Java 2 SDK directory. The Java 2 SDK must be installed on the application server.

Web server Machine Name: _____

The name of the Web server.

Web server Domain Name: _____

The name of the domain where the Web server resides.

Note: The Web server Machine Name and the Web/app server Domain Name form the URL for Blackboard (<http://webservermachinename.domain>). Because these names form the URL do not use any characters other than standard letters and numbers (even underscores and spaces will cause problems) in the Web/app server name or the domain name.

Web server Port Number: _____

The port that the Web server will use for http connections with clients. The default value is 80.

Application Server Port Number: _____

The port that the application engine uses. The default value is 8007.

Mod Perl Port Number: _____

A port used by mod_perl for internal communication. The default value is 8008.

Collaboration Server HTTP Port: _____ The default port is 8011.

Collaboration Server TCP/IP Port: _____ The default port is 8010.

HTTP and TCP/IP port information is required for Collaboration Server to communicate with the applet running in the Web browser. TCP/IP performs better and is the preferred method to communicate, however, HTTP will be used if TCP/IP communication is not available; so both ports must be set.

Database Machine Name: _____

The machine name where the Oracle database that *Blackboard Learning System* will use is installed.

Database Domain Name: _____

The domain name where the database server resides.

Oracle SID: _____

The SID where the *Blackboard Learning System* databases will reside.

Oracle (sys) System Database Administrator Password:

The Oracle Database Administrator password.

Blackboard Database User Password:

A password for an Oracle user that *Blackboard Learning System* creates at install. This account is also used by the application to access the database.

Blackboard Database Report User

Password: _____

This is the password for the Database Report User. This is an Oracle user that the *Blackboard Learning System* uses.

Database Data Directory: _____

The directory that will store the *Blackboard Learning System* database data files. This directory will not store application data or content. This directory must be on the database server in a directory where Oracle has read/write/execute privileges. Make sure that the directory has space to accommodate database growth.

Database Indexes Directory: _____

The directory that will store the *Blackboard Learning System* database index files. This directory must be on the database server in a directory where Oracle has read/write/execute privileges. If possible, this directory should be separate from the data directory.

Sendmail Location: _____

The directory where sendmail is located. Sendmail is used to send email from within the *Blackboard Learning System*. To find Sendmail, use the UNIX `find` command or the GNU `locate` command and search for a file named sendmail. Enter the directory where this file is found when prompted by the installer.

Note: For notifications, such as results of a Course Copy or a lost Password, the *Blackboard Learning System* must be able to communicate with an SMTP server. After installation, update the `/usr/local/blackboard/config/bb-config.properties` file. Locate the `bbconfig.smtpserver.hostname` property and add the name of the SMTP server.

Administrator Password: _____

The Administrator account has full Administrator privileges. This account and the `root_admin` account are the only two accounts that can login until more users are created.

Root Administrator Password: _____

The `root_admin` account has full administrative privileges including the management of Virtual Installations through the System Control Panel. When the `root_admin` account views the System Control Panel the Manage Virtual Installations link appears at the top of the panel. The `root_admin` can login to any Virtual Installation and access the Virtual Installation management features from this link.

Note: The `root_admin` account is created even if your license does not include the use of additional Virtual Installations. The `root_admin` account can be modified from the [Edit Root Administrator Profile page](#).

Integration User Password: _____

The integration user is used only to facilitate *Blackboard Learning System* Snapshot operations. This account cannot be used to login through the GUI nor does it appear in any lists of users in the user interface. To change the password for this account, use the Integration Password feature available on the System Control Panel.

For more information on how the integration account is used during Snapshot processes, please see the *Blackboard Learning System Advanced Integration and Data Management Manual*.

Step by Step Instructions

Overview

The instructions below detail each step needed to successfully run the *Blackboard Learning System* installer for a one-server or two-server configuration. For information on scaling *Blackboard Learning System* out by adding Web/app servers, please see [Chapter 7—Scale with Multiple Web/App Servers](#).

Install *Blackboard Learning System*

Step 1 Complete the pre-installation checklist and the pre-installation worksheet prior to running the *Blackboard Learning System* installer.

Note: *Blackboard Learning System* users **should not** install the Small-Scale Oracle included with the *Blackboard Learning System*. Small-Scale Oracle is designed to work only with the *Blackboard Learning System* – Basic Edition.

Step 2 Download the *Blackboard Learning System* installer from the Blackboard download site onto the Web/app server, or insert the *Blackboard Learning System* CD into a CD-ROM drive on the Web/app server and locate the *Blackboard Learning System* installer.

Step 3 Login as Root. Make sure that the bash shell is in use.

Step 4 If you have not already done so, create the user 'bbuser' with the `useradd` command.

Step 5 GNUTar and GNUZip the installer package into the directory where *Blackboard Learning System* will be installed. Note that the installer will not run properly from the / directory.

Step 6 Change directories to the directory that holds the installation package.

Step 7 Make the package executable with the following command.

Solaris:

```
chmod +x blackboard6_solaris.bin
```

Linux:

```
chmod +x blackboard6_linux.bin
```

Step 8 Run the following command:

Solaris:

```
./blackboard6_solaris.bin
```

Linux:

```
./blackboard6_linux.bin
```

Step 9 The installer will launch. Each section of the installer displays one or more variables. To edit a variable, type the number of the variable and then hit the ENTER key. At the prompt, define the variable and hit ENTER. The installer will display the variables again. After modifying variables so that they all display correctly, type 'c' and hit ENTER to continue to the next set of variables.

Before advancing, make sure that all variables have a value and that the values are correct.

Step 10 After the installer is finished, the *Blackboard Learning System* services are started automatically.

Note: For notifications, such as results of a Course Copy or a lost Password, the *Blackboard Learning System* must be able to communicate with an SMTP server. After installation, update the `/usr/local/blackboard/config/bb-config.properties` file. Locate the `bbconfig.smtpserver.hostname` property and add the name of the SMTP server.

Installation Troubleshooting

Overview

This topic offers some suggestions for where to go for help if the installation is not working properly.

Installation Checklist and Worksheet

Look through the Installation Checklist and Worksheet again and make sure that the system is fully prepared for the installation.

No Matching JVM was found

If the installer returns the message, "No Matching JVM was found," it means that it could not find java in the PATH. Run the command as follows to specifically define where the installer should look for java.

```
./blackboard6_linux.bin -is:javahome /usr/local/j2sdk1.4.2
```

Where `/usr/local/j2sdk1.4.2` is the path to java and `blackboard6_linux.bin` is the version of the installer to be run. For Solaris users, the name of the file will be `blackboard6_solaris.bin`.

Log file

The *Blackboard Learning System* installer creates the following log file:

`Bb6_install_log.txt`

This file is found in the directory from which the installer was launched.

If the installer fails, check the log file to help determine the problem. The log file includes a considerable amount of information about the installation process. Also, if the installer is run more than once the log file will contain a record of each attempt—make sure to focus on the latest attempt (each attempt is appended to the log file so the latest attempt is the last in the list).

Because of the amount of information in the log file it can be frustrating to locate the problem. Try searching for the following strings: `BUILD FAILED` or `Root Cause`. Look closely at the log file both above and below the search string (`BUILD FAILED` or `Root Cause`) for the reason the installation failed.

If the log file does not help diagnose the problem please keep a copy of the file in case you need to contact Blackboard Technical Support. Blackboard Technical Support may be able to use the log file to diagnose the problem.

Blackboard Support Site and Knowledge Base

The Blackboard Knowledge Base, accessible through the Blackboard Support Site, includes several articles that may address your problem. If a login for the Support Site is unavailable please contact a Blackboard Account Manager.

Contact Blackboard Technical Support

Please see Behind the Blackboard for information on contacting Blackboard Technical Support. The URL for Behind the Blackboard is:

<http://www.blackboard.com/products/services/support.htm>

Uninstall Blackboard Learning System

Overview

Blackboard Learning System includes an easy-to-use uninstall program. Before uninstalling *Blackboard Learning System*, be sure to remove any Virtual Installations installed on the system. For information on how to remove Virtual Installations, please see [Remove a Virtual Installation](#).

The *Blackboard Learning System* Uninstaller is installed in a separate directory (`_Blackboard6Uninstall`) at the same level as the `blackboard` directory. Inside the directory is `uninstallBb6.jar`, an executable that will launch the uninstaller.

Note: The uninstall log is written to the `/tmp` directory.

Before running the Uninstaller

It is important to close all *Blackboard Learning System* related sessions that are connected to the Oracle database. Follow these steps to disconnect related sessions:

Step 1 Stop all *Blackboard Learning System* services.

Step 2 Terminate database connections by shutting down and restarting Oracle Database Server

OR

Issue the following SQL command to find connected sessions:

```
SQL>select process from v$session where  
schemaname IN  
( 'BBADMIN' , 'BB_BB60' , 'BB_BB60_STATS' );
```

Issue the `kill -9` command for each session to disconnect.

Uninstall Blackboard Learning System

Follow the steps below to uninstall *Blackboard Learning System*.

- Step 1** Login as root.
- Step 2** Change directories to the *Blackboard Learning System* directory.
- Step 3** Change directories to the uninstall directory:
- ```
cd _blackboard6Uninstall
```
- Step 4** Run the following command:

```
java -cp uninstallBb6.jar run -console
```

Only include the `java -jar` at the beginning of the command if Java is not defined in the PATH.

---

## Chapter 3—Blackboard Learning System Application Architecture

### Overview

This chapter describes the *Blackboard Learning System* from the operating system and database perspective.

### In this chapter

Chapter 3—*Blackboard Learning System* Application Architecture includes the following topics.

| Topic                                                                                         | Description                                                                                                              |
|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <a href="#">File System</a>                                                                   | This topic covers the directory and file structure of the <i>Blackboard Learning System</i> .                            |
| <a href="#">Databases</a>                                                                     | This topic covers the databases and database users that are installed as part of the <i>Blackboard Learning System</i> . |
| <a href="#">Services</a>                                                                      | This topic covers the services that run as part of the application.                                                      |
| <a href="#">Performance Tuning</a>                                                            | This topic covers some basic information on tuning the application for best performance.                                 |
| <a href="#">Backup and Recovery</a>                                                           | This topic introduces system-wide backups and incremental course and organization data protection.                       |
| <a href="#">Command Line Tools</a>                                                            | This topic covers the utilities that are available from the command line.                                                |
| <a href="#">Blackboard Learning System and Blackboard Community Portal System Maintenance</a> | This topic covers updates to the Blackboard system.                                                                      |
| <a href="#">Operating System and Database Maintenance</a>                                     | This topic covers updates to the supported operating systems and databases.                                              |

## File System

---

### Overview

The *Blackboard Learning System* installs into a home directory that is always named "blackboard". This directory not only holds all the application files but it is also the location where content items and log files are stored.

Administrators should not have a reason to delete or modify any of the application files. Doing so may cause the system to fail. This topic reviews several of the more important areas of the file system.

---

### Command line tools

Most of the command line utilities are stored in `/usr/local/blackboard/tools/admin/`. The tools for batch archive/restore/export/import and batch copy are found in the `/usr/local/blackboard/apps/content-exchange/bin/`.

For more information on the command line tools please see [Command Line Tools](#) later in this chapter. For more information on the batch archive/restore/export/import and batch copy tools see the *Blackboard Academic Suite Administrator Manual*.

---

### Content storage

Content for each Virtual Installation is stored in the `/usr/local/blackboard/content/vi/`. Each Virtual Installation has a separate directory. Within each directory there are the following folders:

- **admin:** This directory stores images associated with System Reporting.
- **branding:** This directory stores the HTML that determines how the Gateway page is displayed. Information for modifying the Gateway page can be found in the *Blackboard Academic Suite Administrator Manual*.
- **courses:** This directory includes storage areas for each course and organization. Content items uploaded to the course or organization are stored here.
- **images:** This directory stores images used on the system.

- **modules:** This directory stores .jsp pages for portal modules.
  - **plugins:** This directory stores System Extensions.
  - **recyclebin:** This directory includes deleted course content. Content must be removed from this directory or it will be stored indefinitely.
  - **sessions:** This directory stores session-specific data for users.
  - **sponsors:** This directory stores sponsorship information and images.
- 

## Logs

All logs are stored in the `/usr/local/blackboard/logs` directory. Logs can be managed and viewed from the Logs link on the System Control Panel in the user interface. For more information on managing and viewing logs, please see the *Blackboard Academic Suite Administrator Manual*.

The verbosity of some logs can be adjusted to provide more or less information.

`/usr/local/blackboard/logs/modperl/error_log`

The verbosity of this log is controlled by the `bbconfig.perl.tracelevel` property in the `bb-config.properties` file. The default value, 0, logs only fatal events. The other options are 1, which logs simple warnings, and 3, which logs warnings with stack traces.

`/usr/local/blackboard/logs/bb-services-log.txt`

The verbosity of this log is controlled by the `blackboard.service.log.param.logdef.default.verbosity` property in the `service-config.properties` file. The default value, fatal, logs only fatal events. The valid options from less verbosity to more verbosity are: "fatal", "error", "warning", "information", "debug".

Adjusting the verbosity of a log file will require running `PushConfigUpdates` to take effect.

---



## Databases

---

### Overview

The *Blackboard Learning System* initially installs three databases and three database users. This topic reviews the databases and database users of the *Blackboard Learning System*.

Administrators should not add data directly to the database or modify data in the database directly. Doing so may create serious problems in the system.

**Note:** Even those institutions that are not licensed to use additional Virtual Installations are still, in effect, using one Virtual Installation. When *Blackboard Learning System* installs it creates the first Virtual Installation and then stores data in a Virtual Installation Database, known as bb\_bb60. For more information on Virtual Installations please see [Chapter 4—Virtual Installations](#).

It is possible to move the databases for a Virtual Installation (including bb\_bb60) to another server. For more information on moving the databases for a Virtual Installation please see [Moving Virtual Installation Databases](#).

---

### bb\_admin

This database manages information about the databases that support each Virtual Installation.

---

### bb\_bb60

This is the main database for the first Virtual Installation. It manages all the data needed by the Virtual Installation. Each Virtual Installation will have its own main database.

When creating a Virtual Installation it is important to give this database a name prefixed by "bb\_". When creating a Virtual Installation it is important to give this database a name prefixed by "bb\_". Do not use any special characters (%&#<>=+) or a dash(-) in the name.

---

**bb\_bb60\_stats**

This is the statistics database for the first Virtual Installation. It is useful for Administrators who wish to generate reports on usage, performance, and so forth. Tracking data is sent to this database daily. For more information on generating reports and managing the information in this database please see the Advanced System Reporting topic in the *Blackboard Academic Suite Administrator Manual*.

---

**Database users**

The following database users are created when the *Blackboard Learning System* is installed.

- bbadmin
- bb\_bb60
- bb\_bb60\_report
- bb\_bb60\_stats

Each additional Virtual Installation will have a database user and a stats and reports user. The bb\_bb60\_report user has limited access to view the bb\_bb60 database and can only see a subset of tables and columns.

Change the value in the `bb-config.properties` file and then run the `PushConfigUpdates` command to change the password of a database user. Remember that the password must also be changed within the database to match the new password or the *Blackboard Learning System* will not work properly.

---

## Services

---

### Overview

When the *Blackboard Learning System* is installed, it adds the bb-collab and bb-tomcat services to the operating system. In addition, for *Blackboard Learning System* to run properly the Apache service must be running and the Oracle database must be started and running correctly. When performing maintenance or upgrade tasks it may be necessary to stop some of these services.

For most upgrade tasks, including adding a Virtual Installation or installing *Blackboard Learning System* software updates, the bb-collab, bb-tomcat, and Apache services should be stopped but the database should be running. While this is a good general rule, please refer to the specific instructions for each task to confirm.

---

### Definition of Blackboard Services

**bb-collab:** The bb-collab service runs the Collaboration Tool within *Blackboard Learning System*. Stopping this service will make the Collaboration Tool unavailable to users.

**bb-tomcat:** The bb-tomcat service runs the Java servlet engine. Stopping this service makes any Java servlet pages unavailable to users, including the Login page.

*Blackboard Learning System* uses Apache to manage Web services.

---

### Starting and stopping services

The `ServicesController` utility is used to start and stop services. This utility must be run from the command line.

Syntax:

```
/usr/local/blackboard/tools/admin/ServiceController
<argument>
```

Where the arguments are defined in the table below.

| Argument                                | Description                                                                                  |
|-----------------------------------------|----------------------------------------------------------------------------------------------|
| <code>services.start</code>             | Starts all the services related to the <i>Blackboard Learning System</i> .                   |
| <code>services.stop</code>              | Stops all the services related to the <i>Blackboard Learning System</i> .                    |
| <code>services.restart</code>           | Stops and immediately starts the services related to the <i>Blackboard Learning System</i> . |
| <code>services.appserver.start</code>   | Starts the <code>bb-tomcat</code> service.                                                   |
| <code>services.appserver.stop</code>    | Stops the <code>bb-tomcat</code> service.                                                    |
| <code>services.appserver.restart</code> | Stops and immediately starts the <code>bb-tomcat</code> service.                             |
| <code>services.webserver.start</code>   | Starts the Apache Web service.                                                               |
| <code>services.webserver.stop</code>    | Stops the Apache Web service.                                                                |
| <code>services.webserver.restart</code> | Stops and immediately starts the Apache Web service.                                         |

### Starting and stopping the `bb-collab` service

In rare instances it may be necessary to stop only the `bb-collab` service but leave all other services running. For example, when setting up a dedicated collaboration server in a multiple Web/app server configuration it is necessary to stop the `bb-collab` service on all servers except the collaboration server. Stopping the `bb-collab` service must be done through the operating system.

## Performance Tuning and Maintenance

---

### Overview

This topic reviews some of the issues that administrators should consider to help run the *Blackboard Learning System* at peak performance. Performance tuning is best done through trial and error in a test environment by administrators that are familiar with the institution and its hardware.

---

### Delete content from the recyclebin

Course content that is removed from a course is stored in the recyclebin. While it is a good safety measure in case materials are accidentally removed from a course the recyclebin will take up more and more disk space unless files are removed. Removing files from the recyclebin is done at the operating system level, simply move the files offline or delete them through the operating system.

Each Virtual Installation has its own recycle bin. The recycle bin is located at `/usr/local/blackboard/content/vi/bbuid/recyclebin`, where `bbuid` is the name of the Virtual Installation.

---

### Managing Logs

Log files can grow to be quite large and should be managed so that excessive disk space and resources are not wasted. For more information on managing logs please see the *Blackboard Academic Suite Administrator Manual*.

---

### UNIX Temp directory

Be sure to track the buildup of files in the `/tmp` directory. A bloated temp directory can impact performance.

---

### Tuning the Apache Web server

The Apache Web server should be tested and tuned only by an experienced system administrator. The information presented here provides some general information for tuning the server, for a detailed review of how to tune an Apache Web server, see

<http://perl.apache.org/guide/performance.html>

*Blackboard Learning System* utilizes an embedded application server (mod\_perl) to integrate the Web server (Apache) with the application itself. This integration enables *Blackboard Learning System* to operate at a scale far above standard CGI. This integration additionally enables *Blackboard Learning System* to maintain persistent database connections—greatly reducing the time it takes to access database information.

Another benefit of the *Blackboard Learning System* architecture (using mod\_perl) comes from the way the application pre-compiles within the Web server. The application need only be read once. The database connections, once created, become persistent from one request to another.

Each child recompiles the application and creates its persistent database connection when that specific child is first created. Creating a child is an intensive process, which is why on dedicated machines it is probably worth the sacrifice of RAM to pre-start all children, and pre-load all the information into each of them.

The table below details the variables that may be set to enhance the performance of the Web server.

| <b>Variable</b>     | <b>Description</b>                                                                                                                                                                                                                                                                           |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MaxClients          | The maximum number of child processes the server will spawn. The MaxRequestsPerChild variable is essential—by setting this value to 300 in laboratory testing, each child was able to serve a request without ever having to re-compile the application or create a new database connection. |
| MaxRequestsPerChild | The maximum number of requests an individual child will process before restarting.                                                                                                                                                                                                           |
| StartServers        | The number of children to initially create when starting up the server.                                                                                                                                                                                                                      |
| MinSpareServers     | The minimum number of children awaiting requests.                                                                                                                                                                                                                                            |
| MaxSpareServers     | The maximum number of children awaiting requests.                                                                                                                                                                                                                                            |

## Blackboard Academic Suite Maintenance

---

### Overview

Blackboard is dedicated to proper maintenance of the *Blackboard Learning System*, *Blackboard Learning System—basic* and the *Blackboard Portal System*. Blackboard will make available maintenance releases as needed.

---

### Release 6 updaters

The Release 6 Updaters are used to move from one specific release to another, for example, from Release 6.0.11 to 6.1. Updaters must be run in sequence and may not be skipped. For example, to update from 6.0.3 to 6.0.5, two updaters must be run. The first will update from 6.0.3 to 6.0.4. The second will update from 6.0.4 to 6.0.5.

The Release 6 Updaters and step by step instructions can be found at <http://www.blackboard.com/products/services/support.htm>. An administrator login and client ID is required.

Information about the issues that are resolved in each update are found in the Release Notes. The Release Notes are located in the Reference Center at <http://www.blackboard.com/products/services/support.htm>. An administrator login and client ID is required to view the Release Notes.

**Note:** To determine which release a Blackboard System is running, check the information at the bottom of the Login page or at the bottom of the System Control Panel.

---

### Documentation updates

Blackboard maintains the product documentation after release with updates and additions. The cover of each document shows the published date and the last date the document was revised.

Changes to the documentation are published in the appendix of each manual. Previously, all changes were logged in a separate document.

---

## Operating System and Database Maintenance

---

### Overview

Blackboard supports operating system and database service packs and security patches for the operating systems and databases supported for use with the *Blackboard Learning System, Blackboard Learning System—basic*. Blackboard will test, certify, and, if necessary, provide fixes to ensure that Blackboard systems work with service packs and security patches.

There is, necessarily, a short lag time between a service pack release and the completion of testing. Even during this interim testing period, however, Blackboard will provide support for just released operating system and database service packs and security patches.

**Note:** This policy does not include support for subsequent releases. For example, if Blackboard supports version 1 of a database system any security patches or service packs for version 1 will be supported.

Blackboard will not support a version 2 release of the same database system until that version has been properly tested and published as part of the *Minimum Software Requirements* (available in the Reference Center on <http://www.blackboard.com/products/services/support.htm>) for that release of the Blackboard system.

---

### Applying a service pack or security patch after installing the Blackboard system

Follow these steps to install a service pack or a security patch to the operating system or database.

- Step 1** Back up the system.
- Step 2** Shut down the Blackboard system.
- Step 3** Check with Blackboard Product Support for any prerequisite maintenance that may be required to ensure compatibility with an OS or DBMS service pack or security patch.
- Step 4** Apply the operating system or database service pack or Security patch to the test/development environment.
- Step 5** Restart the test/development server.



- 
- Step 6**      Ensure that system is still shutdown. If auto start mechanisms are configured to restart Blackboard after a server restart, remember to shut down the Blackboard system before continuing.
  
  - Step 7**      Apply any necessary Blackboard prerequisite maintenance to the test/development Blackboard systems.
  
  - Step 8**      Restart the Blackboard systems.
  
  - Step 9**      Check the results either by testing your critical path features or by running your verification procedures.
  
  - Step 10**     If results are satisfactory, back up the system again. (If not, please log a service request with Blackboard Product Support through <http://www.blackboard.com/products/services/support.htm> describing the failure.)
-

## Backup and Recovery

---

### Overview

This topic offers some tips on system-wide backups and describes the tools in the *Blackboard Learning System* for incrementally backing up courses and organizations.

---

### System backup and recovery

System administrators should backup the database and file system according to the needs of the institution. *Blackboard Learning System* supports full backup and restores at the operating system and database levels. As a general rule, daily backups should be kept for two weeks, as errors may not appear for several days. Recovery plans should include how to restore the entire system. For assistance restoring the system, please contact Blackboard Technical Support.

---

### Incremental data protection

The *Blackboard Learning System* includes the following utilities for incrementally backing up individual courses and organizations.

**Export/Import:** Export takes course content and puts it in a package that can be used in another course at a later date. One or more course areas can be included in the package.

**Archive/Restore:** The Archive Course function creates a record of the Course including user interactions. It is most useful for recalling Student performance or interactions at a later time. The archive package is saved as a .ZIP file that can be restored to the system at another time.

The command line tool that processes batch operations for Export/Import and Archive/Restore is a powerful tool for backing up course and organization data. For detailed information on using these utilities please see the *Blackboard Academic Suite Administrator Manual*.

---

## Command Line Tools

---

### Overview

*Blackboard Learning System* includes a set of system administration tools that are run from the command line. These tools must be run from the command line—trying to execute a utility by clicking the .sh file in the operating system GUI will return errors and possibly cause the system to stop functioning.

This topic covers each tool and the syntax to invoke the tool. All of the commands described in this topic are found in the `/usr/local/blackboard/tools/admin/` directory.

---

### ChangeDefaultVirtualInstallation

This tool establishes the Virtual Installation that users are taken to if a user enters an invalid hostname.

Syntax:

```
ChangeDefaultVirtualInstallation.sh <virtual_hostname>
```

---

## ChangeToRemoteVirtualInstallation

This tool is used to move the database for a Virtual Installation to a different database server. It can also be used to move the database for the initial Virtual Installation that is created at install (bb\_bb60).

```
ChangeToRemoteVirtualInstallation.sh <bbuid> <host_name> <instance_name>
```

| Argument        | Description                                                                                                 |
|-----------------|-------------------------------------------------------------------------------------------------------------|
| <bbuid>         | The name of the Virtual Installation main database.                                                         |
| <host_name>     | The full hostname of the target server. Enter as hostname.domainname.                                       |
| <instance_name> | The name of the Oracle SID on the target machine that will hold the databases for the Virtual Installation. |

## LicenseReplace

This tool is used to add additional options and features to the *Blackboard Academic Suite* by upgrading the license.

Syntax:

```
LicenseReplace.sh <full_path_to_new_license_file> -FORCE
```

-FORCE is only used when downgrading a license. This option will force the deletion of any data related to lost functionality. For example, if downgrading from the *Blackboard Learning System* and *Portal System* to the *Blackboard Learning System* any customized modules will be deleted.

**Note:** The new license file must be accessible on a local drive and not from the network.

**PurgeAccumulator**

Every 30 days an automatic process runs that synchronizes the data in the stats database with the data in the main database and then deletes the statistical data from the main database that is more than 30 days old. This process can be run at any time using the `PurgeAccumulator` tool. The `PurgeAccumulator` tool can also be used to delete data from the statistics database.

**Syntax:**

```
PurgeAccumulator.sh <command> <Virtual_Installation>
<days_or_date>
```

| Argument               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <command>              | <ol style="list-style-type: none"> <li><code>purge-live</code> - Takes data from the <i>Blackboard Learning System</i> database and syncs with tables in the statistics database. After synching, it purges statistical data in the main database that is older than the number of days or date set.</li> <li><code>purge-stats</code> - goes to stats DB and purges all data older than the last x days or older than a specific date.</li> </ol> |
| <Virtual_Installation> | Enter the name of the main database (bbuid) of the Virtual Installation to be purged.                                                                                                                                                                                                                                                                                                                                                              |
| <days_or_date>         | The number of days (from the current date) that should not be processed by the <code>PurgeAccumulator</code> tool. It is also possible to set a date in yyyy-mm-dd format. Only data older than the date will be purged.                                                                                                                                                                                                                           |

**PushConfigUpdates**

This tool updates the configuration according to the settings in the `bb.config.properties` file.

**Note:** Running this command will redeploy all of the properties files. If any customizations have been made to these files they will be lost.

Syntax:

```
/usr/local/blackboard/tools/admin/PushConfigUpdates.sh
```

---

**RotateLogs**

This tool processes a log rotation outside the scheduled log rotations configured through the Manage Log Rotation page. The tool stops all necessary services and starts the services after the rotation is finished.

```
/usr/local/blackboard/tools/RotateLogs.sh
```

This command does not take any arguments. If logs are manually rotated using this tool it will not interrupt the regular intervals. However, the logs that were rotated manually will not be included in the archive files created at the regularly scheduled rotation.

For example, if the log rotation is set at 30 days and the logs are manually rotated after 15 days, only the last 15 days of logs will be included in the archives at the next scheduled log rotation.

For more information on managing logs see the *Blackboard Academic Suite Administrator Manual*.

---

**ServiceController**

This tool is used to start and stop services.

```
/usr/local/blackboard/tools/admin/ServiceController
<argument>
```

| <b>Argument</b>            | <b>Description</b>                                                                           |
|----------------------------|----------------------------------------------------------------------------------------------|
| services.start             | Starts all the services related to the <i>Blackboard Learning System</i> .                   |
| services.stop              | Stops all the services related to the <i>Blackboard Learning System</i> .                    |
| services.restart           | Stops and immediately starts the services related to the <i>Blackboard Learning System</i> . |
| services.appserver.start   | Starts the bb-tomcat service.                                                                |
| services.appserver.stop    | Stops the bb-tomcat service.                                                                 |
| services.appserver.restart | Stops and immediately starts the bb-tomcat service.                                          |
| services.webserver.start   | Starts the IIS or Apache Web service.                                                        |
| services.webserver.stop    | Stops the IIS or Apache Web service.                                                         |
| services.webserver.restart | Stops and immediately starts the IIS or Apache Web service.                                  |

**Note:** An error may occur when running this tool if a symbolic link in /bin to the correct location of the bash shell does not exist. Run the following command to create this link:

```
ln -s /bin/bash /usr/local/bin/bash.
```

This assumes that bash resides in /usr/local/bin/bash. If it resides elsewhere, please use that directory in the command.

### **SystemInfo**

This command will create a detailed report of system settings. The report can be viewed in the /usr/local/blackboard/logs/system-info directory. The name of the report will be named `yyyymmdd_OS.log`. Where OS is the operating system and `yyyymmdd` is the date in year-month-day format.

Syntax:

```
/usr/local/blackboard/tools/admin/SystemInfo.sh
```

---



## VirtualInstallation

The VirtualInstallation command line tool is used to create and remove Virtual Installations.

Syntax:

```
VirtualInstallation.sh <command> <viHost> <bbuid>
<password> <Oracle_SID> <viDomain> <default_ind>
<description>
```

If optional arguments are to be left blank they must be represented by a space. Therefore, if entering a value for the <default\_ind> but not the <viDomain> there would be two spaces between the argument for the <dbInstance> and the <default\_ind> argument.

| Argument     | Description                                                                                                                                                                                                                                                                                   |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <command>    | This argument accepts one of the following commands: <ul style="list-style-type: none"> <li><b>create-vi:</b> use this command to create a Virtual Installation</li> <li><b>drop-vi:</b> use this command to remove a Virtual Installation</li> </ul>                                         |
| <viHost>     | This argument will accept the full hostname (hostname.domainname) for the Virtual Installation or just the hostname (hostname). If just the hostname is entered, the domain must be added with the <viDomain> argument.                                                                       |
| <bbuid>      | The name of the main database that will be created for the Virtual Installation. This value must begin with "bb_". When creating a Virtual Installation it is important to give this database a name prefixed by "bb_". Do not use any special characters (%&#<>=+) or a dash(-) in the name. |
| <password>   | The password for the database user that will be created for this Virtual Installation.                                                                                                                                                                                                        |
| <Oracle_SID> | Required. This argument takes the Oracle SID of the Oracle installation that holds the databases for the <i>Blackboard Learning System</i> .                                                                                                                                                  |

|               |                                                                                                                                                                                     |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <viDomain>    | Optional. This argument takes the name of the domain that the host is on. A value must be entered here if the full hostname is not used in the <viHost> argument.                   |
| <default_ind> | Optional. Enter "Y" for this argument to make this Virtual Installation the default. The default Virtual Installation is accessed if a user enters a hostname that is not resolved. |
| <description> | Optional. Enter a description for the Virtual Installation.                                                                                                                         |

**Note:** Users will only be able to access the Virtual Installation using the parameters provided by this command until additional hostnames are added through the [Modify Virtual Information](#) page in the user interface. This means that if a domain is passed with this command then users must enter the full hostname.domainname to access the Virtual Installation.

## Chapter 4—Virtual Installations

---

### Overview

This chapter reviews the installation, configuration, and management of Virtual Installations. Virtual Installations are used to define separate *Blackboard Learning System* environments running on the same hardware and software configuration.

---

### In this chapter

Chapter 4—Virtual Installations includes the following topics.

| Topic                                                   | Description                                                                                                                                                                                                         |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">About Virtual Installations</a>             | This topic defines Virtual Installations and how they function.                                                                                                                                                     |
| <a href="#">Virtual Installation Command Line Tools</a> | This topic covers the utilities for creating and updating Virtual Installations.                                                                                                                                    |
| <a href="#">Create a Virtual Installation</a>           | This topic describes how to create a Virtual Installation.                                                                                                                                                          |
| <a href="#">Remove a Virtual Installation</a>           | This topic describes how to remove a Virtual Installation.                                                                                                                                                          |
| <a href="#">Move a Virtual Installation Database</a>    | This topic describes how to move a Virtual Installation database to a new server.                                                                                                                                   |
| <a href="#">Root Installation Management Panel</a>      | This topic covers the Root Management Control Panel. This panel is available in the user interface to Administrators logged in as root_admin.                                                                       |
| <a href="#">Manage Virtual Installations</a>            | This topic covers the Manage Virtual Installations page. This page in the user interface lists all the Virtual Installations on the system and provides links for accessing or modifying each Virtual Installation. |
| <a href="#">Modify Virtual Installation</a>             | This topic covers the Modify Virtual Information page. Administrators can set some configuration options for Virtual Installations from this page in the user interface.                                            |

---

|                                                 |                                                                                                                                                          |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">Edit Root Administrator Account</a> | This topic covers the Edit Root Administrator Account Profile page. This page appears in the user interface as a means to update the root_admin account. |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|

---

## About Virtual Installations

---

### Overview

Virtual installations are distinct *Blackboard Learning System* environments that run on the same hardware. Each Virtual Installation is supported by its own database and its content files are stored separately, although under the same file system.

It is important to note that all installations of the *Blackboard Learning System* use at least one Virtual Installation. The `bb_bb60` database (and its stats database) and the `bb_bb60` directory in the file system act as a Virtual Installation. If an institution does not license additional Virtual Installations it is important to note that, for the purposes of running commands (particularly with Snapshot integration), `bb_bb60` is considered a Virtual Installation.

Additional Virtual Installations require separate licensing from Blackboard. Please be sure to obtain a license file that allows for Virtual Installations before attempting to create a Virtual Installation.

It is important to include Virtual Installations in hardware planning. While the first *Blackboard Learning System* Virtual Installation may support a moderate number of users, adding Virtual Installations will require additional hardware to provide optimal performance.

---

### Virtual installation databases

Each Virtual Installation is configured with its own databases—a main database and a stats database. Please remember to include the databases for Virtual Installations in maintenance and backup plans. For more information about databases please see the [Databases](#) topic.

---

### Virtual installation application files and file system

Each Virtual Installation runs using the same application files. The file system includes separate storage areas for each Virtual Installation under `/usr/local/blackboard/content/vi/bbuid` (where `bbuid` is the name of the Virtual Installation).

---

## Managing Virtual Installations

Virtual Installations are controlled through command line tools as well as a special area in the user interface accessible only to the root\_admin user. This user account is created at install with a password defined by the person running the installer.

---

## Hostnames

Virtual Installations can have multiple hostnames for users to access the system. A hostname is usually the machine\_name.domain\_name. With Virtual Installations, the hostnames that are used do not correspond to the machine name since more than one Virtual Installation is running on the same hardware. Rather, the hostnames are defined by the person creating the Virtual Installation and resolved against the IP address of the machine on the DNS server. Hostnames can be added, modified, and removed from the [Modify Virtual Information](#) page in the user interface. Remember to remove a hostname from the DNS server if it is removed from the system.

---

## Virtual Installation Command Line Tools

---

### Overview

This topic details the command line tools that are specific to Virtual Installations.

---

### VirtualInstallation

The `VirtualInstallation` command line tool is used to create and remove Virtual Installations.

Syntax:

```
VirtualInstallation.sh <command> <viHost> <bbuid>
<password> <Oracle_SID> <viDomain> <default_ind>
<description>
```

If optional arguments are to be left blank they must be represented by a space. Therefore, if entering a value for the `<default_ind>` but not the `<viDomain>` there would be two spaces between the argument for the `<dbInstance>` and the `<default_ind>` argument.

| Argument  | Description                                                                                                                                                                                                                                           |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <command> | This argument accepts one of the following commands: <ul style="list-style-type: none"> <li><b>create-vi:</b> use this command to create a Virtual Installation</li> <li><b>drop-vi:</b> use this command to remove a Virtual Installation</li> </ul> |
| <viHost>  | This argument will accept the full hostname (hostname.domainname) for the Virtual Installation or just the hostname (hostname). If just the hostname is entered, the domain must be added with the <code>&lt;viDomain&gt;</code> argument.            |

|               |                                                                                                                                                                                                                                                                                                 |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <bbuid>       | The name of the main database that will be created for the Virtual Installation. This value must begin with "bb_". When creating a Virtual Installation it is important to give this database a name prefixed by "bb_". Do not use any special characters (%&#lt;>=+) or a dash(-) in the name. |
| <password>    | The password for the database user that will be created for this Virtual Installation.                                                                                                                                                                                                          |
| <Oracle_SID>  | Required. This argument takes the Oracle SID of the Oracle installation that holds the databases for the <i>Blackboard Learning System</i> .                                                                                                                                                    |
| <viDomain>    | Optional. This argument takes the name of the domain that the host is on. A value must be entered here if the full hostname is not used in the <viHost> argument.                                                                                                                               |
| <default_ind> | Optional. Enter "Y" for this argument to make this Virtual Installation the default. The default Virtual Installation is accessed if a user enters a hostname that is not resolved.                                                                                                             |
| <description> | Optional. Enter a description for the Virtual Installation.                                                                                                                                                                                                                                     |

**Note:** Users will only be able to access the Virtual Installation using the parameters provided by this command until additional hostnames are added through the [Modify Virtual Information](#) page in the user interface. This means that if a domain is passed with this command then users must enter the full hostname.domainname to access the Virtual Installation.

### ChangeDefaultVirtualInstallation

This tool establishes the Virtual Installation that users are taken to if a user enters an invalid hostname.

Syntax:

```
ChangeDefaultVirtualInstallation.sh <virtual_hostname>
```



## ChangeToRemoteVirtualInstallation

This tool is used to move the database for a Virtual Installation to a different database server. It can also be used to move the database for the initial Virtual Installation that is created at install (bb\_bb60).

```
ChangeToRemoteVirtualInstallation.sh <bbuid> <host_name> <instance_name>
```

| Argument        | Description                                                                                                 |
|-----------------|-------------------------------------------------------------------------------------------------------------|
| <bbuid>         | The name of the Virtual Installation main database.                                                         |
| <host_name>     | The full hostname of the target server. Enter as hostname.domainname.                                       |
| <instance_name> | The name of the Oracle SID on the target machine that will hold the databases for the Virtual Installation. |

## Create a Virtual Installation

---

### Overview

This topic includes instructions for creating a new Virtual Installation. Virtual installations are created and deleted through the command line. It is not possible to create a new Virtual Installation through the *Blackboard Learning System* user interface.

Please remember that a valid license is required to create a Virtual Installation. Also, if the number of Virtual Installations allowed with the license has been met, adding another Virtual Installation will fail.

**Note:** Record the virtual host name, database name, and database user password in a safe place. If the Virtual Installation is removed at a later date, this information is required to successfully delete the Virtual Installation.

### Steps to create a Virtual Installation

Follow the steps below to create a new Virtual Installation.

**Note:** The instructions below assume that the *Blackboard Learning System* is installed in the `/usr/local/` directory and the location of the Java 2 SDK is in the PATH. If the *Blackboard Learning System* is installed in a separate location, please make sure that the commands as you enter them point to the right location.

- Step 1** Map the IP address of the Web/app server (or the IP address used to access *Blackboard Learning System* in a load-balanced configuration) to the names of the Virtual Installation on the institution's DNS server.
- Step 2** Stop the `bb-collab`, `bb-tomcat`, and Apache services. Do not stop the *Blackboard Learning System* database. The Virtual Installation will not be created successfully if the database is stopped. If using multiple Web/app servers, the services must be stopped on all servers although the command only needs to be run on one of the servers.
- Step 3** change to the following directory:  
`/usr/local/blackboard/tools/admin`

- Step 4** Run the `VirtualInstallation` utility with the `create-vi` command. For more information on this utility and its arguments please see [Virtual Installation Command Line Tools](#).

**Note:** The recommended naming convention for the `bbuid` is `bb_virtualhostname` (the name must start with "bb\_"). When creating a Virtual Installation it is important to give this database a name prefixed by "bb\_". Do not use any special characters (%&#<>=+) or a dash(-) in the name.

- Step 5** Record the Virtual Installation hostname, database name, and database user password in a safe place.
- Step 6** The Virtual Installation program will run. When it is complete the "BUILD SUCCESSFUL!" message will appear.
- Step 7** Reboot the server. The `bb-collab`, `bb-tomcat`, and Apache services should restart automatically. If they do not, start the services.
- Step 8** The URL for the new Virtual Installation will be <http://hostname.domainname> as entered when running the `VirtualInstallation` utility.
-

## Remove a Virtual Installation

---

### Overview

Removing a Virtual Installation will completely and permanently delete the databases and file system for that Virtual Installation. Blackboard recommends making a backup of the file system and databases prior to deleting any Virtual Installation that has been used in a production environment.

Virtual installations are removed by executing the same utility used to install a Virtual Installation. The only difference being that the remove command is `drop-vi` instead of the install command, which is `create-vi`. It is important to note that to remove a Virtual Installation, the hostname, database name, and database user password are required.

When removing a Virtual Installation remember to delete the host name from the DNS server.

---

### Steps to remove a Virtual Installation

Follow the steps below to remove a Virtual Installation.

**Note:** The instructions below assume that the *Blackboard Learning System* is installed in the `/usr/local/` directory and location of the Java 2 SDK is in the `PATH`. If *Blackboard Learning System* is installed in a separate location, please make sure that the commands as you enter them point to the right location.

- Step 1** Remove the host names of the Virtual Installation from the DNS server. Only remove the host names for the Virtual Installation that will be removed.
- Step 2** Back up the file system and database of the Virtual Installation that will be removed in case it needs to be restored later.
- Step 3** Stop the `bb-collab`, `bb-tomcat`, and Apache services. Do not stop the database. The Virtual Installation will not be removed properly if the database is stopped. If using multiple Web/app servers, the services must be stopped on all servers although the command only needs to be run on one of the servers.

- 
- Step 4** Change to the following directory:  
`/usr/local/blackboard/tools/admin`
- Step 5** Run the VirtualInstallation utility with the `drop-vi` command. See [Virtual Installation Command Line Tools](#) for more information on running this utility.
- Step 6** The Virtual Installation removal program will run. When it is complete the "BUILD SUCCESSFUL!" message will appear.
- Step 7** Restart the Web/app server. The `bb-collab`, `bb-tomcat`, and Apache services should start automatically. If they do not, restart them.
- Step 8** Login to another Virtual Installation using the `root_admin` account. Verify that the removed Virtual Installation no longer exists. To verify, check the [Manage Virtual Installations](#) feature available through the Root Installation Management Panel.
-

## Moving Virtual Installation Databases

---

### Overview

Moving a Virtual Installation database off of the original database server to a remote database server can help improve database performance when the Virtual Installation database becomes too large for the original database server. When moving a Virtual Installation database the statistics database associated with the main database must be moved as well.

Because the first installation of the *Blackboard Learning System* is treated as a Virtual Installation this process can be used to move a database even if the institution is not using additional Virtual Installations. In a one server configuration this process can be used to move the main and statistics database to a remote server.

**Note:** The bbadmin database cannot be moved. Therefore, even if all of the Virtual Installation databases are moved to a remote server the source database server cannot be shut down as it is still required to run the bbadmin database.

### Moving Virtual Installation databases

Follow these steps to move the main database and the statistics database onto another server running Oracle.

The steps below include these assumptions:

- The name of the main database is bb\_bb60 and the name of the statistics database is bb\_bb60\_stats. "\_stats" is appended to the name of the main database to create the name of the statistics database.
- Tablespace names are generated by appending "\_data" for data files and "\_index" for index files.
- Commands that begin with # must be run as root.
- Commands that begin with \$ must be run by Oracle user.
- Commands that start with SQL> are SQL commands.
- The name of the database user associated with each database has the same name as the database. For example, the database user for the bb\_bb60 database is bb\_bb60.
- Any required passwords are expressed as "password." In steps that require a password be sure to use the password that was set at installation or when the Virtual Installation was created.

**Note:** It is not possible to change the name of the databases. Also, the database users must keep the same name and password.

**Step 1** Stop all *Blackboard Learning System* services by running the following command on the Web/app server.

```
/usr/local/blackboard/tools/admin/ServiceController.sh
services.stop
```

**Step 2** Export the main database and the statistic database.

```
$exp bb_bb60/password file=bb_bb60.dmp
$exp bb_bb60_stats/password file=bb_bb60_stats.dmp
```

**Step 3** Move the following exported files to target server.

- bb\_bb60.dmp
- bb\_bb60\_stats.dmp

**Step 4** Create the table spaces for the main and the statistic databases.

```
$sqlplus "sys/password as sysdba"

SQL> CREATE TABLESPACE bb_bb60_data
SQL> DATAFILE '/home/oracle/data/dbf/bb_bb60_data.dbf'
SQL> SIZE 200M REUSE
SQL> AUTOEXTEND ON NEXT 128K MAXSIZE 2000M
SQL> EXTENT MANAGEMENT LOCAL UNIFORM SIZE 128K;

SQL> CREATE TABLESPACE bb_bb60_indx
SQL> DATAFILE '/home/oracle/data/dbf/bb_bb60_indx.dbf'
SQL> SIZE 100M
SQL> REUSE AUTOEXTEND ON NEXT 64K MAXSIZE 2000M
SQL> EXTENT MANAGEMENT LOCAL UNIFORM SIZE 64K;

SQL> CREATE TABLESPACE bb_bb60_stats_data
SQL> DATAFILE
'/home/oracle/data/dbf/bb_bb60_stats_data.dbf'
SQL> SIZE 200M REUSE
SQL> AUTOEXTEND ON NEXT 128K MAXSIZE 2000M
SQL> EXTENT MANAGEMENT LOCAL UNIFORM SIZE 128K;

SQL> CREATE TABLESPACE bb_bb60_stats_indx
SQL> DATAFILE
'/home/oracle/data/dbf/bb_bb60_stats_indx.dbf'
SQL> SIZE 100M REUSE AUTOEXTEND ON NEXT 64K MAXSIZE 2000M
SQL> EXTENT MANAGEMENT LOCAL UNIFORM SIZE 64K;
```

**Step 5** Recreate the main and statistic users. The password must be same as the old ones.

```
SQL> CREATE USER bb_bb60 IDENTIFIED BY password
SQL> DEFAULT TABLESPACE bb_bb60_data
SQL> TEMPORARY TABLESPACE temp
SQL> QUOTA UNLIMITED ON bb_bb60_data
SQL> QUOTA UNLIMITED ON bb_bb60_indx;

SQL> CREATE USER bb_bb60_stats IDENTIFIED BY password
SQL> DEFAULT TABLESPACE bb_bb60_stats_data
SQL> TEMPORARY TABLESPACE temp
SQL> QUOTA UNLIMITED ON bb_bb60_stats_data
SQL> QUOTA UNLIMITED ON bb_bb60_stats_indx;
```

**Step 6** Grant privileges to the main and statistic database users.



```
SQL> GRANT connect, resource TO bb_bb60, bb_bb60_stats;
SQL> GRANT alter user TO bb_bb60, bb_bb60_stats;
SQL> GRANT select any table TO bb_bb60, bb_bb60_stats;
SQL> GRANT analyze any TO bb_bb60, bb_bb60_stats;
SQL> GRANT drop any table TO bb_bb60, bb_bb60_stats;
SQL> GRANT query rewrite TO bb_bb60, bb_bb60_stats;
SQL> GRANT alter tablespace TO bb_bb60, bb_bb60_stats;
SQL> GRANT create sequence TO bb_bb60, bb_bb60_stats;
```

**Step 7** Import the main and statistic databases.

```
$imp sys file=bb60.dmp fromuser=bb_bb60 touser=bb_bb60
log=bb60.log
$imp sys file=bb60_stats.dmp fromuser=bb_bb60_stats
touser=bb_bb60_stats log=bb60_stat.log
```

**Step 8** Run the following command on the Web/app server.

```
/usr/local/Blackboard/tools/admin
ChangeToRemoteVirtualInstallation.sh <bbuid>
<new_host_name> <new_database_instance_name> <new_port>
```

**Step 9** Restart all Blackboard services.

```
/usr/local/blackboard/tools/admin/ServiceController.sh
services.start
```

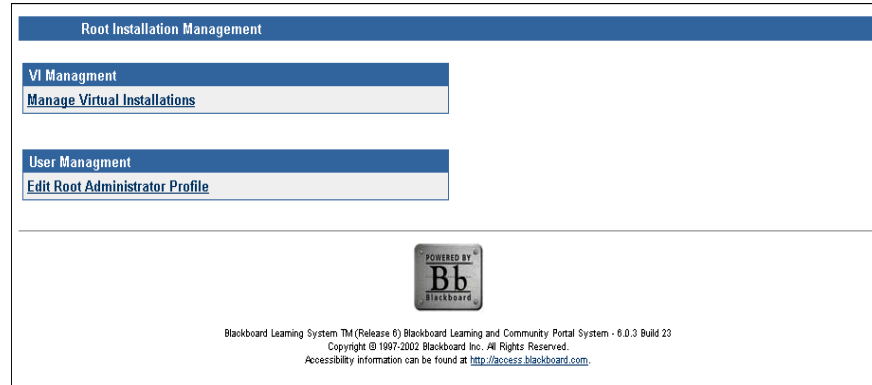
---

## Root Installation Management Panel

---

### Overview

The Root Installation Management Panel provides features for managing Virtual Installations through the *Blackboard Learning System* user interface. Please note that Virtual Installations must be installed first before they can be controlled through the Root Installation Management Panel. This panel will appear when the root\_admin user is logged in on any Virtual Installation.



### Find this page

Follow these steps to open the Root Installation Management Panel.

- Step 1** Login to *Blackboard Learning System* using the root\_admin account.
  - Step 2** Click **Root Installation Management** at the top of the System Control Panel.
-

## Functions

The following functions are available through the Root Installation Configuration Panel:

### VI Management

- [Manage Virtual Installations](#): This page lists the Virtual Installations on the system and provides additional features for managing each Virtual Installation.

### User Management

- [Edit Root Administrator Profile](#): This page is used to modify the root\_admin user account.
-

## Manage Virtual Installations Page

### Overview

System Administrators can view and control all Virtual Installations on the system from the Manage Virtual Installation page. It is important to note that modifying Virtual Installations should be done with caution so as not to disrupt users.

VIRTUAL INSTALLATION MANAGEMENT > MANAGE VIRTUAL INSTALLATIONS

**Manage Virtual Installations**

2 installation(s) located  
Displaying records

| INSTALLATION                              | ID      | DESCRIPTION            | # OF USERS | # OF COURSES |                        |
|-------------------------------------------|---------|------------------------|------------|--------------|------------------------|
| <a href="#">twsrver.dc.blackboard.com</a> | bb_bb60 | My Bb Instance bb_bb60 | 13         | 0            | <a href="#">Modify</a> |
| <a href="#">vi1</a>                       | bb_vi1  | My Bb Instance bb_vi1  | 13         | 0            | <a href="#">Modify</a> |

[OK](#)

### Find this page

Click **Manage Virtual Installations** from the VI Management section of the Root Installation Management Panel.

### Functions

The table below details the functions available from the Manage Virtual Installations page.

| To . . .                      | click . . .                                                                                                                                         |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| modify a Virtual Installation | <a href="#">Modify</a> . The Modify Virtual Information page will appear. From this page, the hostnames and descriptive information can be changed. |
| access an installation        | the name of the installation. The Login page for that installation will appear. A User Name and Password are required to enter the installation.    |

## Modify Virtual Information

### Overview

The Modify Virtual Information page should be used with the utmost caution. Changes made to this page can have serious consequences not only on the Virtual Installation but on the entire system.

**Modify Virtual Information**

---

**1 Virtual Host Information**

Name:

Available:

ID: bb\_vi1

Description:

**2 Virtual Installation Information**

Users: 4

Courses: 0

Organizations: 0

Hostnames (Default Indicated):

Hostname 1:

Hostname 2:

Hostname 3:

Hostname 4:

Hostname 5:

**3 Submit**

Click "Submit" to finish. Click "Cancel" to abort this process.

### Find this page

Follow these steps to open the Modify Virtual Information page.

- Step 1** Click **Manage Virtual Installations** from the VI Management section of the Root Installation Management Panel.
- Step 2** Click **Modify** next to a Virtual Installation. The Modify Virtual Information page will appear populated with data from the selected Virtual Installation.

## Fields

The table below details the fields on the Modify Virtual Information page.

| Field                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Virtual Host Information</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Name:</b>                    | The name of the Virtual Installation, as it appears in the bbadmin database, can be changed in this field. Changing this name will not change the hostnames associated with the Virtual Installation.                                                                                                                                                                                                                                                                                      |
| <b>Available:</b>               | This check box determines whether or not the Virtual Installation is available to users including the root_admin user. If this is deselected and the Virtual Installation is not available it will be impossible to login to the Virtual Installation.<br><br><b>Note:</b> If there is only one Virtual Installation on the system and it is made unavailable there is no way to get back into the Virtual Installation. The software will have to be uninstalled and a restore performed. |
| <b>ID:</b>                      | This field displays the bbuid (name of the main Virtual Installation database).                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description:</b>             | Enter or modify the description of the Virtual Installation. This description does not display to users.                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Database Information</b>     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Users:</b>                   | This field displays the number of users that exist on this Virtual Installation.                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Courses:</b>                 | This field displays the number of courses that exist on this Virtual Installation.                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Organizations:</b>           | This field displays the number of organizations that exist on this Virtual Installation.                                                                                                                                                                                                                                                                                                                                                                                                   |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Hostnames:</b> | <p>The different hostnames that can be used to access the Virtual Installation are shown here. Hostnames can be added or removed from these fields.</p> <p>When adding a hostname through this interface be sure to add it as the full hostname (hostname.domainname). To remove a hostname simply delete from the field and leave the field blank. Remember that any changes made to hostnames on this page must also be updated on the DNS server.</p> |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Note:** After making any changes to the hostnames the Web/app server (or servers) must be restarted for the change to take effect.

## Edit Root Administrator Profile Page

---

### Overview

The Edit Root Administrator Profile page controls the user account for the root\_admin user.

[VIRTUAL INSTALLATION MANAGEMENT](#) > EDIT ROOT ADMINISTRATOR PROFILE

### Edit Root Administrator Profile

---

#### 1 Personal Information

First Name:

Middle Name:

Last Name:

E-mail:

#### 2 Account Information


User Name: root\_admin

Password:

Verify Password:

#### 3 Other Information

Gender:

Birthdate:    

Education Level:

Company:

Job Title:

### Find this page

Click **Edit Root Administrator Profile** from the User Management section of the Root Installation Management Panel.

---



## Fields

The table below details the fields on the Edit Root Administrator Profile page.

| Field                        | Description                                                                                                                |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>Personal Information</b>  |                                                                                                                            |
| <b>First Name:</b>           | Edit the user's first name.                                                                                                |
| <b>Middle Name:</b>          | Edit the user's middle name.                                                                                               |
| <b>Last Name:</b>            | Edit the user's last name.                                                                                                 |
| <b>Email:</b>                | Edit the user's email address.                                                                                             |
| <b>Account Information</b>   |                                                                                                                            |
| <b>User Name:</b>            | Display only.                                                                                                              |
| <b>Password:</b>             | Enter a new password for the root_admin account.                                                                           |
| <b>Verify Password:</b>      | Enter the new password again.                                                                                              |
| <b>Other Information</b>     |                                                                                                                            |
| <b>Gender:</b>               | Edit the user's gender.                                                                                                    |
| <b>Birthdate:</b>            | Select the user's birthdate from the lists by clicking on the drop-down arrow or click the calendar icon to select a date. |
| <b>Education Level:</b>      | Edit the user's education level.                                                                                           |
| <b>Company:</b>              | Edit the user's company.                                                                                                   |
| <b>Job Title:</b>            | Edit the user's job title.                                                                                                 |
| <b>Department:</b>           | Edit the user's department.                                                                                                |
| <b>Street 1:</b>             | Edit the user's address.                                                                                                   |
| <b>Street 2:</b>             | Edit any additional address information.                                                                                   |
| <b>City:</b>                 | Edit the user's city.                                                                                                      |
| <b>State/Province:</b>       | Edit the user's state or province.                                                                                         |
| <b>ZIP/Postal Code:</b>      | Edit the user's ZIP code or postal code.                                                                                   |
| <b>Country:</b>              | Edit the user's country.                                                                                                   |
| <b>Web Site:</b>             | Edit the URL of the user's personal Web site.                                                                              |
| <b>Home Phone:</b>           | Edit the home phone number of the user. The phone number will display exactly as entered.                                  |
| <b>Work Phone:</b>           | Edit the work phone number of the user. The phone number will display exactly as entered.                                  |
| <b>Work Fax:</b>             | Edit the fax number of the user. The fax number will display exactly as entered.                                           |
| <b>Mobile Phone:</b>         | Edit the mobile phone of the user. The phone number will display exactly as entered.                                       |
| <b>Role and Availability</b> |                                                                                                                            |

---

|                                 |                                                                                                                                                                                                                                                                              |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Primary Institution Role</b> | Select a Portal Role from the drop down list. The Portal Role controls what the user sees on the portal. Tabs and modules can be constructed and configured to show to different groups based on Portal Role (with <i>Blackboard Learning and Community Portal System</i> ). |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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## Chapter 5—Setting Up SSL

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### Overview

This chapter reviews how to use the Secure Sockets Layer (SSL) protocol to secure communication between a *Blackboard Learning System* Web/app server and a client machine.

---

### In this chapter

Chapter 5—Setting Up SSL includes the following topics.

| Topic                                    | Description                                                                                                                                                              |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">About SSL and SSL Choice</a> | This topic introduces SSL and the <i>Blackboard Learning System</i> feature, SSL Choice, that lets Administrators select which areas of the system are secured with SSL. |
| <a href="#">Blackboard SSL Installer</a> | This topic covers how to use the Blackboard SSL Installer.                                                                                                               |
| <a href="#">Configure SSL for Apache</a> | This topic gives detailed instructions for configuring Apache to use the SSL protocol. This must be done before using the SSL Choice feature.                            |
| <a href="#">SSL Choice</a>               | This topic reviews the SSL Choice feature available through the user interface.                                                                                          |

---

## About SSL and SSL Choice

---

### Overview

Secure Sockets Layer (SSL) is a protocol for protecting Internet communications. SSL ensures that a communication is not read or changed by another entity. The *Blackboard Learning System* uses SSL to secure all or some communications between the Web server and the client machine. This feature that allows Administrators to select which areas of the *Blackboard Learning System* are secured using SSL is called SSL Choice.

The Apache Web server included with the *Blackboard Learning System* (Release 6.0.11 and later releases) includes mod\_SSL—software required to run SSL with Apache.

Users running an earlier version of Release 6 must install mod\_SSL through the Blackboard SSL Installer before obtaining a certificate and configuring SSL. Please contact your Blackboard Account Administrator to receive the Blackboard SSL Installer. For information on running the Blackboard SSL Installer please see [Blackboard SSL Installer](#).

**Note:** SSL may also be used to secure the connection between the *Blackboard Learning System* and a separate server for authentication. If SSL will be used both for connecting to an authentication server and for client sessions, SSL for the authentication server **must** be configured first. For more information on configuring SSL for securing with an integrated authentication server please see the *Blackboard Learning System Advanced Integration and Data Management Manual*.

### How does SSL Work?

SSL encrypts transmissions using the Rivest-Shamir-Adleman (RSA) algorithm. Transmissions are decrypted and encrypted using certificates. When a user accesses a Web site secured by SSL the Web site sends a certificate to the client machine. The client machine then uses the certificate to establish a secure connection with encryption unique to that connection or session. SSL communications are more resource intensive than standard http—it is recommended that the impact of SSL on performance be tested and planned for prior to implementing.

---

**Obtain a certificate**

The simplest way to obtain a certificate for use with a Web site is through a vendor known as a Certifying Authority (CA). The process, shown in the steps below, is relatively simple.

- Step 1**      Generate a certificate request.
- Step 2**      Send the request to a CA.
- Step 3**      The CA creates and registers a certificate.
- Step 4**      Make this certificate available to the Web Server (Apache).

Certificates created in this way are usually registered and good for one year. After one year the certificate will no longer work and a new certificate must be obtained.

---

**How does SSL appear to users?**

SSL works with the Hypertext Transfer Protocol (HTTP) to secure connections between the *Blackboard Learning System* Web server and the client machines. It is fairly easy to see when a Web page is using SSL to secure transmissions because an "s" is appended to the http at the beginning of the address.

Without SSL:

<http://blackboard.yourinstitution.com>

With SSL:

<https://blackboard.yourinstitution.com>

It is important to understand that if SSL is used to secure the Web page in this example then the first URL (without SSL) is invalid and will return a 404 error.

---

## SSL Choice

The SSL Choice feature is available in the user interface from the System Control Panel. It allows an institution to decide if all, none, or some of the *Blackboard Learning System* is secured with SSL. If SSL is to be used, it is most effective when applied to the entire Web site and not just selected areas.

**Note:** SSL must be configured on the Web Server before using the SSL Choice feature. If SSL Choice is turned on before the Web server is configured then any areas set to use SSL will be unavailable to users!

---

## Blackboard SSL Installer

---

### Overview

**Note:** Only follow these steps if installing Release 6.0.10 or earlier. The *Blackboard Learning System* (Release 6.0.11 and later) includes the mod\_SSL package necessary to run under SSL.

The Apache Web server that is included with the *Blackboard Learning System* does not include the mod\_SSL package necessary to configure SSL and then use the SSL Choice feature. mod\_SSL is not included because of the legalities surrounding the import and export of cryptographic technologies.

For those users that are located in a country that allows the import of the mod\_SSL package they can install mod\_SSL through the Blackboard SSL Installer. Please contact your Blackboard Account Manager for more information.

---

### Install the Blackboard SSL package

Follow these steps to install the Blackboard SSL package.

**Step 1** Download one of the following packages from Blackboard.

- blackboard6SSL\_solaris.bin
- blackboard6SSL\_linux.bin

**Step 2** Change to the directory where the package was downloaded. Make the package executable.

```
chmod +x blackboard6SSL_solaris.bin
```

**Step 3** Execute the package.

```
./blackboard6SSL_solaris.bin
```

**Step 4** Follow the prompts to complete the installation. The installer will confirm that the license agreement is accepted. It will also ask for the location of the *Blackboard Learning System* directory, for example, usr/local/blackboard.

---

## Configuring SSL for Apache

---

### Overview

To use SSL to secure the *Blackboard Learning System* the Apache Web server must first be set to use SSL.

**Note:** Successful completion of this process requires that Solaris users are running Solaris 9 or Solaris 8 with patch 112438-02. Configuring SSL should only be done by an experienced System Administrator.

Once SSL is configured, the SSL Choice feature (accessible from the Learning System's Administrator Control Panel) will function correctly. Trying to use the SSL Choice feature before configuring SSL for Apache can result in serious system errors.

---

### Step by Step

The following steps detail how to configure SSL with Apache.

**Step 1** Login to the Web/application server as root.

**Step 2** Set the PATH to include the OpenSSL provided by Blackboard with the following commands

```
PATH=/usr/local/blackboard/apps/openssl/bin:$P
ATH
export PATH
```

**Step 3** Test that OpenSSL is in the PATH by executing `openssl`. If OpenSSL is set in the PATH correctly, an `OpenSSL>` prompt will appear. Enter `'q'` to exit the prompt.

**Note:** If another instance of `openssl` is installed on the operating system make sure that the version supplied by Blackboard is the version that appears in the PATH.

**Step 4** Create a directory to store certificates. Then change directories. For example:

```
mkdir
/usr/local/blackboard/apps/httpd/conf/certs/
cd
/usr/local/blackboard/apps/httpd/conf/certs/
```



**Step 5** Create a RSA private key:

```
openssl genrsa -out server.key 1024
```

where *server* is a variable for the file name. Typically the server name is used.

Backup this file and make sure that only root has read permissions on it. Make sure that the password is secure and can be recalled when necessary. (need to recall to start the server).

**Step 6** Create a Certificate Signing Request (CSR) for the server RSA private key with the following command:

```
openssl req -new -days 365 -key server.key -out server.csr
```

**Note:** The `-days` option sets the expiration of the certification. Most Certifying Authorities will only sign a certificate for 1 year. At that time the certificate must be resigned.

**Step 7** View the details of the CSR with the following command:

```
openssl req -noout -text -in server.csr
```

When submitting the request, it may be necessary to view the file and copy text from it for submission to the Certifying Authority (CA).

**Step 8** Send the CSR to a Certifying Authority for signing. There are several commercial options available or you can sign your own if you have the capability. The output of either process is a `server.crt` file.**Step 9** Edit the

`/usr/local/blackboard/apps/httpd/conf/httpd.conf` file to include the following directive: `Include conf/ssl.conf`

**Step 10** Edit the

`/usr/local/blackboard/apps/httpd/conf/ssl.conf` file by modifying the following directives, as shown below:

```
SSLCertificateFile /<path>/server.crt
SSLCertificateKeyFile /<path>/server.key
```

**Step 11** Restart the server.

**Step 12** The SSL Choice feature can now be used to select which areas of the *Blackboard Learning System* use SSL. For more information on using SSL Choice, please see [SSL Choice](#).

---

## SSL Choice

---

### Overview

If Apache is configured to support SSL, then the communication between users and the *Blackboard Learning System* can be configured using the SSL Choice feature. SSL Choice allows Administrators to determine if none, all, or some of the *Blackboard Learning System* is secured with SSL.

**Note:** If the SSL Choice is set to use SSL before SSL is configured in Apache the *Blackboard Learning System* will not be accessible! To ensure that users can always login, configure Apache for SSL prior to changing the security options on the SSL Choice page.

If planning on using SSL, Blackboard recommends enforcing SSL on the entire system. This ensures that all proprietary data is secured. If the choice option is chosen, it is important to update SSL settings whenever a new tool is enabled or a System Extension added.

ADMINISTRATION PANEL > SSL CHOICE

### SSL Choice

**1 Instructions**

Select the areas of the application that will require Secure Sockets Layer communication between the Blackboard server and the client browser.

*Note: Changes to these settings may require restarting your webserver, and possible webserver configuration changes.*

**2 Entire System**

Disable SSL System-wide  
 Enable SSL System-wide  
 Enable SSL in select areas of the system (as indicated in subsequent sections)

**3 System Specific Areas**

Personal Information Areas  
 Admin Tab

**4 Blackboard Tools**

Academic Resources       Address Book  
 Announcements             Collaboration  
 Communications             Community Tab  
 Content Area                 Courses Tab

### Find this page

Click **SSL Choice** from the Security and Integration section of the System Control Panel.

---

## Fields

The table below details the fields on the SSL Choice page.

| Field                                                                                             | Description                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Entire System</b>                                                                              |                                                                                                                                                                                 |
| <b>Disable SSL System-wide</b>                                                                    | Select this option and SSL will not be used to secure any of the communication between users and the <i>Blackboard Learning System</i> .                                        |
| <b>Enable SSL System-wide</b>                                                                     | Select this option and SSL will be used to secure all of the communication between users and the <i>Blackboard Learning System</i> .                                            |
| <b>Enable SSL for the following areas</b>                                                         | Select this option to determine which areas of the <i>Blackboard Learning System</i> will be secured through SSL. Select the different areas from the check boxes on this page. |
| <b>System Specific Areas</b>                                                                      |                                                                                                                                                                                 |
| Select the check box for each area that should be secured using SSL.                              |                                                                                                                                                                                 |
| <b>Blackboard Tools</b>                                                                           |                                                                                                                                                                                 |
| Select the check box for each tool, tab, or course content area that should be secured using SSL. |                                                                                                                                                                                 |
| <b>System Extension Tools</b>                                                                     |                                                                                                                                                                                 |
| Select the check box for each System Extension that should be secured using SSL.                  |                                                                                                                                                                                 |

## Chapter 6—Web Email

---

### Overview

This chapter reviews how to install and enable Web Email. Web Email is a front-end Email application that lets users view an email account from within the *Blackboard Learning System*.

---

### In this chapter

Chapter 6—Web Email includes the following topics.

| Topic                                  | Description                                                         |
|----------------------------------------|---------------------------------------------------------------------|
| <a href="#">About Web Email</a>        | This topic introduces Web Email.                                    |
| <a href="#">Web Email Installation</a> | This topic details the steps for installing and enabling Web Email. |

---

## About Web Email

---

### Overview

The *Blackboard Learning System* includes the Web Email feature available in previous versions. Web Email provides an interface within the *Blackboard Learning System* for Users to access an Email account (usually managed by the institution). Once Web Email is installed and enabled a feature for accessing Web Email will appear as a tool within the user interface.

Web Email is provided as a separately licensed product. It is only available to those customers that have already licensed Web Email with a previous version. Please contact your Account Manager with any questions regarding the availability of Web Email.

---

### How does Web Email appear to users?

Web Email appears to users as an additional tool in the Tool Panel on the user interface. When they click the link to access the tool, users are taken to a separate interface that displays the messages in an email account.

---

## Web Email Installation

---

### Overview

Web Email is treated as System Extension within the user interface. To install Web Email, a software package must first be installed before installing and enabling the System Extension.

Installing and enabling Web Email is a simple process.

- Make sure that the *Blackboard Learning System* includes licensing for Web Email. If it does not, obtain a new license file from Blackboard and use the `LicenseReplace` utility to update the license.
  - Obtain the Web Email package.
  - Install the Web Email package.
  - Install and enable the Web Email System Extension.
- 

### Before installing the SMMS Web Email package

The Web Email installer will prompt for the following information.

- Path to the *Blackboard Learning System* home (blackboard) directory. (Example: `/usr/local/blackboard`)
- The Domain name for the mail server or mail servers that will be used with Web Email.
- The Email address of the Administrator.

If a copy of the Web Email package is not available please contact your Blackboard Account Manager.

---

**Installing the SMMS Web Email package**

Follow the steps below to install the SMMS Web Email package.

**Step 1** Obtain one the following packages depending on the operating system.

Linux:

```
SMMS_Linux_Install.bin
```

Solaris:

```
SMMS_Solaris_Install.bin
```

**Step 2** Make the .bin file executable.

```
chmod +x SMMS_Solaris_Install.bin
```

**Step 3** Run the installer.

```
./SMMS_Solaris_Install.bin
```

---

**Install and Enable the System Extension**

After installing the Web Email package the Web Email System Extension must be downloaded and installed. If you have trouble locating the Web Email System Extension contact your Blackboard Account Manager or Blackboard Technical Support. After the System Extension is installed and enabled Web Email will be accessible as a tool.

**Step 1** Download the Web Email System Extension (.WAR file) from Blackboard.

**Step 2** Install the System Extension.

**Step 3** Make the System Extension available through the Manage System Extensions feature on the System Control Panel.

**Step 4** Make Web Email available on the Tools Panel.

---



**Configuring Web Email to work with multiple mail servers**

Many institutions with great numbers of email accounts will use more than one mail server to handle them all. Web Email can be set to work with multiple mail servers by simply editing a configuration file.

To use multiple mail servers, edit the `SMMS.conf` file in `/usr/local/blackboard/apps/smms` by adding additional entries as shown in the example below.

```
imapserver mail1.yourinstitution.com
imapserver mail2.yourinstitution.com
```

or

```
popserver mail1.yourinstitution.com
popserver mail2.yourinstitution.com
```

---

**Uninstall the SMMS Web Email package**

To uninstall the SMMS Web Email package change directories to `/usr/local/blackboard/tools/uninstall` and run the following command:

```
java -cp smms_uninstall.jar run -console
```

---

## Chapter 7—Scale with Multiple Web/app servers

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### Overview

This chapter provides information on configuring a hardware environment with multiple Web/app servers to support the *Blackboard Learning System*. This type of configuration is designed to handle systems that support several thousand users and content-rich courses.

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### In this chapter

Chapter 7—Scaling with Multiple Web/app servers includes the following topics.

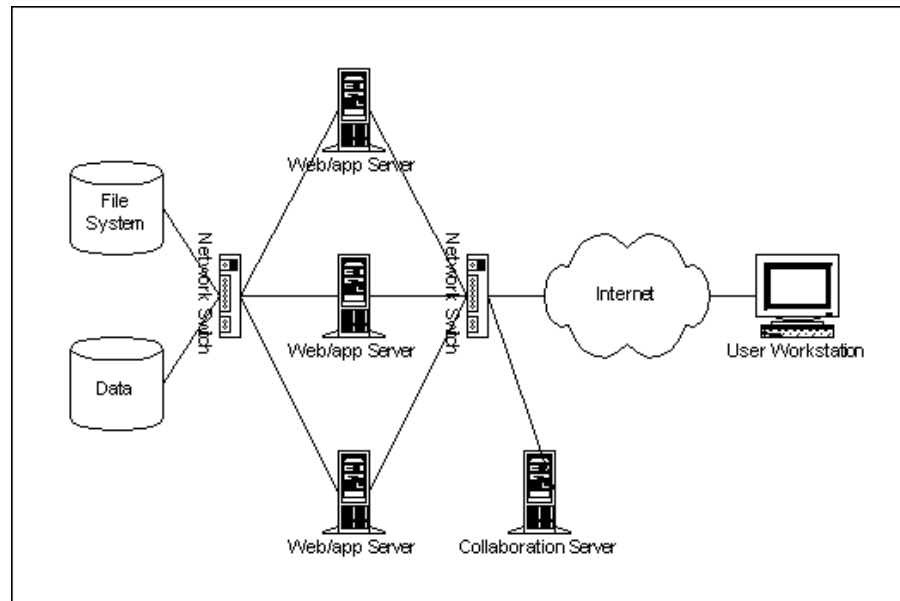
| Topic                                                                                     | Description                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">Scale the <i>Blackboard Learning System</i> with Multiple Web/app servers</a> | This topic introduces some of the concepts important to scaling the <i>Blackboard Learning System</i> with multiple Web/app servers. This is the only topic in the chapter. |
| Configuring SSL for the Collaboration Tool                                                | This topic explains how to secure collaboration sessions in multiple Web/app server environment using SSL.                                                                  |

---

## Scale the *Blackboard Learning System* with Multiple Web/app Servers

### Overview

The *Blackboard Learning System* supports installation across multiple Web/app servers. The diagram below shows the basic architecture of a multiple Web/app server configuration.



### Basic architecture

The basic architecture includes as many as six Web/app servers and three additional servers: a database server, a file system server, and a Collaboration Tool server. A network switch is used to handle communications from the client machines to the Web/app servers and the collaboration server. A separate switch is used to handle a secure, private connection between the Web/app servers and the file system and database servers.

**Benefits of scaling out the Web/app servers**

Scaling out distributes the computing workload among multiple servers by clustering or load balancing, with the ability to add servers to increase capacity. By distributing the workload, processing resources are spread among multiple servers, which improves both performance and the availability of the overall service. Downtime is reduced with a scale out approach because most single points of failure are removed. Should a server go down, other servers pick up the load dynamically, enabling the application to continue servicing clients.

---

**Load-balancing methods**

Institutions can use the load-balancing method of their choice as long as it adheres to a few basic principles:

- The load-balancing method must use session affinity.
  - The blackboard/content directory must be off-loaded to a separate server and shared by all the Web/app servers. The share must be set up prior to installing the *Blackboard Learning System*.
  - A separate server must be configured for the Collaboration Tool.
  - If SSL is used, the same certificate must be shared by all the Web/app servers.
  - The `/etc/hosts` file must have an entry for the virtual IP's hostname that points to the localhost (127.0.0.1).
- 

**Install Blackboard Learning System on Web/app servers**

Install *Blackboard Learning System* as a full two-server configuration on the first Web/app server. This will set up the database, install the application on the Web/app server, and the file system will be installed on the shared file system server.

Run the installer on the other app servers choosing the option to **Add application server to existing system**. Make sure that the passwords entered match on each Web/app server.

---

## Setup a separate collaboration server

The Collaboration Tool must be run on a dedicated server and not spread across the Web/app servers. This enables different users to join the same Collaboration Session. Follow the steps below to configure a separate Collaboration server.

**Step 1** Install an additional Web/app server on a machine that is not configured as part of the multiple server environment. This Web/app server must have a hostname separate from the multiple Web/app configuration host name. Finally, the Collaboration server must be resolved on the DNS server so that it is accessible via the Internet.

**Step 2** On the first Web/app server, stop services and edit the following value in the `bb-config.properties` file so that it points to the full hostname of the Collaboration server.

```
bbconfig.collabserver.fullhostname.default=hostname.domain_name
```

**Step 3** Run the `PushConfigUpdates` command.. See [Command Line Tools](#) for more information on this command.

**Step 4** Start the `bb-tomcat` and Apache services. Do not start the `bb-collab` service. The `bb-collab` service should always be stopped on the Web/app servers.

**Step 5** Repeat steps 2 through 5 for all Web/app servers.

**Step 6** Stop the `bb-tomcat` service on the Collaboration server.

---

## Configuring SSL for the Collaboration Tool

---

### Overview

Setting up SSL to encrypt connections to the *Blackboard Learning System* does not secure the Collaboration Tool because the Collaboration Tool uses Tomcat, not Apache or IIS, to handle user connections and serve pages. Securing the Collaboration Tool requires using a separate SSL certificate with Tomcat.

Most institutions do not need to worry about securing the Collaboration Tool because the Collaboration Tool is not used to transmit sensitive data. It should also be noted that using SSL with the Collaboration Tool slows down performance of the tool. Consider both the need for security and the performance slow down associated with applying SSL before deciding to use SSL with the Collaboration Tool.

As part of the process, a keystore and a self-signed certificate are created. A keystore is a file that stores certificates. A self-signed certificate is a certificate created by you that is not submitted to a Certifying Authority. In most cases, taking the extra step to go through a Certifying Authority is not necessary when securing the Collaboration Tool. Certifying Authorities are used to prove to users of a Web site that the connection is secure and verified by a trusted third party. Users accessing the Collaboration Tool from your *Blackboard Learning System* most likely do not require the validation of a third party before using the tool.

The process for configuring SSL for the Collaboration Tool has three steps:

- Step 1**      Verify that the necessary Java technology is installed on the server that runs the Collaboration Tool.
- Step 2**      Create a keystore.
- Step 3**      Configure Tomcat properties to use SSL encryption.

---

### Verify Required Java Technology

Java 2 SDK version 1.4.2 includes the necessary technologies to create the required keystore.

Those that have not upgraded to Java 2 SDK version 1.4.2 may still create a certificate, but first must download JSSE 1.0.2 or later from <http://java.sun.com/products/jsse>. After download, unpack the compressed package then copy the `jnet.jar`, `jcrt.jar`, and `jsse.jar` files to `C:\jdk1.3.1_08\jre\lib\ext`.

---

## Create the keystore

After creation the keystore contains a self-signed SSL certificate specifically for Tomcat, <tomcat>.

To create the keystore and certificate, follow these steps:

- Step 1** Log on to the Web/app server as the user that runs the *Blackboard Learning System*.
- Step 2** Run the following from the command line:

```
C:\>%JAVA_HOME\bin\keytool -genkey -alias tomcat -keyalg
RSA
```

The keystore will be created in the home directory of the user that runs the command (this is why it is important to log on as the user that runs the *Blackboard Learning System*).

- Step 3** The first prompt asks for a password for the keystore. The default password that Tomcat expects is "changeit", but it is recommended that another password be used. Tomcat can be configured later to accept the new password.
- Step 4** The next few prompts ask for information about the person creating the certificate. This information will appear to users when they first access the Collaboration Tool over SSL. Users are prompted to accept the certificate so it is important to provide accurate information so that users trust the certificate. The information recorded is:
- First and Last Name
  - Organizational Unit
  - Organization
  - City or Locality
  - State or Province
  - Two-letter country code
- Step 5** The last prompt asks for the password for the <tomcat> certificate. This password must be the same as the password entered in Step 2. Simply press ENTER to confirm that the same password will be used.

The keystore will be created in the home directory (or the specified directory) of the user that created the command. The file name is .keystore.

### Configure Tomcat to work with the SSL Certificate

After creating the keystore and certificate, the last step is to edit the `blackboard\apps\tomcat\conf\server.xml` file. Follow these steps to edit the file to work with SSL:

**Step 1** Stop the *Blackboard Learning System* services on the Web/app server.

**Step 2** Make a backup of the following file:

```
blackboard\apps\collab-
server\http\tomcat\conf\server.xml
```

Keep it safe so that the original settings can be restored.

**Step 3** Open the `server.xml.bb` file in Notepad or an XML editor.

**Step 4** Find the following code sample in the file. Note that the sample is commented out.

```
<!-- Define a SSL Coyote HTTP/1.1 Connector on port 8443 -->
<!--
 <Connector className="org.apache.coyote.tomcat4.CoyoteConnector"
 port="8443" minProcessors="5" maxProcessors="75"
 enableLookups="true"
 acceptCount="100" debug="0" scheme="https" secure="true"
 useURIVValidationHack="false" disableUploadTimeout="true">
 <Factory
 className="org.apache.coyote.tomcat4.CoyoteServerSocketFactory"
 clientAuth="false" protocol="TLS" />
 </Connector>
-->
```

The Connector element defines the standard attributes of the send/receive processes. Only the Factory element may be embedded within a Connector element.

**Step 5** Uncomment and edit the code block to configure Tomcat to work with SSL. The `keystorePass` attribute must be added to the `Factory` element and the value must match the password for the keystore and the `<tomcat>` certificate within the keystore. (If the default password, "changeit" is used, it is not necessary to include the `keystorePass` attribute. However, keep in mind that changing the password is recommended for better security.)



```

<!-- Define a SSL Coyote HTTP/1.1 Connector on port 8443 -->
 <Connector className="org.apache.coyote.tomcat4.CoyoteConnector"
 port="8443" minProcessors="5" maxProcessors="75"
 enableLookups="true"
 acceptCount="100" debug="0" scheme="https" secure="true"
 useURIVValidationHack="false" disableUploadTimeout="true">
 <Factory
 className="org.apache.coyote.tomcat4.CoyoteServerSocketFactory"
 clientAuth="false" protocol="TLS" keystorePass="PASSWORD"
 />
 </Connector>

```

When editing the code block keep the following in mind:

- If the `port` attribute is changed remember to change the `redirectPort` attribute in the other configured `Connector` elements to point to the new port value.
- Do not change the `port` attribute to a port below 1024.
- To set a new location for the `.keystore` file, add the `keystoreFile` attribute to the `Factory` element and include the full path to the file.

**Step 6** Run the `PushConfigUpdates` tool.

**Step 7** Save the file and start services.

**Step 8** Test the system. When accessing the Collaboration Tool, a prompt should appear to accept the certificate. After accepting the certificate, the Collaboration Tool will open and communications will be secured using SSL encryption.

**Step 9** Edit the `/blackboard/config/bb-config.properties` file to add the default collaboration ssl port number:  
`<bbconfig.collabserver.portnumber.ssl.default=8443>`

**For more information**

Advanced administrators interested in more detailed information outside the scope of this document should consult the JSSE documentation and the Tomcat documentation at <http://jakarta.apache.org/tomcat-4.0-doc/config/index.html>. The JSSE documentation can be helpful creating a keystore and certificate certified by a third party such as Verisign or Thawte. The Tomcat documentation includes additional details on the elements and attributes in the `server.xml` file.

Please remember to make backups of any files before making changes so that the original settings can be restored.

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## **Appendix—Updates Since Publication**

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This document was published on February 9, 2004.

There have been no updates since publication.