



RED HAT TRAINING & CERTIFICATION

CLASSROOM REQUIREMENTS

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ABOUT THIS DOCUMENT

This document specifies the minimum requirements a training classroom must meet in order to run Red Hat training courses, as of January 19, 2012. Attempting to run courses in classrooms which do not meet these requirements is not supported.

Red Hat is not responsible for any damages related to Client's failure to provide an appropriate facility and/or equipment as described below.

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GENERAL CLASSROOM REQUIREMENTS

The baseline classroom configuration for Red Hat training classes is described in this section. This baseline may then be adjusted by course-specific requirements in subsequent sections.

Classroom Network

A wired Ethernet network must be used to connect the instructor machine and student machines. This network must be isolated to the classroom. That is, machines in other classrooms or in the facility must not be connected to the network. Detailed specifications for the standard network requirements follow.

Important Note: Wireless networking is not to be used to meet these specifications. **Wireless NICs are not permitted for use in exams or in courses, and must be removed from student machines.**

- **Switched Fast Ethernet (100 Mbps) minimum.** Gigabit Ethernet is recommended, and some courses require it.
- **Isolated classroom network.** Only machines in use for the class may be connected to the classroom network. DHCP will be used on that network to assign IP addresses to student machines.

Classroom Internet Access

- **A network connection to the external Internet for the classroom is required for all JBoss exams and the Red Hat Directory Services and Authentication (RH423) course** (see page 8 for details)
- **A network connection is recommended for all remaining courses and exams.** External Internet access is recommended for custom on-site training sessions, and is a strict requirement for some courses. (If Internet access is required for a course, additional guidance is provided in that course's section below.)

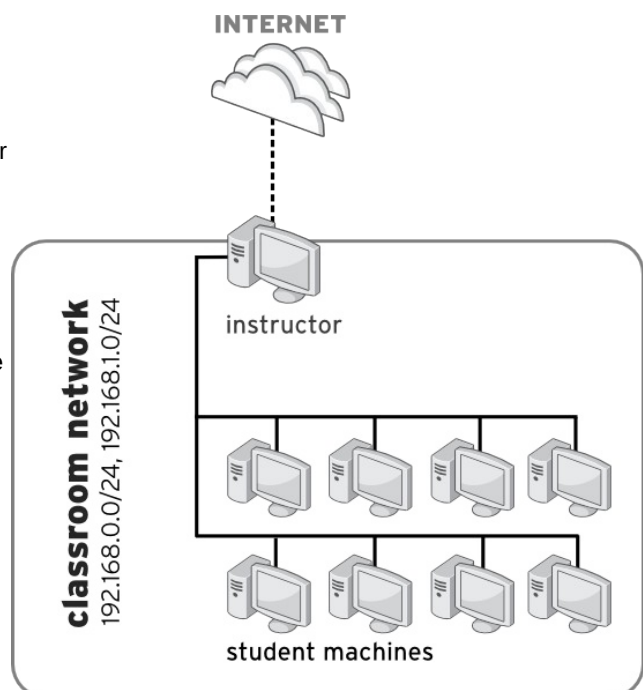
This does not need to be a direct connection to the external Internet, but may be routed to and from it through facility networking. The second NIC on the instructor machine should be attached to this network connection so the instructor can control classroom Internet access as needed.

- **Reserved network addresses.** The classroom may use the following IP address ranges:
 - 192.168.0.0/24
 - 192.168.1.0/24

Facility networking must accommodate classroom assignment of these addresses if Internet access is provided.

Environment

- **Overhead projector with projection screen** capable of 1280x1024 resolution at 2000 ANSI lumens brightness. (1440x1050 resolution recommended for JBoss training courses.)
- **Whiteboard or flip chart** for instructor use with appropriate writing materials.
- **Sufficient desk space** so that students can take notes while working with the computers.
- **Minimal ambient noise and appropriate temperature control** to provide a comfortable learning environment.



CLASSROOM COMPUTING HARDWARE

Most courses require one instructor computer, and one computer per student. This section details the minimal configuration required for these machines. **However, some courses require more capable hardware and/or additional computers.** See the course-specific sections below for details.

Classroom delivery of Red Hat training courses requires physical computers. These specifications can not be met by providing purely virtualized student machines (for example, on VMware or other solutions) or cloud-based solutions. Red Hat training courses routinely use and/or teach the use of virtual machines in the classroom, using the KVM hypervisor integrated into the Red Hat Enterprise Linux (“RHEL”) operating system. (Red Hat does offer virtual training delivery options, the requirements for which are beyond the scope of this document. For some on-site courses, these options can be used in order to provide a classroom environment. Contact Red Hat for details.)

Standard classroom computers

- x86-64 processor, with Intel VT or AMD-V virtualization support, Intel Core 2 Duo class or better. (Additional guidance is provided at the end of this document.)
- 2 GB of RAM minimum. (4 GB of RAM strongly recommended.)
- 100 GB hard disk space minimum. SATA controllers should be set to Native (AHCI) mode in the BIOS.
- One Fast Ethernet (100 Mbps) NIC required (Gigabit Ethernet recommended).
 - **Instructor machine requires two NICs** if Internet access is provided
- DVD-ROM drive and USB2 external port
- All student machines should use identical hardware (**required** for exam sessions)
- Exam sessions require one extra student machine to be available
- Hardware must be supported by the version of the operating system used in the course
- The classroom instructor and students will re-install the operating system and other software on machines being used for the course. For most classes, the instructor will re-install all machines at the start of the course to provide a consistent environment. It should be expected that software and data on the systems being used for the course may be deleted and the systems wiped. Red Hat is not responsible for any lost data.
- We also advise care in hardware selection to **use machines which do not generate excessive heat or fan noise in the classroom environment.** (For example, machines designed for rack-mounted data center use are generally not intended for use in a quiet office environment and are generally inappropriate for the classroom.)
- **Hardware must be accessible to the students in the actual classroom.** Placing hardware in a remote data center and requiring remote desktop access is normally not acceptable. (However, as mentioned above, some on-site sessions *may* be able to use Red Hat’s virtual training infrastructure to provide classroom hardware. Contact Red Hat for details and availability.)

COMPATIBLE HARDWARE

Ideally, use Red Hat certified hardware. When not available, perform a test installation of the relevant release and check if network, disk and graphics are functional.

RED HAT EXAMS

For Red Hat exams, classrooms must strictly follow the requirements to ensure the fairness and comparability of all exams worldwide.

COURSES WITH ADDITIONAL REQUIREMENTS

The following courses require more sophisticated hardware, additional computers, and/or special configurations of the classroom. **Please read through these requirements carefully. Some courses have special requirements described in the text below which can not be detailed in the summary table.**

Course	RAM required	Gigabit Ethernet required	Systems per student	Other? (see below)
All JBoss training courses	4 GB	no	1	yes
The following exams: EX297, EX311, EX336, & EX431	2 GB	no	1	yes
Red Hat Cloud Architecture (CL350)	4 GB	Yes	3 per 2 students	yes
Red Hat Enterprise Virtualization (RH318)	8 GB	Yes	2	yes
Red Hat Enterprise Virtualization Administrator Exam (EX318)	4 GB	Yes	2	yes
Red Hat Linux Troubleshooting (RH242)	4 GB	no	1	no
Red Hat Enterprise Deployment and Systems Management and Exam (RH401 / EX401)	4 GB	Yes	2	yes
Red Hat Directory Services and Authentication and Exam (RH423 / EX423)	2 GB	no	1	yes
Red Hat Enterprise Clustering and Storage Management (and Exam RH436 / EX436)	4 GB	Yes	1	yes
Red Hat Enterprise Security: Network Services Expertise Exam (EX333)	2 GB	no	2	yes
Red Hat Performance Tuning (RH442)	4 GB	Yes	1	no
Red Hat Enterprise Performance Tuning Expertise Exam (EX442)	2 GB	no	1	no

Additional Requirements Summary Table

All JBoss courses

- **4 GB RAM required**
- **Windows XP SP 2 may be pre-loaded** by the training facility on student machines. **(But see JB346 below.)** In addition:
 - Windows access privileges must allow students to install additional software
 - For JB433, Microsoft Excel or OpenOffice.org/LibreOffice Calc should be pre-installed
 - The instructor may replace the Windows installation with Red Hat Enterprise Linux at student request
- **1280x1024 video resolution is required**, but we recommend 1440x1050 resolution for a more satisfactory student experience

USING YOUR OWN

Some participants ask if they may use their everyday laptop in a JBoss class.

Practice has shown that this severely impacts the effectiveness of our exercises, due to the additional time required for troubleshooting.

All machines must be freshly re-installed for class.

Advanced JBoss Administration (JB346)

- **Red Hat Enterprise Linux 5 or above is required** for this course. Machines will be re-installed by the instructor at the start of the course.

RHEL REQUIRED

JB346 discusses advanced administration concepts which are operating system dependent. The labs in this course have been developed and tested on Red Hat Enterprise Linux.

EX297, EX311, EX336, and EX431 Exams

- **Internet access for the classroom:** must permit communication on TCP ports 80, 443, and 22 to remote exam systems managed by Red Hat at 2 Mbps, with 250 ms latency or less. We have a bandwidth test tool which we recommend you run. Please contact us for details.

RHEL REQUIRED

The JBoss exams use locked-down RHEL-based desktops to connect to the remote exam environment. These systems must be installed by the instructor.

Red Hat Cloud Architecture (CL350)

- **4 GB RAM required**
- **Gigabit Ethernet required**
- **Three machines for every pair of students** (there should not be more than two students for every three student machines in the classroom)
- **Two additional machines for the use of the instructor** with the same configuration as student machines (not including the instructor machine normally specified)
- If possible, machines should have dual-core processors for a better student experience

WINDOWS LICENSES

For on-site courses the required Microsoft Windows licenses will be provided by Red Hat.

Training partners scheduling their own courses must provide their own licenses unless otherwise arranged.

In addition, the following requirement is set for training partners not running courses scheduled by Red Hat:

- **A Windows Server 2008 R2 license and a Windows XP or Windows 7 license** for the instructor and each student team, using an Edition of Windows Server capable of running an Active Directory domain controller.
- **The 10.8.0.0/16 network is reserved** for use in the classroom for this course, in addition to the networks in the “Classroom Internet Access” section above.

Red Hat Enterprise Virtualization (RH318)

- **8 GB RAM required**
- **160 GB hard disk space required**
- **Gigabit Ethernet required**
- **Two machines per student**
- **The “Execute Disable” (XD) CPU feature must be available and enabled in the BIOS on all machines.** This may be referred to as “Enhanced Virus Protection” (EVP) on AMD systems, or as the “No Execute” (NX) processor flag.
- **One additional machine for the use of the instructor** (this can be the same as the extra machine normally provided for EX318 if offered in conjunction with the class session)
- **SUN Ultra 20 hardware is NOT supported for this course;** Red Hat Training is investigating the use of this hardware with future software releases but does NOT approve use of this hardware at this time

In addition, the following requirement is set for training partners not running courses scheduled by Red Hat:

- **A Windows Server 2008 R2 license and a Windows 7 license** for each student and the instructor, using an Edition of Windows Server capable of running an Active Directory domain controller.

Red Hat Enterprise Virtualization Administrator Exam (EX318)

- **4 GB RAM required**
- **Gigabit Ethernet required**
- **Two machines per student**
- **Additional requirements identified under RH318 section above**

Red Hat Linux Troubleshooting (RH242)

- **4 GB RAM required** (Note: In Fall 2011, this course replaces *RH142 / Linux Troubleshooting Techniques and Tools*, which has a 2 GB RAM requirement.)

Red Hat Enterprise Deployment and Systems Management and Exam (RH401 and EX401)

- **4 GB RAM required**
- **Gigabit Ethernet required**
- **Two machines per student**
- **Two network interface cards (NICs) for each student machine** and each student must have a **network cable** which can be used to connect them

WINDOWS LICENSES

For on-site courses the required Microsoft Windows licenses will be provided by Red Hat.

Training partners scheduling their own courses must provide their own licenses unless otherwise arranged.

Red Hat Enterprise Directory Services and Authentication and Exam (RH423 and EX423)

For this course / exam, you must provide either

- **Internet access for the classroom:** must permit communication on TCP port 1194 to allow access to remote training hardware managed by Red Hat.
- **OR An extra machine installed with Windows Server 2003 (Standard Edition)** which can be configured as a domain controller for AD.EXAMPLE.COM by the instructor. ***This is the only option for training partners scheduling their own courses unless otherwise arranged.***

WINDOWS LICENSES

For on-site courses the required Microsoft Windows licenses will be provided by Red Hat.

Training partners scheduling their own courses must provide their own licenses unless otherwise arranged.

Red Hat Enterprise Clustering and Storage Management and Exam (RH436 and EX436)

- **4 GB RAM required**
- **Gigabit Ethernet required**
- **The 172.16.0.0/16 and 172.17.0.0/16 networks are reserved** for use of the classroom for this course, in addition to the networks in the “Classroom Internet Access” section above.

Red Hat Performance Tuning (RH442)

- **4 GB RAM required**
- **Gigabit Ethernet required**

Red Hat Enterprise Performance Tuning Expertise Exam (EX442)

- **2 machines per examinee are required** (even though the associated courses only require one machine per student)

CPU SPECIFICATION AND HARDWARE VIRTUALIZATION SUPPORT

All classroom machines should use 64-bit capable x86-64 processors which support the use of either Intel VT-x or AMD-V virtualization extensions. On a system installed with Red Hat Enterprise Linux, a CPU supporting these features will show the `lm` flag, and either the `vmx` (Intel VT-x) or `svm` (AMD-V) flag in the file `/proc/cpuinfo`. In addition, support for virtualization extensions must not be disabled by the machine's BIOS. Processors must be of the Intel Core 2 Duo class or better for acceptable classroom performance.

While not exhaustive, **the following processor models are believed to be supported** for classroom use:

- most Intel Core 2 processors (but verify with vendor, see known problem list below)
- Intel Core i3, Intel Core i5, and Intel Core i7
- Intel Xeon models released after May 2006
- AMD Athlon 64 / AMD Athlon 64 X2 released after May 2006
- AMD Athlon X2, AMD Athlon Neo, AMD Phenom
- most AMD Turion (but verify with vendor, see known problem list below)

- AMD Opteron 1xxx/2xxx/8xxx processor families

This list is subject to change as new processors become available. Again, the critical features which must be available are the 64-bit x86-64 processor architecture and either Intel VT-x or AMD-V hardware virtualization support.

Known Problem List

The following processor models are **not supported for classroom use** as they do not support hardware virtualization and/or are not 64-bit x86-64 processors:

- The following Intel Core 2 (Duo/Quad) processors:
 - *Particularly problematic*: some E7400, some E7500, some Q8300
 - E4xxx family, E7200, E7300, E8190
 - Q8200, Q8200S
 - T5xxx family (except T5600), T6xxx family
 - P7350, P7450
- Intel Atom
- all Intel Pentium 4 and earlier, Pentium M, Pentium D, Pentium Dual-Core, Intel Core, Intel Celeron
- most "Intel Pentium" processors are *problematic* because very few support hardware virtualization. Check with your hardware vendor.
 - *Particularly problematic*: some E5300, some E5400
- AMD Sempron
- AMD Turion ML-* and MT-* families
- AMD Opteron 1xx/2xx/8xx families

This list is not exhaustive and is subject to change.

In addition, some processors which are believed to be supported may have the hardware virtualization support disabled in the BIOS as shipped from the factory. This feature must be enabled by default in the classroom. Some instructions on how to check this are available online at <http://docs.redhat.com> in Chapter 28 of the *RHEL 5 Virtualization Guide*.

CURRENT OPERATING SYSTEM REQUIREMENTS

Hardware used for the following classes must support the version of Red Hat Enterprise Linux (RHEL) listed in the table below unless otherwise approved by Red Hat. This list is subject to change.

<i>Course</i>	<i>RHEL OS version</i>
System Administration I (RH124)	6.0
System Administration II with RHCSA Exam (RH135)	6.0
RHCSA Rapid Track Course with RHCSA Exam (RH200)	6.0
Red Linux Troubleshooting (RH242)	6.1
System Administration III with RHCSA and RHCE Exams (RH255)	6.0
Red Hat Enterprise Linux for Solaris Administrators (RH290)	6.0
RHCE Rapid Track Course with RHCSA and RHCE Exams (RH300)	6.0
Red Hat Enterprise Virtualization (RH318)	6.2
Red Hat Enterprise Security: Network Services (RHS333)	5.1
Red Hat Enterprise Deployment and System Management (RH401)	5.6 and 6.0
Red Hat Enterprise Directory Services and Authentication (RH423)	5.1
Red Hat Enterprise SELinux Policy Administration (RHS429)	5.1
Red Hat Clustering and System Management (RH436)	5.4
Red Hat Enterprise System Monitoring and Performance Tuning (RH442)	6.2
Red Hat Cloud Architecture (CL350)	5.6 and 6.0
<i>All RHD developer courses</i>	5.4
<i>All JBoss Enterprise Middleware courses</i>	5.4