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RED HAT TRAINING & CERTIFICATION

CLASSROOM REQUIREMENTS

VERSION: 2012-07-26

ABOUT THIS DOCUMENT

This document specifies the minimum requirements a training classroom must meet in order to run Red Hat training courses, as of July 26, 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

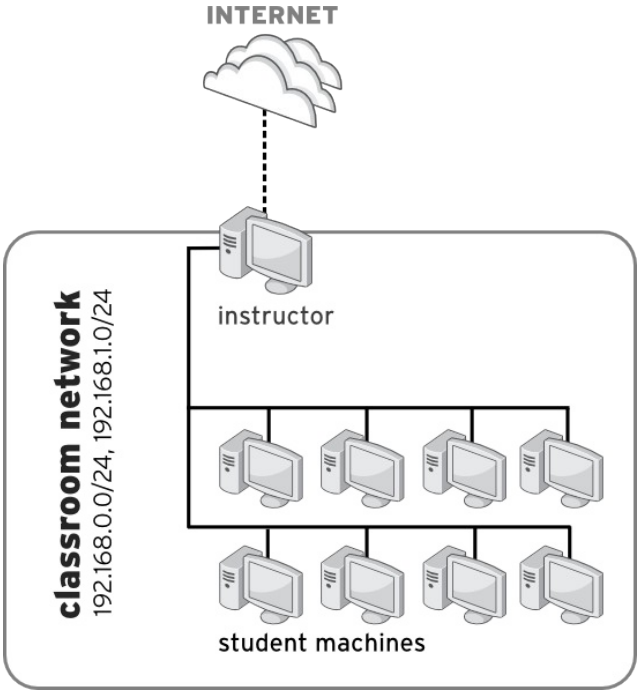
The baseline classroom configuration for Red Hat training classes is described in this section. This baseline may then be adjusted by course-specific requirements in subsequent sections.

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.**

- **Gigabit Ethernet (1000 Mbps) minimum.**
- **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 internet is required for all JBoss exams** (see page 7 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
  - 172.24.0.0/16
  - 172.25.0.0/16

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

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.

Classroom delivery of Red Hat training courses and exams requires physical computers. These specifications cannot be met by third-party virtual machines (e.g., Vmware, Citrix) or cloud-based solutions. Red Hat training courses and exams routinely use and/or teach the use of virtual machines in the classroom using the KVM hypervisor included with Red Hat Enterprise Linux (RHEL). 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

RED HAT EXAMS

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

- 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.)
- 4 GB of RAM minimum. (8 GB of RAM for select courses)
- 100 GB hard disk space minimum. SATA controllers should be set to Native (AHCI) mode in the BIOS.
- Gigabit Ethernet required
  - **Instructor machine requires two NICs** if Internet access is provided
- DVD-ROM drive and USB2 external port
- Machines with UEFI BIOS should be placed in “legacy BIOS” mode to avoid issues. We recommend avoiding machines which *only* support UEFI boot for now due to the number of firmware-related issues reported. Some courses currently *require* “legacy BIOS” support (RH318 and CL260).
- All course participant machines should use identical hardware (**required** for candidate systems in exam sessions)
- Exam sessions require one extra candidate machine to be available
- Hardware must be supported by the operating system release used in the course
- The operating system and other software on machines being used for courses and exams will be overwritten without backup. 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 participants 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.)

COURSES AND EXAMS WITH ADDITIONAL REQUIREMENTS

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

Courses and Exams	*RAM required*	*Gigabit Ethernet required*	*Systems per participant*	*Other? (see below)*
All JBoss training courses	4 GB	**yes**	1	**yes**
The following exams: EX297, EX311, EX336, & EX431	2 GB	no	1	**yes**
Red Hat Enterprise Virtualization (RH318)	**8 GB**	**yes**	**2**	**yes**
Red Hat Enterprise Virtualization Administrator Exam (EX318)	**8 GB**	**yes**	**2**	**yes**
Red Hat Linux Troubleshooting (RH242)	4 GB	**yes**	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)	4 GB	**yes**	1	**yes**
Red Hat Enterprise Clustering and Storage Management and Exam (RH436 / EX436)	**8 GB**	**yes**	1	**yes**
Red Hat Performance Tuning (RH442)	4 GB	**yes**	1	no
Red Hat Performance Tuning Expertise Exam (EX442)	4 GB	no	1	no
Deploying Systems in Cloud Environments (CL260)	**8GB**	**yes**	**4 per 3 students**	**yes**

Additional Requirements Summary Table

All JBoss courses

- **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 is the only supported operating system 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 at 2 Mbps, with 250 ms latency or less to remote exam systems managed by Red Hat. We have a bandwidth test tool that 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 exam proctor.
Red Hat Enterprise Virtualization and Exam (RH318 / EX318) • **8 GB RAM required** • **160 GB hard disk space required** • **Two machines per course participant / exam candidate** • **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. • **Two additional machines for the use of the instructor** • **Machines must support "Legacy BIOS" mode for booting.** (UEFI-only systems can not be used for this class at this time due to temporary RHEV-H limitations.) • **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 course participant and the instructor, using an Edition of Windows Server capable of running an Active Directory domain controller.	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 Deployment and Systems Management and Exam (RH401 and EX401)

- **Two machines per course participant / exam candidate.** One of the machines will run RHEL 5.6 and the other will run RHEL 6.0.
- **Two network interface cards (NICs) for each course participant/exam candidate machine** and one **network cable** to connect them

Red Hat Enterprise Directory Services and Authentication (RH423)

- **One extra machine installed with Windows Server 2008R2 (Standard Edition) that can be** configured as a domain controller for AD.EXAMPLE.COM by the instructor/exam proctor. ***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)

- **8 GB RAM required**
- **One additional machines for the use of the instructor** (this can be the same as the extra machine normally provided for EX436 if offered in conjunction with the class session)
- **The 172.16.0.0/16 is reserved** for use of the classroom for this course, in addition to the networks in the "Classroom Internet Access" section above. 172.17.0.0/16, 172.18.0.0/16, and 172.19.0.0/16 are used as virtual networks but not routed outside of the student machines.

Deploying Systems in Cloud Environments (CL260)

- **8 GB RAM Required**
- **160 GB hard disk space required**
- **The number of machines required per / student is represented in the chart below. Please review and be careful not to exceed the number of students based on available hardware.**
- **Two instructor machines are required. The two instructor machines are accounted for in the chart below.**

Number of Machines Availabile (including 2 instructor machines)	Number of Students Allowed
4-5 (with 1 hypervisor)	1-2
7-9 (with 2 hypervisors)	3-5

11-13 (with 3 hypervisors)	6-8
15-17 (with 4 hypervisors)	9-11
19-21 (with 5 hypervisors)	12-14
23-25 (with 6 hypervisors)	15-17
27-29 (with 7 hypervisors)	18-20

- **Machines must support "Legacy BIOS" mode for booting.** (UEFI-only systems can not be used for this class at this time due to temporary RHEV-H limitations.)
- **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.
- If possible, machines should have dual-core processors
- **Internet access is required** in the classroom in order to access to the Amazon EC2 Cloud

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

- A Windows Server 2008 R2 license for the instructor using an Edition of Windows Server capable of running an Active Directory domain controller.

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 that 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.

Course	*RHEL OS version*
System Administration I (RH124)	6.0
System Administration II with RHCSA Exam (RH135)	6.0 (6.2 used for exam)
RHCSA Rapid Track Course with RHCSA Exam (RH200)	6.0 (6.2 used for exam)
Red Hat Linux Troubleshooting (RH242)	6.2
System Administration III with RHCSA and RHCE Exams (RH255)	6.0 (6.2 used for exam)
Red Hat Enterprise Linux for Solaris Administrators (RH290)	6.0
RHCE Rapid Track Course with RHCSA and RHCE Exams (RH300)	6.0 (6.2 used for exam)
Red Hat Enterprise Virtualization (RH318)	6.2
Red Hat Enterprise Security: Network Services (RHS333) and exam (EX333)	5.8 (6.2 also available for exam)
Red Hat Enterprise Deployment and System Management (RH401) and exam (EX401)	5.6 (6.0 also available for exam)
Red Hat Enterprise Directory Services and Authentication (RH423) and exam (EX423)	5.8
Red Hat Enterprise SELinux Policy Administration (RHS429) and exam (EX429)	5.8 (6.2 also available for exam)
Red Hat Enterprise Clustering and Storage Management (RH436) and exam (EX436)	6.2
Red Hat Enterprise Performance Tuning (RH442) and exam (EX442)	6.2
Deploying Systems in Cloud Environments (CL260)	6.2
All RHD developer courses ***(*RHD355 runs on RHEL6.2 only)***	5.4
All JBoss Enterprise Middleware courses	6.2
All Jboss Enterprise Middleware exams	6.2 (5.4 also available as alternative)

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