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CLASSROOM REQUIREMENTS

13-Jul-2017

Fast Facts

- Meeting classroom requirements is critical for successful Red Hat training events.
- Most events use one computer system per person. Exact requirements vary for each course, documented in this guide.
- For Instructor-Led Training (ILT) classrooms, physical computer systems are required. Virtualized desktops or similar virtual machines are not supported.
- In ILT classrooms, the physical computer system's operating system will be installed by the instructor prior to the starting time on the first day of class. This required installation will overwrite the system's disks.
- For Virtual Training (VT or ROL) classrooms, students may use any computer with a supported browser and properly-tested access to the remote Red Hat classroom.

Desktops vs. Servers

Our classes are designed to use typical desktop or laptop hardware. Server hardware is not appropriate for noise, power and configuration reasons. Servers in a data center can not be used because of security, connectivity and liability reasons.

INTRODUCTION

Red Hat Training classes are highly interactive and thus depend on a well supported classroom. We use automated classroom setup procedures to ensure a consistent and efficient training environment. This document specifies the minimum requirements a training classroom must meet in order to run Red Hat training courses.

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.** Please follow the below requirements. If you have any questions regarding the specifications, please contact your Red Hat Training representative.

THE BASELINE CLASSROOM

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 ENVIRONMENT

- **Overhead projector with projection screen** capable of 1280x1024 resolution at 2000 ANSI lumens brightness, preferably with HDMI connection. Alternatively, a **large screen (55" or greater) LCD/LED television or monitor** (HD resolution or better) with HDMI connections. Minimum 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.

COMPUTERS

Red Hat courses utilize a state of the art lab system that deploys exercises to student systems in an automated fashion. This system depends on a consistent environment that matches the following requirements. Our courses are set to a specific required hardware level. The number of machines per delegate and instructor may differ by course or exam. See the table "Course Specific Requirements" for details.

LEVEL I

- Intel Core i3 CPU with VT support or
  AMD Phenom X4 / AMD FX-4xxx with AMD-V
- 8 GB RAM
- 100 GB HDD on a single disk
- 1280x1024 Screen resolution (1440x1050 recommended for JBoss classes)
- Gigabit Ethernet
- USB2/DVD support (USB3 recommended)

LEVEL II

- Intel Core i5 CPU with VT support or AMD FX-6xxx with AMD-V
- 8 GB RAM
- 250 GB HDD on a single disk
- 1280x1024 Screen resolution (1440x1050 recommended for JBoss classes)
- Gigabit Ethernet
- USB2/DVD support (USB3 recommended)

Hard Disks
Our classroom environment is optimized for systems with a single disk. SSD drives are recommended as they offer a significant improvement in speed. Additional disks should be disconnected or disabled.

Spare Equipment
Hardware is known to fail on occasion. Every course event should have appropriate minimal quantity of spare computer systems, network switches, cables, and power strips.

Physical System Alternatives
Red Hat offers an appropriately sized Red Hat Mobile Kit directly to the event site in most regions. Red Hat also offers a remote-access, virtualized classroom environment for most courses. Discuss the requirements for these choices with your Red Hat Training representative.

Testing for Virtualization Support
On a system installed with Red Hat Enterprise Linux, you can use the tool **virt-host-validate** to check if virtualization is supported and enabled.

LEVEL III

- Intel Core i5 CPU with 4 cores and VT support or AMD FX-6xxx with AMD-V
- 16 GB RAM
- 250 GB HDD on a single disk (SSD recommended)
- 1280x1024 Screen resolution (1440x1050 recommended for JBoss classes)
- Gigabit Ethernet
- USB2/DVD support (USB3 recommended)

LEVEL IV

- Intel Core i7 CPU with VMCS shadowing support (Haswell or newer) or AMD FX-6xxx with AMD-V
- 32 GB RAM
- 250 GB HDD on a single disk (SSD strongly recommended)
- 1440x1050 Screen resolution
- Gigabit Ethernet
- USB3 support (boot from USB required)

GENERAL NOTES

- Systems will be **re-installed** without backup at the beginning of class to ensure a consistent environment. Red Hat is not responsible for any loss of data.
- All course participant machines should use identical hardware (**required** for candidate systems in exam sessions).
- At least one spare system should be available (required for exam sessions).
- **Physical hardware required.** Third-party virtual machines (e.g., VMware, Citrix) or cloud-based solutions are not supported. 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
- Red Hat recommends using classroom computer systems that have been **certified by Red Hat**. See https://hardware.redhat.com/ or https://access.redhat.com/ecosystem. When certified hardware is not available, test computer systems by performing an installation of the relevant operating system release, then confirm proper system, disk, network and graphics functionality.
- **Hardware must be accessible to the participants in the actual classroom.** Hardware in a remote data center and remote desktop access is not supported. Exception: Red Hat Virtual Training Platform for select classes.

BIOS SETTINGS

- Set machines with UEFI BIOS to “legacy BIOS”. We recommend avoiding machines which *only* support UEFI, due to firmware-related issues reported.
- Enable network booting (PXE).
- Set hard disks to AHCI (native). Disable RAID arrays.
- If a second hard drive is installed, deactivate the second drive in the BIOS or disconnect its data cable.
- 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.
- Activate virtualization (Intel VT/AMD-V)
- Boot order should be set to CD->Harddisk->PXE
- Disable wireless network cards on student machines
- If a second NIC is installed on student machines, disable in BIOS or remove from the system.
- BIOS passwords: Ensure that BIOS settings can be changed by instructor

NETWORK

The network configuration for Red Hat training classes is described in this section.

CLASSROOM NETWORK

A **wired** Gigabit Ethernet (1000Mbit) 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.
Wireless networks are not compatible and may not be used. **Wireless NICs must be removed from student machines for exams** for security reasons.

NETWORK SWITCH SETTINGS

- Factory default settings usually work best.
- All network ports of the classroom network must be connected to the same VLAN
- Disable all protocol filters. The isolated network deploys DHCP, TFTP, and other protocols that must be unfiltered/unmanaged.
- If Spanning Tree Protocol (STP) is used, please ensure that the 'Port Fast' option is also enabled.
- Disable any form of MAC address filtering or "Port Security" as the multiple virtual machines will represent numerous MAC addresses.

CLASSROOM INTERNET ACCESS

An internet connection is generally required for all courses and exams. A direct, external Internet connection is not required, but may instead be routed through facility networking. The second NIC on the Instructor machine is used for this Internet access, allowing an instructor to control or disable Internet access to the Classroom network. Although USB network adapters are insufficient for use on the Classroom network, either wired or wireless USB NIC adapters can be used for the Internet uplink as the second NIC. The use of a USB adapter will require manual configuration by the instructor.

Note: Certain classes **require** internet access to complete course exercises. At this time this includes:

- Managing Containers with Red Hat Enterprise Linux Atomic Host (RH270)
    - This class currently requires a >500MB download per student.
- Red Hat CloudForms Hybrid Cloud Management (CL220v4.1)
    - This class is run with VT-based labs only. All deliveries must be provisioned by your region's operations prior to the start of class.

Note: Red Hat Training utilizes the internet connection for exam monitoring. If no internet connection can be made available please contact your Red Hat Training representative.

Certified 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.

OS Version
The RHEL version noted refers to the operating system installed on the physical computer system, and may not represent the operating systems in the course virtual machines used by students during the course or exams.

WARNING: Legacy RHEL Versions
RHEL versions 6.3 and older are not compatible with the Intel Broadwell, Haswell and later architectures.

WARNING: Skylake processors
RHEL versions 7.2 and older are not compatible with the Intel Skylake and later architectures.

COURSE SPECIFIC REQUIREMENTS

SKU	Course & Exam Title	LVL	OS Version	Student Machines	Instructor Machines
CEPH125	Red Hat Ceph Storage Architecture and Administration	3	7.x	1	1
CEPH130	Red Hat Ceph Storage for OpenStack Technologies	3	7.x	1	1
CL110	Red Hat OpenStack Administration I	3	7.x*	1	1
CL210	Red Hat OpenStack Administration II	4	7.x*	1	1
CL220V3	Red Hat CloudForms Hybrid Cloud Management	3	7.x	2	2
CL220V4.1	Red Hat CloudForms Hybrid Cloud Management	1	7.x***	1	1
CL310	Red Hat OpenStack Administration III	3	7.x	1	1
DO180	Introduction to Containers, Kubernetes, and Red Hat OpenShift	3	7.x	1	1
DO276	Containerizing Software Applications	2	7.x	1	1
DO280	OpenShift Enterprise Administration	3	7.x	1	1
DO290	OpenShift Enterprise Development	3	7.x	1	1
DO405	Configuration Management with Puppet	3	7.x	1	1
DO407	Automation with Ansible	2	7.x	1	1
DO409	Automation with Ansible II: Ansible Tower	3	7.x	1	1
EX200	Red Hat Certified System Administrator (RHCSA) exam	1	7.3	1	1
EX210V6	Red Hat Certified System Administrator in Red Hat OpenStack exam	3	6.5 or 7.2	1	1
EX210V8	Red Hat Certified System Administrator in Red Hat OpenStack exam	4	7.3	1	1
EX220	Red Hat Certificate of Expertise in Hybrid Cloud Management exam	3	6.5	2	1
EX220V4	Red Hat Certificate of Expertise in Hybrid Cloud Management exam	4	7.3	1	1
EX225	Red Hat JBoss Certified Developer exam	3	6.5	1	1
EX234	Red Hat Certificate of Expertise in Application Server Management exam	3	7.0	1	1
EX236	Red Hat Certificate of Expertise in Hybrid Cloud Storage exam	3	7.3	1	1
EX248V6	Red Hat Certified JBoss Administration (RHCJA) exam	3	6.5	1	1
EX248V7	Red Hat Certified JBoss Administration (RHCJA) exam	3	7.2	1	1
EX270	Red Hat Certificate of Expertise in Atomic Host Container Administration	3	7.3	1	1
EX276	Red Hat Certificate of Expertise in Containerized Application Development	3	7.1	1	1
EX280V3	Red Hat Certificate of Expertise in Platform-as-a-Service Exam	3	7.1	1	1
EX280V34	Red Hat Certificate of Expertise in Platform-as-a-Service Exam	3	7.3	1	1
EX297	Red Hat Certificate of Expertise in Persistence exam	3	6.5	1	1
EX300	Red Hat Certified Engineer (RHCE) exam	1	7.3	1	1
EX310	Red Hat Certified Engineer in Red Hat OpenStack exam	3	6.5	1	1
EX318	Red Hat Certified Virtualization Administrator (RHCVA) exam	3	6.6	2	1
EX342	Red Hat Certificate of Expertise in Red Hat Linux Diagnostics and Troubleshooting	1	7.2	1	1
EX401	Red Hat Certificate of Expertise in Enterprise Deployment and Systems Management exam	2	6.4	1	1
EX403	Red Hat Certificate of Expertise in Deployment and Systems Management Exam	3	7.2	1	1
EX405	Red Hat Certificate of Expertise in Configuration Management	3	7.1	1	1
EX407	Red Hat Certificate of Expertise in Ansible Automation	2	7.3	1	1
EX413	Red Hat Certificate of Expertise in Security and Server Hardening exam	1	6.4	1	1
EX421v60	Red Hat Certificate of Expertise in Camel Development exam	3	6.5	1	1
EX421v63	Red Hat Certificate of Expertise in Camel Development exam	3	7.2	1	1
EX427v60	Red Hat Certificate of Expertise in Business Process Design exam	3	6.5	1	1

EX427v63	Red Hat Certificate of Expertise in Business Process Design exam	**3**	**7.2**	**1**	**1**
EX436V7	Red Hat Certificate of Expertise in Clustering and Storage Management exam	**3**	**7.1**	**1**	**1**
EX442V7	Red Hat Certificate of Expertise in Performance Tuning exam	**2**	**7**	**1**	**1**
EX450	Red Hat Certificate of Expertise in Data Virtualization exam	**3**	**6.5**	**1**	**1**
EX453	Red Hat Certificate of Expertise in Fast-Cache Application Development	**3**	**6.5**	**1**	**1**
EX465v60	Red Hat Certificate of Expertise in Business Rules exam	**3**	**6.5**	**1**	**1**
EX465v63	Red Hat Certificate of Expertise in Business Rules exam	**3**	**7.2**	**1**	**1**
JB225	Red Hat JBoss Enterprise Application Development	**1**	**7.x**	**1**	**1**
JB248	Red Hat JBoss Application Administration I	**3**	**7.x**	**1**	**1**
JB325	Red Hat JBoss Enterprise Development II	**1**	**7.x**	**1**	**1**
JB348	Red Hat JBoss Application Administration II	**1**	**7.x**	**1**	**1**
JB421	Camel Development with Red Hat JBoss Fuse	**2**	**7.x**	**1**	**1**
JB427	Developing Workflow Applications with Red Hat JBoss BPM Suite	**3**	**7.x**	**1**	**1**
JB435	ESB Deployment with Red Hat JBoss Fuse	**1**	**7.x**	**1**	**1**
JB437	Red Hat JBoss A-MQ Development and Deployment	**1**	**7.x**	**1**	**1**
JB439	Red Hat JBoss Fuse Rapid Track	**1**	**7.x**	**1**	**1**
JB450	Red Hat JBoss Data Virtualization Development	**1**	**7.x**	**1**	**1**
JB453	Red Hat JBoss Data Grid Development	**1**	**6.4**	**1**	**1**
JB461	Authoring Rules with Red Hat JBoss BRMS	**3**	**7.x**	**1**	**1**
JB463	Developing Rules Applications with Red Hat JBoss BRMS	**3**	**7.x**	**1**	**1**
JB465	Implementing Red Hat JBoss BRMS	**3**	**7.x**	**1**	**1**
JB501	Building Advanced Red Hat Enterprise Applications	**3**	**7.x**	**1**	**1**
RH124	Red Hat System Administration I	**1**	**7.x**	**1**	**1**
RH134	Red Hat System Administration II	**1**	**7.x**	**1**	**1**
RH199	RHCSA Rapid Track Course	**1**	**7.x**	**1**	**1**
RH236	Red Hat Gluster Storage Administration	**3**	**7.x**	**1**	**1**
RH254	Red Hat System Administrator III	**1**	**7.x**	**1**	**1**
RH270	Managing Docker Containers with RHEL Atomic Host	**3**	**7.x*** **	**1**	**1**
RH299	RHCE Certification Lab	**1**	**7.x**	**1**	**1**
RH318	Red Hat Enterprise Virtualization	**3**	**7.x****	**2**	**2**
RH342	Red Hat Enterprise Linux Diagnostics and Troubleshooting	**2**	**7.x**	**1**	**1**
RH401	Red Hat Enterprise Deployment and Systems Management	**2**	**6.4**	**2**	**2**
RH403	Red Hat Satellite 6 Administration	**3**	**7.x**	**1**	**1**
RH413	Red Hat Server Hardening	**1**	**6.4**	**1**	**1**
RH436	Red Hat High Availability Clustering	**3**	**7.x**	**1**	**1**
RH442	Red Hat Enterprise Performance Tuning	**2**	**7.x**	**1**	**1**

** uses nested virtualization, a later RHEL version physically installed implies better performance*

*** second system for each student and instructor runs RHEV-H 7.1*

**** second NIC required in instructor machine for internet connectivity*