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CLASSROOM REQUIREMENTS

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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 require a properly configured classroom. Instructors use an automated classroom installation to ensure a consistent and efficient training environment. This document specifies the minimum requirements that a classroom must meet to support a Red Hat Training course.

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 lab 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 Student 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 SSD on a single disk (SSD **required**)
- 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 student 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 students 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 all wireless interfaces 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 classroom network must be **isolated**, meaning that the network used for systems in this room must not connect to any other networks, servers or devices outside this physical classroom. Wireless networks are not sufficiently performant and may not be used for connectivity between student and instructor systems. **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 on all ports.
- 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:

- Red Hat CloudForms Hybrid Cloud Management (CL220v4.1) and Red Hat Certified Specialist in Hybrid Cloud Management Exam (EX220v4)
    - This class and exam are run with remote VT-based labs only. All deliveries must be provisioned by your region's Red Hat Training Operations prior to the start of class.
- Ansible for Network Automation (DO457)
    - This class is run with remote VT-based labs only. All deliveries must be provisioned by your region's Red Hat Training 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
CEPH125V3	Red Hat Ceph Storage Architecture and Administration	4	7.x*	1	1
CL110v10	Red Hat OpenStack Administration I	3	7.x*	1	1
CL110v13	Red Hat OpenStack Administration I: Core Operations for Cloud Operators	4	7.x*	1	1
CL210v10	Red Hat OpenStack Administration II	4	7.x*	1	1
CL210v13	Red Hat OpenStack Administration II: Infrastructure Configuration for Cloud Administrators	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: Networking and Foundations of NFV	4	7.x*	1	1
DO180v3.5	Introduction to Containers, Kubernetes, and Red Hat OpenShift	3	7.x	1	1
DO180v3.9	Introduction to Containers, Kubernetes, and Red Hat OpenShift	4	7.x	1	1
DO280V3.5	Red Hat OpenShift Administration I	3	7.x	1	1
DO280V3.9	Red Hat OpenShift Administration I	4	7.x	1	1
DO285V3.5	Containers, Kubernetes, and Red Hat OpenShift Administration I	3	7.x	1	1
DO285V3.9	Containers, Kubernetes, and Red Hat OpenShift Administration I	4	7.x	1	1
DO288	Red Hat OpenShift Development I: Containerizing Applications	3	7.x	1	1
DO290	OpenShift Enterprise Development	3	7.x	1	1
DO292	Red Hat OpenShift Development II: Creating Microservices with Red Hat OpenShift Application Runtimes	4	7.x	1	1
DO380	Red Hat OpenShift Administration II: High Availability	4	7.x	1	1
DO405	Configuration Management with Puppet	3	7.x	1	1
DO407	Automation with Ansible I	2	7.x	1	1
DO409	Automation with Ansible II: Ansible Tower	3	7.x	1	1
DO410	Automation with Ansible & Ansible Tower	3	7.x	1	1
DO457	Ansible for Network Automation	1	7.x***	1	1
EX125	Red Hat Certified Specialist in Ceph Storage Administration Exam	4	7.x	1	1
EX183v70	Red Hat Certified Enterprise Application Developer Exam	3	7.5	1	1
EX200	Red Hat Certified System Administrator (RHCSA) Exam	1	7.3	1	1
EX210V10	Red Hat Certified System Administrator in Red Hat OpenStack Exam	4	7.3	1	1
EX220V4	Red Hat Certified Specialist in Hybrid Cloud Management Exam	1	7.3***	1	1
EX236	Red Hat Certified Specialist in Gluster Storage Administration Exam	3	7.x	1	1
EX248V7	Red Hat Certified JBoss Administration (RHCJA) Exam	3	7.4	1	1
EX280V35	Red Hat Certified Specialist in OpenShift Administration	3	7.3	1	1
EX280V39	Red Hat Certified Specialist in OpenShift Administration	4	7.5	1	1
EX283v70	Red Hat Certified Enterprise Microservices Developer	3	7.5	1	1
EX288	Red Hat Certified Specialist in OpenShift Application Development	3	7.4	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
EX310V10	Red Hat Certified Engineer in Red Hat OpenStack Exam	4	7.4	1	1
EX318V41	Red Hat Certified Specialist in Virtualization Exam	4	7.3	1	1
EX342	Red Hat Certified Specialist in Linux Diagnostics and Troubleshooting	1	7.x	1	1
EX362	Red Hat Certified Specialist in Identity Management	4	7.x	1	1

EX403	Red Hat Certified Specialist in Deployment and Systems Management Exam	**3**	**7.3**	**1**	**1**
EX405	Red Hat Certified Specialist in Configuration Management Exam	**3**	**7.3**	**1**	**1**
EX407	Red Hat Certified Specialist in Ansible Automation Exam	**2**	**7.3**	**1**	**1**
EX413	Red Hat Certified Specialist in Security and Server Hardening Exam	**1**	**7.3**	**1**	**1**
EX415V75	Red Hat Certified Specialist in Security: Linux	**3**	**7.5**	**1**	**1**
EX421v63	Red Hat Certified Specialist in Camel Development Exam	**3**	**7.5**	**1**	**1**
EX421v70	Red Hat Certified Specialist in Camel Development Exam	**3**	**7.5**	**1**	**1**
EX427v63	Red Hat Certified Specialist in Business Process Design Exam	**3**	**7.5**	**1**	**1**
EX436V7	Red Hat Certified Specialist in Clustering and Storage Management Exam	**3**	**7.3**	**1**	**1**
EX442V7	Red Hat Certified Specialist in Performance Tuning Exam	**2**	**7.x**	**1**	**1**
EX450	Red Hat Certified Specialist in Data Virtualization Exam	**3**	**7.5**	**1**	**1**
EX453	Red Hat Certified Specialist in Fast-Cache Application Development	**3**	**7.5**	**1**	**1**
EX465v63	Red Hat Certified Specialist in Business Rules Exam	**3**	**7.5**	**1**	**1**
JB183	Red Hat Application Development I: Programming in Java EE	**3**	**7.x**	**1**	**1**
JB248	Red Hat JBoss Application Administration I	**3**	**7.x**	**1**	**1**
JB283	Red Hat Application Development II: Implementing Microservices Architectures	**4**	**7.x**	**1**	**1**
JB348	Red Hat JBoss Application Administration II	**1**	**7.x**	**1**	**1**
JB421v63	Camel Development with Red Hat JBoss Fuse	**2**	**7.x**	**1**	**1**
JB421v7	Camel Development with Red Hat JBoss Fuse	**4**	**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**
JB439	Red Hat JBoss Fuse Rapid Track	**1**	**7.x**	**1**	**1**
JB440	Red Hat JBoss AMQ Administration	**2**	**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**
RH299	RHCE Certification Lab	**1**	**7.x**	**1**	**1**
RH318v35	Red Hat Enterprise Virtualization	**3**	**7.x****	**2**	**2**
RH318v4	Red Hat Virtualization	**4**	**7.x***	**1**	**1**
RH342	Red Hat Enterprise Linux Diagnostics and Troubleshooting	**2**	**7.x**	**1**	**1**
RH362	Red Hat Identity Management with Microsoft Active Directory Integration	**4**	**7.x**	**1**	**1**
RH403	Red Hat Satellite 6 Administration	**3**	**7.x**	**1**	**1**
RH413	Red Hat Server Hardening	**1**	**6.4**	**1**	**1**
RH415	Red Hat Security: Linux in Physical, Virtual, and Cloud	**4**	**7.x**	**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*