

Classroom Technology Requirements

Red Hat Training classes and exams are highly interactive and require a properly configured classroom. Instructors use automated classroom installation methods 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, including internet and bandwidth requirements and recommendations for Bring Your Own Device (**BYOD**) users.

Classrooms and personal devices that do not meet these requirements are not supported. **Red Hat is not responsible for any damages resulting from a Client's failure to provide an appropriate physical environment and/or equipment as described below.** Direct any questions regarding these specifications to your Red Hat Training representative.

The Baseline Classroom

The baseline classroom configuration for Red Hat training classes is described in this section. Required adjustments to this baseline to reflect course-specific requirements are detailed in the Course Specific Requirements table of this document.

Classroom Environment

- **Overhead projector with projection screen capable of HD resolution** or better 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.
- **Whiteboard or flipchart** 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. Each course has a specific required hardware level that aligns with the course requirements. The number of machines per student and instructor may differ by course or exam. See the table "Course Specific Requirements" table below for details.

Level	CPU minimum	RAM	Local Storage minimum	Video Graphics minimum	Network	USB and boot method
I	Intel Core i3 with VT support / AMD equivalent Ryzen 3 or better with AMD-V	8 GB	100 GB single HDD	1280x1024 text only 1600x900 graphical	wired Gigabit Ethernet	USB2 and DVD USB3 recommended
II VT Labs Only	Intel Core i5 with VT support / AMD equivalent Ryzen 5 or better with AMD-V	8GB	250 GB single HDD	1280x1024 text only 1600x900 graphical	wired Gigabit Ethernet	USB2 and DVD USB3 recommended
III	Intel Core i5 with VT support 4th Generation or better / AMD equivalent Ryzen 5 or better with AMD-V	16 GB	250 GB single HDD SSD recommended	1280x1024 text only 1600x900 graphical	wired Gigabit Ethernet	USB2 and DVD USB3 recommended
IV	Intel Core i7 or Xeon equivalent with VMCS shadowing 6th Generation or better / AMD equivalent Ryzen 7 or better with AMD-V	32 GB	250 GB SSD SSD required	1600x900 minimum, 1920x1080 (Full HD) recommended	wired Gigabit Ethernet	USB3 USB boot support
V	Intel i7 or i9 or Xeon equivalent VMCS shadowing 9th Generation or better / AMD equivalent Ryzen 9 or better with AMD-V	64 GB	500 GB SSD NVMe SSD recommended	1600x900 minimum, 1920x1080 (Full HD) recommended	wired Gigabit Ethernet	USB3 USB boot support
VI	Intel i7 or i9 or Xeon equivalent VMCS shadowing 9th Generation or better / AMD equivalent Ryzen 9 or better with AMD-V	96 GB	1 TB GB SSD NVMe SSD recommended	1600x900 minimum, 1920x1080 (Full HD) recommended	wired Gigabit Ethernet + 2nd Ethernet or WiFi	USB3 USB boot support
VII	Intel i9 or Xeon equivalent VMCS shadowing 10th Generation or better / AMD equivalent ??? or better with AMD-V	128 GB	1 TB GB SSD NVMe SSD recommended	1920x1080 (Full HD) or better	wired Gigabit Ethernet + 2nd Ethernet or WiFi	USB3 USB boot support
VIII	Intel i9 or Xeon equivalent VMCS shadowing 10th Generation or better / AMD equivalent ??? or better with AMD-V	256 GB	2 TB GB SSD NVMe SSD recommended	1920x1080 (Full HD) or better	wired Gigabit Ethernet + 2nd Ethernet or WiFi	USB3 USB boot support

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.

General Notes

- Systems are installed at the beginning of each class to ensure a consistent environment. A backup is not performed prior to reinstalling, and Red Hat is not responsible for any data loss.
- All student machines used in a course 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 is 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. However, the classroom must be hosted on physical hardware in the student's location.
- 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, and then confirm proper system, disk, network, and graphics functionality.
- **Hardware must be accessible to the students in the physical classroom.** Hardware in a remote data center and remote desktop access is not supported. Exception: Red Hat Online Learning Environment (OLE) used for Virtual Training and for select classes.
- Red Hat recommends that the classroom computer systems are all attached to an Uninterruptible Power Supply (UPS) for battery backup (strongly encouraged for exam sessions).

BIOS Settings

- Set UEFI machines to "legacy BIOS only." This setting is universally supported, whereas booting "UEFI only" requires disabling Secure Boot, and must be tested with specific hardware.
- Enable network booting (PXE).
- Set hard disks to AHCI (native). Disable RAID arrays.
- If a second hard drive is installed, then deactivate the second drive in the BIOS or disconnect its data cable.
- Check that the "Execute Disable" (XD) CPU feature is available and enabled in the BIOS on all machines. This might be referred to as "Enhanced Virus Protection" (EVP) on AMD systems, or as the "No Execute" (NX) processor flag.
- Enable virtualization support. This is referred to as either "VT" on Intel systems or "AMD-V" on AMD systems.
- Set boot order to CD->Hard Disk->PXE
- Disable all wireless interfaces on student machines. If a second NIC is installed on student machines, then disable it in BIOS or remove it from the system.
- BIOS passwords: Ensure that BIOS settings can be changed by the instructor.

Network

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

Classroom Network

A **wired** Gigabit Ethernet (1000Mbit) network is required 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 network performance is insufficient, 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, then ensure that the 'Port Fast' option is enabled on all ports.
- Disable all MAC address filtering and "Port Security" because virtual machine NICs utilize multiple 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 system 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 Instructor system's second NIC. The use of a USB adapter requires manual configuration by the instructor. Please note, certain classes and exams require internet access to complete specific exercises. These courses are indicated in the "**Course & Exam Specific Hardware Requirements**" chart below.

Additional Considerations

- **The following courses require access to the OpenShift shared cluster.**
 - *Developing Event-Driven Applications with Apache Kafka and Red Hat AMQ Streams* (AD482)
 - *Introduction to OpenShift Applications* (DO101 v4.6)
 - *Introduction to Containers, Kubernetes, and Red Hat OpenShift* (DO180 v4.10)
 - *Red Hat OpenShift Development I: Containerizing Applications* (DO288 v4.6 & v4.10)
 - *Red Hat Cloud-native Microservices Development with Quarkus* (DO378)

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: Skylake processors

RHEL versions 7.2 and older and 6.6 and older are not compatible with the Intel Skylake and later architectures.

- **The following courses require access to the quay.io and github.com domains as well as access to ports 80 and 443:**
 - Red Hat OpenShift Administration II: Operating a Production Kubernetes Cluster (DO280)
 - Containers, Kubernetes, and Red Hat OpenShift Administration II (DO285)
 - Red Hat OpenShift Administration III: Scaling Kubernetes Deployments in the Enterprise (DO380)
 - Red Hat OpenShift Installation Lab (DO322)
 - Building Resilient Microservices with Istio and Red Hat Service Mesh (DO328)
- **The following courses require access to the *.nextcle.com, github.com, quay.io, docker.io, registry.connect.redhat.com, and registry.redhat.io domains as well as access to ports 80, 443, and 6443:**
 - Developing Application Business Rules with Red Hat Decision Manager (AD364)
 - Developing Event-Driven Applications with Apache Kafka and Red Hat AMQ Streams (AD482)
 - Introduction to OpenShift Applications (DO101)
 - Introduction to Containers, Kubernetes, and Red Hat OpenShift (DO180)
 - Red Hat OpenShift Development I: Containerizing Applications (DO288)
 - Containers, Kubernetes, and Red Hat OpenShift Development II (DO295)
 - Red Hat Cloud-native Microservices Development with Quarkus (DO378)
 - Red Hat DevOps Pipelines and Processes: CI/CD with Jenkins, Git, and Test Driven Development (TDD) (DO400)
- **Microsoft Windows Automation with Red Hat Ansible (DO417)**
 - This class requires that Your device must be installed with a Remote Desktop Protocol (RDP).
 - If running Microsoft Windows, you should have **Microsoft Remote Desktop** installed.
 - If running macOS, you will need to install **Microsoft Remote Desktop for Mac** (by Microsoft) from the App Store.
 - If running Linux, you may install **Remmina** from their distribution (if available) or following instructions at <https://remmina.org> (if not). If they prefer, they may instead install the FreeRDP clients from their Linux distribution (in the freerdp package in Red Hat Enterprise Linux).
 - This class requires access to public cloud infrastructure for the classroom lab environment virtual machines (VMs) via TCP port 3389.
- **Ansible for Network Automation (DO457)**
 - This class is run with remote VT-based labs only. All deliveries must be provisioned by Red Hat Training Operations in your region prior to the start of class.
- **Cloud-Native API Administration with Red Hat 3scale API Management(DO240)**
 - This class downloads some material from the public internet.
- **Red Hat Certified OpenShift Administrator Exam (EX280 v4.X) & Red Hat Certified OpenShift Application Developer Exam (EX288v4.x)**
 - This exam requires the use of cloud based exam systems for OpenShift Container Platform version 4.10 and 4.12.
- **Red Hat Certified Specialist in Systems Deployment and Systems Management Exam (EX403 v66)**
 - This exam requires the use of cloud based exam systems for Red Hat Satellite version 6.6

Note: Red Hat Training & Certification utilizes the internet connection for exam monitoring. If no internet connection is available, please contact your Red Hat Training & Certification representative.

Internet, Bandwidth, & BYDW Specifications:

In general, when a course requires internet access, the facility must provide students with a minimal bandwidth and latency to the Red Hat Online Learning environment and public cloud infrastructure. As a guideline, a facility that runs any vILT course should provide at least 4 Mbps per student and less than 250 ms latency. Any course that requires a connection to the shared cluster should provide at least 2 Mbps per student and less than 300 ms latency. **Any students that use a bring-your-developer-workstation (BYDW), for a course that supports it, should have at least 16 Mbps bandwidth and less than 300 ms latency.** Tablets will not provide a satisfactory student experience and are not recommended. Laptop devices are required. The following are the recommended specs for your workstation:

Attribute	Minimum Requirements	Recommended
CPU	1.6 GHz or faster processor	Multi-core i7 or equivalent
Memory	8 GB	16 GB or more
Disk	10 GB free space HD	10 GB or more free space SSD
Display Resolution	1024 x 768	1920 x 1080 or greater

All specifications can be tested by using the compatibility tester*.

- **Individual student compatibility tester:**
 - <https://www.redhat.com/rhtapps/services/compatibility>
- **Facility compatibility tester:**
 - <https://www.redhat.com/rhtapps/services/compatibility/classroom>

***The release of a universal compatibility tester is in planning stages and will be released at a later date. The tester application will reside on the same website page as other instant system/internet compatibility testing applications, and the results will be sent to a user provided email. This tester will evaluate both classroom device readiness and individual BYOD user's device & bandwidth readiness.**

Course & Exam Specific Hardware Requirements:

SKU	Course Title	Hardware Level	OS Version	Internet Required for Delivery:	BYDW Optional, Required, or Not Available	Specific Ports Needed
AD141v9	Python Programming with Red Hat	2	7.5***	Yes	Strongly recommended	None
AD183v7	Red Hat Application Development I: Programming in Java EE	3	7.x	No	Not Available	None
AD221v7.10	Cloud-native Integration with Red Hat Fuse	VT Labs Only	8.4***	Yes	Not Available	6443, 80, 443
AD248v7	Red Hat JBoss Application Administration I	4	7.x	No	Not Available	None
AD348v7	Red Hat JBoss Application Administration II	3	7.x	No	Not Available	None
AD364v7.8	Developing Application Business Rules with Red Hat Decision Manager	3	8.x	Yes	Not Available	6443
AD371v7	Red Hat Decision Manager and Red Hat Process Automation Manager for Business Users	4	7.x	No	Not Available	None
AD373v7	Red Hat Decision Manager and Red Hat Process Automation Manager for Developers	4	7.x	No	Not Available	None
AD421v7.1	Camel Development with Red Hat JBoss Fuse	4	7.x	No	Not Available	None
AD427v6.3	Developing Workflow Applications with Red Hat JBoss BPM Suite	3	7.x	No	Not Available	None
AD440v7	Red Hat JBoss AMQ Administration	2	7.x	No	Not Available	None
AD482v1.8	Developing Event-Driven Applications with Apache Kafka and Red Hat AMQ Streams	VT Labs Only	8.x	Yes	Strongly recommended	6443
CL110v16.1	Red Hat OpenStack Administration I: Core Operations for Cloud Operators	5	8.x	No	Not available	None
CL210v16.1	Red Hat OpenStack Administration II: Day 2 Operations for Cloud Operators	5	8.x	No	Not available	None
CL260v4.2	Cloud Storage with Red Hat Ceph Storage	4	8.x	No	Not available	None
CL260v5	Cloud Storage with Red Hat Ceph Storage	4	8.4	Yes	Not available	None
DO100	Red Hat Training: Introduction to Kubernetes Applications	No Lab Env	1.22	-	Strongly recommended	-
DO101v4.6	Introduction to Red Hat OpenShift Applications	VT Labs Only	8.3*	Yes	Strongly recommended	6443
DO120v4.11	Introduction to Red Hat OpenShift Service on AWS (ROSA)	No Lab Env	4.11	-	Strongly recommended	-
DO120v4.12	Introduction to Red Hat OpenShift Service on AWS (ROSA)	No Lab Env	4.12	-	Strongly recommended	-
DO121v4.10	Introduction to Microsoft Azure Red Hat OpenShift (ARO)	No Lab Env	4.10	-	Strongly recommended	-
DO180v4.10	Red Hat OpenShift I: Containers & Kubernetes	VT Labs Only	8.5	Yes	Not available	None
DO180v4.12	Red Hat OpenShift I: Containers & Kubernetes	VT Labs Only	8.6	No	Not available	None
DO188v4.10	Red Hat OpenShift Developer I: Introduction to Containers with Podman	VT Labs Only	8.6	Yes	Not available	None
DO188v4.12	Red Hat OpenShift Developer I: Introduction to Containers with Podman	VT Labs Only	8.6	Yes	Not available	None
DO240v2.11	Cloud-native API Administration with Red Hat 3scale API Management	VT Labs Only	8.5***	Yes	Not Available	80, 443
DO240v2.4	Cloud-native API Administration with Red Hat 3scale API Management	4	7.x***	Yes	Not Available	None
DO244v4.10	Developing Applications with Red Hat OpenShift Serverless and Knative	6	8.6	Yes	Not Available	None
DO280v4.10	Red Hat OpenShift Administration II: Operating a Production Kubernetes Cluster	VT Labs Only	8.6	Yes	Not available	None

DO280v4.12	Red Hat OpenShift Administration II: Operating a Production Kubernetes Cluster	VT Labs Only	8.6	No	Not available	None
DO285v4.10	Containers, Kubernetes, and Red Hat OpenShift Administration II	VT Labs Only	8.2	Yes	Not available	None
DO285v4.6	Containers, Kubernetes, and Red Hat OpenShift Administration II	VT Labs Only	8.6	Yes	Not available	None
DO288v4.10	Red Hat OpenShift Developer II: Building Kubernetes Applications	5	8.6	Yes	Not Available	None
DO288v4.6	Red Hat OpenShift Developer II: Building Kubernetes Applications	VT Labs Only	8.4***	Yes	Not Available	6443
DO295v4.10	Containers, Kubernetes, and Red Hat OpenShift Development II	VT Labs Only	8.6	Yes	Not Available	None
DO295v4.6	Containers, Kubernetes, and Red Hat OpenShift Development II	VT Labs Only	8.4***	Yes	Not Available	6443
DO313v7.6	Red Hat Single Sign-On Administration	VT Labs Only	7.6	No	Not Available	None
DO316v4.10	Managing Virtual Machines with Red Hat OpenShift Virtualization	VT Labs Only	8.5	Yes	Not Available	None
DO322v4.6	Red Hat OpenShift Installation Lab	VT Labs Only	8.2	Yes	Not Available	None
DO326v4.9	Red Hat OpenShift Platform Migration Lab	VT Labs Only	8.4	Yes	Not Available	None
DO328v2.0	Building Resilient Microservices with Istio and Red Hat Service Mesh	VT Labs Only	8.2***	Yes	Not available	None
DO370v4.7	Enterprise Kubernetes Storage with Red Hat OpenShift Data Foundation	VT Labs Only	8.4	Yes	Not available	None
DO374v2.0	Developing Advanced Automation with Red Hat Ansible Automation Platform	4	8.4	No	Not available	None
DO374v2.2	Developing Advanced Automation with Red Hat Ansible Automation Platform	4	8.4	No	Not available	None
DO378v1.11	Red Hat Cloud-native Microservices Development with Quarkus	3	8.4***	Yes	Strongly recommended	6443
DO378v2.13	Red Hat Cloud-native Microservices Development with Quarkus	4	8.6	Yes	Not available	None
DO380v4.12	Red Hat OpenShift Administration III: Scaling Kubernetes Deployments in the Enterprise	VT Labs Only	8.6	No	Not available	None
DO380v4.10	Red Hat OpenShift Administration III: Scaling Kubernetes Deployments in the Enterprise	VT Labs Only	8.6	No	Not available	None
DO380v4.6	Red Hat OpenShift Administration III: Scaling Kubernetes Deployments in the Enterprise	VT Labs Only	8.2	Yes	Not available	None
DO400v4.6	Red Hat DevOps Pipelines and Processes: CI/CD with Jenkins, Git, and Test Driven Development (TDD)	VT Labs Only	8.2***	Yes	Strongly recommended	6443
DO417v2.8	Microsoft Windows Automation with Red Hat Ansible	VT Labs Only	8.x	Yes	Strongly recommended	3389
DO447v3.5	Advanced Automation: Red Hat Ansible Best Practices	4	8.x	No	Not available	None
DO457v3.2	Red Hat Ansible for Network Automation	VT Labs Only	7.x***	Yes	Not available	None
DO467v2.2	Managing Enterprise Automation with Red Hat Ansible Automation Platform	5	8.6	No	Not available	None
DO480v4.10	Multicluster Management with Red Hat OpenShift Platform Plus	VT Labs Only	8.5	Yes	Not available	None
DO700v3.x	OpenShift Catalyst Boot Camp for Administrators	VT Labs Only	-	Yes	Not Available	None
DO700v4.x	OpenShift Catalyst Boot Camp for Administrators	VT Labs Only	-	Yes	Not Available	6443
DO710v2.x	Red Hat Ansible Automation Platform Boot Camp	VT Labs Only	-	Yes	Not Available	None
DO720v4.x	OpenShift Catalyst Boot Camp for Developers	VT Labs Only	-	Yes	Not Available	None

RH104v9	Red Hat Training: Getting Started with Linux Fundamentals	VT Labs Only	9	No	Not Available	None
RH124v8	Red Hat System Administration I	2	8.x	No	Not Available	None
RH124v8.2	Red Hat System Administration I	3	8.x	No	Not Available	None
RH124v9	Red Hat System Administration I	3	9.x	No	Not Available	None
RH134v8	Red Hat System Administration II	2	8.x	No	Not Available	None
RH134v8.2	Red Hat System Administration II	3	8.x	No	Not Available	None
RH134v9	Red Hat System Administration II	3	9.x	No	Not Available	None
RH199v8	RHCSA Rapid Track Course	2	8.x	No	Not Available	None
RH199v8.2	RHCSA Rapid Track Course	3	8.x	No	Not Available	None
RH199v9	RHCSA Rapid Track Course	3	9.x	No	Not Available	None
RH254v7	Red Hat System Administrator III	1	7.x	No	Not Available	None
RH294v8	Red Hat Enterprise Linux Automation with Ansible	2	8.x	No	Not Available	None
RH294v8.4	Red Hat Enterprise Linux Automation with Ansible	3	8.x	No	Not Available	None
RH294v9	Red Hat Enterprise Linux Automation with Ansible	3	9	No	Not Available	None
RH299v7	RHCE Certification Lab	1	7.x	No	Not Available	None
RH318v4.3	Red Hat Virtualization	4	7.x*	No	Not Available	None
RH342v7.2	Red Hat Enterprise Linux Diagnostics and Troubleshooting	2	7.x	No	Not Available	None
RH342v8.4	Red Hat Enterprise Linux Diagnostics and Troubleshooting	3	8.4	Yes	Not Available	None
RH354v8	Red Hat Enterprise Linux 8 New Features for Experienced Linux Administrators	3	8.x	No	Not Available	None
RH358v8.1	Red Hat Services Management and Automation	3	8.x	No	Not Available	None
RH362v7.4	Red Hat Identity Management with Microsoft Active Directory Integration	4	7.x	No	Not Available	None
RH362v9.1	Red Hat Identity Management with Microsoft Active Directory Integration	VT Labs Only	9.1	Yes	Not Available	None
RH403v6.11	Red Hat Satellite 6 Administration	VT Labs Only	RHEL 8 / RHEL 9	Yes	Not available	None
RH403v6.6	Red Hat Satellite 6 Administration	VT Labs Only	7.x and 8.x	Yes	Not available	None
RH415v9	Red Hat Security: Linux in Physical, Virtual, and Cloud	VT Labs Only	9	Yes	Not Available	None
RH436v8.3	Red Hat High Availability Clustering	3	8.x	No	Not Available	None
RH442v8	Red Hat Enterprise Performance Tuning	2	8.x	No	Not Available	None
RH445v8.4	Scaling SAP with Red Hat Enterprise Linux for SAP Solutions	VT Labs Only	SAP HANA	Yes	Not Available	None
TL112	Introduction to Pragmatic SRE	No Lab Env	-	-	-	-
TL250	Red Hat Training: Open Practices for your DevOps Journey	No Lab Env	-	-	-	-
TL500	DevOps Culture & Practice	VT Labs Only	8.6	Yes	Not Available	None

SKU	Exam Title	Hardware Level	OS Version	Internet Required for Delivery:	BYDW Optional, Required, or Not Available	Specific Ports Needed for Delivery
EX180v46	Red Hat Certified Specialist in Containers and Kubernetes Exam	3	8.x	Yes	-	-
EX180v410	Red Hat Certified Specialist in Containers and Kubernetes Exam	2	8.2	Yes	-	443
EX183v7	Red Hat Certified Enterprise Application Developer Exam	3	7.x**	-	-	-
EX188	Red Hat Certified Specialist in Containers	1	RHEL 8.6	No	-	-
EX200	Red Hat Certified System Administrator (RHCSA) Exam	1	7.x**	-	-	-
EX200v8	Red Hat Certified System Administrator (RHCSA) Exam	3	8.x	-	-	-
EX200v9	Red Hat Certified System Administrator (RHCSA) Exam	3	9.0	No	-	-

EX210v13	Red Hat Certified Specialist in Cloud Infrastructure Exam	4	7.x**	-	-	-
EX210v16	Red Hat Certified Specialist in Cloud Infrastructure Exam	3	8.2	Yes	-	-
EX221v7.10	Red Hat Certified Specialist in Cloud-native Integration exam	4	8.2	No	-	-
EX240v24	Red Hat Certified Specialist in API Management Exam	4	7.x**	-	-	-
EX240v211	Red Hat Certified Specialist in API Management Exam	3	8.5	Yes	-	-
EX248	Red Hat Certified JBoss Administration (RHCJA) Exam	3	7.x**	-	-	-
EX260v42	Red Hat Certified Specialist in Ceph Cloud Storage Exam	4	8.*	-	-	-
EX260v5	Red Hat Certified Specialist in Ceph Cloud Storage Exam	4	8.4*	No	-	-
EX280v46	Red Hat Certified OpenShift Administrator exam	1	8.x*	Yes	-	443
EX280v410	Red Hat Certified OpenShift Administrator exam	2	8.2	Yes	-	443, 22
EX280v412	Red Hat Certified OpenShift Administrator exam	2	8.*	No	-	-
EX288v46	Red Hat Certified Specialist in Kubernetes Application Development Exam	2	8.x*	Yes	-	443
EX288v410	Red Hat Certified Specialist in Kubernetes Application Development Exam	2	8.4	Yes	-	-
EX294	Red Hat Certified Engineer (RHCE) Exam	2	8.x	-	-	-
EX294v84	Red Hat Certified Engineer (RHCE) Exam	2	8.x*	Yes	-	-
EX294v9	Red Hat Certified Engineer (RHCE) Exam	3	9*	No	-	-
EX318v43	Red Hat Certified Specialist in Virtualization Exam	1	7.6+	Yes	-	-
EX328	Red Hat Certified Specialist in Service Mesh for Resilient Microservices Exam	2	8.x	Yes	-	-
EX342	Red Hat Certified Specialist in Linux Diagnostics and Troubleshooting Exam	2	7.x**	-	-	-
EX342v80	Red Hat Certified Specialist in Linux Diagnostics and Troubleshooting Exam	3	8.x**	-	-	-
EX342v84	Red Hat Certified Specialist in Linux Diagnostics and Troubleshooting Exam	3	8.x	-	-	-
EX358	Red Hat Certified Specialist in Services Management and Automation Exam	3	8.x (8.1)	-	-	-
EX362v45	Red Hat Certified Specialist in Identity Management	4	8.x*	-	-	-
EX364v78	Red Hat Certified Specialist in Decision Management Exam	4	8.2	-	-	-
EX370	Red Hat Certified Specialist in OpenShift Data Foundation Exam	2	8.x*	Yes	-	443
EX374v20	Red Hat Certified Specialist in Developing Automation with Ansible Automation Platform exam	4	8.4	No	-	-
EX374v22	Red Hat Certified Specialist in Developing Automation with Ansible Automation Platform exam	4	8.6*	No	-	-
EX378v17	Red Hat Certified Cloud-native Developer Exam	4	8.2	-	-	-
EX380	Red Hat Certified Specialist in Scaling OpenShift Deployments Exam	2	8.x**	Yes	-	-
EX380v46	Red Hat Certified Specialist in Scaling OpenShift Deployments Exam	2	8.x*	Yes	-	443
EX380v410	Red Hat Certified Specialist in Scaling OpenShift Deployments Exam	2	8.4	Yes	-	-
EX403v66	Red Hat Certified Specialist in Deployment and Systems Management Exam	1	7.6+	Yes	-	-
EX403v611	Red Hat Certified Specialist in Deployment and Systems Management Exam	2	8.6	Yes	-	443/tcp 443/udp, 50022,50080,5 0443,51022,520 22,52122,52222,5 3022,53090
EX415v75	Red Hat Certified Specialist in Security: Linux Exam	3	7.x**	-	-	-
EX417	Red Hat Certified Specialist in Ansible Automation for Microsoft Windows Exam	2	8.x*	Yes	-	443
EX421	Red Hat Certified Specialist in Camel Development Exam	3	7.x**	-	-	-

EX425v311	Red Hat Certified Specialist in Security: Containers and OpenShift Container Platform Exam	4	7.x			-
EX427	Red Hat Certified Specialist in Business Process Design Exam	3	7.x**	-	-	-
EX436v7	Red Hat Certified Specialist in Clustering and Storage Management Exam	3	7.x**	-	-	-
EX436v83	Red Hat Certified Specialist in Clustering and Storage Management Exam	3	8.x*	-	-	-
EX440	Red Hat certified Specialist in Messaging Administration exam	3	8.2	-	-	-
EX442v7	Red Hat Certified Specialist in Performance Tuning Exam	2	7.x**	-	-	-
EX442v8	Red Hat Certified Specialist in Performance Tuning Exam	2	8.x	-	-	-
EX457v25	Red Hat Certified Specialist in Red Hat Ansible Network Automation Exam	1	8.2	Yes	-	-
EX457v29	Red Hat Certified Specialist in Red Hat Ansible Network Automation Exam	3	8.4	Yes	-	-
EX467v22	Red Hat Certified Specialist in Advanced Automation: Ansible Best Practices Exam	1	8.6	Yes	-	-
EX480v410	Red Hat Certified Specialist in Advanced Cluster Management for OpenShift Exam	2	8.4*	Yes	-	-
EX482	Red Hat Certified Specialist in Reactive Application Development Exam	4	8.x	-	-	-
PE110V16	Red Hat Preliminary Exam in Red Hat OpenStack Administration Version 16	-	-	Yes	Required	-
PE124V80	Red Hat Preliminary Exam in System Administration I Version 8.0	-	-	Yes	Required	-
PE124V9	Red Hat Preliminary Exam in System Administration I Version 9.0	1	9.*	Yes	Required	-
PE180v412	Preliminary Exam in Red Hat OpenShift Administration	-	8.*	Yes	Required	-

* This course requires nested virtualization. Note, physical machines running later RHEL versions provide the best performance.

** The maximum Foundation version is 7.5 due to issues with registration. Foundation 7.6 or later may be allowed with prior approval from the Certification Team.

*** A second NIC is required in the instructor machine for internet connectivity.