Red Hat Virtualization 4.3

Installing Red Hat Virtualization as a self-hosted engine using the Cockpit web interface

How to use Cockpit to install the Red Hat Virtualization Manager as a virtual machine running on the same hosts it manages

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Abstract

This document describes how to install a self-hosted engine environment - where the Red Hat Virtualization Manager (or "engine") is installed on a virtual machine that runs on specialized hosts in the same environment it manages - using the Cockpit web interface to configure and run an automated installation. If this is not the configuration you want to use, see the other Installation Options in the Product Guide.

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PREFACE

Self-hosted engine installation is automated using Ansible. The Cockpit web interface's installation wizard runs on an initial deployment host, and the Red Hat Virtualization Manager (or "engine") is installed and configured on a virtual machine that is created on the deployment host. The Manager and Data Warehouse databases are installed on the Manager virtual machine, but can be migrated to a separate server post-installation if required.

Cockpit is available by default on Red Hat Virtualization Hosts, and can be installed on Red Hat Enterprise Linux hosts.

Hosts that can run the Manager virtual machine are referred to as self-hosted engine nodes. At least two self-hosted engine nodes are required to support the high availability feature.

A storage domain dedicated to the Manager virtual machine is referred to as the self-hosted engine storage domain. This storage domain is created by the installation script, so the underlying storage must be prepared before beginning the installation.

See the *Planning and Prerequisites Guide* for information on environment options and recommended configuration. See Self-Hosted Engine Recommendations for configuration specific to a self-hosted engine environment.

Table 1. Red Hat Virtualization Key Components

Component Name	Description
Red Hat Virtualization Manager	A service that provides a graphical user interface and a REST API to manage the resources in the environment. The Manager is installed on a physical or virtual machine running Red Hat Enterprise Linux.
Hosts	Red Hat Enterprise Linux hosts (RHEL-based hypervisors) and Red Hat Virtualization Hosts (image-based hypervisors) are the two supported types of host. Hosts use Kernel-based Virtual Machine (KVM) technology and provide resources used to run virtual machines.
Shared Storage	A storage service is used to store the data associated with virtual machines.
Data Warehouse	A service that collects configuration information and statistical data from the Manager.

SELF-HOSTED ENGINE ARCHITECTURE

The Red Hat Virtualization Manager runs as a virtual machine on self-hosted engine nodes (specialized hosts) in the same environment it manages. A self-hosted engine environment requires one less physical server, but requires more administrative overhead to deploy and manage. The Manager is highly available without external HA management.

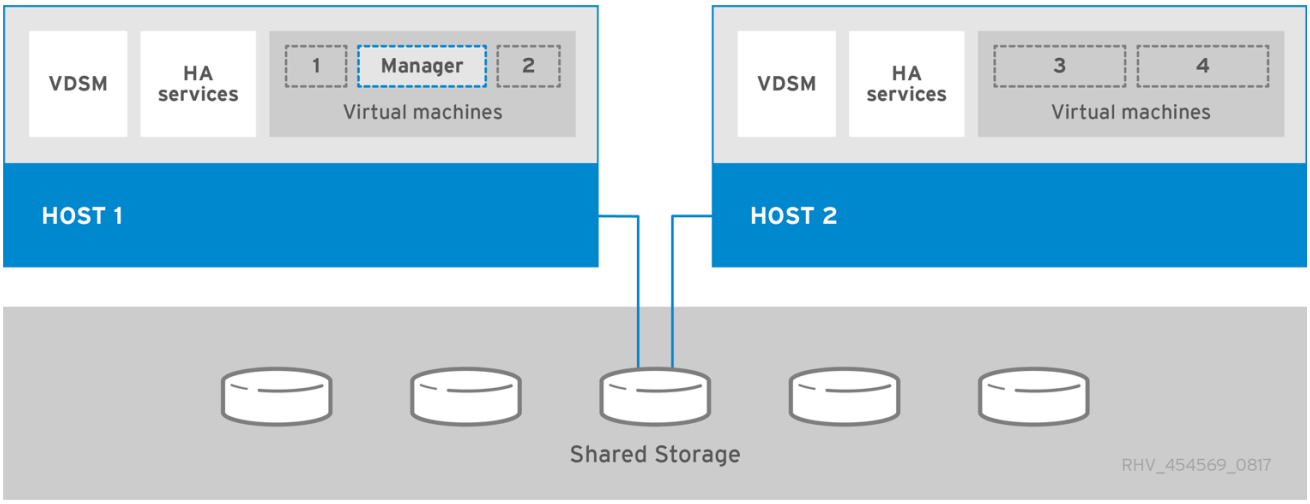
The minimum setup of a self-hosted engine environment includes:

- One Red Hat Virtualization Manager virtual machine that is hosted on the self-hosted engine nodes. The RHV-M Appliance is used to automate the installation of a Red Hat Enterprise Linux 7 virtual machine, and the Manager on that virtual machine.

- A minimum of two self-hosted engine nodes for virtual machine high availability. You can use Red Hat Enterprise Linux hosts or Red Hat Virtualization Hosts (RHVH). VDSM (the host agent) runs on all hosts to facilitate communication with the Red Hat Virtualization Manager. The HA services run on all self-hosted engine nodes to manage the high availability of the Manager virtual machine.

- One storage service, which can be hosted locally or on a remote server, depending on the storage type used. The storage service must be accessible to all hosts.

Figure 1. Self-Hosted Engine Red Hat Virtualization Architecture



CHAPTER 1. INSTALLATION OVERVIEW

The self-hosted engine installation uses Ansible and the RHV-M Appliance (a pre-configured Manager virtual machine image) to automate the following tasks:

- Configuring the first self-hosted engine node
- Installing a Red Hat Enterprise Linux virtual machine on that node
- Installing and configuring the Red Hat Virtualization Manager on that virtual machine
- Configuring the self-hosted engine storage domain

NOTE

The RHV-M Appliance is only used during installation. It is not used to upgrade the Manager.

Installing a self-hosted engine environment involves the following steps:

1. Prepare storage to use for the self-hosted engine storage domain and for standard storage domains. You can use one of the following storage types:
   - NFS
   - iSCSI
   - Fibre Channel (FCP)
   - Red Hat Gluster Storage
2. Install a deployment host to run the installation on. This host will become the first self-hosted engine node. You can use either host type:
   - Red Hat Virtualization Host
   - Red Hat Enterprise Linux
     Cockpit is available by default on Red Hat Virtualization Hosts, and can be installed on Red Hat Enterprise Linux hosts.
3. Install and configure the Red Hat Virtualization Manager:
   a. Install the self-hosted engine through the deployment host's Cockpit web interface.
   b. Register the Manager with the Content Delivery Network and enable the Red Hat Virtualization Manager repositories.
   c. Connect to the Administration Portal to add hosts and storage domains.
4. Add more self-hosted engine nodes and standard hosts to the Manager. Self-hosted engine nodes can run the Manager virtual machine and other virtual machines. Standard hosts can run all other virtual machines, but not the Manager virtual machine.
   a. Use either host type, or both:
      - Red Hat Virtualization Host

- Red Hat Enterprise Linux

b. Add hosts to the Manager as self-hosted engine nodes.

c. Add hosts to the Manager as standard hosts.

5. Add more storage domains to the Manager. The self-hosted engine storage domain is not recommended for use by anything other than the Manager virtual machine.

6. If you want to host any databases or services on a server separate from the Manager, you can migrate them after the installation is complete.

IMPORTANT

Keep the environment up to date. See https://access.redhat.com/articles/2974891 for more information. Since bug fixes for known issues are frequently released, Red Hat recommends using scheduled tasks to update the hosts and the Manager.

CHAPTER 2. REQUIREMENTS

2.1. RED HAT VIRTUALIZATION MANAGER REQUIREMENTS

2.1.1. Hardware Requirements

The minimum and recommended hardware requirements outlined here are based on a typical small to medium-sized installation. The exact requirements vary between deployments based on sizing and load.

Hardware certification for Red Hat Virtualization is covered by the hardware certification for Red Hat Enterprise Linux. For more information, see https://access.redhat.com/solutions/725243. To confirm whether specific hardware items are certified for use with Red Hat Enterprise Linux, see https://access.redhat.com/ecosystem/#certifiedHardware.

Table 2.1. Red Hat Virtualization Manager Hardware Requirements

Resource	Minimum	Recommended
CPU	A dual core CPU.	A quad core CPU or multiple dual core CPUs.
Memory	4 GB of available system RAM if Data Warehouse is not installed and if memory is not being consumed by existing processes.	16 GB of system RAM.
Hard Disk	25 GB of locally accessible, writable disk space.	50 GB of locally accessible, writable disk space. You can use the RHV Manager History Database Size Calculator to calculate the appropriate disk space for the Manager history database size.
Network Interface	1 Network Interface Card (NIC) with bandwidth of at least 1 Gbps.	1 Network Interface Card (NIC) with bandwidth of at least 1 Gbps.

2.1.2. Browser Requirements

The following browser versions and operating systems can be used to access the Administration Portal and the VM Portal.

Browser support is divided into tiers:

- Tier 1: Browser and operating system combinations that are fully tested and fully supported. Red Hat Engineering is committed to fixing issues with browsers on this tier.
- Tier 2: Browser and operating system combinations that are partially tested, and are likely to work. Limited support is provided for this tier. Red Hat Engineering will attempt to fix issues with browsers on this tier.

- Tier 3: Browser and operating system combinations that are not tested, but may work. Minimal support is provided for this tier. Red Hat Engineering will attempt to fix only minor issues with browsers on this tier.

Table 2.2. Browser Requirements

Support Tier	Operating System Family	Browser
Tier 1	Red Hat Enterprise Linux	Mozilla Firefox Extended Support Release (ESR) version
	Any	Most recent version of Google Chrome, Mozilla Firefox, or Microsoft Edge
Tier 2		
Tier 3	Any	Earlier versions of Google Chrome or Mozilla Firefox
	Any	Other browsers

2.1.3. Client Requirements

Virtual machine consoles can only be accessed using supported Remote Viewer (**virt-viewer**) clients on Red Hat Enterprise Linux and Windows. To install **virt-viewer**, see Installing Supporting Components on Client Machines in the *Virtual Machine Management Guide*. Installing **virt-viewer** requires Administrator privileges.

Virtual machine consoles are accessed through the SPICE, VNC, or RDP (Windows only) protocols. The QXL graphical driver can be installed in the guest operating system for improved/enhanced SPICE functionalities. SPICE currently supports a maximum resolution of 2560x1600 pixels.

Supported QXL drivers are available on Red Hat Enterprise Linux, Windows XP, and Windows 7.

SPICE support is divided into tiers:

- Tier 1: Operating systems on which Remote Viewer has been fully tested and is supported.
- Tier 2: Operating systems on which Remote Viewer is partially tested and is likely to work. Limited support is provided for this tier. Red Hat Engineering will attempt to fix issues with remote-viewer on this tier.

Table 2.3. Client Operating System SPICE Support

Support Tier	Operating System
Tier 1	Red Hat Enterprise Linux 7.2 and later
	Microsoft Windows 7
Tier 2	Microsoft Windows 8

Support Tier	Operating System
	Microsoft Windows 10

2.1.4. Operating System Requirements

The Red Hat Virtualization Manager must be installed on a base installation of Red Hat Enterprise Linux 7 that has been updated to the latest minor release.

Do not install any additional packages after the base installation, as they may cause dependency issues when attempting to install the packages required by the Manager.

Do not enable additional repositories other than those required for the Manager installation.

2.2. HOST REQUIREMENTS

Hardware certification for Red Hat Virtualization is covered by the hardware certification for Red Hat Enterprise Linux. For more information, see https://access.redhat.com/solutions/725243. To confirm whether specific hardware items are certified for use with Red Hat Enterprise Linux, see https://access.redhat.com/ecosystem/#certifiedHardware.

For more information on the requirements and limitations that apply to guests see https://access.redhat.com/articles/rhel-limits and https://access.redhat.com/articles/906543.

2.2.1. CPU Requirements

All CPUs must have support for the Intel® 64 or AMD64 CPU extensions, and the AMD-V™ or Intel VT® hardware virtualization extensions enabled. Support for the No eXecute flag (NX) is also required.

The following CPU models are supported:

- AMD
  - Opteron G4
  - Opteron G5
  - EPYC
- Intel
  - Nehalem
  - Westmere
  - Sandybridge
  - Haswell
  - Haswell-noTSX
  - Broadwell
  - Broadwell-noTSX

- Skylake (client)
- Skylake (server)

- IBM POWER8

2.2.1.1. Checking if a Processor Supports the Required Flags

You must enable virtualization in the BIOS. Power off and reboot the host after this change to ensure that the change is applied.

1. At the Red Hat Enterprise Linux or Red Hat Virtualization Host boot screen, press any key and select the **Boot** or **Boot with serial console** entry from the list.
2. Press **Tab** to edit the kernel parameters for the selected option.
3. Ensure there is a space after the last kernel parameter listed, and append the parameter **rescue**.
4. Press **Enter** to boot into rescue mode.
5. At the prompt, determine that your processor has the required extensions and that they are enabled by running this command:

```
# grep -E 'svm|vmx' /proc/cpuinfo | grep nx
```

If any output is shown, the processor is hardware virtualization capable. If no output is shown, your processor may still support hardware virtualization; in some circumstances manufacturers disable the virtualization extensions in the BIOS. If you believe this to be the case, consult the system's BIOS and the motherboard manual provided by the manufacturer.

2.2.2. Memory Requirements

The minimum required RAM is 2 GB. The maximum supported RAM per VM in Red Hat Virtualization Host is 4 TB.

However, the amount of RAM required varies depending on guest operating system requirements, guest application requirements, and guest memory activity and usage. KVM can also overcommit physical RAM for virtualized guests, allowing you to provision guests with RAM requirements greater than what is physically present, on the assumption that the guests are not all working concurrently at peak load. KVM does this by only allocating RAM for guests as required and shifting underutilized guests into swap.

2.2.3. Storage Requirements

Hosts require storage to store configuration, logs, kernel dumps, and for use as swap space. Storage can be local or network-based. Red Hat Virtualization Host (RHVH) can boot with one, some, or all of its default allocations in network storage. Booting from network storage can result in a freeze if there is a network disconnect. Adding a drop-in multipath configuration file can help address losses in network connectivity. If RHVH boots from SAN storage and loses connectivity, the files become read-only until network connectivity restores. Using network storage might result in a performance downgrade.

The minimum storage requirements of RHVH are documented in this section. The storage requirements for Red Hat Enterprise Linux hosts vary based on the amount of disk space used by their existing configuration but are expected to be greater than those of RHVH.

The minimum storage requirements for host installation are listed below. However, Red Hat recommends using the default allocations, which use more storage space.

- / (root) - 6 GB
- /home - 1 GB
- /tmp - 1 GB
- /boot - 1 GB
- /var - 15 GB
- /var/crash - 10 GB
- /var/log - 8 GB
- /var/log/audit - 2 GB
- swap - 1 GB (for the recommended swap size, see https://access.redhat.com/solutions/15244)
- Anaconda reserves 20% of the thin pool size within the volume group for future metadata expansion. This is to prevent an out-of-the-box configuration from running out of space under normal usage conditions. Overprovisioning of thin pools during installation is also not supported.
- **Minimum Total - 55 GB**

If you are also installing the RHV-M Appliance for self-hosted engine installation, **/var/tmp** must be at least 5 GB.

If you plan to use memory overcommitment, add enough swap space to provide virtual memory for all of virtual machines. See Memory Optimization.

2.2.4. PCI Device Requirements

Hosts must have at least one network interface with a minimum bandwidth of 1 Gbps. Red Hat recommends that each host have two network interfaces, with one dedicated to supporting network-intensive activities, such as virtual machine migration. The performance of such operations is limited by the bandwidth available.

For information about how to use PCI Express and conventional PCI devices with Intel Q35-based virtual machines, see *Using PCI Express and Conventional PCI Devices with the Q35 Virtual Machine* .

2.2.5. Device Assignment Requirements

If you plan to implement device assignment and PCI passthrough so that a virtual machine can use a specific PCIe device from a host, ensure the following requirements are met:

- CPU must support IOMMU (for example, VT-d or AMD-Vi). IBM POWER8 supports IOMMU by default.
- Firmware must support IOMMU.
- CPU root ports used must support ACS or ACS-equivalent capability.
- PCIe devices must support ACS or ACS-equivalent capability.

- Red Hat recommends that all PCIe switches and bridges between the PCIe device and the root port support ACS. For example, if a switch does not support ACS, all devices behind that switch share the same IOMMU group, and can only be assigned to the same virtual machine.

- For GPU support, Red Hat Enterprise Linux 7 supports PCI device assignment of PCIe-based NVIDIA K-Series Quadro (model 2000 series or higher), GRID, and Tesla as non-VGA graphics devices. Currently up to two GPUs may be attached to a virtual machine in addition to one of the standard, emulated VGA interfaces. The emulated VGA is used for pre-boot and installation and the NVIDIA GPU takes over when the NVIDIA graphics drivers are loaded. Note that the NVIDIA Quadro 2000 is not supported, nor is the Quadro K420 card.

Check vendor specification and datasheets to confirm that your hardware meets these requirements. The **lspci -v** command can be used to print information for PCI devices already installed on a system.

2.2.6. vGPU Requirements

If you plan to configure a host to allow virtual machines on that host to install a vGPU, the following requirements must be met:

- vGPU-compatible GPU
- GPU-enabled host kernel
- Installed GPU with correct drivers
- Predefined **mdev_type** set to correspond with one of the mdev types supported by the device
- vGPU-capable drivers installed on each host in the cluster
- vGPU-supported virtual machine operating system with vGPU drivers installed

2.3. NETWORKING REQUIREMENTS

2.3.1. General Requirements

Red Hat Virtualization requires IPv6 to remain enabled on the computer or virtual machine where you are running the Manager (also called "the Manager machine"). Do not disable IPv6 on the Manager machine, even if your systems do not use it.

2.3.2. Firewall Requirements for DNS, NTP, IPMI Fencing, and Metrics Store

The firewall requirements for all of the following topics are special cases that require individual consideration.

DNS and NTP

Red Hat Virtualization does not create a DNS or NTP server, so the firewall does not need to have open ports for incoming traffic.

By default, Red Hat Enterprise Linux allows outbound traffic to DNS and NTP on any destination address. If you disable outgoing traffic, define exceptions for requests that are sent to DNS and NTP servers.

IMPORTANT

- The Red Hat Virtualization Manager and all hosts (Red Hat Virtualization Host and Red Hat Enterprise Linux host) must have a fully qualified domain name and full, perfectly-aligned forward and reverse name resolution.
- Running a DNS service as a virtual machine in the Red Hat Virtualization environment is not supported. All DNS services the Red Hat Virtualization environment uses must be hosted outside of the environment.
- Red Hat strongly recommends using DNS instead of the **/etc/hosts** file for name resolution. Using a hosts file typically requires more work and has a greater chance for errors.

IPMI and Other Fencing Mechanisms (optional)

For IPMI (Intelligent Platform Management Interface) and other fencing mechanisms, the firewall does not need to have open ports for incoming traffic.

By default, Red Hat Enterprise Linux allows outbound IPMI traffic to ports on any destination address. If you disable outgoing traffic, make exceptions for requests being sent to your IPMI or fencing servers.

Each Red Hat Virtualization Host and Red Hat Enterprise Linux host in the cluster must be able to connect to the fencing devices of all other hosts in the cluster. If the cluster hosts are experiencing an error (network error, storage error...) and cannot function as hosts, they must be able to connect to other hosts in the data center.

The specific port number depends on the type of the fence agent you are using and how it is configured.

The firewall requirement tables in the following sections do not represent this option.

Metrics Store, Kibana, and ElasticSearch

For Metrics Store, Kibana, and ElasticSearch, see Network Configuration for Metrics Store virtual machines.

2.3.3. Red Hat Virtualization Manager Firewall Requirements

The Red Hat Virtualization Manager requires that a number of ports be opened to allow network traffic through the system's firewall.

The **engine-setup** script can configure the firewall automatically, but this overwrites any pre-existing firewall configuration if you are using **iptables**. If you want to keep the existing firewall configuration, you must manually insert the firewall rules required by the Manager. The **engine-setup** command saves a list of the **iptables** rules required in the **/etc/ovirt-engine/iptables.example** file. If you are using **firewalld**, **engine-setup** does not overwrite the existing configuration.

The firewall configuration documented here assumes a default configuration.

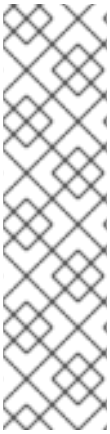
NOTE

A diagram of these firewall requirements is available at https://access.redhat.com/articles/3932211. You can use the IDs in the table to look up connections in the diagram.

Table 2.4. Red Hat Virtualization Manager Firewall Requirements

ID	Port(s)	Protocol	Source	Destination	Purpose
M1	-	ICMP	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Red Hat Virtualization Manager	Optional. May help in diagnosis.
M2	22	TCP	System(s) used for maintenance of the Manager including backend configuration, and software upgrades.	Red Hat Virtualization Manager	Secure Shell (SSH) access. Optional.
M3	2222	TCP	Clients accessing virtual machine serial consoles.	Red Hat Virtualization Manager	Secure Shell (SSH) access to enable connection to virtual machine serial consoles.
M4	80, 443	TCP	Administration Portal clients VM Portal clients Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts REST API clients	Red Hat Virtualization Manager	Provides HTTP and HTTPS access to the Manager.
M5	6100	TCP	Administration Portal clients VM Portal clients	Red Hat Virtualization Manager	Provides websocket proxy access for a web-based console client, **noVNC**, when the websocket proxy is running on the Manager. If the websocket proxy is running on a different host, however, this port is not used.

ID	Port(s)	Protocol	Source	Destination	Purpose
M6	7410	UDP	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Red Hat Virtualization Manager	If Kdump is enabled on the hosts, open this port for the fence_kdump listener on the Manager. See fence_kdump Advanced Configuration.
M7	54323	TCP	Administration Portal clients	Red Hat Virtualization Manager (ImageIO Proxy server)	Required for communication with the ImageIO Proxy (**ovirt-imageio-proxy**).
M8	6442	TCP	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Open Virtual Network (OVN) southbound database	Connect to Open Virtual Network (OVN) database
M9	9696	TCP	Clients of external network provider for OVN	External network provider for OVN	OpenStack Networking API
M10	35357	TCP	Clients of external network provider for OVN	External network provider for OVN	OpenStack Identity API
M11	53	TCP, UDP	Red Hat Virtualization Manager	DNS Server	DNS lookup requests from ports above 1023 to port 53, and responses. Open by default.
M12	123	UDP	Red Hat Virtualization Manager	NTP Server	NTP requests from ports above 1023 to port 123, and responses. Open by default.



NOTE

- A port for the OVN northbound database (6641) is not listed because, in the default configuration, the only client for the OVN northbound database (6641) is **ovirt-provider-ovn**. Because they both run on the same host, their communication is not visible to the network.
- By default, Red Hat Enterprise Linux allows outbound traffic to DNS and NTP on any destination address. If you disable outgoing traffic, make exceptions for the Manager to send requests to DNS and NTP servers. Other nodes may also require DNS and NTP. In that case, consult the requirements for those nodes and configure the firewall accordingly.

2.3.4. Host Firewall Requirements

Red Hat Enterprise Linux hosts and Red Hat Virtualization Hosts (RHVH) require a number of ports to be opened to allow network traffic through the system's firewall. The firewall rules are automatically configured by default when adding a new host to the Manager, overwriting any pre-existing firewall configuration.

To disable automatic firewall configuration when adding a new host, clear the **Automatically configure host firewall** check box under **Advanced Parameters**.

To customize the host firewall rules, see https://access.redhat.com/solutions/2772331.

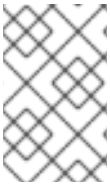


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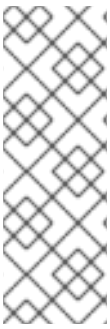
Table 2.5. Virtualization Host Firewall Requirements

ID	Port(s)	Protocol	Source	Destination	Purpose
H1	22	TCP	Red Hat Virtualization Manager	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Secure Shell (SSH) access. Optional.
H2	2223	TCP	Red Hat Virtualization Manager	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Secure Shell (SSH) access to enable connection to virtual machine serial consoles.

ID	Port(s)	Protocol	Source	Destination	Purpose
H3	161	UDP	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Red Hat Virtualization Manager	Simple network management protocol (SNMP). Only required if you want Simple Network Management Protocol traps sent from the host to one or more external SNMP managers. Optional.
H4	111	TCP	NFS storage server	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	NFS connections. Optional.
H5	5900 - 6923	TCP	Administration Portal clients VM Portal clients	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Remote guest console access via VNC and SPICE. These ports must be open to facilitate client access to virtual machines.
H6	5989	TCP, UDP	Common Information Model Object Manager (CIMOM)	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Used by Common Information Model Object Managers (CIMOM) to monitor virtual machines running on the host. Only required if you want to use a CIMOM to monitor the virtual machines in your virtualization environment. Optional.

ID	Port(s)	Protocol	Source	Destination	Purpose
H7	9090	TCP	Red Hat Virtualization Manager Client machines	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Required to access the Cockpit web interface, if installed.
H8	16514	TCP	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Virtual machine migration using **libvirt**.
H9	49152 - 49216	TCP	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Virtual machine migration and fencing using VDSM. These ports must be open to facilitate both automated and manual migration of virtual machines.
H10	54321	TCP	Red Hat Virtualization Manager Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	VDSM communications with the Manager and other virtualization hosts.
H11	54322	TCP	Red Hat Virtualization Manager (ImageIO Proxy server)	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Required for communication with the ImageIO daemon (**ovirt-imageio-daemon**).
H12	6081	UDP	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	Required, when Open Virtual Network (OVN) is used as a network provider, to allow OVN to create tunnels between hosts.

ID	Port(s)	Protocol	Source	Destination	Purpose
H13	53	TCP, UDP	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	DNS Server	DNS lookup requests from ports above 1023 to port 53, and responses. This port is required and open by default.
H14	123	UDP	Red Hat Virtualization Hosts Red Hat Enterprise Linux hosts	NTP Server	NTP requests from ports above 1023 to port 123, and responses. This port is required and open by default.



NOTE

By default, Red Hat Enterprise Linux allows outbound traffic to DNS and NTP on any destination address. If you disable outgoing traffic, make exceptions for the Red Hat Virtualization Hosts

Red Hat Enterprise Linux hosts to send requests to DNS and NTP servers. Other nodes may also require DNS and NTP. In that case, consult the requirements for those nodes and configure the firewall accordingly.

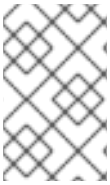
2.3.5. Database Server Firewall Requirements

Red Hat Virtualization supports the use of a remote database server for the Manager database (**engine**) and the Data Warehouse database (**ovirt-engine-history**). If you plan to use a remote database server, it must allow connections from the Manager and the Data Warehouse service (which can be separate from the Manager).

Similarly, if you plan to access a local or remote Data Warehouse database from an external system, such as Red Hat CloudForms, the database must allow connections from that system.

IMPORTANT

Accessing the Manager database from external systems is not supported.



NOTE

A diagram of these firewall requirements is available at https://access.redhat.com/articles/3932211. You can use the IDs in the table to look up connections in the diagram.

Table 2.6. Database Server Firewall Requirements

ID	Port(s)	Protocol	Source	Destination	Purpose
D1	5432	TCP, UDP	Red Hat Virtualization Manager Data Warehouse service	Manager (**engine**) database server Data Warehouse (**ovirt-engine-history**) database server	Default port for PostgreSQL database connections.
D2	5432	TCP, UDP	External systems	Data Warehouse (**ovirt-engine-history**) database server	Default port for PostgreSQL database connections.

CHAPTER 3. PREPARING STORAGE FOR RED HAT VIRTUALIZATION

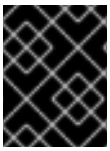
Prepare storage to be used for storage domains in the new environment. A Red Hat Virtualization environment must have at least one data storage domain, but adding more is recommended.

A data domain holds the virtual hard disks and OVF files of all the virtual machines and templates in a data center, and cannot be shared across data centers while active (but can be migrated between data centers). Data domains of multiple storage types can be added to the same data center, provided they are all shared, rather than local, domains.

Self-hosted engines must have an additional data domain dedicated to the Manager virtual machine. This domain is created during the self-hosted engine deployment, and must be at least 74 GiB. You must prepare the storage for this domain before beginning the deployment.

You can use one of the following storage types:

- NFS
- iSCSI
- Fibre Channel (FCP)
- Red Hat Gluster Storage



IMPORTANT

If you are using iSCSI storage, the self-hosted engine storage domain must use its own iSCSI target. Any additional storage domains must use a different iSCSI target.

WARNING

Creating additional data storage domains in the same data center as the self-hosted engine storage domain is highly recommended. If you deploy the self-hosted engine in a data center with only one active data storage domain, and that storage domain is corrupted, you will not be able to add new storage domains or remove the corrupted storage domain; you will have to redeploy the self-hosted engine.

3.1. PREPARING NFS STORAGE

Set up NFS shares that will serve as storage domains on a Red Hat Enterprise Linux server.

For information on setting up and configuring NFS, see Network File System (NFS) in the *Red Hat Enterprise Linux 7 Storage Administration Guide*.

Specific system user accounts and system user groups are required by Red Hat Virtualization so the Manager can store data in the storage domains represented by the exported directories. The following procedure sets the permissions for one directory. You must repeat the **chown** and **chmod** steps for all of the directories you intend to use as storage domains in Red Hat Virtualization.

Procedure

1. Create the group **kvm**:

```
# groupadd kvm -g 36
```

2. Create the user **vdsm** in the group **kvm**:

```
# useradd vdsm -u 36 -g 36
```

3. Set the ownership of your exported directory to 36:36, which gives **vdsm:kvm** ownership:

```
# chown -R 36:36 /exports/data
```

4. Change the mode of the directory so that read and write access is granted to the owner, and so that read and execute access is granted to the group and other users:

```
# chmod 0755 /exports/data
```

3.2. PREPARING ISCSI STORAGE

Red Hat Virtualization supports iSCSI storage, which is a storage domain created from a volume group made up of LUNs. Volume groups and LUNs cannot be attached to more than one storage domain at a time.

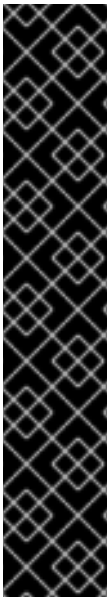
For information on setting up and configuring iSCSI storage, see Online Storage Management in the *Red Hat Enterprise Linux 7 Storage Administration Guide* .

IMPORTANT

If you are using block storage and you intend to deploy virtual machines on raw devices or direct LUNs and to manage them with the Logical Volume Manager, you must create a filter to hide the guest logical volumes. This will prevent guest logical volumes from being activated when the host is booted, a situation that could lead to stale logical volumes and cause data corruption. See https://access.redhat.com/solutions/2662261 for details.

IMPORTANT

Red Hat Virtualization currently does not support storage with a block size of 4K. You must configure block storage in legacy (512b block) mode.



IMPORTANT

If your host is booting from SAN storage and loses connectivity to the storage, the storage file systems become read-only and remain in this state after connectivity is restored.

To prevent this situation, Red Hat recommends adding a drop-in multipath configuration file on the root file system of the SAN for the boot LUN to ensure that it is queued when there is a connection:

```
# cat /etc/multipath/conf.d/host.conf
multipaths {
    multipath {
        wwid boot_LUN_wwid
        no_path_retry queue
    }
```

3.3. PREPARING FCP STORAGE

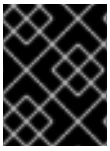
Red Hat Virtualization supports SAN storage by creating a storage domain from a volume group made of pre-existing LUNs. Neither volume groups nor LUNs can be attached to more than one storage domain at a time.

Red Hat Virtualization system administrators need a working knowledge of Storage Area Networks (SAN) concepts. SAN usually uses Fibre Channel Protocol (FCP) for traffic between hosts and shared external storage. For this reason, SAN may occasionally be referred to as FCP storage.

For information on setting up and configuring FCP or multipathing on Red Hat Enterprise Linux, see the *Storage Administration Guide* and *DM Multipath Guide*.

IMPORTANT

If you are using block storage and you intend to deploy virtual machines on raw devices or direct LUNs and to manage them with the Logical Volume Manager, you must create a filter to hide the guest logical volumes. This will prevent guest logical volumes from being activated when the host is booted, a situation that could lead to stale logical volumes and cause data corruption. See https://access.redhat.com/solutions/2662261 for details.



IMPORTANT

Red Hat Virtualization currently does not support storage with a block size of 4K. You must configure block storage in legacy (512b block) mode.

IMPORTANT

If your host is booting from SAN storage and loses connectivity to the storage, the storage file systems become read-only and remain in this state after connectivity is restored.

To prevent this situation, Red Hat recommends adding a drop-in multipath configuration file on the root file system of the SAN for the boot LUN to ensure that it is queued when there is a connection:

```
# cat /etc/multipath/conf.d/host.conf
multipaths {
    multipath {
        wwid boot_LUN_wwid
        no_path_retry queue
    }
```

3.4. PREPARING RED HAT GLUSTER STORAGE

For information on setting up and configuring Red Hat Gluster Storage, see the *Red Hat Gluster Storage Installation Guide*.

For the Red Hat Gluster Storage versions that are supported with Red Hat Virtualization, see https://access.redhat.com/articles/2356261.

CHAPTER 4. INSTALLING THE SELF-HOSTED ENGINE DEPLOYMENT HOST

A self-hosted engine can be deployed from a Red Hat Virtualization Host or a Red Hat Enterprise Linux host.

IMPORTANT

If you plan to use bonded interfaces for high availability or VLANs to separate different types of traffic (for example, for storage or management connections), you should configure them on the host before beginning the self-hosted engine deployment. See Networking Recommendations in the *Planning and Prerequisites Guide*.

4.1. INSTALLING RED HAT VIRTUALIZATION HOSTS

Red Hat Virtualization Host (RHVH) is a minimal operating system based on Red Hat Enterprise Linux that is designed to provide a simple method for setting up a physical machine to act as a hypervisor in a Red Hat Virtualization environment. The minimal operating system contains only the packages required for the machine to act as a hypervisor, and features a Cockpit web interface for monitoring the host and performing administrative tasks. See http://cockpit-project.org/running.html for the minimum browser requirements.

RHVH supports NIST 800-53 partitioning requirements to improve security. RHVH uses a NIST 800-53 partition layout by default.

The host must meet the minimum host requirements.

Procedure

1. Download the RHVH ISO image from the Customer Portal:
   a. Log in to the Customer Portal at https://access.redhat.com.
   b. Click **Downloads** in the menu bar.
   c. Click **Red Hat Virtualization**. Scroll up and click **Download Latest** to access the product download page.
   d. Go to **Hypervisor Image for RHV 4.3** and and click **Download Now**.
   e. Create a bootable media device. See Making Media in the *Red Hat Enterprise Linux Installation Guide* for more information.
2. Start the machine on which you are installing RHVH, booting from the prepared installation media.
3. From the boot menu, select **Install RHVH 4.3** and press **Enter**.

NOTE

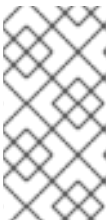
You can also press the **Tab** key to edit the kernel parameters. Kernel parameters must be separated by a space, and you can boot the system using the specified kernel parameters by pressing the **Enter** key. Press the **Esc** key to clear any changes to the kernel parameters and return to the boot menu.

4. Select a language, and click **Continue**.
5. Select a time zone from the **Date & Time** screen and click **Done**.
6. Select a keyboard layout from the **Keyboard** screen and click **Done**.
7. Select the device on which to install RHVH from the **Installation Destination** screen. Optionally, enable encryption. Click **Done**.

IMPORTANT

Red Hat strongly recommends using the **Automatically configure partitioning** option.

8. Select a network from the **Network & Host Name** screen and click **Configure...** to configure the connection details.



NOTE

To use the connection every time the system boots, select the **Automatically connect to this network when it is available** check box. For more information, see Edit Network Connections in the *Red Hat Enterprise Linux 7 Installation Guide*.

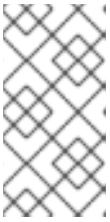
Enter a host name in the **Host name** field, and click **Done**.

9. Optionally configure **Language Support**, **Security Policy**, and **Kdump**. See Installing Using Anaconda in the *Red Hat Enterprise Linux 7 Installation Guide* for more information on each of the sections in the **Installation Summary** screen.
10. Click **Begin Installation**.
11. Set a root password and, optionally, create an additional user while RHVH installs.

WARNING

Red Hat strongly recommends not creating untrusted users on RHVH, as this can lead to exploitation of local security vulnerabilities.

12. Click **Reboot** to complete the installation.



NOTE

When RHVH restarts, **nodectl check** performs a health check on the host and displays the result when you log in on the command line. The message **node status: OK** or **node status: DEGRADED** indicates the health status. Run **nodectl check** to get more information. The service is enabled by default.

4.1.1. Enabling the Red Hat Virtualization Host Repository

Register the system to receive updates. Red Hat Virtualization Host only requires one repository. This section provides instructions for registering RHVH with the Content Delivery Network, or with Red Hat Satellite 6.

Registering RHVH with the Content Delivery Network

1. Log in to the Cockpit web interface at **https://*HostFQDNorIP*:9090**.
2. Navigate to **Subscriptions**, click **Register System**, and enter your Customer Portal user name and password. The **Red Hat Virtualization Host** subscription is automatically attached to the system.
3. Click **Terminal**.
4. Enable the **Red Hat Virtualization Host 7** repository to allow later updates to the Red Hat Virtualization Host:

```
# subscription-manager repos --enable=rhel-7-server-rhvh-4-rpms
```

Registering RHVH with Red Hat Satellite 6

1. Log in to the Cockpit web interface at **https://*HostFQDNorIP*:9090**.
2. Click **Terminal**.
3. Register RHVH with Red Hat Satellite 6:

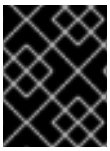
```
# rpm -Uvh http://satellite.example.com/pub/katello-ca-consumer-latest.noarch.rpm
# subscription-manager register --org="org_id"
# subscription-manager list --available
# subscription-manager attach --pool=pool_id
# subscription-manager repos \
  --disable='*' \
  --enable=rhel-7-server-rhvh-4-rpms
```

4.2. INSTALLING RED HAT ENTERPRISE LINUX HOSTS

A Red Hat Enterprise Linux host is based on a standard basic installation of Red Hat Enterprise Linux 7 on a physical server, with the **Red Hat Enterprise Linux Server** and **Red Hat Virtualization** subscriptions attached.

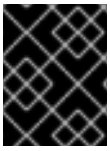
For detailed installation instructions, see the *Red Hat Enterprise Linux 7 Installation Guide* .

The host must meet the minimum host requirements.



IMPORTANT

Virtualization must be enabled in your host's BIOS settings. For information on changing your host's BIOS settings, refer to your host's hardware documentation.



IMPORTANT

Third-party watchdogs should not be installed on Red Hat Enterprise Linux hosts, as they can interfere with the watchdog daemon provided by VDSM.

4.2.1. Enabling the Red Hat Enterprise Linux Host Repositories

To use a Red Hat Enterprise Linux machine as a host, you must register the system with the Content Delivery Network, attach the **Red Hat Enterprise Linux Server** and **Red Hat Virtualization** subscriptions, and enable the host repositories.

Procedure

1. Register your system with the Content Delivery Network, entering your Customer Portal user name and password when prompted:

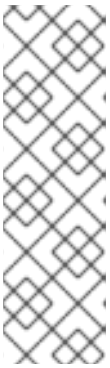
```
# subscription-manager register
```

2. Find the **Red Hat Enterprise Linux Server** and **Red Hat Virtualization** subscription pools and record the pool IDs:

```
# subscription-manager list --available
```

3. Use the pool IDs to attach the subscriptions to the system:

```
# subscription-manager attach --pool=poolid
```



NOTE

To view currently attached subscriptions:

```
# subscription-manager list --consumed
```

To list all enabled repositories:

```
# yum repolist
```

4. Configure the repositories:

```
# subscription-manager repos \
    --disable='*' \
    --enable=rhel-7-server-rpms \
    --enable=rhel-7-server-rhv-4-mgmt-agent-rpms \
    --enable=rhel-7-server-ansible-2-rpms
```

For Red Hat Enterprise Linux 7 hosts, little endian, on IBM POWER8 hardware:

```
# subscription-manager repos \
    --disable='*' \
    --enable=rhel-7-server-rhv-4-mgmt-agent-for-power-le-rpms \
    --enable=rhel-7-for-power-le-rpms
```

For Red Hat Enterprise Linux 7 hosts, little endian, on IBM POWER9 hardware:

```
# subscription-manager repos \
    --disable='*' \
    --enable=rhel-7-server-rhv-4-mgmt-agent-for-power-9-rpms \
```

```
--enable=rhel-7-for-power-9-rpms
```

5. Ensure that all packages currently installed are up to date:

```
# yum update
```

6. Reboot the machine.

4.2.2. Installing Cockpit on Red Hat Enterprise Linux Hosts

You can install Cockpit for monitoring the host's resources and performing administrative tasks.

Procedure

1. Install the dashboard packages:

```
# yum install cockpit-ovirt-dashboard
```

2. Enable and start the **cockpit.socket** service:

```
# systemctl enable cockpit.socket
# systemctl start cockpit.socket
```

3. Check if Cockpit is an active service in the firewall:

```
# firewall-cmd --list-services
```

You should see **cockpit** listed. If it is not, enter the following with root permissions to add **cockpit** as a service to your firewall:

```
# firewall-cmd --permanent --add-service=cockpit
```

The **--permanent** option keeps the **cockpit** service active after rebooting.

You can log in to the Cockpit web interface at **https://*HostFQDNorIP*:9090**.

CHAPTER 5. INSTALLING THE RED HAT VIRTUALIZATION MANAGER

The RHV-M Appliance is installed during the deployment process; however, if required, you can install it on the deployment host before starting the installation:

```
# yum install rhvm-appliance
```

Manually installing the Manager virtual machine is not supported.

5.1. DEPLOYING THE SELF-HOSTED ENGINE USING COCKPIT

Deploy a self-hosted engine, using Cockpit to collect the details of your environment. This is the recommended method. Cockpit is enabled by default on Red Hat Virtualization Hosts, and can be installed on Red Hat Enterprise Linux hosts.

Prerequisites

- FQDNs prepared for your Manager and the deployment host. Forward and reverse lookup records must both be set in the DNS.

Procedure

1. Log in to Cockpit at **https://*HostIPorFQDN*:9090** and click **Virtualization → Hosted Engine**.
2. Click **Start** under the **Hosted Engine** option.
3. Enter the details for the Manager virtual machine:
   a. Enter the **Engine VM FQDN**. This is the FQDN for the Manager virtual machine, not the base host.
   b. Enter a **MAC Address** for the Manager virtual machine, or accept a randomly generated one.
   c. Choose either **DHCP** or **Static** from the **Network Configuration** drop-down list.

NOTE

For IPv6, Red Hat Virtualization supports only static addressing.

   - If you choose **DHCP**, you must have a DHCP reservation for the Manager virtual machine so that its host name resolves to the address received from DHCP. Specify its MAC address in the **MAC Address** field.
   - If you choose **Static**, enter the following details:
     - **VM IP Address** - The IP address must belong to the same subnet as the host. For example, if the host is in 10.1.1.0/24, the Manager virtual machine's IP must be in the same subnet range (10.1.1.1-254/24).
     - **Gateway Address**
     - **DNS Servers**

d. Select the **Bridge Interface** from the drop-down list.

e. Enter and confirm the virtual machine's **Root Password**.

f. Specify whether to allow **Root SSH Access**.

g. Enter the **Number of Virtual CPUs** for the virtual machine.

h. Enter the **Memory Size (MiB)**. The available memory is displayed next to the input field.

4. Optionally expand the **Advanced** fields:

a. Enter a **Root SSH Public Key** to use for root access to the Manager virtual machine.

b. Select or clear the **Edit Hosts File** check box to specify whether to add entries for the Manager virtual machine and the base host to the virtual machine's **/etc/hosts** file. You must ensure that the host names are resolvable.

c. Change the management **Bridge Name**, or accept the default **ovirtmgmt**.

d. Enter the **Gateway Address** for the management bridge.

e. Enter the **Host FQDN** of the first host to add to the Manager. This is the FQDN of the base host you are running the deployment on.

5. Click **Next**.

6. Enter and confirm the **Admin Portal Password** for the **admin@internal** user.

7. Configure event notifications:

a. Enter the **Server Name** and **Server Port Number** of the SMTP server.

b. Enter the **Sender E-Mail Address**.

c. Enter the **Recipient E-Mail Addresses**.

8. Click **Next**.

9. Review the configuration of the Manager and its virtual machine. If the details are correct, click **Prepare VM**.

10. When the virtual machine installation is complete, click **Next**.

11. Select the **Storage Type** from the drop-down list, and enter the details for the self-hosted engine storage domain:

- For NFS:

a. Enter the full address and path to the storage in the **Storage Connection** field.

b. If required, enter any **Mount Options**.

c. Enter the **Disk Size (GiB)**.

d. Select the **NFS Version** from the drop-down list.

e. Enter the **Storage Domain Name**.

- For iSCSI:

  a. Enter the **Portal IP Address**, **Portal Port**, **Portal Username**, and **Portal Password**.

  b. Click **Retrieve Target List** and select a target. You can only select one iSCSI target during the deployment, but multipathing is supported to connect all portals of the same portal group.

  NOTE

  To specify more than one iSCSI target, you must enable multipathing before deploying the self-hosted engine. See *Red Hat Enterprise Linux DM Multipath* for details. There is also a Multipath Helper tool that generates a script to install and configure multipath with different options.

  c. Enter the **Disk Size (GiB)**.

  d. Enter the **Discovery Username** and **Discovery Password**.

- For Fibre Channel:

  a. Enter the **LUN ID**. The host bus adapters must be configured and connected, and the LUN must not contain any existing data. To reuse an existing LUN, see Reusing LUNs in the *Administration Guide*.

  b. Enter the **Disk Size (GiB)**.

- For Red Hat Gluster Storage:

  a. Enter the full address and path to the storage in the **Storage Connection** field.

  b. If required, enter any **Mount Options**.

  c. Enter the **Disk Size (GiB)**.

12. Click **Next**.

13. Review the storage configuration. If the details are correct, click **Finish Deployment**.

14. When the deployment is complete, click **Close**.
    One data center, cluster, host, storage domain, and the Manager virtual machine are already running. You can log in to the Administration Portal to add further resources.

15. Optionally, add a directory server using the **ovirt-engine-extension-aaa-ldap-setup** interactive setup script so you can add additional users to the environment. For more information, see Configuring an External LDAP Provider in the *Administration Guide*.

The self-hosted engine's status is displayed in Cockpit's **Virtualization → Hosted Engine** tab. The Manager virtual machine, the host running it, and the self-hosted engine storage domain are flagged with a gold crown in the Administration Portal.

Enabling the Red Hat Virtualization Manager repositories is not part of the automated installation. Log in to the Manager virtual machine to register it with the Content Delivery Network:

5.2. ENABLING THE RED HAT VIRTUALIZATION MANAGER REPOSITORIES

Register the system with Red Hat Subscription Manager, attach the **Red Hat Virtualization Manager** subscription, and enable the Manager repositories.

Procedure

1. Register your system with the Content Delivery Network, entering your Customer Portal user name and password when prompted:

```
# subscription-manager register
```

NOTE

If you are using an IPv6 network, use an IPv6 transition mechanism to access the Content Delivery Network and subscription manager.

2. Find the **Red Hat Virtualization Manager** subscription pool and record the pool ID:

```
# subscription-manager list --available
```

3. Use the pool ID to attach the subscription to the system:

```
# subscription-manager attach --pool=pool_id
```

NOTE

To view currently attached subscriptions:

```
# subscription-manager list --consumed
```

To list all enabled repositories:

```
# yum repolist
```

4. Configure the repositories:

```
# subscription-manager repos \
    --disable='*' \
    --enable=rhel-7-server-rpms \
    --enable=rhel-7-server-supplementary-rpms \
    --enable=rhel-7-server-rhv-4.3-manager-rpms \
    --enable=rhel-7-server-rhv-4-manager-tools-rpms \
    --enable=rhel-7-server-ansible-2-rpms \
    --enable=jb-eap-7.2-for-rhel-7-server-rpms
```

Log in to the Administration Portal, where you can add hosts and storage to the environment:

5.3. CONNECTING TO THE ADMINISTRATION PORTAL

Access the Administration Portal using a web browser.

1. In a web browser, navigate to **https://*manager-fqdn*/ovirt-engine**, replacing *manager-fqdn* with the FQDN that you provided during installation.

NOTE

You can access the Administration Portal using alternate host names or IP addresses. To do so, you need to add a configuration file under **/etc/ovirt-engine/engine.conf.d/**. For example:

```
# vi /etc/ovirt-engine/engine.conf.d/99-custom-sso-setup.conf
SSO_ALTERNATE_ENGINE_FQDNS="alias1.example.com
alias2.example.com"
```

The list of alternate host names needs to be separated by spaces. You can also add the IP address of the Manager to the list, but using IP addresses instead of DNS-resolvable host names is not recommended.

2. Click **Administration Portal**. An SSO login page displays. SSO login enables you to log in to the Administration and VM Portal at the same time.

3. Enter your **User Name** and **Password**. If you are logging in for the first time, use the user name **admin** along with the password that you specified during installation.

4. Select the **Domain** to authenticate against. If you are logging in using the internal **admin** user name, select the **internal** domain.

5. Click **Log In**.

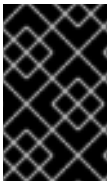
6. You can view the Administration Portal in multiple languages. The default selection is chosen based on the locale settings of your web browser. If you want to view the Administration Portal in a language other than the default, select your preferred language from the drop-down list on the welcome page.

To log out of the Red Hat Virtualization Administration Portal, click your user name in the header bar and click **Sign Out**. You are logged out of all portals and the Manager welcome screen displays.

CHAPTER 6. INSTALLING HOSTS FOR RED HAT VIRTUALIZATION

Red Hat Virtualization supports two types of hosts: Red Hat Virtualization Hosts (RHVH) and Red Hat Enterprise Linux hosts. Depending on your environment, you may want to use one type only, or both. At least two hosts are required for features such as migration and high availability.

See Section 6.3, "Recommended Practices for Configuring Host Networks" for networking information.



IMPORTANT

SELinux is in enforcing mode upon installation. To verify, run **getenforce**. SELinux must be in enforcing mode on all hosts and Managers for your Red Hat Virtualization environment to be supported by Red Hat.

Table 6.1. Host Types

Host Type	Other Names	Description
Red Hat Virtualization Host	RHVH, thin host	This is a minimal operating system based on Red Hat Enterprise Linux. It is distributed as an ISO file from the Customer Portal and contains only the packages required for the machine to act as a host.
Red Hat Enterprise Linux Host	RHEL-based hypervisor, thick host	Red Hat Enterprise Linux systems with the appropriate subscriptions attached can be used as hosts.

Host Compatibility

When you create a new data center, you can set the compatibility version. Select the compatibility version that suits all the hosts in the data center. Once set, version regression is not allowed. For a fresh Red Hat Virtualization installation, the latest compatibility version is set in the default data center and default cluster; to use an earlier compatibility version, you must create additional data centers and clusters. For more information about compatibility versions see *Red Hat Virtualization Manager Compatibility* in the Red Hat Virtualization Life Cycle .

6.1. RED HAT VIRTUALIZATION HOSTS

6.1.1. Installing Red Hat Virtualization Hosts

Red Hat Virtualization Host (RHVH) is a minimal operating system based on Red Hat Enterprise Linux that is designed to provide a simple method for setting up a physical machine to act as a hypervisor in a Red Hat Virtualization environment. The minimal operating system contains only the packages required for the machine to act as a hypervisor, and features a Cockpit web interface for monitoring the host and performing administrative tasks. See http://cockpit-project.org/running.html for the minimum browser requirements.

RHVH supports NIST 800-53 partitioning requirements to improve security. RHVH uses a NIST 800-53 partition layout by default.

The host must meet the minimum host requirements.

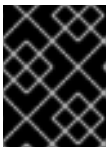
Procedure

1. Download the RHVH ISO image from the Customer Portal:
   a. Log in to the Customer Portal at https://access.redhat.com.
   b. Click **Downloads** in the menu bar.
   c. Click **Red Hat Virtualization**. Scroll up and click **Download Latest** to access the product download page.
   d. Go to **Hypervisor Image for RHV 4.3** and and click **Download Now**.
   e. Create a bootable media device. See Making Media in the *Red Hat Enterprise Linux Installation Guide* for more information.
2. Start the machine on which you are installing RHVH, booting from the prepared installation media.
3. From the boot menu, select **Install RHVH 4.3** and press **Enter**.

NOTE

You can also press the **Tab** key to edit the kernel parameters. Kernel parameters must be separated by a space, and you can boot the system using the specified kernel parameters by pressing the **Enter** key. Press the **Esc** key to clear any changes to the kernel parameters and return to the boot menu.

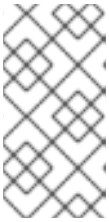
4. Select a language, and click **Continue**.
5. Select a time zone from the **Date & Time** screen and click **Done**.
6. Select a keyboard layout from the **Keyboard** screen and click **Done**.
7. Select the device on which to install RHVH from the **Installation Destination** screen. Optionally, enable encryption. Click **Done**.



IMPORTANT

Red Hat strongly recommends using the **Automatically configure partitioning** option.

8. Select a network from the **Network & Host Name** screen and click **Configure...** to configure the connection details.



NOTE

To use the connection every time the system boots, select the **Automatically connect to this network when it is available** check box. For more information, see Edit Network Connections in the *Red Hat Enterprise Linux 7 Installation Guide*.

Enter a host name in the **Host name** field, and click **Done**.

9. Optionally configure **Language Support**, **Security Policy**, and **Kdump**. See Installing Using Anaconda in the *Red Hat Enterprise Linux 7 Installation Guide* for more information on each of the sections in the **Installation Summary** screen.

10. Click **Begin Installation**.

11. Set a root password and, optionally, create an additional user while RHVH installs.

WARNING

Red Hat strongly recommends not creating untrusted users on RHVH, as this can lead to exploitation of local security vulnerabilities.

12. Click **Reboot** to complete the installation.

NOTE

When RHVH restarts, **nodectl check** performs a health check on the host and displays the result when you log in on the command line. The message **node status: OK** or **node status: DEGRADED** indicates the health status. Run **nodectl check** to get more information. The service is enabled by default.

6.1.2. Enabling the Red Hat Virtualization Host Repository

Register the system to receive updates. Red Hat Virtualization Host only requires one repository. This section provides instructions for registering RHVH with the Content Delivery Network, or with Red Hat Satellite 6.

Registering RHVH with the Content Delivery Network

1. Log in to the Cockpit web interface at **https://*HostFQDNorIP*:9090**.

2. Navigate to **Subscriptions**, click **Register System**, and enter your Customer Portal user name and password. The **Red Hat Virtualization Host** subscription is automatically attached to the system.

3. Click **Terminal**.

4. Enable the **Red Hat Virtualization Host 7** repository to allow later updates to the Red Hat Virtualization Host:

```
# subscription-manager repos --enable=rhel-7-server-rhvh-4-rpms
```

Registering RHVH with Red Hat Satellite 6

1. Log in to the Cockpit web interface at **https://*HostFQDNorIP*:9090**.
2. Click **Terminal**.
3. Register RHVH with Red Hat Satellite 6:

```
# rpm -Uvh http://satellite.example.com/pub/katello-ca-consumer-latest.noarch.rpm
# subscription-manager register --org="org_id"
# subscription-manager list --available
# subscription-manager attach --pool=pool_id
# subscription-manager repos \
  --disable='*' \
  --enable=rhel-7-server-rhvh-4-rpms
```

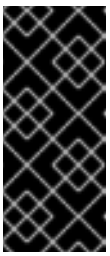
6.1.3. Advanced Installation

6.1.3.1. Custom Partitioning

Custom partitioning on Red Hat Virtualization Host (RHVH) is not recommended. Red Hat strongly recommends using the **Automatically configure partitioning** option in the **Installation Destination** window.

If your installation requires custom partitioning, select the **I will configure partitioning** option during the installation, and note that the following restrictions apply:

- Ensure the default **LVM Thin Provisioning** option is selected in the **Manual Partitioning** window.
- The following directories are required and must be on thin provisioned logical volumes:
  - root (/)
  - **/home**
  - **/tmp**
  - **/var**
  - **/var/crash**
  - **/var/log**
  - **/var/log/audit**



IMPORTANT

Do not create a separate partition for **/usr**. Doing so will cause the installation to fail.

/usr must be on a logical volume that is able to change versions along with RHVH, and therefore should be left on root (/).

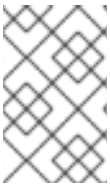
For information about the required storage sizes for each partition, see Section 2.2.3, "Storage Requirements".

- The /**boot** directory should be defined as a standard partition.
- The /**var** directory must be on a separate volume or disk.
- Only XFS or Ext4 file systems are supported.

Configuring Manual Partitioning in a Kickstart File

The following example demonstrates how to configure manual partitioning in a Kickstart file.

```
clearpart --all
part /boot --fstype xfs --size=1000 --ondisk=sda
part pv.01 --size=42000 --grow
volgroup HostVG pv.01 --reserved-percent=20
logvol swap --vgname=HostVG --name=swap --fstype=swap --recommended
logvol none --vgname=HostVG --name=HostPool --thinpool --size=40000 --grow
logvol / --vgname=HostVG --name=root --thin --fstype=ext4 --poolname=HostPool --
fsoptions="defaults,discard" --size=6000 --grow
logvol /var --vgname=HostVG --name=var --thin --fstype=ext4 --poolname=HostPool
--fsoptions="defaults,discard" --size=15000
logvol /var/crash --vgname=HostVG --name=var_crash --thin --fstype=ext4 --poolname=HostPool --
fsoptions="defaults,discard" --size=10000
logvol /var/log --vgname=HostVG --name=var_log --thin --fstype=ext4 --poolname=HostPool --
fsoptions="defaults,discard" --size=8000
logvol /var/log/audit --vgname=HostVG --name=var_audit --thin --fstype=ext4 --poolname=HostPool -
-fsoptions="defaults,discard" --size=2000
logvol /home --vgname=HostVG --name=home --thin --fstype=ext4 --poolname=HostPool --
fsoptions="defaults,discard" --size=1000
logvol /tmp --vgname=HostVG --name=tmp --thin --fstype=ext4 --poolname=HostPool --
fsoptions="defaults,discard" --size=1000
```



NOTE

If you use **logvol --thinpool --grow**, you must also include **volgroup --reserved-space** or **volgroup --reserved-percent** to reserve space in the volume group for the thin pool to grow.

6.1.3.2. Automating Red Hat Virtualization Host Deployment

You can install Red Hat Virtualization Host (RHVH) without a physical media device by booting from a PXE server over the network with a Kickstart file that contains the answers to the installation questions.

General instructions for installing from a PXE server with a Kickstart file are available in the *Red Hat Enterprise Linux Installation Guide*, as RHVH is installed in much the same way as Red Hat Enterprise Linux. RHVH-specific instructions, with examples for deploying RHVH with Red Hat Satellite, are described below.

The automated RHVH deployment has 3 stages:

- Section 6.1.3.2.1, "Preparing the Installation Environment"
- Section 6.1.3.2.2, "Configuring the PXE Server and the Boot Loader"

- Section 6.1.3.2.3, “Creating and Running a Kickstart File”

6.1.3.2.1. Preparing the Installation Environment

1. Log in to the Customer Portal.
2. Click **Downloads** in the menu bar.
3. Click **Red Hat Virtualization**. Scroll up and click **Download Latest** to access the product download page.
4. Go to **Hypervisor Image for RHV 4.3**and and click **Download Now**.
5. Make the RHVH ISO image available over the network. See Installation Source on a Network in the *Red Hat Enterprise Linux Installation Guide* .
6. Extract the **squashfs.img** hypervisor image file from the RHVH ISO:

```
# mount -o loop /path/to/RHVH-ISO /mnt/rhvh
# cp /mnt/rhvh/Packages/redhat-virtualization-host-image-update* /tmp
# cd /tmp
# rpm2cpio redhat-virtualization-host-image-update* | cpio -idmv
```

NOTE

This **squashfs.img** file, located in the **/tmp/usr/share/redhat-virtualization-host/image/** directory, is called **redhat-virtualization-host-*version_number*_version.squashfs.img**. It contains the hypervisor image for installation on the physical machine. It should not be confused with the **/LiveOS/squashfs.img** file, which is used by the Anaconda **inst.stage2** option.

6.1.3.2.2. Configuring the PXE Server and the Boot Loader

1. Configure the PXE server. See Preparing for a Network Installation in the *Red Hat Enterprise Linux Installation Guide*.
2. Copy the RHVH boot images to the **/tftpboot** directory:

```
# cp mnt/rhvh/images/pxeboot/{vmlinuz,initrd.img} /var/lib/tftpboot/pxelinux/
```

3. Create a **rhvh** label specifying the RHVH boot images in the boot loader configuration:

```
LABEL rhvh
MENU LABEL Install Red Hat Virtualization Host
KERNEL /var/lib/tftpboot/pxelinux/vmlinuz
APPEND initrd=/var/lib/tftpboot/pxelinux/initrd.img inst.stage2=URL/to/RHVH-ISO
```

If you are using information from Red Hat Satellite to provision the host, you must create a global or host group level parameter called **rhvh_image** and populate it with the directory URL where the ISO is mounted or extracted:

```
<%#
kind: PXELinux
name: RHVH PXELinux
```

```
%>
# Created for booting new hosts
#

DEFAULT rhvh

LABEL rhvh
KERNEL <%= @kernel %>
APPEND initrd=<%= @initrd %> inst.ks=<%= foreman_url("provision") %> inst.stage2=<%=
@host.params["rhvh_image"] %> intel_iommu=on console=tty0 console=ttyS1,115200n8
ssh_pwauth=1 local_boot_trigger=<%= foreman_url("built") %>
IPAPPEND 2
```

4. Make the content of the RHVH ISO locally available and export it to the network, for example, using an HTTPD server:

```
# cp -a /mnt/rhvh/ /var/www/html/rhvh-install
# curl URL/to/RHVH-ISO/rhvh-install
```

6.1.3.2.3. Creating and Running a Kickstart File

1. Create a Kickstart file and make it available over the network. See Kickstart Installations in the *Red Hat Enterprise Linux Installation Guide* .

2. Ensure that the Kickstart file meets the following RHV-specific requirements:

   - The **%packages** section is not required for RHVH. Instead, use the **liveimg** option and specify the **redhat-virtualization-host-*version_number*_version.squashfs.img** file from the RHVH ISO image:

     ```
     liveimg --url=example.com/tmp/usr/share/redhat-virtualization-host/image/redhat-
     virtualization-host-version_number_version.squashfs.img
     ```

   - Autopartitioning is highly recommended:

     ```
     autopart --type=thinp
     ```

     NOTE

     Thin provisioning must be used with autopartitioning.

     The **--no-home** option does not work in RHVH because **/home** is a required directory.

     If your installation requires manual partitioning, see Section 6.1.3.1, “Custom Partitioning” for a list of limitations that apply to partitions and an example of manual partitioning in a Kickstart file.

   - A **%post** section that calls the **nodectl init** command is required:

     ```
     %post
     nodectl init
     %end
     ```

This Kickstart example shows you how to deploy RHVH. You can include additional commands and options as required.

```
liveimg --url=http://FQDN/tmp/usr/share/redhat-virtualization-host/image/redhat-virtualization-host-version_number_version.squashfs.img
clearpart --all
autopart --type=thinp
rootpw --plaintext ovirt
timezone --utc America/Phoenix
zerombr
text

reboot

%post --erroronfail
nodectl init
%end
```

This Kickstart example uses information from Red Hat Satellite to configure the host network and register the host to the Satellite server. You must create a global or host group level parameter called **rhvh_image** and populate it with the directory URL to the **squashfs.img** file. **ntp_server1** is also a global or host group level variable.

```
<%#
kind: provision
name: RHVH Kickstart default
oses:
- RHVH
%>
install
liveimg --url=<%= @host.params['rhvh_image'] %>squashfs.img

network --bootproto static --ip=<%= @host.ip %> --netmask=<%= @host.subnet.mask %> --gateway=<%= @host.subnet.gateway %> --nameserver=<%= @host.subnet.dns_primary %> --hostname <%= @host.name %>

zerombr
clearpart --all
autopart --type=thinp

rootpw --iscrypted <%= root_pass %>

# installation answers
lang en_US.UTF-8
timezone <%= @host.params['time-zone'] || 'UTC' %>
keyboard us
firewall --service=ssh
services --enabled=sshd

text
reboot

%post --log=/root/ks.post.log --erroronfail
nodectl init
<%= snippet 'subscription_manager_registration' %>
```

```
<%= snippet 'kickstart_networking_setup' %>
/usr/sbin/ntpdate -sub <%= @host.params['ntp_server1'] || '0.fedora.pool.ntp.org' %>
/usr/sbin/hwclock --systohc

/usr/bin/curl <%= foreman_url('built') %>

sync
systemctl reboot
%end
```

3. Add the Kickstart file location to the boot loader configuration file on the PXE server:

```
APPEND initrd=/var/tftpboot/pxelinux/initrd.img inst.stage2=_URL/to/RHVH-ISO_
inst.ks=_URL/to/RHVH-ks_.cfg
```

4. Install RHVH following the instructions in Booting from the Network Using PXE in the *Red Hat Enterprise Linux Installation Guide*.

6.2. RED HAT ENTERPRISE LINUX HOSTS

6.2.1. Installing Red Hat Enterprise Linux Hosts

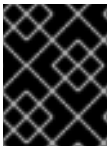
A Red Hat Enterprise Linux host is based on a standard basic installation of Red Hat Enterprise Linux 7 on a physical server, with the **Red Hat Enterprise Linux Server** and **Red Hat Virtualization** subscriptions attached.

For detailed installation instructions, see the *Red Hat Enterprise Linux 7 Installation Guide* .

The host must meet the minimum host requirements.

IMPORTANT

Virtualization must be enabled in your host's BIOS settings. For information on changing your host's BIOS settings, refer to your host's hardware documentation.



IMPORTANT

Third-party watchdogs should not be installed on Red Hat Enterprise Linux hosts, as they can interfere with the watchdog daemon provided by VDSM.

6.2.2. Enabling the Red Hat Enterprise Linux Host Repositories

To use a Red Hat Enterprise Linux machine as a host, you must register the system with the Content Delivery Network, attach the **Red Hat Enterprise Linux Server** and **Red Hat Virtualization** subscriptions, and enable the host repositories.

Procedure

1. Register your system with the Content Delivery Network, entering your Customer Portal user name and password when prompted:

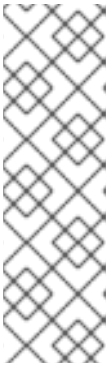
```
# subscription-manager register
```

2. Find the **Red Hat Enterprise Linux Server** and **Red Hat Virtualization** subscription pools and record the pool IDs:

```
# subscription-manager list --available
```

3. Use the pool IDs to attach the subscriptions to the system:

```
# subscription-manager attach --pool=poolid
```



NOTE

To view currently attached subscriptions:

```
# subscription-manager list --consumed
```

To list all enabled repositories:

```
# yum repolist
```

4. Configure the repositories:

```
# subscription-manager repos \
    --disable='*' \
    --enable=rhel-7-server-rpms \
    --enable=rhel-7-server-rhv-4-mgmt-agent-rpms \
    --enable=rhel-7-server-ansible-2-rpms
```

For Red Hat Enterprise Linux 7 hosts, little endian, on IBM POWER8 hardware:

```
# subscription-manager repos \
    --disable='*' \
    --enable=rhel-7-server-rhv-4-mgmt-agent-for-power-le-rpms \
    --enable=rhel-7-for-power-le-rpms
```

For Red Hat Enterprise Linux 7 hosts, little endian, on IBM POWER9 hardware:

```
# subscription-manager repos \
    --disable='*' \
    --enable=rhel-7-server-rhv-4-mgmt-agent-for-power-9-rpms \
    --enable=rhel-7-for-power-9-rpms
```

5. Ensure that all packages currently installed are up to date:

```
# yum update
```

6. Reboot the machine.

6.2.3. Installing Cockpit on Red Hat Enterprise Linux Hosts

You can install Cockpit for monitoring the host's resources and performing administrative tasks.

Procedure

Procedure

1. Install the dashboard packages:

```
# yum install cockpit-ovirt-dashboard
```

2. Enable and start the **cockpit.socket** service:

```
# systemctl enable cockpit.socket
# systemctl start cockpit.socket
```

3. Check if Cockpit is an active service in the firewall:

```
# firewall-cmd --list-services
```

You should see **cockpit** listed. If it is not, enter the following with root permissions to add **cockpit** as a service to your firewall:

```
# firewall-cmd --permanent --add-service=cockpit
```

The **--permanent** option keeps the **cockpit** service active after rebooting.

You can log in to the Cockpit web interface at **https://*HostFQDNorIP*:9090**.

6.3. RECOMMENDED PRACTICES FOR CONFIGURING HOST NETWORKS

If your network environment is complex, you may need to configure a host network manually before adding the host to the Red Hat Virtualization Manager.

Red Hat recommends the following practices for configuring a host network:

- Configure the network with Cockpit. Alternatively, you can use **nmtui** or **nmcli**.
- If a network is not required for a self-hosted engine deployment or for adding a host to the Manager, configure the network in the Administration Portal after adding the host to the Manager. See Creating a New Logical Network in a Data Center or Cluster .
- Use the following naming conventions:
  - VLAN devices: ***VLAN_NAME_TYPE_RAW_PLUS_VID_NO_PAD***
  - VLAN interfaces: ***physical_device.VLAN_ID*** (for example, **eth0.23**, **eth1.128**, **enp3s0.50**)
  - Bond interfaces: **bond*number*** (for example, **bond0**, **bond1**)
  - VLANs on bond interfaces: **bond*number.VLAN_ID*** (for example, **bond0.50**, **bond1.128**)
- Use network bonding. Networking teaming is not supported in Red Hat Virtualization and will cause errors if the host is used to deploy a self-hosted engine or added to the Manager.
- Use recommended bonding modes:
  - If the **ovirtmgmt** network is not used by virtual machines, the network may use any supported bonding mode.

- If the **ovirtmgmt** network is used by virtual machines, see *Which bonding modes work when used with a bridge that virtual machine guests or containers connect to?*.
- Red Hat Virtualization's default bonding mode is **(Mode 4) Dynamic Link Aggregation**. If your switch does not support Link Aggregation Control Protocol (LACP), use **(Mode 1) Active-Backup**. See Bonding Modes for details.

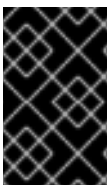
- Configure a VLAN on a physical NIC as in the following example (although **nmcli** is used, you can use any tool):

```
# nmcli connection add type vlan con-name vlan50 ifname eth0.50 dev eth0 id 50
# nmcli con mod vlan50 +ipv4.dns 8.8.8.8 +ipv4.addresses 123.123.0.1/24 +ivp4.gateway
123.123.0.254
```

- Configure a VLAN on a bond as in the following example (although **nmcli** is used, you can use any tool):

```
# nmcli connection add type bond con-name bond0 ifname bond0 bond.options
"mode=active-backup,miimon=100" ipv4.method disabled ipv6.method ignore
# nmcli connection add type ethernet con-name eth0 ifname eth0 master bond0 slave-type
bond
# nmcli connection add type ethernet con-name eth1 ifname eth1 master bond0 slave-type
bond
# nmcli connection add type vlan con-name vlan50 ifname bond0.50 dev bond0 id 50
# nmcli con mod vlan50 +ipv4.dns 8.8.8.8 +ipv4.addresses 123.123.0.1/24 +ivp4.gateway
123.123.0.254
```

- Do not disable **firewalld**.
- Customize the firewall rules in the Administration Portal after adding the host to the Manager. See Configuring Host Firewall Rules.



IMPORTANT

When creating a management bridge that uses a static IPv6 address, disable network manager control in its interface configuration (ifcfg) file before adding a host. See https://access.redhat.com/solutions/3981311 for more information.

6.4. ADDING SELF-HOSTED ENGINE NODES TO THE RED HAT VIRTUALIZATION MANAGER

Self-hosted engine nodes are added in the same way as a standard host, with an additional step to deploy the host as a self-hosted engine node. The shared storage domain is automatically detected and the node can be used as a failover host to host the Manager virtual machine when required. You can also attach standard hosts to a self-hosted engine environment, but they cannot host the Manager virtual machine. Red Hat highly recommends having at least two self-hosted engine nodes to ensure the Manager virtual machine is highly available. Additional hosts can also be added using the REST API. See Hosts in the *REST API Guide*.

Prerequisites

- If you are reusing a self-hosted engine node, remove its existing self-hosted engine configuration. See Removing a Host from a Self-Hosted Engine Environment .

IMPORTANT

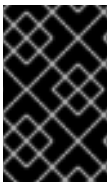
When creating a management bridge that uses a static IPv6 address, disable network manager control in its interface configuration (ifcfg) file before adding a host. See https://access.redhat.com/solutions/3981311 for more information.

Procedure

1. In the Administration Portal, click **Compute → Hosts**.
2. Click **New**.
   For information on additional host settings, see Explanation of Settings and Controls in the New Host and Edit Host Windows in the *Administration Guide*.
3. Use the drop-down list to select the **Data Center** and **Host Cluster** for the new host.
4. Enter the **Name** and the **Address** of the new host. The standard SSH port, port 22, is auto-filled in the **SSH Port** field.
5. Select an authentication method to use for the Manager to access the host.
   - Enter the root user's password to use password authentication.
   - Alternatively, copy the key displayed in the **SSH PublicKey** field to **/root/.ssh/authorized_keys** on the host to use public key authentication.
6. Optionally, configure power management, where the host has a supported power management card. For information on power management configuration, see Host Power Management Settings Explained in the *Administration Guide*.
7. Click the **Hosted Engine** tab.
8. Select **Deploy**.
9. Click **OK**.

6.5. ADDING STANDARD HOSTS TO THE RED HAT VIRTUALIZATION MANAGER

Adding a host to your Red Hat Virtualization environment can take some time, as the following steps are completed by the platform: virtualization checks, installation of packages, and creation of a bridge.



IMPORTANT

When creating a management bridge that uses a static IPv6 address, disable network manager control in its interface configuration (ifcfg) file before adding a host. See https://access.redhat.com/solutions/3981311 for more information.

Procedure

1. From the Administration Portal, click **Compute → Hosts**.
2. Click **New**.
3. Use the drop-down list to select the **Data Center** and **Host Cluster** for the new host.

4. Enter the **Name** and the **Address** of the new host. The standard SSH port, port 22, is auto-filled in the **SSH Port** field.

5. Select an authentication method to use for the Manager to access the host.

    - Enter the root user's password to use password authentication.

    - Alternatively, copy the key displayed in the **SSH PublicKey** field to **/root/.ssh/authorized_keys** on the host to use public key authentication.

6. Optionally, click the **Advanced Parameters** button to change the following advanced host settings:

    - Disable automatic firewall configuration.

    - Add a host SSH fingerprint to increase security. You can add it manually, or fetch it automatically.

7. Optionally configure power management, where the host has a supported power management card. For information on power management configuration, see Host Power Management Settings Explained in the *Administration Guide*.

8. Click **OK**.

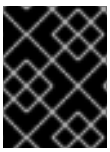
The new host displays in the list of hosts with a status of **Installing**, and you can view the progress of the installation in the **Events** section of the **Notification Drawer** (). After a brief delay the host status changes to **Up**.

CHAPTER 7. ADDING STORAGE FOR RED HAT VIRTUALIZATION

Add storage as data domains in the new environment. A Red Hat Virtualization environment must have at least one data domain, but adding more is recommended.

Add the storage you prepared earlier:

- NFS
- iSCSI
- Fibre Channel (FCP)
- Red Hat Gluster Storage



IMPORTANT

If you are using iSCSI storage, new data domains must not use the same iSCSI target as the self-hosted engine storage domain.

WARNING

Creating additional data domains in the same data center as the self-hosted engine storage domain is highly recommended. If you deploy the self-hosted engine in a data center with only one active data storage domain, and that storage domain is corrupted, you will not be able to add new storage domains or remove the corrupted storage domain; you will have to redeploy the self-hosted engine.

7.1. ADDING NFS STORAGE

This procedure shows you how to attach existing NFS storage to your Red Hat Virtualization environment as a data domain.

If you require an ISO or export domain, use this procedure, but select **ISO** or **Export** from the **Domain Function** list.

Procedure

1. In the Administration Portal, click **Storage → Domains**.
2. Click **New Domain**.
3. Enter a **Name** for the storage domain.
4. Accept the default values for the **Data Center**, **Domain Function**, **Storage Type**, **Format**, and **Host to Use** lists.

5. Enter the **Export Path** to be used for the storage domain. The export path should be in the format of *123.123.0.10:/data* (for IPv4), *[2001:0:0:0:0:0:0:5db1]:/data* (for IPv6), or *domain.example.com:/data*.

6. Optionally, you can configure the advanced parameters:

    a. Click **Advanced Parameters**.

    b. Enter a percentage value into the **Warning Low Space Indicator** field. If the free space available on the storage domain is below this percentage, warning messages are displayed to the user and logged.

    c. Enter a GB value into the **Critical Space Action Blocker** field. If the free space available on the storage domain is below this value, error messages are displayed to the user and logged, and any new action that consumes space, even temporarily, will be blocked.

    d. Select the **Wipe After Delete** check box to enable the wipe after delete option. This option can be edited after the domain is created, but doing so will not change the wipe after delete property of disks that already exist.

7. Click **OK**.

The new NFS data domain has a status of **Locked** until the disk is prepared. The data domain is then automatically attached to the data center.

7.2. ADDING ISCSI STORAGE

This procedure shows you how to attach existing iSCSI storage to your Red Hat Virtualization environment as a data domain.

Procedure

1. Click **Storage → Domains**.

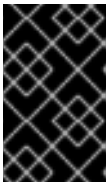
2. Click **New Domain**.

3. Enter the **Name** of the new storage domain.

4. Select a **Data Center** from the drop-down list.

5. Select **Data** as the **Domain Function** and **iSCSI** as the **Storage Type**.

6. Select an active host as the **Host to Use**.



IMPORTANT

Communication to the storage domain is from the selected host and not directly from the Manager. Therefore, all hosts must have access to the storage device before the storage domain can be configured.

7. The Manager can map iSCSI targets to LUNs or LUNs to iSCSI targets. The **New Domain** window automatically displays known targets with unused LUNs when the iSCSI storage type is selected. If the target that you are using to add storage does not appear, you can use target discovery to find it; otherwise proceed to the next step.

    a. Click **Discover Targets** to enable target discovery options. When targets have been

discovered and logged in to, the **New Domain** window automatically displays targets with LUNs unused by the environment.

NOTE

LUNs used externally to the environment are also displayed.

You can use the **Discover Targets** options to add LUNs on many targets or multiple paths to the same LUNs.

b. Enter the FQDN or IP address of the iSCSI host in the **Address** field.

c. Enter the port with which to connect to the host when browsing for targets in the **Port** field. The default is **3260**.

d. If CHAP is used to secure the storage, select the **User Authentication** check box. Enter the **CHAP user name** and **CHAP password**.

NOTE

You can define credentials for an iSCSI target for a specific host with the REST API. See StorageServerConnectionExtensions: add in the *REST API Guide* for more information.

e. Click **Discover**.

f. Select one or more targets from the discovery results and click **Login** for one target or **Login All** for multiple targets.

IMPORTANT

If more than one path access is required, you must discover and log in to the target through all the required paths. Modifying a storage domain to add additional paths is currently not supported.

8. Click the **+** button next to the desired target. This expands the entry and displays all unused LUNs attached to the target.

9. Select the check box for each LUN that you are using to create the storage domain.

10. Optionally, you can configure the advanced parameters:

    a. Click **Advanced Parameters**.

    b. Enter a percentage value into the **Warning Low Space Indicator** field. If the free space available on the storage domain is below this percentage, warning messages are displayed to the user and logged.

    c. Enter a GB value into the **Critical Space Action Blocker** field. If the free space available on the storage domain is below this value, error messages are displayed to the user and logged, and any new action that consumes space, even temporarily, will be blocked.

    d. Select the **Wipe After Delete** check box to enable the wipe after delete option. This option can be edited after the domain is created, but doing so will not change the wipe after delete property of disks that already exist.

e. Select the **Discard After Delete** check box to enable the discard after delete option. This option can be edited after the domain is created. This option is only available to block storage domains.

11. Click **OK**.

If you have configured multiple storage connection paths to the same target, follow the procedure in Configuring iSCSI Multipathing to complete iSCSI bonding.

If you want to migrate your current storage network to an iSCSI bond, see Migrating a Logical Network to an iSCSI Bond.

7.3. ADDING FCP STORAGE

This procedure shows you how to attach existing FCP storage to your Red Hat Virtualization environment as a data domain.

Procedure

1. Click **Storage → Domains**.
2. Click **New Domain**.
3. Enter the **Name** of the storage domain.
4. Select an FCP **Data Center** from the drop-down list.
   If you do not yet have an appropriate FCP data center, select **(none)**.
5. Select the **Domain Function** and the **Storage Type** from the drop-down lists. The storage domain types that are not compatible with the chosen data center are not available.
6. Select an active host in the **Host to Use** field. If this is not the first data domain in a data center, you must select the data center's SPM host.

IMPORTANT

All communication to the storage domain is through the selected host and not directly from the Red Hat Virtualization Manager. At least one active host must exist in the system and be attached to the chosen data center. All hosts must have access to the storage device before the storage domain can be configured.

7. The **New Domain** window automatically displays known targets with unused LUNs when **Fibre Channel** is selected as the storage type. Select the **LUN ID** check box to select all of the available LUNs.
8. Optionally, you can configure the advanced parameters.
   a. Click **Advanced Parameters**.
   b. Enter a percentage value into the **Warning Low Space Indicator** field. If the free space available on the storage domain is below this percentage, warning messages are displayed to the user and logged.
   c. Enter a GB value into the **Critical Space Action Blocker** field. If the free space available on the storage domain is below this value, error messages are displayed to the user and logged, and any new action that consumes space, even temporarily, will be blocked.

d. Select the **Wipe After Delete** check box to enable the wipe after delete option. This option can be edited after the domain is created, but doing so will not change the wipe after delete property of disks that already exist.

e. Select the **Discard After Delete** check box to enable the discard after delete option. This option can be edited after the domain is created. This option is only available to block storage domains.

9. Click **OK**.

The new FCP data domain remains in a **Locked** status while it is being prepared for use. When ready, it is automatically attached to the data center.

7.4. ADDING RED HAT GLUSTER STORAGE

To use Red Hat Gluster Storage with Red Hat Virtualization, see *Configuring Red Hat Virtualization with Red Hat Gluster Storage*.

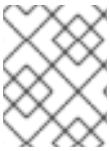
For the Red Hat Gluster Storage versions that are supported with Red Hat Virtualization, see https://access.redhat.com/articles/2356261.

APPENDIX A. TROUBLESHOOTING A SELF-HOSTED ENGINE DEPLOYMENT

To confirm whether the self-hosted engine has already been deployed, run **hosted-engine --check-deployed**. An error will only be displayed if the self-hosted engine has not been deployed.

A.1. TROUBLESHOOTING THE MANAGER VIRTUAL MACHINE

Check the status of the Manager virtual machine by running **hosted-engine --vm-status**.



NOTE

Any changes made to the Manager virtual machine will take about 20 seconds before they are reflected in the status command output.

Depending on the **Engine status** in the output, see the following suggestions to find or fix the issue.

Engine status: "health": "good", "vm": "up" "detail": "up"

1. If the Manager virtual machine is up and running as normal, you will see the following output:

```
--== Host 1 status ==--

Status up-to-date              : True
Hostname                       : hypervisor.example.com
Host ID                        : 1
Engine status                  : {"health": "good", "vm": "up", "detail": "up"}
Score                          : 3400
stopped                        : False
Local maintenance              : False
crc32                          : 99e57eba
Host timestamp                 : 248542
```

2. If the output is normal but you cannot connect to the Manager, check the network connection.

Engine status: "reason": "failed liveliness check", "health": "bad", "vm": "up", "detail": "up"

1. If the **health** is **bad** and the **vm** is **up**, the HA services will try to restart the Manager virtual machine to get the Manager back. If it does not succeed within a few minutes, enable the global maintenance mode from the command line so that the hosts are no longer managed by the HA services.

```
# hosted-engine --set-maintenance --mode=global
```

2. Connect to the console. When prompted, enter the operating system's root password. For more console options, see https://access.redhat.com/solutions/2221461.

```
# hosted-engine --console
```

3. Ensure that the Manager virtual machine's operating system is running by logging in.

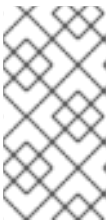
4. Check the status of the **ovirt-engine** service:

```
# systemctl status -l ovirt-engine
# journalctl -u ovirt-engine
```

5. Check the following logs: **/var/log/messages**, **/var/log/ovirt-engine/engine.log,** and **/var/log/ovirt-engine/server.log**.

6. After fixing the issue, reboot the Manager virtual machine manually from one of the self-hosted engine nodes:

```
# hosted-engine --vm-shutdown
# hosted-engine --vm-start
```



NOTE

When the self-hosted engine nodes are in global maintenance mode, the Manager virtual machine must be rebooted manually. If you try to reboot the Manager virtual machine by sending a **reboot** command from the command line, the Manager virtual machine will remain powered off. This is by design.

7. On the Manager virtual machine, verify that the **ovirt-engine** service is up and running:

```
# systemctl status ovirt-engine.service
```

8. After ensuring the Manager virtual machine is up and running, close the console session and disable the maintenance mode to enable the HA services again:

```
# hosted-engine --set-maintenance --mode=none
```

Engine status: "vm": "down", "health": "bad", "detail": "unknown", "reason": "vm not running on this host"

1. If you have more than one host in your environment, ensure that another host is not currently trying to restart the Manager virtual machine.

2. Ensure that you are not in global maintenance mode.

3. Check the **ovirt-ha-agent** logs in **/var/log/ovirt-hosted-engine-ha/agent.log**.

4. Try to reboot the Manager virtual machine manually from one of the self-hosted engine nodes:

```
# hosted-engine --vm-shutdown
# hosted-engine --vm-start
```

Engine status: "vm": "unknown", "health": "unknown", "detail": "unknown", "reason": "failed to getVmStats"

This status means that **ovirt-ha-agent** failed to get the virtual machine's details from VDSM.

1. Check the VDSM logs in **/var/log/vdsm/vdsm.log**.

2. Check the **ovirt-ha-agent** logs in **/var/log/ovirt-hosted-engine-ha/agent.log**.

Engine status: The self-hosted engine's configuration has not been retrieved from shared storage

If you receive the status **The hosted engine configuration has not been retrieved from shared storage. Please ensure that ovirt-ha-agent is running and the storage server is reachable** there is an issue with the **ovirt-ha-agent** service, or with the storage, or both.

1. Check the status of **ovirt-ha-agent** on the host:

```
# systemctl status -l ovirt-ha-agent
# journalctl -u ovirt-ha-agent
```

2. If the **ovirt-ha-agent** is down, restart it:

```
# systemctl start ovirt-ha-agent
```

3. Check the **ovirt-ha-agent** logs in **/var/log/ovirt-hosted-engine-ha/agent.log**.
4. Check that you can ping the shared storage.
5. Check whether the shared storage is mounted.

Additional Troubleshooting Commands

IMPORTANT

Contact the Red Hat Support Team if you feel you need to run any of these commands to troubleshoot your self-hosted engine environment.

- **hosted-engine --reinitialize-lockspace**: This command is used when the sanlock lockspace is broken. Ensure that the global maintenance mode is enabled and that the Manager virtual machine is stopped before reinitializing the sanlock lockspaces.
- **hosted-engine --clean-metadata**: Remove the metadata for a host's agent from the global status database. This makes all other hosts forget about this host. Ensure that the target host is down and that the global maintenance mode is enabled.
- **hosted-engine --check-liveliness**: This command checks the liveliness page of the ovirt-engine service. You can also check by connecting to **https://*engine-fqdn*/ovirt-engine/services/health/** in a web browser.
- **hosted-engine --connect-storage**: This command instructs VDSM to prepare all storage connections needed for the host and and the Manager virtual machine. This is normally run in the back-end during the self-hosted engine deployment. Ensure that the global maintenance mode is enabled if you need to run this command to troubleshoot storage issues.

A.2. CLEANING UP A FAILED SELF-HOSTED ENGINE DEPLOYMENT

If a self-hosted engine deployment was interrupted, subsequent deployments will fail with an error message. The error will differ depending on the stage in which the deployment failed.

If you receive an error message, you can run the cleanup script on the deployment host to clean up the failed deployment. However, it's best to reinstall your base operating system and start the deployment from the beginning.

NOTE

The cleanup script has the following limitations:

- A disruption in the network connection while the script is running might cause the script to fail to remove the management bridge or to recreate a working network configuration.
- The script is not designed to clean up any shared storage device used during a failed deployment. You need to clean the shared storage device before you can reuse it in a subsequent deployment.

Procedure

1. Run **/usr/sbin/ovirt-hosted-engine-cleanup** and select **y** to remove anything left over from the failed self-hosted engine deployment.

```
# /usr/sbin/ovirt-hosted-engine-cleanup
This will de-configure the host to run ovirt-hosted-engine-setup from scratch.
Caution, this operation should be used with care.
Are you sure you want to proceed? [y/n]
```

2. Define whether to reinstall on the same shared storage device or select a different shared storage device.
   - To deploy the installation on the same storage domain, clean up the storage domain by running the following command in the appropriate directory on the server for NFS, Gluster, PosixFS or local storage domains:

```
# rm -rf storage_location/*
```

   - For iSCSI or Fibre Channel Protocol (FCP) storage, see https://access.redhat.com/solutions/2121581 for information on how to clean up the storage.
   - Alternatively, select a different shared storage device.
3. Redeploy the self-hosted engine.

APPENDIX B. MIGRATING DATABASES AND SERVICES TO A REMOTE SERVER

Although you cannot configure remote databases and services during the automated installation, you can migrate them to a remote server post-installation.

B.1. MIGRATING THE SELF-HOSTED ENGINE DATABASE TO A REMOTE SERVER

You can migrate the **engine** database of a self-hosted engine to a remote database server after the Red Hat Virtualization Manager has been initially configured. Use **engine-backup** to create a database backup and restore it on the new database server.

The new database server must have Red Hat Enterprise Linux 7 installed and the required repositories enabled:

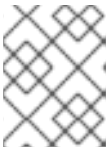
Enabling the Red Hat Virtualization Manager Repositories

Register the system with Red Hat Subscription Manager, attach the **Red Hat Virtualization Manager** subscription, and enable the Manager repositories.

Procedure

1. Register your system with the Content Delivery Network, entering your Customer Portal user name and password when prompted:

```
# subscription-manager register
```



NOTE

If you are using an IPv6 network, use an IPv6 transition mechanism to access the Content Delivery Network and subscription manager.

2. Find the **Red Hat Virtualization Manager** subscription pool and record the pool ID:

```
# subscription-manager list --available
```

3. Use the pool ID to attach the subscription to the system:

```
# subscription-manager attach --pool=pool_id
```

NOTE

To view currently attached subscriptions:

```
# subscription-manager list --consumed
```

To list all enabled repositories:

```
# yum repolist
```

4. Configure the repositories:

```
# subscription-manager repos \
    --disable='*' \
    --enable=rhel-7-server-rpms \
    --enable=rhel-7-server-supplementary-rpms \
    --enable=rhel-7-server-rhv-4.3-manager-rpms \
    --enable=rhel-7-server-rhv-4-manager-tools-rpms \
    --enable=rhel-7-server-ansible-2-rpms \
    --enable=jb-eap-7.2-for-rhel-7-server-rpms
```

Migrating the Self-Hosted Engine Database to a Remote Server

1. Log in to a self-hosted engine node and place the environment into **global** maintenance mode. This disables the High Availability agents and prevents the Manager virtual machine from being migrated during the procedure:

```
# hosted-engine --set-maintenance --mode=global
```

2. Log in to the Red Hat Virtualization Manager machine and stop the **ovirt-engine** service so that it does not interfere with the engine backup:

```
# systemctl stop ovirt-engine.service
```

3. Create the **engine** database backup:

```
# engine-backup --scope=files --scope=db --mode=backup --file=file_name --
log=backup_log_name
```

4. Copy the backup file to the new database server:

```
# scp /tmp/engine.dump root@new.database.server.com:/tmp
```

5. Log in to the new database server and install **engine-backup**:

```
# yum install ovirt-engine-tools-backup
```

6. Restore the database on the new database server. *file_name* is the backup file copied from the Manager.

```
# engine-backup --mode=restore --scope=files --scope=db --file=file_name --
log=restore_log_name --provision-db --no-restore-permissions
```

7. Now that the database has been migrated, start the **ovirt-engine** service:

```
# systemctl start ovirt-engine.service
```

8. Log in to a self-hosted engine node and turn off maintenance mode, enabling the High Availability agents:

```
# hosted-engine --set-maintenance --mode=none
```

B.2. MIGRATING DATA WAREHOUSE TO A SEPARATE MACHINE

This section describes how to migrate the Data Warehouse database and service from the Red Hat Virtualization Manager to a separate machine. Hosting the Data Warehouse service on a separate machine reduces the load on each individual machine, and allows each service to avoid potential conflicts caused by sharing CPU and memory resources with other processes.

You can migrate the Data Warehouse service and connect it with the existing Data Warehouse database (**ovirt_engine_history**), or you can migrate the Data Warehouse database to the separate machine before migrating the Data Warehouse service. If the Data Warehouse database is hosted on the Manager, migrating the database in addition to the Data Warehouse service further reduces the competition for resources on the Manager machine. You can migrate the database to the same machine onto which you will migrate the Data Warehouse service, or to a machine that is separate from both the Manager machine and the new Data Warehouse service machine.

B.2.1. Migrating the Data Warehouse Database to a Separate Machine

Migrate the Data Warehouse database (**ovirt_engine_history**) before you migrate the Data Warehouse service. Use **engine-backup** to create a database backup and restore it on the new database machine. For more information on **engine-backup**, run **engine-backup --help**.

To migrate the Data Warehouse service only, see Section B.2.2, “Migrating the Data Warehouse Service to a Separate Machine”.

The new database server must have Red Hat Enterprise Linux 7 installed. Enable the required repositories on the new database server.

Enabling the Red Hat Virtualization Manager Repositories
Register the system with Red Hat Subscription Manager, attach the **Red Hat Virtualization Manager** subscription, and enable the Manager repositories.

Procedure

1. Register your system with the Content Delivery Network, entering your Customer Portal user name and password when prompted:

```
# subscription-manager register
```

NOTE

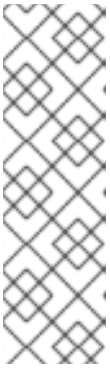
If you are using an IPv6 network, use an IPv6 transition mechanism to access the Content Delivery Network and subscription manager.

2. Find the **Red Hat Virtualization Manager** subscription pool and record the pool ID:

```
# subscription-manager list --available
```

3. Use the pool ID to attach the subscription to the system:

```
# subscription-manager attach --pool=pool_id
```



NOTE

To view currently attached subscriptions:

```
# subscription-manager list --consumed
```

To list all enabled repositories:

```
# yum repolist
```

4. Configure the repositories:

```
# subscription-manager repos \
    --disable='*' \
    --enable=rhel-7-server-rpms \
    --enable=rhel-7-server-supplementary-rpms \
    --enable=rhel-7-server-rhv-4.3-manager-rpms \
    --enable=rhel-7-server-rhv-4-manager-tools-rpms \
    --enable=rhel-7-server-ansible-2-rpms \
    --enable=jb-eap-7.2-for-rhel-7-server-rpms
```

Migrating the Data Warehouse Database to a Separate Machine

1. Create a backup of the Data Warehouse database and configuration files on the Manager:

```
# engine-backup --mode=backup --scope=dwhdb --scope=files --file=file_name --
log=log_file_name
```

2. Copy the backup file from the Manager to the new machine:

```
# scp /tmp/file_name root@new.dwh.server.com:/tmp
```

3. Install **engine-backup** on the new machine:

```
# yum install ovirt-engine-tools-backup
```

4. Install the PostgreSQL server package:

```
# yum install rh-postgresql10 rh-postgresql10-postgresql-contrib
```

5. Initialize the PostgreSQL database, start the **postgresql** service, and ensure that this service starts on boot:

```
# scl enable rh-postgresql10 -- postgresql-setup --initdb
# systemctl enable rh-postgresql10-postgresql
# systemctl start rh-postgresql10-postgresql
```

6. Restore the Data Warehouse database on the new machine. *file_name* is the backup file copied from the Manager.

```
# engine-backup --mode=restore --scope=files --scope=dwhdb --file=file_name --
log=log_file_name --provision-dwh-db --no-restore-permissions
```

The Data Warehouse database is now hosted on a separate machine from that on which the Manager is hosted. After successfully restoring the Data Warehouse database, a prompt instructs you to run the **engine-setup** command. Before running this command, migrate the Data Warehouse service.

B.2.2. Migrating the Data Warehouse Service to a Separate Machine

You can migrate the Data Warehouse service installed and configured on the Red Hat Virtualization Manager to a separate machine. Hosting the Data Warehouse service on a separate machine helps to reduce the load on the Manager machine. Notice that this procedure migrates the Data Warehouse service only. To migrate the Data Warehouse database (**ovirt_engine_history**) prior to migrating the Data Warehouse service, see Section B.2.1, "Migrating the Data Warehouse Database to a Separate Machine".

Prerequisites

- You must have installed and configured the Manager and Data Warehouse on the same machine.
- To set up the new Data Warehouse machine, you must have the following:
  - The password from the Manager's **/etc/ovirt-engine/engine.conf.d/10-setup-database.conf** file.
  - Allowed access from the Data Warehouse machine to the Manager database machine's TCP port 5432.
  - The username and password for the Data Warehouse database from the Manager's **/etc/ovirt-engine-dwh/ovirt-engine-dwhd.conf.d/10-setup-database.conf** file. If you migrated the **ovirt_engine_history** database using Section B.2.1, "Migrating the Data Warehouse Database to a Separate Machine", the backup includes these credentials, which you defined during the database setup on that machine.

Installing this scenario requires four steps:

1. Setting up the New Data Warehouse Machine
2. Stopping the Data Warehouse service on the Manager machine
3. Configuring the new Data Warehouse machine
4. Disabling the Data Warehouse package on the Manager machine

B.2.2.1. Setting up the New Data Warehouse Machine

Enable the Red Hat Virtualization repositories and install the Data Warehouse setup package on a Red Hat Enterprise Linux 7 machine:

1. Enable the required repositories:
   a. Register your system with the Content Delivery Network, entering your Customer Portal user name and password when prompted:

      ```
      # subscription-manager register
      ```

   b. Find the **Red Hat Virtualization Manager** subscription pool and record the pool ID:

```
# subscription-manager list --available
```

c. Use the pool ID to attach the subscription to the system:

```
# subscription-manager attach --pool=pool_id
```

d. Configure the repositories:

```
# subscription-manager repos \
    --disable='*' \
    --enable=rhel-7-server-rpms \
    --enable=rhel-7-server-supplementary-rpms \
    --enable=rhel-7-server-rhv-4.3-manager-rpms \
    --enable=rhel-7-server-rhv-4-manager-tools-rpms \
    --enable=rhel-7-server-ansible-2-rpms \
    --enable=jb-eap-7.2-for-rhel-7-server-rpms
```

2. Ensure that all packages currently installed are up to date:

```
# yum update
```

3. Install the **ovirt-engine-dwh-setup** package:

```
# yum install ovirt-engine-dwh-setup
```

B.2.2.2. Stopping the Data Warehouse Service on the Manager Machine

1. Stop the Data Warehouse service:

```
# systemctl stop ovirt-engine-dwhd.service
```

2. If the database is hosted on a remote machine, you must manually grant access by editing the postgres.conf file. Edit the */var/opt/rh/rh-postgresql10/lib/pgsql/data/postgresql.conf* file and modify the listen_addresses line so that it matches the following:

```
listen_addresses = '*'
```

If the line does not exist or has been commented out, add it manually.

If the database is hosted on the Manager machine and was configured during a clean setup of the Red Hat Virtualization Manager, access is granted by default.

See Section B.2.1, “Migrating the Data Warehouse Database to a Separate Machine” for more information on how to configure and migrate the Data Warehouse database.

3. Restart the postgresql service:

```
# systemctl restart rh-postgresql10-postgresql
```

B.2.2.3. Configuring the New Data Warehouse Machine

The order of the questions shown in this step may differ depending on your environment.

1. If you are migrating both the **ovirt_engine_history** database and the Data Warehouse service to the **same** machine, run the following, otherwise proceed to the next step.

```
# sed -i '/^ENGINE_DB_/d' \
      /etc/ovirt-engine-dwh/ovirt-engine-dwhd.conf.d/10-setup-database.conf

# sed -i \
    -e 's;^\(OVESETUP_ENGINE_CORE/enable=bool\):True;\1:False;' \
    -e '/^OVESETUP_CONFIG\/fqdn/d' \
    /etc/ovirt-engine-setup.conf.d/20-setup-ovirt-post.conf
```

2. Run the **engine-setup** command to begin configuration of Data Warehouse on the machine:

```
# engine-setup
```

3. Press **Enter** to configure Data Warehouse:

```
Configure Data Warehouse on this host (Yes, No) [Yes]:
```

4. Press **Enter** to accept the automatically detected host name, or enter an alternative host name and press **Enter**:

```
Host fully qualified DNS name of this server [autodetected host name]:
```

5. Press **Enter** to automatically configure the firewall, or type **No** and press **Enter** to maintain existing settings:

```
Setup can automatically configure the firewall on this system.
Note: automatic configuration of the firewall may overwrite current settings.
Do you want Setup to configure the firewall? (Yes, No) [Yes]:
```

   If you choose to automatically configure the firewall, and no firewall managers are active, you are prompted to select your chosen firewall manager from a list of supported options. Type the name of the firewall manager and press **Enter**. This applies even in cases where only one option is listed.

6. Enter the fully qualified domain name and password for the Manager. Press **Enter** to accept the default values in each other field:

```
Host fully qualified DNS name of the engine server []: engine-fqdn
Setup needs to do some actions on the remote engine server. Either automatically, using ssh
as root to access it, or you will be prompted to manually perform each such action.
Please choose one of the following:
1 - Access remote engine server using ssh as root
2 - Perform each action manually, use files to copy content around
(1, 2) [1]:
ssh port on remote engine server [22]:
root password on remote engine server engine-fqdn: password
```

7. Enter the FQDN and password for the Manager database machine. Press **Enter** to accept the default values in each other field:

```
Engine database host []: manager-db-fqdn
Engine database port [5432]:
```

```
Engine database secured connection (Yes, No) [No]:
Engine database name [engine]:
Engine database user [engine]:
Engine database password: password
```

8. Confirm your installation settings:

```
Please confirm installation settings (OK, Cancel) [OK]:
```

The Data Warehouse service is now configured on the remote machine. Proceed to disable the Data Warehouse service on the Manager machine.

B.2.2.4. Disabling the Data Warehouse Service on the Manager Machine

1. On the Manager machine, restart the Manager:

```
# service ovirt-engine restart
```

2. Disable the Data Warehouse service:

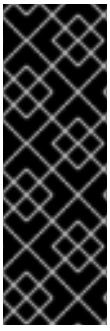
```
# systemctl disable ovirt-engine-dwhd.service
```

3. Remove the Data Warehouse files:

```
# rm -f /etc/ovirt-engine-dwh/ovirt-engine-dwhd.conf.d/* .conf /var/lib/ovirt-engine-dwh/backups/*
```

The Data Warehouse service is now hosted on a separate machine from the Manager.

B.3. MIGRATING THE WEBSOCKET PROXY TO A SEPARATE MACHINE



IMPORTANT

The websocket proxy and noVNC are Technology Preview features only. Technology Preview features are not supported with Red Hat production service-level agreements (SLAs) and might not be functionally complete, and Red Hat does not recommend using them for production. These features provide early access to upcoming product features, enabling customers to test functionality and provide feedback during the development process. For more information see Red Hat Technology Preview Features Support Scope.

For security or performance reasons the websocket proxy can run on a separate machine that does not run the Red Hat Virtualization Manager. The procedure to migrate the websocket proxy from the Manager machine to a separate machine involves removing the websocket proxy configuration from the Manager machine, then installing the proxy on the separate machine.

The **engine-cleanup** command can be used to remove the websocket proxy from the Manager machine:

Removing the Websocket Proxy from the Manager machine

1. On the Manager machine, run **engine-cleanup** to remove the required configuration.

```
# engine-cleanup
```

2. Type **No** when asked to remove all components and press **Enter**.

```
Do you want to remove all components? (Yes, No) [Yes]: No
```

3. Type **No** when asked to remove the engine and press **Enter**.

```
Do you want to remove the engine? (Yes, No) [Yes]: No
```

4. Type **Yes** when asked to remove the websocket proxy and press **Enter**.

```
Do you want to remove the WebSocket proxy? (Yes, No) [No]: Yes
```

Select **No** if asked to remove any other components.

Installing a Websocket Proxy on a Separate Machine

IMPORTANT

The websocket proxy and noVNC are Technology Preview features only. Technology Preview features are not supported with Red Hat production service-level agreements (SLAs) and might not be functionally complete, and Red Hat does not recommend using them for production. These features provide early access to upcoming product features, enabling customers to test functionality and provide feedback during the development process. For more information see Red Hat Technology Preview Features Support Scope.

The websocket proxy allows users to connect to virtual machines through a noVNC console. The noVNC client uses websockets to pass VNC data. However, the VNC server in QEMU does not provide websocket support, so a websocket proxy must be placed between the client and the VNC server. The proxy can run on any machine that has access to the network, including the the Manager machine.

For security and performance reasons, users may want to configure the websocket proxy on a separate machine.

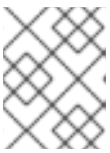
Procedure

1. Install the websocket proxy:

```
# yum install ovirt-engine-websocket-proxy
```

2. Run the **engine-setup** command to configure the websocket proxy.

```
# engine-setup
```



NOTE

If the **rhvm** package has also been installed, choose **No** when asked to configure the Manager (**Engine**) on this host.

3. Press **Enter** to allow **engine-setup** to configure a websocket proxy server on the machine.

```
Configure WebSocket Proxy on this machine? (Yes, No) [Yes]:
```

4. Press **Enter** to accept the automatically detected host name, or enter an alternative host name and press **Enter**. Note that the automatically detected host name may be incorrect if you are using virtual hosts:

```
Host fully qualified DNS name of this server [host.example.com]:
```

5. Press **Enter** to allow **engine-setup** to configure the firewall and open the ports required for external communication. If you do not allow **engine-setup** to modify your firewall configuration, then you must manually open the required ports.

```
Setup can automatically configure the firewall on this system.
Note: automatic configuration of the firewall may overwrite current settings.
Do you want Setup to configure the firewall? (Yes, No) [Yes]:
```

6. Enter the FQDN of the Manager machine and press **Enter**.

```
Host fully qualified DNS name of the engine server []: manager.example.com
```

7. Press **Enter** to allow **engine-setup** to perform actions on the Manager machine, or press **2** to manually perform the actions.

```
Setup will need to do some actions on the remote engine server. Either automatically, using
ssh as root to access it, or you will be prompted to manually perform each such action.
Please choose one of the following:
1 - Access remote engine server using ssh as root
2 - Perform each action manually, use files to copy content around
(1, 2) [1]:
```

   a. Press **Enter** to accept the default SSH port number, or enter the port number of the Manager machine.

```
ssh port on remote engine server [22]:
```

   b. Enter the root password to log in to the Manager machine and press **Enter**.

```
root password on remote engine server engine_host.example.com:
```

8. Select whether to review iptables rules if they differ from the current settings.

```
Generated iptables rules are different from current ones.
Do you want to review them? (Yes, No) [No]:
```

9. Press **Enter** to confirm the configuration settings.

```
--== CONFIGURATION PREVIEW ==--

Firewall manager                    : iptables
Update Firewall                     : True
Host FQDN                           : host.example.com
Configure WebSocket Proxy           : True
```

```
Engine Host FQDN                   : engine_host.example.com

Please confirm installation settings (OK, Cancel) [OK]:
```

Instructions are provided to configure the Manager machine to use the configured websocket proxy.

```
Manual actions are required on the engine host
in order to enroll certs for this host and configure the engine about it.

Please execute this command on the engine host:
   engine-config -s WebSocketProxy=host.example.com:6100
and than restart the engine service to make it effective
```

10. Log in to the Manager machine and execute the provided instructions.

```
# engine-config -s WebSocketProxy=host.example.com:6100
# systemctl restart ovirt-engine.service
```

APPENDIX C. CONFIGURING A HOST FOR PCI PASSTHROUGH

NOTE

This is one in a series of topics that show how to set up and configure SR-IOV on Red Hat Virtualization. For more information, see Setting Up and Configuring SR-IOV

Enabling PCI passthrough allows a virtual machine to use a host device as if the device were directly attached to the virtual machine. To enable the PCI passthrough function, you must enable virtualization extensions and the IOMMU function. The following procedure requires you to reboot the host. If the host is attached to the Manager already, ensure you place the host into maintenance mode first.

Prerequisites

- Ensure that the host hardware meets the requirements for PCI device passthrough and assignment. See PCI Device Requirements for more information.

Configuring a Host for PCI Passthrough

1. Enable the virtualization extension and IOMMU extension in the BIOS. See Enabling Intel VT-x and AMD-V virtualization hardware extensions in BIOS in the *Red Hat Enterprise Linux Virtualization Deployment and Administration Guide* for more information.
2. Enable the IOMMU flag in the kernel by selecting the **Hostdev Passthrough & SR-IOV** check box when adding the host to the Manager or by editing the **grub** configuration file manually.
   - To enable the IOMMU flag from the Administration Portal, see Adding Standard Hosts to the Red Hat Virtualization Manager and Kernel Settings Explained.
   - To edit the **grub** configuration file manually, see Enabling IOMMU Manually.
3. For GPU passthrough, you need to run additional configuration steps on both the host and the guest system. See Preparing Host and Guest Systems for GPU Passthrough for more information.

Enabling IOMMU Manually

1. Enable IOMMU by editing the grub configuration file.

NOTE

If you are using IBM POWER8 hardware, skip this step as IOMMU is enabled by default.

- For Intel, boot the machine, and append **intel_iommu=on** to the end of the **GRUB_CMDLINE_LINUX** line in the **grub** configuration file.

```
# vi /etc/default/grub
...
GRUB_CMDLINE_LINUX="nofb splash=quiet console=tty0 ... intel_iommu=on
...
```

- For AMD, boot the machine, and append **amd_iommu=on** to the end of the **GRUB_CMDLINE_LINUX** line in the **grub** configuration file.

```
# vi /etc/default/grub
...
GRUB_CMDLINE_LINUX="nofb splash=quiet console=tty0 ... amd_iommu=on
...
```

NOTE

If **intel_iommu=on** or **amd_iommu=on** works, you can try adding **iommu=pt** or **amd_iommu=pt**. The **pt** option only enables IOMMU for devices used in passthrough and provides better host performance. However, the option might not be supported on all hardware. Revert to previous option if the **pt** option doesn't work for your host.

If the passthrough fails because the hardware does not support interrupt remapping, you can consider enabling the **allow_unsafe_interrupts** option if the virtual machines are trusted. The **allow_unsafe_interrupts** is not enabled by default because enabling it potentially exposes the host to MSI attacks from virtual machines. To enable the option:

```
# vi /etc/modprobe.d
options vfio_iommu_type1 allow_unsafe_interrupts=1
```

2. Refresh the **grub.cfg** file and reboot the host for these changes to take effect:

```
# grub2-mkconfig -o /boot/grub2/grub.cfg
```

```
# reboot
```

To enable SR-IOV and assign dedicated virtual NICs to virtual machines, see https://access.redhat.com/articles/2335291.

APPENDIX D. REMOVING THE RED HAT VIRTUALIZATION MANAGER

You can use the **engine-cleanup** command to remove specific components or all components of the Red Hat Virtualization Manager.

NOTE

A backup of the Manager database and a compressed archive of the PKI keys and configuration are always automatically created. These files are saved under **/var/lib/ovirt-engine/backups/**, and include the date and **engine-** and **engine-pki-** in their file names respectively.

Procedure

1. Run the following command on the Manager machine:

```
# engine-cleanup
```

2. You are prompted whether to remove all Red Hat Virtualization Manager components:

   - Type **Yes** and press **Enter** to remove all components:

```
Do you want to remove all components? (Yes, No) [Yes]:
```

   - Type **No** and press **Enter** to select the components to remove. You can select whether to retain or remove each component individually:

```
Do you want to remove Engine database content? All data will be lost (Yes, No) [No]:
Do you want to remove PKI keys? (Yes, No) [No]:
Do you want to remove PKI configuration? (Yes, No) [No]:
Do you want to remove Apache SSL configuration? (Yes, No) [No]:
```

3. You are given another opportunity to change your mind and cancel the removal of the Red Hat Virtualization Manager. If you choose to proceed, the **ovirt-engine** service is stopped, and your environment's configuration is removed in accordance with the options you selected.

```
During execution engine service will be stopped (OK, Cancel) [OK]:
ovirt-engine is about to be removed, data will be lost (OK, Cancel) [Cancel]:OK
```

4. Remove the Red Hat Virtualization packages:

```
# yum remove rhvm* vdsm-bootstrap
```

APPENDIX E. SECURING RED HAT VIRTUALIZATION

This topic includes limited information about how to secure Red Hat Virtualization. This information will increase over time.

This information is specific to Red Hat Virtualization; it and does not cover fundamental security practices related to:

- Disabling unnecessary services
- Authentication
- Authorization
- Accounting
- Penetration testing and hardening of non-RHV services
- Encryption of sensitive application data

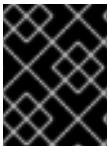
Prerequisites

- You should be proficient in your organization's security standards and practices. If possible, consult with your organization's Security Officer.
- Consult the Red Hat Enterprise Linux Security Guide before deploying RHEL-based hypervisors.

E.1. DISA STIG FOR RED HAT LINUX 7

The Defense Information Systems Agency (DISA) distributes Security Technical Implementation Guides (STIGs) for various platforms and operating systems.

While installing Red Hat Virtualization Host (RHVH), the **DISA STIG for Red Hat Linux 7**profile is one of the security policies available. Enabling this profile as your security policy during installation removes the need regenerate SSH keys, SSL certificates, or otherwise re-configure the host later in the deployment process.



IMPORTANT

The DISA STIG security policy is the only security policy that Red Hat officially tests and certifies.

DISA STIGs are "configuration standards for DOD IA and IA-enabled devices/systems. Since 1998, DISA has played a critical role in enhancing the security posture of DoD's security systems by providing the Security Technical Implementation Guides (STIGs). The STIGs contain technical guidance to 'lock down' information systems/software that might otherwise be vulnerable to a malicious computer attack."

These STIGs are based on requirements put forth by the National Institute of Standards and Technology (NIST) Special Publication 800-53, a catalog of security controls for all U.S. federal information systems except those related to national security.

To determine which various profiles overlap, Red Hat refers to the Cloud Security Alliance's Cloud Controls Matrix (CCM). This CCM specifies a comprehensive set of cloud-specific security controls, and maps each one to the requirements of leading standards, best practices, and regulations.

To help you verify your security policy, Red Hat provides OpenSCAP tools and Security Content Automation Protocol (SCAP) profiles for various Red Hat platforms, including RHEL and RHV.

Red Hat's OpenSCAP project provides open source tools for administrators and auditors to assess, measure, and enforce of SCAP baselines. NIST awarded SCAP 1.2 certification to OpenSCAP in 2014.

NIST maintains the SCAP standard. SCAP-compliant profiles provide detailed low-level guidance on setting the security configuration of operating systems and applications.

Red Hat publishes SCAP baselines for various products and platforms to two locations:

- The NIST National Checklist Program (NCP), the U.S. government repository of publicly available security checklists (or benchmarks).
- The Department of Defense (DoD) Cyber Exchange

Additional resources

- NIST National Checklist Program Repository for Red Hat
- The DoD Cyber Exchange download page for Unix/Linux-related STIGs
- NIST Special Publication 800-53 Rev. 4
- NIST Special Publication 800-53 Rev. 5 (DRAFT)
- The OpenSCAP Project
- Cloud Security Alliance: Cloud Controls Matrix

E.2. APPLYING THE DISA STIG FOR RED HAT LINUX 7 PROFILE

This topic shows you how to enable the *DISA STIG for Red Hat Linux 7* security profile while installing the Red Hat Virtualization (RHV) Manager ("the Manager"), the RHV Host (RHVH), and the Red Hat Enterprise Linux host (RHEL-H).

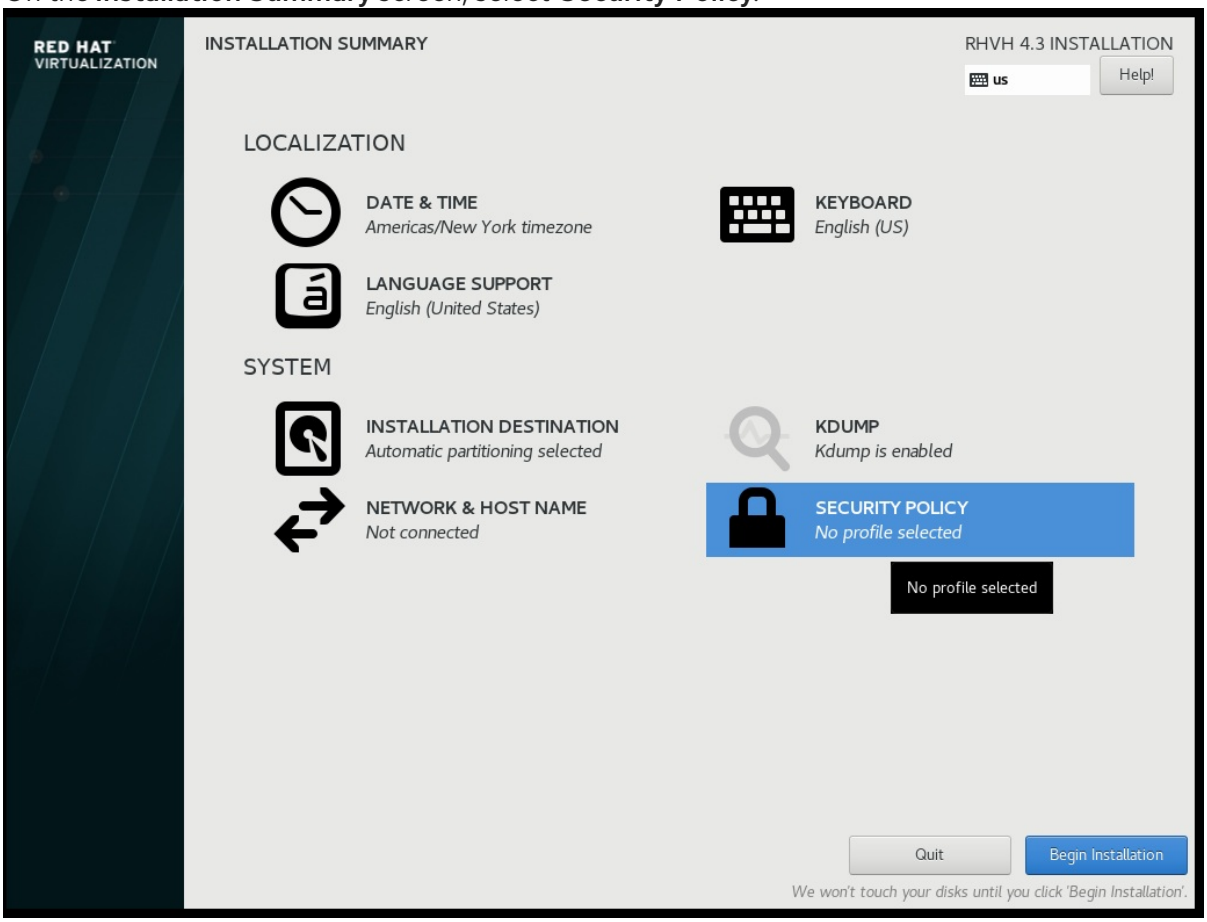
Enable DISA STIG for Red Hat Linux 7 for RHVH

The following procedure applies to installing Red Hat Virtual Host (RHVH) for two different purposes:

- Using RHVH as the host for the Manager virtual machine when you deploy RHV as a Self-Hosted Engine.
- Using RHVH as an ordinary host in an RHV cluster.

If you use the Anaconda installer to install RHVH:

1. On the **Installation Summary** screen, select **Security Policy**.



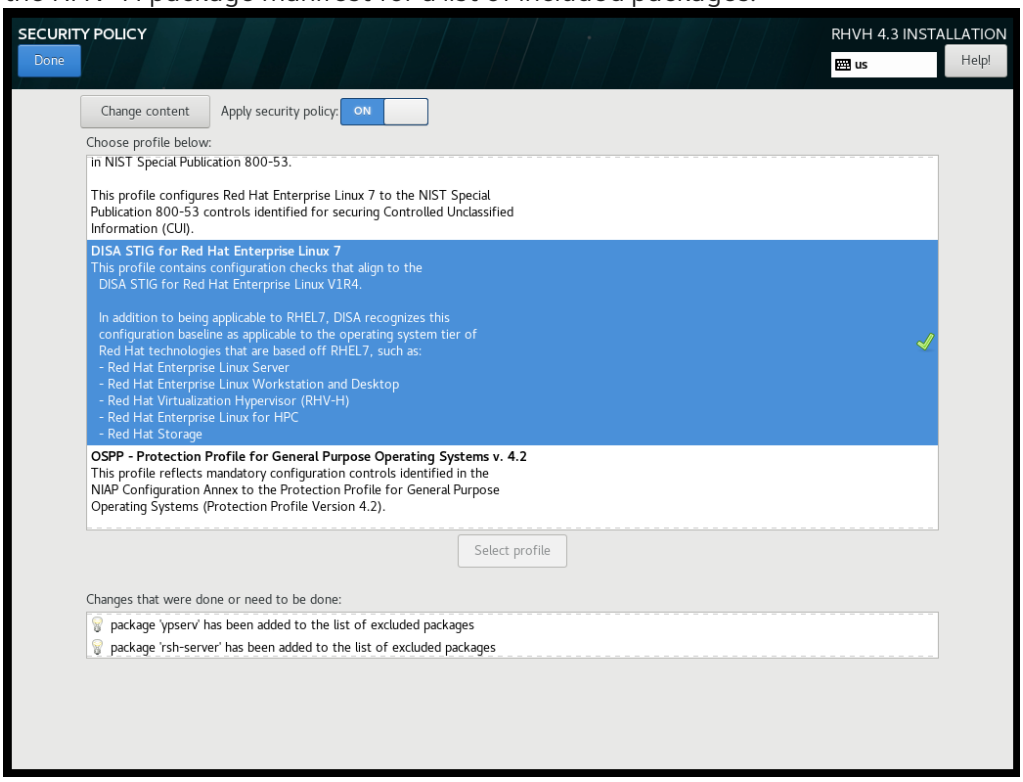
2. On the **Security Policy** screen that opens, toggle the **Apply security policy** setting to **On**.

3. Scroll down the list of profiles and select **DISA STIG for Red Hat Linux 7**

4. Click the **Select profile** button. This action adds a green checkmark next to the profile and adds packages to the list of **Changes that were done or need to be done**

NOTE

These packages are already part of the RHVH image. RHVH ships as a single system image. Installation of packages required by any other selected security profiles which are not part of the RHV-H image may not be possible. Please see the RHV-H package manifest for a list of included packages.

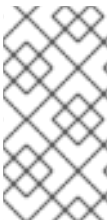


5. Click **Done**.

6. On the **Installation Summary** screen, verify that the status of **Security Policy** is **Everything okay**.

7. Later, when you log into RHVH, the command line displays the following information.

```
You are accessing a U.S. Government (USG) Information System (IS) that is
provided for USG-authorized use only. By using this IS (which includes any
device attached to this IS), you consent to the following conditions:

-The USG routinely intercepts and monitors communications on this IS for
purposes including, but not limited to, penetration testing, COMSEC monitoring,
network operations and defense, personnel misconduct (PM), law enforcement
(LE), and counterintelligence (CI) investigations.

-At any time, the USG may inspect and seize data stored on this IS.

-Communications using, or data stored on, this IS are not private, are subject
to routine monitoring, interception, and search, and may be disclosed or used
for any USG-authorized purpose.

-This IS includes security measures (e.g., authentication and access controls)
to protect USG interests--not for your personal benefit or privacy.

-Notwithstanding the above, using this IS does not constitute consent to PM, LE
or CI investigative searching or monitoring of the content of privileged
communications, or work product, related to personal representation or services
by attorneys, psychotherapists, or clergy, and their assistants. Such
communications and work product are private and confidential. See User
Agreement for details.

localhost login:
```



NOTE

If you deploy RHV as a Self-Hosted Engine using the command line , during the series of prompts after you enter **ovirt-hosted-engine-setup**, the command line will ask **Do you want to apply a default OpenSCAP security profile?** Enter **Yes** and follow the instructions to select the *DISA STIG for Red Hat Linux 7* profile.

Additional resources

- Configuring and Applying SCAP Policies During Installation