



Red Hat Virtualization 4.1

Planning and Prerequisites Guide

Planning for the Installation and Configuration of Red Hat Virtualization 4.1

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Planning for the Installation and Configuration of Red Hat Virtualization 4.1

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Abstract

This document provides requirements, options, and recommendations for Red Hat Virtualization environments.

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CHAPTER 1. INTRODUCTION

Red Hat Virtualization is made up of connected components that each play different roles in the environment. Planning and preparing for their requirements in advance helps these components communicate and run efficiently.

This guide covers:

- Hardware and security requirements
- The options available for various components
- Recommendations for optimizing your environment

1.1. MINIMUM ARCHITECTURE

The minimum setup of a standalone Manager environment includes:

- One Red Hat Virtualization Manager machine.
- A minimum of two hosts for virtual machine high availability.
- One storage service, which must be accessible to all hosts.

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

- One Red Hat Virtualization Manager virtual machine that is hosted on one of the self-hosted engine nodes.
- A minimum of two self-hosted engine nodes for virtual machine high availability.
- One storage service, which must be accessible to all hosts.

For more details, see [Architecture](#) in the *Product Guide*.

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 User 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
Tier 2	Windows	Internet Explorer 11 or later
	Any	Most recent version of Google Chrome or Mozilla Firefox
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 Supported Components](#) in the *Virtual Machine Management Guide*. Installing **virt-viewer** requires Administrator privileges.

Console access on other operating systems, such as OS X, is available only through the unsupported SPICE HTML5 browser client. Virtual machine consoles are accessed through the SPICE protocol. The QXL graphical driver can be installed in the guest operating system for improved/enhanced SPICE functionalities.

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 documented in the *Installation Guide*.

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>.

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 G1
 - Opteron G2
 - Opteron G3
 - Opteron G4
 - Opteron G5
- Intel
 - Conroe
 - Penryn
 - Nehalem
 - Westmere
 - Sandybridge

- Haswell
- Haswell-noTSX
- Broadwell
- Broadwell-noTSX
- Skylake
- 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 is 2 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 local storage to store configuration, logs, kernel dumps, and for use as swap space. The minimum storage requirements of Red Hat Virtualization Host 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 Red Hat Virtualization Host.

These are the minimum storage requirements for host installation. 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/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 - 45 GB**

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

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. Hardware Requirements For Device Assignment

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 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.

See: [Configuring a Host for PCI Passthrough](#) in the *Installation Guide*.

2.3. NETWORKING REQUIREMENTS

2.3.1. DNS Requirements

The Manager and all hosts must have a fully qualified domain name and full, perfectly aligned forward and reverse name resolution. Red Hat strongly recommends using DNS; using the `/etc/hosts` file for name resolution typically requires more work and has a greater chance for errors.

Due to the extensive use of DNS in a Red Hat Virtualization environment, running the environment's DNS service as a virtual machine hosted in the environment is not supported. All DNS services that the Red Hat Virtualization environment uses for name resolution must be hosted outside of the environment.

2.3.2. 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.

Table 2.4. Red Hat Virtualization Manager Firewall Requirements

Port(s)	Protocol	Source	Destination	Purpose
-	ICMP	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	Red Hat Virtualization Manager	Optional. May help in diagnosis.
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.

Port(s)	Protocol	Source	Destination	Purpose
2222	TCP	Clients accessing virtual machine serial consoles.	Red Hat Virtualization Manager	Secure Shell (SSH) access to enable connection to virtual machine serial consoles.
80, 443	TCP	Administration Portal clients User Portal clients Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s) REST API clients	Red Hat Virtualization Manager	Provides HTTP and HTTPS access to the Manager.
6100	TCP	Administration Portal clients User Portal clients	Red Hat Virtualization Manager	Provides websocket proxy access for web-based console clients (noVNC and spice-htm15) 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.
7410	UDP	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	Red Hat Virtualization Manager	Must be open for the Manager to receive Kdump notifications, if Kdump is enabled.
54323	TCP	Administration Portal clients	Red Hat Virtualization Manager (ImageIO Proxy server)	Required for communication with the ImageIO Proxy (ovirt-imageio-proxy).

2.3.3. 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>.

Table 2.5. Virtualization Host Firewall Requirements

Port(s)	Protocol	Source	Destination	Purpose
22	TCP	Red Hat Virtualization Manager	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	Secure Shell (SSH) access. Optional.
2223	TCP	Red Hat Virtualization Manager	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	Secure Shell (SSH) access to enable connection to virtual machine serial consoles.
161	UDP	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	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.
111	TCP	NFS storage server	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	NFS connections. Optional.

Port(s)	Protocol	Source	Destination	Purpose
5900 - 6923	TCP	Administration Portal clients User Portal clients	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	Remote guest console access via VNC and SPICE. These ports must be open to facilitate client access to virtual machines.
5989	TCP, UDP	Common Information Model Object Manager (CIMOM)	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	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.
9090	TCP	Red Hat Virtualization Manager Client machines	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	Required to access the Cockpit user interface, if installed.
16514	TCP	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	Virtual machine migration using libvirt .
49152 - 49216	TCP	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	Virtual machine migration and fencing using VDSM. These ports must be open to facilitate both automated and manual migration of virtual machines.

Port(s)	Protocol	Source	Destination	Purpose
54321	TCP	Red Hat Virtualization Manager Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	VDSM communications with the Manager and other virtualization hosts.
54322	TCP	Red Hat Virtualization Manager (ImageIO Proxy server)	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	Required for communication with the ImageIO daemon (ovirt-imageio-daemon).
6081	UDP	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	Red Hat Virtualization Host(s) Red Hat Enterprise Linux host(s)	Required, when Open Virtual Network (OVN) is used as a network provider, to allow OVN to create tunnels between hosts.

2.3.4. 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. Accessing the Manager database from external systems is not supported.

Table 2.6. Database Server Firewall Requirements

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

CHAPTER 3. CONSIDERATIONS

This chapter describes the advantages, limitations, and available options for various Red Hat Virtualization components.

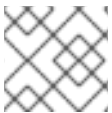
3.1. HOST TYPES

Use the host type that best suits your environment. You can also use both types of host in the same cluster if required.

3.1.1. Red Hat Virtualization Hosts

Red Hat Virtualization Hosts (RHVH) have the following advantages over Red Hat Enterprise Linux hosts:

- RHVH is included in the subscription for Red Hat Virtualization. Red Hat Enterprise Linux hosts may require additional subscriptions.
- RHVH is deployed as a single image. This results in a streamlined update process; the entire image is updated as a whole, as opposed to packages being updated individually.
- Only the packages and services needed to host virtual machines or manage the host itself are included. This streamlines operations and reduces the overall attack vector; unnecessary packages and services are not deployed and, therefore, cannot be exploited.
- The Cockpit user interface is available by default and includes extensions specific to Red Hat Virtualization, including virtual machine monitoring tools and a GUI installer for the self-hosted engine. Cockpit is supported on Red Hat Enterprise Linux hosts, but must be manually installed.



NOTE

Importing RHVH images into Satellite from configured repositories is not supported.

3.1.2. Red Hat Enterprise Linux Hosts

Red Hat Enterprise Linux hosts have the following advantages over Red Hat Virtualization Hosts:

- Red Hat Enterprise Linux hosts are highly customizable, so may be preferable if, for example, your hosts require a specific file system layout.
- Red Hat Enterprise Linux hosts are better suited for frequent updates, especially if additional packages are installed. Individual packages can be updated, rather than a whole image.

3.2. STORAGE TYPES

A storage domain can be made of either block devices (iSCSI or Fibre Channel) or a file system.

The following storage types are supported for use as data storage domains. ISO and export storage domains only support file-based storage types. The ISO domain supports local storage when used in a local storage data center.



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.

See:

- [Storage](#) in the *Administration Guide*.
- [Red Hat Enterprise Linux Storage Administration Guide](#)

3.2.1. NFS

NFS versions 3 and 4 are supported by Red Hat Virtualization 4. Production workloads require an enterprise-grade NFS server, unless NFS is only being used as an ISO storage domain. When enterprise NFS is deployed over 10GbE, segregated with VLANs, and individual services are configured to use specific ports, it is both fast and secure.

As NFS exports are grown to accommodate more storage needs, Red Hat Virtualization recognizes the larger data store immediately. No additional configuration is necessary on the hosts or from within Red Hat Virtualization. This provides NFS a slight edge over block storage from a scale and operational perspective.

See:

- [Network File System \(NFS\)](#) in the *Red Hat Enterprise Linux Storage Administration Guide*.
- [Preparing and Adding NFS Storage](#) in the *Administration Guide*.

3.2.2. iSCSI

Production workloads require an enterprise-grade iSCSI server. When enterprise iSCSI is deployed over 10GbE, segregated with VLANs, and utilizes CHAP authentication, it is both fast and secure.

iSCSI can also use multipathing to improve high availability.

See:

- [Online Storage Management](#) in the *Red Hat Enterprise Linux Storage Administration Guide*.
- [Adding iSCSI Storage](#) in the *Administration Guide*.

3.2.3. Fibre Channel

Fibre Channel is both fast and secure, and should be taken advantage of if it is already in use in the target data center. It also has the advantage of low CPU overhead as compared to iSCSI and NFS.

Fibre Channel can also use multipathing to improve high availability.

See:

- [Online Storage Management](#) in the *Red Hat Enterprise Linux Storage Administration Guide*.
- [Adding FCP Storage](#) in the *Administration Guide*.

3.2.4. Fibre Channel over Ethernet

To use Fibre Channel over Ethernet (FCoE) in Red Hat Virtualization, you must enable the **fcoe** key on the Manager, and install the *vdsm-hook-fcoe* package on the hosts.

See:

- [Online Storage Management](#) in the *Red Hat Enterprise Linux Storage Administration Guide*.
- [How to Set Up Red Hat Virtualization Manager to Use FCoE](#) in the *Administration Guide*.

3.2.5. Red Hat Gluster Storage

Red Hat Gluster Storage (RHGS) is a POSIX-compliant and open source file system. Three or more servers are configured as a Red Hat Gluster Storage cluster, instead of network-attached storage (NAS) appliances or a storage area network (SAN) array.

Red Hat Gluster Storage should be utilized over 10GbE and segregated with VLANs.

Check the compatibility matrix in <https://access.redhat.com/articles/2356261> before using RHGS with Red Hat Virtualization.

See:

- [Red Hat Gluster Storage](#)
- [Configuring Red Hat Virtualization with Red Hat Gluster Storage](#)

3.2.6. Red Hat Hyperconverged Infrastructure

Red Hat Hyperconverged Infrastructure (RHHI) combines Red Hat Virtualization and Red Hat Gluster Storage on the same infrastructure, instead of connecting Red Hat Virtualization to a remote Red Hat Gluster Storage server. This compact option reduces operational expenses and overhead.

See:

- [Deploying Red Hat Hyperconverged Infrastructure](#)
- [Maintaining Red Hat Hyperconverged Infrastructure](#)

3.2.7. Red Hat Ceph File System

Red Hat Ceph File System (CephFS) is a file system compatible with POSIX standards that uses a Ceph Storage Cluster to store its data. No special configuration is required on the Red Hat Virtualization side when adding CephFS as a storage domain; it is added the same way as any other POSIX-compliant FS storage.

See: [Ceph File System Guide](#)

3.2.8. POSIX-Compliant FS

Other POSIX-compliant file systems can be used as storage domains in Red Hat Virtualization, as long as they are clustered file systems, such as Red Hat Global File System 2 (GFS2), and support sparse files and direct I/O. The Common Internet File System (CIFS), for example, does not support direct I/O, making it incompatible with Red Hat Virtualization.

See:

- [Red Hat Enterprise Linux Global File System 2](#)
- [Adding POSIX Compliant File System Storage](#) in the *Administration Guide*.

3.2.9. Local Storage

Local storage is set up on an individual host, using the host's own resources. When you set up a host to use local storage, it is automatically added to a new data center and cluster that no other hosts can be added to. Virtual machines created in a single-host cluster cannot be migrated, fenced, or scheduled.

See: [Preparing and Adding Local Storage](#) in the *Administration Guide*.

3.3. NETWORKING CONSIDERATIONS

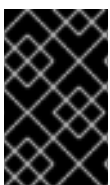
Familiarity with network concepts and their use is highly recommended when planning and setting up networking in a Red Hat Virtualization environment. Read your network hardware vendor's guides for more information on managing networking.

Logical networks may be supported using physical devices such as NICs, or logical devices such as network bonds. Bonding improves high availability, and provides increased fault tolerance, because all network interface cards in the bond must fail for the bond itself to fail. Bonding modes 1, 2, 3, and 4 support both virtual machine and non-virtual machine network types. Modes 0, 5, and 6 only support non-virtual machine networks. Red Hat Virtualization uses Mode 4 by default.

It is not necessary to have one device for each logical network, as multiple logical networks can share a single device by using Virtual LAN (VLAN) tagging to isolate network traffic. To make use of this feature, VLAN tagging must also be supported at the switch level.

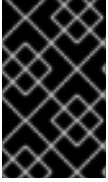
The limits that apply to the number of logical networks that you may define in a Red Hat Virtualization environment are:

- The number of logical networks attached to a host is limited to the number of available network devices combined with the maximum number of Virtual LANs (VLANs), which is 4096.
- The number of networks that can be attached to a host in a single operation is currently limited to 50.
- The number of logical networks in a cluster is limited to the number of logical networks that can be attached to a host as networking must be the same for all hosts in a cluster.
- The number of logical networks in a data center is limited only by the number of clusters it contains in combination with the number of logical networks permitted per cluster.



IMPORTANT

Take additional care when modifying the properties of the Management network (**ovirtmgmt**). Incorrect changes to the properties of the **ovirtmgmt** network may cause hosts to become unreachable.



IMPORTANT

If you plan to use Red Hat Virtualization to provide services for other environments, remember that the services will stop if the Red Hat Virtualization environment stops operating.

3.4. DIRECTORY SERVER SUPPORT

During installation, Red Hat Virtualization Manager creates a default **admin** user in a default **internal** domain. This account is intended for use when initially configuring the environment, and for troubleshooting. You can create additional users on the **internal** domain using **ovirt-aaa-jdbc-tool**. User accounts created on local domains are known as local users. See [Administering User Tasks From the Command Line](#) in the *Administration Guide*.

You can also attach an external directory server to your Red Hat Virtualization environment and use it as an external domain. User accounts created on external domains are known as directory users. Attachment of more than one directory server to the Manager is also supported.

The following directory servers are supported for use with Red Hat Virtualization. For more detailed information on installing and configuring a supported directory server, see the vendor's documentation.

Active Directory

<https://docs.microsoft.com/en-us/windows-server/identity/identity-and-access>

Identity Management (IdM - based on IPA)

https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/7/html/Linux_Domain_Identity_Authentication_and_Policy_Guide/index.html

Red Hat Directory Server 9 (RHDS 9 - based on 389DS)

<https://access.redhat.com/documentation/en/red-hat-directory-server/>

OpenLDAP

<http://www.openldap.org/doc/>

IBM Security (Tivoli) Directory Server

https://www.ibm.com/support/knowledgecenter/SSVJJU_6.4.0/com.ibm.IBMDS.doc_6.4/welcome.html



IMPORTANT

A user with permissions to read all users and groups must be created in the directory server specifically for use as the Red Hat Virtualization administrative user. Do **not** use the administrative user for the directory server as the Red Hat Virtualization administrative user.

See: [Users and Roles](#) in the *Administration Guide*.

3.5. INFRASTRUCTURE CONSIDERATIONS

3.5.1. Local or Remote Hosting

The following components can be hosted on either the Manager or a remote machine. Keeping all components on the Manager machine is easier and requires less maintenance, so is preferable when performance is not an issue. Moving components to a remote machine requires more maintenance, but it improves the performance of both the Manager and the Data Warehouse.

Data Warehouse

To host Data Warehouse on the Manager, select **Yes** when prompted by **engine-setup**.

To host Data Warehouse on a remote machine, select **No** when prompted by **engine-setup**, and see [Installing and Configuring Data Warehouse on a Separate Machine](#) in the *Data Warehouse Guide*.

To migrate Data Warehouse post-installation, see [Migrating Data Warehouse to a Separate Machine](#) in the *Data Warehouse Guide*.

Manager database

To host the Manager database on the Manager, select **Local** when prompted by **engine-setup**.

To host the Manager database on a remote machine, see [Preparing a Remote PostgreSQL Database for Use with the Red Hat Virtualization Manager](#) in the *Installation Guide* before running **engine-setup** on the Manager.

To migrate the Manager database post-installation, see [Migrating the Engine Database to a Remote Server Database](#) in the *Administration Guide*.

Websocket proxy

To host the websocket proxy on the Manager, select **Yes** when prompted by **engine-setup**.

To host the websocket proxy on a remote machine, select **No** when prompted by **engine-setup**, and see [Installing a Websocket Proxy on a Separate Machine](#) in the *Installation Guide*.

To migrate the websocket proxy post-installation, see [Migrating the Websocket Proxy to a Separate Machine](#) in the *Administration Guide*.



IMPORTANT

Self-hosted engine environments use an appliance to install and configure the Manager virtual machine, so Data Warehouse, the Manager database, and the websocket proxy can only be made external post-installation.

3.5.2. Remote Hosting Only

The following components must be hosted on a remote machine:

DNS

Due to the extensive use of DNS in a Red Hat Virtualization environment, running the environment's DNS service as a virtual machine hosted in the environment is not supported.

Storage

With the exception of [local storage](#) and [Red Hat Hyperconverged Infrastructure](#), the storage service must not be on the same machine as the Manager or any host.

Identity Management

IdM (**ipa-server**) is incompatible with the **mod_ssl** package, which is required by the Manager.

CHAPTER 4. RECOMMENDATIONS

This chapter describes configuration that is not strictly required, but may improve the performance or stability of your environment.

4.1. GENERAL RECOMMENDATIONS

- Take a full backup as soon as the deployment is complete, and store it in a separate location. Take regular backups thereafter. See [Backups and Migration](#) in the *Administration Guide*.
- Avoid running any service that Red Hat Virtualization depends on as a virtual machine in the same environment. If this is done, it must be planned carefully to minimize downtime, if the virtual machine containing that service incurs downtime.
- Ensure the bare-metal host or virtual machine that the Red Hat Virtualization Manager will be installed on has enough entropy. Values below 200 can cause the Manager setup to fail. To check the entropy value, run `cat /proc/sys/kernel/random/entropy_avail`. To increase entropy, install the `rng-tools` package and follow the steps in <https://access.redhat.com/solutions/1395493>.
- You can automate the deployment of hosts and virtual machines using PXE, Kickstart, Satellite, CloudForms, Ansible, or a combination thereof. However, installing a self-hosted engine using PXE is not supported. See:
 - [Automating Red Hat Virtualization Host Deployment](#) in the *Installation Guide*, for the additional requirements for automated RHVH deployment using PXE and Kickstart.
 - [Preparing for a Network Installation](#) in the *Red Hat Enterprise Linux 7 Installation Guide*.
 - [Kickstart Installations](#) in the *Red Hat Enterprise Linux 7 Installation Guide*.
 - [Red Hat Satellite 6.2 Provisioning Guide](#)
 - [Red Hat CloudForms 4.5 Provisioning Virtual Machines and Hosts](#)
 - [Automating Configuration Tasks using Ansible](#) in the *Administration Guide*.
- Set the system time zone for all machines in your deployment to UTC. This ensures that data collection and connectivity are not interrupted by variations in your local time zone, such as daylight savings time.
- Use Network Time Protocol (NTP) on all hosts and virtual machines in the environment in order to synchronize time. Authentication and certificates are particularly sensitive to time skew. Using `chronyd` is recommended over `ntpd`. See the following sections of the *Red Hat Enterprise Linux 7 System Administrator's Guide*:
 - [Configuring NTP Using the chrony Suite](#)
 - [Synchronizing the System Clock with a Remote Server](#)
- Document everything, so that anyone who works with the environment is aware of its current state and required procedures.

4.2. SECURITY RECOMMENDATIONS

- Do not disable any security features (such as HTTPS, SELinux, and the firewall) on the hosts or virtual machines.
- Register all hosts and Red Hat Enterprise Linux virtual machines to either the Red Hat Content Delivery Network or Red Hat Satellite in order to receive the latest security updates and errata.
- Create individual administrator accounts, instead of allowing many people to use the default **admin** account, for proper activity tracking.
- Limit access to the hosts and create separate logins. Do not create a single **root** login for everyone to use. See [Managing Users and Groups](#) in the *Red Hat Enterprise Linux 7 System Administrator's Guide*.
- Do not create untrusted users on hosts.
- When deploying the Red Hat Enterprise Linux hosts, only install packages and services required to satisfy virtualization, performance, security, and monitoring requirements. Production hosts should not have additional packages such as analyzers, compilers, or other components that add unnecessary security risk.

4.3. HOST RECOMMENDATIONS

- Standardize the make, model, hardware, and firmware/BIOS version of hosts in the same cluster. Mixing different makes of servers within the same cluster does not provide consistent performance from host to host.
- Although running both RHEL hosts and RHVH in the same cluster is supported, Red Hat recommends having, and documenting, a business or technical use case behind the mixed design.
- Configure fencing devices at deployment time. Fencing devices are required for high availability.
- Use separate hardware switches for fencing traffic. If monitoring and fencing go over the same switch, that switch becomes a single point of failure for high availability.

4.4. NETWORKING RECOMMENDATIONS

- Bond network interfaces, especially on production hosts. Bonding improves the overall availability of service, as well as network bandwidth. See [Bonds](#) in the *Administration Guide*.
- For optimal performance and simplified troubleshooting, use VLANs to separate different traffic types and make the best use of 10GbE or 40GbE networks.
- 1GbE networks should only be used for management traffic. Use 10GbE or 40GbE for virtual machines and Ethernet-based storage.
- If additional physical interfaces are added to a host for storage use, uncheck **VM traffic** so that the VLAN is assigned directly to the physical interface.
- If Red Hat OpenStack Platform is already deployed, integrate Red Hat Virtualization with OpenStack Networking (neutron) to add Open vSwitch capabilities.

4.5. SELF-HOSTED ENGINE RECOMMENDATIONS

- Create a separate data center and cluster for the Red Hat Virtualization Manager and other

infrastructure-level services, if the environment is large enough to allow it. Although the Manager virtual machine can run on hosts in a regular cluster, separation from production virtual machines helps facilitate backup schedules, performance, availability, and security.

- A storage domain dedicated to the Manager virtual machine is created during self-hosted engine deployment. Do not use this storage domain for any other virtual machines.
- If you are anticipating heavy storage workloads, separate the migration, management, and storage networks to reduce the impact on the Manager virtual machine's health.
- Although there is technically no hard limit on the number of hosts per cluster, Red Hat recommends limiting self-hosted engine nodes to 7 nodes per cluster. Distribute the servers in a way that allows better resilience (such as in different racks).
- All self-hosted engine nodes should have an equal CPU family so that the Manager virtual machine can safely migrate between them. If you intend to have various families, begin the installation with the lowest one.
- If the Manager virtual machine shuts down or needs to be migrated, there must be enough memory on a self-hosted engine node for the Manager virtual machine to restart on or migrate to it.